East Palestine Train Derailment Site
East Palestine, OH

AIR SAMPLING AND ANALYSIS PLAN (SAP)

Version 2.1

Prepared on Behalf of:
Norfolk Southern Railway Company

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LIST OF ACRONYMS/ABBREVIATIONS AND TERMS WITH DEFINITIONS

ACRONYM / ABBREVIATION /TERM	DEFINITION OR EXPLANATION
Ambient Air	The portion of the atmosphere, external to buildings, to which the general public has access
ARF	Analytical Request Form
ATSDR	Agency for Toxic Substances and Disease Registry
Breathing Zone	The area within an approximate 10-inch radius of an individual's nose and mouth
CA	Corrective Action
CCV	Continuing Calibration Verification
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
COC	Chain of Custody
COI	Constituent of Interest
CRDL	Contract-Required Detection Limit
CSM	Conceptual Site Model
CTEH	Center for Toxicology and Environmental Health, LLC
DMP	Data Management Plan
DQI	Data Quality Indicator
DQO	Data Quality Objective
EDD	Electronic Data Deliverable
EMA	Emergency Management Agency
EPA	Environmental Protection Agency
FB	Field Blank
FSP	Field Sampling Plan
GC	Gas Chromatograph
GIS	Geographic Information System
GPS	Global Positioning System
IAP	Incident Action Plan
IC	Incident Command
ICAL	Initial Calibration
ICV	Initial Calibration Verification
LCS	Laboratory Control Sample
LIMS	Laboratory Information Management Systems
LOQ	Limit of Quantitation
MB	Method Blank
MCL	Maximum Contaminant Level
MDL	Method Detection Limit
MPC	Measurement Performance Criteria

ACRONYM / ABBREVIATION /TERM	DEFINITION OR EXPLANATION
MS/MSD	Matrix Spike/Matrix Spike Duplicate
NSRC	Norfolk Southern Railway Company
O_2	Oxygen
ODNR	Ohio Department of Natural Resources
OSC	On-Scene Coordinators
PARCC	Precision, Accuracy, Representativeness, Completeness, and Comparability
PAL	Project Action Level
PDF	Portable Document Format
PID	Photoionization Detector
PM	Project Manager
PRQL	Project-Required Quantitation Limit
PT	Proficiency Testing (previously known as performance evaluation (PE) sample)
PTR-MS	Proton Transfer Reaction-Mass Spectrometry
QA	Quality Assurance
QAPP	Quality Assurance Project Plan
QC	Quality Control
ODH	Ohio Department of Health
OEPA	Ohio Environmental Protection Agency
QL	Quantitation Limit
QS	Quality System
OSC	On-Scene Coordinator
QSM	Quality Systems Manual
RPD	Relative Percent Difference
RSD	Relative Standard Deviation
RT	Retention Time
QAPP	Quality Assurance Project Plan
SAP	Sampling and Analysis Plan
SD	Standard Deviation
SDG	Sample Delivery Group
SOP	Standard Operating Procedure
SQLs	Sample Quantitation Limits
SRM	Standard Reference Material
Sustained	Instrument reading above the action level continuously for the listed time period
TAGA	Trace Atmospheric Gas Analyzer
TBD	To Be Determined
TIC	Tentatively Identified Compound

ACRONYM / ABBREVIATION /TERM	DEFINITION OR EXPLANATION
TNI	The NELAC Institute
UAO	Unilateral Administrative Order
UC	Unified Command
UFP	Uniform Federal Policy
USEPA	United States Environmental Protection Agency
VC	Vinyl chloride
VOC	Volatile Organic Compounds
WP	Work Plan

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1.0 INTRODUCTION

On February 3, 2023, at approximately 20:55 EST, a train derailment occurred near Taggart Road in East Palestine, Columbiana County, Ohio (hereinafter referred to as the "East Palestine Train Derailment Site" or the "Site"). Norfolk Southern Railway Company (NSRC) reported the incident at 22:53 EST to the National Response Center. At that time, it was reported that an unknown number of train cars had derailed. Later, it was verified that the train consisted of 149 rail cars, 50 of which were affected by the derailment and the rest of which were uncoupled and removed from the site. The rail cars directly impacted by the derailment contained both hazardous materials (e.g., vinyl chloride, butyl acrylate, ethylhexyl acrylate, ethylene glycol monobutyl ether, isobutylene) and non-hazardous materials (e.g., wheat, plastic pellets, malt liquors). The derailment resulted in a large fire affecting numerous rail cars, including rail cars carrying hazardous materials that were breached and/or burning. In response to the derailment, Center for Toxicology and Environmental Health, LLC (CTEH) was mobilized on behalf of NSRC to perform air monitoring and sampling for public health and worker safety.

Federal, state, and local officials, along with NSRC representatives and contractors, mobilized to the site after the derailment, including representatives of the United States Environmental Protection Agency (US EPA), EPA Superfund Technical Assessment Response Team (START), Ohio Environmental Protection Agency (OEPA), Pennsylvania Department of Environmental Protection (PA DEP), Ohio Department of Natural Resources (ODNR), Columbiana County Emergency Management Agency (CCEMA), Butler County Incident Management Team (IMT), Village of East Palestine, NSRC and its contractor CTEH, LLC (CTEH), the Federal Railroad Administration (FRA), and the National Transportation Safety Board (NTSB).

1.1 Site History

There are no known previous releases at the Site. Thus, this section will focus on further information relevant to the incident and the purpose of this Air Sampling and Analysis Plan (SAP). Releases of hazardous substances occurred after the derailment and subsequent fires. Hazardous substances spilled from the rail cars, and when smoke from burning rail cars was produced, hazardous substances including vinyl chloride, phosgene, and hydrogen chloride were released. Releases to surface water occurred when liquid product exited rail cars and also when run-off from firefighting efforts at the derailment location moved through a ditch to Sulphur Run, which joins Leslie Run, to Bull Creek, to North Fork Little Beaver Creek, to Little Beaver Creek, and then the Ohio River. Releases to soil occurred when liquid product exited rail cars.

In response to the incident, NSRC immediately mobilized response personnel to the incident to stop, contain, and recover the released content and rail cars and tank cars. That work continues and has expanded to include efforts to assess the nature and extent of the potential impacts to human health and the environment and to plan and implement actions to address any impacts to provide short- and long-term protection of human health and the environment. Subsequent emergency response activities continue, as well as operations that previously occurred, including the controlled "vent and burn" that occurred on February 6, 2023.

CTEH developed an Air SAP prior to arrival on-site. Over the course of a few weeks, revisions were made to the SAP (i.e., versions 1.0 to 1.6) to account for updated analytes, operations, and site conditions. Version 2.0 of this Air SAP was prepared to comply with this Uniform Federal Policy (UFP) for this Air SAP in response to the Unilateral Administrative Order (UAO) for Removal Actions (hereinafter, UAO) after preparing the Uniform Federal Policy (UFP), which was effective February 27, 2023.

This SAP addresses the requirements set forth in Section XI (paragraph 40) and Section XII (paragraphs 47 and 48) of the UAO for activities associated with the immediate response for air monitoring and sampling activities performed by CTEH on behalf of NSRC. At the time of development, many aspects of the investigation/delineation and remediation activities are in planning stages and are not yet final or approved. Accordingly, this SAP provides overall guidance and is intended to assist CTEH in documenting the procedural and analytical requirements for the East Palestine Derailment project involving air monitoring and sampling activities conducted to characterize areas of potential environmental contamination. This document combines the basic elements of the QAPP and a field sampling plan (FSP).

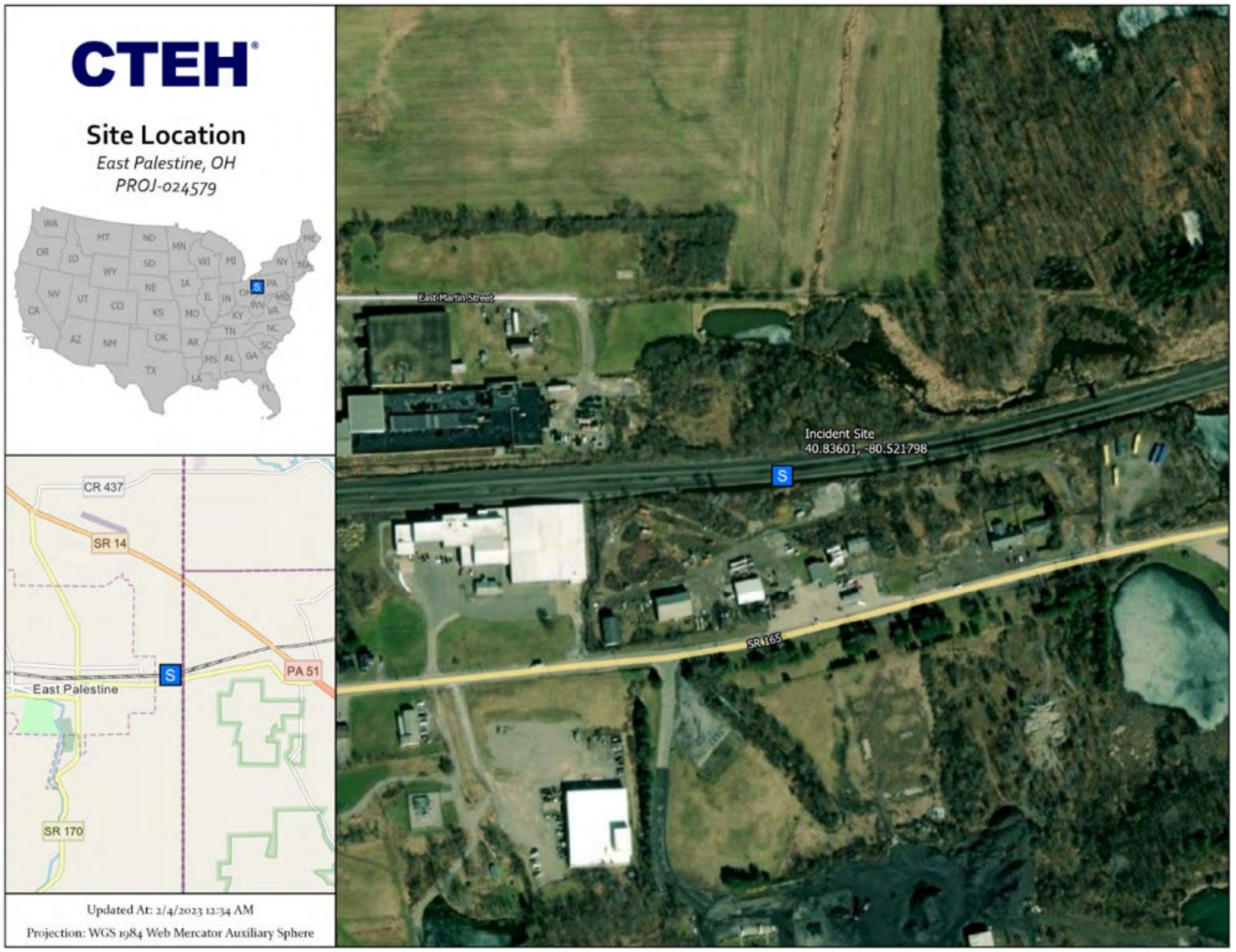
Within the framework of the UAO, this SAP will be updated to include QA requirements for additional investigation/delineation and remediation activities as operational activities change, sampling or monitoring is transitioned, or until CTEH is demobilized from the project. Quality objectives associated assessment and remediation of the Site include:

- NSRC and CTEH are committed to deliver products and services that adhere to the UAO, contractual requirements, and applicable guidelines. This includes but is not limited to timely, accurate, and defensible data, written deliverables, and services.
- To achieve data quality objectives (DQOs) as defined in this QAPP to support regulatory compliance to the UAO.
- To continually assess and improve work processes to comply with this QAPP.

1.2 Site Name

The site is designated as the “East Palestine Train Derailment Site,” per the Unilateral Administrative Order (UAO) for Removal Actions published by the United States Environmental Protection Agency (US EPA; CERCLA Docket No. V-W-23-C-004) and is shown in Figure 1.2.

Figure 1.2 Site Location Map



1.3 Sampling Area Location

The Site is located within a mixed-use residential, commercial, and industrial area, with residential properties northwest, southeast, and south of the Site. Air monitoring and sampling will occur: (1) within the defined work area(s) at the Site; (2) along the perimeter of the defined work area(s); and (3) in community areas (including residential, commercial, and industrial areas) surrounding the work area(s), especially in the 1-mile x 2-mile evacuation area. In addition, background samples may be collected from locations distal to the incident location, such as in a neighboring, upwind town. Background samples may be taken periodically throughout the study period. The U.S. EPA in consultation with Unified Command may direct NSRC to modify air monitoring or air sampling locations and procedures.

Maps showing current locations of real-time air monitoring and fixed analytical air sampling are provided in Figures 1.3a, 1.3b, and 1.3c for illustration purposes. Types of data collected at each fixed monitoring and sampling location are summarized in Table 1.3.

Figure 1.3a Handheld Real-Time Air Monitoring Locations

0700 EST April 4, 2023, to 0700 EST April 5, 2023

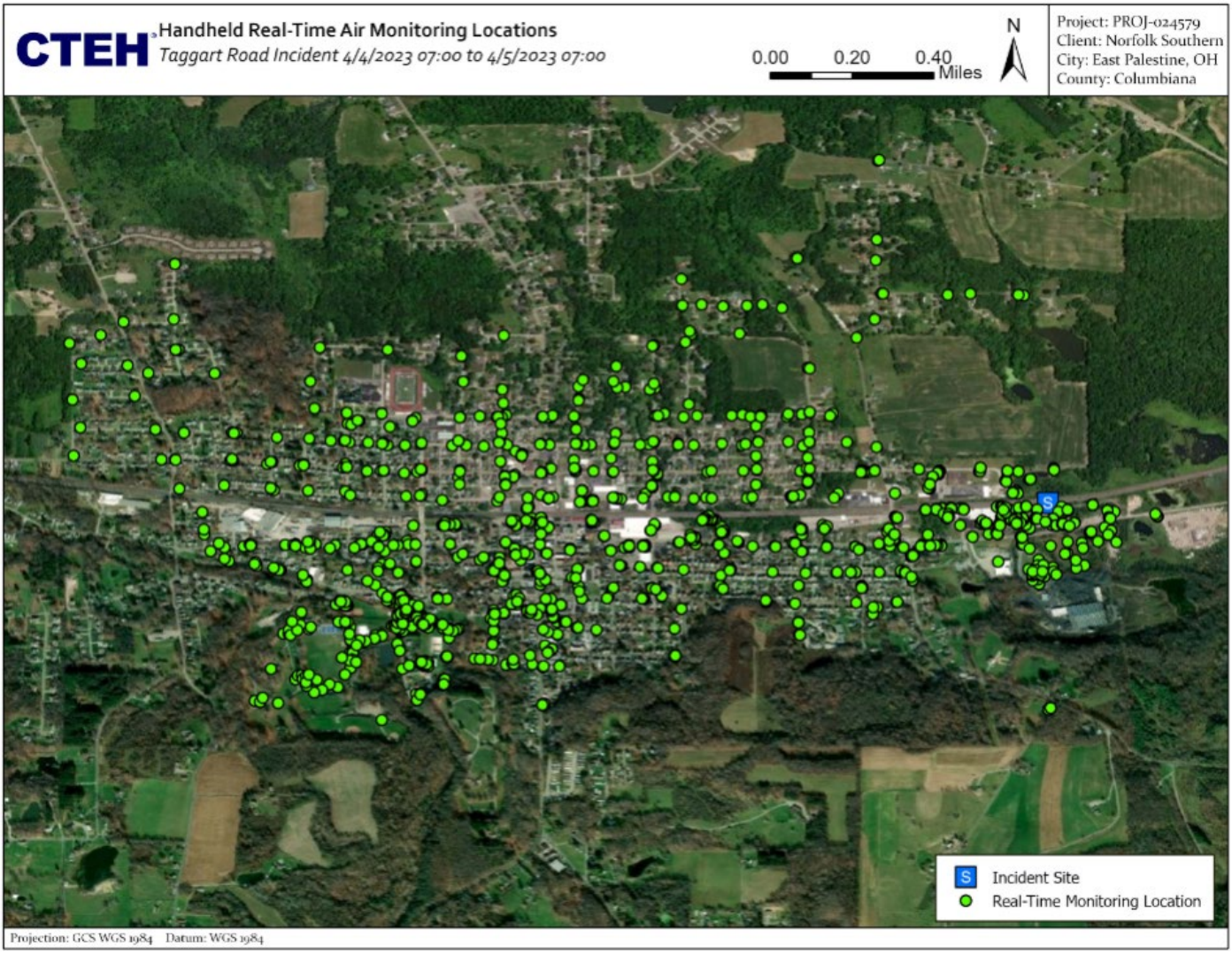


Figure 1.3b Stationary Radio-Telemetered Real-Time Air Monitoring Locations

As of April 18, 2023*

*AreaRAEs are instruments that are fixed locations and radio-telemeter data back to a console in real-time. This map is current for where stations are located.

Figure 1.3c Air Sampling Locations

As of April 18, 2023

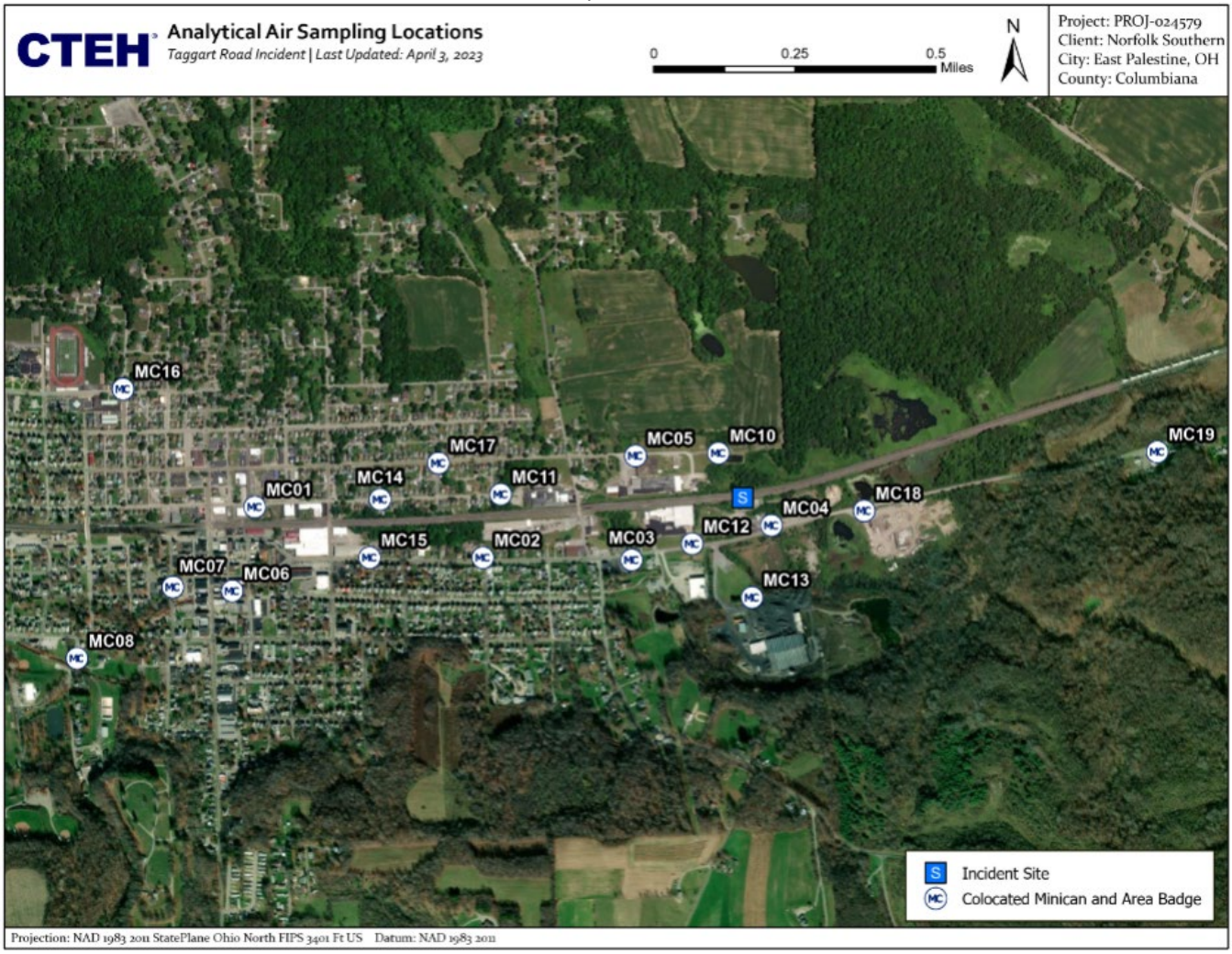


Table 1.3 Types of Data Collected at Fixed Locations†

Station Type	Monitoring/Sampling Equipment	COIs	Location Code
Stationary Radio-Telemetering Real-Time Air Monitoring	AreaRAEs	Total VOCs, %LEL	AR04
			AR08
			AR09
			AR10
			AR11
			AR12
			AR13
			AR14
			AR16
			AR18
			AR19
Analytical Air Sampling	Evacuated canisters and organic vapor monitor badges	VOCs via EPA Method TO-15 (plus butyl acrylate) and butyl acrylate via modified NIOSH Method 2537	MC01
			MC02
			MC03
			MC04
			MC05
			MC06
			MC07
			MC08
			MC10
			MC11
			MC12
			MC13
			MC14
			MC15
			MC16
			MC17
			MC18
			MC19
Personal Air Sampling*	Organic vapor monitor badges	Vinyl chloride via NIOSH Method 1007 and butyl acrylate via NIOSH Method 2537	NA*

*Personal air sampling for vinyl chloride and butyl acrylate is conducted on workers selected from various work groups. These data are being collected routinely but are not associated with any fixed location. †GPS coordinates for stationary radio-telemetering real-time air monitoring locations and analytical air sampling locations (evacuated canisters and organic vapor badges) can be found in the data exports provided to the EQuIS database.

1.4 Responsible Agency

Air monitoring and sampling in accordance with this SAP is being conducted by CTEH personnel on behalf of NSRC.

1.5 Project Organization

Overall project organization is described in the UAO. Key personnel relative to implementation of the Quality Assurance Project Plan (QAPP) for air monitoring and sampling are presented in Table 1.5. Figure 1.5a further identifies project organization, lines of authority, and lines of communication within the Quality Assurance (QA) Program structure. CTEH project organization, lines of authority, and lines of communication relative to QA communications are presented in Figure 1.5b.

Table 1.5 Key Project Personnel Contact Information

Organizational Stakeholders	Connection	Contact
US EPA Region 5 – Incident Commander	Ralph Dollhopf	dollhopf.ralph@epa.gov
US EPA Region 3	Jack Kelly	kelly.jack@epa.gov
Village of East Palestine Fire Department	Chief Keith Drabick	k.a.drabick@eastpalestine-oh.gov
Ohio EPA	Anne Vogel/ Mike Eberle	anne.vogel@epa.ohio.gov michael.eberle@epa.ohio.gov
Columbiana County EMA	Peggy Clark/ Brian Rutledge	peggy.clark@ccoema.org brian.rutledge@ccoema.org
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NSRC Industrial Hygienist	Mark Dudle	mark.dudle@nscorp.com
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CTEH Project Manager	Ethan Currie	ecurrie@cteh.com
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Air Sampling Lead	Rotating	
Worker Monitoring and Sampling Lead	Rotating	
CTEH Data Manager	Rotating	
CTEH On-Site Toxicologist	Dr. Sarah Burnett	sburnett@cteh.com
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Figure 1.5a Project Organization and Communication Pathways for the QA Program Under the UAO

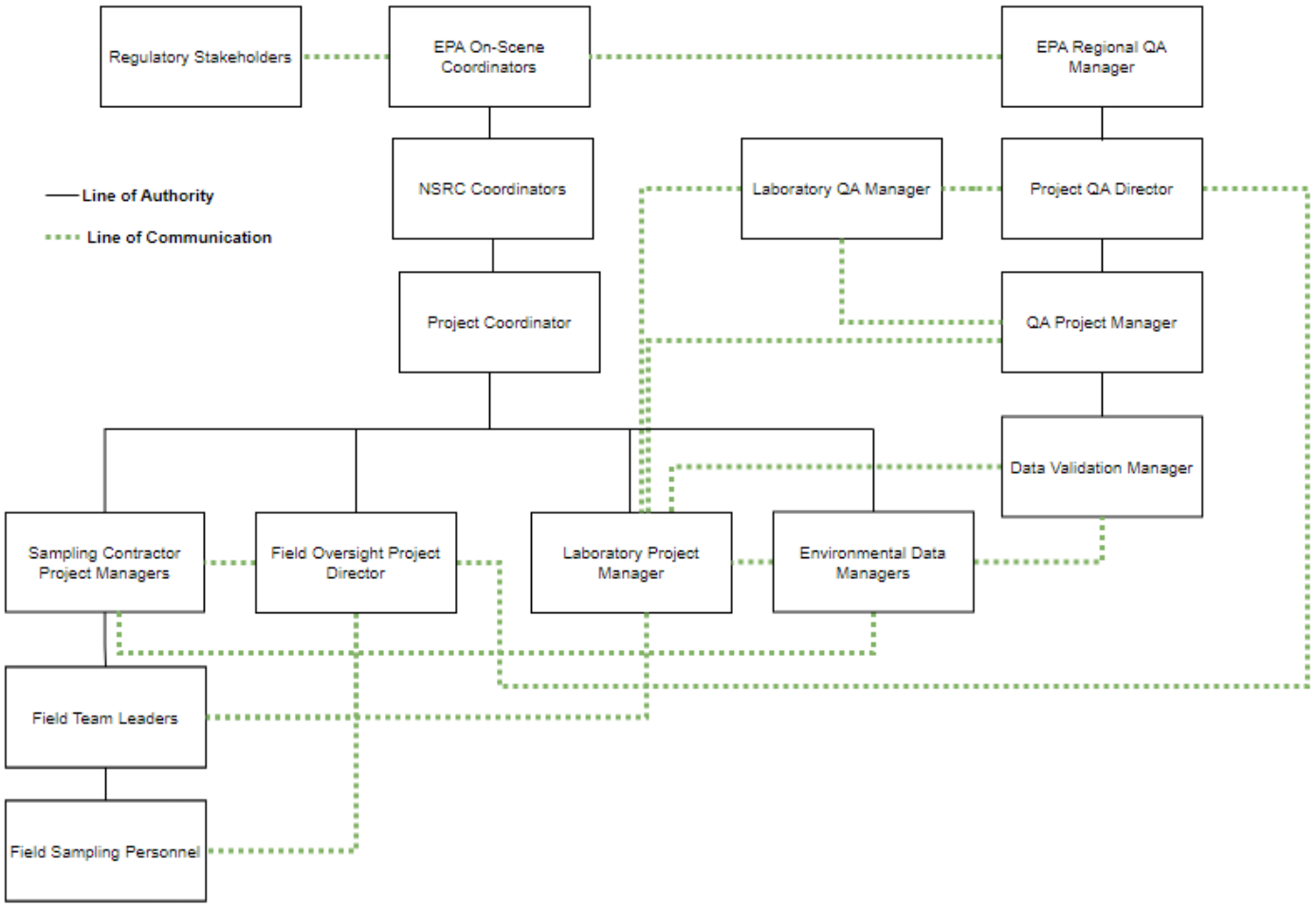
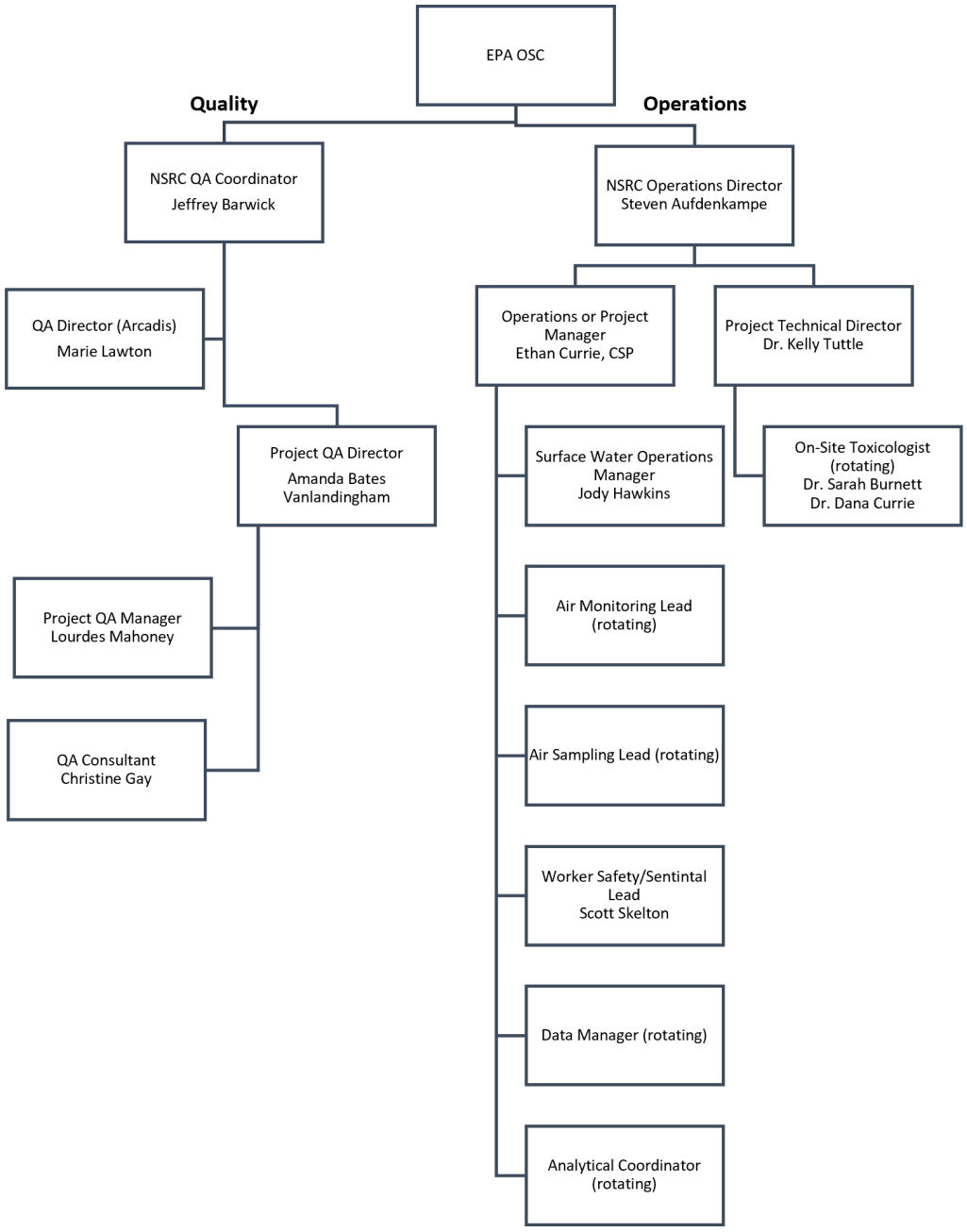


Figure 1.5b CTEH Organizational Structure for QA Communications*



*The CTEH Project QA Director will obtain operational information from the Project Manager or Project Technical Director. All organizational positions are two-way communication for information flow.

2.0 BACKGROUND

A description of the East Palestine Train Derailment Site and surroundings is provided in Section 2.1. Operational history and context are described in Section 2.2. The scope and intent of this SAP and potential impacts of the derailment are discussed in Sections 2.3 and 2.4, respectively.

2.1 Site Area Description

The derailment occurred on the property located at the Rail Line east northeast of the intersection of East Taggart Street and North Pleasant Drive (Latitude: 40.8360395; Longitude: 80.5222838) in East Palestine, Ohio (referred to as Site). The East Palestine Train Derailment Site is located within a mixed-use residential, commercial, and industrial area, with residential properties northwest, southeast, and south of the derailment area. The nearest residences are less than 1,000 feet from the derailment Site. Residential properties are also located along waterways which were impacted following the derailment and are within the affected area. The Ohio-Pennsylvania border is located less than 1 mile from the derailment location. The nearest public well supply is located approximately 1 mile from the derailment location. A ditch, located on the south side of the tracks flows west for approximately 1,000 feet before it empties into Sulphur Run, which joins Leslie Run, to Bull Creek, to North Fork Little Beaver Creek, to Little Beaver Creek before emptying into the Ohio River. Wetlands and State Line Lake are located immediately adjacent to the Northeast of the Site.

2.2 Operational History

As a result of the derailment, tank cars breached and released some of their contents, impacting soil, surface water, sediment, and the air environment around the Site. In response to the incident, Norfolk Southern Railway Company (NSRC) immediately mobilized response personnel to the incident to stop, contain, and recover the released content and rail cars and tank cars. That work continues and has expanded to include efforts to assess the nature and extent of the potential impacts to human health and the environment and to plan and implement actions to address any impacts to provide short- and long-term protection of human health and the environment.

2.3 Scope

This SAP defines the objectives for air monitoring and sampling conducted by CTEH on behalf of NSRC. This SAP is intended to be used during cleanup of product release from East Palestine, Ohio, where monitoring and sampling of atmospheric conditions to protect and inform nearby communities and the pubic are required. This SAP is designed to consider chemical components commonly associated with the spilled products. Data gathered during the implementation of this SAP will be used to assess the potential for community exposures, if any. All fieldwork and data collection will be conducted in accordance with this work plan. The use of this work plan will involve forethought and planning that should help direct the monitoring, sampling, and analytical work. It is meant to be used in emergency response events where monitoring and sampling teams (hereinafter referred to as Field Teams) are deployed to conduct air monitoring and sampling in the work zone and in the community. Field Teams should always reference this SAP for standard quality procedures, SOPs, and standard methods for sampling and analytical guidance when necessary. The development of this SAP will improve the documentation, communication, planning, and overall quality associated with the monitoring/sampling and analysis by:

- Encouraging Field Teams to consider their goals and objectives before the generation of environmental data,

- Documenting predetermined information in a standardized format,
- Increasing the communication between sampling personnel and decision makers, and
- Detailing expectations and objectives before samples are collected.

This SAP will define the schedule, resources, and milestones for the project. The SAP and QAPP will define applicable requirements that must be met by the project.

2.4 Impact on Human Health and the Environment

Hazardous substances discharged to surface soils, surface waters, and air present potential impacts to human health, ecological health, and the environment. Potential exposure pathways include consumption of contaminated drinking water or groundwater; contact with contaminated surface and subsurface soils; exposure to contaminated sediment and surface waters; and inhalation of contaminated air. This SAP focuses on characterizing air with respect to constituents of interest (COIs) to determine whether COIs are present in the air within the Site work areas and surrounding community and, if present, if the concentrations of COIs present in air pose a risk to human health. Current primary COIs are listed in Table 2.4.

Table 2.4 Constituents of Interest

CONSTITUENT OF INTEREST (COI)	CAS #
Vinyl Chloride	75-01-4
n-Butyl Acrylate	141-32-2

3.0 PROJECT AND DATA QUALITY OBJECTIVES

Project and data quality objectives will address what are the constituents of interest (COIs), how COIs are measured, and the quality criteria on which the data are screened. The objectives for the project and associated data are described below.

3.1 Project Task and Problem Definition

There is potential that compounds emitted from derailed tank cars and/or impacted soil, sediment, or water may be present in the air in work areas and community areas surrounding the incident site. If present at certain concentrations in air, these (COI, including vinyl chloride and butyl acrylate, could potentially pose a threat to human health or the environment. Therefore, the air in work and community areas needs to be characterized to evaluate the presence and potential levels of COIs in air and to protect human health and the environment.

The goal of this SAP is to protect human health and the environment by characterizing the air in work and community areas with respect to the presence and potential levels of COIs in air. This SAP focuses on

characterizing air with respect to COI to determine whether COIs are present in the air within the Site work areas and surrounding community and, if present, if the concentrations of COI present in air pose a risk to human health. This characterization is being accomplished through a multilayered air monitoring and air sampling approach in work areas where cleanup and remediation operations are ongoing and in community areas surrounding the incident site. The specific objectives are: (1) to evaluate the presence of COIs in air; (2) if detected in air, to evaluate the concentrations of COIs in air; (3) to compare the concentrations of COIs in air to worker or community screening values established and approved in this QAPP and Air SAP; (4) to record observations of activities and potential alternative sources of COIs unrelated to Site activities to determine "background" levels; (5) to use data generated to make data-driven decisions about the placement of air monitoring and sampling locations and the frequency of air monitoring and sampling, including when air monitoring and sampling activities can decrease or cease; and (6) to use data generated to advise Site management, including the U.S. EPA and the Unified Operations branch, on the potential need for engineering controls and advise workers on proper personal protective equipment (PPE), primarily respiratory protection, if needed. All results will be provided to NSRC and UC for sharing with appropriate parties to make data-driven decisions.

3.2 Data Quality Objectives

For the purpose of this investigation, data will be focused on achieving sufficient sensitivity to meet community and worker action levels and screening values protective of human health. Data collected under this work plan may be utilized as secondary data once action levels and screening levels are determined, provided data are sufficiently sensitive to meet the objectives of this SAP and corresponding data quality objectives outlined in the QAPP. A summary of the decision analysis and response actions based on the collected community and worker air monitoring and sampling data is presented in Tables 3.2a through 3.d. The Data Quality Objectives (DQO) worksheet for air monitoring and sampling data is provided in Appendix A.

Narrative for Table 3.2a: Community analytical sampling locations are comprised of a 1.4L evacuated canister and a 525 assay passive badge at each location. There are two badges used for this project and are 525 and 566 assay badges using the same media. The 525 badges are used for community sampling intended for longer duration sampling for 12-hour and 24-hour sampling. The 566 are used for work area or personal sampling and shorter duration for 8-hours or work shift. The badges are collected to have samples analyzed for n-butyl acrylate. Badges can either be 12-hours (back-to-back), where there are two deployed consecutively to account for the 24-hr duration, or one badge will sample for 24-hours. Note: the MDL for n-butyl via badge is 7 ppb for 24-hour sample and 16ppb for 12-hour samples. Canisters are used to analyze for vinyl chloride and n-butyl acrylate and have a sampling period of 24-hours. The MDL for n-butyl acrylate is 4.19 ppbv via TO-15 and for vinyl chloride via TO-15 is 0.0949 ppbv. All results will be reported via data management process to NSRC and UC, where UC then publishes data for public view. The screening values for these compounds are the ITSL and MRL which are both 20ppb for n-butyl acrylate and vinyl chloride. If results reported are below either the ITSL or MRL, the term "no appreciable risk" is used and are utilized in the decision statements in Table 3.2a on the next page.

Table 3.2a Community Sampling Data Quality Objectives

WORKPLAN	ANALYTE	DECISION STATEMENT #	INVESTIGATIVE QUESTION	ACTION
COMMUNITY SAMPLING AT FIXED ANALYTICAL LOCATIONS AS DESCRIBED IN FIGURE 1.3C.	n-butyl acrylate via 525 passive air badges (NIOSH 2537) and 1.4L evacuated canisters (TO-15)	1	Are passive badge samples and/or 1.4L evacuated canisters non-detect (i.e., below the MDL) for n-butyl acrylate?	If 525 passive air badges and/or 1.4L evacuated canisters are non-detect for n-butyl acrylate below the laboratory method detection limit (MDL), and the MDL is below the ITSL (20 ppb for butyl acrylate), then it is determined that there is no appreciable risk to the community. No further action will be taken, and air sampling for n-butyl acrylate will continue until work operations are complete.
		2	Are passive badge samples and/or 1.4L evacuated canisters results detected above the MDL for n-butyl acrylate, but below the ITSL (20 ppb)?	If 525 passive air badges and/or 1.4L evacuated canisters have detections of n-butyl acrylate above the laboratory MDL, but below the ITSL (20 ppb), then it is determined that there is no appreciable risk to the community. No further action will be taken, and air sampling for n-butyl acrylate will continue until work operations are completed.
		3	If a badge sample(s) and/or 1.4L evacuated canister(s) result(s) is/are detected in one sample, but not the other?	If a n-butyl acrylate is detected in one sample media but not the other, than the higher result will be utilized and compared to the ITSL (20ppb for n-butyl acrylate).
		4	Are passive badge samples and/or 1.4L evacuated canisters results detected above the MDL for n-butyl acrylate and are at or above the ITSL (20 ppb) for one sampling event?	If 525 passive air badges and/or 1.4L evacuated canisters have detections of n-butyl acrylate at or above the ITSL (20 ppb), a retrospective assessment of the sampling location, weather conditions, and work activities will be performed to assess potential causes of the exceedance. Results will be communicated to Unified Command and the NS Hazmat Manager to assess on-site work operations and potential sources of n-butyl acrylate, as well as the need for engineering controls or changes to work operations. Additional sampling locations may be implemented as a result of the detection above the ITSL.
		5	Are passive badge samples and/or 1.4L evacuated canisters results detected at or above the ITSL (20 ppb) for n-butyl acrylate for more than one sampling event at the same location?	If 525 passive air badges and/or 1.4L evacuated canisters have detections of n-butyl acrylate at or above the ITSL (20 ppb) for two or more consecutive days at the same location, then, in addition to the actions above, expedited communication to the broader community beyond standard communication of results will be assessed in accordance with the Long-Term Monitoring Plan, and may include, but are not limited to, flyers, calls, and/or townhall meetings.
		6	Is the MDL above the ITSL for n-butyl acrylate in either the 1.4L evacuated canister or badge?	If 525 passive air badges and/or 1.4L evacuated canisters are non-detect for n-butyl acrylate, but the MDL is above the ITSL (20 ppb) due to dilution or other interferences, then the result for n-butyl acrylate will not be used for decision making purposes. This does not invalidate results for analytes reported from the canister sample.
	Vinyl Chloride via 1.4L evacuated	7	Are 1.4L evacuated canisters non-detect (i.e., below the MDL) for vinyl chloride?	If 1.4L evacuated canisters are non-detect for vinyl chloride below the laboratory method detection limit (MDL), and the MDL is below the intermediate minimum risk level (IMRL; 20 ppb), then it is determined that there is no appreciable risk to the community. No further action will be taken, and air sampling for vinyl chloride will continue until work

WORKPLAN	ANALYTE	DECISION STATEMENT #	INVESTIGATIVE QUESTION	ACTION
	canisters (TO-15)			operations are complete. If 1.4L evacuated canisters are non-detect for vinyl chloride at the MDL, but the MDL is above the IMRL (20 ppb) due to dilution or other interferences, than this result will not be used for on-site decision-making purposes.
		8	Are 1.4L evacuated canisters results detected above the MDL for vinyl chloride but below the IMRL of 20 ppb?	If 1.4L evacuated canisters have detections of vinyl chloride but they are below the IMRL (20 ppb), then it is determined that there is no appreciable risk to the community. No further action will be taken, and air sampling for vinyl chloride will continue.
		9	Are 1.4L evacuated canisters results detected for vinyl chloride at or above the IMRL of 20 ppb for one sampling event at a distinct location?	If 1.4L evacuated canisters have detections of vinyl chloride at or above the IMRL (20 ppb), a retrospective assessment of the sampling location, weather conditions, and work activities will be performed to assess potential causes for the exceedance. Results will be expedited to communicated to Unified Command and the NS Hazmat Manager to assess on-site work operations and potential sources of vinyl chloride, as well as the need for engineering controls or changes to work operations. Additional sampling locations may be implemented as a result of the detection above the IMRL.
		10	Are 1.4L evacuated canisters results detected above the MDL for vinyl chloride at or above the IMRL of 20 ppb for more than one consecutive sampling event at the same location?	If 1.4L evacuated canisters have detections of vinyl chloride at or above the IMRL (20 ppb) for two or more consecutive days at the same location, then, in addition to the actions above, expedited communication to the broader community in addition to standard communication will be assessed in accordance with the Long-Term Community Monitoring and Sampling Plan, and may include, but is not limited to, flyers, calls, and/or townhall meetings.
	n-Butyl Acrylate and Vinyl Chloride	11	Are 525 passive badge samples and/or 1.4L evacuated canisters continually non-detect (i.e., below the MDL) for n-butyl acrylate and vinyl chloride?	If 525 passive air badges and/or 1.4L evacuated canisters are non-detect for n-butyl acrylate and vinyl chloride below the laboratory method detection limit (MDL), and the MDL is below the ITSL and IMRL (20 ppb) for both analytes for over two weeks, then it is determined that there is no appreciable risk to the community. If other analytes reported via TO-15 are COIs and used for decision-making purposes, than sampling will continue. If there are no other analytes are COIs than only n-butyl acrylate or vinyl chloride, then the analytical location will be assessed regarding proximity to the derailment site and whether other analytical stations are located between the derailment site and the analytical location being examined and whether the nearer analytical location has also been non-detect or below the ITSL or IMRL of 20 ppb. If appropriate community coverage is maintained and site conditions warrant, the analytical station may be removed. Any potential location reductions will be proposed to and approved by Unified Command.
LONG-TERM COMMUNITY MONITORING	**UNDER THE LONG-TERM COMMUNITY AIR MONITORING AND SAMPLING PLAN, 525 PASSIVE BADGES OR 1.4L EVACUATED CANISTERS (TO-15) MAY BE DEPLOYED FOR N-BUTYL ACRYLATE ANALYSIS IN RESPONSE TO A COMMUNITY ODOR COMPLAINT OR A HOTLINE CALL REQUESTING AIR MONITORING OR SAMPLING RELATED TO ODORS. ALL THESE INVESTIGATIONS ARE INTENDED TO BE ONE TIME SAMPLING EVENTS.**			
	n-butyl acrylate via 525 passive	12	Are 525 passive badge samples and/or 1.4L evacuated canisters	If 525 passive air badges and/or 1.4L evacuated canisters are deployed in response to an odor complaint or hotline call (these are intended to be one time sampling events) and are non-detect for n-butyl acrylate below the laboratory method detection limit (MDL),

WORKPLAN	ANALYTE	DECISION STATEMENT #	INVESTIGATIVE QUESTION	ACTION
	air badges (NIOSH 2537) or 1.4L evacuated canisters (TO-15)		non-detect (i.e., below the MDL) for n-butyl acrylate?	and the MDL is below the ITSL (20 ppb), then it is determined that there is no appreciable risk to the community. Sampling at that location will continue if other COIs are detect used for decision-making purposes, and results will be communicated with the resident/caller indicating that results are non-detect for butyl acrylate. Analytical results will be documented in the call log as well as the analytical air data set.
		13	Are 525 passive badge samples and/or 1.4L evacuated canisters results detected above the MDL for n-butyl acrylate but below the ITSL (20 ppb)?	If 525 passive air badges and/or 1.4L evacuated canisters are deployed in response to an odor complaint or hotline call and have detections of n-butyl acrylate below the ITSL (20 ppb), then it is determined that there is no appreciable risk to the community. Results will be communicated with the resident/caller, indicating that results show detections of butyl acrylate below the ITSL. Analytical results will be documented in the call log as well as the analytical air data set. Results will be reported to Unified Command and the NS HAZMAT Manager to assess work activities and potential sources of n-butyl acrylate.
		14	Are 525 passive badge samples and/or 1.4L evacuated canisters results detected above the MDL for n-butyl acrylate at or above the ITSL (20 ppb)?	If 525 passive air badges and/or 1.4L evacuated canisters are deployed in response to an odor complaint or hotline call and have detections of n-butyl acrylate at or above the ITSL (20 ppb), then sampling at that location will continue as a standard analytical location (above). Results will be communicated with the resident/caller, indicating that results show detections of butyl acrylate at or above the ITSL and that further samples are being collected to characterize the area. Analytical results will be documented in the call log as well as the analytical air data set. Results will be reported to Unified Command and the NS HAZMAT Manager to assess work activities, engineering controls, and potential sources of n-butyl acrylate.
	WHILE VINYL CHLORIDE ANALYSIS VIA 1.4L EVACUATED CANISTERS IN RESPONSE TO ODOR COMPLAINTS OR HOTLINE CALLS IS NOT CURRENTLY INCLUDED IN THE LONG-TERM COMMUNITY AIR MONITORING AND SAMPLING PLAN, THE FOLLOWING SECTION IS INCLUDED IN THE CASE THAT VINYL CHLORIDE ANALYSIS IS IMPLEMENTED IN THE FUTURE FOR THIS PLAN.			
	Vinyl Chloride via 1.4L evacuated canisters (TO-15) - If deployed	15	Are 1.4L evacuated canisters non-detect (i.e., below the MDL) for vinyl chloride?	If 1.4L evacuated canisters are deployed in response to an odor complaint or hotline call and are non-detect for vinyl chloride below the laboratory method detection limit (MDL), and the MDL is below the IMRL (20 ppb), then it is determined that there is no appreciable risk to the community. Sampling at that location will not continue, and results will be communicated with the resident/caller, indicating that results are non-detect for vinyl chloride. Analytical results will be documented in the call log as well as the analytical air data set.
		16	Are 1.4L evacuated canisters results detected above the MDL for vinyl chloride but below the IMRL (20 ppb)?	If 1.4L evacuated canisters are deployed in response to an odor complaint or hotline call and there are detections of vinyl chloride below the IMRL (20 ppb), then it is determined that there is no appreciable risk to the community. Results will be communicated with the resident/caller, indicating that results show detections of vinyl chloride below the MRL. Analytical results will be documented in the call log as well as the analytical air data set. Expedited communications of these results will be reported to Unified Command and the NS HAZMAT Manager to assess work activities and potential sources of vinyl chloride, along with all data will be provided using standard practices.

WORKPLAN	ANALYTE	DECISION STATEMENT #	INVESTIGATIVE QUESTION	ACTION
		17	Are 1.4L evacuated canisters results detected above the MDL for vinyl chloride and at or above the IMRL (20 ppb)?	If 1.4L evacuated canisters are deployed in response to an odor complaint or hotline call and there are detections of vinyl chloride at or above the IMRL (20 ppb), sampling at that location will continue as a standard analytical location (above). Results will be communicated with the resident/caller, indicating that results show detections of vinyl chloride at or above the MRL and that samples will continue to be collected to further characterize the area. Analytical results will be documented in the call log as well as the analytical air data set. Expedited communication of the results will be reported to Unified Command and the NS HAZMAT Manager to assess work activities and potential sources of vinyl chloride. All results are still reported following standard practices. Engineering controls will be implemented as described in the TAGA/PTR-MS Decision Tree.
TAGA/PTR-MS	**1.4L EVACUATED CYLINDER GRAB SAMPLES MAY BE DEPLOYED IN RESPONSE TO A SUSTAINED DETECTION ABOVE THE 20 PPB ACTION LEVEL IN THE TAGA/PTR-MS DECISION TREE AND LONG-TERM COMMUNITY MONITORING AND SAMPLING PLAN. THE ANALYSIS WILL BE RECEIVED AFTER THE EVENT AND, THUS, WILL NOT BE APPLICABLE TO THE IMMEDIATE DECISION-MAKING PROCESS OF THE TAGA/PTR-MS DECISION TREE.**			
	n-butyl acrylate via 1.4L evacuated canisters (Grab Sample, TO-15) - If deployed	18	Are 1.4L evacuated canister grab samples non-detect for n-butyl acrylate?	If 1.4L evacuated canisters are deployed and are non-detect for n-butyl acrylate at the laboratory method detection limit (MDL), and the MDL is below the ITSL (20 ppb), then it is determined that there is no appreciable risk to the community. Sampling at that location will not continue unless other compounds used for decision-making purposes are detected, and results will be communicated with TAGA and PTR-MS for comparison and consistency. Analytical results will be documented in the analytical air data set. Results will be reported as part of the standard reporting with the TAGA/PTR-MS Decision Tree.
		19	Are 1.4L evacuated canister grab sample results detected above the MDL for n-butyl acrylate below the ITSL (20 ppb)?	If 1.4L evacuated canisters are detect for n-butyl acrylate above the MDL and below the ITSL (20 ppb), then it is determined that there is no appreciable risk to the community. Results will be communicated with TAGA and/or PTR-MS for comparison and consistency. Analytical results will be documented in the analytical air data set. Results will be reported to Unified Command and the NS HAZMAT Manager to assess work activities, engineering controls, and potential sources of n-butyl acrylate. Results will also be reported a part of the standard reporting with the TAGA/PTR-MS Decision Tree.
		20	Are 1.4L evacuated canister grab sample results detected above the MDL for n-butyl acrylate at or above the ITSL (20 ppb)?	If 1.4L evacuated canister grab samples are deployed and have detections of n-butyl acrylate at or above the ITSL (20 ppb), sampling at that location will continue as a standard analytical location (above). Results will be quickly communicated with the TAGA and/or PTR-MS for comparison and consistency. Analytical results will be documented in the call log as well as the analytical air data set. Expedited communication of these results will be reported to Unified Command and the NS HAZMAT Manager to assess work activities, engineering controls, and potential sources of n-butyl acrylate. Results will also be reported a part of the standard reporting with the TAGA/PTR-MS Decision Tree.

Narrative for Table 3.2b: Worker fixed station locations or personnel samples comprise of a 566 assay passive badge at each location. The difference between 525 badges and 566 badges, is that 566 badges are intended for shorter durations and used for 8-hour or shift purposes. The badges are collected and analyzed for n-butyl acrylate and vinyl chloride. Badges are collected for a sampling period of 8-hours or shift. Results are then compared to 8-hour screening values. Note: the LOQ for 0.150ppm for n-butyl acrylate and 0.052ppm for vinyl chloride. There are no TO-15 samples collected for personnel samples or work area samples. Personal sampling results will be communicated to the worker, the worker's company health and safety contact, site management, and Unified Command, regardless is there is a non-detect or detection. For exceedances of the occupational exposure limit (OEL), additional personnel samples may be conducted for this job task or similar exposure group (SEG) to further evaluate the potential for exposure to vinyl chloride or n-butyl acrylate, whichever is appropriate. Personal sampling letter will be prepared by the worker's company or CTEH, if requested by NSRC.

ACGIH Threshold Limit Value (TWA) Time Weighted Average (TWA) or ACGIH TLV-TWA is defined as: the concentration for a conventional 8-hour workday and a 40-hour workweek, to which it is believed that nearly all workers may be repeatedly exposed, day after day, for a working lifetime without adverse effect. Occupational Safety and Health Administration (OSHA) Permissible Exposure Limit (PEL) TWA is defined as: the maximum amount or concentration of a chemical that a worker may be exposed to under OSHA regulations for an average exposure over the course of an 8-hour work shift. The OSHA PEL-TWA for vinyl chloride is 1ppm and the ACGIH TLV-TWA for n-butyl acrylate is 2ppm.

Table 3.2b Worker Sampling Data Quality Objectives

ANALYTE	DECISION STATEMENT #	INVESTIGATIVE QUESTION	ACTION
Vinyl Chloride via 566 passive diffusion badge (NIOSH 1007)	21	Are personnel badges non-detect (i.e., below the method detection limit) for vinyl chloride?	If 566 passive diffusion badges are below the laboratory's method detection limit (MDL) for vinyl chloride, and the MDL is below the OSHA Permissible Exposure Limit Time-weighted Average (PEL-TWA) for vinyl chloride, then results are defined as: "without incurring the risk of adverse health effects." Results will be communicated to the worker, the worker's company health and safety contact, site management, and Unified Command. Personnel sampling will continue for specific work groups and job tasks until site operations are completed.
	22	Are personnel badges for vinyl chloride above the MDL but below the OSHA PEL-TWA of 1 ppm?	If 566 passive diffusion badges above the MDL for vinyl chloride but below the OSHA PEL-TWA, then results are defined as: "without incurring the risk of adverse health effects." A review of environmental conditions, engineering controls, and personal protective equipment (PPE) will be conducted to ensure worker health and safety. Personnel sampling will continue for specific work groups and job tasks until site operations are completed.
	23	Do personnel badges for vinyl chloride exceed the OSHA PEL-	If 566 passive diffusion badge results for vinyl chloride are above the OSHA PEL-TWA, results will be communicated to the worker, the worker's company health and safety contact, site management, and Unified Command. While a single sample detection above the OSHA PEL-TWA does not necessarily indicate results are

ANALYTE	DECISION STATEMENT #	INVESTIGATIVE QUESTION	ACTION
		TWA of 1 ppm?	defined as: "without incurring the risk of adverse health effects" with respect to vinyl chloride, an assessment of the environmental conditions, engineering controls, personal protective equipment (PPE), etc. will be conducted to evaluate the scenario and to determine how to reduce future potential exposures above the OSHA PEL-TWA. Additional personnel sampling for the worker for the specific job task will be conducted, in addition to additional sampling for workers in the same similar exposure group (SEG). The results will be reported to the NS Hazmat Manager to assess work activities and potential engineering controls to limit worker exposure to vinyl chloride.
n-butyl acrylate via 566 passive diffusion badges (NIOSH 1007)	24	Are personnel badges non-detect (i.e., below the method detection limit) for n-butyl acrylate?	If 566 passive diffusion badges are below the laboratory's method detection limit (MDL) for n-butyl acrylate, and the MDL is below the ACGIH Threshold Limit Value Time-Weighted Average (TLV-TWA) for n-butyl acrylate, are defined as: "airborne concentrations of chemical substances and represent conditions under which it is believed that nearly all workers may be repeatedly exposed, day after day, over a working lifetime, without adverse health effects." Results will be communicated to the worker, the worker's company health and safety contact, site management, and Unified Command. Personnel sampling will continue for specific work groups and job tasks until site operations are completed.
	25	Are personnel badges for n-butyl acrylate above the MDL but below the ACGIH TLV-TWA of 2 ppm?	If 566 passive diffusion badges are detected for n-butyl acrylate but are below the ACGIH TLV-TWA, then results are defined as: "airborne concentrations of chemical substances and represent conditions under which it is believed that nearly all workers may be repeatedly exposed, day after day, over a working lifetime, without adverse health effects." Results will be communicated to the worker, the worker's company health and safety contact, site management, and Unified Command. Additional personnel samples may be conducted for this job task or similar exposure group (SEG) to further evaluate the potential for exposure to n-butyl acrylate. A review of environmental conditions, engineering controls, and personal protective equipment (PPE) will be conducted to protect worker health and safety. Personnel sampling will continue for specific work groups and job tasks until site operations are completed.
	26	Do personnel badges for n-butyl acrylate exceed the ACGIH TLV-TWA of 2 ppm?	If 566 passive diffusion badges are detected for n-butyl acrylate at or above the ACGIH TLV-TWA, results will be communicated to the worker, the worker's company health and safety contact, site management, and Unified Command. While a single sample detection above the ACGIH TLV-TWA does not necessarily indicate results are defined as: "airborne concentrations of chemical substances and represent conditions under which it is believed that nearly all workers may be repeatedly exposed, day after day, over a working lifetime, without adverse health effects" with respect to n-butyl acrylate, an assessment of the environmental conditions, engineering controls, personal protective equipment (PPE), etc. will be conducted to evaluate the scenario and to determine how to reduce future potential exposures above the ACGIH TLV-TWA. Additional personnel sampling for the worker for the specific job task will be conducted, in addition to additional sampling for workers in the same similar exposure group (SEG). The results will be reported to the NS Hazmat Manager to assess work activities and potential engineering controls to limit worker exposure to n-butyl acrylate.

Narrative for Table 3.2c: If any VOC readings are detected are sustained for 5 minutes or more, then additional assessment at that location will be performed. Handheld real-time air monitoring for VOCs, vinyl chloride, and n-butyl acrylate are screening tools used for the presence/absence of these COIs and the potential for offsite fugitive emissions due to work operations to assist in real-time decision making regarding sampling and on-site operations. These readings are not used in risk-based decision making for the community. They represent screening tools and are not used for broader decision-making for public health. Instantaneous real-time readings are not compared to health-based screening levels (i.e., ITSL or MRL). Monitoring of volatile organic compounds (VOCs) via a handheld 10.6eV photoionization detector (PID) is used as a general screening tool and is not used to make definitive risk-based decisions regarding public safety and/or exposure.

The 10.6eV PID lamp is capable of detecting a broad range of compounds, both man-made and natural, that have a similar or lower ionization energy (IE) than that of the PID lamp. For more information, see Honeywell Technical TN-106. Additionally, the SidePak 510 and 520 are used to monitor for Particulate Matter (PM) at particle sizes 2.5 micrometers or smaller shown as PM2.5. The site-specific action level of 0.079 mg/m3 is derived from smoke guideline for public health official found. Gastec or Nextteq colorimetric detector tubes are used to measure vinyl chloride in air. The detection limits vary depending on the tube used but range from 0.02ppm to 0.2ppm (reference to tubes and detection limits). The Draeger X-PID 8500 is a GC-PID used to measure and speciate the two COIs and has a detection limit of 0.33ppm for vinyl chloride and estimated DL of 1.5ppm for n-butyl acrylate. See link for more information for the X-PID 8500 all use a 10.6 eV lamp and details.

Table 3.2c Community Real-Time Air Monitoring Data Quality Objectives

WORKPLAN	ANALYTE	DECISION STATEMENT #	INVESTIGATIVE QUESTION	ACTION
COMMUNITY REAL-TIME AIR MONITORING	VOCs via 10.6 eV PID	27	Is roaming real-time air monitoring for VOCs in the community non-detect (i.e., below the instrument's limit of detection)?	If real-time air monitoring results indicate that VOCs are not detected (i.e., below the instrument's LOD), air monitoring for VOCs will continue.
		28	Is there a detection of VOCs via roaming real-time air monitoring in the community above the instrument's LOD?	If real-time community air monitoring results indicate that VOCs are detected, then environmental conditions will be assessed to determine whether the detections are due to ambient sources of VOCs or whether they could be due to site operations and/or fugitive emissions. To conduct this assessment, the air monitoring personnel will document environmental observations (e.g., a passing vehicle, nearby heavy traffic or operational heavy machinery, fire or cigarette smoke, presence of odors, etc.) and continue to monitor the area to determine if

WORKPLAN	ANALYTE	DECISION STATEMENT #	INVESTIGATIVE QUESTION	ACTION
				the reading is transient or sustained (at least 5 minutes). If air monitoring personnel determine that the detection of VOCs is due to ambient sources unrelated to site operations, the personnel will document accordingly and continue with their community air monitoring route. If air monitoring personnel determine that the detection of VOCs may be associated with site operations or fugitive emissions, the personnel will stay in the area and continue monitoring to further characterize the area for at least 5 minutes to determine if detections of VOCs are sustained. This will also include chemical-specific air monitoring for vinyl chloride and documenting any odors possibly consistent with butyl acrylate (see Decision Statement #32-33). The CTEH Project Manager will be notified, who will then notify the CTEH Project Technical Director, Unified Command, and NS Hazmat Manager to assess the need for engineering controls or operational adjustments. Stationary AreaRAE real-time air monitoring data will also be evaluated along with other real-time data being collected both in the community and in the work area.
	PM2.5 via SidePak AM510/AM520	29	Is roaming real-time air monitoring for particulate matter (PM2.5) in the community below the site-specific action level of 0.079 mg/m^3?	If air monitoring results indicate that PM2.5 is not measured above site-specific action level of 0.079 mg/m^3, then air monitoring for PM2.5 will continue.
		30	Is roaming real-time air monitoring for PM2.5 in the community at or above the site-specific action level of 0.079 mg/m^3 sustained for 5 minutes?	If air monitoring results indicate that PM2.5 is measured above the site-specific action level of 0.079 mg/m^3, environmental conditions will be assessed to determine whether the readings are due to ambient sources of PM2.5 or whether they could be due to site operations. To conduct this assessment, the air monitoring personnel will document environmental observations (e.g., a passing vehicle, nearby heavy traffic or operational heavy machinery, fire or cigarette smoke, presence of odors) and continue to monitor the area to determine if the reading is transient or sustained (at least 5 minutes). If air monitoring personnel determine that the detection of PM2.5 is due to ambient sources or is transient, the personnel will document accordingly and continue with their community monitoring route. If monitoring personnel determine that the detection of PM2.5 is sustained for at least 5 minutes, not due to ambient sources, and cannot rule out the contribution from site operations, the personnel will stay in the area and continue monitoring to further characterize the area (at least 15 minutes). If the monitoring personnel determines that PM2.5 is above

WORKPLAN	ANALYTE	DECISION STATEMENT #	INVESTIGATIVE QUESTION	ACTION
		31	Is roaming real-time air monitoring for particulate in the community at or above the action level site-specific action level of 0.138 mg/m^3 sustained for 5 minutes?	0.079 mg/m^3 for the 15-minute period, the CTEH Project Manager will be notified, who will then notify the CTEH Project Technical Director, Unified Command, and NS Hazmat Manager to assess the need for engineering controls or operational adjustments. If air monitoring results indicate that PM2.5 is detected above the site-specific action level of 0.138 mg/m^3, environmental conditions will be assessed to determine whether the readings are due to ambient sources of PM2.5 or whether they could be due to site operations. To conduct this assessment, the air monitoring personnel will document environmental observations (e.g., a passing vehicle, nearby heavy traffic or operational heavy machinery, fire or cigarette smoke, presence of odors) and continue to monitor the area to determine if the reading is transient or sustained (at least 5 minutes). If monitoring personnel determine that the detection of PM2.5 is due to ambient sources or is transient, the personnel will continue with their community monitoring route. If monitoring personnel determine that the reading of PM2.5 is sustained, not due to ambient sources, and cannot rule out the contribution from site operations, the personnel will notify the CTEH Project Manager, who will then notify the CTEH Project Technical Director, Unified Command, and the NS Hazmat Manager to assess the need for engineering controls or operational adjustments.
	Vinyl Chloride via colorimetric tube	32	Is roaming real-time air monitoring for vinyl chloride in the community non-detect (i.e., below the instrument's limit of detection)?	If air monitoring results for vinyl chloride are non-detect in response to detections of VOCs, then it will be determined that vinyl chloride is not present above the instrument's limit of detection (LOD), then air monitoring for vinyl chloride will continue in response to elevated PID readings. See LODs reference above.
		33	Is there a detection of vinyl chloride via roaming real-time air monitoring in the community above the instrument's LOD?	If air monitoring results for vinyl chloride in response to elevated VOC readings detected above the instrument's LOD, indicating that vinyl chloride is detected above the instrument's LOD, the air monitoring personnel will continue monitoring to evaluate whether the detection is transient or sustained (at least 5 minutes). The CTEH Project Manager will be notified, who will then notify the CTEH Project Technical Director, Unified Command, and the NS Hazmat Manager to assess the need for engineering controls or operational adjustments. Any additional decisions will be made based on a review of analytical air sampling results for vinyl chloride (Decision Statement(s) #7-10).
LONG-TERM COMMUNITY	VOCs via 10.6 eV PID	34	Is roaming real-time air monitoring for VOCs (as defined above) in the community non-detect (i.e., below the	If real-time air monitoring results indicate that VOCs are not detected (i.e., below the instrument's LOD), air monitoring for VOCs will continue.

WORKPLAN	ANALYTE	DECISION STATEMENT #	INVESTIGATIVE QUESTION	ACTION
			instrument's limit of detection)?	
		35	Is there a detection of VOCs via roaming real-time air monitoring in the community above the instrument's LOD?	If real-time community air monitoring results indicate that VOCs are detected, then environmental conditions will be assessed to determine whether the detections are due to ambient sources of VOCs or whether they could be due to site operations and/or fugitive emissions. In response to an odor complaint or hotline call and have detections of n-butyl acrylate below the ITSL (20 ppb), then it is determined that there is no appreciable risk to the community. Results will be communicated with the resident/caller, indicating that results show detections of butyl acrylate below the ITSL. Analytical results will be documented in the call log as well as the analytical air data set. To conduct this assessment, the air monitoring personnel will document environmental observations (e.g., a passing vehicle, nearby heavy traffic or operational heavy machinery, fire or cigarette smoke, presence of odors, etc.) and continue to monitor the area to determine if the reading is transient or sustained (at least 5 minutes). If air monitoring personnel determine that the detection of VOCs is due to ambient sources unrelated to site operations, the personnel will document accordingly and continue with their community air monitoring route. If air monitoring personnel determine that the detection of VOCs may be associated with site operations or fugitive emissions, the personnel will stay in the area and continue monitoring to further characterize the area for at least 5 minutes to determine if detections of VOCs are sustained. This will also include chemical-specific air monitoring for vinyl chloride and documenting any odors possibly consistent with butyl acrylate (see Decision Statement #32-33). The CTEH Project Manager will be notified, who will then notify the CTEH Project Technical Director, Unified Command, and NS Hazmat Manager to assess the need for engineering controls or operational adjustments. Stationary AreaRAE real-time air monitoring data will also be evaluated along with other real-time data being collected both in the community and in the work area.
LONG-TERM COMMUNITY	Vinyl Chloride via colorimetric tube	36	Is roaming real-time air monitoring for vinyl chloride in the community non-detect (i.e., below the instrument's limit of detection)?	If air monitoring results indicate that vinyl chloride is not detected in response to detections of VOCs, then it will be determined that vinyl chloride is not present above the instrument's limit of detection (LOD). Air monitoring for vinyl chloride will continue in response to elevated PID readings. See note above on LOD.
LONG-TERM		37	Is there a detection of	If air monitoring results indicate that vinyl chloride is detected above the instrument's LOD, the

WORKPLAN	ANALYTE	DECISION STATEMENT #	INVESTIGATIVE QUESTION	ACTION
COMMUNITY			vinyl chloride via roaming real-time air monitoring in the community above the instrument's LOD?	air monitoring personnel will continue monitoring to evaluate whether the detection is transient or sustained (at least 5 minutes). The CTEH Project Manager will be notified, who will then notify the CTEH Project Technical Director, Site Management, and on-site operations to assess the need for engineering controls or operational adjustments. See note above on LOD.
	Vinyl Chloride via Drager X-PID (if colorimetric tubes are unavailable)	38	Is roaming real-time air monitoring for vinyl chloride in the community non-detect (i.e., below the instrument's limit of detection)?	If air monitoring results indicate that vinyl chloride is not detected in response to detections of VOCs, then it will be determined that vinyl chloride is not present above the instrument's limit of detection (LOD). Air monitoring for vinyl chloride will continue in response to elevated PID readings.
		39	Is there a detection of vinyl chloride via roaming real-time air monitoring in the community above the instrument's LOD?	If air monitoring results indicate that vinyl chloride is detected above the instrument's LOD, the air monitoring personnel will continue monitoring to evaluate whether the detection is transient or sustained (at least 5 minutes). The CTEH Project Manager will be notified, who will then notify the CTEH Project Technical Director, Site Management, and on-site operations to assess the need for engineering controls or operational adjustments.
	WHILE VINYL CHLORIDE ANALYSIS VIA TAGA/PTR-MS IS NOT CURRENTLY INCLUDED IN THE DECISION TREE FOR ONGOING OPERATIONS, THE FOLLOWING SECTION IS INCLUDED IN THE CASE THAT VINYL CHLORIDE ANALYSIS IS IMPLEMENTED IN THE FUTURE FOR THIS PLAN.			
TAGA/PTR-MS	Vinyl Chloride	40	Are TAGA/PTR-MS readings for vinyl chloride in the community below the IMRL (20 ppb)?	If TAGA/PTR-MS is collecting readings for vinyl chloride in the community and readings are above the instrument's LOD and below 20 ppb, then it will be determined that vinyl chloride is not present above the IMRL. Analytical air sampling results (i.e., 1.4L evacuated canisters) will be evaluated to assess whether air concentrations of vinyl chloride are below the IMRL (Decision Statement(s) #7-10).
		41	Are TAGA/PTR-MS readings for vinyl chloride in the community above the IMRL (20 ppb)?	If TAGA/PTR-MS is collecting readings for vinyl chloride in the community and readings are above the IMRL (20 ppb) instantaneously, then the TAGA or PTR-MS (whichever is available) will conduct a downwind assessment by moving to the nearest downwind receptor (i.e., residence, business, etc.) to monitor for vinyl chloride. In addition, the NS HAZMAT Manager will be notified and will contact on-site personnel to identify the locations and types of operations occurring. Work area real-time air monitoring will continue to characterize the area and identify potential source(s) of emissions. If the TAGA/PTR-MS readings for vinyl chloride during the downwind assessment are above the IMRL (20 ppb) instantaneously, then the TAGA or PTR-MS will assess the width of the plume and will remain in the area for 15 minutes to determine whether the detection is sustained (15-minute average above 20 ppb). If the downwind assessment shows that the detection is not sustained above 20 ppb, the TAGA/PTR-MS will continue its community monitoring route. If the downwind assessment shows that the detection is sustained above 20 ppb, the Norfolk Southern HAZMAT Manager will be notified, and engineering controls will be instituted in accordance with the Decision Tree for Ongoing Operations (Air SAP v 2.1, Appendix E, Attachment D). In addition, TAGA/PTR-MS will remain in

WORKPLAN	ANALYTE	DECISION STATEMENT #	INVESTIGATIVE QUESTION	ACTION
				the area for three additional 15-minute intervals to further characterize the area. If concentrations persist after the third 15-minute interval, additional engineering controls will be implemented, and the cycle will repeat until concentrations decrease below 20 ppb as a 15-minute average. In addition, analytical air sampling results (i.e., 1.4L evacuated canisters) will be evaluated to assess whether air concentrations of vinyl chloride are above or below the IMRL.
	n-butyl acrylate	42	Are TAGA/PTR-MS readings for butyl acrylate in the community below the ITSL (20 ppb)?	If TAGA/PTR-MS readings for butyl acrylate in the community are below 20 ppb (ITSL), then it will be determined that butyl acrylate is not present above the ITSL. In addition, analytical air sampling results for butyl acrylate (i.e., 1.4L evacuated canisters and/or passive vapor badges) will be evaluated to assess whether air concentrations of butyl acrylate are below the ITSL (Decision Statement(s) #1-5).
		43	Are TAGA/PTR-MS readings for butyl acrylate in the community above the site-specific acute MRL (50 ppb)?	If TAGA/PTR-MS readings for butyl acrylate in the community are above the site-specific acute MRL (50 ppb) instantaneously, then the TAGA or PTR-MS (whichever is available) will conduct a downwind assessment by moving to the nearest downwind receptor (i.e., residence, business, etc.) to monitor for butyl acrylate. In addition, the Norfolk Southern HAZMAT Manager will be notified and will contact on-site personnel to identify the locations and types of operations occurring. Work area real-time air monitoring will continue to characterize the area and identify potential source(s) of emissions.
		44	Are TAGA/PTR-MS readings for butyl acrylate during the downwind assessment sustained above the ITSL (20 ppb)?	If the TAGA/PTR-MS readings for butyl acrylate during the downwind assessment are above the ITSL (20 ppb) instantaneously, then the TAGA or PTR-MS will assess the width of the plume and will remain in the area for 15 minutes to determine whether the detection is sustained (15-minute average above 20 ppb). If the downwind assessment shows that the detection is not sustained above 20 ppb, the TAGA/PTR-MS will continue its community monitoring route. If the downwind assessment shows that the detection is sustained above the ITSL (20 ppb), the Norfolk Southern HAZMAT Manager will be notified, and engineering controls will be instituted in accordance with the Decision Tree for Ongoing Operations. In addition, TAGA/PTR-MS will remain in the area for three additional 15-minute intervals to further characterize the area. If concentrations persist after the third 15-minute interval, additional engineering controls will be implemented, and the cycle will repeat until concentrations decrease below the ITSL (20 ppb) as a 15-minute average.

Narrative for Table 3.2d: Handheld real-time air monitoring in the Work Area is primarily used as a screening tool during operations to promote worker safety and allow for the modification of work operations in real time. While use in real-time decision making, they are not used in risk-based decision making. They represent screening tools and are not used for broader decision-making for worker health. Monitoring of volatile organic compounds (VOCs) via a 10.6eV photoionization detector (PID) is used as a general screening tool and is not used to make definitive risk-based decisions regarding worker safety and/or exposure. The 10.6eV PID lamp is capable of detecting a broad range of compounds, both man-

made and natural, that have a similar or lower ionization energy (IE) than that of the PID lamp. Out of an abundance of caution, VOC action levels are based on the detection of vinyl chloride (IE: 9.99, PID correction factor: 2).

Table 3.2d Worker Real-Time Air Monitoring Data Quality Objectives

ANALYTE	DECISION STATEMENT #	INVESTIGATIVE QUESTION	ACTION
VOCs via 10.6eV PID	45	Is air monitoring for VOCs in the work area below the instrument's limit of detection (LOD)?	If monitoring for VOCs via the 10.6 eV PID are non-detect (<0.1 ppm), and the detection limit of the PID, no additional chemical-specific real-time monitoring for VOCs will be performed. Work operations and air monitoring will continue. Note: the occupational exposure limit for vinyl chloride 1 ppm. Thus, any detection on the PID for VOCs are below the occupational exposure limit and action level, though monitoring data is not directly compared to occupational exposure limits.
	46	Is air monitoring for VOCs in the work area sustained at or above the site-specific action level of 0.2 ppm for 5 minutes or longer?	If monitoring for VOCs via the 10.6 eV PID are detected at or above the site-specific action level of 0.2 ppm, then the air monitoring personnel will remain in the area to assess whether the readings are sustained. If the detection is sustained for 5 minutes or longer at or above 0.2 ppm, but below the site-specific action level of 0.5 ppm, then chemical-specific monitoring for vinyl chloride will be conducted (see Decision Statements #51-57). Work will still be performed while a monitoring with a second 10.6 eV PID is being used to confirm or deny PID readings. If chemical-specific monitoring indicates the detections are related to vinyl chloride, but still remain below the action level, then results will be communicated with workers and on-site safety and work operations and air monitoring will continue. If the chemical-specific monitoring indicates it is another chemical, then follow Decision Statement #48 and refer back to the site-specific Health and Safety Plan (HASP) v1.3.
	47	Is air monitoring for VOCs in the work area sustained at or above the site-specific action level of 0.5 ppm for 5 minutes or longer?	If monitoring for VOCs via the 10.6 eV PID are detected at or above the site-specific action level of 0.5 ppm, then the air monitoring personnel will remain in the area to assess whether the readings are sustained. If the detection is sustained for 5 minutes or longer above 0.5 ppm, but below the site-specific action level of 1.2 ppm, then chemical specific monitoring for vinyl chloride using colorimetric tubes will be performed. If vinyl chloride is confirmed, results will be communicated to workers and on-site safety. Workers will be instructed to don self-contained breathing apparatus or exit area upwind of the location the area. Monitoring readings will be reported to Unified Command and the NS Hazmat manager to assess work operations and engineering controls. Workers and on-site safety will be appraised of the readings, and work operations and air monitoring will continue, if using respirators. If vinyl chloride is not confirmed, then decision statement #47 will be followed.
	48	Is air monitoring for VOCs in the work area sustained at or above the site-specific action level of 1.2 ppm for 5 minutes or longer?	If monitoring for VOCs via the 10.6 eV PID are detected at or above the site-specific action level of 1.2 ppm, then the air monitoring personnel will remain in the area to assess whether the readings are sustained. If the detections are sustained for 5 minutes or longer, and vinyl chloride is not present as indicated by colorimetric tube, workers and on-site safety will be appraised of the results, workers will be instructed to don a respirator or exit the area to an upwind location. Drager X-PID assessment of n-butyl acrylate will be performed. Results will be reported to Unified Command and the NS Hazmat manager to

ANALYTE	DECISION STATEMENT #	INVESTIGATIVE QUESTION	ACTION
			assess work operations and engineering controls.
PM4.0 via SidePak AM510/AM520	49	Is air monitoring for PM4.0 in the work area below the site-specific action level of 1.5 mg/m^3?	If SidePak AM510/520 air monitoring results for PM4.0 are below the site-specific action level (1/2 the ACGIH TLV-TWA for PNOS), then no action is needed. Worker operations and air monitoring will continue.
	50	Is air monitoring for PM4.0 sustained above the site-specific action level of 1.5 mg/m^3 for five minutes or longer?	If SidePak AM510/520 air monitoring results for PM4.0 are above the site-specific action level (1/2 the ACGIH TLV-TWA for PNOS), then the air monitoring personnel will remain in the area to assess whether the readings are sustained, workers and on-site safety will be alerted to elevated readings. If readings are sustained for five minutes or longer, results will be communicated to workers and on-site safety, workers will be instructed to don a respirator or exit the area to an upwind location. Results will be reported to Unified Command and the NS Hazmat manager to assess work operations and engineering controls.
Vinyl Chloride via Colorimetric Tube	51	Is air monitoring for vinyl chloride in the work area non-detect?	If colorimetric tube analysis of vinyl chloride in response to elevated PID readings is non-detect, no additional chemical-specific real-time monitoring will be performed. Work operations and air monitoring will continue.
	52	Is air monitoring for vinyl chloride in the work area below the site-specific action level of 0.5 ppm?	If colorimetric tube analysis of vinyl chloride in response to elevated PID readings shows a detection below the site-specific action level of 0.5 ppm, additional chemical-specific real-time monitoring will be performed. Work operations and air monitoring will continue.
	53	Is air monitoring for vinyl chloride in the work area sustained at or above the site-specific action level of 0.5 ppm, but below the occupational exposure limit of 1.0 ppm for five minutes or longer?	If colorimetric tube analysis of vinyl chloride in response to elevated PID readings is a detection above the site-specific action level of 0.5 ppm, then a secondary instrument will be used to confirm that the compound is vinyl chloride. If the confirmation reading is non-detect or detected below the action level, then no action is required other than results will be communicated with workers and on-site safety. Work operations and air monitoring will continue.
	54	Is air monitoring for vinyl chloride in the work area sustained at or above the site-specific action level of 1.0 ppm for five minutes or longer?	If colorimetric tube analysis of vinyl chloride in response to elevated PID readings is at or above the site-specific action level, then the air monitoring personnel will continue monitoring to determine whether the readings are sustained. If sustained above the site-specific action level for five minutes or longer, results will be communicated to workers and on-site safety and the workers will be instructed to don self-contained breathing apparatus or exit the area to an upwind location. Results will be reported to Unified Command and the NS Hazmat manager to assess work operations and engineering controls to minimize exposure to vinyl chloride.
Vinyl Chloride via Drager X-pid 8500	55	Is air monitoring for vinyl chloride in the work area below the instrument detection limit of 0.33 ppm on	If results from the Drager X-pid show the analyte is not detected below the instrument detection limit of 0.33 ppm, then no further actions are required, and work operations can continue.

ANALYTE	DECISION STATEMENT #	INVESTIGATIVE QUESTION	ACTION
		the Drager X-pid 8500?	
	56	Is air monitoring for vinyl chloride detected at or above the instrument detection limit of 0.3 ppm on the Drager X-pid 8500, but below the site-specific action level of 1.0 ppm?	If Drager X-pid analysis of vinyl chloride in response to elevated PID readings is below the site-specific action level of 1.0 ppm (OSHA PEL-TWA), then readings will be confirmed with a consecutive run on the X-pid. If the result remains between the instrument detection limit, but below the site-specific action level of 1.0 ppm, then workers and on-site safety will be appraised of the results, and work operations and air monitoring will continue. If the confirmation reading is below the instrument detection limit, then decision statement #55 will be followed since the reading is not sustained. However, if the confirmation reading is still between 0.33 and 1 ppm, then decision statement #56 will be followed. Lastly, if the confirmation reading is above the site-specific action level of 1.0 ppm, then decision statement #57 will be used.
	57	Is air monitoring for vinyl chloride in the work area sustained above the site-specific action level of 1.0 ppm?	If Drager X-pid analysis of vinyl chloride in response to elevated PID readings (when using another PID that provides sustained readings) is at or above the site-specific action level of 1.0 ppm (OSHA PEL-TWA), then the air monitoring personnel will continue monitoring to determine whether the readings are sustained. If sustained above the site-specific action level, results will be communicated to workers and on-site safety. Workers will be instructed to don respiratory protection or exit the area to an upwind location. Results will be reported to Unified Command and the NS Hazmat Manager to assess work operations and engineering controls to minimize potential exposure to n-butyl acrylate.
n-butyl acrylate via Drager X-pid 8500	58	Is air monitoring for n-butyl acrylate in the work area below the instrument detection limit of 1.5 ppm on the Drager X-pid 8500?	If results from the Drager show the analyte is not detected below the instrument detection limit of 1.5 ppm, then no further actions are required, and work operations can continue.
	59	Is air monitoring for n-butyl acrylate detected at or above the instrument detection limit of 1.5 ppm on the Drager X-pid 8500, but below the site-specific action level of 2.0 ppm?	If Drager X-PID analysis of n-butyl acrylate in response to elevated PID readings is below the site-specific action level of 2.0 ppm (ACGIH TLV-TWA), then readings will be confirmed with another run on the X-pid. If the result remains between the instrument detection limit, but below the site-specific action level of 2.0 ppm, then workers and on-site safety will be appraised of the results, and work operations and air monitoring will continue. If the secondary reading is below the instrument detection limit, then decision statement #58 will be followed. However, if the secondary reading is still between 1.5 and 2 ppm, then decision statement #59 will be followed. Lastly, if the secondary reading is above the site-specific action level of 2.0 ppm, then decision statement #60 will be used.
	60	Is air monitoring for n-butyl acrylate in the work area sustained above the site-specific action level of 2.0 ppm?	If Drager X-pid analysis of n-butyl acrylate in response to elevated PID readings (when using another PID that provides sustained readings) is at or above the site-specific action level of 2.0 ppm (ACGIH TLV-TWA), then the air monitoring personnel will continue monitoring to determine whether the readings are sustained. If sustained above the site-specific action level, results will be communicated to workers and on-site safety. Workers will be instructed to don respiratory protection or exit the area to an upwind location. Results will be reported to Unified Command and the NS Hazmat Manager to assess work operations and engineering controls to minimize potential exposure to n-butyl acrylate.

3.3 Measurement Quality Objectives

Measurement Quality Objectives (MQO) are designed to evaluate overall uncertainty of a measurement process. MQOs for this response include the use of measurement performance criteria for field air QC samples, air samples collected via evacuated canisters and Organic Vapor Monitor badges, and air monitoring, which are provided in Tables 3.3a, 3.3b, and 3.3c.

Table 3.3a Performance Criteria for Field Air QC Samples

QC SAMPLE	ANALYTICAL GROUP†	FREQUENCY	DATA QUALITY INDICATORS (DQIS)	DESCRIPTION AND DETAIL	MEASUREMENT PERFORMANCE CRITERIA*
Field Duplicate	Evacuated Canisters	One per 10 field samples, if performed, or 5% of samples	Precision	Precision is determined from the analyzed concentrations of samples collected simultaneously from the same air mass using two discrete canisters collected through the same sampling inlet	If both the original and duplicate results are ≥ 5× LOQ, the RPD should be ≤ 30% for air samples; preferrable ≤ 25%
Field Co-located	Evacuated Canisters	One per 10 field samples, when conducted	Precision	Precision is determined from the analyzed concentrations of samples collected simultaneously from the same air mass using two discrete canisters collected through two separate sampling inlets; this determines the precision of the sampling and analysis processes.	If both the original and co-located results are ≥ 5× LOQ, the RPD should be ≤ 30% for air samples; preferrable ≤ 25%
Field Spikes	Evacuated Canisters	Not Performed	N/A	Indicates that sample handling practices do not deteriorate sample integrity.	Measured concentrations of VOCs within ±30% of theoretical spiked concentrations
Field Blanks	Evacuated Canisters	Not Performed	N/A	N/A	Each target VOC concentration should be approximately 20 pptv or less
Field Co-located	Badges	One per 10 field samples	Precision	Efficiencies may be slightly different	If both the original and co-located results are ≥ 5× LOQ, the RPD should be ≤ 30% for air samples
Field Blanks	Badges	At least 2 per batch	Accuracy, bias, contamination	N/A	No analytes detected > ½ LOQ or > 1/10th the amount measured in any sample or 1/10th the regulatory limit, whichever is greater.
Field Spikes	Badges	Not Performed	N/A	N/A	N/A

† Evacuated canisters analyzed for VOCs via EPA Method TO-15 + TICs; badges analyzed for vinyl chloride and butyl acrylate via NIOSH Method 1007 and modified NIOSH Method 2537, respectively
* LOQ = Limit of Quantification; RPD = Relative Percent Difference

Table 3.3b Performance Criteria for Air Samples via Evacuated Canisters†

DATA QUALITY INDICATOR(S)	MEASUREMENT PERFORMANCE CRITERIA	QC SAMPLE AND/OR ACTIVITY USED TO ASSESS MEASUREMENT PERFORMANCE	FREQUENCY	ERROR ASSESSED BY QC SAMPLE*
Completeness	≥ 95%	% Complete = $\frac{usable\ results}{results\ reported} \times 100\%$	-	S&A
Sensitivity	Method Detection Limits (MDL) for non-detect results are less than Project-Required Quantitation Limits (PRQL)	Evaluate laboratory MDLs and Limits of Quantification (LOQ)	-	A
Accuracy, bias, contamination	No analytes detected > ½ LOQ or > 1/10th the amount measured in any sample or 1/10th the regulatory limit, whichever is greater	Method Blank	Initially, every 24 hours	A
Accuracy, bias	≤ 30 %	Continuing Calibration Verification (CCV)	Initially, every 24 hours	A
Instrument performance	Tune criteria consistent with analytical method	Mass spectrometer tuning	Initially, every 24 hours	A
Sensitivity, accuracy, bias	Recoveries within 60% to 140% of ICAL midpoint standard area or the CCV on days when ICAL is not performed	Internal standards	Every field sample and QC sample, added prior to analysis	A
Precision	Relative percent difference (RPD) must be ≤ 25%	Laboratory duplicate	One per batch of 20 samples	A

† Evacuated canisters analyzed for VOCs via EPA Method TO-15 + TICs
* LOQ = Limit of Quantification; S = Sampling; A = Analysis; S&A = Both Sampling and Analysis

Table 3.3c Performance Criteria for Air Samples via Badges[†]

DATA QUALITY INDICATOR(S)	MEASUREMENT PERFORMANCE CRITERIA	QC SAMPLE AND/OR ACTIVITY USED TO ASSESS MEASUREMENT PERFORMANCE	FREQUENCY	ERROR ASSESSED BY QC SAMPLE*
Completeness	≥ 95%	% Complete = $\frac{usable\ results}{results\ reported} \times 100\%$	-	S&A
Sensitivity	Reporting Limits (RL) for non-detect results are less than Project-Required Quantitation Limits (PRQL)	Evaluate laboratory Limit of Quantification (LOQ)	-	A
Accuracy, bias, contamination	No analytes detected > ½ LOQ or > 1/10th the amount measured in any sample or 1/10th the regulatory limit, whichever is greater	Method Blank	Initially, every 24 hours	A
Accuracy, bias	Within 70-130%	Detection Limit Standard	Initially, before daily CCV and samples	A
Accuracy, bias	Within laboratory statistically derived acceptance criteria	Continuing Calibration Verification (CCV)	Initially, every 20 injections or 12 hours, and at the end of the run	A
Accuracy	See QAPP Worksheet #28 for percent recoveries	Laboratory Control Sample (LCS)/LCS Duplicate (LCSD)	One per batch of 20 samples	A
Precision	See QAPP Worksheet #28 for precision criteria	LCS/LCSD	One per batch of 20 samples	A

[†] Badges analyzed for vinyl chloride and butyl acrylate via NIOSH Method 1007 and modified NIOSH Method 2537, respectively
* LOQ = Limit of Quantification; S = Sampling; A = Analysis; S&A = Both Sampling and Analysis

3.4 Data Review and Validation

Analytical data generated under the UAO will be subjected to data usability assessment as described in the QAPP. The purpose of analytical data verification and validation is to ensure data completeness, correctness, and method compliance/conformance, and identify data quality, including unusable data that would not be sufficient to support environmental decisions. In addition to the laboratory QA review, the data presented in Level IV data packages will be verified and validated by the Data Validators. A Level IV data package will be acquired for all air samples. Level II data validation will be performed on all air samples, and Level IV data validation will be performed on approximately 10% of samples. Environmental Standards, Inc. has been hired as the data validation firm for CTEH, for the following:

- Compliance with requested testing requirements
- Completeness

- Reporting accuracy (including hardcopy to EDD)
- Confirmation of receipt of requested items
- Traceability, sensibility, and usability of the data

Data review will be performed with guidance from the National Functional Guidelines for Organic Data Review (US EPA). These validation guidance documents specifically address analyses performed in accordance with the Contract Laboratory Program (CLP) analytical methods and are not completely applicable to the type of analyses and analytical protocols performed for the EPA and NIOSH methods utilized by the laboratory for these samples. Therefore, data validators will use professional judgment to determine the usability of the analytical results and compliance relative to EPA and NIOSH methods utilized by the laboratory.

Data usability directly affects whether project objectives can be achieved. The results of these evaluations will be included in the project report. Data characteristics will be evaluated for multiple concentration levels if the evaluator determines that it is necessary to do so. To the extent required by the type of data being reviewed, the assessors will consult with other technically competent individuals to render sound assessments of the data characteristics, as outlined in Table 3.4.

Table 3.4 Data Usability Assessment and Characteristics

DATA USABILITY INDICATOR	DESCRIPTION
Precision	The degree of agreement between the numerical values of a set of duplicate samples performed in an identical fashion constitutes the precision of the measurement. During the collection of data using field methods and/or instruments, precision is checked by reporting measurements at one location and comparing results. $$\%RPD = abs\left[\frac{\mathrm{A}-\mathrm{B}}{\left(\frac{A+B}{2}\right)}\right] \times 100$$ Where: A = Value of original sample B = Value of duplicate sample
Accuracy	Accuracy is the degree to which a given result agrees with the true value. The accuracy of an entire measurement system is an indication of any bias that exists. Spiked sample results provide information needed to assess the accuracy of analyses. Surrogate spike, MS/MSD, and LCS %Rs are used to assess accuracy. Every organic sample is spiked with known quantities of non-target surrogate compounds. The formula used to calculate accuracy for all accuracy indicators, except MS, is:

DATA USABILITY INDICATOR	DESCRIPTION
	$\% R = \left(\frac{A_T}{A_F}\right) \times 100$ Where: A_T = Total concentration of the analyte measured or recovered A_F = Concentration of the analyte spiked The formula used to calculate accuracy for the MS is: $\% R = \left(\frac{A_T - A_O}{A_F}\right) \times 100$ Where: A_T = Concentration of the analyte measured or recovered A_0 = Unspiked concentration of the analyte A_F = Concentration of the analyte spiked
Representativeness	Representativeness expresses the degree to which sample data are accurate and precisely represent a characteristic of a population, parameter variations at a sampling point, or an environmental condition. Representativeness is a qualitative parameter associated with the proper design of the sampling program.
Completeness	Completeness is a measure of the degree to which the amount of sample data collected meets the needs of the sampling program and is quantified as the relative number of analytical data points that meet the acceptance criteria (including accuracy, precision, and any other criteria required by the specific analytical method used). Completeness is defined as a comparison between actual numbers of usable data points expressed as a percentage of expected number of points. The minimum goal for completeness is 95%; the ability to exceed this goal is dependent on the applicability of the analytical methods to the sample matrix analyzed. If data cannot be reported without qualifications, project completion goals may still be met if the qualified data (data of known quality, even if not perfect) are suitable for specified project goals. $\%C = \frac{total\ number\ of\ usable\ results}{total\ number\ of\ results} \times 100$
Comparability	Comparability is a qualitative parameter used to express the confidence with which one data set can be compared with another. The comparability of the data, a relative measure, is influenced by sampling and analytical procedures. By providing specific protocols for obtaining and analyzing samples, data sets will be comparable regardless of who collects the sample or who performs the sample analysis.
Sensitivity	Analytical sensitivity is a measure of an analytical technique's capability to reliably detect a positive signal compared to background noise. Sensitivity is measured in terms of laboratory-specific MDLs. The Detection and reporting limits will be compared to project Als and DQOs to ensure sufficient sensitivity to meet project objectives. If sensitivity goals are not achieved, the limitations on the data will be described.

Accuracy and precision will be quantitatively assessed by comparing recoveries and relative percent difference to the goals identified in the QAPP. Data associated with accuracy or precision indicators that do not meet these goals will be assigned data usability qualifiers as identified in QAPP.

These data usability qualifiers, along with data qualification reason codes, will be stored as attributes to the analytical results in the project database.

The Data Validation PM will coordinate review data generated by the laboratories for analyses of project samples. Any issues observed during data validation will be brought to the attention of the Project QA Director; the Laboratory PM will be contacted to determine and implement an appropriate corrective action if warranted.

Data validation reports will be prepared and reviewed by the Data Validation PM. The data validation reports will summarize the data reviewed, the level of review, any issues observed, and any data qualification. Data validation reports will be submitted to the project data portal.

3.5 Data Assessment

Air monitoring will be conducted by CTEH personnel using handheld and stationary real-time air monitoring instrumentation, in accordance with the SAP and QAPP. Air samples will be collected by CTEH personnel and sent to Pace Analytical or SGS Galson for laboratory analysis, in accordance with the SAP and QAPP. Air monitoring and sampling data will be assessed using appropriate statistical methods and by comparison to established action levels and screening values, as outlined in the SAP and QAPP. Analytical methods and laboratory quantitation limits as well as screening values are listed by COI and sample category in Table 3.5.

Table 3.5 Laboratory Quantitation Limits and Screening Values

SAMPLING CATEGORY	ANALYTE	CAS #	ANALYTICAL METHOD	PROJECT SCREENING VALUE (PPB)	LABORATORY-SPECIFIC QUANTITATION LIMIT (PPB)
Worker Monitoring (Badges)	Butyl Acrylate	141-32-2	mod. NIOSH Method 2537	2,000[a]	130
	Vinyl Chloride	75-01-4	NIOSH Method 1007	1,000[a]	45
Community Sampling (Badges)	Butyl Acrylate	141-32-2	mod. NIOSH Method 2537	20[b]	9-15[c]
Community Sampling (evacuated canisters)	Butyl Acrylate	141-32-2	EPA Method TO-15	20[b]	19
	Vinyl Chloride	75-01-4	EPA Method TO-15	20[d]	0.200

a: American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Value (TLV) – Time-Weighted Average (TWA)
b: Michigan Department of Natural Resources and Environment Initial Threshold Screening Level (ITSL)
c: Laboratory-Specific Quantitation Limit varies whether badges are deployed for 12-hour or 24-hour periods
d: ATSDR Intermediate Minimal Risk Level (MRL) for Inhalation

3.6 Assessment Oversight

One of the goals of the project QA program is to quickly identify, correct, and resolve errors and to prevent recurrence. A description of assessments conducted as part of the project QA program and parties responsible for the corrective action response are presented in Table 3.6.

Table 3.6 Assessment Oversight and Corrective Actions

ASSESSMENT TYPE	FREQUENCY	INTERNAL OR EXTERNAL	ORGANIZATION PERFORMING ASSESSMENT	PERSON RESPONSIBLE FOR PERFORMING ASSESSMENT	PERSON(S) RESPONSIBLE FOR RESPONDING TO ASSESSMENT FINDINGS	PERSON(S) RESPONSIBLE FOR IDENTIFYING/ IMPLEMENTING CA	PERSON(S) RESPONSIBLE FOR MONITORING EFFECTIVENESS OF CA
Onsite Laboratory Systems Audit	During certification period, at discretion of the Accreditation Officer	External	TNI	TNI Auditor	Lab. QA Manager	Lab. QA Manager	Lab.QA Manager
Field Oversight/QA/Audits	Minimum 1 per investigation/matrix	External	Geosyntec Consultants	Field Oversight Project Director	Field Team Leader	Field Oversight Project Director	Field Oversight Project Director
QC of Daily Field readings, summaries, field forms, review against SAP requirements	Each sample event	Internal	Sampling Contractor	Field Team Leader	N/A	Sampling Contractor Project Manager	Sampling Contractor Project Manager
Laboratory Report Deliverables – verification of data package completeness, analytical compliance, and data correctness	Each SDG	Internal	Laboratory	Lab. Project Manager	Lab. QA Manager	Lab. QA Manager	Lab. QA Manager
Data Validation	Each SDG	Internal	Environmental Standards	Data Validation Project Manager	Lab. PM or Lab. QA Manager	Project QA Director and Lab. QA Manager	Project QA Director
Laboratory Corrective Action Investigation	As needed	Internal	Environmental Standards	Project QA Director	Lab. QA Manager	Lab. QA Manager	Project QA Director
Performance Evaluation Samples	Minimum of 1 per investigation	External	Environmental Standards	Project QA Director	Lab. QA Manager	Lab. QA Manager	Project QA Director

4.0 HOME ASSESSMENTS

The Air Monitoring and Residential Re-Entry Plan (dated February 14, 2023; Appendix B) details that home assessments are part of a voluntary air monitoring program and has been prepared in anticipation of residential clearance air monitoring for two purposes: 1) To provide indoor air quality monitoring for residents living within the evacuated area who are re-entering their homes after the evacuation order has been lifted; and 2) To respond to requests for indoor air quality monitoring from residents voluntarily remaining within the evacuated or affected area.

During the initial response and assessment phase of the incident, the following substances were identified for re-entry air monitoring: volatile organic compounds (VOC), hydrogen chloride, and vinyl chloride. VOCs encompass a variety of compounds, including vinyl chloride, n-butyl acrylate, 2-ethylhexyl acrylate, isobutylene, ethylene glycol monobutyl ether acetate, and benzene. However, it was later determined that CTEH would monitor for VOCs during every assessment and monitor for vinyl chloride only in the instance of a VOCs detection.

An Addendum to the Air Monitoring and Residential Re-Entry Plan (dated April 4, 2023; Appendix C) was developed. Per the Addendum, requests for home assessments include air monitoring for VOCs and possible deployment of an air sampling badge for butyl acrylate. The air sampling badge for butyl acrylate will be deployed outside of the home in a public location near the resident's property and between the residence and the incident site.

5.0 LONG-TERM COMMUNITY AIR MONITORING AND SAMPLING PLAN

The Long-Term Community Air Monitoring and Sampling Plan (dated April 12, 2023; Appendix E) details the workflow for outdoor air monitoring and sampling in community areas using a combination of available tools: handheld and stationary real-time air monitoring, stationary analytical air sampling, the USEPA Trace Atmospheric Gas Analyzer (TAGA), and Proton Transfer Reaction-Mass Spectrometry (PTR-MS) instruments. This Plan also includes the workflow for responding to odor complaints in the community and an updated Decision Tree for Ongoing Operations (the original Decision Tree, dated March 15, 2023, is included as Appendix D as a reference). The Long-Term Community Air Monitoring and Sampling Plan and its appendices replace the Air Monitoring and Residential Re-Entry Plan and its corresponding Addendum and the original Decision Tree for Ongoing Operations.

6.0 SAMPLING DESIGN AND RATIONALE

Strategy for air monitoring and sampling activities as described in this SAP is provided in the following subsections.

6.1 Air Monitoring and Sampling Strategy

As part of a larger group of plans collectively making up the project Removal Action Plan, the work described in this SAP will be conducted in accordance with the Quality Assurance Project Plan (QAPP), Health and Safety Plan (HASP), and other overall documents that provide procedures for sample collection, identification, and analysis. Media-specific sampling and analysis procedures are presented below to support the scope of work discussed in the SAP.

CTEH is focusing on the chemicals and indicators of flammability and toxicity outlined in this SAP because they are among the most important and readily monitored hazards of spilled or released vinyl chloride, acrylates, and other substances involved in this derailment and their combustion products. The possible hazards of these substances vary with the environmental conditions associated with the release. Monitoring and sampling for some chemicals or indicators may be conducted less frequently or even discontinued as monitoring and sampling results indicate that these chemicals and indicators do not pose a health concern.

The strategy will utilize three broadly defined monitoring plans: 1) Worker Monitoring; 2) Community Monitoring; and 3) Site Assessment. Worker Monitoring will generally take place in the presence of workers performing/supporting remediation operations. The readings will generally be taken at a height consistent with that of the samplers breathing zone and in proximity to workers without interfering or obstructing their remediation tasks. Community Monitoring may take place in those residential and commercial locations surrounding the incident site. Unlike Worker Monitoring and Community Monitoring, Site Assessment does not necessarily represent ambient air monitoring near breathing zone level. Site Assessment may involve a variety of different monitoring tasks intended to provide information that may help to delineate the nature and extent of the release (e.g., fence line monitoring, worst case determination, container head space, ground level, etc.).

Free-roaming handheld real-time air monitoring will be conducted in a variety of areas based on levels of activity, proximity to the release, site conditions, and meteorological patterns (e.g., wind direction). Handheld real-time air monitoring will be conducted extensively in areas within a one-mile radius of the incident site, especially in areas containing sensitive receptors, including neighborhoods, public facilities (e.g., schools, medical facilities), and water bodies (e.g., potentially impacted creeks and their downstream areas). Handheld real-time air monitoring will also be conducted in areas outside of a one-mile radius, especially in those areas that contain sensitive receptors, are downwind of the incident site, or are downstream of potentially impacted water bodies.

In addition to handheld real-time air monitoring, stationary real-time air monitoring locations (radio-telemetering RAE Systems by Honeywell AreaRAE/AreaRAE Plus units) will be established in community areas or along the work area perimeter to provide nearly continuous air monitoring in multiple areas. Stationary real-time air monitoring also allows the quantification of concentration averages over time in distinct geographic locations. AreaRAE/AreaRAE Plus readings will be received and monitored in a centralized location by CTEH personnel to allow for recognition, communication, and response to changing conditions.

Real-time air monitoring data of VOCs used for daily summaries and general reporting are not corrected or adjusted for the chemical-specific correction factor. However, action levels (as listed in Tables 5.3a, b, and c) are adjusted to reflect the correction factor for each chemical. Data are then compared directly to the site-specific and chemical-specific action levels, as outlined in this SAP.

Discrete air samples will be collected in all monitoring areas and sent to an off-site laboratory for chemical analysis. These analytical air sampling techniques may be used to provide air quality data beyond the scope of real-time instruments. Air sampling locations will be established along the work area perimeter and in community areas within a one-mile radius of the incident site, especially in areas containing sensitive receptors, including

neighborhoods, public facilities (e.g., schools, medical facilities), and water bodies (e.g., potentially impacted creeks and their downstream areas). Air sampling locations may also be established in areas outside of a one-mile radius, especially in those areas that contain sensitive receptors, are downwind of the incident site, or are downstream of potentially impacted water bodies.

Discrete air samples will also be collected on individual workers (personal sampling) to provide exposure data over the course of a work shift for more direct comparison to occupational exposure values.

As noted in the Data Quality Objectives, real time instruments may be calibrated in excess of the manufacturer's recommendations, whenever indicated by site conditions or instrument readings, or after 24 hours of use. Serial numbers for all analytical equipment used in field deployment will be recorded in the Air Monitoring Field Sheets or in Carbon. Lot numbers and expiration dates will be recorded with use of Gastec colorimetric tubes. Meter readings for baseline samples will be evaluated on a daily basis to determine the percent drift, if any.

6.2 CTEH Site-Specific Action Levels

CTEH site-specific action levels may be employed in all air monitoring plans to provide information for corrective action to limit potential exposures. These values do not replace occupational or community exposure standards or guidelines but are intended to represent a concentration limit that triggers a course of action to better address worker and public safety. Action level exceedances will be communicated to the CTEH Project Manager (PM), who will inform the CTEH Project Technical Director and Site Management. Additional actions will be taken in accordance with Tables 6.3a to 6.5b, and work practice may be assessed and then altered if necessary. Site-specific action levels are not utilized for Site Assessment monitoring. The purpose of Site Assessment is to provide information that may help to delineate the nature and extent of the release; therefore, Site Assessment monitoring is not necessarily indicative of or relevant to the breathing zone, and action levels are, thus, not applicable. Action levels and rationale, where applicable, are provided along with instrument details in Tables 6.3a and 6.3b for worker monitoring, 6.4 for community monitoring, and 6.5a and 6.5b for site assessment monitoring to 6.5b.

6.3 Sampling Design and Rationale: Worker Monitoring

Objective: Report air levels before they reach those requiring respiratory protection.

Table 6.3a Worker Monitoring – Constituents of Interest and Action Levels

Analyte*	Action Level	Action to be Taken	Basis	Instrument	Detection Limit	Notes	Correction Factor
Total VOCs†	0.2 ppm 5 min.	Assess for the presence of vinyl chloride; Report reading to PM	To avoid over-exposure to vinyl chloride	MultiRAE PID AreaRAE PID	0.1 ppm	Range: 1 – 5,000 ppm	2 (vinyl chloride)
				ppbRAE 3000+	1 ppb	Range: 1 ppb – 10,000 ppm	2 (vinyl chloride)
				MultiRAE ppb PID	10 ppb	Range: 10 ppb – 2,000 ppm	2 (vinyl chloride)
	0.5 ppm 5 min.	If vinyl chloride is confirmed, don self-contained breathing apparatus or evacuate area; Report reading to PM	OSHA PEL for vinyl chloride (1 ppm; corrected); Upgrade respiratory protection per OSHA 1910.1017	Same instrumentation as above			
	1.2 ppm 5 min.	If no vinyl chloride is confirmed, don respirator or evacuate area; Report reading to PM	ACGIH TLV-TWA for butyl acrylate (2 ppm; corrected)	MultiRAE PID AreaRAE PID	0.1 ppm	Range: 1 – 5,000 ppm	1.6 (butyl acrylate)
Vinyl Chloride	0.5 ppm 5 min.	Report reading to PM; Confirm reading with secondary detector tube	½ ACGIH TLV-TWA; OSHA action level	Gastec Tube #131L	0.02 ppm	Range: 0.1 – 6.9 ppm Volume: Variable	Variable
				Gastec Tube #131La	0.05 ppm	Range: 0.25 – 54 ppm; Volume: Variable	Variable
				Gastec Tube #131LB	0.2 ppm	Range: 0.4 – 70 ppm; Volume: Variable	Variable
				Nextteq Tube NX221L	0.05 ppm	Range: 0.1 – 12 ppm; Volume: Variable	Variable
				Drager X-pid 8500	0.33 ppm	Range: 1 – 100 ppm	NA
	1 ppm 5 min.	Don self-contained breathing apparatus; Report reading to PM	OSHA PEL; Upgrade respiratory protection per OSHA 1910.1017	Same instrumentation as above			
n-Butyl Acrylate^	2 ppm 5 min.	Test only as requested; Don respirator or evacuate area; Report reading to PM	ACGIH TLV-TWA	Drager X-pid 8500	1.5 ppm (estimated)	Range: 7.6 – 760 ppm (estimated)	NA
PM (PM_4)	1.5 mg/m^3 5 min.	Don respirator or evacuate area; Report reading to PM	½ ACGIH guideline for particulates not otherwise specified	SidePak AM510 SidePak AM520	0.001 mg/m^3	PM_4 impactor – 50% cut-off at 4 microns	NA

Analyte*	Action Level	Action to be Taken	Basis	Instrument	Detection Limit	Notes	Correction Factor
			(PNOS)				

MultiRAE PID, AreaRAE PID, ppbRAE 3000+, MultiRAE ppb PID, and Drager X-pid 8500 all use a 10.6 eV lamp.
* Monitoring for some constituents may cease depending on site conditions.
†Total volatile organic compounds (VOCs) are any volatile compound that can be detected using a photoionization detector (PID) with a 10.6 eV lamp. Vinyl chloride, ethylene glycol monobutyl ether, 2-ethylhexyl acrylate, n-butyl acrylate, and isobutylene are all detectable by 10.6 eV PID. Vinyl chloride has the most restrictive action level and is, thus, used for the total VOCs action level above. For a full list, see Table 5.3c.
^ n-Butyl acrylate can be qualified using Drager X-pid 8500 but not quantified. The detection limit and measuring range are estimates.

Table 6.3c SAP PID Response and Action Level Breakdown

Analyte	Worker Monitoring Action Level	Action to be Taken	Basis	Instrument	Detection Limit	Notes	Correction Factor
Vinyl Chloride (75-01-4)	0.2 ppm 5 min.	Confirm reading with secondary instrument; Report reading to PM	½ ACGIH TLV-TWA; OSHA action level (corrected)	MultiRAE PID AreaRAE PID	0.1 ppm	Range: 1 – 5,000 ppm	2
	0.5 ppm 5 min.	Don respirator or evacuate area; Report reading to PM	ACGIH TLV-TWA; OSHA PEL (1 ppm; corrected)				
n-Butyl Acrylate (141-32-2)	1.2 ppm	Don respirator or evacuate area; Report reading to PM	ACGIH TLV-TWA (2 ppm; corrected)	MultiRAE PID AreaRAE PID	0.1 ppm	Range: 1 – 5,000 ppm	1.6

MultiRAE PID and AreaRAE PID use a 10.6 eV lamp.

6.4 Sampling Design and Rationale: Community Assessment

Objective: Report air levels before they reach those causing nuisance or health issues.

Table 6.4 Community Assessment – Constituents of Interest and Action Levels

Analyte*	Action Level	Action to be Taken	Basis	Instrument	Detection Limit	Notes	Correction Factor
Total VOCs[†]	Detection	Report reading to PM	Instrument detection limit; To inform PM/PTD of potential off-site issues	MultiRAE PID AreaRAE PID	0.1 ppm	Range: 1 – 5,000 ppm	Variable
				ppbRAE 3000+	1 ppb	Range: 1 ppb – 10,000 ppm	Variable
				MultiRAE ppb PID	10 ppb	Range: 10 ppb – 2,000 ppm	Variable
Vinyl Chloride	Detection	Test only as requested; Report reading to PM	Instrument detection limit; To inform PM/PTD of potential off-site issues	Gastec Tube #131L	0.02 ppm	Range: 0.1 – 6.9 ppm; Volume: Variable	Variable
				Gastec Tube #131La	0.05 ppm	Range: 0.25 – 54 ppm; Volume: Variable	Variable
				Gastec Tube #131LB	0.2 ppm	Range: 0.4 – 70 ppm Volume: Variable	Variable
				Nextteq Tube NX221L	0.05 ppm	Range: 0.1 – 12 ppm Volume: Variable	Variable
				Drager X-pid 8500	0.33 ppm	Range: 1 – 100 ppm	NA
Particulate Matter ($PM_{2.5}$)[§]	0.138 mg/m^3 5 min.	Site conditions will be assessed to determine whether PM readings are due to on-site activities or ambient particulates. On-site operations will be notified to assess the need for engineering controls or operational adjustments.	Wildfire Smoke Guidelines upper-bound breakpoint for unhealthy for sensitive groups AQI (1-hour average)	SidePak AM510 SidePak AM520	0.001 mg/m^3	PM2.5 impactor – 50% cut-off at 2.5 microns	NA
	0.079 mg/m^3 8 hr.		Wildfire Smoke Guidelines upper-bound breakpoint for unhealthy for sensitive groups AQI (8-hour average)	Same instrumentation as above			

MultiRAE PID, AreaRAE PID, ppbRAE 3000+, MultiRAE ppb PID, and Drager X-pid 8500 all use a 10.6 eV lamp.

* Monitoring for some constituents may cease depending on site factors.

[†] Vinyl chloride, ethylene glycol monobutyl ether, 2-ethylhexyl acrylate, n-butyl acrylate, and isobutylene are all detectable by 10.6 eV PID.

[§] $PM_{2.5}$ is especially prone to interference from high humidity, in cases of high humidity, PM10 impactors may be used which are not as sensitive to humidity. In general, correction factors may be used to adjust PM readings for humidity.

6.5 Sampling Design and Rationale: Site Assessment

Objective: Characterize nature and extent of release.

Table 6.5a Site Assessment – Constituents of Interest and Action Levels

Analyte*	Action Level	Action to be Taken	Basis	Instrument	Detection Limit	Notes	Correction Factor
Total VOCs†	NA	Report reading to PM	NA	MultiRAE PID AreaRAE PID	0.1 ppm	Range: 1 – 5,000 ppm	2
Vinyl Chloride	NA	Report reading to PM	NA	Gastec Tube #131L	0.02 ppm	Range: 0.1 – 6.9 ppm Volume: Variable	Variable
				Drager X-pid 8500	0.33 ppm	Range: 1 – 100 ppm	NA
n-Butyl Acrylate	NA	Report reading to PM	NA	MultiRAE PID	0.1	Range: 1 – 5,000 ppm	1.6
				Drager X-pid 8500	1.5 ppm	Range: 1 – 100 ppm	NA

MultiRAE PID, AreaRAE PID, and Drager X-pid 8500 all use a 10.6 eV lamp.
* Monitoring for some constituents may cease depending on site factors.
† Vinyl chloride and n-butyl acrylate are detectable by 10.6 eV PID.

Table 6.5b Site Assessment – Flammability Action Levels

Analyte	Action Level	Corrected Value	Action to be Taken	Basis	Instrument	Detection Limit	Notes	Correction Factor
% LEL	NA	NA	Report reading to PM	NA	MultiRAE Sensor AreaRAE Sensor	1 %	Range: 1 – 100 %	2*
Total VOCs†	NA	NA	Report reading to PM	NA	MultiRAE PID AreaRAE PID	0.1 ppm	Range: 1 – 5,000 ppm	1.1

MultiRAE PID and AreaRAE PID use a 10.6 eV lamp.
*Per RAE Systems by Honeywell Technical Note TN-156, % LEL correction factor for vinyl chloride with a 10.6 eV lamp is 2.0.
† Of the constituents of interest, 2-ethylhexyl acrylate has the lowest LEL and is, thus, used for the flammability action levels above. The LEL for 2-ethylhexyl acrylate is 0.8 % (equivalent to 8,000 ppm VOCs; 1 % LEL

7.0 REQUEST FOR ANALYSES

7.1 Analysis Narrative

Whole air samples will be collected and submitted to Pace Analytical for analysis of VOCs using EPA Method TO-15 using a 1.4-liter evacuated canister. The maximum holding time from collection to preparation is no more than 30 days, and the time from preparation to analysis is no more than five days. Analytical air sampling badges will be collected and submitted to SGS Galson for analysis of vinyl chloride via NIOSH method 1007 and butyl acrylate via modified NIOSH method 2537.

7.2 Analytical Laboratory

A summary of the analytical methods that will be used are shown in Table 7.2.

Table 7.2 Analytical Methods

ANALYTE	MEDIA/CAN	METHOD
VOCs	Evacuated canister (1.4 L)	EPA TO-15
Vinyl chloride	566 Organic Vapor Monitor badges	NIOSH 1007
n-Butyl acrylate	566 Organic Vapor Monitor badges, 525 Organic Vapor Monitor badges	Modified NIOSH 2537

8.0 FIELD METHODS AND PROCEDURES

8.1 Field Equipment

Field equipment includes a variety of handheld real-time air monitoring devices, including instruments with photoionization detectors (RAE Systems by Honeywell MultiRAE instruments) chemical-specific colorimetric detector tubes (Gastec and Nextteq tubes), portable particulate monitors (SidePak AM510/AM520 instruments), and portable micro gas chromatography instruments with photoionization detectors (MicroGC; Drager X-pid 8500 instruments). Field equipment also includes stationary real-time air monitoring devices, including instruments with photoionization detectors (RAE Systems by Honeywell AreaRAE instruments).

8.2 List of Equipment

A full list of equipment used is shown in below in Table 8.2 and detailed in tables in sections 5 and 6 (CTEH SharePoint Site for SOPs).

Table 8.2 List of Equipment

INSTRUMENT
AreaRAE PID
ppbRAE 3000+
MultiRAE ppb PID
Gastec Tube #131L
Gastec Tube #131La
Gastec Tube #131LB
Nextteq Tube NX221L
Drager X-pid 8500
SidePak AM510
SidePak AM520
Drager X-pid 8500
Evacuated canister (1.4 L)
Treated charcoal
566 Organic Vapor Monitor badges, 525 Organic Vapor Monitor badges
Piston pump
Impactors

8.3 Calibration of Field Equipment

Real-time instruments may be calibrated in excess of the manufacturer's recommendations, whenever indicated by site conditions or instrument readings, or at least every 24 hours. Particulate monitoring devices and MicroGC instruments are calibrated per manufacturer's instructions.

8.4 Air Sampling

Evacuated canisters will be placed at discrete locations, including along the perimeter of the work area and in community areas. Air samples via canisters will be collected daily and for a duration of approximately 24 hours. Air samples via canisters will be submitted to Pace Analytical for analysis of VOCs using EPA Method TO-15 + TICs. Non-targeted TIC analysis does not include detection of butyl acrylate specifically as a target analyte, but samples are generally evaluated for presence or absence, depending on whether certain criteria are met. Per Pace Analytical standard procedures for TIC evaluation, three criteria are required in order to be verified as a TIC:

1. Is the identified compound concentration above 10 ppbv?
2. If so, is the quality match for the TIC above 85%?
3. If the concentration is above 10ppbv, and the quality match is below 85%, the compound is reported as 'Unknown'.

Per a request from CTEH on March 26, 2023, Pace Analytical employed a targeted TIC evaluation procedure on all samples collected between February 4, 2023, and March 21, 2023. A targeted TIC evaluation is a routine process that uses the reference spectra from the NIST library to assist the analyst in identifying analytes of concern in a sample chromatogram. In this case, Pace also had the benefit of recent injections made from a certified reference standard of butyl acrylate to assist in identifying not only the spectral chromatogram acquired under standard lab conditions but also the expected retention time of the compound of concern. These additional tools increase the confidence level of the evaluation and, although presence of the targeted compound was identified below the 10 ppbv threshold, Pace Analytical confirmed the original TIC results as reported. All data for samples collected between February 4, 2023, and March 21, 2023, were evaluated via targeted TIC analysis, and no samples showed a detection of butyl acrylate above 10 ppb. Samples collected beginning on March 22, 2023, were analyzed on instrumentation with standard TO-15 calibration and instrument verification procedures for butyl acrylate; thus, the targeted TIC processes will no longer be necessary, and butyl acrylate will be reported as a TIC in all samples collected on or after March 22, 2023.

Passive air sampling badges (525 Organic Vapor Monitor badges) will also be placed at discrete locations, including along the perimeter of the work area and in community areas. Passive air sampling badges may be co-located with canister air samples. All air samples via badges will be collected daily and for a duration of approximately 12 or 24 hours. Air samples via badges will be submitted to SGS Galson for analysis of vinyl chloride via NIOSH method 1007 and butyl acrylate via modified NIOSH method 2537.

In addition to stationary air sampling locations, personal air sampling of workers will also be conducted. Personal air sampling will be conducted via 566 Organic Vapor Monitor badges for workers present in work areas or conducting work operations. Each badge will be affixed to the lapel of the worker's shirt or outer layer and within the breathing zone. All personal air samples via badges will be collected for a duration of either 15 minutes (for comparison to short-term exposure levels or ceiling values) or 8 hours (for comparison to time-weighted average exposure levels).

9.0 SAMPLE CONTAINERS, PRESERVATION, PACKING, AND SHIPPING

Information on sample containers, preservation, and shipping and holding times is shown in Table 9.0.

Table 9.0 Sample Containers, Preservation, and Holding Times

MATRIX	ANALYTICAL GROUP	ANALYTICAL METHOD	CONTAINERS OR MEDIA	PRESERVATION REQUIREMENTS	MAXIMUM HOLDING TIME*
Air (evacuated canisters)	VOCs	EPA Method TO-15	1.4-liter evacuated canister	None	Collection to preparation: 30 days; preparation to analysis: 5 days
Air (Badges)	Vinyl chloride; butyl acrylate	NIOSH Method 1007; modified NIOSH Method 2537	566 or 525 Organic Vapor Monitor badges	None; ship and store at room temperature	Return to lab within 14 days

* Maximum holding time is calculated from the time the sample is collected to the time the sample is prepared/extracted.

10.0 DISPOSAL OF MATERIALS

CTEH air monitoring and sampling activities do not typically generate anything outside of general waste. One-use consumables and general waste are disposed of following the applicable local and national waste disposal regulations. Spent calibration gas cylinders are consumables which are treated according to the manufacturer's specifications (i.e., returned to the manufacturer for disposal or reuse).

10.1 Sample Documentation

Air monitoring and sampling field logs, notebooks, photographs, and data will be accounted for in accordance with the data sources and data management guidance listed in Table 10.1.

Table 10.1 Data Sources and Data Management

DATA SOURCE	REQUIRED INFORMATION	PROCESSING INSTRUCTIONS	PROCESSING FREQUENCY	PROCESSING RESPONSIBILITY	STORAGE LOCATION	FINAL OUTPUT
Site Documents	Site Files, Plans, Addendums	File hard copies and electronic copies in indicated storage location	Beginning of project and as needed	Field Sampling Project Manager	Digital: CTEH Projects Secure Server; Hard Copy: Project secure file	.pdf and other image formats
Field Sheets	Sample No., Date, Time, Sampler, Location, Field conditions	File hard copies and electronic copies in indicated storage location	Per sampler, location, equipment, and date	Field Team Leads	Digital: CTEH Projects Secure Server; Hard Copy: Project secure file	.pdf and other image formats
Real-Time Monitoring Data	Background concentrations, instrument data with time, date, and GPS location	Upload into Mobile Data Systems (MDS) software	At least every 10 data logs	Data Manager	CTEH Secure Server	.pdf and other image formats
Other Data Sources (as requested)					Digital: CTEH Projects Secure Server; Hard Copy: Project secure file	.pdf and other image formats

10.2 Sample Labeling

The following guidance is based on the CTEH Environmental Sample Nomenclature. Sample IDs will contain 12 characters, with characters 10, 14, and 15 optional. Sample IDs will contain no spaces; all zeros will contain lines

and a strikethrough on the letter. Duplicates will remain blind to the laboratory unless stated on the chain-of-custody (COC).

Character	Description
1, 2, 3, 4	Two Character Site Prefix (City, State)
5, 6, 7, 8	Two Digit Month and Two Digit Day (e.g., 0206)
9, 10	Matrix Code and Sample Types (Below)
11, 12, 13	Three Digit Serial ID (000-999)
14, 15	QC Sample Code

Matrix Codes and Sample Types*

CL – Co-located

D – Duplicate

F – Field Blank

* Other values A through Z correspond to matrix types as assigned by field personnel.

Samples suspected of containing high concentrations of contaminants will be indicated on the COC to prevent damage to laboratory equipment.

10.3 Sample Chain-of-Custody Forms and Custody Seals

Changes or corrections to the information documented by the chain-of-custody (COC) record (including, but not limited to, field sample ID or requested analyses) must be changed by marking through the incorrect information with a single strikethrough line and dating and initialing the change. If the request for a change or correction comes from the Field Sampling Personnel after the COC records have been relinquished to the laboratory, a copy of the COC record will be revised, initialed, and forwarded to the laboratory, where the revised version will supersede the original COC record, or the laboratory will be emailed with instructions to add information to the COC, for which the email will provide traceability. This record will be used to document sample custody transfer from the sampler to the laboratory and will become a permanent part of the Project File.

11.0 QUALITY CONTROL

Quality control measures for air monitoring and sampling include field samples, field blanks, and field duplicates and co-located samples. Quality control samples are described in further detail below.

11.1 Field Quality Control Samples

Several quality control measures will be implemented, including field blanks, field duplicates, and field co-located samples. These quality control measures are intended to characterize accuracy, precision, and completeness of the data and to ensure that samples are not biased or contaminated.

11.1.1 Field Contamination (Blanks)

Field blanks will be performed for analytical air sampling badges to ensure that samples are not biased or contaminated. At least two field blanks will be collected per batch of air sampling badges deployed.

11.1.2 Field Variability (Field Duplicate and Co-Located Samples)

Field duplicates and field co-located samples will be collected to characterize the precision of the air sampling data. For field duplicates, air will be collected into two evacuated canisters simultaneously through the same sampling inlet, and precision will be determined by calculating the relative percent difference between the concentrations of the two samples, as outlined in Tables 4 and 5. One field duplicate per ten field samples (alternatively, 5% of field samples) will be collected. In addition, field co-located samples may be collected, in which air will be collected into two canisters through two separate sampling inlets, and precision will be determined in the same manner as described above. One field co-located sample may be collected per ten field samples.

For air sampling badges, no field duplicates will be collected. Field co-located samples will be collected in the same manner as described above (one sample per ten field samples). In addition, evacuated canisters and badge samples will be co-located, and concentrations of the samples collected via evacuated canisters and via badge will be compared for concordance.

No split samples will be collected. Confirmation of samples will be collected via duplicates or co-located samples, as described above.

12.0 HEALTH AND SAFETY PROCEDURES

Refer to the site-wide Health and Safety Plan (HASP).

13.0 GENERAL INFORMATION ON PROCEDURES (ASSESSMENT TECHNIQUES) USED

Table 13.0 Description of General Air Monitoring and Analytical Air Procedures Used

Procedure	Description
Guardian Network	A Guardian network will be established with AreaRAEs equipped with electrochemical sensors at locations around the work area perimeter. The AreaRAEs will telemeter instantaneous data at 15-second intervals to a computer console. MultiRAE Pros may also be used in the network. The data will be visible in real-time at the computer console and will be monitored 24 hours per day by CTEH personnel.
Real-time handheld survey	CTEH staff members will utilize handheld instruments (e.g., MultiRAE, Drager X-pid 8500, SidePak AM510/520, colorimetric detector tubes) to measure airborne concentrations of compounds. CTEH will use these handheld instruments primarily to monitor the ambient air quality at breathing zone level. Additionally, measurements may be made at grade level, as well as in elevated workspaces, as indicated by site conditions or by request. CTEH may also use these techniques to verify detections observed by the AreaRAE network.
Stationary real-time monitoring locations	Multiple locations in the community and along the perimeter of the work area may be monitored at the same location approximately once per hour using handheld instruments. This allows the use of statistical analysis more effectively than with a random approach.
Analytical sampling	Analytical sampling data may be used to corroborate the stationary and handheld real-time monitoring data, or to provide data beyond the scope of the real-time instruments. Analytical samples will be collected as whole air samples in evacuated canisters or on specific collection media and sent to an off-site laboratory for further chemical analysis (as outlined in Table 7.2).

14.0 CHANGE MANAGEMENT

DATE	VERSION NUMBER	REASON FOR CHANGE	REVIEW PROCESS	NAME (CTEH ONLY)	SIGNATURE
February 3, 2023	0.0	Original Version	Author	Katrina Jew, Ph.D., Toxicologist,	
February 4, 2023	1.0	Executed	Reviewer	Sarah Burnett, Ph.D., Toxicologist	
February 5, 2023	1.1	Document title and introduction were changed to reflect site conditions. In all Plans, footnote was added for total VOCs stating that vinyl chloride, ethylene glycol monobutyl ether acetate, 2-ethylhexyl acrylate, n-butyl acrylate, and isobutylene are all detectable by 10.6 eV PID and that the action level for VOCs is based on vinyl chloride. Action levels in the Worker Monitoring Plan based on ½ ACGIH TLV-TWA were removed for chlorine, hydrogen chloride, phosgene, and benzene. Action levels based on ACGIH TLV-Ceiling values were changed from a duration of instantaneous to a sustained duration of 1 minute. Based on information about on-site operations and a series of non-detects, chlorine, hydrogen chloride, phosgene, benzene, nitrogen dioxide, sulfur dioxide, and formaldehyde were removed from regular sampling and carbon monoxide was removed as an analyte. Analytical methods for ethylene glycol monobutyl ether acetate, 2-ethylhexyl acrylate, and n-butyl acrylate were added, and the analytical method for benzene was removed, as benzene is detectable via EPA TO-15. In all Plans, % LEL action level based on VOCs was changed to reflect calculation for 2-ethylhexyl acrylate.	Preparer Reviewer	Kelly Tuttle, Ph.D., CIH, DABT, Project Technical Director and Toxicologist Sarah Burnett, Ph.D.	
February 10, 2023	1.2	In the Worker Monitoring Plan, a secondary action level for $PM_{2.5}$ at 1,500 µg/m^3 was added. Based on information about site conditions and because the fire was extinguished, monitoring for nitrogen dioxide, sulfur dioxide, and formaldehyde were removed from both the Worker Monitoring and Community Monitoring Plans. Monitoring for chlorine was also removed from all Plans, and monitoring for flammability was removed from the Community Monitoring Plan. Analytical methods for polycyclic aromatic hydrocarbons and ethylene glycol monobutyl ether acetate were removed.	Preparer Reviewer	Kelly Tuttle, Ph.D., CIH, DABT Sarah Burnett, Ph.D.	
February 19, 2023	1.3	Based on information about site conditions and due to no active fire, monitoring for phosgene was removed from all Plans. Based on updated safety data sheets for the impacted railcars, ethylene glycol monobutyl ether acetate was removed and replaced with ethylene glycol monobutyl ether in table footnotes of this document and in the SAP Appendix. Analytical method for vinyl chloride was added.	Preparer	Sarah Burnett, Ph.D.	
February 22, 2023	1.4	Incident name changed from “Derailment and Fire” to “Taggart Road Incident” on page 1. In the Air Monitoring and Sampling Strategy section, additional details were added regarding the strategy for determining real-time air monitoring locations. In all Plans, a secondary instrument option was added for vinyl chloride (Drager X-pid 8500	Preparer	Sarah Burnett, Ph.D.	

		instrumentation). In the Worker Monitoring Plan, a secondary action level for vinyl chloride at 10 ppm was added, and the corresponding action level for vinyl chloride via PID was added in the Appendix. In the Worker Monitoring Plan, monitoring for n-butyl acrylate (qualifiable, not quantifiable) was added to test as requested. Analytical method for n-butyl acrylate via 566 Organic Vapor Monitor badges was added.			
February 26, 2023	1.5	Client name was revised on page 1 from "Norfolk Southern" to "Norfolk Southern Railway Company". In the Worker Monitoring Plan, monitoring for $PM_{2.5}$ was removed (along with the associated action levels and footnotes specific to $PM_{2.5}$) and replaced with PM_4. Language in the Community Monitoring Plan was revised to clarify that particulate matter monitoring in the community is for $PM_{2.5}$. Action levels for particulate matter in both the Worker Monitoring and Community Monitoring Plans were converted from $\mu g/m^3$ to mg/m^3 to present action levels in the same unit as measured by the instrument.	Preparer	Sarah Burnett, Ph.D.	
March 3, 2023	1.6	Incident name changed to match EPA UAO incident name; Included site-wide statement to introduce this Plan in relation to EPA UAO.	Preparer Reviewer	Jody Hawkins Sarah Burnett, Ph.D.	 
April 5, 2023	2.0	Document template updated and re-formatted to add several sections. Revision history combined into one table (Section 13.0; Change Management). Removed benzene and hydrogen chloride from analyte list for all plans. Qualified $PM_{2.5}$ as being monitored for at the request of the CTEH PM/PTD as site conditions warrant. Added ppbRAE and MultiRAE ppb PID for VOCs, and added Gastec #131La, #131LB, and Nextteq NX221L for vinyl chloride. Added 525 Organic Vapor Monitor badge for n-butyl acrylate sampling. Added second action level for % LEL sensors to be consistent with total VOC action levels for % LEL. Revised language regarding action level for total VOCs for clarity based on chemical-specific monitoring. Revised Work Area action levels and respiratory protection for vinyl chloride to be consistent with current operations in the Work Area.	Preparer Reviewer	Dana Currie, Ph.D., Toxicologist Sarah Burnett, Ph.D.	 
April 19, 2023	2.1	Comments received from UC addressed, including the addition of Table 1.3 and Section 5.0, added language in Sections 6.2 and 8.4, and the addition of Appendices for the Original Decision Tree for Ongoing Operations and the Long-Term Community Air Monitoring and Sampling Plan; in-text references to tables/figures updated to reflect accurate table/figure numbers; text of Section 1.5 updated for clarity; table numbers updated	Preparer Reviewers	Sarah Burnett, Ph.D. Dana Currie, Ph.D. Kelly Tuttle, Ph.D., CIH, DABT,	  

Appendix A

Data Quality Objectives Worksheet

AIR MONITORING AND SAMPLING DATA QUALITY OBJECTIVES

STEP 1. DEFINE THE PROBLEM

There is potential that compounds emitted from derailed tank cars and/or impacted soil, sediment, or water may be present in the air in work areas and community areas surrounding the incident site. If present at certain concentrations in air, these constituents of interest (COI), including vinyl chloride and butyl acrylate, could potentially pose a threat to human health or the environment. Therefore, the air in work and community areas needs to be characterized to evaluate the presence and potential levels of COIs in air and to protect human health and the environment.

STEP 2. IDENTIFY THE DECISION OR GOAL OF THE SAMPLING AND MONITORING STUDY

The goal of this QAPP is to protect human health and the environment by characterizing the air in work and community areas with respect to the presence and potential levels of COIs in air. This characterization is being accomplished through a multilayered air monitoring and air sampling approach in work areas where cleanup and remediation operations are ongoing and in community areas surrounding the incident site. The specific objectives are: (1) to evaluate the presence of COIs in air; (2) if detected in air, to evaluate the concentrations of COIs in air; (3) to compare the concentrations of COIs in air to worker or community screening values established and approved in this QAPP and Air SAP; (4) to record observations of activities and potential alternative sources of COIs unrelated to Site activities to determine "background" levels; (5) to use data generated to make data-driven decisions about the placement of air monitoring and sampling locations and the frequency of air monitoring and sampling, including when air monitoring and sampling activities can decrease or cease; and (6) to use data generated to advise Site management on the potential need for engineering controls and advise workers on proper personal protective equipment (PPE), primarily respiratory protection, if needed. All results will be provided to NSRC and UC for sharing with appropriate parties to make data-driven decisions.

IDENTIFY THE ALTERNATIVE ACTIONS THAT MAY BE TAKEN BASED ON THE DECISIONS	• If air sampling results indicate results are "not detected" above laboratory established reporting limits (RLs), then it will be determined there are no COIs present and no further sampling is required. • If any of the COIs are not reported as a TIC, then it will be determined that non-target COIs are not present. • If COIs in the air are present at concentration below the arithmetic mean at the upper 95% upper tolerance limit (UTL) for background sampling results, then no further sampling is required. • If COCs in the air samples are present at concentrations below UC agreed upon screening values, then no further sampling is required. • If historical sampling results are obtained and air sampling results over 24-hr periods are less than historical concentrations three days in a row, then no further sampling is required, unless requested buy NSRC.

STEP 3. IDENTIFY INPUTS NEEDED FOR THE DECISION	
IDENTIFY THE INFORMATIONAL INPUTS NEEDED TO RESOLVE A DECISION	• Analytical results for VOCs following TO-15 and vinyl chloride by NIOSH 1007 and butyl acrylate by NIOSH 2537. • Background sampling results. • Community air monitoring data from fixed and roaming locations, including from downwind and "background" locations • Worker air monitoring data from roaming locations within the work area and fixed locations along the work area perimeter • Geographical locations (i.e., coordinates) for air monitoring and sampling data • Meteorological data, primarily wind direction, to determine downwind and "background" locations • Odor, work activity, and situational observations • Incident action plan on latest operations • Air action levels and screening values for workers and the community • Air sampling QA/QC metrics, including: (1) duplicate samples and their relative percent difference (RPD); (2) split samples sent to different laboratories and their relative percent difference; (3) field blank samples for badge samples; (4) co-located samples for butyl acrylate measured using two different media/methods; (5) laboratory qualifiers; (6) duplicates, split, and co-located samples within acceptable RPD; (7) spikes within %R and %RPD limit; and (8) Level II, III or Level IV data validation, as applicable. • Air monitoring QA/QC metrics, including: (1) single and/or multi-point calibration of real-time instrument at least once daily; (2) bump or challenges to sensors or PID; (3) zero air calibration; (4) detection confirmations by repeated measurements with the instrument; (5) detection confirmations and parallel monitoring with a secondary instrument; and (6) proper maintenance of instrument following manufacturer recommendations.
IDENTIFY THE SOURCES FOR EACH INFORMATIONAL INPUT AND LIST THE INPUTS THAT ARE OBTAINED THROUGH ENVIRONMENTAL MEASUREMENTS.	• Community, worker, and work area perimeter air monitoring data using stationary and handheld real-time air monitoring instrumentation • Monitoring for total VOCs • If VOCs are detected above the action level, chemical-specific monitoring for vinyl chloride, butyl acrylate, and other analytes, as appropriate. • Air sampling data • Results of 1.4-liter evacuated canisters for VOCs (including vinyl chloride and butyl acrylate) via EPA Method TO-15 plus TICs • Results 525 Organic Vapor Monitor (OVM) badges for butyl acrylate via modified NIOSH Method 2537 • Results from OVM badges analyzed via modified NIOSH 1007 for butyl acrylate • Logged GPS coordinates • Meteorological data from a local meteorological station

	• Odor, work activity, and situational observations electronically documented • Action levels based on established occupational exposure standards and guidelines (e.g., American Conference of Governmental Industrial Hygienists [ACGIH] Threshold Limit Values [TLVs], Occupational Safety and Health Administration [OSHA] Permissible Exposure Limits [PELs]) • Action levels and screening values for the community detailed in Air SAP and based on established community exposure guidelines (e.g., Agency for Toxic Substances and Disease Registry [ATSDR] Minimal Risk Levels [MRLs], USEPA Regional Screening Levels [RSLs] for Resident Air) and/or other applicable screening values • Air sampling QA/QC metrics from the laboratory (e.g., Pace Analytical, SGS Galson), third-party data validator (Environmental Standards, Inc.), and this QAPP; use of real-time readings as secondary information to support analytical results • Air monitoring QA/QC metrics from multiple different instruments measuring the same parameter and use of confirmation readings; use of analytical results to support averaged real-time air monitoring results over the same period
BASIS FOR THE CONTAMINANT SPECIFIC ACTON LEVELS	• Air samples are collected from areas outside of the work area and in community locations to determine the absence or presence of COIs above or below screening levels based upon established community exposure guidelines (e.g., Agency for Toxic Substances and Disease Registry [ATSDR] Minimal Risk Levels [MRLs], USEPA Regional Screening Levels [RSLs] for Resident Air) and/or other applicable screening values. • Air samples are being collected from areas inside of the work area in and around the Site around active operations to determine the absence or presence of the COIs above or below the established occupational exposure standards and guidelines (e.g., American Conference of Governmental Industrial Hygienists [ACGIH] Threshold Limit Values [TLVs], Occupational Safety and Health Administration [OSHA] Permissible Exposure Limits [PELs]) • Action levels and screening values for the community detailed in Air SAP and based on established community exposure guidelines (e.g., Agency for Toxic Substances and Disease Registry [ATSDR] Minimal Risk Levels [MRLs], USEPA Regional Screening Levels [RSLs] for Resident Air) and/or other applicable screening values.
IDENTIFY POTENTIAL SAMPLING TECHNIQUES AND APPROPRIATE ANALYTICAL METHODS.	• EPA Method TO-15 • NIOSH Method 1007 • Modified NIOSH Method 2537

STEP 4. DEFINE THE BOUNDARIES OF THE STUDY	
DEFINE THE DOMAIN OR GEOGRAPHIC AREA WITHIN WHICH ALL DECISIONS MUST APPLY	The Site is located within a mixed-use residential, commercial, and industrial area, with residential properties northwest, southeast, and south of the Site. Air monitoring and sampling will occur: (1) within the defined work area(s) at the Site; (2) along the perimeter of the defined work area(s); and (3) in community areas (including residential, commercial, and industrial areas) surrounding the work area(s), especially in the 1-mile x 2-mile evacuation area.
SPECIFY THE CHARACTERISTICS THAT DEFINE THE POPULATION OF INTEREST	Results are representative of the area monitored and sampled at the specific time and/or sampling period. Specific monitoring and sampling patterns and locations will be determined based on Site conditions, previous results, and work activities and will be tailored using monitoring and sampling data. Upwind and downwind locations are determined by prevailing winds, as derived from local meteorological data.
DEFINE THE SCALE OF DECISION MAKING	Results of air monitoring and sampling will be used to determine the presence or absence of target VOCs in air compared to established action levels and screening values. Results will be provided to UC and NSRC for sharing with appropriate parties to make data-driven decisions, including altering the frequency of air monitoring and sampling activities, ceasing air monitoring or sampling activities, demobilizing our team, communicating to Site management the potential need for engineering controls, and communicating with workers and community members, as appropriate.
DETERMINE THE TIME FRAME TO WHICH THE DATA APPLY	The data will apply until air monitoring and sampling cease at a location or until air monitoring and sampling activities are demobilized (i.e., cease completely), as directed by UC or NSRC, and based on current and historical air monitoring and sampling results. These data include operational conditions in and around the derailment Site and neighboring community for which measurements and samples are collected. This includes data from initial monitoring and sampling until last readings or samples are collected. This time frame is undetermined. Furthermore, use of publicly accessible public health air data can be utilized for use of determining baseline or background.
DETERMINE WHEN TO COLLECT DATA	Monitoring and sampling is ongoing after approval of the first SAP and will continue until ceasing at the request of UC or NSRC or meeting criteria established in this QAPP for data-driven decision making.
IDENTIFY PRACTICAL CONSTRAINTS ON DATA COLLECTION	• Inclement weather • Access not attainable • Not safe to enter area • Other unforeseen hazards • Lack of security or access • Lack of materials or supply chain limitations

STEP 5. DEVELOP APPROACH/DECISION RULE	
SPECIFY THE PARAMETER THAT CHARACTERIZES POTENTIAL EXPOSURE FOR THE POPULATION OF INTEREST	The detections of target COIs from air monitoring and analytical air sampling compared to established, instrument and laboratory reporting limits, background or upwind concentrations, and established community and worker screening values.
SPECIFY THE ACTION LEVEL FOR THE DECISION	• If air monitoring results indicate that COIs are "not detected", then it will be determined that there are no COIs present above the instrument's detection limit and that monitoring may cease. • If air monitoring results indicate that COIs are detected below action levels, then it will be determined that the monitoring for COIs in the area can cease. • If air monitoring results indicate that COIs are detected at above action levels, then it will be determined that further monitoring and/or sampling for COIs is warranted. Air monitoring may continue to further characterize airborne levels of COIs. In addition, Site management will be advised on the potential need for engineering controls and workers will be advised on the proper PPE, primarily respiratory protection, if needed. • If air sampling results indicate that COIs are not detected above established laboratory RLs, then it will be determined that there are no COIs present and no further sampling is required, but sampling may be requested by UC or NSRC. • If air sampling results indicate that COIs are detected at levels below screening values, then no COIs are present, and no further sampling is required. • If air sampling results are present at background concentrations, but below established screening values, then UC and NSRC will make determination on further actions. • If air sampling results indicate that COIs are detected at levels above screening values, then it will be determined that further sampling for COIs is warranted. For the "if" statements above, air monitoring or sampling data will be compiled and may cease after results have been summarized and submitted to UC or at the direction of NSRC.

STEP 6. SPECIFY PERFORMANCE OR ACCEPTANCE CRITERIA OR LIMITS ON DECISION ERRORS	
DEVELOP A DECISION RULE	Air Monitoring: • If air monitoring results indicate that COIs are not detected, then it will be determined that there are no COIs present above the instrument's detection limit, and that there is no risk to human health with respect to the COI in air and monitoring may cease. • If air monitoring results indicate that COIs are detected below action levels, then it will be determined that the COIs do not pose an airborne risk to human health. • If UC (i.e., EPA) posts air monitoring readings or summaries created by CTEH, then data are deemed valid and usable for its intended purposes. • If averaged air monitoring readings (over the same sampling period for a sample collected within 10 feet), are higher than analytical sampling results, then it will be determined the air monitoring data can support analytical results, but spiked events must be discussed, and air sampling data is indicative of actual exposures. • If air monitoring results indicate that COIs are detected at above action levels, then it will be determined that further monitoring and/or sampling for COIs is warranted. Site management will be advised on the potential need for administrative or engineering controls, and workers will be advised on the proper PPE, primarily respiratory protection, if needed. • If downwind monitoring and/or sampling results are present above upwind results, but below established public health guideline values, then it will be determined that analytes detected do not present an increased human health risk and no further action is required. • If upwind sampling results are deemed usable by a third-party validator (Level II) and meteorological data confirm that the sampling location is upwind and results are detected at concentrations greater than agreed upon public health screening values, then upwind sampling results become the new screening value for that day's sampling for downwind samples. • If downwind concentrations are less than upwind concentrations, then it will be determined that results do not present an increased human health risk. Air Sampling: • If air sampling results indicate that COIs are not detected above established laboratory method detection limits (MDLs), then it will be determined that there are no COIs present and that there is no risk to human health with respect to the COI in air.

	• If air sampling results indicate that COIs are detected at levels below screening values, then it will be determined that the COIs do not pose an airborne risk to human health. • If air sampling results are present at background concentrations, but below established screening values, then UC and NSRC will make determination on further actions. • If air sampling results indicate that COIs are detected at levels above screening values, then it will be determined that further sampling for COIs is warranted. Data will be compiled and submitted to UC for sharing with appropriate parties to make data-driven decisions, and air sampling will continue to further characterize airborne levels of COIs. In addition, Site management will be advised on the potential need for engineering controls, if needed. • If UC (i.e., EPA) posts air sampling readings or summaries created by CTEH, then data are deemed valid and usable for its intended purposes. • For the "if" statements above, air sampling data will be compiled and summarized, and may cease after results have been summarized and submitted to UC or at the direction of NSRC.
DETERMINE THE POSSIBLE RANGE OF THE PARAMETER OF INTEREST	• Contaminant concentrations may range from below the RL for each specific constituent to more than the approved screening value. • Concentrations of COIs may range from below the instrument or laboratory detection limit to above the established action level • Concentrations of COIs may range from below the instrument or laboratory detection limit to exceeding the upper limit of the instrument calibration range. • For air monitoring readings, concentrations may range from below instrument detection limits or resolution to above the upper limits of the instruments operating range. Readings above the upper range are considered "pegging out the instrument or saturating the detector or sensor". Based upon use and manufacturers technical notes, instruments can be used after this, but only once readings return to baseline and/or bump calibration or re-calibration.
DEFINE BOTH TYPES OF DECISION ERRORS AND IDENTIFY THE POTENTIAL CONSEQUENCES OF EACH	Determinations about actions are to be determined by UC.
DEFINE THE TRUE STATE OF NATURE FOR THE MORE SEVERE DECISION ERROR AS THE BASELINE	Air Monitoring: • H_o: The COI represented by the air monitoring reading is above the action level. • H_a: The COI represented by the air monitoring reading is below the action level.

CONDITION OR THE NULL HYPOTHESIS (H_O) AND DEFINE THE TRUE STATE FOR THE LESS SEVERE DECISION ERROR AS THE ALTERNATIVE HYPOTHESIS (H_A).	Air Sampling: • H_o: The COI represented by the air sample is above the approved screening value. • H_a: The COI represented by the air sample is below the approved screening value.
ASSIGN THE TERMS "FALSE POSITIVE" AND "FALSE NEGATIVE" TO THE PROPER DECISION ERRORS.	• False Positive Error = Type I • False Negative Error = Type II
ASSIGN PROBABILITY VALUES TO POINTS ABOVE AND BELOW THE ACTION LEVEL THAT REFLECT THE ACCEPTABLE PROBABILITY FOR THE OCCURRENCES OF DECISION ERRORS.	To be assigned based on discussions with UC, EPA, and NSRC.

STEP 7. OPTIMIZE THE DESIGN	
REVIEW THE DQOs	DQOs will be reviewed as site conditions change, air monitoring or sampling are scaled back, and/or as decision rules are reached.

Appendix B

Home Safely Plan (Residential Re-Entry Plan)

Norfolk Southern Railway Company

Taggart Road Incident

East Palestine, OH

Air Monitoring and Residential Re-Entry Plan

Prepared On Behalf Of:

Norfolk Southern Railway Company

Prepared By:

CTEH

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Updated February 14, 2023

	Position/Name	Signature	Date Signed
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Approved By:	Mark M. Dudle, CIH (NS)	MMD	02/24/2023

1.0 Introduction

This plan describes a *voluntary* air monitoring program and has been prepared in anticipation of residential clearance air monitoring for two purposes: 1) To provide indoor air quality monitoring for residents living within the evacuated area who are re-entering their homes after the evacuation order has been lifted; and 2) To respond to requests for indoor air quality monitoring from residents voluntarily remaining within the evacuated area.

2.0 Air Monitoring Procedure

2.1 Selection of Analytes

Based on air monitoring data collected in community areas since February 4, 2023, the following substances have been targeted for re-entry air monitoring: volatile organic compounds (VOCs), hydrogen chloride, and vinyl chloride. VOCs encompass a variety of compounds, including vinyl chloride, n-butyl acrylate, 2-ethylhexyl acrylate, isobutylene, ethylene glycol monobutyl ether acetate, and benzene.

2.2 Selection of Air Monitoring Equipment

The Agency for Toxic Substances and Disease Registry (ATSDR) is an independent operating agency within the Department of Health and Human Services. ATSDR Regions 5 and 3 have recommended health-based screening levels to be used as guidelines for the comparison of community air monitoring data. The screening levels for the substances that have been targeted for monitoring, as well as their associated odor thresholds, are provided in **Appendix A**. For example, ATSDR has developed Minimal Risk Levels (MRLs), which are defined as "…*an estimate of the daily human exposure to a hazardous substance that is likely to be without appreciable risk of adverse non-cancer health effects over a specific duration of exposure*." The acute MRL for inhalation of vinyl chloride is 0.5 ppm and is applicable for one- to 14-day exposures. To provide a margin of safety below this health-protective guideline, all air monitoring equipment used during re-entry operations will have detection limits of 0.1 ppm or lower.

The potential list of air monitoring equipment includes, but is not limited to, the following instruments:

- Photoionization detectors (PIDs): PIDs with 10.6 eV lamps (e.g., RAE Systems by Honeywell MultiRAE instruments) will be used to screen for volatile organic compounds (VOCs) including n-butyl acrylate, 2-ethylhexyl acrylate, isobutylene, and ethylene glycol monobutyl ether acetate. The minimum detection limit of the PID for VOCs in general is 0.1 ppm. The correction factors for the various VOCs and their corresponding corrected detection limits are summarized in **Table 1**. For example, the correction factor for vinyl chloride on the PID is 2. The corrected detection limit for vinyl chloride is calculated by multiplying the minimum detection limit (0.1 ppm) by the correction factor (2), resulting in a corrected detection limit of 0.2 ppm for vinyl chloride on the

PID. These correction factors will be used during both outdoor and indoor air monitoring if VOC detections are observed.

Table 1. Correction Factors and Corrected Detection Limits for Various VOCs

Analyte	Correction Factor	Corrected Detection Limit
Vinyl Chloride (75-01-4)	2	0.2 ppm
n-Butyl Acrylate (141-32-2)	1.6	0.16 ppm
2-Ethylhexyl Acrylate (103-11-7)	1.1	0.11 ppm
Isobutylene (115-11-7)	1	0.1 ppm
Ethylene Glycol Monobutyl Ether Acetate (112-07-2)	1.27	0.127 ppm

- Chemical-specific colorimetric detector tubes: The Gastec 131L colorimetric detector tube may be used for the specific measurement of vinyl chloride in air (detection limit of 0.02 ppm). The Gastec 14L colorimetric detector tube may be used for the specific measurement of hydrogen chloride in air (detection limit of 0.05 ppm).
- Honeywell SPM Flex instruments: The SPM Flex instrument will be used for the specific measurement of hydrogen chloride in air (detection limit of 0.02 ppm).

2.3 Procedure for Testing Homes of Residents Returning to the Evacuated Area

Norfolk Southern (NS) in conjunction with its contractors, local authorities, and state and federal regulators will establish residential re-entry teams to offer indoor air monitoring of the homes in the evacuation area by request. The residential re-entry team will consist of one to two air monitoring personnel from an NS contractor (CTEH), a member of local law enforcement, an EPA representative, and as available, a state representative, along with at least one representative from each household. Residents will be escorted back into their homes in a systematic fashion. The numbers of residents escorted in at a given time will be dependent upon the number of entry teams available. Both outdoor and indoor air monitoring will be conducted in the following manner:

1. NS contractors will schedule a time to meet the resident at an established location and predetermined time to pair up with air monitoring teams.
2. The air monitoring team will consist of one to two CTEH personnel, a member of local law enforcement, an EPA representative, and as available, a state representative.
3. The air monitoring team will conduct air monitoring in outdoor areas surrounding the home, including the backyard, if accessible. VOCs and hydrogen chloride will be evaluated in outdoor air at every home.

4. Once given access into the home, the air monitoring team will enter the home and conduct a screening evaluation in all living spaces of the home, including all floors and the basement, if present. VOCs and hydrogen chloride will be evaluated in indoor air at every home. The presence of any odors and a description of the odor, if present, will be documented for every reading.
5. If there are no sustained detections of VOCs at or above 0.1 ppm and no detections of hydrogen chloride within the home, no further air monitoring will be conducted.
6. If there are any sustained detections of VOCs within the home at or above 0.1 ppm (regardless of hydrogen chloride result), vinyl chloride will be monitored.
    a. If vinyl chloride is specifically detected, the concentrations will be compared to the screening levels established in **Appendix A**. If hydrogen chloride is specifically detected, the hydrogen chloride reading will be confirmed using a Gastec tube. If confirmed, the concentrations will be compared to the screening levels established in **Appendix A**.
    b. Correction factors for n-butyl acrylate, 2-ethylhexyl acrylate, isobutylene, and ethylene glycol monobutyl ether acetate will be applied to the VOC readings as outlined in **Table 1**, and the concentrations of target analytes will be compared to the screening levels established in **Appendix A**.
7. If the corrected concentrations do not exceed the associated screening levels, it will be suggested that the resident open windows and/or doors to encourage ventilation.
    a. Note: In an abundance of caution, all residents, regardless of their choice to participate in this voluntary air monitoring program or the results of their monitoring, should be encouraged to open windows and/or doors to ventilate their homes upon return home.
8. If the corrected concentration exceeds the associated screening level for n-butyl acrylate, odors will be used as a secondary indicator of the presence of n-butyl acrylate (the odor threshold is presented in **Appendix A**). If no odors consistent with n-butyl acrylate are detected, the corrected concentrations and associated action steps will be based on screening levels for the other target compounds.
9. If the corrected concentration exceeds the associated screening level (and, for n-butyl acrylate, if odors consistent with n-butyl acrylate are also detected), it will be suggested that the resident open windows and/or doors to encourage ventilation. The resident will be informed that, if desired, the air monitoring team can stay at the home and conduct an indoor air monitoring re-screen after windows and/or doors have been opened, the air has been ventilated for a few minutes, and the windows and/or doors have been closed again.
10. The cycle of ventilation and re-screening can be repeated until the concentrations do not exceed the associated screening levels. If the concentration(s) continue to exceed the associated screening level(s), the resident will be informed that NS, in conjunction with its contractors, will provide a professional ventilation service free of charge, if desired.

a. If the resident chooses professional ventilation, the air monitoring team can schedule a time to return to the home with the resident and conduct an indoor air monitoring re-screen after the professional ventilation has been completed, if desired.

The clearance process will also take into consideration any other pertinent data and information gathered under the direction of Unified Command and state and federal regulatory agencies.

2.4 Procedure for Testing Homes of Residents Voluntarily Remaining Inside the Evacuated Area

This procedure will be conducted in the same manner as described in Section 2.3 above.

3.0 Notification and Logistics Plan for Air Monitoring

3.1 Goals

- Ensure the safe return of East Palestine residents to their homes
  - Address air quality concerns
  - Address public safety concerns
- Clearly explain the process for air monitoring using available communications tools
  - Online, in-person, and by media telephone
  - Operation Home Safely program handout
- Provide resources to residents to address residents' questions and concerns
  - Online, in-person, and by toll-free number
  - Operation Home Safely FAQ sheet

3.2 Logistics Plan

- To address the logistical challenge of performing air quality monitoring in numerous homes, we are meeting residents who request air monitoring at a time and location TBD.
- Here's how it will work:
  1. Evacuees can request air monitoring in their homes by calling the Residential Re-Entry Request Hotline at (330) 849-3919.
     a. Depending on the number of requests, a zone approach may be implemented that prioritizes residences near the incident site and on a case-by-case basis.
  2. In order to participate in the voluntary residential air monitoring program, residents must have appropriate photo identification with proof that they reside in the home, which can include:
     a. Any government-issued photo identification with an address that matches the address of the home
     b. Any government-issued photo identification along with:

- Utility bill matching the address and the name of the individual on the photo identification; or
- Tax statements for the home in the name of the individual on the photo identification
- Should a resident not have any form of identification that ties back to the residence, other methods will be employed to verify that the home is the home of the individual, if necessary

c. Prior to air monitoring, the resident will also sign an access agreement granting permission for the air monitoring team to enter their home.

3. The resident will meet the air monitoring team at the established appointment time and location. The team (including one to two CTEH representatives, a police officer, an EPA representative, and as available, a state representative) will either meet the resident at the home or at a central location to travel together to the home, as agreed upon. Upon arrival at the home, the police officer will complete a quick security inspection outside the home prior to opening the door while the air monitoring team conducts outdoor air monitoring surrounding the entrance to the home.
4. Indoor air monitoring event:
    a. The resident will unlock the door to their home. The resident may remain outside during the air monitoring event, if desired.
    b. The air monitoring team will enter the home and collect air monitoring readings inside the home. Air monitoring will be conducted in all living spaces, including throughout each floor of the home and in the basement, if present.
    c. A representation of air monitoring readings will be documented. All documented air monitoring readings will be both logged in an electronic data management software and recorded on a physical data form that will be provided to the resident.
    d. All air monitoring instrumentation will be calibrated daily or per manufacturer's recommendations.
5. If there are no sustained detections of VOCs at or above 0.1 ppm and there are no detections of hydrogen chloride within the home:
    a. Notify the resident of the air monitoring data and provide the resident with the data form.
    b. Advise the resident that there are no air quality concerns with respect to the monitored substances and that they can remain in the home, if they choose to do so.
    c. Provide the resident with a copy of the Operation Home Safely FAQ document and the phone number the resident can call should they have any questions.
6. If there are any sustained detections of VOCs within the home at or above 0.1 ppm (regardless of hydrogen chloride result), vinyl chloride will be monitored.

a. If vinyl chloride is specifically detected, the concentrations will be compared to the screening levels established in **Appendix A**. If hydrogen chloride is specifically detected, the hydrogen chloride reading will be confirmed using a Gastec tube. If confirmed, the concentrations will be compared to the screening levels established in **Appendix A**.
b. Correction factors for n-butyl acrylate, 2-ethylhexyl acrylate, isobutylene, and ethylene glycol monobutyl ether acetate will be applied to the VOC readings as outlined in **Table 1**, and the concentrations of target analytes will be compared to the screening levels established in **Appendix A**.

7. If the concentrations do not exceed the associated screening levels, suggest that the resident open windows and/or doors to encourage ventilation.
    a. *Note: In an abundance of caution, all residents, regardless of their choice to participate in this voluntary air monitoring program or the results of their monitoring, should be encouraged to open windows and/or doors to ventilate their homes upon return home.*
8. If the corrected concentration exceeds the associated screening level for n-butyl acrylate, odors will be used as a secondary indicator of the presence of n-butyl acrylate (the odor threshold is presented in **Appendix A**). If no odors consistent with n-butyl acrylate are detected, the corrected concentrations and associated action steps will be based on screening levels for the other target compounds.
9. If the corrected concentration exceeds the associated screening level (and, for n-butyl acrylate, if odors consistent with n-butyl acrylate are also detected), suggest that the resident open windows and/or doors to encourage ventilation. Inform the resident that, if desired, the air monitoring team can stay at the home and conduct an indoor air monitoring re-screen after windows and/or doors have been opened, the air has been ventilated for a few minutes, and the windows and/or doors have been closed again.
10. The cycle of ventilation and re-screening can be repeated until the concentrations do not exceed the associated screening levels. If the concentration(s) continue to exceed the associated screening level(s), inform the resident that NS, in conjunction with its contractors, will provide a professional ventilation service free of charge, if desired.
    a. If the resident chooses professional ventilation, the ventilation contractor will be contacted, and the ventilation event will be scheduled with the resident. Air exchanges in the home will be conducted for at least two hours. The standby police officer will be contacted and will mobilize to the home address for security purposes during the ventilation event. The air monitoring team can schedule a time to return to the home with the resident and conduct an indoor air monitoring re-screen after the professional ventilation has been completed, if desired.

Appendix A

Screening Levels and Odor Thresholds for Target Compounds

Table 1. Screening Levels and Odor Thresholds for Target Compounds

Analyte	Screening Level	Screening Level Basis	Odor Threshold
Vinyl Chloride (75-01-4)	0.5 ppm	ATSDR Acute EMEG	3,000 ppm
Hydrogen Chloride (7647-01-0)	1.4 ppm	California EPA REL	0.26 – 10.0 ppm
n-Butyl Acrylate (141-32-2)	0.33 ppm	NIOSH REL, adjusted for 24-hour exposure, adjusted for sensitive populations with a factor of 10	0.00029 – 0.101 ppm
2-Ethylhexyl Acrylate (103-11-7)	0.83 ppm	OSHA TWA, adjusted for 24-hour exposure, adjusted for sensitive populations with a factor of 10	-
Isobutylene (115-11-7)	8.3 ppm	ACGIH TLV, adjusted for 24-hour exposure, adjusted for sensitive populations with a factor of 10	-
Ethylene Glycol Monobutyl Ether Acetate (112-07-2)	-	-	-

A.1 Screening Level Selection

On February 7, 2023, ATSDR representatives proposed a set of screening levels for various substances potentially associated with the incident, including vinyl chloride, hydrogen chloride, and n-butyl acrylate, 2-ethylhexyl acrylate, and isobutylene. The February 7 guidance included screening levels of:

- 0.5 ppm for vinyl chloride, based on the ATSDR Acute Environmental Media Evaluation Guidelines (EMEG);
- 1.4 ppm for hydrogen chloride, based on the California EPA Reference Exposure Level (REL);
- 3.3 ppm for n-butyl acrylate, based on the National Institute for Occupational Safety and Health (NIOSH) Recommended Exposure Limit (REL) and adjusted for 24-hour exposure;
- 8.3 ppm for 2-ethylhexyl acrylate, based on the Occupational Safety and Health Administration (OSHA) 8-hour Time-Weighted Average (TWA) and adjusted for 24-hour exposure; and

- 83 ppm for isobutylene, based on the American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Value (TLV) and adjusted for 24-hour exposure

These screening levels proposed by ATSDR were incorporated into this Residential Air Monitoring and Re-Entry Plan, which was subsequently reviewed and agreed upon by representatives from the US EPA, Ohio EPA, Ohio Department of Health, Pennsylvania Department of Health, Columbiana County Health District, and Norfolk Southern Railway Company and approved by the Incident Commander prior to the lifting of the evacuation and shelter-in-place order. The evacuation and shelter-in-place order was lifted on February 8, 2023, and residential re-entry air monitoring assessments began on the evening of February 8, 2023.

On February 9, 2023, ATSDR representatives released a draft of updated screening levels for discussion, which included a draft screening level of 0.05 ppm for n-butyl acrylate. Following discussion between representatives in Incident Command and discussion between US EPA and ATSDR representatives, ATSDR representatives proposed an updated set of screening levels on February 10, 2023, which included a screening level of 0.33 ppm for n-butyl acrylate, 0.83 ppm for 2-ethylhexyl acrylate, and 8.3 ppm for isobutylene, each decreased by a factor of 10 from the original ATSDR recommendations to adjust for sensitive populations. These updated screening levels proposed by ATSDR were incorporated into this Residential Air Monitoring and Re-Entry Plan, which was again discussed and agreed upon by various representatives of Incident Command. Residential re-entry air monitoring assessments continued.

From the initiation of residential re-entry air monitoring assessments on February 8, 2023, to the evening of February 12, 2023, nearly 300 assessments were completed. On the evening of February 12, 2023, ATSDR representatives proposed a second update to the established screening levels, which included a screening level of 0.05 ppm for n-butyl acrylate. However, the detection limit for the instrumentation outlined in Section 2.2 and used for home assessments between February 8 and 12, 2023 is 0.1 ppm (a corrected detection limit of 0.16 ppm for n-butyl acrylate; less than twenty times the initial screening level recommended by ATSDR and less than twice the updated screening level). Thus, the second update to the established screening levels would have necessitated a detection limit and corrected action level of 0.031 ppm VOCs (so that the corrected detection limit for n-butyl acrylate would be 0.05 ppm), an unfeasible measurement for the instrumentation being used and within generally-accepted background levels of VOCs in ambient air and indoor spaces. Further, the odor of n-butyl acrylate (i.e., pungent, fruity odor) is detectible and recognizable at a concentration of approximately 0.035 ppm (and as low as 0.0001 ppm). Thus, odor indication serves as a sensitive and reliable indicator of n-butyl acrylate even at concentrations below 0.05 ppm.

The proposed updates were discussed by representatives of Incident Command on February 13, 2023. Due to the low odor threshold of n-butyl acrylate, representatives of Incident Command agreed to continue using odor as a secondary indicator of n-butyl acrylate, even if/when VOCs were not being detected using established instrumentation. Based on the detection limits of the available

instrumentation and the fact that 0.031 ppm VOCs is a common background level of VOCs, representatives of Incident Command and CTEH agreed that implementing a screening level of 0.05 ppm would be unfeasible. Utilizing multiple lines of evidence of no documented sustained VOC levels within the community and the low odor threshold that could be used as a secondary indicator, representatives of Incident Command agreed that decreasing the screening level to 0.05 ppm was unachievable and would suggest that VOC levels below instrument detection limits may be unsafe for residents.

Collectively, Incident Command agreed to keep the screening levels previously established by ATSDR and adopted in this Residential Re-Entry Plan in place, and residential re-entry air monitoring assessments continued with the same workflow that had been used for over 300 home assessments prior to receiving ATSDR's third set of proposed updates.

Appendix C

Addendum to the Home Safely Plan (Residential Re-Entry Plan)

East Palestine Train Derailment
East Palestine, OH

Air Monitoring and Residential Re-Entry Plan
Addendum

Prepared On Behalf Of:

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Prepared By:

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April 4, 2023

	Position/Name	Signature	Date Signed
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Approved By:			
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1.0 Introduction

This addendum provides an interim approach to address odors and ongoing indoor air monitoring assessments associated with the current Air Monitoring and Residential Re-Entry Plan, which was approved on February 14, 2023. This addendum includes a combination of real-time air monitoring and analytical air sampling. The real-time air monitoring instruments are used as screening tools and will be supplemented with the analytical air sampling procedures described below.

2.0 Air Monitoring Procedure

Indoor and outdoor air monitoring will continue to be conducted in accordance with the approved Residential Re-Entry Plan for the following target analytes: total volatile organic compounds (VOCs), with specific emphasis on n-butyl acrylate and vinyl chloride.

3.0 Analytical Air Sampling Procedure

Analytical air samples will be collected as described in Section 4.0 and will be sent to a third-party accredited laboratory for analysis**.**

As the incident has progressed, an analytical air sampling badge has been identified and proposed for use for community air assessments. The analytical air sampling badge is a passive sampler and useful tool to help keep the community safe, as it is specific for n-butyl acrylate, has a detection limit below the current n-butyl acrylate screening value, is small and portable, and can be used to continuously measure over a 24-hour period. Results from the analytical sampling badge can be directly compared to the 24-hour health-protective screening value for n-butyl acrylate.

The odor threshold for n-butyl acrylate and the screening value that will be used to compare with analytical air sampling results is shown in **Table 1**. The analytical air sampling method and detection limit are shown in **Table 2**.

Table 1. Odor Threshold and Screening Value for Analytical Air Sampling

Analyte	Screening Value	Screening Value Basis	Odor Threshold
n-Butyl Acrylate (141-32-2)	0.02 ppm	Michigan ITSL	0.00029 – 0.101 ppm

Table 2. Analytical Methods and Detection Limits

Analyte	Media/Can	Method	Estimated Detection Limit	Lab	Notes
n-Butyl Acrylate (141-32-2)	525 Organic Vapor Monitor Badges	Modified NIOSH 2537	Approximately 0.009 ppm	SGS Galson	24-hour duration

4.0 Revised Procedure for Air Monitoring in the Evacuated Area

Norfolk Southern (NS) in conjunction with its contractors, local authorities, and state and federal regulators will continue utilizing air monitoring teams to offer indoor and outdoor air monitoring of the properties in the evacuation area by request. In addition, the air monitoring team may deploy an analytical air sampling badge for n-butyl acrylate at an outdoor location near to the property if odors are present or by request. The air monitoring team will consist of one to two air monitoring personnel from an NS contractor (CTEH), a member of local law enforcement, an EPA representative, and as available, a state representative, along with at least one representative from each property. Air monitoring will be conducted in the following manner:

1. NS contractors will schedule a time to meet the individual at an established location and predetermined time to pair up with an air monitoring team.
2. The air monitoring team will be provided with information about the purpose and results of community outdoor air sampling and the rationale of why outdoor sampling is effective to inform the individual of potential indoor butyl acrylate detections.
    a. The primary objective of these assessments is to ensure the health and safety of the community.
    b. Passive sampling badges provide a way to specifically measure n-butyl acrylate in the air at levels below the health-protective screening value and over a 24-hour period.
    c. If n-butyl acrylate is not detected outside of the property or in outdoor air, there is no reason to believe that it will be inside the property or in indoor air.
    d. The resident/property representative will be contacted within 4 to 7 days with the results of the analytical air sampling conducted in outdoor air near their property.
    e. For any additional questions, the individual will be referred to the CTEH Toxicologist hotline.
3. Per the approved Residential Re-entry Plan, permissions will be acquired to access the individual's property. The air monitoring team will conduct air monitoring in outdoor areas surrounding the property, including the backyard, if accessible. In accordance with the approved Residential Re-Entry Plan, VOCs will be evaluated in outdoor air at every location.
4. Once given access into the property, the air monitoring team will enter and conduct a screening evaluation in all living/commonly occupied spaces, including all floors and the basement, if present. In accordance with the approved Residential Re-Entry Plan, VOCs will be evaluated in indoor air at every property. The presence of any odors and a description of the odor, if present, will be thoroughly documented for every reading.
5. If odors are present or the individual requests additional sampling, CTEH will deploy a 24-hour analytical air sampling badge in an outdoor location within the vicinity of the individual's property in a public location between the property and the incident location, as feasible. Results from analytical air sampling will be compared to the screening value for n-butyl acrylate (Table 1).
6. Detection of n-butyl acrylate above 20 ppb will initiate the following:
    a. An offer of reasonable accommodations for the resident.
    b. At a minimum, additional air sampling badges will be deployed to confirm the initial n-butyl acrylate results and will continue until the results are less than the screening level.
    c. Engagement of community outreach to communicate information about odors.

    d. A retrospective analysis of onsite activities will be conducted to evaluate possible source contribution to the residential detection.
    e. Site management will be advised on the potential need for engineering controls.
7. All Residential Re-Entry analytical air sampling results will be communicated to Unified Command for review and potential follow-up, if needed, on a case-by-case basis.
8. Once results are received, a toxicologist from Unified Command will verbally notify the individual of the results received via a phone call. The individual will be contacted within 4 to 7 days of result receipt. Notifications will be documented by CTEH.
9. If air sampling results indicate that n-butyl acrylate is not detected or is detected at levels below the screening value, air sampling at the location will be discontinued and reasonable accommodations will be discontinued.
10. Toxicologists supporting the CTEH hotline are prepared to review odor thresholds, air monitoring and sampling data in the individual's community, and the results of n-butyl acrylate air sampling conducted near their property (if applicable).

Appendix D

Original Decision Tree for Ongoing Operations

3/15/2023

Decision Tree for Ongoing Operations

Key Analytes:

Vinyl chloride

- Intermediate comparison value: 20 ppb (ATSDR MRL for intermediate inhalation)

n-butyl acrylate

- Chronic comparison value: 5 ppb (ATSDR proposed interim value for chronic inhalation)
- Intermediate comparison value: 20 ppb (Michigan Department of Natural Resources and Environment 24-hour average Initial Threshold Screening Level [ITSL]); used as a 15-minute or 1-hour average)

Provisions to be Enacted:

- Analytical air sampling will continue along the perimeter of the work area and in community areas.
- Additional air analytical sampling stations, in the breathing zone, for n-butyl acrylate and 2-ethylhexyl acrylate will be established in community areas nearest to and downwind of the derailment site, especially near soil excavation activities (12- or 24-hour sampling durations).
- Real-time air monitoring will continue within the work area, at the work area perimeter, and in community areas, with additional emphasis on community areas nearest to the work area.
- Odor reports in community areas will continue to be investigated by CTECH/EPA Odor Complaint Team who immediately respond to the area of the odor report and conduct handheld real-time air monitoring to characterize the area.
- Limit working hours to daylight hours (8 AM to 5 PM) and the availability of TAGA. Also, work schedule will take into consideration optimal weather conditions (e.g., wind direction, temperature conditions).

Decision Criteria for Ongoing Operations:

- VOC concentrations in the work area continue to be below action levels as established in the Air Sampling and Analysis Plan (SAP), or if above action levels, actions continue to be taken in accordance with the SAP. SAP may be provided upon inquiry.
- VOC concentrations in the community continue to be below action levels as outlined in this Plan, or if above action levels, actions are taken in accordance with this Plan.
    - TAGA conducts real-time mobile analysis of n-butyl acrylate[1] in community areas nearest to and downwind of the work area along predefined routes based on forecasted wind direction (see Appendix for maps of TAGA routes).

[1] Based on the chemistry of n-butyl acrylate and 2-ethylhexyl acrylate (vapor pressure 4 mmHg at 68°F vs. 0.01 mmHg at 68°F, respectively), real time measurements of n-butyl acrylate via TAGA are being used as a surrogate for 2-ethylhexyl acrylate. Measurements of n-butyl acrylate below the corresponding comparison value are expected to also be protective for 2-ethylhexyl acrylate. Measurements of 2-ethylhexyl acrylate will be confirmed with analytical air sampling.

- Analytical air sampling results for vinyl chloride in community areas continue to show average concentrations below intermediate comparison values. Analytical results for n-butyl acrylate to date have been below the previous acute comparison value.
- If possible, excavated soil will be moved off-site as soon as possible, moved to an area away from nearby community receptors, and/or covered to reduce potential emissions.

Decision Tree During Operations:

- The start time of operations (including excavation, uncovering of stockpiles, and loading of trucks) will be communicated to the TAGA.
- When the TAGA detects an instantaneous concentration of n-butyl acrylate above the initial action level of 50 ppb, the TAGA will conduct a downwind assessment.
    - The Norfolk Southern HAZMAT Manager will also be notified (via text and confirmation from Norfolk Southern or telephone) and will contact on-site personnel to identify the locations and types of operations occurring. Real-time air monitoring will continue within the work area and at the work area perimeter to characterize the area, identify source of emission and take appropriate actions in accordance with the SAP.
    - The TAGA will assess the width of the plume by passing through the area and back and conducting focused monitoring at downwind receptors based on prevailing wind direction (i.e., increased passes at downwind residential or commercial areas).
        - If concentrations are above an instantaneous 20 ppb, TAGA will remain in downwind receptor area for 15 minutes. If sustained above 20 ppb for 15 minutes, Norfolk Southern HAZMAT Manager will be notified, who will institute an engineering control as outlined in the section below. TAGA will remain in the area to for an additional 15 minutes. If concentrations persist, Norfolk Southern HAZMAT Manager will be notified to implement additional engineering controls. This cycle will repeat until concentration decrease below 20 ppb. If concentrations or complainants related to site activities persist for greater than 1-hour, TAGA will notify Unified Command, who will engage a community outreach team to discuss potential avenues for community outreach with downwind receptors (e.g., distribution of flyers or other information, personal contact to answer questions).
        - If/when concentrations are below sustained below 20 ppb for 15 minutes, TAGA will return to mobile monitoring
    - Before the end of shift TAGA will return to the most recent area where n-butyl acrylate was detected at concentrations above 50 ppb to verify that readings diminish to concentrations below 50 ppb.

When initial 50 ppb is exceeded

- Work area operations (i.e., the locations and types of operations occurring) and site conditions will be examined.
- The nature of the exceedance (i.e., driven by an instantaneous peak measurement or consistently elevated measurements) will be evaluated to determine the trend of the measurements.

- Operational activities and environmental conditions (e.g., wind direction, temperature) will be evaluated to determine the potential basis of the measurements. Environmental changes or operations that may result in elevated potential for continuous community exposure will be investigated.

When 20 ppb is exceeded at downwind receptors:

Implement an engineering control, following the order outlined below:

- Utilize a fan (i.e., tunnel fan, airboat)
- Utilize a vapor suppressant, following the order outlined below:
  - Butyl buster
  - Foam
  - Water misting
  - Impermeable cover
  - Cover with soil
- Shift work to a different area (e.g., away from nearby community areas, further upwind, or to a work area with lower potential emissions) to allow airborne concentrations to dissipate.

- Minimize disturbance of stockpiles or utilize smaller stockpiles that require less disturbance.
- Cover stockpiles or other potential sources of emissions. If possible, immediately remove the excavated soil and transport it off-site.
- If the actions and engineering controls outlined above do not decrease 1-hour average concentrations to below the 20 ppb, a temporary stop work may be implemented until community air monitoring shows 1-hour average concentrations below action levels.

Daily Evaluations:

- Evaluate forecasted wind direction versus work areas and operations.
  - For work operations in areas with higher potential emissions, plan work for specific wind directions (i.e., where residential and commercial areas are upwind or crosswind of the work area) and weather conditions.
  - Shift work to a different area (e.g., away from nearby community areas, further upwind, or to a work area with lower potential emissions) to allow airborne concentrations to dissipate when necessary.
- Implement appropriate actions and engineering controls as preventative measures as well as to reduce exceedances such as:
  - Utilize a fan (i.e., tunnel fan, airboat)
  - Utilize a vapor suppressant, following the order outlined below:
    - Butyl buster
    - Foam
    - Water misting
    - Impermeable cover
    - Cover with soil

- Ensure that stockpiles are covered at the end of work each day to minimize the potential for odors and emissions. Keep piles covered as much as possible and only uncover as needed to maintain, add, or load piles.
- If possible, locate new staging piles toward the east, away from residential and commercial areas, and utilize smaller stockpiles to minimize disturbance.

Data Summaries:

- Provide a daily air monitoring data summary to ATSDR for review.
    - Provide a summary of analytical air sampling data when results are received.
- Compare real-time air monitoring measurements (both TAGA) to analytical air sampling results.
- Ensure regular meetings to review the effectiveness of this plan and make adjustments to operations as needed.

Appendix E

Long-Term Community Air Monitoring and Sampling Plan

CTEH®

Norfolk Southern Railway Company

East Palestine Train Derailment

East Palestine, Ohio

Long-Term Community Air Monitoring and Sampling Plan

Prepared On Behalf Of:
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April 12, 2023

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1.0 INTRODUCTION AND PROJECT SCOPE

This Long-Term Community Air Monitoring and Sampling Plan ("Plan") was prepared on behalf of Norfolk Southern Railway Company (Norfolk Southern; NS) as an addendum to the site-specific Air SAP and accompanying QAPP. This plan provides additional detail regarding long-term community air monitoring and sampling related to the February 3, 2023, train derailment in East Palestine, Ohio.

This Plan describes a community air monitoring and sampling program that has been prepared to address two objectives: 1) ongoing requests for air quality monitoring for individuals within the previously evacuated area; and 2) ongoing outdoor air sampling in community areas within the previously evacuated area.

This Plan replaces the previous Air Monitoring and Residential Re-Entry Plan signed on February 14, 2023, which was implemented to provide voluntary indoor air monitoring to residents returning to their homes who had previously been evacuated. The Air Monitoring and Residential Re-Entry Plan was reviewed and agreed on by multiple agencies and authorities, including the USEPA, Ohio EPA, ATSDR, and Ohio and Pennsylvania Departments of Health. In developing this Plan, CTEH collaborated extensively with Unified Command including NS and regulatory agencies and developed a "Decision Tree for Ongoing Operations" dated March 15, 2023, and updated herein. This updated Decision Tree for Ongoing Operations is attached in **Appendix A**. The Decision Tree for Ongoing Operations details community monitoring and communications as it pertains to on-site work operations, with specific emphasis on the detection of n-butyl acrylate in the community utilizing various types of air monitoring instrumentation (i.e., EPA Trace Atmospheric Gas Analyzer [TAGA], NS/CTEH Proton Transfer Reaction Mass Spectrometry [PTR-MS], and EPA HAPSITE).

Based on the air monitoring and sampling data collected in the community to date, this Long-Term Community Air Monitoring and Sampling Plan will act as a replacement for indoor home assessments conducted under the Air Monitoring and Residential Re-Entry Plan (i.e., Home Safely Plan).

2.0 HEALTH AND SAFETY

Safety is the most important consideration when implementing this plan. All site personnel will review and adhere to the overall site-specific Health and Safety Plan (HASP) and company/contractor-specific HASPs, as applicable. In general, sampling and GIS activities will be conducted only during daylight hours (if possible) by qualified personnel and under weather and other environmental conditions that do not create an unsafe working environment. Daily tailgate safety briefings will be conducted prior to going into the field. Additional safety briefings may be given prior to undertaking activities such as sampling near water, handling sample containers, source samples, etc. The appropriate personal protective equipment (PPE) will be utilized for each task. Any health and safety-related incidents will be promptly reported to site personnel.

3.0 DATA QUALITY OBJECTIVES

The objectives of this Long-Term Community Air Monitoring and Sampling Plan include:

- Providing ongoing assessment of community air quality as it relates to on-site cleanup and remediation as part of the East Palestine Train Derailment Site;
- Responding to odor complaints reported to the various hotlines and agencies as described in this Plan;
- Providing actionable air monitoring and sampling to direct on-site operations to reduce the potential for fugitive odors entering the surrounding community; and
- Communicating ongoing air monitoring and sampling efforts with the community.

A strategic planning approach based on the scientific method will be employed for data collection activities, which provides a systematic procedure to ensure that the type, quantity, and quality of data used in decision-making will be appropriate for the intended application. All analytical air samples will be submitted to a National Environmental Laboratory Accreditation Program (NELAP)-accredited and state-accredited laboratory for analysis and a Level IV data quality package.

Air monitoring and sampling results will be compared to established action levels and screening values to document community air quality, provide ongoing information to the community, respond to community requests, initiate on-site investigations, engineering controls, and work task modifications as needed, and determine the need for ongoing sampling. These action levels and screening values are defined in the Air SAP and associated QAPP (see Worksheet #15-A and SAP Sections 6.3-6.5). Data quality objectives and decision statements for each type of air monitoring and sampling are also defined in the Air SAP and associated QAPP (see SAP Section 3.2 and QAPP Worksheet #11-A). A summary of these decision statements with respect to activities associated with the Long-Term Community Air Monitoring and Sampling Plan is provided in Table 1 below.

Table 2. Data Quality Objectives and Investigative Questions

Investigative Questions	Action
What real-time air monitoring is being performed in the community to characterize air quality?	A combination of handheld real-time air monitoring and the EPA TAGA/HAPSITE and NS/CTEH PTR-MS are being performed outdoors in the community. Various action levels have been established in accordance with the varying objectives of community monitoring. Real-time air monitoring will prioritize the community areas nearest to and downwind of the incident site, especially near soil excavation activities.
How do real-time air monitoring results compare to action levels?	If real-time air monitoring for COIs shows air concentrations below action levels, then air monitoring will continue until work operations have concluded and the potential for fugitive vapor emissions has been removed. Data will be compiled and submitted to Unified Command (UC) prior to permanently ceasing air monitoring activities. If real-time air monitoring shows that COIs are detected at concentrations above action levels, then it will be determined that further monitoring and/or sampling for COIs is warranted. Data will be compiled and submitted to UC for sharing with appropriate parties to make data-driven decisions, and air monitoring and/or sampling will continue to further characterize airborne levels of COIs. In addition, site management will be advised on the potential need for engineering controls, and workers will be advised on the proper personal protective equipment (PPE), primarily respiratory protection, if needed.
How do real-time air monitoring results compare to the instantaneous	If the TAGA and/or PTR-MS instantaneously detects n-butyl acrylate at a concentration above the initial action level of 50 ppb:

Investigative Questions	Action
community action level of 50 ppb for n-butyl acrylate?	• The TAGA or PTR-MS (whichever is available) will conduct a downwind assessment by moving to the nearest downwind receptor to monitor for n-butyl acrylate. • If available, EPA may use a HAPSITE as an additional air monitoring asset to assess downwind receptors if the TAGA or PTR-MS are not available or are conducting air monitoring in other areas. • The Norfolk Southern HAZMAT Manager will be notified and will contact on-site personnel to identify the locations and types of operations occurring. Work area real-time air monitoring will continue to characterize the area and identify the potential source(s) of emissions. Appropriate actions will be taken in accordance with the SAP.
How do real-time air monitoring results compare to the sustained community action level of 20 ppb for n-butyl acrylate?	If the TAGA and/or PTR-MS instantaneously detects n-butyl acrylate at a concentration above the action level of 20 ppb during the downwind assessment: • The TAGA or PTR-MS will assess the width of the plume and will remain in the area for 15 minutes to determine whether detections are sustained. • If available, EPA may use a HAPSITE to take a 15-minute sample if the TAGA or PTR-MS are not available or are conducting air monitoring in other areas. • If the downwind assessment shows a sustained detection of n-butyl acrylate at a concentration above 20 ppb for 15 minutes, then the NS HAZMAT manager will be notified, and engineering controls will be instituted in accordance with the Decision Tree for Ongoing Operations. • TAGA or PTR-MS will remain in area for three (3) additional 15-minute data acquisitions. • If available, EPA may use a HAPSITE to take the 15-minute samples if the TAGA or PTR-MS are not available or are conducting air monitoring in other areas. • If concentrations persist after the third data acquisition, additional engineering controls will be implemented. This cycle will repeat until concentrations decrease below 20 ppb n-butyl acrylate sustained for 15 minutes. • If concentrations are elevated above 20 ppb for more than one (1) hour (i.e., four rounds of 15-minute samples), UC will be notified to engage community outreach to downwind receptors. A temporary stop work will be issued until 15-minute average concentrations return to < 20 ppb.
What is the long-term status of community air quality?	To characterize ongoing air quality, analytical samples may include: • Minican • Passive Diffusion Badges • Will be utilized to provide 12hr, 24hr, and secondary analytical analysis to supplement real-time air monitoring.
How do analytical air sampling results in the community compare to analytical screening values?	If analytical air sampling results indicate that COIs are not detected above established laboratory reporting limits (RLs), then it will be determined that there are no COIs present. Data will be compiled and submitted to UC prior to permanently ceasing air sampling activities. If air sampling results indicate that COIs are detected at levels below screening values established in the Air SAP and associated QAPP, then it will be determined that the COIs do not pose an airborne risk to human health. Data will be compiled and submitted to UC prior to ceasing air sampling activities.

Investigative Questions	Action
	If air sampling results indicate that COIs are detected at levels above screening values, then it will be determined that further sampling for COIs is warranted. Data will be compiled and submitted to UC for sharing with appropriate parties to make data-driven decisions, and air sampling will continue to further characterize airborne levels of COIs. A retrospective assessment of work activities during the sampling period may be performed to assess the need to implement operational changes (i.e., engineering controls).
What if community odor complaints and requests for air monitoring are received?	If odor complaints and/or air monitoring requests are received, then: • A Community Strike Team will be mobilized to the area where the complaint/request was noted to initiate outdoor air sampling and monitoring. • PTR-MS will be mobilized to the area for 15 minutes to assess potential fugitive plumes. • Additional analytical stations may be implemented in the area for additional analytical sampling.
How will air results be shared with the community?	Air monitoring and sampling data will be available to the community through: • CTEH Toxicology Hotline • CTEH Home Assessment Hotline • NSMakingitright.com • Public Announcement • Family Assistance Center • Public Forum • If real-time air monitoring exceeds screening criteria for a sustained period of time, then the nearby community will be notified through: • Distribution of Flyers or other information • Personal Contact

4.0 SAMPLING METHODOLOGY AND ANALYSIS

4.1 Air Monitoring Procedure

4.1.1 Selection of Analytes

Based on air monitoring data collected in community areas since February 4, 2023, the following substances have been targeted for ongoing outdoor air monitoring requests: VOCs, with specific emphasis on n-butyl acrylate and vinyl chloride.

4.1.2 Handheld Real-Time Air Monitoring Equipment

Air monitoring equipment is described in the Air SAP and associated QAPP (see SAP Sections 6.3-6.5 and 8.2). The potential list of real-time air monitoring equipment includes, but is not limited to, the following instruments:

- Photoionization detectors (PIDs): PIDs with 10.6 eV lamps (e.g., RAE Systems by Honeywell MultiRAE and ppbRAE instruments) will be used to screen for volatile organic compounds (VOCs). The minimum detection limit of the PID for VOCs in general is 0.1 ppm for the MultiRAE and 0.001 ppm for the ppbRAE.

The correction factors for the various VOCs and their corresponding corrected detection limits via PID are summarized in **Table 2**.

- Chemical-specific colorimetric detector tubes: The Gastec 131L colorimetric detector tube may be used for the specific measurement of vinyl chloride in air (detection limit = 0.02 ppm).

Table 2. Correction Factors and Corrected Detection Limits for VOCs via PID

Analyte	Instrument	Correction Factor	Corrected Detection Limit
Vinyl Chloride (75-01-4)	MultiRAE PID	2	0.2 ppm
	ppbRAE PID	2	0.002 ppm
n-Butyl Acrylate (141-32-2)	MultiRAE PID	1.6	0.16 ppm
	ppbRAE PID	1.6	0.0016 ppm

4.1.3 PTR-MS

In addition to roaming real-time monitoring, one (1) or two (2) PTR- MS mobile laboratories will be logging real-time assessments for n-butyl acrylate in the community in accordance with the Decision Tree for Ongoing Operations (Appendix A). Operational hours for the PTR-MS mobile laboratory will correspond with onsite work operations and the availability of the PTR-MS mobile lab(s) and appropriate staff. The PTR-MS mobile lab(s) will operate in tandem with the TAGA but may also operate independently to provide additional sampling during period when the TAGA is unavailable, to allow for extended work hours, or to increase community coverage. Performance criteria for comparisons of real-time assessments conducted by the TAGA and PTR-MS are provided in Appendix B. When not responding to odor complaints in collaboration with the Community Strike Team, the PTR-MS mobile lab(s) will prioritize community areas downwind and nearest to ongoing work operations as described in the Decision Tree for Ongoing Operations (Appendix A).

Data quality objectives and decision statements with respect to PTR-MS operations are also defined in the Air SAP and associated QAPP (see SAP Section 3.2 and QAPP Worksheet #11-A).

4.2 Air Sampling Procedure

4.2.1 Air Sampling Equipment and Methodology

Air samples are being collected throughout the community and are being sent to a third-party laboratory for analysis. A map of analytical samples locations is provided in the Air SAP. A summary of analytical methods used, and their respective detection limits are included in **Table 3** below.
n-Butyl acrylate was not a target analyte in the EPA Method TO-15 for samples collected from February 4, 2023, to March 21, 2023. However, Pace Analytical has used a standard tentatively identified compound (TIC) evaluation approach for all reported analytical air sampling results. This TIC evaluation includes the following:

- Is the identified compound concentration above 10 ppbv?
- If so, is the quality match for the TIC above 85%?
- If the concentration is above 10 ppbv and the quality match is below 85%, the compound is reported as “Unknown.”

Based on these criteria, n-butyl acrylate would have been reported by Pace Analytical if it was present in the analytical air samples and met the above criteria. Additionally, Pace Analytical has confirmed that butyl acrylate is included in the Mass Spectral library used for TIC evaluation. As of March 22, 2023, Pace Analytical is reporting n-butyl acrylate as a target analyte using standard EPA Method TO-15 calibration and instrument verification procedures (**Appendix C**).

Table 3. Analytical Methods and Detection Limits

Analyte	Media/Can	Method	Estimated Detection Limit	Lab	Notes
VOCs	Minicans (1L)	EPA TO-15 with TICs	1 ppb	Pace Analytical	24-hr Sample (Reports General VOCs, including vinyl chloride and n-butyl acrylate)
n-butyl acrylate	525 Organic Vapor Monitor Badges	Modified NIOSH 2537	~15 ppb (12 hr.) ~9 ppb (24 hr.)	SGS Galson	Work Area Perimeter – 12 hrs. Community – 24 hrs.
	Minicans	EPA TO-15 with TICs	1 ppb	Pace Analytical	Community Grab Samples

4.3 Selection of Screening Levels

- The Agency for Toxic Substances and Disease Registry (ATSDR) Regions 5 and 3 have recommended health-based screening levels to be used as guidelines for the comparison of community air monitoring data. The screening levels for the substances that have been targeted for air monitoring and sampling, as well as their associated odor thresholds, are provided in **Table 4.** For example, ATSDR has developed Minimal Risk Levels (MRLs), which are defined as "*…an estimate of the daily human exposure to a hazardous substance that is likely to be without appreciable risk of adverse non-cancer health effects over a specific duration of exposure*." The intermediate MRL for inhalation of vinyl chloride is 0.02 ppm and is applicable for 15-day to 1 year exposure. Furthermore, ATSDR has accepted an intermediate screening level for n-butyl acrylate of 0.02 ppm based on the Michigan ITSL.

Table 4. Screening Levels and Odor Thresholds

Analyte	Screening Level	Screening Level Basis	Odor Threshold
Vinyl Chloride (75-01-4)	0.02 ppm	ATSDR Intermediate MRL	3,000 ppm
n-Butyl Acrylate (141-32-2)	0.02 ppm	Michigan ITSL	0.00029 – 0.101 ppm

It should be noted that while PID instrumentation has detection limits above the screening levels in **Table 4**, these instruments are meant to be used as screening tools only in conjunction with odor descriptions. The screening levels listed in **Table 4** are more appropriately used for instrumentation such as the TAGA or PTR-MS as well as analytical air sampling, which have more sensitive detection limits.

A full list of screening values is defined in the Air QAPP (see Worksheet #15-A). Data quality objectives and decision statements for each type of air sampling are also defined in the Air SAP and associated QAPP (see SAP Section 3.2 and QAPP Worksheet #11-A).

4.4 Community Strike Team

A Community Strike Team will continue to be available for targeted community air monitoring in response to calls to the Toxicology Hotline, the Home Assessment Hotline, the NS Family Assistance Center, or other avenues. This team will mobilize as needed to areas within the community in outdoor areas where odors have been reported and/or air monitoring is requested.

The Community Strike Team will also respond to action levels exceedances noted by the TAGA or PTR-MS in accordance with the Decision Tree for Ongoing Operations (**Appendix A**). The Community Strike Team will perform handheld real-time monitoring, and in the instances of action level exceedance with the TAGA and/or PTR-MS, will collect grab samples for analytical analysis for n-butyl acrylate.

Data quality objectives and decision statements with respect to Community Strike Team operations is defined in the Air SAP and associated QAPP (see SAP Section 3.2 and QAPP Worksheet #11-A).

4.5 Procedure for Community Air Monitoring and Sampling

NS, in conjunction with its contractors, local authorities, and state and federal regulators as available, will perform air monitoring and sampling throughout the community using the instrumentation and methodologies listed above and in the Air SAP, as well as those elucidated in the Air QAPP and the Decision Tree for Ongoing Operations, respectively.

1. Roving handheld real-time air monitoring will continue 24-hours a day in general outdoor areas in the community in accordance with the Air SAP and associated QAPP.
2. If odor complaints and/or requests for air monitoring are received:
    a. Ongoing air monitoring and sampling results will be communicated with the individual.
    b. If the individual requests air monitoring, the Community Strike Team and PTR-MS will be mobilized to the area to provide outdoor air monitoring in the community surrounding the area/building of interest, with emphasis between the incident site and the area/building of interest.
    c. If odors are noted/present or if the resident requests additional sampling, a passive diffusion vapor badge will be deployed in a public area between the incident site and near the area/building of interest.
    d. The need to add an additional continuous sampling location for VOCs/n-butyl acrylate will be assessed, and if deemed appropriate, will be added.
    e. Detections of VOCs or other constituents of concern will be evaluated based data quality objectives as outlined in the Air SAP and associated QAPP.
    f. Results of air monitoring and any air sampling performed will be communicated with the caller.
3. Air sampling locations are summarized in the Air SAP. Analytical locations are located around the perimeter of the work area and distributed throughout the community.
4. If analytical air concentrations do not exceed the associated screening levels, data will continue to be documented and reported through current approved mechanisms within UC. Summaries of air

monitoring and sampling data will be provided to the CTEH Hotlines to address any questions or odor complaints.

5. If concentrations exceed the associated screening levels for analytical air samples, data will be averaged by sampling location using appropriate methods and evaluated to determine whether the average concentration is greater than the screening value.
    a. If the average concentration is greater than the screening value, then it will be determined that further sampling for COIs is warranted. Data will be compiled and submitted to UC for sharing with appropriate parties to make data-driven decisions, and air sampling will continue to further characterize airborne levels of COIs. In addition, site management will be advised on the potential need for engineering controls, if needed.
    b. If the average concentration is less than the screening value, then it will be determined that the COIs do not pose a risk to human health. Data will be compiled and submitted to UC for sharing with appropriate parties.
6. Additional follow-up will be performed in accordance with the data quality objectives outlined in the Air SAP and associated QAPP.

5.0 NOTIFICATION AND LOGISTICS PLAN FOR AIR MONITORING AND SAMPLING

5.1 Goals

- Conduct ongoing outdoor air monitoring and analytical air sampling within the community.
    - Address air quality concerns
    - Address public safety concerns
- Clearly explain the process for air monitoring using available communications tools
    - Online, in-person, and by media and telephone

5.2 Communication Plan

Air monitoring and sampling will continue to be reported to UC. Additionally, community members may request updates on air monitoring and sampling results by contacting one of the following:

- CTEH Toxicology Hotline
- CTEH Home Assessment Hotline
- Family Assistance Center
- Public Forum
- USEPA Website

Community members will also be able to visit Family Assistance Center for community air monitoring and sampling results. Results will also be available on NSmakingitright.com.

In the event of a sustained exceedance of an action level for vinyl chloride and/or n-butyl acrylate in the community as described above, these results will be report to UC and a determination made whether additional

notification beyond that described in the Decision Tree for Ongoing Operations is warranted. Notification may include press releases, handouts, public meetings, and individual in-person communications.

More information regarding communications actions can be found within the data quality objectives and decision statements for each type of air monitoring and sampling, which are defined in the Air SAP and associated QAPP (see SAP Section 3.2 and QAPP Worksheet #11-A).

6.0 SAMPLE HANDLING PROCEDURES, LABELING, AND QUALITY ASSURANCE

All procedures for sample handling, sample labeling, quality assurance, and records management are provided in the Air SAP version 2.0 and associated QAPP (see SAP Sections 9.0, 10.1, 10.2, and 10.3 and QAPP Worksheets #26, 27, and 29).

Appendix A

Decision Tree for Ongoing Operations

4.19.23

TAGA/PTR-MS DECISION TREE FOR ONGOING OPERATIONS – APRIL 19, 2023

This plan outlines the collaborative efforts relating to community air monitoring and communications as it pertains to on-site work operations, specifically related to potential detections of n-butyl acrylate in the community. This plan should be implemented with the Air SAP and QAPP.

Key Analytes and Applicable Screening Values:

- Vinyl Chloride
  - Intermediate comparison value: 20 ppb (ATSDR MRL for intermediate inhalation)
- n-Butyl Acrylate
  - Intermediate comparison value: 20 ppb (Michigan Department of Natural Resources and Environment 24-hour average Initial Threshold Screening Level [ITSL]); used as a 15-minute or 1-hour average.

Provisions to be Enacted:

- Analytical air sampling will continue along the perimeter of the work area and in community areas for VOCs and n-butyl acrylate as discussed in the Air SAP and associated QAPP (see **Attachment A** for a map of combined EPA and Norfolk Southern sampling stations).
- Additional air analytical locations, in the breathing zone, for n-butyl acrylate include community areas nearest to and downwind of the derailment site, especially near soil excavation activities (12- or 24-hour sampling durations).
- Real-time air monitoring will continue within the work area, at the work area perimeter, and in community areas, with additional emphasis on community areas nearest to the work area.
- Odor reports in community areas will continue to be investigated by Community Strike Teams consisting of CTEH and EPA Odor Complaint Team as available, who immediately respond to the area of the odor report and conduct outdoor handheld real-time air monitoring to characterize the area.
- Analytical air sampling via the TAGA and/or PTR-MS will be conducted while work is occurring at the work area which will be limited to daylight hours to daylight hours and/or the availability of TAGA and/or PTR-MS mobile lab(s). Consider scheduling work for more optimal weather conditions when possible (e.g., wind direction, temperature conditions).

Decision Criteria for Ongoing Operations:

- VOC concentrations in the work area and community continue to be below action levels as established in the NS Air Sampling and Analysis Plan (SAP), or if above action levels, actions continue to be taken in accordance with the Air SAP and associated QAPP. SAP may be provided upon inquiry.
- TAGA and/or PTR-MS mobile lab(s) conducts real-time analysis of n-butyl acrylate[1] in community areas nearest to and downwind of the work area along predefined routes based on forecasted wind direction (see **Attachment B** for maps of TAGA/PTR-MS routes).

[1] Based on the chemistry of n-butyl acrylate and 2-ethylhexyl acrylate (vapor pressure 4 mmHg at 68°F vs. 0.01 mmHg at 68°F, respectively), real time measurements of n-butyl acrylate via TAGA are being used as a surrogate for 2-ethylhexyl acrylate. Measurements of n-butyl acrylate below the corresponding comparison value are expected to also be protective for 2-ethylhexyl acrylate. Measurements of 2-ethylhexyl acrylate will be confirmed with analytical air sampling.

- Analytical air sampling results for vinyl chloride in community areas continue to show average concentrations below intermediate comparison values. Analytical results for n-butyl acrylate continue to show average concentrations below the intermediate screening value.
- If possible, excavated soil will be moved off-site as soon as possible, moved to an area away from nearby community receptors, and/or covered to reduce potential emissions.

Decision Tree During Operations:

- The hours of operations (including excavation, uncovering of stockpiles, and loading of trucks) will be communicated to the operators of the TAGA and/or PTR-MS mobile lab(s).
- When the TAGA and/or PTR-MS detect an instantaneous concentration of n-butyl acrylate above 50 ppb (i.e., a one-minute average of readings collected once per second), the TAGA and/or PTR-MS will conduct a downwind assessment.
    - The Norfolk Southern HAZMAT Manager will be notified (via text or telephone with confirmation from Norfolk Southern) and will contact on-site personnel to identify the locations and types of operations occurring.
    - Real-time air monitoring will continue within the work area and at the work area perimeter to characterize the area, identify source of emission and take appropriate actions in accordance with the Air SAP and associated QAPP.
    - The TAGA and/or PTR-MS will assess the width of the plume by passing through the area of persistent detections above the threshold and back and conducting focused monitoring at downwind receptors based on prevailing wind direction (i.e., increased passes at downwind residential or commercial areas).
    - If additional TAGA/PTR-MS/HAPSITE mobile asset(s) is/are available:
        - Secondary team will be activated to conduct focused monitoring at the closest downwind receptor. EPA may collect 1L ALTEF bags over 15-minute periods to assess concentration of n-butyl acrylate with a HAPSITE. TAGA/PTR-MS may also take measurements over a 15-minute period, depending on which secondary assets are available when the initial exceedance is reported.
        - If the 15-minute average measurement has a concentration < 20 ppb, EPA Ops Chief is notified, and regular monitoring is resumed.
        - If the measurement has a concentration > 20 ppb, three (3) more 15-minute data acquisitions will be collected to evaluate the average concentration over a one-hour period to allow for comparison to the 20 ppb ITSL.
            - If the 1st, 2nd, or 3rd 15-minute average have concentrations > 20 ppb, EPA will be notified, and NS HAZMAT Manager will be directed by EPA to implement additional engineering controls and report the locations and types of operations conducted on-site.
            - If the 4th 15-minute average has a concentration > 20ppb or the one-hour average concentration is > 20 ppb, EPA will be notified, and NS will be directed by EPA to temporarily stop work (or specific activities resulting in elevated readings) until 15-minute average concentrations return to < 20 ppb.

        - Monitoring will continue until the running one-hour average concentration is < 20 ppb. If the average n-butyl acrylate detection levels over a second hour is > 20 ppb, Unified Command will be notified.
    - If Secondary Mobile Asset is not available:
        - If instantaneous concentrations (i.e., a one-minute average of readings collected once per second) are present above 20 ppb, the TAGA and/or PTR-MS will remain in downwind receptor area for 15 minutes. If the 15-miute average is still sustained above 20 ppb, the Norfolk Southern HAZMAT Manager will be notified, who will institute engineering controls as outlined in the section below. The TAGA and/or PTR-MS will remain in the area for an additional 15 minutes. If concentrations persist, Norfolk Southern HAZMAT Manager will again be notified to implement additional engineering controls. This cycle will repeat until the 15-minute average concentration decreases below 20 ppb.
    - If concentrations or odor complaints specifically related to n-butyl acrylate site activities persist for greater than one hour, the TAGA and/or PTR-MS will notify Unified Command, who will engage a community outreach team to discuss potential avenues for communications with downwind receptors (e.g., distribution of flyers or other information via websites, use of hotlines to answer questions, etc.).
        - If/when concentrations are sustained below 20 ppb for 15 minutes, the TAGA and/or PTR-MS will return to mobile monitoring.
    - Before the end of shift, the TAGA and/or PTR-MS will return to the most recent area where n-butyl acrylate was detected at concentrations above 50 ppb to verify that readings diminish to concentrations below 50 ppb.

Corrective actions when initial instantaneous 50 ppb action level is exceeded:

- Work area operations (i.e., the locations and types of operations occurring) and site conditions will be examined.
- The nature of the exceedance (i.e., driven by an instantaneous peak measurement or consistently elevated measurements) will be evaluated to determine the trend of the measurements.
- Operational activities and environmental conditions (i.e., wind direction, temperature) will be evaluated to determine the potential basis of the measurements. Environmental changes or operations that may result in elevated potential for continuous community exposure will be investigated.

Corrective actions when instantaneous and/or sustained 20 ppb action level is exceeded:

- Implement an engineering control, following the order outlined below:
    - Utilize a fan (i.e., tunnel fan, airboat)
    - Utilize one of the following vapor suppressants, following the order outlined below:
        - Butyl buster
        - Non-fluorinated Foam
        - Water misting
        - Impermeable cover
        - Cover with soil

    - Shift work to a different area (e.g., away from nearby community areas, further upwind, or to a work area with lower potential emissions) to allow airborne concentrations to dissipate.
    - Minimize disturbance of stockpiles or utilize smaller stockpiles that require less disturbance.
    - Cover stockpiles or other potential sources of emissions. If possible, immediately remove the excavated soil and transport it off-site.
- If the actions and engineering controls outlined above do not decrease 1-hour average concentrations to below 20 ppb sustained for 15 minutes, a temporary stop work may be implemented until community air monitoring shows 1-hour average concentrations below action levels.

Daily Evaluations:

- Evaluate forecasted wind direction versus work areas and operations.
    - For work operations in areas with higher potential emissions, plan work for specific wind directions (i.e., where residential and commercial areas are upwind or crosswind of the work area) and weather conditions.
    - Shift work to a different area (i.e., away from nearby community areas, further upwind, or to a work area with lower potential emissions) to allow airborne concentrations to dissipate when necessary.
- Ensure that stockpiles are covered at the end of work each day to minimize the potential for odors and emissions. Keep piles covered as much as possible and only uncover as needed to maintain, add, or load piles.
- If possible, locate new staging piles toward the east, away from residential and commercial areas, and utilize smaller stockpiles to minimize disturbance.
- Continue to implement appropriate actions and engineering controls as preventative measures as well as to reduce the potential for exceedances (see engineering controls listed above).

Data Summaries:

- Produce a daily air monitoring data summary for review.
    - Provide a summary of analytical air sampling data when results are received.
- Compare real-time air monitoring measurements (both TAGA, PTR-MS, and HAPSITE and handheld instrumentation) to analytical air sampling results.
- Ensure regular meetings as needed to review the effectiveness of this plan and make adjustments to operations as needed.

Appendix B

TAGA and PTR-MS Performance Criteria

Performance Criteria Comparison of TAGA and PTR-MS Measurements of n-Butyl Acrylate

Introduction

The purpose of this document is to provide a set of comparison criteria to validate the methodology and results of the Proton Transfer Reaction Mass Spectrometry (PTR-MS) compared to the USEPA Trace Atmospheric Gas Analyzer (TAGA). The overall goal is for the PTR-MS mobile lab(s) to replace the TAGA for community monitoring related to the East Palestine Train Derailment. Currently, one PTR-MS mobile lab is onsite, with a second unit tentatively arriving onsite on April 18, 2023.

Initial calibration curves for the PTR-MS instrument response to n-butyl acrylate were generated using eight standard concentrations, including zero. This span was utilized to prove linearity of response of the instrument span. Initial calibration concentrations were: 196 ppb, 65.3 ppb 28 ppb, 16.3 ppb, 9.31 ppb, 4.65 ppb, 2.94 ppb and zero ppb. The R^2 values for both the raw and corrected counts per second were greater than 0.99. Future calibration curves may use three- to six-point target concentrations consistent with those listed above and in accordance with the minimum requirements listed in USEPA Method 18.

Morning instrument calibration checks

- Utilize three-point calibration check standards.
    - Target concentrations used in the checks are 196 ppb, 28 ppb, 16.3 ppb, and zero ppb.
- Criteria for passing check standards is less than ± 20% per non-zero concentration. If calibration check recovery acceptance criteria is less than ± 20% of the initial calibration value for non-zero concentrations, proceed to testing.
- If calibration check criteria is greater than ± 20%, the slope of the three-point responses is used to adjust the response factor, and the three-point checks are repeated to ensure that the calibration check criteria is less than ± 20%.

Evening instrument calibration checks

- Post-test single-point calibration checks using midpoint concentrations (i.e., approximately 16.3 ppb) are performed at the end of the day using the same procedure as described for morning calibration.
- If calibration check criteria is greater than ± 20%, the full four-point calibration will be conducted. The response that gives the most conservative (highest value) will be used to determine the concentrations.

Correlation of spectra over time and space between PTR-MS and TAGA

1. Identify peaks and compare intensity.
    - Confirm temporal and spatial resolution between the two instruments.
        - Confirm the time of TAGA peak with the time of PTR-MS peak.
            - Propose five-minute temporal resolution time, when appropriate.
        - Confirm the location of the TAGA peak with the location of the PTR-MS peak.
            - Propose 250-meter spatial resolution, when vehicles are operated in tandem.

- The criteria for comparison of peak performance is ≤ 60% to account for wind speed, plume width, opposing traffic (mechanically caused turbulence) and any other variables.

2. The comparison of PTR-MS and TAGA data will be evaluated over a period of three to five days. After this time, the PTR-MS will be approved for independent assessments.

Instrument Maintenance and Optimization

- Provide evidence of general service standard operating procedure and documentation of last service. Service is performed as needed. Performance is checked by instrument manufacturer after any component change and before any sampling campaign. This includes system tuning and sensitivity optimizations.

Vision for how PTR-MS and TAGA will work in tandem and/or independently

PTR-MS mobile lab(s) and/or TAGA can:

- Confirm a peak at specific location and within a specific time period;
- Respond to odor complaints at distinct locations in the community;
- Assess outdoor air concentrations of n-butyl acrylate in response to community requests for air monitoring near their properties;
- Capture the concentration gradient as the instrument moves further from the source;
- Provide a standby/backup instrument (i.e., second PTR-MS) in the event of one instrument going offline; or
- Deploy one instrument that is focused on work area perimeter monitoring and another instrument that is dedicated to community monitoring.

Data Transfer

Mobile Map Dashboard

During operating hours, EPA and Unified Command will have access to the Montrose Mobile Mapping Dashboard to access PTR-MS data collected for n-butyl acrylate related to on-site operations. User accounts will be provided for individuals at directed by EPA, at a minimum to:

- EPA Operations Section Supervisor or delegate
- EPA Data Coordinator
- EPA Planning Section Supervisor

Each time data is uploaded to the mobile map, the PTR-MS will be offline and unable to conduct air monitoring for a minimum of 30 minutes to 1 hour. In order to minimize downtime due to uploads while maintaining immediate information dispersal to key personnel, the TAGA text chain will be used as described below to alert key personnel regarding mobile monitoring operations and action level exceedances. In an effort to reduce downtime of the unit and reductions in air monitoring capabilities and to maximize community monitoring, the PTR-MS will upload data to the mobile map once per day at the end of operations if the PTR-MS is following TAGA or working independently. If the PTR-MS is in the process of being validated for independent use, but is working independently due to site needs, the PRT-MS will upload data a minimum of two times per day, once at midday and once at the end of operations.

Data Export

At the conclusion of work hours each day, the readings and data collected during the day will be exported into an excel spreadsheet and shared with individuals as directed by Unified Command.

Accessing Mobile Map Dashboard

Currently, the Montrose PTR-MS mobile mapping dashboard can be accessed at:
https://go.sensibleiot.com/Account/Login
After logging in, PTR-MS data can be visualized by clicking map, then Mobile Map on the screen menu. From there a series of drop-down boxes allow you to select the appropriate site (only one, East Palestine will be available).

Teams Meeting Viewing

In addition to the data uploads described above, a daily Microsoft Teams meeting will be established for each PTR-MS in operation for real-time viewing of the PTR-MS during operating hours (microphones and sound will not be available). The links will be provided for these meetings and require no additional account set-up to access.

Operational Briefing

Prior to the initiation of work activities for the day, PTR-MS and TAGA will have an on-site operational briefing with the EPA Operations Section Supervisor or delegate. During the briefing, operations for the day will be discussed and solidified. This meeting will occur daily at 7:30 AM at the Command Post (895 E. Taggart St., East Palestine, OH, 44413).
Using the TAGA notification text chain, the following notifications will be sent for each unit in independent operation:

- PTR/TAGA Moving – means the PTR-MS/TAGA is leaving the FOB (Staging Area) to conduct monitoring
- PTR/TAGA @ FOB – PTR-MS/TAGA just arrived @ FOB from routine monitoring
- Report any Delays and Cause of Delay on the Thread as well as estimated time start.
- Report immediately TAGA/PTR-MS Action Level Detection (50 ppbv)
    - Stay in the location for Monitoring (at least 15 min)
    - Note/Text the location (Pin Drop)
    - Note/Text wind direction
- Report all results and/or next steps as needed per the decision tree.

Daily Summary

In addition to the mobile mapping dashboard and data export, at the conclusion of work activities each day an operational summary e-mail will be drafted for submittal to Unified Command. The daily summary will include:

- General overview of PTR-MS operations
- Summary of air monitoring
- Any events of note
    - Peaks
    - Downtime
    - Etc.

Appendix C

Pace Analytical TIC Memo for n-Butyl Acrylate

PEOPLE ADVANCING SCIENCE

4/13/23
1200 Peachtree St. NE Box 13
Atlanta, GA 30309

NS Project Team,

The purpose of this letter is to address the client request from March 30, 2023, to document the recent discussions and procedures Pace® has used to evaluate all previous NORSOUAGA East Palestine air data for the presence of Butyl Acrylate.

From the beginning of this project, all samples were evaluated for the presence of significant non-target impact via the Pace® standard of procedures for TIC (tentatively identified compound) evaluation. While there are additional reference spectra evaluations that occur to verify the correct TIC is reported, this procedure includes 3 main evaluation points.

- Is the identified compound concentration above 10ppbv?
- If so, is the quality match for the TIC above 85%?
- If the concentration is above 10ppbv, and the quality match is below 85%, the compound is reported as 'Unknown'.

Based on the above criteria, no TIC detections were reported for Butyl Acrylate during original data review (1).

Upon request of the NS Project team, after discussion on March 26, 2023, Pace® employed a targeted TIC evaluation procedure on all samples collected between 02/05 and 03/22. A targeted TIC evaluation is a routine process that uses the reference spectra from the NIST library to assist the analyst in identifying analytes of concern in a sample chromatogram. In this case, Pace® also had the benefit of recent injections made from a certified reference standard of Butyl Acrylate to assist in identifying, not only the spectral chromatogram acquired under standard lab conditions, but also the expected retention time of the compound of concern. These additional tools increase the confidence level of the evaluation and, although presence of the targeted compound was identified below the 10ppbv threshold (2), we have confirmed original TIC results as reported.

All data for samples collected between 24 hour collection periods from 2/4-2/5/23 and 3/21-3/22/23 has been evaluated via TIC analysis and no samples were detected above 10 ppbv. The data analysis for the standard and targeted TIC analyses are presented in the tables that follow. Samples collected 3/22/23 and going forward are being analyzed on instrumentation with standard TO-15 calibration and instrument verification procedures specific to butyl acrylate which will now be reported as a target analyte; thus, the targeted TIC processes will no longer be necessary.

Definitions:

Target reporting: *This includes the use of a certified reference standard, injected into the instrumentation to create a calibration curve based on the response of the analyte across a linear range. This process also allows the laboratory to view the standard ion response under the conditions of the instrumentation and define the specific retention time the analyte appears in the chromatography. Client samples are then injected and quantitatively evaluated against the calibration curve for concentration using the known Retention time and ion chromatogram to identify the compound of interest for reporting.*

TIC reporting: *This process uses the standard ion chromatograph provided by the NIST library to identify ions specific to the compound of interest. A search of the predominate ions at the expected ratios – either by the software (standard) or by the analyst (targeted) – is then performed of the entire client sample chromatograph to qualitatively evaluate for presence of the compound in the sample. If the compound of concern is identified as present and meets the concentration and quality thresholds set by the laboratory, the compound is reported as tentatively identified with an estimated concentration.*

In addition, while Pace cannot speak to the stability of butyl acrylate in a summa canister over time, calibrations for method development of butyl acrylate and current sample processing were/are prepared in summa canisters and recovery has been consistent, confirming within expectations for method TO-15. To this point, there are no breakdown products visible in the butyl acrylate reference standard chromatography, nor any siloxane peaks indicating reaction with the Silonite coated canister. Note: Due to the reactivity class of the compound, being highly reactive to heat/light, we have placed 3 day holding time on the expected tedlar bags being received for field verification.

Sincerely,

Christopher M Johnson

Chris Johnson, Product Manager – Air

Lab Sample ID	Client Sample ID	[1] Detected (standard criteria > 10 ppbv)	[2] Detected (expanded criteria 0-10 ppbv)
L1582712-01	EAOH0204MC01	No	Yes
L1582712-02	EAOH0204MC02	No	No
L1582712-03	EAOH0204MC03	No	No
L1582712-04	EAOH0204MC04	No	No
L1582712-05	EAOH0204MC05	No	Yes
L1583251-01	EAOH0205MC01	No	Yes
L1583251-02	EAOH0205MC02	No	Yes
L1583251-03	EAOH0205MC03	No	No
L1583251-04	EAOH0205MC04	No	Yes
L1583251-05	EAOH0205MC05	No	Yes
L1583247-04	EAOH0206MC02	No	No
L1583247-05	EAOH0206MC03	No	No
L1583247-06	EAOH0206MC05	No	Yes
L1583247-01	EAOH0206MC06	No	Yes
L1583247-02	EAOH0206MC07	No	Yes
L1583247-03	EAOH0206MC08	No	Yes
L1583786-05	EAOH0207MC01	No	Yes
L1583786-08	EAOH0207MC02	No	No
L1583786-06	EAOH0207MC03	No	No
L1583786-01	EAOH0207MC04	No	Yes
L1583786-07	EAOH0207MC05	No	Yes
L1583786-04	EAOH0207MC06	No	Yes
L1583786-02	EAOH0207MC07	No	Yes
L1583786-03	EAOH0207MC08	No	Yes
L1584374-01	EAOH0208MC01	No	Yes
L1584374-06	EAOH0208MC02	No	Yes
L1584374-07	EAOH0208MC03	No	Yes
L1584374-02	EAOH0208MC04	No	Yes
L1584374-08	EAOH0208MC05	No	Yes
L1584374-03	EAOH0208MC06	No	Yes
L1584786-01	EAOH0209MC01	No	Yes
L1584786-03	EAOH0209MC03	No	No
L1584786-05	EAOH0209MC05	No	No
L1584786-06	EAOH0209MC06	No	Yes
L1584786-07	EAOH0209MC07	No	Yes
L1584786-08	EAOH0209MC08	No	Yes
L1585201-05	EAOH0210MC01	No	No
L1585201-06	EAOH0210MC02	No	No
L1585201-07	EAOH0210MC03	No	No
L1585201-04	EAOH0210MC04	No	No
L1585201-08	EAOH0210MC05	No	No
L1585201-01	EAOH0210MC06	No	No
L1585201-02	EAOH0210MC07	No	No
L1585201-03	EAOH0210MC08	No	No

L1585206-05	EAOH0211MC01	No	No
L1585206-07	EAOH0211MC03	No	No
L1585206-04	EAOH0211MC04	No	No
L1585206-08	EAOH0211MC05	No	No
L1585206-01	EAOH0211MC06	No	No
L1585206-02	EAOH0211MC07	No	No
L1585206-03	EAOH0211MC08	No	No
L1585374-05	EAOH0212MC01	No	No
L1585374-07	EAOH0212MC02	No	No
L1585374-08	EAOH0212MC03	No	No
L1585374-04	EAOH0212MC04	No	No
L1585374-06	EAOH0212MC05	No	No
L1585374-01	EAOH0212MC06	No	No
L1585374-02	EAOH0212MC07	No	No
L1585374-03	EAOH0212MC08	No	No
L1585604-05	EAOH0213MC01	No	No
L1585604-06	EAOH0213MC02	No	No
L1585604-07	EAOH0213MC03	No	Yes
L1585604-04	EAOH0213MC04	No	Yes
L1585604-08	EAOH0213MC05	No	No
L1585604-01	EAOH0213MC06	No	No
L1585604-02	EAOH0213MC07	No	No
L1585604-03	EAOH0213MC08	No	No
L1586211-05	EAOH0214MC01	No	No
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L1586211-04	EAOH0214MC04	No	Yes
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L1586211-03	EAOH0214MC08	No	No
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L1586651-06	EAOH0215MC02	No	No
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L1586651-08	EAOH0215MC05	No	No
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L1586651-02	EAOH0215MC07	No	No
L1586651-03	EAOH0215MC08	No	No
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L1587155-04	EAOH0216MC04	No	Yes
L1587155-08	EAOH0216MC05	No	Yes
L1587155-01	EAOH0216MC06	No	Yes
L1587155-02	EAOH0216MC07	No	Yes
L1587155-03	EAOH0216MC08	No	No

L1587547-04	EAOH0217MC01	No	No
L1587547-05	EAOH0217MC02	No	No
L1587547-06	EAOH0217MC03	No	No
L1587547-03	EAOH0217MC04	No	No
L1587547-07	EAOH0217MC05	No	No
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L1587547-02	EAOH0217MC07	No	No
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L1587544-01	EAOH0219MC07	No	No
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L1588884-01	EAOH0222MC05	No	No
L1588884-05	EAOH0222MC06	No	No
L1588884-06	EAOH0222MC07	No	No
L1588884-04	EAOH0222MC08	No	No

L1589357-04	EAOH0223MC01	No	No
L1589357-06	EAOH0223MC02	No	No
L1589357-05	EAOH0223MC03	No	No
L1589357-03	EAOH0223MC04	No	No
L1589357-07	EAOH0223MC05	No	No
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L1590197-05	EAOH0227MC09	No	No
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L1590197-07	EAOH0227MC11	No	No
L1591168-04	EAOH0228MC01	No	Yes

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L1591163-04	EAOH0228MC03	No	No
L1591168-03	EAOH0228MC04	No	No
L1591163-05	EAOH0228MC05	No	No
L1591168-01	EAOH0228MC06	No	No
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L1591850-21	EAOH0303MC04	No	No
L1591850-13	EAOH0303MC05	No	No
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L1591850-18	EAOH0303MC08	No	No
L1591850-23	EAOH0303MC09	No	No
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L1591850-14	EAOH0303MC11	No	No
L1591850-15	EAOH0303MC12	No	No
L1591971-04	EAOH0304MC01	No	No
L1591971-11	EAOH0304MC02	No	No
L1591971-10	EAOH0304MC03	No	No

L1591971-03	EAOH0304MC04	No	Yes
L1591971-07	EAOH0304MC05	No	No
L1591971-01	EAOH0304MC06	No	No
L1591971-02	EAOH0304MC07	No	No
L1591971-12	EAOH0304MC08	No	No
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L1591971-09	EAOH0304MC12	No	No
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L1591971-22	EAOH0305MC03	No	Yes
L1591971-15	EAOH0305MC04	No	Yes
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L1592949-11	EAOH0306MC02	No	Yes
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L1592949-03	EAOH0306MC04	No	No
L1592949-07	EAOH0306MC05	No	Yes
L1592949-01	EAOH0306MC06	No	No
L1592949-02	EAOH0306MC07	No	No
L1592949-12	EAOH0306MC08	No	No
L1592949-05	EAOH0306MC09	No	No
L1592949-06	EAOH0306MC10	No	No
L1592949-08	EAOH0306MC11	No	No
L1592949-09	EAOH0306MC12	No	Yes
L1592949-16	EAOH0307MC01	No	Yes
L1592949-23	EAOH0307MC02	No	No
L1592949-22	EAOH0307MC03	No	No
L1592949-15	EAOH0307MC04	No	No
L1592949-13	EAOH0307MC06	No	No
L1592949-14	EAOH0307MC07	No	No
L1592949-24	EAOH0307MC08	No	No
L1592949-17	EAOH0307MC09	No	No
L1592949-18	EAOH0307MC10	No	No
L1592949-20	EAOH0307MC11	No	No
L1592949-21	EAOH0307MC12	No	No
L1593996-04	EAOH0308MC01	No	No
L1593996-11	EAOH0308MC02	No	No
L1593996-10	EAOH0308MC03	No	No

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L1593996-07	EAOH0308MC05	No	No
L1593996-01	EAOH0308MC06	No	No
L1593996-02	EAOH0308MC07	No	No
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L1593996-09	EAOH0308MC12	No	No
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L1593996-23	EAOH0309MC02	No	No
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L1593996-13	EAOH0309MC06	No	No
L1593996-14	EAOH0309MC07	No	No
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L1594394-18	EAOH0311MC10	No	No
L1594394-21	EAOH0311MC12	No	Yes
L1594840-04	EAOH0312MC01	No	No
L1594840-11	EAOH0312MC02	No	Yes
L1594840-10	EAOH0312MC03	No	No

L1594840-03	EAOH0312MC04	No	No
L1594840-07	EAOH0312MC05	No	No
L1594840-01	EAOH0312MC06	No	Yes
L1594840-02	EAOH0312MC07	No	No
L1594840-12	EAOH0312MC08	No	No
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L1595699-01	EAOH0314MC06	No	No
L1595699-02	EAOH0314MC07	No	No
L1595699-12	EAOH0314MC08	No	No
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L1595699-09	EAOH0314MC13	No	No
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L1595699-23	EAOH0315MC02	No	No
L1595699-22	EAOH0315MC03	No	No
L1595699-15	EAOH0315MC04	No	No
L1595699-18	EAOH0315MC05	No	No
L1595699-13	EAOH0315MC06	No	No
L1595699-14	EAOH0315MC07	No	No
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L1595699-20	EAOH0315MC12	No	No
L1595699-21	EAOH0315MC13	No	No
L1596424-04	EAOH0316MC01	No	No
L1596424-11	EAOH0316MC02	No	No
L1596424-10	EAOH0316MC03	No	No

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L1596424-06	EAOH0316MC05	No	No
L1596424-01	EAOH0316MC06	No	No
L1596424-02	EAOH0316MC07	No	No
L1596424-12	EAOH0316MC08	No	No
L1596424-05	EAOH0316MC10	No	No
L1596424-07	EAOH0316MC11	No	No
L1596424-08	EAOH0316MC12	No	No
L1596424-09	EAOH0316MC13	No	No
L1596424-22	EAOH0317MC01	No	No
L1596424-17	EAOH0317MC02	No	No
L1596424-16	EAOH0317MC03	No	No
L1596424-21	EAOH0317MC04	No	No
L1596424-24	EAOH0317MC05	No	No
L1596424-19	EAOH0317MC06	No	No
L1596424-20	EAOH0317MC07	No	No
L1596424-18	EAOH0317MC08	No	No
L1596424-23	EAOH0317MC10	No	No
L1596424-13	EAOH0317MC11	No	No
L1596424-14	EAOH0317MC12	No	No
L1596424-15	EAOH0317MC13	No	No
L1596542-04	EAOH0318MC01	No	No
L1596542-11	EAOH0318MC02	No	No
L1596542-10	EAOH0318MC03	No	No
L1596542-03	EAOH0318MC04	No	No
L1596542-06	EAOH0318MC05	No	No
L1596542-01	EAOH0318MC06	No	No
L1596542-02	EAOH0318MC07	No	No
L1596542-12	EAOH0318MC08	No	No
L1596542-05	EAOH0318MC10	No	No
L1596542-07	EAOH0318MC11	No	No
L1596542-08	EAOH0318MC12	No	No
L1596542-09	EAOH0318MC13	No	No
L1596542-16	EAOH0319MC01	No	No
L1596542-23	EAOH0319MC02	No	No
L1596542-22	EAOH0319MC03	No	No
L1596542-15	EAOH0319MC04	No	No
L1596542-18	EAOH0319MC05	No	No
L1596542-13	EAOH0319MC06	No	No
L1596542-14	EAOH0319MC07	No	No
L1596542-24	EAOH0319MC08	No	No
L1596542-17	EAOH0319MC10	No	No
L1596542-19	EAOH0319MC11	No	No
L1596542-20	EAOH0319MC12	No	No
L1596542-21	EAOH0319MC13	No	No
L1597393-06	EAOH0320MC01	No	No
L1597393-11	EAOH0320MC02	No	No

L1597393-10	EAOH0320MC03	No	No
L1597393-05	EAOH0320MC04	No	No
L1597393-03	EAOH0320MC05	No	No
L1597393-02	EAOH0320MC06	No	No
L1597393-08	EAOH0320MC07	No	No
L1597393-12	EAOH0320MC08	No	No
L1597393-01	EAOH0320MC10	No	No
L1597393-07	EAOH0320MC11	No	No
L1597393-04	EAOH0320MC12	No	No
L1597393-09	EAOH0320MC13	No	No
L1597396-02	EAOH0321MC01	No	No
L1597396-08	EAOH0321MC02	No	No
L1597396-05	EAOH0321MC03	No	No
L1597396-09	EAOH0321MC04	No	No
L1597396-01	EAOH0321MC05	No	No
L1597396-12	EAOH0321MC06	No	No
L1597396-10	EAOH0321MC07	No	No
L1597396-06	EAOH0321MC08	No	No
L1597396-03	EAOH0321MC10	No	No
L1597396-11	EAOH0321MC11	No	No
L1597396-07	EAOH0321MC12	No	No
L1597396-04	EAOH0321MC13	No	No

Appendix F

Acknowledgement Sheet

By signing, I acknowledge that I have read, understand, and agree to follow Version 2.1 of this Air Sampling and Analysis Plan.

Printed Name	Signature	Date

This page will be re-printed. All signatures must be PDFed and retained on projects.cteh.com or data portal.