CTEH CENTER FOR TOXICOLOGY AND ENVIRONMENTAL HEALTH, LLC

Air Sampling and Analysis Plan

Version: 1.1 Effective Date: 9/18/2014

Incident:	**Stevens Facility Release – Crude Oil**
Location:	**Pachuta, MS**
Client:	**Plains All American Pipeline**
Version History:	**1.1**

CTEH Site-Specific Action Levels

The following chemicals were determined to have the greatest potential for human health impacts based on the relative levels in air of volatile organics emitted from fresh crude oil, together with published information regarding health-based worker exposure guidelines. Site specific action levels were employed in all monitoring zones (i.e. Work Areas) to provide information for corrective action to limit chemical exposure. These levels are intended to be a concentration limit that triggers a course of action to better address worker safety before regulatory exposure limits are reached.

Plan/Assignment: **WORK AREA**

Objective: Report air levels before they reach those requiring respiratory protection or other precautionary actions

Analyte	Plan	Action Level	Basis	Action to be Taken
Total VOCs	Work Area	1 ppm	Calculated corrected VOC value for benzene OSHA PEL (0.5 ppm)	Perform benzene test with UltraRAE. If <0.5 ppm benzene, follow next VOC action level.
Total VOCs	Work Area	30 ppm	1/10 ACGIH® TLV for gasoline - Reading sustained for 15 minutes	Report reading to Site Management, evaluate work practices. Pull HTEX colorimetric tubes.
Benzene	Work Area	0.5 – 2.5 ppm	OSHA PEL Action level – Readings sustained for 15 minutes (STEL is 2.5 ppm)	Evacuate Area or don air purifying respirator; report reading to Site Management.
Toluene	Work Area	20 ppm	ACGIH® TLV – Reading sustained for 15 minutes	Report reading to Site Management, evaluate work practices.
Hexane	Work Area	50 ppm	ACGIH® TLV (n-hexane) – Reading sustained for 15 minutes	Report reading to Site Management, evaluate work practices.
Hydrogen Sulfide	Work Area	1 ppm	ACGIH® TLV – Reading sustained for 15 minutes	Evacuate Area, report reading to Site Management.

Plan: **All – FLAMMABILITY**

Objective: Report areas where flammability is most likely

Analyte	Instrument Reading	Corrected Value	Correction Factor	Basis	Action to be Taken
LEL	1 %	2.5 %	2.5 for crude oil LEL*	1% LEL	Egress and Notify Site Management

*Estimate based on common crude oil volatiles

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Methods

Real-Time Methods

Analyte	Instrument	Detection limit*	Tube/Lamp	Notes	Correction Factor
VOC	MultiRAE	0.1 ppm	PID 10.6 eV lamp	Measuring range: 1 – 5,000	NA
	AreaRAE	0.1 ppm	PID 10.6 eV lamp	Measuring range: 1 – 5,000	NA
Benzene	UltraRAE	0.05 ppm	PID 9.8 eV lamp	Change SEP tube frequently (Ben. Cal Gas)	NA
	MultiRAE	0.05 ppm	PID 10.6 eV lamp	Measuring range: 1 – 5,000	0.53
	AreaRAE	0.05 ppm	PID 10.6 eV lamp	Measuring range: 1 – 5,000	0.53
Toluene	MultiRAE	0.05 ppm	PID 10.6 eV lamp	Measuring range: 1 – 5,000	0.5
	AreaRAE	0.05 ppm	PID 10.6 eV lamp	Measuring range: 1 – 5,000	0.5
	Colorimetric	0.5 ppm	Gastec tube #122L	Range: 2 – 50 ppm Volume: 100 ml	1
Hexane	MultiRAE	0.43 ppm	PID 10.6 eV lamp	Measuring range: 1 – 5,000	4.3
	AreaRAE	0.43 ppm	PID 10.6 eV lamp	Measuring range: 1 – 5,000	4.3
	Colorimetric	1 ppm	Gastec tube #102L	Range: 4 – 50 ppm Volume: 500 mL	1/12
Hydrogen Sulfide	AreaRAE	0.1 ppm	Sensor	Measuring range: 0 – 100 ppm	NA
	MultiRAE Pro	0.1 ppm	Sensor	Measuring range: 0.1 – 100 ppm	NA
LEL	MultiRAE	2.5 %	Sensor	Measuring range: 1 – 100%	2.5
	AreaRAE	2.5 %	Sensor	Measuring range: 1 – 100%	2.5
Xylene	Colorimetric	1 ppm	Gastec tube #123	Range: 1 – 10 ppm Volume: 200 mL	0.5

*For electronic instruments the detection limit is listed as the resolution adjusted by the correction factor.

Analytical Methods

Analyte	Media/Can	Method	Detection Limit	Target compounds
BTEX (+Hexane)	3M 3520 Badge	Modified NIOSH 1501	Compare to appropriate health based exposure limit	Benzene, Toluene, Ethylbenzene, Xylene, Hexane.

General Information on Procedures (Assessment Techniques) Used

Procedure	Description
Guardian Network	A Guardian network may be established with AreaRAEs equipped with electrochemical sensors will be positioned at established locations around the work zone. 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.
Hand-held Survey	CTEH® staff members may utilize handheld instruments (e.g. MultiRAE Plus; UltraRAE, Gastec colorimetric detector tubes, etc.) to measure airborne chemical concentrations. CTEH® will use these hand-held instruments primarily to measure the breathing zone. Additionally, measurements can 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.
Analytical sampling	Analytical sampling may be used to validate the hand-held data monitoring data, or to provide data beyond the scope of the real-time instruments. Analytical samples may be collected on specific collection media such as personal-type badges, and sent to an off-site laboratory for further chemical analysis.

Sampling Areas

Sampling Area	Description
Work Area	The general area around the incident location where workers are actively or sporadically participating in remediation activities.
Other	During the course of the remediation, some additional areas or specific tasks may require a unique set of action levels or sampling (e.g. decontamination zones, commercial zones, etc.). Any monitoring or sampling in these zones will be addressed in addenda to this Sampling and Analysis Plan.

Quality Assurance/Quality Control Procedures

Method	Procedure
Real-time	• Real time instruments may be calibrated in excess of the manufacturer's recommendations. o 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.
Other	

Change from version 1.0 to 1.1

- *In the section titled: Further refined monitoring equipment based upon site needs. Clarified use of personal badges. Removed notation concerning whole air sampling. Added language for clarifying addenda of other monitoring or sampling needs or areas.*

	Name/Position	Signature	Date Signed
Prepared By:	BJ Fogleman, ESPM		9/18/14

Initial Version 1.0

	Name/Position	Signature	Date Signed
Prepared By:	Chris Kuhlman/Toxicologist		9/17/14