CTEH®
THE SCIENCE OF READY℠

Tank Fire

Deer Park, TX

Preliminary Air Sampling and Analysis Plan (SAP)

Version 1.1

Prepared on Behalf of:

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March 18, 2019

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Air Monitoring and Sampling Strategy

CTEH®, LLC is focusing on the mixtures, chemicals, and indicators of flammability chosen below because they are among the most important and readily monitored hazards of burning naphtha products. The possible hazards of a naphtha fire vary by the mixture and composition of naphtha as well as with the environmental conditions associated with the surrounding area. Monitoring and sampling for some chemicals or indicators of the presence of naphtha may be conducted less frequently or even discontinued as product-specific information becomes available or as initial monitoring and sampling results indicate that these chemicals and indicators do not pose a health concern.

The strategy is to utilize two broadly defined monitoring plans: **1)** Community Monitoring; **2)** Site Assessment. Community Monitoring may take place in those residential and commercial locations immediately surrounding the incident site, not necessarily currently occupied by members of the community. Monitoring locations within the community will initially focus on areas downwind of the fire site and near locations likely to have sensitive receptors (schools, hospitals, nursing homes). Monitoring locations will be updated based on changing real-time conditions, as reported from the field. Unlike 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 may be conducted in a variety of areas based on levels of activity, proximity to the release, and site conditions. Fixed-location handheld real-time locations may be established in the Community in order to provide concentration averages that may be observed and analyzed over time in distinct geographic locations in the community. Specific equipment used to monitor for each analyte is listed in the Plan 1 and Plan 2 tables below.

Radio-telemetering RAE Systems® AreaRAE/AreaRAE Plus units may be deployed in all monitoring plans to allow for continuous air monitoring in multiple areas. AreaRAE/AreaRAE Plus readings may be received and monitored in a centralized location by CTEH® personnel to allow for recognition, communication, and response to changing conditions.

Discrete air samples may 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. When necessary, discrete air samples may be collected to provide air quality data over a period of time for more direct comparison to community exposure standards or guidelines.

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 community exposure standards or guidelines, but are intended to represent a concentration limit that triggers a course of action to better address public safety and community health. The action levels documented in this SAP are derived from concentrations estimated to cause mild irritation in sensitive populations within a community and should be reversible upon removal of exposure. Action level exceedances will be communicated to Site Management and the CTEH Project Technical Director by the CTEH Project Manager (PM). Exceedances of action levels will be used to guide allocation of monitoring personnel and determine sampling locations to collect additional data. Should any detection exceed a value which would pose a risk for human health, ITC will be notified immediately.

Site-Specific Action Levels are not utilized for Site Characterization monitoring.

Plan 1: Community Monitoring

Objective: Report air levels of analytes documented during monitoring efforts

Analyte	Action Level	Action to be Taken	Basis	Instrument	Detection Limit	Notes	Correction Factor
Total VOCs	0.5 ppm 5 minutes	Report reading to PM. Assess for the presence of benzene/toluene/hexane, if requested	Approximate background level - Reading sustained for 5 minutes	MultiRAE PID AreaRAE PID	0.1 ppm	Measuring range: 1 – 5,000 ppm	NA
Naphtha	Detection	Sample only as requested, Report reading to PM	Inform PM/PTD of potential off-site issues	Gastec tube #106	0.1 ppm	Measuring range: 0.5 – 28 ppm	Var.
Naphthalene	Detection	Sample only as requested, Report reading to PM	Inform PM/PTD of potential off-site issues	Gastec tube #60	0.5 ppm	Range: 0.5 to 14 Volume: 200 mL	Var.
Benzene	Detection	Sample only as requested, Report reading to PM	Inform PM/PTD of potential off-site issues	UltraRAE PID	0.025 ppm	UltraRAE - Change SEP tube frequently	NA
				Gastec tube #121L	0.05 ppm	Range: 0.1 – 65 ppm Volume: Variable	Var.
Toluene	Detection	Sample only as requested, Report reading to PM	Inform PM/PTD of potential off-site issues	Gastec tube #122L	0.5 ppm	Range: 1 – 100 ppm Volume: Variable	Var.
Hexane	Detection	Sample only as requested, Report reading to PM	Inform PM/PTD of potential off-site issues	Gastec tube #102L	1 ppm	Range: 4 – 1,200 ppm Volume: Variable	Var.
Hydrogen sulfide	Detection	Exit Area, report reading to PM	Inform PM/PTD of potential off-site issues	MultiRAE Sensor	1 ppm	MultiRAE - Measuring range: 0 – 100 ppm	NA
				MultiRAE Pro Sensor	0.1 ppm	MultiRAE Pro - Measuring range: 0 – 100 ppm	NA
				Gastec tube #4LL	0.1 ppm	Range: 0.25 to 120 Volume: Variable	Var.
Xylene	Detection	Report Reading to PM	Inform PM/PTD of potential off-site issues	Gastec tube #123	1 ppm	Measuring range: 5 – 625 ppm	Var.
				Gastec tube #123L	1 ppm	Measuring range: 2 – 200 ppm	Var.

Combustion Products							
Analyte	Action Level	Action to be Taken	Basis	Instrument	Detection Limit	Notes	Correction Factor
Particulate Matter ($PM_{2.5}$ or PM_{10})*	138 µg/m^3 Sustained 5 min	Report reading to PM	Wildfire Smoke Guidelines for 1 hr. avg. upper-bound breakpoint for unhealthy for sensitive groups AQI	SidePak AM510	0.001 mg/m^3	$PM_{2.5}$ impactor – 50% cut-off at 2.5 micron PM_{10} impactor – 50% cut-off at 10 micron	NA
$PM_{2.5}$ or PM_{10}	79 µg/m^3 8 hr.	Report reading to PM	See above - 8 hr. guideline	SidePak AM510	0.001 mg/m^3	See above	NA
Carbon monoxide	25 ppm 5 min	Report reading to PM	½ TEEL-0. Inform PM/PTD of potential off-site issues	MultiRAE Sensor	1 ppm	Range: 0 – 500 ppm	NA
				Gastec tube #1LC	0.5 ppm	Range: 1 – 30 ppm Volume: 100 mL	1
Sulfur dioxide	0.2 ppm 5 min	Report reading to PM	AEGL-1 Value. Inform PM/PTD of potential off-site issues	MultiRAE Sensor	0.1 ppm	Range: 0 – 20 ppm	NA
				Gastec tube #5Lb	0.05 ppm	Range: 0.05 – 10 ppm Volume: Var.	Var.
Nitrogen dioxide	0.5 ppm 5 min	Report reading to PM	PAC-1 Value (based on 60m AEGL). Inform PM/PTD of potential off-site issues	MultiRAE PID	1 ppm	Measuring range: 1 – 5,000 ppm	16
				MultiRAE Sensor	0.1 ppm	Range: 0 – 20 ppm	NA
				Gastec tube #9L	0.1 ppm	Range: 0.5 – 125 ppm Volume: Var.	Var.
Formaldehyde	Detection	Sample only as requested, Report reading to PM	Inform PM/PTD of potential off-site issues	Gastec tube #91L	0.05 ppm	Range: 0.1 – 40 ppm Volume: Var.	Var.

*$PM_{2.5}$ is especially prone to interference from high humidity, in cases of high humidity, PM_{10} impactors may be used which are not as sensitive to humidity. In general, correction factors may be used to adjust PM readings for humidity. Monitoring for combustion products may be discontinued when the fire is extinguished.

Flammability

Analyte	Action Level	Corrected Value	Action to be Taken	Basis	Instrument	Detection Limit	Notes	Correction Factor
LEL	1 % 1 min	2.5 %	Notify PM	Elevated LEL sustained 1 min	MultiRAE Sensor AreaRAE Sensor	1 %	Measuring range: 1 – 100%	2.5*
LEL	4 %	10 %	Exit area and Notify PM		MultiRAE Sensor AreaRAE Sensor	1 %	Measuring range: 1 – 100%	2.5*

*Rough estimate based on common crude oil volatiles.

Plan 2: Site Assessment

Objective: Characterize nature and extent of release

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	Measuring range: 1 – 5,000 ppm	NA
Naphtha	NA	Report reading to PM	NA	Gastec tube #106	0.1 ppm	Measuring range: 0.5 – 28 ppm	Var.
Naphthalene	NA	Report reading to PM	NA	Gastec tube #60	0.5 ppm	Range: 0.5 to 14 ppm	Var.
Benzene	NA	Report reading to PM	NA	UltraRAE PID Gastec tube #121L	0.05 ppm 0.05 ppm	UltraRAE - Change SEP tube frequently Range: 0.1 – 65 ppm Volume: Variable	NA Var.
Toluene	NA	Report reading to PM	NA	Gastec tube #122L	0.5 ppm	Range: 1 – 100 ppm Volume: Variable	Var.
Hexane	NA	Report reading to PM	NA	Gastec tube #102L	1 ppm	Range: 4 – 1,200 ppm Volume: Variable	Var.
Hydrogen Sulfide	NA	Report reading to PM	NA	MultiRAE Sensor	1 ppm	Measuring range: 0 – 100 ppm	NA
				MultiRAE Pro Sensor	0.1 ppm	Measuring range: 0 – 100 ppm	NA
				MultiRAE PID	0.1 ppm	Measuring range: 0 – 5,000 ppm	3.3
				Gastec tube #4LL	0.1 ppm	Range: 0.25 to 2.5 ppm Volume: 1,000 mL	Var.
Xylene	NA	Report reading to PM	NA	Gastec tube #123 Gastec tube #123L	1 ppm 1 ppm	Measuring range: 5 – 625 ppm Measuring range: 2 – 200 ppm	Var. Var.

Analytical Methods

Analyte	Media/Can	Method	Notes
VOCs	MiniCans (1L)	EPA TO-15 with TICs	
Benzene	Charcoal tube	NIOSH 1501	
BTEX (+Hexane)	3M 3520 Badge or Assay 566	Modified NIOSH 1500/1501	
PAHs (18 PNAH Profile - Galson)	37PTFE 2.0/Treated Amberlite XAD-2	Method 5506	

General Information on Procedures (Assessment Techniques) Used

Procedure	Description
Guardian Network	A Guardian network may be established with AreaRAEs equipped with electrochemical sensors at locations around the work zone perimeter. The AreaRAEs will be telemetering 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 may utilize handheld instruments (e.g. MultiRAE Plus; ppbRAE, Gastec colorimetric detector tubes, etc.) to measure airborne chemical concentrations. 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 chemical properties or site conditions. CTEH may also use these techniques to verify detections observed by the AreaRAE network.
Fixed Real-Time Monitoring locations	Multiple Community locations may be identified and 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 may be used to validate the fixed and handheld real-time monitoring data, or to provide data beyond the scope of the real-time instruments. Analytical samples may 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.
Particulate Monitoring Network	A network of data-logging particulate monitors may be set up and positioned around the Community.

Quality Assurance/Quality Control Procedures

Method	Procedure
Real-Time	Real-time instruments may be calibrated in excess of the manufacturer's recommendations. At a minimum whenever indicated by site conditions or instrument readings. Co-located sampling for analytical analysis may be conducted, if necessary, to assess accuracy and precision in the field. Lot numbers and expiration dates may be recorded with use of Gastec colorimetric tubes.
Analytical	Chain of custody documents may be completed for each sample. Level IV data validation may be performed on the first sample group analyzed. Level II data validation may be performed on 20% of all samples. Level IV data validation may be performed on 10% of all samples.
Reporting	Daily data summaries may be provided for informational purposes using data that have not undergone complete QA/QC. Comprehensive reports of real-time and/or analytical data may be generated following QA/QC and may be delivered 60 days following receipt of validated results, if applicable.

Glossary

Term	Definition
Sustained	Instrument reading above the action level continuously for the listed time period.
Excursion Limit	Whenever a reading exceeds an ACGIH® TLV by 5 times (if the chemical does not have a STEL- or Ceiling-based action level), exit the area and notify the PM
Breathing zone	The area within an approximate 10-inch radius of an individual's nose and mouth.
Ambient Air	That portion of the atmosphere (indoor or outdoor) to which workers and the general public have access.

Change from version 1.0 to 1.1

In the section titled Air Monitoring and Sampling Strategy: Addition of sentences 3 and 4 in paragraph 2.
In the section titled Air Monitoring and Sampling Strategy: Addition of sentence 3 in paragraph 3.
In the section titled CTEH Site-Specific Action Levels: Addition of sentences 3 and 5.
Changed title of project: Updated from "Naphtha Tank Fire" to "Tank Fire"

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Change from version 1.1 to 1.2

In the section titled:

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