Air Monitoring

1. Purpose

The purpose of this policy is to provide accurate and thorough air monitoring procedures and to ensure that USPL's portable air monitoring equipment is properly selected, operated, and maintained to reliably assess potentially hazardous atmospheres in the workplace. Portable air monitoring equipment includes personal air monitoring equipment.

For fixed air monitoring equipment, follow the manufacturer's recommendations and BP GP 30-85 "Fire and Gas Detection".

2. Scope

This policy applies to all BP and contractor personnel who are responsible for operating and maintaining portable air monitoring equipment. Other policies in this manual contain additional requirements related to working in potentially hazardous atmospheres and should be consulted for guidance:

- Benzene
- Confined Space Entry
- Excavation
- HAZWOPER
- Hot Work
- Hydrogen Sulfide
- Respiratory Protection

3. Minimum Requirements

	Minimum Requirements	Supporting Documentation
1.	Portable air monitoring equipment shall be calibrated, inspected, and used in accordance with this policy and the manufacturer's instructions.	Sections 6 and 7
2.	The use of portable air monitoring equipment is mandatory in the following situations: • Issuing Hot Work Checklists~~Permits~~ in classified areas • Confined space entry and operations • Excavation entry and operations • Potential HAZWOPER (emergency response and uncontrolled releases) situations	Section 6
3.	Prior to performing air monitoring, employees and contractors shall be trained in the proper use and maintenance of air monitoring equipment in accordance with this policy and manufacturer's instructions.	Sections 7 and 8
4.	Authorized Gas Testers shall complete training as specified in the Training and Competency Matrix.	Section 8

4. Definitions

Air monitoring equipment—An instrument or device designed to measure the concentration of gases and vapors in air, including:

- Combustible or flammable gas or vapor (LEL)
- Oxygen (O_2)
- Toxins, such as benzene, hydrogen sulfide (H_2S), carbon monoxide (CO), etc.

Air monitoring equipment is used to assess the atmosphere in confined spaces, excavations, sites where there is a known or suspected release, and in classified areas when performing hot work.

Authorized Gas Tester—Personnel who have been trained and demonstrate competency in elements listed in Section 8 of this policy. An Authorized Gas Tester shall receive initial training prior to conducting air monitoring for Confined Space, Hot Work and Excavation permitting and related work.

Bump Test (also called a Function Check)—The process of exposing the instrument to a concentration of a challenge gas sufficient to activate all alarms and qualitatively verify the performance of the instrument before each day's use. A bump test is very simple and takes only a few seconds to complete.

Calibration—The process of exposing the instrument to a known concentration of gas to determine the accuracy of its response, readings, and alarm set points. The instrument's response may be adjusted if needed. A two-point calibration (zero gas and a known concentration) is used to perform a full calibration.

Continuous air monitoring—The constant sampling and analysis of ambient air to detect the infiltration of flammable, toxic, or oxygen-depleting gases and vapors into the work site. There are two types of continuous air monitoring programs:

- **Attended**—The air monitoring instrument is observed by an Authorized Gas Tester at all times. The tester surveys the work space periodically (at least once an hour) with the instrument to determine whether hazardous gases or vapors have infiltrated the area.
- **Non-attended**—Air monitors are strategically positioned in or near the work area, run at all times, and periodically checked (at least once an hour).

Flammable (explosive) range—The range of a gas or vapor concentration in air that will burn or explode if exposed to a source of ignition. Limiting concentrations are commonly called the Lower Explosive (Flammable) Limit (LEL) and the Upper Explosive Limit (UEL). *See also* Lower Explosive Limit (LEL); Upper Explosive Limit (UEL).

Hazardous atmosphere—An atmosphere that is flammable, corrosive, irritating, oxygen-deficient, or toxic and may cause death, illness, or injury. Hazardous atmospheres include but are not limited to the following:

- Lower Explosive Limit (LEL) at 10% or greater
- Oxygen level lower than 19.5% or greater than 23.5%
- H_2S concentration greater than 10 ppm
- Benzene concentration greater than 1 ppm
- Total hydrocarbon concentration greater than 300 ppm
- Any other toxic chemical concentration greater than its recognized Occupational Exposure Limits (OELs)

Inert atmosphere—An atmosphere that contains less than 5% oxygen. Nitrogen is often used to create an inert atmosphere in order to reduce the risk of ignition, minimize oxidation, purge containers, or other purposes.

Initial Confined Space Entry Air Monitoring—Air monitoring conducted less than two hours before the start of a work shift involving entry into a confined space. Oxygen (O_2), flammability (LEL), and concentrations of toxics are assessed for every initial entry at the start of a work shift.

Lower Explosive Limit (LEL)—The minimum concentration (percentage) of a flammable gas or vapor that will propagate a flame in the presence of an ignition source. The more explosive the gas, the lower the LEL. A mixture below this level is considered too "lean" to burn. LEL is usually expressed as a percentage (from zero to 100% explosive) and is often used interchangeably with Lower Flammability Limit (LFL).

Occupational Exposure Limit (OEL)—The concentration of an atmospheric contaminant that workers may be exposed to without the likelihood of experiencing adverse health effects. OELs are set by industry recognized organizations/authorities.

Oxygen-deficient atmosphere—Any atmosphere that contains less than 19.5% oxygen.

Oxygen-enriched atmosphere—Any atmosphere that contains more than 23.5% oxygen.

Parts per million (ppm)—The number of contaminant parts in a million parts of air.

Toxic atmosphere—Any atmosphere that contains a concentration of hydrogen sulfide (H_2S), carbon monoxide (CO), benzene, or any other recognized contaminants in concentrations exceeding the recognized Occupational Exposure Limits (OEL).

Upper Explosive Limit (UEL)—The highest concentration (percentage) of a flammable gas or vapor that will propagate a flame in the presence of an ignition source. Concentrations higher than the UEL are too "rich" to burn.

5. Roles and Responsibilities

A. Supervisors are responsible for implementing and enforcing the requirements stated in this policy.

B. Personnel using air monitoring equipment are responsible for following the requirements of this policy as well as the manufacturer's instructions for operating and maintaining air monitoring equipment.

C. Personnel charged with the operation and maintenance of air monitoring equipment (i.e., Authorized Gas Testers) are responsible for completing the required training prior to performing air monitoring (see Section 8).

6. Portable Air Monitoring Equipment

Portable air monitors are hand-held instruments that measure the concentration of combustible or toxic gases and vapors as well as oxygen concentration. All instruments used in USPL sound an audible alarm when concentrations exceed preset limits (see Appendix I). Since air monitoring equipment is designed for various applications, each instrument may have its own operating characteristics and limitations.

Specific initial and continuous monitoring requirements for Hot Work, Confined Space, and Excavations are specified in the respective policies. These policies should be referenced for air monitoring specifics.

The Safety Coordinator should be consulted regarding air monitoring equipment and procedures.

6.1. General Requirements

A. Portable air monitoring equipment shall be used strictly in accordance with this policy and the manufacturer's recommendations.

B. All portable air monitoring instruments shall be set to alarm at the settings listed in Appendix I.

C. The use of portable air monitoring equipment is mandatory in the following situations:

1. Hot Work
   a) Performing initial air monitoring to detect LEL prior to issuing Hot Work Checklists ~~Permits~~ in a classified area (Class I, Divisions I and II)
   b) Performing attended continuous air monitoring while hot work is being conducted in a classified area
2. Confined Space
   a) Performing initial air monitoring prior to entering a confined space
   b) Performing Continuous air monitoring while confined spaces are occupied
3. Excavations
   a) Before entering an excavation site that is known or suspected to be contaminated
   b) Performing continuous monitoring while an excavation is occupied
4. Contaminated Sites and emergency response
   a) To determine the Hot Zone and required PPE while addressing a spill or other release.
5. Personal, single gas monitors for H_2S shall be worn while performing the following tasks/jobs:
   a) Draining and/or line breaking equipment or piping in crude oil or heavy fuel oil service
   b) Launching or retrieving pigs or tools in crude oil lines.
   c) Purging crude oil lines or systems.

   If personal monitors alarm, the area shall be cleared until the source of contamination is controlled or eliminated. In addition to personal monitors, 4-gas monitors may be used to continuously monitor the area.

6.2. Monitoring During Incident Response Activities and Assessing Unknown Environments

A. In the event of a spill, vapor or gas release, or fire (potential HAZWOPER situation), an Authorized Gas Tester shall perform air monitoring to assess the concentration of hazardous substances before anyone is allowed to enter the area. The results of this monitoring will determine whether respiratory protection is required and, if so, the level of respiratory protection.

B. Gas detection instruments equipped with an active sampling pump and sample probe shall be used to survey the area. Sampling shall proceed from areas of the lowest detectable concentration to higher concentrations. Respiratory protection appropriate for the level of measured contamination shall be used (see the HAZWOPER, Respiratory Protection, and PPE policies).

7. Calibration and Maintenance of Air Monitoring Equipment

Routine periodic calibration along with bump tests, verify that portable air monitoring equipment is operating within its acceptable calibration settings.

A. Portable air monitoring equipment shall be inspected and calibrated according to the manufacturer's recommendations.

B. A calibration shall also be performed if:

1. Damage to the equipment is suspected (e.g., it has been dropped);
2. The previous calibration is questionable or the meter is not responding as anticipated;
3. The battery is completely dead (which can damage H_2S sensors);
4. The instrument responded to extremely high concentrations (maximum sensor response);
5. The instrument's sampling pump has sucked in liquid material; or
6. The instrument has failed a bump test.

C. Calibration shall be documented by the air monitoring equipment operator, and the records shall be retained for at least 12 months at the field office or in the instrument's carrying case.

Note: Many manufactures provide instrument docking stations that can perform automated calibrations and bump tests and store all calibration and bump test records. If calibrations and/or bump tests are being performed manually, see Appendix IV for a sample documentation form.

D. Toxic gas sensors shall be calibrated according to the manufacturer's recommendations.

E. A bump test shall be performed and documented prior to each daily use.

Note: Most USPL air monitoring equipment can be automatically calibration-checked. If the instrument is being used in the field or another location where an automatic bump test cannot be performed, a bump test can be conducted by following the instructions in Appendix IV. A sample bump test form is provided in Appendix IV. Contractors are responsible for documenting their bump tests, and if requested shall provide such documentation.

F. An air monitoring instrument that fails a bump test shall receive a full calibration, and possibly repair, before it can be used.

G. Contractors shall verify that their monitors are functioning properly by performing a bump test using a test gas containing concentrations that will activate all the alarms of the monitor being tested. This shall be done in the presence of BP personnel or a representative, e.g. AOD. Additionally, contractors may be asked to provide documentation of the last calibration performed. If requested, the documentation shall indicate a successful calibration per the manufacturer's recommendations or within the last 31 days.

H. Special precautions shall be used with calibration/bump test gas cylinders. The contents of gas cylinders are under pressure, and the following safety practices shall be observed:

1. Do not use oil, grease, or flammable solvents on the flow control valve of the cylinder.

2. Do not store cylinders near heat or fire or within reach of children.
3. Secure calibration gas cylinders to prevent accidental damage.
4. When the cylinder is empty, discard it in a safe place out of the reach of children. Do not throw, incinerate, or puncture it. *Note:* It is illegal and hazardous to refill most calibration/bump test gas cylinders.

8. Training

A. Anyone who operates portable air monitoring equipment and conducts air monitoring for hot work, confined space entry, excavations, or incident response shall receive Authorized Gas Test training prior to conducting air monitoring.

B. Authorized Gas Testers shall successfully train~~ing~~ as specified in the Training and Competency Matrix.

C. Authorized Gas Testing training shall include the following:

1. The operation, limitations, and care (including calibration) of the instrument in accordance with this policy and the manufacturer's instructions.
2. Gas testing techniques, principles, and requirements of this policy, including the appendices.
3. Continuous monitoring requirements and procedures.
4. Requirements and procedures for the documentation of gas testing and monitor calibration.

D. Prior to using personal or portable monitors for non-~~-permit~~ checklist required procedures, users shall be trained in the use and operation of the air monitoring equipment.

E. Training shall be documented via the USPL learning management system.

9. References

1. BP Fire and Gas Detection ETPs, “Guidance on Practice for Fire and Gas Detection”, GP-30-85 and “Guidance on Industry Standard for Fire and Gas Detection”,GIS-30-851.
2. American Petroleum Institute, ANSI/API Recommended Practice 2016, “Guidelines and Procedures for Entering and Cleaning Petroleum Storage Tanks,” 1st ed., August 2001.
3. American Petroleum Institute, API Recommended Practice 2009, “Safe Welding, Cutting, and Other Hot Work Practices in the Petroleum and Petrochemical Industries,” 7th ed., February 2002.
4. Instrumentation, Systems, and Automation Society, ANSI/ISA-RP 12.13, Part II-87, “Recommended Practice for the Installation, Operation, and Maintenance of Combustible Gas Detection Instruments.”
5. National Fire Protection Association, *Fire Protection Handbook,* Section 5, Chapter 8. Occupational Safety and Health Administration, Department of Labor, 29 CFR 1910.1000, “Air Contaminants.”
6. International Safety Equipment Association, “ISEA Statement on Validation of Operation For Direct Reading portable Gas Monitors”. March 5, 2010.

Appendix I

Alarm Settings of Portable Air Monitors

Contaminant	Low Alarm Set Point	High Alarm Set Point
Flammability/LEL	10% LEL	20% LEL
Oxygen	N/A	<19.5 or >23.5%
Hydrogen Sulfide (H_2S)	10 ppm	20 ppm
Carbon Monoxide (CO)	35 ppm	70 ppm
Benzene	1.0 ppm	5.0 ppm
Gasoline (measured as total hydrocarbons)	300 ppm	1,000 ppm

Appendix II

Air Monitoring Information and Guidance

It is important to identify the potential airborne contaminants that may be encountered based on the job characteristics and substances associated with the work to ensure that the correct air monitoring equipment and accessories are selected to perform the appropriate monitoring.

9.1. Air Contaminants

Oxygen (O_2)

The oxygen percentage in the atmosphere being tested has significance for these reasons:

- Oxygen deficient atmospheres (< 19.5%), may cause adverse health effects, such as poor judgment, impaired coordination, mental failure, and death.
- Oxygen-enriched atmospheres (>23.5%) readily support combustion and increase the risk of flash fires.
- Most flammability (LEL) monitors require a minimum of about 15% oxygen to provide proper readings.

Oxygen-deficient atmospheres are more likely to form in confined spaces as substances such as acetylene, carbon monoxide, solvents, and other hydrocarbon vapors may displace oxygen because of limited ventilation. Welding or torch cutting may also reduce the oxygen level in a confined space.

When the possibility exists for an oxygen-deficient atmosphere, the oxygen level could be below the level required by the air monitor to give the correct flammability (LEL) reading. This could occur where a tank, vessel, or piping contains an inert gas such as nitrogen or carbon dioxide.

Flammable Range (LEL/UEL)

All hydrocarbon vapors (other than methane) are heavier than air at ambient temperature. Air monitoring shall be very thorough and include all low points (such as sumps, drains, liquid boots) and all confined areas (such as floating roof pontoons, piping, excavations, and vessels).

Equipment parts that seal flammable material can have higher potential for leaks and may warrant special monitoring attention. These include flanges, valves, pump seals, and clamps on lines.

If initial monitoring detects a measurable LEL reading (>0%), hot work cannot start. If any LEL is detected while hot work is being conducted, it shall be stopped immediately and the source of vapors shall be located and controlled (see the Hot Work policy).

Toxic Substances

A. Benzene

Benzene is a human carcinogen that has been shown to cause leukemia with prolonged or repeated exposure. It has a very low occupational exposure limit of 1.0 ppm for an eight-hour shift. Benzene is a component in gasoline and crude oil.

B. Hydrogen Sulfide (H_2S)

Hydrogen sulfide is an extremely toxic, flammable gas. It is colorless, slightly heavier than air, and with a distinctive “rotten egg” odor. H_2S odor cannot always be used to detect its presence as prolonged exposure to relatively low concentrations may cause loss of the sense of smell.

It is present in crude oil and because it is more volatile than most other components, low levels of H_2S in crude can produce relatively high concentrations of the gas in the space directly above the liquid.

Hydrogen sulfide is extremely irritating to the skin and mucous membranes. In low concentrations it causes eye and respiratory tract irritation. At higher concentrations (around 500 ppm) loss of balance and reasoning, dizziness, and breathing problems can result. Concentrations around 700 ppm can cause unconsciousness and respiratory failure. Concentrations of 1,000 ppm can cause immediate unconsciousness, permanent brain damage, and death.

C. Carbon Monoxide (CO)

Carbon monoxide is a product of incomplete combustion and is present in the exhaust from diesel and gasoline engines. It is a colorless, odorless gas that when inhaled can cause headaches, dizziness, loss of consciousness, coma, and death.

Confined spaces with little or poor ventilation are subject to CO infiltration of exhaust from equipment such as cranes, compressors, generators, and fork lifts used inside or positioned outside the confined space. Compressors and generators located within a confined space can create high concentrations of CO.

D. Total Petroleum Hydrocarbons

This term is used to describe all types of hydrocarbon vapors generated from petroleum products such as gasoline and diesel fuel. The Total Petroleum Hydrocarbon Occupational Exposure Limit (OEL) of 300 ppm is based on gasoline vapors.

9.2. Equipment Descriptions

A. **Multi-Gas monitors** are devices/instruments which can continuously measure the concentration in air of at least 2 and up to 6 different gasses/vapors. Multi-gas monitors will at minimum measure LEL and O_2 concentrations and typically measure LEL, O_2, H_2S and CO. Basic multi-gas monitors will use natural diffusion to expose the sensors to atmospheric contaminants. Others may be equipped with a powered sampling pump to draw air across the gas sensors. Monitors equipped with a powered sampling pump can be equipped with a probe and extended sample line (up to 100 feet), for remote monitoring. If remote monitoring is performed using extended sampling lines, sampling periods/time shall be increased to effectively purge the sample line to achieve accurate results. The operation manual for the monitor should be consulted to determine the required sample time for the length of sample line being used.

B. **Colorimetric detector (Drager) tubes** can be used to measure benzene, total hydrocarbon and gasoline vapor concentrations in air. This air monitoring system consists of substance specific detector tubes and a sampling pump. The pump may be either a bellows or piston type pump. Each detector tube contains a media which is designed to chemically react with the contaminant being sampled and produce a color change to the media. As a determined volume of air is pulled through the detector tube, the length of the stain (color change), is compared to a linear scale printed on the tube to determine the concentration (ppm or % volume), of the contaminant.

   Because reading the length of the color stain is subjective, colorimetric tube air monitoring systems may not be as accurate as direct reading instruments.

C. **Photo ionization detectors (PIDs)** are relatively sophisticated, direct reading devices that perform well for surveying the concentration of most hydrocarbons in air. This technology uses a small heated lamp to ionize or excite sampled hydrocarbon molecules. The amount of ionization is then detected and converted to a concentration (ppm). Some PIDs can be equipped with a pre-sample separation tube that can “scrub” the sampled air and let only the desired contaminant through to be ionized and

detected. Compound specific PIDs are typically used to measure benzene in air concentrations.

D. **Single gas personal gas detectors/warning devices** are small diffusion monitors designed to be worn on a person. These devices use similar gas sensor technology as the standard multi-gas instruments. Single gas monitors that can measure many individual gasses are available, but units to detect H_2S are typically used in the oil industry. These devices can be very simple warning devices of hazardous concentrations or be equipped with more sophisticated software data logging capabilities to provide exposure assessment information such as Peak, Short Term and Average exposure data.

This type of monitor shall never be used to conduct Hot Work, Initial Confined Space or Excavation entry or Continuous Confined Space monitoring for jobs involving more than one entrant.

9.3. Air Monitoring Techniques and Practices

Air Monitoring shall be conducted prior to and while conducting hot work, confined space entry, entering excavations, during incident response activities and assessing unknown potentially hazardous environments. The applicable policies shall be reviewed for specific air monitoring procedures.

In general, air monitoring shall be performed in such a manner as to thoroughly and accurately evaluate the work place atmosphere for hazardous components. The following air monitoring techniques and practices can be used to perform effective air monitoring:

A. Since most hydrocarbons are heavier than air, vapors are most likely to accumulate in low areas of the workplace such as near the bottom of excavations and in confined spaces with limited ventilation such as storage tanks, vaults and pipe alleys. Additional attention should be given to thoroughly evaluate such areas.

B. When assessing a vertical space for contaminants, such as gas testing storage tanks from a roof hatch prior to entry, measurements shall be taken for at least 3 height levels. Measurements should be taken near the bottom or floor of the tank, middle and near the top or roof of the tank. When using extended sampling lines and probes, adequate sampling time to purge the sample line and get a representative sample shall be taken according to the manufacturer's recommendations.

C. In order to take remote samples when using monitoring equipment that cannot be equipped with extended sample lines and probes (e.g. colorimetric detector tubes, PIDs), lengths of Tygon tubing connected to a sample pump can be used to fill a clean Tedlar sample bag. The contents in the bag can then be sampled using detector tubes or a PID. This technique also requires that the Tygon sample line be adequately purged to obtain a representative sample.

D. Hot work and confined space air monitoring shall be thorough. The safety and/or health of others are dependent on the quality of the air monitoring performed to assess workspace hazards. Flammable gasses and vapors can exist in pockets or restricted areas in the workplace. All tank internals such as pontoons, gauging tubes, etc. shall be checked for residual liquids and vapors. All potential sources of gas/vapor infiltration such as bleeders, valves, and inlet or outlet piping even if blinded, shall be assessed.

E. Workplace atmospheres can be very dynamic and changing, especially when working in excavations in or around contaminated soil. Consequently, should **any** amount of a contaminant such as benzene be detected, additional periodic gas testing should be conducted to assure contaminant levels have not increased.

F. Contaminant concentrations may not be consistent or remain consistent throughout the workspace. Therefore, workplace control decisions such as respirator use, which are based on air monitoring shall be made conservatively. Because of instrument and

sampling error, even if monitoring results are slightly below the concentration which may trigger a workplace control decision, the workplace control should be implemented until additional monitoring/sampling indicate with certainty that contaminant concentrations are indeed below levels which will trigger controls.

G. When performing continuous, non-attended air monitoring, placement of the monitor in the workspace is important. Air monitors should be placed between the worker(s) and potential source(s) of contaminant infiltration. Monitors shall also be placed so they are visible to those in the workspace in the event of an alarm.

Appendix III

Recommended Air Monitoring Equipment

The following air monitoring devices are recommended for use by USPL Employees:

Benzene Field Measuring Devices

1). Rae Systems UltraRae benzene specific PID

2). Drager **C**hip **M**anagement **S**ystem (CMS) for benzene

3). Drager, MSA or Kitigawa Colorimetric Detector Tubes for benzene

Personal Single Gas Monitors

1). Altair and Altair Pro Single Gas Monitors

2). BW GasAlert Extreme and GasAlertClip Extreme

3). Industrial Scientific GasBadge Pro or Plus, Tango

Photo Ionization Detectors (PIDs) for Total hydrocarbons

1). RaeSystems Minirae PIDs

Multi-Gas Monitors

1). Industrial Scientific Ventis MX4

2). MSA Orion

3). BW Technologies GasAlert Max XT

Appendix IV
Sample Calibration and Bump Test Form

This example of the bump test Form is for reference only. For a downloadable version of the form, go to DRM . The electronic version may be filled out online or printed and completed as hard copy.

Calibration and Bump Test Check Form

Location:

Field Bump Test for Air Monitoring Equipment

Instrument Type	Serial Number	Calibration / Bump Test Results (Satisfactory/Unsatisfactory)	Inspector's Name	Date (mm/dd/yyyy)

Instructions for performing a bump test:

1. Turn the instrument on and let run for approximately 1 minute.
2. Connect the challenge gas to the inlet of the instrument per the manufacturer's instructions.
3. If the instrument alarms, the bump test is successful. The instrument can now be used. If the instrument fails to alarm, the instrument shall be fully calibrated or possibly repaired before it can be used.

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Appendix V

Toxic Contaminant Air Monitoring Instruments and Equipment Guidance

The following table provides guidance on direct reading gas detection instruments and equipment that can be used for Toxic Contaminant testing.

Toxic Contaminant	**Dräger Tubes (colorimetric)** (Order No.)	**Dräger Tube Standard Measuring Range**	**Dräger CMS Chips** (Order No.)	**Dräger CMS Chip Standard Measuring Range**	**Direct Reading Multi-gas portable monitor**	**Photoionization Detector (PID)**
Benzene	81 01 841	0.5-10ppm	64 06 600	0.05-2.5ppm	N/A	~~N/A~~X
	67 28 071	5-50ppm	64 06 030	0.2-10ppm		
	81 01 741	15-420ppm				
Hydrogen Sulfide (H_2S)	67 28 041	0.5-15ppm	64 06 050	2-50ppm	X	N/A
	81 01 831	1-200ppm	64 06 150	20-500ppm		
Total Petroleum Hydrocarbons (TPH)	81 01 691	10-300ppm	64 06 200	20-500ppm	N/A	X
	67 30 201	100-2,500ppm				
Diesel Fuel	81 03 475	25 -200 mg/m3	64 06 200	20-500ppm	N/A	X
Ethanol	81 01 631 (Alcohol)	25-2,000ppm	64 06 370	100-2,500ppm	N/A	X*

X - Can be used for real-time monitoring of contaminant.
N/A - Not Applicable
* - Can be used for real-time monitoring of contaminant providing it is the only contaminant present. For instance, a PID can be used to measure ethanol for entry into an ethanol storage tank. It cannot be used to measure ethanol concentrations to enter a space contaminated with a gasoline/ethanol blend.
** - Can be used providing the Benzene Sep-tube is not in-place allowing the instrument to measure Total Hydrocarbons and the contaminant is not part of a mixture or blend. (See * above)

Appendix VI

Toxic Air Monitoring Guidance

The following table provides guidance on potential contaminants to monitor based on the actual / potential contamination product.

Product	Potential Contaminants to Monitor			
	Benzene	**H_2S**	**Ethanol**	**TPH**
Crude oil	X	X		
Bunker fuel or Heavy fuel oil		X		
Gasoline or NGL	X			
Transmix (Potentially containing H_2S)	X	X		
Transmix (No Potential H_2S)	X			
Ethanol	X		X	
Diesel or Distillate				X