LEAK DETECTION AND COMPLIANCE PLAN GUIDANCE

City of Grand Prairie
Dallas, Tarrant, Johnson and Ellis Counties, Texas

Last Revision:
February 2011

Grand Prairie
TEXAS

TABLE OF CONTENTS

PAGE

ATTACHMENTS

Leak Detection and Compliance Plan Guidance

PURPOSE

This guidance is provided as a starting point for oil and gas operators who plan to extract natural gas or related constituents within the urban environment of Grand Prairie, Texas and the associated ETJ. The nature of exploration and production activities is that a high potential exists for fugitive air emissions from equipment operating at high pressures and handling volatile compounds. Additionally, many of the waste byproducts of this process can be hazardous when not properly addressed through a holistic operating plan that anticipates when and where releases can occur and how waste generation should be handled. As with all programs designed to obtain continuous compliance, monitoring is the only way to ensure goals are being met.

The City of Grand Prairie is located above the Barnett Shale Formation and within the Fort Worth Basin. The Barnett Shale is an unconventional natural gas reservoir that typically requires the installation of horizontal wells at depth followed by hydraulic fracturing to increase available natural gas flow to the wells. Responsible extraction of natural gas from this resource is anticipated to be a long term part of the landscape in Grand Prairie and its ETJ. As such, we want to ensure that all natural gas operations are performed in as protective a manner as possible.

As part of the City's requirements to grant a permit for the proposed use we require that a Leak Detection and Compliance Plan (LDCP) be in place with communication of the monitoring results to the City. In conjunction with the development of a LDCP we recommend the operator review all other applicable regulations to determine and ensure compliance with the most stringent requirements. This should also include the consideration of potential receptors that will be present near the proposed facility and the air, soil, and water thresholds anticipated to be safe under current TCEQ and EPA criteria for these parties in the short and long term.

The City has prepared this guidance document as part of the ongoing efforts to ensure that oil and gas operators within the City Boundaries are undertaking adequate efforts to minimize potential fugitive and non-fugitive emissions, fluid spills or other types of releases that can impact the quality of life within the City. While the U.S. Environmental protection Agency (EPA), Texas Commission on Environmental Quality (TCEQ) and Texas Railroad Commission (RRC) have regulatory authority over operational aspects of the proposed activities and provide guidance when significant release have occurred, we anticipate a long term relationship with any operators that enter the City and expect that every Operator will enact a robust LDCP to address concerns before they become significant issues or fall outside of acceptable regulatory thresholds.

The primary purpose of this guidance is to offer some of our expectations on elements that will be included in a responsible LDCP and confirm the regular communication schedule of the results from the LDCP to the City. This guidance is offered to Operators conforming with Section 13-505(c)(35) of the Grand Prairie Ordinance Drilling, Completion, and Production Operations Permit for Class 1/Class 2 Wells and for those operators amending an existing padsite.

> *A Leak Detection and Compliance Plan to ensure all site activities and equipment are in compliance with applicable rules and regulations. This plan should outline methodology to assess and evaluate the impact of drilling, fracturing, production, and other activities at the padsite and immediate surroundings. Specific elements shall include, but is not be limited to: a quarterly leak detection monitoring program, methods and equipment for emission measurements, and a response plan to address issues, if they arise, and any other information as required by the Environmental Services Director. Monitoring shall include evaluation of potential impact to air, soil, surface water, or groundwater. Quarterly reporting of the monitoring results to the Environmental Services Department is required with all laboratory data sheets, field logs, data summaries, and actions taken in the previous period. The plan must be created in accordance with the Environmental Services Department Guidelines.*

Disclaimer

The City of Grand Prairie has provided this document as guidance only. All applicants will need to determine the appropriate equipment, monitoring schedule, and operational practices required to meet regulatory requirements both on and off the drilling operation areas. Additional guidance on potential emission sources and mitigation approaches can be obtained by the Texas Railroad Commission, Texas Commission on Environmental Quality, and/or U.S. Environmental Protection Agency. Mention of specific equipment does not imply an endorsement.

1 POTENTIAL FOR EMISSIONS

1.1 COMMON EMISSION POINTS

A typical padsite can have hundreds of potential points where emissions may occur. Many can be the result of poorly maintained equipment and others may result from operational issues. Below is a listing of equipment that should be considered for monitoring if present on site.

Pumps are used to move fluids from one point to another. Two types of pumps extensively used in petroleum refineries and chemical plants are centrifugal pumps and positive displacement, or reciprocating pumps.	**Leaks from pumps** typically occur at the seal.
Valves are used to either restrict or allow the movement of gases or fluids. Valves come in numerous varieties and with the exception of connectors, are the most common piece of process equipment in industry.	**Leaks from valves** usually occur at the stem or gland area of the valve body and are commonly caused by a failure of the valve packing or O-ring.
Connectors are components such as flanges and fittings used to join piping and process equipment together. Gaskets and blinds are usually installed between flanges.	**Leaks from connectors** are commonly caused from gasket failure and improperly torqued bolts on flanges.
Sampling connections are utilized to obtain samples from within a process. AST “thief” hatches and vents can present concerns when nor appropriately maintained.	**Leaks from sampling connections** usually occur at the outlet of the sampling valve when the sampling line is purged to obtain the sample or when flanges wear out.
Compressors are designed to increase the pressure of a fluid or gas and provide motive force. They can have rotary or reciprocating designs.	**Leaks from compressors** most often occur from the seals.
Open-ended lines are pipes or hoses open to the atmosphere or surrounding environment. May be found on ASTs containing petroleum fluids valves and rupture disks are examples of pressure relief devices.	**Leaks from pressure relief valves** can occur if the valve is not seated properly, operating too close to the set point, or if the seal is worn or damaged. Leaks from rupture disks can occur around the disk gasket if not properly installed.
Pressure relief devices are safety devices designed to protect equipment from exceeding the maximum allowable working pressure. Pressure relief.	**Leaks from open-ended lines** occur at the point of the line open to the atmosphere and are usually controlled by using caps, plugs, and flanges. Leaks can also be caused by the incorrect implementation of the block and bleed procedure.

1.2 COMMON EMISSION SOURCES AND CONSTITUENTS

The most common equipment present on a padsite will be gas wells, separation equipment, above ground storage tanks for produced water, oil and/or condensate, gas dehydration equipment, ponded water, compressor equipment, and other ancillary engines, heaters or turbines. Non-equipment sources may include land farming activities, ponded water, connective equipment outlined in Section 1.1 and operations activities that agitate or temporarily allow volatile compounds to be released.

Common emission constituents identified in previous studies have included:

Methane
Ethane
Propane
Isobutane
n-butane
2,2-Dimethylpropane
Isopentane
n-pentane
2,2-Dimethylbutane
Cyclopentane
2,3-Dimethylbutane
2-Methylpentane
3-Methylpentane
n-Hexane
Methylcyclopentane
Benzene
Cyclohexane
2-Methylhexane
3-Methylhexane
2,2,4-Trimethylpentane
C_7+ Hydrocarbons
n-Heptane
Methylcyclohexane
Toluene
n-Octane
Ethylbenzene
m+p-Xylene
o-Xylene
n-Nonane
Trimethylbenzenes
Sulfide Compounds
Carbonyl Compounds
Combustion Byproducts

1.3 POTENTIAL SPILL POINTS

In addition to the air emission sources outlined above, any use or storage of chemicals, waste fluids (e.g. condensate or produced water) should have appropriate secondary containment to prevent impact to soil, groundwater or surface water. To avoid spills, padsite operations should include detailed plans of how to respond to a release, and ways to minimize impact to the surrounding environment.

1.4 ALTERNATIVES

We strongly encourage all permit applicants to fully consider the operations planned and select equipment that will have the least potential for emissions or spills. Since the operations will be within an urban environment, we expect all applicants to use the best practices possible when it comes to protecting human health and the environment.

The EPA has found that modifying/replacing leaking equipment with “leakless” components will greatly reduce the potential for emissions. Additional information on available technology to reduce potential emissions can be found at the EPA Natural Gas STAR Program (www.epa.gov/gasstar/). Another best practice has been the inclusion of Vapor Recovery Units (VRUs) for VOC emission reduction when appropriate. These devices are good at controlling high VOC emission rates and their use is highly encouraged. There is an informative article by the EPA regarding the cost savings associated with VRUs, which can be found at: www.epa.gov/gasstar/documents/ll_final_vap.pdf.

Benefits to having a robust LDCP will include the capture of lost revenue that would otherwise be emitted if left unresolved. Additionally, the selection and maintenance of the most effective equipment to mitigate emissions and spills directly results in safer working conditions, less potential exposure to the surrounding community, and avoidance of regulatory enforcement and possible fines.

2 BEST MANAGEMENT PRACTICES

In this Section we have included some Best Management Practices (BMPs) currently found in monitoring programs where volatile emissions are anticipated. It is suggested that the applicant use these as a starting point when considering what approach will be proposed in the LDCP to Grand Prairie. The ultimate LDCP should reflect the specific equipment anticipated at the site and staff training required to ensure compliance with the plan will occur. The BMPs offered below are generally consistent with Leak Detection and Repair (LDAR) programs required by many regulatory agencies as an emissions control strategy.

2.1 EQUIPMENT INVENTORY

For each padsite, a unique name and catalog of the current and planned equipment inventory should be made. From this the individual equipment and connections should be evaluated for where emissions of spills are most likely.

A site diagram prepared to scale with clear depictions of the system components, including piping and instrumentation diagrams (P&IDs) or process flow diagrams are recommended. In some cases the use of specific tags to identify the equipment and potential emission source points (e.g., valves, connectors) will be made to allow consistent monitoring over time, and allow for a record of replacement of poor performance.

Common Issues:

- Insufficient detail of all equipment and connection components
- Poor recordkeeping
- Lack of field verification of equipment inventory

2.2 LEAK AND COMPLIANCE DEFINITIONS

As with any program, it is important to set the goals clearly so they can be measured. In this case the LDCP is part of the overall requirements the Applicant will have to State and Federal regulatory authorities. This includes the potential impact to off-site receptors. For the purposes of this guidance, it is anticipated that any leak definition should include the lowest of the governing regulatory requirements for air, soil, groundwater, and surface water. Because of the nature of the urban environment, the governing rules for a spill will be based on the actual receptor put at risk. While some operational equipment should be expected to have allowable emissions (See Type I Leak Definition in Attachment A) in accordance with manufacturer specifications and regulatory requirements, the resulting impact off the pad site and approaching the urban environment should not be expected to allow a deleterious results to occur (See Type II Leak Definition in Attachment A).

Common Issues:

- Utilizing a leak or spill definition lower than what the regulation requires or that would allow off-site receptors to be exposed to elevated chemical concentrations.

2.3 SITE MONITORINIG ACTIVITIES

While the stringent LDAR monitoring outlined for certain operations under 40 Code of Federal Regulations (CFR) 60 (New Source Performance Standard; NSPS), 40 CFR 61 (National Emissions Standards for Hazardous Air Pollutants; NESHAP), 40 CFR 63 (Maximum Achievable Control Technology; MACT), and 40 CFR 264 (Hazardous Waste Handling) may not apply to the operations proposed, this guidance offers the BMP for LDAR programs. These utilize EPA Reference Method 21 (40 CFR Part 60, Appendix A) to locate and then repair leaking components (e.g., valves, pumps, connectors, compressors, and agitators) to minimize fugitive volatile organic compounds (VOC) and hazardous air pollutants (HAP) emissions.

EPA Method 21 has become a common field methodology associated with the evaluation for VOC leaks from process equipment using a portable detection instrument. We have included a general description of typical monitoring steps and EPA Method 21 as Attachments A and B, respectively. It is anticipated that Type II monitoring would be the most applicable to urban applications. Spills should be monitored visually and through the use of a handheld instrument that allows the inspection of fluids, stains or soil for possible VOCs.

An alternate or supplemental tool to the direct monitoring approach offered under Method 21 may be the inclusion of real or near real-time VOC and methane monitoring equipment such as dedicated stations with data logging or wireless transmission capability.

Monitoring frequencies are very important to the LDCP as many equipment failures can lead to unacceptable exposures within very short time periods.

Common Issues:

- Not visually inspecting the site for visual or olfactory evidence of spills.
- Not following Method 21 or selected monitoring approach properly to evaluate VOC emissions.
- Failing to monitor at actual source of the emission or the maximum leak location (once the highest reading is obtained by placing the probe on and around the interface, hold the probe at that location approximately two times the response rate of the instrument).
- Not monitoring long enough to identify a leak.
- Holding the detection probe too far away from the component interface. The reading must be taken at the interface.
- Not monitoring all potential leak interfaces.
- Using an incorrect or an expired calibration gas.
- Not monitoring the correct components.
- Not completing monitoring if the first monitoring attempt is unsuccessful due to equipment being temporarily out of service.
- Lack of QA/QC procedures to verify field results with periodic laboratory verification.

2.4 EQUIPMENT REPAIR AND REPLACEMENT

All equipment has a useful lifespan and needs to be maintained to ensure proper function. For the proposed equipment at the padsite the Applicant needs to have a realistic plan for what components will require replacement and which will require repair and then set a schedule to keep all parts of the production facility in compliance.

In general this requires repairing all leaking components as soon as practicable, but not later than a specified number of calendar days after a minor leak is detected. For more significant leaks or spills immediate attention is recommended. Major releases should be communicated to the City as soon as possible and in compliance with all requirements of the current Ordinance governing Oil and Gas exploration and production.

Common Issues:

- Not repairing leaking equipment within the required amount of time specified by the applicable regulations or LDCP.
- Not developing a plan and timetable for repairing and replacing system components.
- Not monitoring components daily to several days to ensure a leak has been successfully repaired.
- Not replacing problem components with “leakless” or other appropriate technologies.

2.5 RECORD KEEPING

For a LDCP to be fully effective there needs to be written records of the procedures, staff training, monitoring event findings, repair/replacement events, and communication with regulatory authorities.

Common Issues:

- Not keeping detailed and accurate records required by the LDCP.
- Not updating records to designate new components that are subject to LDCP monitoring.
- Lack of internal and third-party audits of LDCP records on a regular basis to ensure compliance.
- Lack of electronic monitoring data to allow trend evaluation.
- Lack of regular records for performance of maintenance.
- Failure to update the LDCP in accordance with updated regulatory requirements.

3 LDCP PROGRAM ELEMENTS

Below are the anticipated program elements we anticipate will be discussed in any LDCP proposed in the City of Grand Prairie. As outlined earlier, the Applicant is responsible for developing an operations-specific LDCP based on the proposed site activities and regulatory compliance criteria associated with the planned use. Please include each of these sections in your formal LDCP.

3.1 WRITTEN LDCP PROGRAM

A written LDCP program should specify the regulatory requirements and facility-specific procedures for recordkeeping certifications, monitoring, and repairs. A written program also delineates the roles of each person on the LDCP team as well as documents all the required procedures to be completed and data to be gathered, thus establishing accountability. The plan should identify all process units subject to federal, state, and local requirements and be updated as necessary to ensure accuracy and continuing compliance.

Anticipated Written Elements:

- Defined leak and spill goals for the padsite equipment. Type II emissions may be the most appropriate to minimize the potential for off-site impacts above applicable air compliance requirements. This may include field monitoring criteria, infrared camera screening criteria, or other measurable criteria.
- A list of all equipment in light liquid and/or in gas/vapor service that has the potential to leak methane, VOCs and HAPs, at each padsite.
- Inventory and procedures/proposed frequency for identifying leaking equipment within process units.
- Example field monitoring logs and methodology for identification of padsite equipment.
- Procedures and proposed frequency for repairing and keeping track of leaking equipment.
- A process for evaluating new and replacement equipment to promote the consideration of installing equipment that will minimize leaks or eliminate chronic leakers.

- A list of “LDCP Personnel” and a description of their roles and responsibilities, including the person or position for each Applicant that has the authority to implement improvements to the LDCP.
- Response plan that documents how the Applicant will address spills or fugitive emissions (Leaks) when identified.
- Proposed method for meeting QA/QC goals.
- Method for delivery of monthly communication of the LCDP results to the City and development of an annual monitoring report.

3.2 LDCP TRAINING

The Applicant must ensure that an appropriate LDCP training program is in place that ensures all appropriate personnel are versed on the monitoring commitments outlined. Training documentation should be maintained and included in the monthly reporting to the City.

3.3 MONITORING PROGRAM

Within the written LDCP, the selected method for field screening for emissions from equipment is required. This can utilize real-time hand held analyzers, real-time IR equipment with appropriate wavelength capability to identify the suspect chemical constituents outlined in Section 1.2 of this guidance, near real-time monitoring stations appropriately located on the pad site and/or short-term monitoring using appropriate sampling material to the analyses proposed.

Monitoring Points:

The LDCP should specifically detail all equipment and associated fittings and connections. Examples of equipment and emission points anticipated to be included within a LDCP are:

- **Active Well Pads**

  Valves
  Connectors
  Separators
  Dehydrators
  Pneumatic Controllers
  Pressure Relief Devices
  Emergency Vents
  Lift Compressors
  Fracture Blowback Tanks
  Pumps
  Process Piping
  Tank Batteries
  Ancillary Equipment

Line/Lift Compressor Stations

Compressors
Valves
Connectors
Seal Vents
Pressure Relief Devices
Storage Tanks
Separators
Process Lines
Dehydrators
Control Devices
Closed Vent Systems
Ancillary Equipment

- **Processing facilities**
  - Valves
  - Connectors
  - Vents
  - Pressure Relief Devices
  - Separators
  - Dehydrators
  - Fractionation Towers
  - Process Lines
  - Closed Vent Systems
  - Storage tanks
  - Control Devices
  - Ancillary Equipment
- **Well Installation and Development**
  - Drilling Equipment
  - Fracking Operations
  - Storage Tanks
  - Ponded Fluids
  - Process Lines
  - Control Devices
  - Connectors
  - Valves
  - Vents
  - Completion Operations
  - Ancillary Equipment
- **Dehydration Units/Saltwater Evaporation**
  - Valves
  - Connectors
  - Vents
  - Pressure Relief Devices
  - Storage Tanks
  - Separators
  - Process Lines
  - Ancillary Equipment
- **Water Treatment, Recycling, and Disposal**
  - Valves
  - Connectors
  - Vents
  - Pressure Relief Devices
  - Storage Tanks
  - Separators
  - Process Lines
  - Ancillary Equipment
- **Gathering Stations**
  - Valves
  - Connectors
  - Metering Equipment
  - Process Piping
  - Ancillary Equipment

Monitoring Equipment – Field:

The Applicant will need to specify the types of equipment to be employed and frequency of inspection. Effective LDCPs will typically utilize a variety of tools to ensure the goals are being met.

- **Flame Ionization Detector (FID)** – The FID can measure volatile compounds in parts per million by volume (ppmv). These units are typically calibrated with methane, which makes them well suited for natural gas evaluations. The monitor will need to be placed in close proximity to the area being tested to register a leak.

- **Photo Ionization Detector (PID)** – The PID is unable to register methane under traditional lamp ionizing potentials, but can identify many other gas constituents that would be present when a significant release was identified. Just as noted with the FID, the monitor will need to be placed in close proximity to the area being tested to register a leak.

- **Flow Rate Sampler** – A HiFlow Sampler is a portable, intrinsically safe instrument designed to determine the rate of gas leakage from components in natural gas service. A component's leak rate is measured by sampling at a high enough flow rate to ensure that all of the gas emitted from the component will be captured. The HiFlow Sampler calculates the resulting leak rate as percent methane concentration per cubic feet/minute. If releases are suspected, this equipment could allow estimation of severity.

- **Infrared Camera** - While the approach outlined by EPA within the Method 21 guidance included in the appendix is anticipated, we also welcome supplementation of this method using IR equipment. The EPA completed a review of the FLIR ThermaCAM GasFindIR camera in December 2010 for this type of monitoring and noted the following:
    - Detects hydrocarbon gases based on their transmission and absorption characteristics utilizing an optimized narrow band- pass cold filter
    - The IR camera can detect methane, ethane, propane, benzene, toluene, and other HAPs
    - The FLIR camera concentration estimates were considered comparable to laboratory results allowing use to conform with EPA Method 21

- The cost of the FLIR GasFindIRTM MW camera was estimated at $64,950 with an optional 50-mm and 100-mm lenses for the FLIR GasFindIRTM MW camera at $7,500 and $9,950, respectively.

Many other models of IR camera are available but may not be able to provide field estimation of emission constituents or concentrations. Properly calibrated and operated, any IR could be used to supplement the other field screening tools noted above.

Monitoring Equipment – Fixed:

The Applicant may elect to include static monitoring equipment that can wirelessly transmit pad-site conditions to the operator and city. These instruments must be appropriately selected to monitor the appropriate chemicals of concern, be properly maintained and calibrated and work over sufficient duration to make them a viable part of your LDCP. Field gas chromatograph instrumentation has become a common tool for the TCEQ to monitor ambient conditions in the Barnett Shale.

Monitoring Verification – Laboratory:

An effective LDCP will require periodic verification of monitoring results. The laboratory program should be used to supplement the field monitoring process and ensure the operations are not impacting the surrounding environment above acceptable regulatory thresholds at the nearby receptors. It is incumbent on the Applicant to select the appropriate laboratory analyses based on the equipment on site. At a minimum, this should include VOCs by EPA Method TO-15. Additional methods may be requested by the City.

- **Summa Canister** - A Summa Canister is an evacuated six liter stainless steel canister used to collect short term air samples for subsequent laboratory analysis.

- **Tedlar Bags** – Inert plastic containers that allow passive or active sampling of short-term air samples for subsequent laboratory analysis.

- **Sampling Tubes** – Sampling tubes are usually laboratory prepared with specific sampling media to allow specific air testing to be performed. The type of media will depend on the chosen method.

4 REFERENCES

EPA 1995. *Protocol for Equipment Leak Emission Estimates*, EPA-453/R-95-017

EPA 1998. *Inspection Manual: Federal Equipment Leak Regulations for the Chemical Manufacturing Industry*, EPA/305/B-98/011 (Volumes 1-3).

EPA 1999 *Enforcement Alert, EPA Office of Enforcement and Compliance Assurance*, EPA 300-N-99-014.

EPA 2007. *Leak Detection and Repair Compliance Assistance Guidance—A Best Practices Guide,* EPA-305-D-07-001.

EPA 2010 *ETVP Passive Infrared Optical Imagers Application: Leak Detection and Repair Technologies.*

EPA Method 21 - *Determination of Volatile Organic Compound Leaks,* (40 CFR Part 60, Appendix A).

TCEQ 2004. *Leak Detection and Repair (LDAR) Investigation and Enforcement Protocol*, TCEQ-20086.

TCEQ 2008. *Technical Supplement 3: Equipment Leak Fugitives*, TCEQ publication RG-360A

TCEQ 2011 *Automated Gas Chromatographs (AutoGCs) Barnett Shale Monitoring Network* http://www.tceq.texas.gov/airquality/monops/agc/agc_barnett.html

TERC 2009, *VOC Emissions From Oil and Condensate Storage Tanks: Final Report*.

5 ACRONYMS

A listing of common acronyms associated with monitoring activities has been provided to aid the guidance material. Additional acronyms may be defined within the text as well.

AST	Aboveground storage tank
ASTM	ASTM International
BACT	Best Available Control Technology
BMP	Best Management Practice
CAA	Clean Air Act
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act of 1980
CERCLIS	Comprehensive Environmental Response, Compensation and Liability Information System
CESQG	Conditionally Exempt Small Quantity Generator
COC	Chemicals of Concern
EPA	United States Environmental Protection Agency
ESL	Effect Screening Level (Short or Long Term Criteria)
ETJ	Extra Territorial Jurisdiction
FID	Flame Ionization Detector
FRP	Fiberglass Reinforced Plastic
HAP	Hazardous Air Pollutant
HASP	Health and Safety Plan
HQ	Hazard Quotient
IDLH	Immediately Dangerous to Life and Health
IHW	TCEQ Industrial & Hazardous Waste Program
LDAR	Leak Detection and Repair
LDCP	Leak Detection and Compliance Plan
MACT	Maximum Achievable Control Technology
MSDS	Material Safety Data Sheet
NESHAP	National Emissions Standards for Hazardous Air Pollutants
NORM	(Technologically Enhanced) Naturally Occurring Radioactive Material
NSPS	New Source Performance Standard
OSHA	Occupational Safety & Health Administration
PEL	OSHA Permissible Exposure Limit
PID	Photo Ionization Detector
RBEL	Risk Based Exposure Limit
RCRA	Resource Conservation and Recovery Act
RfC	Reference Concentration
ROD	Record of Decision
RRC	Texas Railroad Commission
SVOCs	Semi-volatile Organic Compounds
TCEQ	Texas Commission on Environmental Quality

TOX	Total Organic Halides
TPH	Total Petroleum Hydrocarbons
TPWD	Texas Parks and Wildlife Department
TRRP	Texas Risk Reduction Program
TWDB	Texas Water Development Board
TXU	Texas Utilities
URF	Unit Risk Factor
USC	United States Code
USGS	United States Geological Survey
UST	Underground Storage Tank
VOCs	Volatile Organic Compounds

APPENDIX A

EPA Method 21
Summary Description

Appendix A – EPA Method 21 Description

This method is applicable for the determination of VOC leaks from process equipment. These sources include, but are not limited to, valves, flanges and other connections, pumps and compressors, pressure relief devices, process drains, open-ended valves, pump and compressor seal system degassing vents, accumulator vessel vents, agitator seals, and access door seals.

Adherence to the requirements of this method will enhance the quality of the data obtained from air pollutant sampling methods.

Summary of Method

A portable instrument is used to detect VOC leaks from individual sources. The instrument detector type is not specified, but it must meet the specifications and performance criteria of the program. A leak definition concentration based on a reference compound is specified in each applicable regulation. This method is intended to locate and classify leaks only, and is not to be used as a direct measure of mass emission rate from individual sources.

Definitions

Calibration gas means the VOC compound used to adjust the instrument meter reading to a known value. The calibration gas is usually the reference compound at a known concentration approximately equal to the leak definition concentration.

Calibration precision means the degree of agreement between measurements of the same known value, expressed as the relative percentage of the average difference between the meter readings and the known concentration to the known concentration.

Leak definition concentration means the local VOC concentration at the surface of a leak source that indicates that a VOC emission (leak) is present. The leak definition is usually an instrument meter reading based on a reference compound.

No detectable emission means a local VOC concentration at the surface of a leak source, adjusted for local VOC ambient concentrations, that is less than 2.5% of the specified leak definition concentration. That indicates that a VOC emission (leak) is not present.

Reference compound means the VOC species selected as the instrument calibration basis for specification of the leak definition concentration. (For example, if a leak definition concentration is 1,000 ppm as methane, then any source emission that results in a local concentration that yields a meter reading of 5,000 on an instrument meter calibrated with methane would be classified as a leak. In this example, the leak definition concentration is 1,000 ppm and the reference compound is methane.)

Response factor means the ratio of the known concentration of a VOC compound to the observed meter reading when measured using an instrument calibrated with the reference compound specified in the applicable regulation.

Response time means the time interval from a step change in VOC concentration at the input of the sampling system to the time at which 90 percent of the corresponding final value is reached as displayed on the instrument readout meter.

Safety

Disclaimer. This method may involve hazardous materials, operations, and equipment. This test method may not address all of the safety problems associated with its use. It is the responsibility of the user of this test method to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to performing this test method.

Several of the compounds, leaks of which may be determined by this method, may be irritating or corrosive to tissues (e.g., heptane) or may be toxic (e.g., benzene, methyl alcohol). Nearly all are fire hazards. Compounds in emissions should be determined through familiarity with the source. Appropriate precautions should be included in the operators health and safety considerations.

Equipment and Supplies

A VOC monitoring instrument meeting the following specifications is required:

- The VOC instrument detector shall respond to the compounds being processed. Detector types that may meet this requirement include, but are not limited to, catalytic oxidation, flame ionization, infrared absorption, and photoionization.

- The instrument shall be capable of measuring the leak definition concentration specified in the regulation.

- The scale of the instrument meter shall be readable to ±2.5 % of the specified leak definition concentration.

- The instrument shall be equipped with an electrically driven pump to ensure that a sample is provided to the detector at a constant flow rate. The nominal sample flow rate, as measured at the sample probe tip, shall be 0.10 to 3.0 l/min (0.004 to 0.1 ft 3 /min) when the probe is fitted with a glass wool plug or filter that may be used to prevent plugging of the instrument.

- The instrument shall be equipped with a probe or probe extension or sampling not to exceed 6.4 mm (1/4”) in outside diameter, with a single end opening for admission of sample.

- The instrument shall be intrinsically safe for operation in explosive atmospheres as defined by the National Electrical Code by the National Fire Prevention Association or other applicable regulatory code for operation in any explosive atmospheres that may be encountered in its use. The instrument shall, at a minimum, be intrinsically safe for Class 1, Division 1 conditions, and/or Class 2, Division 1 conditions, as appropriate, as defined by the example code. The instrument shall not be operated with any safety device, such as an exhaust flame arrestor, removed.

Reagents and Standards

Two gas mixtures are required for instrument calibration and performance evaluation:

- Zero Gas. Air, less than 10 parts per million by volume (ppmv) VOC.

- Calibration Gas. For each organic species that is to be measured during individual source surveys, obtain or prepare a known standard in air at a concentration approximately equal to the applicable leak definition specified in the regulation.

- Cylinder Gases. If cylinder calibration gas mixtures are used, they must be analyzed and certified by the manufacturer to be within 2% accuracy, and a shelf life must be specified. Cylinder standards must be either reanalyzed or replaced at the end of the specified shelf life.

- Prepared Gases. Calibration gases may be prepared by the user according to any accepted gaseous preparation procedure that will yield a mixture accurate to within 2%. Prepared standards must be replaced each day of use unless it is demonstrated that degradation does not occur during storage.

- Mixtures with non-Reference Compound Gases. Calibrations may be performed using a compound other than the reference compound. In this case, a conversion factor must be determined for the alternative compound such that the resulting meter readings during source surveys can be converted to reference compound results.

Sample Collection, Preservation, Storage, and Transport

Instrument Performance Evaluation

- Assemble and start up the instrument according to the manufacturer's instructions for recommended warm up period and preliminary adjustments.

- Response Factor. A response factor must be determined for each compound that is to be measured, either by testing or from reference sources. The response factor tests are required before placing the analyzer into service, but do not have to be repeated at subsequent intervals.

    - Calibrate the instrument with the reference compound as specified in the applicable regulation. Introduce the calibration gas mixture to the analyzer and record the observed meter reading. Introduce zero gas until a stable reading is obtained. Make a total of three measurements by alternating between the calibration gas and zero gas. Calculate the response factor for each repetition and the average response factor.

    - The instrument response factors for each of the individual VOC to be measured shall be less than 10 unless otherwise specified in the applicable regulation. When no instrument is available that meets this specification when calibrated with the reference VOC specified in the applicable regulation, the available instrument may be calibrated with one of the VOC to be measured, or any other VOC, so long as the instrument then has a response factor of less than 10 for each of the individual VOC to be measured.

- Alternatively, if response factors have been published for the compounds of interest for the instrument or detector type, the response factor determination is not required, and existing results may be referenced.

- Calibration Precision. The calibration precision test must be completed prior to placing the analyzer into service and at subsequent 3-month intervals or at the next use, whichever is later.

    - Make a total of three measurements by alternately using zero gas and the specified calibration gas. Record the meter readings. Calculate the average algebraic difference between the meter readings and the known value. Divide this average difference by the known calibration value and multiply by 100 to express the resulting calibration precision as a percentage.

    - The calibration precision shall be equal to or less than 10 % of the calibration gas value.

- Response Time. The response time test is required before placing the instrument into service. If a modification to the sample pumping system or flow configuration is made that would change the response time, a new test is required before further use.

    - Introduce zero gas into the instrument sample probe. When the meter reading has stabilized, switch quickly to the specified calibration gas. After switching, measure the time required to attain 90 % of the final stable reading. Perform this test sequence three times and record the results. Calculate the average response time.

    - The instrument response time shall be equal to or less than 30 seconds. The instrument pump, dilution probe (if any), sample probe, and probe filter that will be used during testing shall all be in place during the response time determination.

- Instrument Calibration. Calibrate the VOC monitoring instrument according to Section 10.0.

<u>Individual Source Surveys.</u>

Type I — Leak Definition Based on Concentration

- Place the probe inlet at the surface of the component interface where leakage could occur. Move the probe along the interface periphery while observing the instrument readout. If an increased meter reading is observed, slowly sample the interface where leakage is indicated until the maximum meter reading is obtained. Leave the probe inlet at this maximum reading location for approximately two times the instrument response time. If the maximum observed meter reading is greater than the leak definition in the applicable regulation, record and report the results as specified in the regulation reporting requirements. Examples of the application of this general technique to specific equipment types are:

- o Valves. The most common source of leaks from valves is the seal between the stem and housing. Place the probe at the interface where the stem exits the packing gland and sample the stem circumference. Also, place the probe at the interface of the packing gland take-up flange seat and sample the periphery. In addition, survey valve housings of multipart assembly at the surface of all interfaces where a leak could occur.

- o Flanges and Other Connections. For welded flanges, place the probe at the outer edge of the flange-gasket interface and sample the circumference of the flange. Sample other types of nonpermanent joints (such as threaded connections) with a similar traverse.

- o Pumps and Compressors. Conduct a circumferential traverse at the outer surface of the pump or compressor shaft and seal interface. If the source is a rotating shaft, position the probe inlet within 1 cm of the shaft-seal interface for the survey. If the housing configuration prevents a complete traverse of the shaft periphery, sample all accessible portions. Sample all other joints on the pump or compressor housing where leakage could occur.

- o Pressure Relief Devices. The configuration of most pressure relief devices prevents sampling at the sealing seat interface. For those devices equipped with an enclosed extension, or horn, place the probe inlet at approximately the center of the exhaust area to the atmosphere.

- o Process Drains. For open drains, place the probe inlet at approximately the center of the area open to the atmosphere. For covered drains, place the probe at the surface of the cover interface and conduct a peripheral traverse.

- o Open-ended Lines or Valves. Place the probe inlet at approximately the center of the opening to the atmosphere.

  - Seal System Degassing Vents and Accumulator Vents. Place the probe inlet at approximately the center of the opening to the atmosphere.
  - Access door seals. Place the probe inlet at the surface of the door seal interface and conduct a peripheral traverse.

Type II —"No Detectable Emission" *(Anticipated for Urban Settings)*

Determine the local ambient VOC concentration around the source by moving the probe randomly upwind and downwind at a distance of one to two meters from the source. If an interference exists with this determination due to a nearby emission or leak, the local ambient concentration may be determined at distances closer to the source, but in no case shall the distance be less than 25 centimeters. Then move the probe inlet to the surface of the source and determine the concentration as outlined above. The difference between these concentrations determines whether there are no detectable emissions. Record and report the results as specified by the regulation. For those cases where the regulation requires a specific device installation, or that specified vents be ducted or piped to a control device, the existence of these conditions shall be visually confirmed. When the regulation also requires that no detectable emissions exist, visual observations and sampling surveys are required. Examples of this technique are:

- Pump or Compressor Seals. If applicable, determine the type of shaft seal. Perform a survey of the local area ambient VOC concentration and determine if detectable emissions exist as described earlier.

- Seal System Degassing Vents, Accumulator Vessel Vents, Pressure Relief Devices If applicable, observe whether or not the applicable ducting or piping exists. Also, determine if any sources exist in the ducting or piping where emissions could occur upstream of the control device. If the required ducting or piping exists and there are no sources where the emissions could be vented to the atmosphere upstream of the control device, then it is presumed that no detectable emissions are present. If there are sources in the ducting or piping where emissions could be vented or sources where leaks could occur, the sampling surveys described earlier shall be used to determine if detectable emissions exist.

Additional evaluation of connectors, valves, flanges, access doors may be applicable depending on the nature of the equipment.

Alternative Screening Procedure

A screening procedure based on the formation of bubbles in a soap solution that is sprayed on a potential leak source may be used for those sources that do not have continuously moving parts, that do not have surface temperatures greater than the boiling point or less than the freezing point of the soap solution, that do not have open areas to the atmosphere that the soap solution cannot bridge, or that do not exhibit evidence of liquid leakage. Sources that have these conditions present must be surveyed using the instrument technique of outlined above.

- Spray a soap solution over all potential leak sources. The soap solution may be a commercially available leak detection solution or may be prepared using concentrated detergent and water. A pressure sprayer or squeeze bottle may be used to dispense the solution. Observe the potential leak sites to determine if any bubbles are formed. If no bubbles are observed, the source is presumed to have no detectable emissions or leaks as applicable. If any bubbles are observed, the instrument techniques outlined earlier shall be used to determine if a leak exists, or if the source has detectable emissions, as applicable.

APPENDIX B

EPA Method 21

METHOD 21 - DETERMINATION OF VOLATILE ORGANIC COMPOUND LEAKS

1.0 Scope and Application.

1.1 Analytes.

Analyte	CAS No.
Volatile Organic Compounds (VOC)	No CAS number assigned

1.2 Scope. This method is applicable for the determination of VOC leaks from process equipment. These sources include, but are not limited to, valves, flanges and other connections, pumps and compressors, pressure relief devices, process drains, open-ended valves, pump and compressor seal system degassing vents, accumulator vessel vents, agitator seals, and access door seals.

1.3 Data Quality Objectives. Adherence to the requirements of this method will enhance the quality of the data obtained from air pollutant sampling methods.

2.0 Summary of Method.

2.1 A portable instrument is used to detect VOC leaks from individual sources. The instrument detector type is not specified, but it must meet the specifications and performance criteria contained in Section 6.0. A leak definition concentration based on a reference compound is specified in each applicable regulation. This method is intended to locate and classify leaks only, and is not to be used as a direct measure of mass emission rate from individual sources.

3.0 Definitions.

3.1 *Calibration gas* means the VOC compound used to adjust the instrument meter reading to a known value. The calibration gas is usually the reference compound at a known concentration approximately equal to the leak definition concentration.

3.2 *Calibration precision* means the degree of agreement between measurements of the same known value, expressed as the relative percentage of the average difference between the meter readings and the known concentration to the known concentration.

3.3 *Leak definition concentration* means the local VOC concentration at the surface of a leak source that indicates that a VOC emission (leak) is present. The leak definition is an instrument meter reading based on a reference compound.

3.4 *No detectable emission* means a local VOC concentration at the surface of a leak source, adjusted for local VOC ambient concentration, that is less than 2.5 percent of the specified leak definition concentration. that indicates that a VOC emission (leak) is not present.

3.5 *Reference compound* means the VOC species selected as the instrument calibration basis for specification of the leak definition concentration. (For example, if a leak definition concentration is 10,000 ppm as methane, then any source emission that results in a local concentration that yields a meter reading of 10,000 on an instrument meter calibrated with methane would be classified as a leak. In this example, the leak definition concentration is 10,000 ppm and the reference compound is methane.)

3.6 *Response factor* means the ratio of the known concentration of a VOC compound to the observed meter reading when measured using an instrument calibrated with the reference compound specified in the applicable regulation.

3.7 *Response time* means the time interval from a step change in VOC concentration at the input of the sampling system to the time at which 90 percent of the corresponding final value is reached as displayed on the instrument readout meter.

4.0 Interferences. [Reserved]

5.0 Safety.

5.1 Disclaimer. This method may involve hazardous materials, operations, and equipment. This test method may not address all of the safety problems associated with its use. It is the responsibility of the user of this test method to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to performing this test method.

5.2 Hazardous Pollutants. Several of the compounds, leaks of which may be determined by this method, may be irritating or corrosive to tissues (*e.g.*, heptane) or may be toxic (*e.g.*, benzene, methyl alcohol). Nearly all are fire hazards. Compounds in emissions should be determined through familiarity with the source. Appropriate precautions can be found in reference documents, such as reference No. 4 in Section 16.0.

6.0 Equipment and Supplies.

A VOC monitoring instrument meeting the following specifications is required:

6.1 The VOC instrument detector shall respond to the compounds being processed. Detector types that may meet this requirement include, but are not limited to, catalytic oxidation, flame ionization, infrared absorption, and photoionization.

6.2 The instrument shall be capable of measuring the leak definition concentration specified in the regulation.

6.3 The scale of the instrument meter shall be readable to ±2.5 percent of the specified leak definition concentration.

6.4 The instrument shall be equipped with an electrically driven pump to ensure that a sample is provided to the detector at a constant flow rate. The nominal sample flow rate, as measured at the sample probe tip, shall be 0.10 to 3.0 l/min (0.004 to 0.1 ft^3/min) when the probe is fitted with a glass wool plug or filter that may be used to prevent plugging of the instrument.

6.5 The instrument shall be equipped with a probe or probe extension for sampling not to exceed 6.4 mm (1/4 in) in outside diameter, with a single end opening for admission of sample.

6.6 The instrument shall be intrinsically safe for operation in explosive atmospheres as defined by the National Electrical Code by the National Fire Prevention Association or other applicable regulatory code for operation in any explosive atmospheres that may be encountered in its use. The instrument shall, at a minimum, be intrinsically safe for Class 1, Division 1 conditions, and/or Class 2, Division 1 conditions, as appropriate, as defined by the example code. The instrument shall not be operated with any safety device, such as an exhaust flame arrestor, removed.

7.0 Reagents and Standards.

7.1 Two gas mixtures are required for instrument calibration and performance evaluation:

7.1.1 Zero Gas. Air, less than 10 parts per million by volume (ppmv) VOC.

7.1.2 Calibration Gas. For each organic species that is to be measured during individual source surveys, obtain or prepare a known standard in air at a concentration approximately equal to the applicable leak definition specified in the regulation.

7.2 Cylinder Gases. If cylinder calibration gas mixtures are used, they must be analyzed and certified by the manufacturer to be within 2 percent accuracy, and a shelf life must be specified. Cylinder standards must be either reanalyzed or replaced at the end of the specified shelf life.

7.3 Prepared Gases. Calibration gases may be prepared by the user according to any accepted gaseous preparation procedure that will yield a mixture accurate to within 2 percent. Prepared standards must be replaced each day of use unless it is demonstrated that degradation does not occur during storage.

7.4 Mixtures with non-Reference Compound Gases. Calibrations may be performed using a compound other than the reference compound. In this case, a conversion factor must be determined for the alternative compound such that the resulting meter readings during source surveys can be converted to reference compound results.

8.0 Sample Collection, Preservation, Storage, and Transport.

8.1   Instrument Performance Evaluation. Assemble and start up the instrument according to the manufacturer's instructions for recommended warmup period and preliminary adjustments.

8.1.1 Response Factor. A response factor must be determined for each compound that is to be measured, either by testing or from reference sources. The response factor tests are required before placing the analyzer into service, but do not have to be repeated at subsequent intervals.

8.1.1.1 Calibrate the instrument with the reference compound as specified in the applicable regulation. Introduce the calibration gas mixture to the analyzer and record the observed meter reading. Introduce zero gas until a stable reading is obtained. Make a total of three measurements by alternating between the calibration gas and zero gas. Calculate the response factor for each repetition and the average response factor.

8.1.1.2 The instrument response factors for each of the individual VOC to be measured shall be less than 10 unless otherwise specified in the applicable regulation. When no instrument is available that meets this specification when calibrated with the reference VOC specified in the applicable regulation, the available instrument may be calibrated with one of the VOC to be measured, or any other VOC, so long as the instrument then has a response factor of less than 10 for each of the individual VOC to be measured.

8.1.1.3 Alternatively, if response factors have been published for the compounds of interest for the instrument or detector type, the response factor determination is not required, and existing results may be referenced. Examples of published response factors for flame ionization and catalytic oxidation detectors are included in References 1-3 of Section 17.0.

8.1.2 Calibration Precision. The calibration precision test must be completed prior to placing the analyzer into service and at subsequent 3-month intervals or at the next use, whichever is later.

8.1.2.1 Make a total of three measurements by alternately using zero gas and the specified calibration gas. Record the meter readings. Calculate the average algebraic difference between the meter readings and the known value. Divide this average difference by the known calibration value and multiply by 100 to express the resulting calibration precision as a percentage.

8.1.2.2 The calibration precision shall be equal to or less than 10 percent of the calibration gas value.

8.1.3 Response Time. The response time test is required before placing the instrument into service. If a modification to the sample pumping system or flow configuration is made that would change the response time, a new test is required before further use.

8.1.3.1 Introduce zero gas into the instrument sample probe. When the meter reading has stabilized, switch quickly to the specified calibration gas. After switching, measure the time required to attain 90 percent of the final stable reading. Perform this test sequence three times and record the results. Calculate the average response time.

8.1.3.2 The instrument response time shall be equal to or less than 30 seconds. The instrument pump, dilution probe (if any), sample probe, and probe filter that will be used during testing shall all be in place during the response time determination.

8.2 Instrument Calibration. Calibrate the VOC monitoring instrument according to Section 10.0.

8.3 Individual Source Surveys.

8.3.1 Type I - Leak Definition Based on Concentration. Place the probe inlet at the surface of the component interface where leakage could occur. Move the probe along the interface periphery while observing the instrument readout. If an increased meter reading is observed, slowly sample the interface where leakage is indicated until the maximum meter reading is obtained. Leave the probe inlet at this maximum reading location for approximately two times the instrument response time. If the maximum observed meter reading is greater than the leak definition in the applicable regulation, record and report the results as specified in the regulation reporting requirements. Examples of the application of this general technique to specific equipment types are:

8.3.1.1 Valves. The most common source of leaks from valves is the seal between the stem and housing. Place the probe at the interface where the stem exits the packing gland and sample the stem circumference. Also, place the probe at the interface of the packing gland take-up flange seat and sample the periphery. In addition, survey valve housings of multipart assembly at the surface of all interfaces where a leak could occur.

8.3.1.2 Flanges and Other Connections. For welded flanges, place the probe at the outer edge of the flange-gasket interface and sample the circumference of the flange.

Sample other types of nonpermanent joints (such as threaded connections) with a similar traverse.

8.3.1.3 Pumps and Compressors. Conduct a circumferential traverse at the outer surface of the pump or compressor shaft and seal interface. If the source is a rotating shaft, position the probe inlet within 1 cm of the shaft-seal interface for the survey. If the housing configuration prevents a complete traverse of the shaft periphery, sample all accessible portions. Sample all other joints on the pump or compressor housing where leakage could occur.

8.3.1.4 Pressure Relief Devices. The configuration of most pressure relief devices prevents sampling at the sealing seat interface. For those devices equipped with an enclosed extension, or horn, place the probe inlet at approximately the center of the exhaust area to the atmosphere.

8.3.1.5 Process Drains. For open drains, place the probe inlet at approximately the center of the area open to the atmosphere. For covered drains, place the probe at the surface of the cover interface and conduct a peripheral traverse.

8.3.1.6 Open-ended Lines or Valves. Place the probe inlet at approximately the center of the opening to the atmosphere.

8.3.1.7 Seal System Degassing Vents and Accumulator Vents. Place the probe inlet at approximately the center of the opening to the atmosphere.

8.3.1.8 Access door seals. Place the probe inlet at the surface of the door seal interface and conduct a peripheral traverse.

8.3.2 Type II - "No Detectable Emission". Determine the local ambient VOC concentration around the source by moving the probe randomly upwind and downwind at a distance of one to two meters from the source. If an interference exists with this determination due to a nearby emission or leak, the local ambient concentration may be determined at distances closer to the source, but in no case shall the distance be less than 25 centimeters. Then move the probe inlet to the surface of the source and determine the concentration as outlined in Section 8.3.1. The difference between these concentrations determines whether there are no detectable emissions. Record and report the results as specified by the regulation. For those cases where the regulation requires a specific device installation, or that specified vents be ducted or piped to a control device, the existence of these conditions shall be visually confirmed. When the regulation also requires that no detectable emissions exist, visual observations and sampling surveys are required. Examples of this technique are:

8.3.2.1 Pump or Compressor Seals. If applicable, determine the type of shaft seal. Perform a survey of the local area ambient VOC concentration and determine if detectable emissions exist as described in Section 8.3.2.

8.3.2.2 Seal System Degassing Vents, Accumulator Vessel Vents, Pressure Relief Devices. If applicable, observe whether or not the applicable ducting or piping exists. Also, determine if any sources exist in the ducting or piping where emissions could occur upstream of the control device. If the required ducting or piping exists and there are no sources where the emissions could be vented to the atmosphere upstream of the control device, then it is presumed that no detectable emissions are present. If there are sources in the ducting or piping where emissions could be vented or sources where leaks could occur, the sampling surveys described in Section 8.3.2 shall be used to determine if detectable emissions exist.

8.3.3 Alternative Screening Procedure.

8.3.3.1 A screening procedure based on the formation of bubbles in a soap solution that is sprayed on a potential leak source may be used for those sources that do not have continuously moving parts, that do not have surface temperatures greater than the boiling point or less than the freezing point of the soap solution, that do not have open areas to the atmosphere that the soap solution cannot bridge, or that do not exhibit evidence of liquid leakage. Sources that have these conditions present must be surveyed using the instrument technique of Section 8.3.1 or 8.3.2.

8.3.3.2 Spray a soap solution over all potential leak sources. The soap solution may be a commercially available leak detection solution or may be prepared using concentrated detergent and water. A pressure sprayer or squeeze bottle may be used to dispense the solution. Observe the potential leak sites to determine if any bubbles are formed. If no bubbles are observed, the source is presumed to have no detectable emissions or leaks as applicable. If any bubbles are observed, the instrument techniques of Section 8.3.1 or 8.3.2 shall be used to determine if a leak exists, or if the source has detectable emissions, as applicable.

9.0 Quality Control.

Section	Quality Control Measure	Effect
8.1.2	Instrument calibration precision check	Ensure precision and accuracy, respectively, of instrument response to standard
10.0	Instrument calibration	

10.0 Calibration and Standardization.

10.1 Calibrate the VOC monitoring instrument as follows. After the appropriate warmup period and zero internal calibration procedure, introduce the calibration gas into the instrument sample probe. Adjust the instrument meter readout to correspond to the calibration gas value.

NOTE: If the meter readout cannot be adjusted to the proper value, a malfunction of the analyzer is indicated and corrective actions are necessary before use.

11.0 Analytical Procedures. [Reserved]

12.0 Data Analyses and Calculations. [Reserved]

13.0 Method Performance. [Reserved]

14.0 Pollution Prevention. [Reserved]

15.0 Waste Management. [Reserved]

16.0 References.

1. Dubose, D.A., and G.E. Harris. Response Factors of VOC Analyzers at a Meter Reading of 10,000 ppmv for Selected Organic Compounds. U.S. Environmental Protection Agency, Research Triangle Park, NC. Publication No. EPA 600/2-81051. September 1981.

2. Brown, G.E., *et al*. Response Factors of VOC Analyzers Calibrated with Methane for Selected Organic Compounds. U.S. Environmental Protection Agency, Research Triangle Park, NC. Publication No. EPA 600/2-81-022. May 1981.

3. DuBose, D.A. *et al*. Response of Portable VOC Analyzers to Chemical Mixtures. U.S. Environmental

Protection Agency, Research Triangle Park, NC. Publication No. EPA 600/2-81-110. September 1981.

4. Handbook of Hazardous Materials: Fire, Safety, Health. Alliance of American Insurers. Schaumberg, IL. 1983.

17.0 Tables, Diagrams, Flowcharts, and Validation Data.

[Reserved]

APPENDIX C

Example Forms

Leak Detection And Compliance – Release Notice

Filed by:_________________________________ Date:___________ Time:__________
Site Name: ____ Page ___ of ___
Operator Name: ____________________________________

Release Summary

Describe equipment/operational failure.	
Type of release (Air, Spill, Other) and estimated volumes and time of release (as possible).	
Has release been controlled?	
Is impact to neighboring properties anticipated? If so list address and type of impact.	
Is there endangerment to human health or property?	
What corrective action is being taken?	
Has notice to other regulatory agencies occurred?	
Contact Information for Responsible Party	Name: Phone: Email:

Other incident details:

Attach all documentation, photographs or communication available concerning the release.

Leak Detection And Compliance – Monitoring Report Log

Field Surveyor Name: ____________________________________ Date:____________
Site Name: ____ Page ___ of ___
Operator Name: ______________________________________

Monitoring Summary

Equipment	# Monitored Components	Leak Definition	Leaks Found			Highest Observed	Repaired (Y/N)	Confirmation Monitoring
Well No.1			Valves	Connector	Other			
Well No. 2								
Piping to Separator								
Separator								
Piping to ASTs								
ASTs – Ground level								
ASTs – Hatch Seals								
Dehy Unit								
Piping to Comp								
Compressor								

Equipment Maintenance – Leak Detected/Not Repaired

Equipment	Monitoring Results	Tagged	Tag ID	Repair /Replacement Schedule	Comments:

Monitoring Equipment

Monitor Type		**Calibration Gas**		**Upwind Dir**		**Upwind Result**	
Monitor Serial No.		**Calibration Result**		**Downwind Dir**		**Downwind Result**	

Notes:

THIS FIELD FORM IS PROVIDED AS AN EXAMPLE ONLY. PLEASE GENERATE A FORM COMPLIANT TO YOUR LDCP NEEDS ©2011kt