STRONGER

State Review of Oil & Natural Gas Environmental Regulations

Colorado Department of Public Health and Environment

2017 Air Quality State Review Report

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Table of Contents

Introduction

In 1990, the Interstate Oil Compact Commission (IOCC), later renamed the Interstate Oil and Gas Compact Commission (IOGCC), and the U.S. Environmental Protection Agency (EPA) jointly published a Study of State Regulation of Oil and Gas Exploration and Production Waste, which contained Guidelines for the regulation of oil and gas exploration and production wastes by the IOCC member states (the "1990 Guidelines"). The published Guidelines, developed by state, environmental, and industry stakeholders, provided the basis for the state review process- a multi-stakeholder evaluation of state oil and gas waste management programs against the Guidelines. The initial purposes of the state review process were to document the successes of states in regulating oil and gas wastes, to identify gaps in regulation, and to offer recommendations for program improvement.

In 1999, administration of the state review process shifted to a nonprofit, multi-stakeholder organization named State Review of Oil and Natural Gas Environmental Regulations, Inc. (STRONGER). Since 1999, STRONGER has expanded the scope of the Guidelines to address additional issues including Stormwater Management, Hydraulic Fracturing, Air Quality, and Reused and Recycled Fluids. The purpose of the STRONGER State Review process is to assist state environmental regulatory agencies with the continuous improvement of their oil and gas programs through an independent, multi-stakeholder evaluation that identifies program strengths and provides recommendations for improvement.

In early 2017 the Colorado Department of Public Health and Environment (CDPHE) volunteered for an Air Quality review focused on the oil and gas program of its Air Pollution Control Division (APCD). The review began with a questionnaire based on the STRONGER 2015 Edition Air Quality Guidelines that was completed by APCD staff. The questionnaire was intended to capture the status of the APCD's oil and gas program relative to the Guidelines.

The STRONGER review team included Laura Finley, Oklahoma Department of Environmental Quality, representing the state stakeholders; Jesse Sandlin, Devon Energy, representing the industry stakeholders; and Jon Goldstein, Environmental Defense Fund, representing the environmental stakeholders. Lisa Thompson, United States Environmental Protection Agency (EPA), served as an Official Observer. On September 25, 2017 the review team conducted an interview with APCD staff at the CDPHE offices in Denver, CO. Following the interview, and after review of the written materials provided by the APCD, the review team members developed this report.

This report contains the review team's findings and recommendations based on their analysis of the questionnaire and supporting information provided by the APCD, as well as information provided during the interview in Denver. This report is intended to capture a "snapshot in time"

of Colorado's oil and gas air quality management program. Where available, hyperlinks to external documentation are included.

Topic headings, findings, and recommendations are noted in a numbered format that corresponds to the relevant section of the Guidelines. For example, the report section "10.2.2 Jurisdiction and Cooperation Between Agencies" contains "Finding 10.2.2.a" as well as "Finding 10.2.2.b" and "Recommendation 10.2.2.b"; all of which pertain to Section 10.2.2 of the 2015 Edition STRONGER Guidelines. The ".a,b,c.." suffix is added where there is more than one finding or recommendation in a given section.

Appendix A contains a glossary of acronyms used in this report. Appendix B contains the list of attendees at the interview in Denver. Appendix C contains the APCD's response to the questionnaire. Appendix D contains the 2015 Edition STRONGER Guidelines.

Executive Summary

A multi-stakeholder review team has completed an in-depth review of the Colorado Department of Public Health and Environment Air Pollution Control Division's oil and gas regulatory program against the criteria of the 2015 Edition STRONGER Air Quality Guidelines. Review team members and official observers were granted full access to the staff of the APCD, and all questions were answered in a responsive and open manner.

The review team has concluded the APCD's oil and gas program is well managed, professional, and fully meets the criteria of the 2015 Edition STRONGER Air Quality Guidelines. The review team identified a number of program strengths that warrant special recognition as well as recommendations for continuous improvement. The review team also identified a serious, looming budget shortfall that will require legislative action to address. The review team urges the Colorado General Assembly to take swift and effective action on this important issue.

Key Findings

Finding 10.2.2.a

The review team finds that the APCD meets the criteria of this section of the Guidelines. The 75% reduction in reported observations of emissions from storage tanks is a testament to the state's efforts.

Finding 10.2.3.c

The review team specifically commends APCD's development of an application completeness checklist, and the success of APCD's lean process improvement. These initiatives have made permit applications more efficient and predictable for both the state and operators.

Finding 10.2.6.a

The review team finds that the APCD meets the criteria of this section of the Guidelines. The creation of a dedicated oil and gas team within APCD, the increase in staffing and the training provided to that staff on infrared camera and emerging methane monitoring technologies is highly commendable.

Finding 10.2.6.b

The review team finds that due to APCD's funding relying on permitting fees established in 2008 and capped in statute at that time, a growth in expenditures over the last ten years commensurate with the growth of Colorado's economy and population, and a decline in emissions as a result of successful regulation, APCD's funding is inadequate to sustain necessary staffing beyond the current fiscal year.

Finding 10.2.9

The review team finds that the APCD meets the criteria of this section of the Guidelines. The review team commends the APCD's unique approach to public involvement so that interested parties at the individual, town, county, and state level can be involved in, and informed of, the rulemaking and compliance processes.

Key Recommendations

Recommendation 10.2.6.b

The review team strongly recommends that the Colorado General Assembly revise the structure of APCD's funding, either by raising fee caps or by supplementing the Division's funding with a mechanism outside of the Stationary Sources Fund.

Recommendation 10.2.7.a

The review team recommends CDPHE endeavor, wherever practical, to coordinate with the COGCC to create a unified, publically accessible database of environmental information and records concerning oil and gas wells.

10.2 Administrative

As it pertains to regulation of the oil and gas industry, the CDPHE promulgates and implements regulations through the APCD and the Colorado Air Quality Control Commission (AQCC) who are likewise responsible for implementing the federal Clean Air Act (CAA) and the Colorado Air Quality Control Program. Within the APCD, the agency has created a specific oil and gas team in charge of permitting, compliance and enforcement, as well as monitoring and response to complaints. The duties of the aforementioned regulatory bodies are set forth at:

- Clean Air Act (42 U.S.C.A. §§ 7401—7642)
- Colorado Revised Statutes (CRS) Title 25, Article 7, §§ 101 *et seq*

Finding 10.2

The review team finds the CDPHE meets the criteria of this section of the Guidelines.

10.2.1 Scope of Authority

The AQCC has statutory authority as designated by the Colorado Air Pollution Prevention and Control Act, CRS Title 25 Article 7, most recently revised in July of 2006. This Act grants the AQCC the responsibility for promulgating regulations for the state covering a wide range of activities and industries. These responsibilities include State Implementation Plans (SIP) for the National Ambient Air Quality Standards (NAAQS), emission control regulations, and the minimum elements of a Title V permit program of the Clean Air Act, among other broad responsibilities as granted to it by the Colorado and Federal statutes. CRS 25-7-105(1)(a) describes the broadness of the responsibilities as such, noting that for any regulation or action the commission takes that isn't required by Part C, D, or Title V of the Clean Air Act, "…such provision, standard, or regulation is hereby declared to be adopted under powers reserved to the state of Colorado pursuant to section 116 of the [Clean Air Act]. Any such provision, standard, or regulation adopted exclusively under state authority shall not constitute part of the state implementation plan." The EPA authorized Colorado to implement and enforce the NSPS and NESHAP programs through an automatic delegation process in 2000 and 2014 (65 Fed. Reg. 49919, 79 Fed. Reg. 60993).

As pertaining to emission control regulations, the AQCC is granted authority in CRS 25-7-109(2) to develop control requirements that may apply to, but are not limited to, nitrogen oxides, carbon oxides, hydrocarbons, visible pollutants, particulates, sulfur oxides, hazardous air pollutants, and odors. CRS 25-7-109(3) enumerates some examples of activities that should be regulated by the commission. With respect to oil and gas development, relevant activities include, but are not limited to, storage and transfer of petroleum products and volatile organic compounds, industrial process equipment, and diesel-powered machines, vehicles, engines, and equipment.

There are elements the AQCC must consider in setting standards, outlined by CRS 25-7-109(b)(I-VIII):

> "(I) The state policy regarding air pollution, as set forth in section 25-7-102;
> (II) Federal recommendations and requirements;
> (III) The degree to which altitude, topography, climate, or meteorology in certain portions of the state require that emission control regulations be more or less stringent than in other portions of the state;
> (IV) The degree to which any particular type of emission is subject to treatment, and the availability, technical feasibility, and economic reasonableness of control techniques;
> (V) The extent to which the emission to be controlled is significant;
> (VI) The continuous, intermittent, or seasonal nature of the emission to be controlled;
> (VII) The economic, environmental, and energy costs of compliance with such emission control regulation;
> (VIII) Whether an emission control regulation should be applied throughout the entire state or only within specified areas or zones of the state, and whether it should be applied only when a specified class or type of pollution is concerned."

The AQCC may also exempt specific classes of minor or insignificant sources of air pollution from notice and permitting requirements if there is a negligible impact on air quality expected from those activities.

As designated by CRS 25-7-111, the APCD shall, "administer and enforce the air quality control programs adopted by the commission. In furtherance of such responsibility of the APCD, the Executive Director of the Department of Public Health and Environment shall establish within the APCD a separate air quality control agency…". In furtherance of that responsibility, the APCD is granted authority to conduct studies and collect date from field monitoring to determine the nature and quality of ambient air across the state, and perform inspections of property, premises, and places to investigate actual, suspected, or potential sources of air pollutants. The statutory provisions require the General Assembly to direct the AQCC to adjust its fees so that the revenues approximate the annual appropriations to the APCD to carry out its duties with respect to stationary sources, which ensures adequate funding is available for staff and equipment for the AQCC to perform its duties.

Statutory definitions are found in CRS 25-7-103, and regulatory definitions are found throughout regulatory documents. Those pertaining to oil and gas are mainly found in the Common Provisions Regulation Section I.G, Regulation Number 3, Part A, Section I.B and Regulation Number 7, Sections XII, XVII, XVIII.

CRS 24-4-103(2) outlines the AQCC's stakeholder engagement process. This includes a public notice and comment period, and the development of representative groups of interested parties

to submit their views through both formal and informal means on proposals and rules under consideration by the AQCC.

Finding 10.2.1

The review team finds the CDPHE meets the criteria of this section of the Guidelines.

10.2.2 Jurisdiction and Cooperation Between Agencies

The EPA has delegated the authority to Colorado to implement and enforce New Source Performance Standards (NSPS) and Maximum Achievable Control Technology (MACT) standards. The AQCC has adopted and incorporated by reference a number of oil and gas related NSPS and MACT standards including: NSPS OOOO, NSPS Kb, NSPS KKK, MACT HH and MACT HHH. The AQCC has also incorporated by reference several federal NSPS and MACT standards covering equipment that is frequently used in exploration and production, such as NSPS IIII, NSPS JJJJ and MACT ZZZZ.

Regulation of Colorado's oil and gas sector is largely housed in the AQCC's Regulation 7, establishing Reasonably Available Control Technology (RACT) standards to satisfy CAA Ozone RACT State Implementation Plan requirements. Regulation 7, Sections I - VIII, XII, XV, and XVI contain SIP requirements for this sector, and particularly Section XII. Section XII includes requirements specific to condensate storage tanks, glycol natural gas dehydrators, and natural gas processing plants that were first adopted for inclusion into the SIP in 2004. Since then, this section has been revised in 2006, 2008, 2012, 2014 and 2017. These sections address Volatile Organic Compound (VOC) and Nitrogen Oxide (Nox) emissions.

The APCD is also working to address ozone nonattainment issues related to oil and gas development. In 2007, the Denver Metro North Front Range (DMNFR) was designated as subpart 2 marginal nonattainment for the 1997 8-hour ozone standard. The DMNFR includes large portions of the Denver-Julesberg Basin oil and gas production area. In 2012, the DMNFR was classified as subpart 2 marginal nonattainment for the 2008 8-hour ozone standard. Subsequently, the AQCC adopted State-Only oil and gas industry control measures in 2014. In 2016, the DMNFR was reclassified as subpart 2 moderate nonattainment for the 2008 8-hour ozone standard. Colorado has recently concluded a rulemaking to address Reasonably Available Control Technology recommendations in EPA’s Control Techniques Guidelines for the Oil and Natural Gas Industry in Colorado’s Ozone SIP.

Since the implementation of the Division’s infrared cameras inspection program and

promulgation of Colorado's Regulation 7 revisions in 2014, the department reports a 75% drop in the number of observations of emissions from storage tanks subject to the APCD's Leak Detection and Repair (LDAR) program.

Through annual meetings, technical assistance, and coordination via the agency's Office of Health Equity and Environmental Justice, the APCD also seeks to coordinate with the Southern Ute Indian Tribe on areas of shared interest concerning air quality and oil and gas development on tribal lands. The APCD also coordinates on a quarterly basis with their colleagues at the Colorado Oil and Gas Conservation Commission (COGCC). This coordination includes, from time to time, technical and policy training offered to COGCC staff.

Finding 10.2.2.a

The review team finds that the APCD meets the criteria of this section of the Guidelines. The 75% reduction in reported observations of emissions from storage tanks is a testament to the state's efforts.

Finding 10.2.2.b

The review team commends CDPHE for its communication and coordination with the Southern Ute Indian Tribe and the COGCC.

10.2.3 Permits, Authorizations, and Exemptions

Colorado is a SIP-Approved state, and under the authority granted by EPA and described in section 10.2.1 above, the APCD may issue both major and minor source construction permits, stationary source new source review (NSR) permits, and major source Title V Operating Permits to oil and gas industry sources. Most oil and gas sources in Colorado are minor sources.

The APCD used Regulation 3 to describe and enumerate most of the oil and gas related permitting programs. Part A contains emissions reporting, Part B includes minor source construction permits, Part C outlines Title V requirements and Part D contains Major Stationary Source NSR and Prevention of Significant Deterioration requirements. There are some exemptions afforded to oil and gas sources in Part A, Section II.D, Part B, Section II.D, and Part C, Section II.E, each of which are expected to have a negligible impact on air quality.

In 2008, the APCD went through a "lean" process improvement event that included multiple stakeholders to improve the efficiency of the permitting process. A key outcome of this effort was the development of an application completeness checklist that the state and operators use to help ensure complete permit applications are submitted. This action addressed a need identified during the lean event which indicated applications are often incomplete due to lack of

common understanding of what is required by the agency. Additionally, the APCD developed new emissions reporting forms specific to oil and gas sources to improve the APCD's emission reporting functionality. Colorado allows both general permits and individual permits for minor source construction permitting. If an operator meets all applicable requirements, the operator is eligible to use the general permit option. Currently there are six available to oil and gas industry, which include storage tank batteries, diesel and natural gas fired engines, and land development. The APCD is currently considering developing general permits for separators.

When certain criteria are met, operators and other permit applicants are required to submit an ambient air quality modeling analysis with the permit application to demonstrate that the new or modified source will not cause or contribute to a violation of the National Ambient Air Quality Standards. The criteria for when that modeling is required, and how it is to be performed, are included in Guidelines online.

Additionally, modeling is required to estimate an individual site's emissions profile. The APCD has staff to review the information provided, even though it may not have access to each suite of modeling software to duplicate the models. Typically, the oil and gas sector uses a software model such as GlyCalc, E&P Ttanks, or Promax paired with data from the site itself to develop an estimate for emissions from individual facilities.

To ensure accuracy, Colorado allows the drilling and commencement of operation for exploration and production facilities prior to submittal of an application. This also allows for companies to gather accurate production information to ensure accurate emissions reporting within permit applications. Operators have 90 days to evaluate their sites and develop accurate production information for permit applications. However, emissions are still required to be controlled during the first 90 days of operation.

Finding 10.2.3.a

The review team finds that the APCD meets the criteria of this section of the Guidelines.

Finding 10.2.3.b

The review team commends APCD for its permit application process that allows operators to accurately gather actual production information to use as the basis for emissions reporting and regulatory review before submitting an application.

Finding 10.2.3.c

The review team specifically commends APCD's development of an application completeness checklist, and the success of APCD's lean process improvement. These initiatives have made

permit applications more efficient and predictable for both the state and operators.

10.2.4 Compliance Monitoring, Demonstration & Assurance

Per CRS 25-7-111, the APCD has the authority to conduct unannounced inspections, conduct sampling and monitoring, as well as access and copy records. Regulation 3, Part C, Section V.C.16.b. and 16.b.(iii)-(iv) requires as a part of determining compliance with a Title V permit, that a source allow APCD staff to inspect a facility including any monitoring of air pollution control equipment.

The APCD has created a unit dedicated specifically to the oil and gas industry. This unit reviews all source-submitted reports, supports review of compliance tests, and conducts full compliance evaluations and partial compliance evaluations as well as approximately 2,000 infrared (IR) camera inspections per year. Unannounced reciprocating internal combustion engine (RICE) monitoring is also conducted. Inspections are conducted according to the APCD's compliance monitoring plan.

The Colorado Air Compliance and Tracking System (CACTIS) is the compliance and enforcement electronic database that supports the functions performed by APCD staff and is used to report to EPA systems. If a compliance issue is noted in a report, the violation is addressed through either formal or informal enforcement proceedings (see "Section 10.2.5 – Enforcement Tools" of this report for additional information regarding enforcement). Reports are stored long term in an electronic database known as Records Manager 8 (RM8). Regulation 3, Part C, Section V.C.7.a provides for alternative reporting format and schedules to avoid duplicative or unnecessary reporting by Title V sources.

The APCD maintains records according to an established records retention policy. Records submitted during inspections or which detail a violation are maintained for forty (40) years. Source submitted reports are maintained for 15-30 years. Inspection reports are detailed in documenting the conditions and observations of the facility during the inspection and are also maintained for 40 years.

Complaints received from the public are investigated by field inspection staff. CRS 25-7-115(2) speaks to enforcement pursuant to complaints and sets forth that a source found to be in violation is handled through the APCD's standard enforcement procedures. Complainants are contacted by the APCD, given follow up information, and notified of closure of the complaint once the issue is resolved. Personal information regarding a complainant is held in confidence by the APCD.

Finding 10.2.4

The review team finds that the APCD meets the criteria of this section of the Guidelines.

10.2.5 Enforcement

10.2.5.1 Enforcement Tools

Notices of Violation (NOV) or Compliance Advisories are issued to initiate the formal enforcement process in response to inspections or reports. An immediate NOV (INOV) may be issued for violations of Regulation 7 for visible emissions from flares and open thief hatches on storage tanks, with the intent of immediately addressing a significant air quality event. The INOV review process is more expedient, with the goal to issue the INOV within ten days.

The APCD has authority to issue cease-and-desist orders requiring the immediate discontinuation of the discharge of any air pollutants where that activity creates a clear, present, and immediate danger to the environment or to the health of the public. The APCD may appeal to the district court for a temporary restraining order, or temporary or permanent injunction; such an action is given top priority over all matters pending before the court. The APCD has the ability to include permit termination, modification, or revocation in orders.

The APCD attempts to resolve most enforcement cases through negotiated settlements, resulting in lower penalties, and more expeditious resolution. Resolution of minor simple enforcement actions is handled through an Early Settlement Agreement, whereas more complex issues are resolved through Compliance Orders on Consent. The APCD also utilizes an informal enforcement process which includes verbal and written warnings to address minor issues that can quickly be remedied.

Finding 10.2.5.1.a

The review team commends APCD for streamlining the enforcement process to ensure issues such as smoking flares and open thief hatches are corrected as quickly as possible through the use of Immediate Notices of Violation.

Finding 10.2.5.1.b

The review team commends APCD for its ability to issue immediate cease and desist orders for the discharge of any air pollutants where that activity creates a clear, present, and immediate danger to the environment or to the health of the public.

10.2.5.2 Penalties

Statutory factors for civil penalties set forth at CRS 25-7-122 provide the aggravating and/or mitigating factors the APCD must consider in assessing a penalty. CRS 25-7-115(3)(b) grants the APCD the authority to include in Orders the assessment of penalties. CRS 25-7-122.1 grants the APCD the authority to seek criminal penalties. The APCD does not have set dollar amounts for violations, which could make consistency and predictability challenging in assessing penalties.

APCD has a Voluntary Disclosure statute providing that penalty mitigation is available if the person or entity qualifies under the statute. More information is also located on the APCD's dedicated self-audit website. Notably, CRS 25-1-114.6 established an environmental self-audit pilot project in conjunction with a memorandum of agreement with EPA to encourage the regulated community to voluntarily identify environmental concerns and to address them expeditiously without fear of penalties or additional enforcement action by regulatory agencies.

Finding 10.2.5.2.a

The review team finds the APCD meets the criteria of this section of the Guidelines.

Finding 10.2.5.2.b

The review team wishes to commend APCD for undertaking a project to encourage regulated entities to self-audit and disclose both criminal and civil violations.

10.2.5.3 Right of Appeal

Following the Enforcement NOV Conference during formal enforcement, and again if the APCD issues a unilateral Compliance Order, the APCD informs sources of their appeal rights. Pursuant to CRS 25-7-115(4), recipients of an Order have the right to appeal and request a hearing to determine whether any violations exist or existed, whether a revision to a SIP or regulation should be implemented with respect to the violation or whether the owner or operator is subject to penalties.

Finding 10.2.5.3

The review team finds the APCD meets the criteria of this section of the Guidelines.

10.2.6 Staffing and Training

Colorado has a team of staff dedicated to permitting and inspection of oil and gas industry sources housed within the Stationary Sources Program. Over the past decade this team has grown from five to twenty-eight full time employees. This team is managed by a section supervisor and comprised of four work units. Two work units are dedicated to field inspection and two work units to permitting. One staff member of the inspection unit is a work lead that oversees the implementation of the APCD's IR camera inspection and monitoring program. Training opportunities, including exposure to the latest, emerging methane monitoring techniques, are also made available.

The APCD is funded to a large extent by emission and permitting fees paid into the Colorado Stationary Sources Fund. These fees are capped in statute, and are used to pay for a range of activities including issuance of required permits, inspection of stationary emission sources, air quality planning and regulatory development; and ambient air quality monitoring, modeling and forecasting. The Legislature set the existing fee caps in 2008. At that time, the Division indicated that the 2008 caps should provide adequate funding until 2013, and committed to its stakeholders to not seek a fee increase during that time.

Due to growth in expenditures over the last nearly ten years, and a more recent decline in emission fees resulting from Colorado's successful air pollution reduction measures, the Stationary Sources Fund is currently running a substantial deficit. This deficit, if left unchecked, will result in a depletion of the existing fund balance within the next fiscal year. A depletion of the fund will necessitate the elimination of approximately 30 full time positions dedicated to the regulation and oversight of stationary air emission sources in Colorado.

A reduction in permitting staff will have a substantial negative impact on Colorado's economy by delaying the issuance of required air quality permits. The elimination of non-permitting staff will significantly reduce the number of air quality inspections and compliance assistance activities the Division conducts, diminish the Division's air quality planning capabilities, including the development of new pollution reduction measures, and lead to a substantial decline in the Division's capacity to monitor ambient air quality, forecast air quality conditions, and notify the public of potential air quality issues.

Finding 10.2.6.a

The review team finds that the APCD meets the criteria of this section of the Guidelines. The creation of a dedicated oil and gas team within APCD, the increase in staffing and the training provided to that staff on infrared camera and emerging methane monitoring technologies is highly commendable.

Finding 10.2.6.b

The review team finds that due to APCD's funding relying on permitting fees established in 2008 and capped in statute at that time, a growth in expenditures over the last ten years commensurate with the growth of Colorado's economy and population, and a decline in emissions as a result of successful regulation, APCD's funding is inadequate to sustain necessary staffing beyond the currnet fiscal year.

Recommendation 10.2.6.b

The review team strongly recommends that the Colorado General Assembly revise the structure of APCD's funding, either by raising fee caps or by supplementing the Division's funding with a mechanism outside of the Stationary Sources Fund.

10.2.7 Data Management

The APCD maintains four main database systems to assist in the tracking, management, and enforcement for which the APCD is responsible. These four systems are the Permit Tracking System (PTS), the Colorado Air Compliance and Tracking System (CACTIS), the Colorado Air Inventory System (CAIS), and Records Manager 8 (RM8).

The PTS is used mainly for tracking information from individual facilities and emissions sources, and tracks their progress from application to permit issuance. It tracks critical dates for all facilities, and is in turn used to track APCD employee productivity. The CACTIS system supports the enforcement and compliance assurance functions performed by APCD staff. It allows APCD staff to see compliance history at a particular facility, along with scheduled and past activities at the site. This database is also used to report to Federal EPA systems. The CAIS system is used for the state's emissions inventory, and it generates annual bills based on the tonnage of pollutants from individual sources. These data are used to develop SIP activities. Finally, RM8 is the APCD's digital records management system. It allows external entities to search for and download digital copies of records, permits, inspection reports and emissions data made available by the APCD.

Finding 10.2.7

The review team finds that the APCD meets the criteria of this section of the Guidelines. Relevant data are shared with partner state and federal agencies and the public.

Recommendation 10.2.7.a

The review team recommends CDPHE endeavor, wherever practical, to coordinate with the COGCC to create a unified, publically accessible database of environmental information and records concerning oil and gas wells.

Recommendation 10.2.4.b

The review team recommends that the APCD consider implementing an electronic reporting system to further improve the efficiency of the submission and review of reports and records submitted by regulated entities.

10.2.8 Public Involvement

The AQCC Procedural Rules outline the process by which the public can engage with the AQCC and involve themselves in the regulation development process. The AQCC Procedural Rules provide an opportunity at each general meeting for the AQCC to accept public comments. The AQCC Procedural Rules also encourage the public to participate in rulemaking hearings by commenting on proposed rules or alternate proposals. Additionally, depending on criteria met by certain sites, Regulation 3 provides an opportunity for the public to comment on draft minor source permits for individual projects. The public may also request a hearing before the Commission for sources attempting to obtain a major source Title V operating permit. All general permits are developed within a statewide notice and comment process, and at that time interested parties may provide input for the APCD to consider regarding the provisions within the permit.

The APCD also maintains an Oil and Gas email list that provides reminders on key deadlines, and assists in compliance by ensuring members of the regulated community are informed of key air quality issues.

Additionally, the Department maintains an Oil and Gas Health Information Response (OGHIR) Program to provide information to the general public when concerned about potential health impacts from oil and gas drilling and production activities. The Department maintains a website with relevant information, as well as Department contact information to receive comments and concerns. As of November 1, 2017 the OGHIR Program has thus far responded to over 364 individual complaints.

Finding 10.2.8

The review team finds the APCD meets the criteria of this section of the Guidelines.

10.2.9 Outreach

The APCD has a wide variety of outreach programs, each designed to provide information to different audiences. The APCD takes an active role in interacting with partner organizations and state and local government officials through presentations, workshops, and meetings. The APCD tailors its messages to each of these individual audiences, for example, when interacting with the public, the APCD attempts to communicate through examples in non-scientific terms, but will typically speak on a more technical level with oil and gas groups.

The APCD also works with the Colorado Oil and Gas Conservation Commission in implementing its local governmental designee program, which allows local governments to receive notice of drilling applications.

The APCD, in concert with the Department's Oil and Gas Health Information Response Program, also has authority to do air quality sampling with its mobile air quality sampling lab and can provide information to the concerned public or local government officials where appropriate.

The APCD also works with smaller operators in coordination with trade associations, providing permit application assistance and other guidance. The APCD also hosts field days with operators to demonstrate how inspections are conducted. The public, non-governmental organizations, and other interested stakeholders are invited to these events as well.

Additionally, the APCD maintains an online resource center with FAQs, guidance memos and other documents to provide knowledge to the industry and Colorado citizenry on oil and gas operations and their requirements.

Finding 10.2.9

The review team finds that the APCD meets the criteria of this section of the Guidelines. The review team commends the APCD's unique approach to public involvement so that interested parties at the individual, town, county, and state level can be involved in, and informed of, the rulemaking and compliance processes.

10.2.10 Strategic Program and Resource Planning

The APCD has a Planning and Policy program that continually assesses Colorado's air quality needs and develops strategies to meet them. This program works closely with the oil and gas team, local governments, environmental groups, and the regulated community. The APCD monitors upcoming federal regulations. Required SIP revisions and requests from the AQCC or Governor's office trigger revisiting resource planning. Additionally, Regulation 3 requires that all sources with hazardous, toxic, or odorous air pollutants of greater than 250 pounds per year

must file an air pollutant emission notice, and all sources with uncontrolled actual criteria pollutant emissions of 1 TPY (non-attainment areas) or 2 TPY (attainment areas) or more must file an air pollutant emission notice. These low emissions reporting thresholds help the APCD to track emission totals across the state and plan pollution control strategies.

The APCD routinely meets with the Colorado Oil and Gas Association (COGA) to stay abreast of trends and developments in the industry. Tracking the number of oil and gas permit applications received each month helps the APCD to plan for and ensure appropriate staffing and resources. Also, having a compliance monitoring strategy helps the APCD to plan for and ensure available resources to conduct all necessary oil and gas inspections during the year.

The Regional Air Quality Council (RAQC) is the lead planning agency for air quality planning for the Denver metropolitan area and the Denver Metro/North Front Range Ozone Non-Attainment Area. The RAQC is independent from the APCD; its board is appointed by the Governor's office. The RAQC coordinates with the APCD to develop emission reduction strategies.

The APCD recognizes that public and industry input is essential to proper planning, and therefore hosts a number of workshops for the regulated community and interested citizens.

Finding 10.2.10

The review team finds that the APCD meets the criteria of this section of the Guidelines.

10.3.1 Delineation of Sources

As required in Regulation 3, Part A, Section II.B.3 Colorado requires each oil and gas emissions point with uncontrolled actual emissions of a criteria pollutant (Part A, Section I.B.17) greater than 1 ton per year (in a non-attainment area) and 2 tons per year (in an attainment area) to file an air pollutant emissions notice (APEN) with the APCD. In addition, emissions points with greater than 250 pounds of a non-criteria reportable air pollutant (e.g. hazardous air pollutant, see Part A, Section I.B.30) must be reported.

For ozone planning purposes, the APCD developed an inventory that is specific to the ozone nonattainment area. The APCD coordinated closely with the RAQC and exchanged data with oil and gas operators to develop and refine this inventory. The most recent oil and gas inventory developed with the RAQC may be obtained online and is made routinely available through public meetings.

Finding 10.3.1

The review team finds that the APCD meets the criteria of this section of the Guidelines.

10.3.2 Source Requirements

In 2004 Colorado began a process to implement new regulations for oil and gas sources as part of the Early Action Compact Ozone Action Plan. Through this process, requirements were placed on condensate storage tanks, glycol dehydrators, reciprocating internal combustion engines, and LDAR was required at natural gas processing plants in the nonattainment area.

In addition, in 2006, requirements specific to condensate tank emissions in the nonattainment area were made more stringent in response to modeling from expected increases in development of the basin. At the same time, the Air Quality Control Commission adopted new state-wide requirements for storage tanks, glycol dehydrators, and natural gas-fired reciprocating internal combustion engines (RICE). In 2008 Colorado adopted further revisions to reduce emissions of VOC and NOx from production operations. These requirements applied to condensate tanks and pneumatic controllers in the nonattainment area. The Commission also expanded the RICE requirements state-wide.

In 2014, the Air Quality Control Commission adopted revisions to Regulation Number 7 to address reductions in VOC emissions and other emissions from oil and gas facilities. The AQCC established these requirements for oil and gas production sites by incorporating EPA's NSPS OOOO requirements. Additionally, Colorado Regulation 7 contains LDAR requirements for oil and gas production sites including well production facilities and natural gas compressor stations. According to guidance posted on the APCD's website:

"Well production facilities constructed on or after October 15, 2014, must be inspected 15- 30 days after the facility commences operation, and thereafter in accordance with Table 4. Well production facilities constructed before October 15, 2014, must be inspected within 90 days of the phase-in schedule in Table 4, within 30 days of the phase-in schedule for facilities subject to monthly AIMM, or by January 1, 2016, for facilities subject to a one time AIMM, and also thereafter in accordance with the frequencies in Table 4. The frequency of inspections is based on the uncontrolled actual VOC emissions from the highest emitting storage tank, or the total controlled actual VOC emissions from all permanent equipment and components for well production facilities without oil or condensate storage tanks."

Table 4 – Well Production Facility Component Inspections				
Thresholds (per XVII.F.4.c.)				
Well production facilities without storage tanks (tpy)	Well production facilities with storage tanks (tpy)	Approved Instrument Monitoring Method Inspection Frequency	AVO Inspection Frequency	Phase-in Schedule
> 0 and ≤ 6	> 0 and ≤ 6	One Time	Monthly	January 1, 2016
> 6 and ≤ 12	> 6 and ≤ 12	Annually	Monthly	January 1, 2016
> 12 and ≤ 20	> 12 and ≤ 20	Quarterly	Monthly	January 1, 2015
> 20	> 20	Monthly		January 1, 2015

There are also additional control requirements for storage tanks, compressorss, glycol dehydrators, well completions, liquids unloading, and pneumatic controllers. The APCD worked with staff at the COGCC to develop and maintain regulations around venting and flaring activities on production sites during drilling and well completion activities, requiring reduced emissions completions, where emissions are routed to production equipment for sales as soon as practicable.

The APCD also requires operators to minimize and prevent unplanned and episodic emissions, and report and respond to the APCD when they occur. Most common among those conditions are startup, shutdown, and malfunction. Operators do have an affirmative defense available to claim for startup, shutdown, and malfunction emissions, so long as all reporting and circumstantial requirements for the particular activity had been met. Sources with a Title V operating permit are required to report emergency incidents resulting in non-compliance with any technology-based limitation due to unavoidable increases in emissions attributable to emergency. For emissions caused by malfunction, the company must notify the APCD verbally as soon as possible and no later than noon of the next working day. These events are tracked using the APCD's CACTIS data management system, and, in order to qualify for the affirmative defense from penalties, operators are required to demonstrate compliance with the affirmative defense provisions. These requirements include a demonstration that emissions were caused by a sudden, unavoidable breakdown of equipment, could not have been easily prevented, and that they were minimized to the extent possible.

Finding 10.3.2

The review team finds that the APCD meets the criteria of this section of the Guidelines.

10.3.3 Air Quality Monitoring Networks

All air quality monitoring performed by the APCD is conducted in accordance with EPA's methods, standards and requirements. The APCD has established an extensive network of ambient air quality monitors across Colorado. The monitors are mainly focused on criteria pollutants, but they also have some PM2.5 chemical speciation network sites. They have deployed 22 ozone monitors. Their network meets or exceeds the EPA standards for all criteria pollutants.

Additionally, other agencies also perform ambient monitoring, primarily for ozone but also NOx and particulates, including EPA, National Park Service, Bureau of Land Management, US Forest Service, Southern Ute Indian Tribe, Garfield County, and the City of Aspen.

The APCD has a network that monitors for ozone precursors at two sites in the North Front Range of Colorado. One site is specific to oil and gas development in the Denver-Julesburg Basin. Garfield County also operates a network of 5 locations aimed at oil and gas development in the Piceance Basin. All of this monitoring focuses on the Photochemical Assessment Monitoring Station (PAMS) list of non-methane organic compounds.

The APCD has a mobile response trailer that responds to oil and gas complaints, outfitted with GC/MS for organic compounds, as well as monitors for methane, PM, Ozone, CO, NOx, HS,

NH3, and meteorology. The unit also collects and analyzes odor plume and activity-specific grab samples.

Finding 10.3.3.a

The review team finds the APCD meets the criteria of this section of the Guidelines.

Finding 10.3.3.b

The review team commends the ACPD for its investment in a mobile air quality monitor as it acts to bridge the gap between their stationary monitors and provides site-specific monitoring and analysis.

10.3.4 Reporting, Emission Inventories & Recordkeeping

Common emissions sources captured in the APCD's oil and gas inventory include: storage tanks (condensate, crude, produced water), glycol dehydrators, amine units, fugitive component leaks, hydrocarbon loading to tanker trucks, pneumatic pumps, reciprocating internal combustion engines (natural gas and diesel), gas-liquid separator venting, turbines, produced water evaporation ponds, process heaters, flares and maintenance activities including pigging and blowdowns.

The APCD uses the emissions information provided by sources, in conjunction with additional data, to produce a public facing Colorado Air Pollutant Emissions Inventory. This online tool allows the public to view the amount of criteria emissions being released by county, broken down into eleven source categories including oil and gas point sources, oil and gas area sources and condensate tanks.

The APCD generally uses refined methods for estimating state oil and gas emissions due to the availability of more accurate site-specific data from operators. Therefore, the APCD does not use the EPA Oil & Gas Emission Estimation Tool. In the 2011 National Emissions Inventory (NEI), Colorado used data from the 2011 3-State Study, a project done by Ramboll ENVIRON for the Western Regional Air Partnership (WRAP) that included emissions estimates for non-condensate tank well-pad sources. These oil and gas emissions were grown from 2006 survey-based data acquired for the WRAP. The 2011 oil and gas inventory for the mid-stream sources such as compressor stations and natural gas processing facilities was based on data reported by operators via Air Pollutant Emissions Notices (APEN) and included in the CAIS inventory database as point sources.

Recordkeeping requirements are prescribed through both federal and state regulations and within permit conditions issued by the APCD. Depending on the specific facility, process or pollutant various records are required by such permits to demonstrate compliance with terms and conditions. Typical records include oil and gas production volumes, volumes of gas combusted, and monitoring data of parameters indicative of proper operation of emissions control equipment (e.g. presence of pilot lights, temperatures and pressure drop across a catalyst, etc.). In addition, operators are required to maintain records of emissions calculations for criteria and hazardous air pollutants emitted. In some cases these emissions estimates are based on emissions factors and recorded process data and at other times the estimates are based on software models.

Finding 10.3.4

The review team finds that the APCD meets the criteria of this section of the Guidelines.

10.3.5 Corrective Actions & Emergency Response

The APCD and local emergency response agencies receive notification of releases depending on release criteria under Emergency Planning and Community Right-to-Know Act (EPCRA) thresholds. For releases that pose a danger to the public health and safety, the APCD has mobile air quality monitoring equipment to evaluate potential impacts and develop plans for mitigating harm in cooperation with local emergency responders.

Finding 10.3.5

The review team finds that the APCD meets the criteria of this section of the Guidelines.

10.3.6 Long-Term Planning, Prioritization & Evaluation

The data collected by the APCD from monitors and inventories allow the agency to have access to sufficient information to quantify and assess air emissions from oil and gas operations and to evaluate emissions reduction strategies. The APCD's long-term planning process is informed by the requirements of the Clean Air Act, EPA regulatory actions, the AQCC, State Legislature, Governor's Office, other court actions and the associated regulatory deadlines, etc. Prioritization of organization activities and the evaluation process is based on whether the requirement necessitates regulatory changes, the amount of time available to implement, level of coordination with other agencies, available staff resources, and funding.

Finding 10.3.6

The review team finds that the APCD meets the criteria of Section 10.3.6 of the STRONGER Guidelines.

Appendix A: Acronyms

APCD	Air Pollution Control Division
APEN	Air Pollution Emissions Notice
AQCC	Air Quality Control Commission
CAA	Clean Air Act
CACTIS	Colorado Air Compliance and Tracking System
CAIS	Colorado Air Inventory System
CDPHE	Colorado Department of Public Health and Environment
CO	Carbon Monoxide
COGA	Colorado Oil and Gas Association
COGCC	Colorado Oil and Gas Conservation Commission
CRS	Colorado Revised Statutes
DMNFR	Denver Metro North Front Range
EPCRA	Emergency Planning and Community Right-to-Know Act
GC/MS	Gas Chromatography/Mass Spectrometry
HS	Hydrogen Sulfide
INOV	Immediate Notices of Violation
IOCC	Interstate Oil Compact Commission
IOGCC	Interstate Oil and Gas Compact Commission
IR	Infrared
LDAR	Leak Detection and Repair
MACT	Maximum Achievable Control Technology
NAAQS	National Ambient Air Quality Standards
NEI	National Emissions Inventory
NH3	Ammonia
NESHAP	National Emission Standards for Hazardous Air Pollutants
NOV	Notices of Violation
NOX	Nitrogen Oxide
NSPS	New Source Performance Standards
NSR	New Source Review
OGHIR	Oil and Gas Health Information Response
PAMS	Photochemical Assessment Monitoring Station
PM2.5	Atmospheric particulate matter having a diameter of less than 2.5 micrometers
PTS	Permit Tracking System
RACT	Reasonably Available Control Technology
RAQC	Regional Air Quality Control Council
RICE	Reciprocating Internal Combustion Engine
RM8	Records Manager 8

SIP	State Implementation Plan
STRONGER	State Review of Oil and Natural Gas Environmental Regulations
USEPA	United States Environmental Protection Agency
VOC	Volatile Organic Compound
WRAP	Western Regional Air Partnership

Appendix B: Interview Attendees

Attendees may not have been present for the duration of the interview.

Mark McMillan, CDPHE
Chris Colclasure, CDPHE
Shannon McMillan, CDPHE
Gordon Pierce, CDPHE
Chris Laplante, CDPHE
Curt Taipale, CDPHE
Leah Martland, CDPHE
Kent Kuster, CDPHE
Martha Rudolph, CDPHE
Jesse Sandlin, Devon Energy
Laura Finley, OKDEQ
Jon Goldstein, EDF
Lisa Thompson, EPA
Ryan Steadley, STRONGER

Appendix C: ACPD Questionnaire Response

COLORADO
Department of Public Health & Environment

Dedicated to protecting and improving the health and environment of the people of Colorado

Ryan Steadley
Executive Director
STRONGER, Inc.

August 18, 2017

Re: State of Colorado Response to STRONGER Air Quality Guidelines Questionnaire

Mr. Steadley:

The State of Colorado Department of Public Health and Environment, Air Pollution Control Division ("Division") is pleased to participate in the STRONGER Air Quality review process with your organization. Please find attached for your consideration our responses to the regulatory review committee's questionnaire.

We look forward to the on site committee interview upcoming on September 25, 2017. If you have any questions leading up to that meeting, please contact my staff members Mark McMillan at 303-692-3140 or mark.mcmillan@state.co.us or Christopher Laplante at 303-692-3216 or christopher.laplante@state.co.us.

Sincerely,

Garry Kaufman
Director, Air Pollution Control Division
Colorado Department of Public Health and Environment

Attachment: Colorado STRONGER Air Quality Guidelines Questionnaire Responses, 25 pages

cc: Chris Colclasure, APCD
Mark McMillan, APCD
Christopher Laplante, APCD

State of Colorado
STRONGER Air Quality Guidelines Questionnaire Responses

1. Identify the agency or agencies with jurisdictional responsibilities for air quality related to oil and gas exploration and production and provide the information requested below.

a. **Statutory authority detailing powers and duties (10.2.1.2)**

The Colorado Air Pollution Prevention and Control Act, CRS Title 25 Article 7 outlines Colorado's statutory authority and directive related to air quality.

b. **Authority for oversight and ability to develop regulations to meet state obligations under federal law (10.2.1.3)**

The Colorado Air Quality Control Commission is responsible for promulgating a wide variety of regulations for the state. Responsibilities include, but are not limited to, the creation of State Implementation Plans (SIP) to attain and maintain the National Ambient Air Quality Standards (NAAQS) and prevent significant deterioration of air quality, emission control regulations, a prevention of significant deterioration program, and rules necessary to implement the provisions of the emission notice and construction permit programs as well as the minimum elements of a permit program provided in Title V of the federal act. Additional information regarding the duties of the Commission are described in CRS 25-7-105(1)(a)-(c), (12).

The Act gives the Commission broad authority to develop regulations to address air quality issues in Colorado. *See e.g.* CRS 25-7-105(1); 25-7-106(1) ("the Commission shall have maximum flexibility in developing an effective air quality program…"). In addition to these broad general grants of authority, the Act provides the Commission with specific authority to address the myriad of requirements necessary to effectively regulate air emissions in Colorado. *See* CRS 25-7-101 *et. seq.*

The Commission's authority to promulgate emission control regulations is detailed in CRS 25-7-109(2)-(3). Under this statute, emission control regulations may include, but are not limited to, regulations pertaining to nitrogen oxides, carbon oxides, hydrocarbons and odors. These regulations must include, but are not limited to, regulations pertaining to the storage and transfer of petroleum products and any other volatile organic compounds.

As detailed in CRS 25-7-111, the Colorado Air Pollution Control Division ("Division") administers and enforces the air quality control programs adopted by the Commission.

c. **Authority to promulgate more stringent than federal regulations as necessary to protect public health and the environment (10.2.1.4)**

Section 116 of the federal Clean Air Act allows states to adopt and enforce their own standards and limitations as long as they are equally stringent or more stringent than the federal standards or limitations. Under CRS 25-7-105.1 the Commission may promulgate standards or regulations that are more stringent and/or not required federally. However, any such provision, standard, or regulation adopted exclusively under state authority shall not constitute part of the state implementation plan.

d. Authority to accept delegation of federal air programs for oil and gas (10.2.1.5)

In 2000 and 2014, (65 Fed. Reg. 49919, 79 Fed. Reg. 60993) EPA authorized an automatic delegation process to implement and enforce the NSPS and NESHAP to Colorado.

e. Authority to consider cost effectiveness in setting standards and to exempt de minimus facilities or sources (10.2.1.6)

The CRS 25-7-109(1)(a), (b)(VII), specifies that the Commission must consider the economic, environmental, and energy costs of compliance with emission control regulations.

As stated in CRS 25-7-114.1, CRS 25-7-114.2, and CRS 25-7-114.6(1), the Commission may exempt specific classes of minor or insignificant sources of air pollution from air pollution emission notice and permitting requirements due to their negligible impact on air quality.

f. Statutes and regulations with clearly defined terminology (10.2.1.7)

Statutory Definitions are found at CRS 25-7-103.
Regulatory definitions are found throughout the regulatory documents including:

- Common Provisions Regulation Section I.G,
- Regulation Number 3 Stationary Source Permitting and Air Pollutant Emission Notice Requirements Part A, Section I.B,
- Regulation Number 7 Control of Ozone via Ozone Precursors and Control of Hydrocarbons via Oil and gas Emissions (Emissions of Volatile Organic Compounds and Nitrogen Oxides) Sections XII, XVII, and XVIII.

Additional state regulations may be reviewed online.

g. Adequacy of funding for staff and equipment to carry out duties and meet objectives (10.2.1.8)

The CRS 25-7-114.6(3) specifies that the general assembly shall direct the Commission to adjust its fees so that the revenues approximate the annual appropriations to the Division to carry out its duties with respect to stationary sources.

h. Mechanisms for coordination among stakeholders (10.2.1.9)

The Air Quality Control Commission involves stakeholders in the rule-making process as outlined in CRS 24-4-103(2). This includes making a public announcement and establishing a representative group of participants with an interest in the subject of the rule-making to submit views or otherwise participate informally in conferences on the proposals under consideration or to participate in the public rule-making proceedings on the proposed rules.

i. Technical criteria for air emission controls (10.2.1.10)

Per CRS 25-7-109(1)(b), the Commission must consider a variety of technical criteria in the formulation of emission control regulations, including but not limited to, federal and state policies regarding air pollution, recommendations and requirements, technical feasibility and economic reasonableness of control techniques, and whether an emission control regulation should be applied throughout the entire state or only within specified areas or zones. The Commission must include in a proposed rule-making packet an explanation of the proposed rule, including an economic impact analysis.

2. Provide reference to any oil and gas exploration and production related NAAQS non-attainment areas and related SIP approval status. (10.2.2)

In 2007, the Denver Metro North Front Range (DMNFR) was designated as "subpart 2 Marginal nonattainment" for the 1997 8-hour ozone standard. The DMNFR includes large portions of the Denver-Julesberg Basin oil and gas production area. Regulation of Colorado's oil and gas sector is largely housed in Colorado's Air Quality Control Commission's Regulation 7, establishing Reasonably Available Control Technology (RACT) to satisfy CAA Ozone RACT State Implementation Plan (SIP) requirements. Regulation 7, Sections I - VIII, XII, XV, and XVI contain SIP requirements for this sector, and particularly Section XII. Section XII requirements specific to condensate tank, glycol dehydration and gas plants were first adopted for inclusion into the SIP in 2004. Since then, this section has been revised in 2006, 2008, 2012, 2014 and 2017. These sections address VOC and NOx emissions. Most of these provisions are currently SIP approved by EPA. Colorado continues to work with EPA to work through technical and legal issues regarding specific language approval. Current EPA approved provisions of these sections can be found on EPA's website.

In 2012, the DMNFR was classified as subpart 2 Marginal nonattainment for the 2008 8-hour ozone standard. Subsequently, the Commission adopted State-Only oil and gas industry control measures in 2014.

In 2016, the DMNFR was reclassified as subpart 2 Moderate nonattainment for the 2008 8-hour ozone standard. Colorado is currently conducting a rulemaking to address Reasonably Available Control Technology recommendations in EPA's Control Techniques Guidelines for the Oil and Natural Gas Industry in Colorado's Ozone SIP. A hearing on this proposal is anticipated in October 2017.

3. Describe the level of federal delegation of air quality requirements related to oil and gas exploration and production. (10.2.2)

Colorado has the delegated authority to implement and enforce New Source Performance Standards (NSPS) and Maximum Achievable Control Technology (MACT). The Commission has adopted and incorporated by reference a number of oil and gas related NSPS and MACT including: NSPS OOOO, NSPS Kb, NSPS KKK, MACT HH and MACT HHH. The Commission has also incorporated by reference several federal NSPS and MACT standards covering equipment that is frequently used in exploration and production, such as NSPS IIII, NSPS JJJJ and MACT ZZZZ. For a complete list of MACT subparts adopted by reference see Regulation 8, Part E and for a complete list of NSPS adopted by reference see Regulation 6, Part A.

4. **Describe your permitting program and the process by which emissions are estimated during the permitting process. (10.2.3)**

Colorado is a SIP-approved state with authority from EPA to issue both minor source construction permits, major stationary source NSR permits and major source Title V Operating Permits to oil and gas industry sources. Most of the oil and gas sources in the state are minor sources.

Colorado's permitting programs are prescribed in Regulation 3. Part A contains emissions reporting requirements, Part B minor source construction permit requirements, Part C Title V Operating permit requirements and Part D Major Stationary Source New Source Review and Prevention of Significant Deterioration requirements. Various emissions reporting and permitting exemptions are afforded to the oil and gas sector as prescribed in Part A, Section II.D, Part B, Section II.D and Part C, Section II.E.

For new and modified minor sources, companies follow a well-defined application process as described on our website. In 2008 the minor source permitting process was refined through a "lean" (process improvement) event with industry members to ensure appropriate application material and guidance are provided to obtain complete and accurate information from companies upon initial submittal. One key element of this work was to complete an application completeness checklist and

create many new emissions reporting forms (e.g. Air Pollutant Emissions Notices, or APENs) for the unique emissions source types within this industry.

Colorado offers a number of different minor source preconstruction permitting options including both general permits and traditional construction permits. An operator may choose to use the streamlined general permit option if they meet all defined applicability requirements. Currently Colorado offers six general permits that may be used by the oil and gas industry for coverage of common emissions sources. These permits are designed to allow for commencement of construction and operation upon submittal of a complete application provided the operator complies with all terms and conditions of the permits and applicable state and federal regulations.

For permit actions, when defined criteria are met, companies are required to include an ambient air impact modeling analysis with the permit application to demonstrate the new or modified source will not cause or contribute to a violation of National Ambient Air Quality Standards (NAAQS). The criteria for when an ambient air impact analysis is required are contained in the Colorado Modeling Guideline for Air Quality Permits.

Emissions estimates and supporting documentation are supplied by the applicant and summarized on APENs for each emissions unit. Division staff review the information provided and QA/QC the data to ensure its accuracy. Various methods of estimating emissions may be used when applying for a permit. For the oil and gas industry the most typical approaches include using emissions factor data or site specific data coupled with a software model (e.g. GlyCalc, EPA Tanks, etc.) or process simulation software (e.g. Promax, E&P Tanks 3.0). Colorado has established a provision in Regulation 3 which allows for the drilling and commencement of operation of exploration and production facilities (e.g. well pads) prior to submittal of a permit application so that site specific production and emissions data may be gathered to support accurate emissions inventory data submittals with the initial application. This helps to ensure that accurate regulatory determinations are made based on actual emissions. During the maximum 90 day evaluation period, companies are required to control the primary sources of emissions at storage tanks per Regulation 7, Section XVII.C.1.c.(i) to provide assurance that regulatory thresholds are not exceeded.

5. Describe your compliance monitoring, demonstration and assurance program, including the information requested below. (10.2.4)

a. Procedures for receipt, evaluation, retention and investigation of notices and reports (10.2.4.1)

The Division has one full time employee (FTE) responsible for initial handling and data entry for all reports submitted to the Division by the regulated community. Minimal details (e.g. type of report, date received) are entered into the Division's compliance & enforcement database, CACTIS. The reports are

then provided to a field inspector who's responsible for reviewing the reports in more detail and entering additional details into CACTIS regarding the report. If there are compliance issues identified in the report, the reviewer will notify the assigned inspector for the facility so they are aware of the issues and in case follow-up needs to be prioritized. During compliance inspections, these reports will be reviewed by the facility inspector in great detail and any compliance issues addressed as part of the overall inspection.

All reports received by the Division are retained in Division files, most of which are now maintained in electronic format in the Division's electronic file systems, RM8. The Department and Division have a record retention policy. For source-submitted reports, the records are maintained for 15-30 years, depending on the type of report, before purging.

b. Inspection and monitoring procedures that are independent of information supplied by the regulated entity (10.2.4.2)

The Division's compliance monitoring teams include the Compliance Monitoring Unit and the Oil and Gas Unit. These teams conduct a variety of compliance monitoring and enforcement activities, as outlined in more detail below. In 2006, the Division created the Oil and Gas Unit to address several objectives related to the increased oil and gas activity in the state. These objectives include the following: addressing permitting issues for oil and gas operations; maintaining effective compliance and inspection procedures and schedules; and allowing for innovative planning and program development as well as facilitating better collaboration and coordination with other states, Federal Land Managers, EPA, regulated industry, local government and stakeholders. The Division's Compliance Monitoring Unit and Oil and Gas Unit work together to maintain a unified compliance monitoring and enforcement strategy for the state.

Inspecting sources of air pollution is one of the primary tools that the Division uses to determine a stationary source's compliance status. Inspections also serve to bring sources into compliance and help ensure that sources remain in compliance with air pollution regulations. As inspections are very resource intensive, the Division strives to efficiently and effectively plan and conduct inspections to assure maximum compliance.

The Oil and Gas Unit conducts several types of inspections, including full compliance evaluations, partial compliance evaluations, infrared camera (IR Camera) inspections, and complaint investigations. In addition, as part of compliance oversight activities for the Oil & Gas industry, the compliance teams review source-submitted reports (e.g. malfunction reports, Title V reports, NSPS, MACT and Regulation No. 7 reports), observe & review results of EPA reference method compliance tests, review & approve compliance plans, and review documentation regarding self-certification for construction permit

requirements. Additionally the Division conducts unannounced reciprocating internal combustion engine testing using portable monitoring equipment.

c. Procedures for receipt and evaluation of information submitted by the public (10.2.4.3)

Complaints received from the general public are investigated by field inspection staff at the Division. Investigations may include contacting the source, surveillance, a partial compliance evaluation focused on the specific issue raised in the complaint, or a full compliance evaluation. Those sources found to be out of compliance are handled through the Division's standard enforcement procedures.

d. Authority to conduct unannounced inspections and inspect, sample, monitor or otherwise determine compliance (10.2.4.4)

CRS 25-7-111 describes the Division's authority to conduct inspections, sample and monitor air, and otherwise determine compliance with regulations. The statute specifies that Division personnel may enter and inspect any property, premises, or place for the purpose of investigating any actual, suspected, or potential source of air pollution or ascertaining compliance or noncompliance with any requirement, regulation or permit. The statue further states that the Division may, at reasonable times, have access to and copy any record, inspect any monitoring equipment or method, or sample any emissions required pursuant to this statute. If entry is denied and it is not an emergency situation, the Division may obtain a warrant to enter and inspect the property from the district or county court in which the property is located.

e. Authority to copy or obtain records (10.2.4.5)

C.R.S. 25-7-111(2)(c) specifies the Division's authority to copy or obtain records.

f. Procedures to ensure that documents and evidence are managed in a manner that will permit their use during enforcement proceedings (10.2.4.6)

The Division maintains records and reports submitted by a source consistent with the records retention policy. For records submitted during the inspection, the records are maintained for 40 years. Any observations or photographs taken during the inspection that may document a violation would be retained for 40 years as well. Source submitted reports are maintained for 15-30 years depending on the type of record.

Inspection reports are written by inspectors and include detailed information about the source, observations made during the inspection, and compliance determinations (with supporting explanations and referencing records/documentation) for each permit condition and applicable requirement.

Under the records retention policy, inspection reports are maintained for 40 years.

g. Authority to require stack testing to establish or verify compliance (10.2.4.7)

CRS 25-7-111(2)(c) and (i) gives the Division the authority to collect data, including stack test data. These data may be collected by the Division, individual stationary sources, or indirect air pollution sources.

The Air Quality Control Commission's Common Provisions Regulation, Section II.C., details requirements for performance testing, which includes stack testing, to demonstrate compliance with applicable emission control regulations. At the request of the Division, the owner or operator of any pollution source must conduct performance test(s) and provide the test results to the Division. Performance tests must be completed in accordance with the applicable reference test methods unless the Division specifies or approves a different test. Similarly, performance tests must be conducted under the conditions specified by the Division based on representative performance of the facility. The owner or operator must provide the Division with the necessary records to determine the conditions of the performance test(s) and will notify the Division thirty days prior to the performance test so that the Division may observe the test. Each performance test must consist of at least three separate runs using the applicable test method and be conducted for the time and under the conditions specified in the applicable standard.

The AQCC Regulation No.3, Part B, Section III.G.3 specifies that before final permit approval is granted, the Division may require the applicant to conduct and pay for performance tests in accordance with methods approved by the Division. In this instance, a test protocol must be submitted to the Division for review and approval at least thirty days prior to testing. The Division may monitor the tests and may, at its expense, conduct its own performance tests.

h. Authority to establish requirements for recordkeeping, reporting, sampling, stack testing, and compliance certification. (10.2.4.8)

The Commission has the authority to promulgate regulations requiring sources to establish and maintain records, install use and maintain monitoring equipment and record monitor and sample emissions. CRS 25-7-106(6). The Division has broad authority under the Act to require sources to provide information related to their air emissions. CRS 25-7-111(2)(i).

The AQCC Common Provisions Regulation, Section II.B, specifies that the Division has the authority to require owners or operators of stationary air pollution sources to install, maintain, and use instrumentation to monitor and record emission data as a basis for periodic reports to the Division.

The AQCC Regulation No.3, Part B, Section III.E specifies that the Division can include any term or condition in a permit that it deems necessary which provides the authority to include recording keeping requirements in permits to demonstrate compliance. For major source Operating Permits Regulation 3, Part C, Section V.C.4-6 explicitly outline the requirements for recordkeeping and sampling while Section V.C.7 outlines reporting and V.C.16 outlines compliance certification requirements. For minor sources Regulation 3, Part B, Section III.G.2 states that sources must demonstrate compliance with the terms and conditions of the initial approval construction permit within 180 calendar days of operation commencement. The Division may also inspect the source to determine whether or not the operating terms and conditions of the initial approval construction permit have been satisfied.

6. Describe your enforcement program, including the available enforcement tools and the relative frequency of their use. (10.2.5.1)

The Division utilizes a variety of enforcement tools to address compliance issues discovered for a particular facility, including informal and formal enforcement processes. The Division typically uses the informal process for minor compliance issues which have already been corrected by the source and which were addressed directly by a field inspector. The informal process can result in either a verbal warning or a warning letter issued by the inspector.

The Division may initiate the formal enforcement process by sending the source an initiating document (e.g. Compliance Advisory, Notice of Violation, or Immediate Notice of Violation). The document includes a request for a written source response as well as a request for a meeting to discuss the alleged violations. After consideration of the information provided by the source in the source response and/or meeting, the Division makes a final determination of what, if any, violations occurred. The Division then works to resolve the enforcement action through a settlement agreement which both parties sign. In order to reach a mutual agreement, the parties must agree on the violation(s), what it will take for the source to return to compliance, and any penalties that may be appropriate. The final agreement is documented in one of two documents, an Early Settlement Agreement or a Compliance Order on Consent.

If the parties can't reach agreement, the Division may issue a unilateral Compliance Order. The Compliance Order is a formal document ordering the source to comply with specific regulatory requirements and may also assess a penalty. The State Air Quality Control Act allows sources to appeal Compliance Orders to the Air Quality Control Commission with further appeal available in court. Civil penalties are assessed to sources violating Compliance Orders and non-compliance penalties are assessed to sources for violations per the Federal Clean Air Act and CRS 25-7-122. The Division is involved throughout the enforcement process including conducting conferences, preparing testimony, and in negotiation of settlements.

For additional information and detail, please see the Division's Compliance Assistance and Enforcement Guide.

7. Provide any penalty calculation guidance in use in your program. (10.2.5.2)

With a few exceptions (e.g. open burning violations, APEN violations), the Division has the authority to assess up to $15,000 per violation per day of violation. The Division calculates penalties according to the CRS 25-7-122 which provides the authority for penalties and specifies the factors that shall be considered.

According the CRS 25-7-122, a number of factors should be considered when determining the amount of a civil penalty including:

- The violator's compliance history;
- Good-faith efforts on behalf of the violator to comply;
- Payment by the violator of penalties previously assessed for the same violation;
- Duration of the violation;
- Economic benefit of non-compliance to the violator;
- Impact on, or threat to, the public health or welfare or the environment as a result of the violation;
- Malfeasance; and
- Whether legal and factual theories were advanced for purposes of delay.

In addition to the above factors, the following circumstances shall be considered as grounds for reducing or eliminating civil penalties:

- The voluntary and complete disclosure by the violator of such violation in a timely fashion after discovery of the non-compliance;
- Full and prompt cooperation by the violator following disclosure of the violation including, when appropriate, entering into a legally enforceable commitment to undertake compliance and remedial efforts;
- The existence and scope of a regularized and comprehensive environmental compliance program or an environmental audit program;
- Substantial economic impact of a penalty on the violator;
- Nonfeasance; and
- Other mitigating factors.

The Division has the discretion to defer or suspend civil penalties if deemed appropriate based on consideration of the above factors. Also, in certain cases, the Division is required to consider and collect any economic benefit obtained by the source as a result of the violation. In these cases, a separate and additional "non-compliance penalty" is included in the final order.

8. Describe the appeal or review rights afforded to persons aggrieved by an action of the agency. (10.2.5.3)

C.R.S. Section 25-7-115(4)(a)(I) provides that within 20 days after receipt of a Compliance Order, a Source may appeal the Order by filing a written petition with the AQCC. Hearings before the AQCC are governed by the AQCC Procedural Rules located at 5 CCR 1001-1. Final decisions of the AQCC may also be appealed to the courts.

9. Describe your staffing patterns, training opportunities provided to staff, and methods used to assess and retain staff. (10.2.6)

Colorado has a team of staff dedicated to permitting and inspection of oil and gas industry sources. This team is located within the Stationary Sources Program. This team is managed by a section supervisor and comprised of four work units each with a dedicated supervisor. Two work units are dedicated to field inspection and two work units to permitting. One staff member of the inspection units is a work lead that oversees the implementation of our infrared (IR) camera inspection and monitoring program. The allocation of FTE includes the Oil and Gas Team supervisor, 13 field inspection staff (including 2 supervisors) and 14.5 permitting staff (including 2 supervisors).

The supervisors of the oil and gas team are dedicated to the professional development of their team members. When new employees are on boarded they are typically assigned a mentor who is another more senior staff member on the team. The mentor serves as a resource, along with the supervisor to help train the new staff and answer questions. In addition, supervisors have outlined a range of critical subject matters that are the standard lessons to teach to the staff to build their capacity to complete oil and gas facility field inspection and permitting work. These topics are typically taught to the staff by other team subject matter experts. A full range of technical topics are covered related to emission source operations and control technologies as well as state and federal oil and gas regulatory requirements.

New staff will also shadow their team members while they are reviewing permit applications or completing field inspections to get hands on observation of the work practices and field work. In addition, the Division provides opportunities for staff to seek formal trainings and certifications through organizations like WESTAR, EPA conferences, Air and Waste Management Association and the state's Department of Personnel and Administration (DPA). The DPA trainings tend to focus on leadership and management and soft skills while other trainings offer opportunities to learn about oil and gas industry operational and emissions control practices. Permit writers have frequently been sent to training such as the Fundamentals of Natural Gas Processing short course offered at the Colorado School of Mines. In addition, the Division has committed resources to make private-party leadership training available to staff.

Staff on the oil and gas team meet monthly with their supervisors for informal meetings to assess progress on their work and professional development. In addition, formal reviews are completed on a semiannual and annual basis as required by the state performance review process. Supervisors are encouraged to track and recommend promotions for their team members when knowledge, skills and performance warrant the promotion. Staff members have been placed in team work lead positions as they develop leadership and technical skills.

In addition the Division provides a strong work life balance to their staff members to encourage retention. This includes flexible work schedules (e.g. flextime and telecommute options) as well as Wellness programs.

The Oil and Gas Team works closely with our sister agency the Colorado Oil and Gas Conservation Commission (COGCC) located within the Department of Natural Resources. The primary mission of the COGCC is to foster the responsible development of Colorado's oil and gas natural resources including efficient exploration and production of oil and gas resources and prevention of waste while mitigating adverse environmental impacts and protecting public health, safety and welfare. CDPHE's primary mission is to protect and improve the health of Colorado's people and the quality of its environment. CDPHE employs an oil and gas liaison who assists with coordination of environmental and public health protection activities, including citizen complaint responses, which overlap between our two agencies. In addition, CDPHE launched the Oil and Gas Health Information and Response Program (OGHIR) in fall 2015 with the goal to provide state-level technical expertise and centralized response to concerns by citizens and other stakeholders related to the health effects from oil and gas development.

The OGHIR is an important part of Colorado's commitment to public health protection and responding to citizen concerns. The program published a summary report to the state legislature describing key elements of this program that is available online.

10. Describe your data management program, including access to data systems in other programs containing inventories of facilities, and describe how information is made available to the public. (10.2.7)

The Air Pollution Control Division maintains a number of unique database systems designed specifically for managing and tracking our permitting and compliance monitoring work, emissions inventory data and records. The primary data management programs are described below:

Permit Tracking System (PTS) – this database is primarily used for tracking facility information including emissions points, permit numbers associated with facilities and permit applications. This system is used to track permits from application receipt to permit issuance. The system is used to track all critical dates and

information in the permitting process is used to develop reports that track employee productivity.

Colorado Air Compliance and Tracking System (CACTIS) – this database supports the primary compliance and enforcement functions performed by Division staff. It provides a complete view of the source's compliance history, current status and scheduled activities. The information in this database is used to report to Federal EPA systems.

Colorado Air Inventory System (CAIS) – this database is used to maintain air emissions inventories for plants, emissions points and processes. The information in this system is used to generate annual bills based on the tonnage of pollutants emitted by sources. This system is also used to generate emissions data for regulatory development and State Implementation Planning (SIP) activities.

Records Manager 8 (RM8) – this software is the Division's digital records management system which contains all records related to permits, inspection reports and emissions data. Integrated into this system is an application called Web Drawer which is a web-based platform that enables external entities to search for and download digital copies of records for review.

11. Describe any public involvement provisions that are part of your program. (10.2.8)

Colorado Regulation 3 provides opportunity for a public comment process on draft minor source permits when specific criteria are met for the project. These provisions may be reviewed in Regulation 3, Part B, Section III.C. In addition, Regulation 3 requires a public comment process and opportunity to request a hearing in front of the Air Quality Control Commission for sources obtaining a major source Title V Operating Permit. These provisions may be reviewed in Regulation 3, Part C, Section VI.B.

When the Division develops general permits Regulation 3, Part B, Section III.I.7 requires the draft permit undergo a statewide public notice and comment process. Through this public comment process, interested parties may provide input for the Division to consider regarding the proposed terms and conditions of the general permit.

In addition, the Division proactively communicates on oil and gas air quality matters through the use of an email list by which interested citizens may sign up to receive information from the Division. The Division regularly e-mails out oil and gas related information, such as guidance documents, updated forms and notices of rule makings to parties signed up to this list. This is an intentional effort to keep people informed and offer opportunity for further engagement with the Division.

The Division's Oil and Gas Health Information Response (OGHIR) program maintains an e-mail address (cdphe_oghealth@state.co.us) and phone line (303-

389-1687) dedicated to receiving comments or concerns from citizens regarding oil and gas development. Since implementation of this phone line and email address the Division has received and responded to over 300 complaints through this program. The public also has the ability to obtain public health information and ask questions through the OGHIR website.

12. Describe any outreach efforts of your program. (10.2.9)

The Department provides presentations to local governments, partner organizations such as the Regional Air Quality Council, citizen oil and gas advisory groups, and local governmental designees on our role in regulating and permitting oil and gas operations. These presentations included extensive discussion on air quality regulations, ambient air quality monitoring and the Department's Oil and Gas Health Information and Response program, which handles concerns about odors and health risks.

When presenting information on air quality regulations and ambient air quality to the public, the Department makes every effort to provide examples of the permitting requirements in non-scientific terms. Presenting to an oil and gas advisory group normally requires a more technical discussion and the Department's technical experts attend those meetings to assist with any questions. The Colorado Oil and Gas Conservation Commission (COGCC) within the Department of Natural Resources established the local governmental designee program which allows local governments to receive notice of drilling applications. This program also provides a channel through which local governments can provide comments to the COGCC from citizens and local officials.

The Department organizes and hosts training sessions for local governmental designees throughout Colorado to increase their knowledge of air quality regulations so that they can better communicate them with their citizens. There are numerous points of contact within the Department to address citizen questions and concerns along with a clearinghouse with links to information, articles and studies on all aspects of oil and gas operations including air quality concerns. The clearinghouse is contained on the Department's Oil and Gas Health Information and Response program website (links previously referenced).

The Department's Oil and Gas Health Information and Response program also operates a telephone line and website to address odor complaints and health concerns from oil and gas operations. Citizens call or visit the website to leave contact information for an odor or health concern and receive a return phone call from a public health professional. Air quality sampling may also occur and the results of the sampling and the potential health impacts are explained in a report that is posted to the Department's website.

In addition to the outreach described above, the Department works closely with the regulated community and strives to ensure clear understanding of regulatory requirements related to oil and gas development. The APCD Oil and Gas team

hosts several workshops on an annual basis that operators, citizens, public officials and media are welcome to attend. These include local health agency trainings, a small operator workshop, a site inspection field day and regular (typically annual) update presentations to the Air Quality Control Commission and the public. Common goals of these trainings and presentations are to provide transparency and understanding of oil and gas regulatory requirements and update the Commission on progress made through oil and gas regulations previously adopted. Further, the Division coordinates regular meetings with industry associations such as the Colorado Oil and Gas Association (COGA) to communicate on important and emerging air quality issues and receive feedback on how the state program is working for operators.

An additional important component of the Department's outreach is the development of FAQ documents and guidance memos specifically related to the implementation of oil and gas air quality regulations and the permitting program. The Oil and Gas team has been diligent developing materials to build the knowledge of citizens and the regulated community.

13. Describe your strategic and resource planning processes. (10.2.10)

The Division includes a Planning and Policy program that continually assesses Colorado's air quality needs and develops strategies to meet these needs. The Planning and Policy program works closely with other programs within the Division, including the oil and gas team, to evaluate potential air quality issues and identify both regulatory and non-regulatory solutions. As part of this process, the Division works closely with the regulated community, local governments and the environmental groups. In the DMNFR the Division also works closely with the Regional Air Quality Council ("RAQC") to analyze potential strategies to address high ambient air ozone levels, including strategies associated with the oil and gas sector, other industrial sources, area sources and the transportation sector.

In addition to self-directed strategic planning processes, the Division monitors upcoming federal regulatory actions that may impact both existing resource allocation and the need for new resources to support air quality protection work related to oil and natural gas production in Colorado. Major activities such as State Implementation Plan (SIP) revisions to address the ozone nonattainment area or requests from the state's Air Quality Control Commission or Governor's office to address specific air quality concerns are key triggers to revisit resource planning.

The Division routinely meets with the Colorado Oil and Gas Association (COGA) industry trade group to maintain an active understanding of the trends in oil and gas development activities. These meetings help the Division stay apprised of future cycles in the industry that may impact Division workload. Additional tracking of key indicators such as the number of O&G permit applications received each month help the Division actively plan for and ensure that appropriate staffing is available to manage the work. This is particularly important due to the nature of permit

applications being directly impacted by market conditions and associated industry investments.

Annually the Oil and Gas team inspection unit supervisors develop a compliance monitoring strategy (CMS) which formalizes our commitments to EPA in accordance published guidance. These planning efforts involve targeting specific oil and gas facilities, in part, based on the size and significance of emissions. In addition, the Division actively monitors the frequency of annual inspections to meet goals on the cycle time between inspections. As part of our CMS planning the oil and gas team implements a robust infrared camera inspection program of facilities. These partial compliance inspections are focused on identifying emissions that may be eliminated through routine maintenance or updates to design and operations practices. Through this CMS inspection planning process, the Division thoughtfully considers available staff resources and how to effectively apply them in the coming year to complete oil and gas industry inspections. The Division routinely receives accolades from EPA Region 8 regarding our compliance monitoring work.

14. **Describe your inventories of oil and gas exploration and production sources and activities. (10.3.1)**

As required in Regulation 3, Part A, Section II.B.3 Colorado implements one of the lowest emissions inventory reporting thresholds in the nation. Each oil and gas emissions point with uncontrolled actual emissions of a criteria pollutant (Part A, Section I.B.17) greater than 1 ton per year (in a non-attainment area) and 2 tons per year (in an attainment area) is required to file an air pollutant emissions notice (APEN) with the Division. In addition, emissions points with greater than 250 pounds of a non-criteria reportable air pollutant (e.g. hazardous air pollutant, see Part A, Section I.B.30) must be reported. These low thresholds for emissions reporting results in a robust inventory of oil and gas emissions sources in the state of Colorado. Sources with emissions lower than these thresholds are considered de minimus and therefore exempt from emissions reporting. In addition, the Air Quality Control Commission has adopted categorical emission reporting exemptions under Regulation 3, Part A, Section II.D.1. Operators are required to update their emissions inventories according to the schedule and requirements outlined in Regulation 3, Part A, Section II.C.

For ozone planning purposes, the Division developed an inventory that is specific to the ozone nonattainment area. The Division coordinated closely with the RAQC and exchanged data with oil and gas operators to develop and refine this inventory.

Common emissions sources captured in the Division's oil and gas inventory include: storage tanks (condensate, crude, produced water), glycol dehydrators, amine units, fugitive component leaks, hydrocarbon loading to tanker trucks, pneumatic pumps, reciprocating internal combustion engines (natural gas and diesel), gas-liquid separator venting, turbines, produced water evaporation ponds, process heaters, flares and maintenance activities including pigging and

blowdowns. The Division provides emissions inventory reporting forms for these sources online.

The Division uses the emissions information provided by sources, in conjunction with additional data, to produce a public facing Colorado Air Pollutant Emissions Inventory. This online tool allows the public to view the amount of criteria emissions being released by county, broken down into eleven source categories including oil and gas point sources, oil and gas area sources and condensate tanks.

15. **Describe how the air program addresses the reporting and correction of unplanned and episodic emissions. (10.3.2)**

The Division requires sources to report, respond to, minimize and prevent unplanned and episodic emissions. The most common types of these events are excess emissions due to startup and shutdown or excess emissions due to malfunction. Under the Common Provisions Regulation, sources have the opportunity to claim an affirmative defense from penalties for violations/excess emissions due to start up, shutdown or malfunction, if the reporting requirements and all circumstantial requirements of the affirmative defense provisions are met.

When a source reports excess emissions due to start up, shutdown or malfunction, the initial report is logged into the Division's CACTIS database and the assigned inspector is notified of the event. Depending on the circumstances reported, the inspector may contact the source immediately regarding the event to better understand the issue(s), the potential duration, and what the source is doing to minimize emissions. The source must also submit a more detailed report regarding the event to demonstrate that all of the criteria of the affirmative defense provisions (e.g. emissions were caused by a sudden, unavoidable breakdown of equipment, event could not have been reasonably prevented, emissions were minimized) were met. The assigned inspector will review the details and information provided by the source during the compliance evaluation. Based on their evaluation, the inspector will recommend providing the source with the affirmative defense from penalties or recommend enforcement for the violations arising from the event.

More detailed information and malfunction reporting guidance is available on the Division's website.

Sources may also be required to report these unplanned or episodic emissions under federal regulations (e.g. NSPS or MACT).

Sources are also required to report their actual emissions under AQCC Regulation No. 3, Part A. Under these provisions, sources must report their actual emissions at least every five years or more frequently when certain criteria are met (e.g. increase in emissions, transfer of ownership). If actual emissions exceed previously reported emissions by a certain amount, the source must submit an updated APEN to the Division for that calendar year's emissions. The specific language can be found in AQCC Regulation No. 3, Part A, Section II.A. and Section II.C.

16. **Describe how the air program interfaces with the oil and gas conservation program on wasted gas from venting and flaring. (10.3.2)**

The Department's Air Pollution Control Division works closely with staff at the Department of Natural Resources Oil and Gas Conservation Commission (COGCC). Both agencies have adopted requirements to minimize venting and flaring activities related to drilling and well completion activities.

The COGCC maintains well completion requirements under Series 800.b.(3) regulations that promote resource preservation through "green completion" practices to minimize venting and flaring.

The State of Colorado has adopted by reference into Regulation 6, Part A, federal requirements under New Source Performance Standard (NSPS) Subpart OOOO for Oil and Natural Gas Sector: Emission Standards for New, Reconstructed, and Modified Sources which also include requirements to implement reduced emissions completion practices during the initial and separation stages of gas well flowback. These practices are also intended to minimize venting and flaring of natural gas.

Colorado has been a national leader in the development of air quality and public health protection plans related to oil and natural gas development activity. In February 2014 Colorado was the first state in the nation to adopt monitoring and repair requirements (aka LDAR) for fugitive component equipment leaks at well production facilities and natural gas compressor stations (Regulation 7, Section XVII.F) that target both volatile organic compound (VOC) and methane emissions (e.g. hydrocarbon emissions). In addition, operators are required to implement best management practices to minimize hydrocarbon emissions from venting during well maintenance and liquids unloading events (Regulation 7, Section XVII.H). Further, Colorado adopted new requirements to capture gas coming off of production separators (Regulation 7, Section XVII.G) and implemented requirements for the use of low bleed and no bleed pneumatic controllers in certain circumstances (Regulation 7, Section XVIII).

Many of the requirements adopted in Colorado Regulation 7 were predicated on the need to address emerging rapid development of oil and gas resources in the Denver-Julesburg basin which is located inside the ozone non-attainment area. Colorado has been diligent in developing emissions control requirements that go above and beyond many states. In addition, Colorado's regulations have become, in many examples, the basis for national regulations adopted by EPA such as NSPS OOOO/OOOOa.

17. **Describe your air quality monitoring network as it relates to oil and gas exploration and production activities. Including the following. (10.3.3)**

a. The number and location of monitors and frequency of monitoring.

For specific monitoring related to oil and gas development, the Division has one fixed site that monitors for "ozone precursors." This includes the PAMS list of non-methane organic compounds, plus methane, using whole air "Summa" canisters and carbonyls using DNPH cartridges. Monitoring is conducted on an every 6th day schedule (following the EPA national schedule) for 3-hours, from 6 - 9 a.m. This site is located in Platteville, Colorado, in the middle of the Denver-Julesburg oil and natural gas basin. The Division also has an equivalent site in Downtown Denver to look at the urban mix of compounds.

The Division has a mobile response trailer to respond to oil and gas complaints. This trailer is outfitted with a GC/MS for organic compounds as well as monitors for methane, particulates, ozone, carbon monoxide, nitrogen oxides, hydrogen sulfide, ammonia and meteorology. The trailer can operate unattended for a few days at a time, with GC/MS results being reported every hour and all other samples being continuous/hourly averages. As needed, odor plume and activity-specific grab samples have also been collected and analyzed. To date, complaint response has focused on odors related to oil and gas drilling activities, but will expand in the future to other activities.

While not Division sampling, Garfield County (in Western Colorado) also operates a network of 5 locations that are related to oil and gas development in the Piceance Basin. The sites in Western Colorado near Rifle and Battlement Mesa sample for the PAMS list of non-methane organic compounds using whole air "Summa" canisters and carbonyls using DNPH cartridges. Non-methane organic sampling is conducted on an every 6th day schedule (following the EPA national schedule) for 24-hours and carbonyl sampling is conducted every 12th day for 24-hours.

b. Ambient air quality monitoring

Beyond the oil and gas-related "ozone precursor" monitoring, the Division has an extensive network of ambient air quality monitors in Colorado, particularly in the North Front Range area which is designated as a non-attainment area for ozone. This monitoring is primarily focused on EPA's "Criteria" pollutants and meteorological parameters, plus a few PM2.5 "chemical speciation network" monitoring sites. Colorado currently has 22 ozone monitors located throughout the state as well as numerous other monitors for other criteria pollutants. Colorado's monitoring network meets or exceeds EPA standards for all of the criteria pollutants.

In addition, a number of other agencies perform ambient air quality monitoring in Colorado, primarily for ozone, plus a few nitrogen oxides monitors. These include EPA, NPS, BLM, USFS, Southern Ute Indian Tribe, Garfield County, and the City of Aspen.

The Division is coordinating with EPA, academic researchers and others to improve air quality monitoring techniques. The Division has participated in the Department of Energy's APRA-e initiative to improve methane monitoring. These efforts are

intended to help develop smaller, lower cost monitors and are not used for regulatory purposes.

c. **Sharing with the public the air quality data from the monitoring network.**

All continuous data from Division ambient air monitoring sites are posted hourly to a website for public viewing and for use in forecasting.

Once data are quality assured, they are uploaded to EPA's Air Quality System (AQS) database. Filter-based particulate data are uploaded to AQS after results have been received from the gravimetric laboratory and quality assured.

For the Division's oil and gas-related "ozone precursor" monitoring, the data are uploaded to AQS after lab analysis. The data are also compiled into Excel files for dissemination to the public/other agencies on request as an easier format than AQS.

For the Division's mobile response trailer, data are compiled into Excel files, which are provided to the Department's Disease Control and Environmental Epidemiology Division's Oil and Gas Health Information Response program, who perform risk analyses with the data and develop summary reports. These summary reports are then posted on a Department website for public access. Data from the as-needed grab samples are also compiled into Excel files.

18. **Describe the reporting, emissions inventory and recordkeeping requirements applicable to various oil and gas activities. (10.3.4)**

Oil and gas sources are subject to various reporting requirements contained in state regulation. For example, Regulation 7 requires specific semi-annual and annual compliance reports to be submitted for condensate storage tank emissions controls (Regulation 7, Section XII.F.4), glycol dehydrator emissions controls (Regulation 7, Section XII.H.6) and leak detection and repair activities (Regulation 7, Section XVII.F.9). In addition, federal NSPS and MACT typically require initial notification and compliance reports which are submitted to the Division through our delegation for those rules. Oil and gas sources with Title V Operating permits are required to submit semi-annual monitoring and deviation reports and annual compliance reports.

Oil and Gas emissions inventory requirements are described in response to question #14.

Recordkeeping requirements are prescribed through both federal and state regulations and within permit conditions issued by the Division. Depending on the specific facility, process or pollutant various records are required within permits to demonstrate compliance with terms and conditions. Typical records include oil and gas production volumes, volumes of gas combusted, and monitoring data of parameters indicative of proper operation of emissions control equipment (e.g. presence of pilot lights, temperatures and pressure drop across a catalyst, etc.). In

addition, operators are required to maintain records of emissions calculations for criteria and hazardous air pollutants emitted. In some cases these emissions estimates are based on emissions factors and recorded process data and other times the estimates are based on software models (e.g. GRI GlyCALC, E&P Tanks, ProMax, etc). Permits are the primary mechanism to enforce the maintenance of records related to actual emissions from oil and gas sources. While the Division issues many traditional construction permits (i.e. facility specific), the Division also makes available the following general permits for condensate storage tanks (GP01), natural gas fired engines (GP02), produced water tanks (GP05), diesel fueled engines (GP06), hydrocarbon liquid loading operations (GP07) and condensate, crude oil and produced water storage tanks (GP08). These permits may be reviewed to see addition details on recordkeeping requirements.

19. **Describe the oil and gas emission tools used in determining sources to be reported to EPA every three years. (10.3.4)**

The Division generally uses refined methods for estimating state oil and gas emissions due to the availability of more accurate site-specific data from O&G producers. Therefore, the Division does not use the EPA Oil & Gas Emission Estimation Tool. In the 2011 National Emissions Inventory (NEI), Colorado used data from the 2011 3-State Study, a project done by Ramboll ENVIRON for the Western Regional Air Partnership (WRAP) that included emissions estimates for non-condensate tank well-pad sources. These oil and gas emissions were grown from 2006 survey-based data acquired for the WRAP. The 2011 oil and gas inventory for the mid-stream sources such as compressor stations and natural gas processing facilities was based on data reported by operators via Air Pollutant Emissions Notices (APEN) and included in the CAIS inventory database as point sources.

In the process of developing a base and future year emission inventory for the recent Denver Metro/North Front Range Moderate area Ozone SIP, the Division obtained detailed oil and gas emission data from the top oil and gas producers in the Denver-Julesburg Basin. The data were specifically used to inform the development of the 2014 NEI for O&G emissions associated with condensate tanks and other nonpoint sources reported to EPA. For other O&G point sources, the Division uses information from our emissions inventory (CAIS) data system.

20. **Describe methods you are using to develop air quality emission projections related to oil and gas, and methods used in making the information available to the public. (10.3.4)**

The Division projects O&G emissions for purposes of developing State Implementation Plans, such as Regional Haze and the Denver Metro/North Front Range Ozone NAA. Generally, the future year O&G emission estimates are made from base year data that is adjusted using an extrapolation of historical trend data of oil and gas production and well counts reported to the Colorado Oil and Gas Conservation Commission (COGCC). In the specific situation of the ozone NAA,

the Division developed a future year (2017) oil and gas emission inventory by obtaining estimates from five of the top six producers in the DJ Basin to determine oil production growth in the ozone NAA, and used that growth to project emissions to the rest of the producers in the NAA. The Division assumed no growth in the rest of the State.

The most recent oil and gas inventory developed with the Regional Air Quality Council may be obtained online and is made routinely available through public meetings.

21. Describe the criteria used for the reporting of significant releases to the air, and required emergency response reports and actions. (10.3.5)

See the response to question #15 above.

In addition to the response in question #15, sources that have a Title V Operating Permit are also required to report emergency incidents resulting in non-compliance with any technology-based emission limitation under the permit due to unavoidable increases in emissions attributable to the emergency. (See AQCC Regulation No. 3, Part C, Section VII.)

For excess emissions caused by a malfunction the company must notify the Division verbally as soon as possible and no later than noon of our next working day. In order for the excess emissions to obtain an affirmative defense the circumstances must meet the following criteria (see Valid Upset Determination Policy), among others:

- The excess emissions were caused by a sudden, unavoidable breakdown of equipment, or a sudden, unavoidable failure of a process to operate in the normal or usual manner, beyond the reasonable control of the owner or operator;
- The excess emissions did not stem from any activity or event that could have reasonably been foreseen and avoided, or planned for, and could not have been avoided by better operation and maintenance practices;
- Repairs were made as expeditiously as possible when the applicable emission limitations were being exceeded.
- The amount and duration of the excess emissions (including any bypass) were minimized to the maximum extent practicable during periods of such emissions;
- All Reasonably possible steps were taken to minimize the impact of the excess emissions on ambient air quality;
- All Reasonably possible steps were taken to minimize the impact of the excess emissions on ambient air quality;

The Division and local emergency response agencies are also notified of releases to the air if the release exceeds certain criteria under EPCRA regulations. These regulations require notification of the excess emissions if they exceed the

Reportable Quantity (RQ) for that pollutant in a 24 hour period. In these circumstances, the Department is notified and this notification is then shared with the Air Pollution Control Division for follow-up. These notifications typically provide the same information that is included in a startup/shutdown or malfunction report. As such, there is often duplication in reporting.

22. Describe your long-term planning, prioritization and evaluation process. (10.3.6)

The Division's long-term planning process is informed by the requirements of the Clean Air Act, EPA regulatory actions, State Legislature, Governor's Office, other court actions and the associated regulatory deadlines. Prioritization of organization activities and the evaluation process is based on the whether the requirement necessitates regulatory changes, the amount of time available to implement, level of coordination with other agencies, available staff resources, and funding. Any regulatory change involving inclusion in the federal SIP must undergo legislative review, which requires additional time to accommodate the regulatory development and legislative review process.

23. Provide any additional information pertaining to the air quality control of oil and gas exploration and production facility emissions that you feel would be beneficial to the review team in the preparation of the review report. This should include any 'above and beyond' program functions that may be of interest to other states.

As discussed in our response to question #16 Colorado is a leader in the development of air quality regulations for the oil and natural gas development sector. Substantial regulation of emissions from the oil and gas sector commenced in 2004 through the implementation of the Early Action Compact Ozone Action Plan which resulted in implementation of emissions control requirements for condensate storage tanks, glycol dehydrators, reciprocating internal combustion engines and LDAR at natural gas processing plants in the ozone nonattainment area.

In 2006 requirements specific to control of emissions from condensate storage tanks in the ozone nonattainment area were made more stringent based on monitoring information that demonstrated unanticipated growth and rapid increase in development of oil and gas within the basin. At the same time in 2006 the Air Quality Control Commission adopted new emissions controls requirements for the oil and gas industry that applied statewide. These statewide requirements were adopted through statutory authority set forth in Sections 25-7-106 and 25-7-109 of the Colorado Air Pollution Prevention and Control Act ("Act"), which allow the Commission to promulgate emission control regulations and recordkeeping requirements applicable to air pollution sources and authority set forth in Section 25-7-105.1, which allows the Commission to adopt state-only standards. At that time the Commission adopted emissions control requirements statewide for condensate storage tanks, glycol dehydrators and natural gas fired reciprocating internal combustion engines (RICE). The new statewide provisions constituted a

forward-looking approach to deal with a rapidly growing source of air emissions, and were designed to reduce the possibility of future problems with respect to the attainment of National Ambient Air Quality Standards.

In 2008 Colorado adopted further revisions to reduce emissions of both VOC and NOx from oil and gas production operations. These revisions included specific provisions for the ozone nonattainment area as well as more general statewide provisions. The adopted rules continued to enhance the regulation of condensate storage tanks in the nonattainment area by requiring mandatory emissions controls during the first 90 days of production which coincides with peak production, use of auto igniters on enclosed combustors to minimize downtime and increased record keeping and reporting requirements. In addition, new requirements were adopted to address emissions from pneumatic controllers to ensure use of low bleed devices in the nonattainment area. At that time the Air Quality Control Commission (AQCC) also expanded the emissions control requirements for RICE > 500 horsepower (HP) from the nonattainment area to the entire state.

In 2014 Colorado's AQCC adopted revisions to Regulation Number 7 to address reductions in VOC emissions and the associated co-benefits of other hydrocarbon (e.g. including methane and ethane) emissions from oil and gas facilities, including well production facilities and natural gas compressor stations. The Commission expanded existing oil and gas control requirements and established additional monitoring, recordkeeping, and reporting requirements. For example, the revisions increased control requirements and improved capture efficiency requirements for oil and gas storage tanks. Simultaneously, the storage tank emissions control requirements were expanded to cover crude oil and produced water tanks in additional to condensate. The AQCC also established new requirements to minimize fugitive emissions from leaking components (aka LDAR) at natural gas compressor stations and well production facilities. The Commission also established requirements to minimize emissions at new and modified oil and gas wells, at wells undergoing maintenance, and during liquids unloading events. Moreover, the AQCC expanded control requirements for pneumatic devices and glycol natural gas dehydrators. Although this rulemaking was primarily motivated in response to reducing ozone precursor emissions, it was the first time Colorado chose to adopt oil and gas regulations that directly required greenhouse gas emission reductions.

With regards to oil and gas planning, the Division provides input on National Environmental Policy Act (NEPA) reviews for select oil and gas leasing projects, Environmental Impact Statements, and Resource Management Plans. Reviews include assessing both federal air quality requirements and Colorado project permitting requirements.

In addition, the Division pursues a number of opportunities to work collaboratively with our industry partners. For example, we have developed a reporting tool for companies to share with us the most important permitting priorities to ensure those pre-construction permits are issued in a timely manner. This helps us to

collectively ensure Division resources are applied to the projects of most critical importance to operators. We also work with operators to schedule company specific field safety trainings for our inspection staff. This helps to ensure that company field safety practices and directly conveyed to Division staff. We find these cross training efforts are an important mechanism to highlight the importance of safety.

Appendix D: 2015 STRONGER Guidelines

2015 Guidelines

State Review of Oil and Natural Gas Environmental Regulations, Inc.
www.strongerinc.org

SECTION 1 | Introduction

1.1 Background

The 1980 amendments to the Resource Conservation and Recovery Act (RCRA) created an exemption to the federal hazardous waste program for oil and gas exploration and production (E&P) wastes pending completion of a study by the U.S. Environmental Protection Agency (EPA). In 1988, EPA completed its study and determined that these wastes should not be regulated as hazardous wastes. EPA's regulatory determination concluded that existing state and federal regulations were generally adequate, but that some regulatory gaps existed and that enforcement of existing regulations was inconsistent. EPA proposed a three-pronged approach to address these concerns that included working with the states to encourage improvement in state regulations and enforcement programs. Further discussion of the regulatory determination follows in section 1.2.

In 1989, the Interstate Oil and Gas Compact Commission ("IOGCC") responded by offering to assist EPA by creating a state regulatory review process. The IOGCC created the Council on Regulatory Needs, bringing together state, environmental, and industry representatives to develop national guidelines for state oil and gas programs. In early 1990, the Council released a document entitled "EPA/IOCC Study of State Regulation of Oil and Gas Exploration and Production Waste". This document established guidelines that represented recommended criteria for regulatory programs. The Council also proposed to implement a process by which state oil and gas programs were reviewed in comparison with those guidelines.

In 1990, EPA provided a grant to the IOGCC to initiate state regulatory program reviews in comparison with the guidelines. Review teams were comprised of state regulatory officials, environmental representatives, and industry representatives. Representatives of other interested parties, such as federal agencies and tribal governments, were invited to observe the process. State reviews were conducted in states that volunteered for review. Recommendations were offered as blueprints for change to be considered by state legislators and regulators.

The Council recommended that the guidelines be reviewed and updated every three years. In 1994, the Council updated the guidelines and added sections regarding naturally occurring radioactive material (NORM) and abandoned wells.

In 1999 a multi-stakeholder organization was formed by the state review program participants to revitalize and carry the state review program forward. This organization is called State Review of Oil and Natural Gas Environmental Regulations, Inc. ("STRONGER"). STRONGER is a non-profit corporation that has been formed to educate regulators and the public as to the appropriate elements of a state oil and gas exploration and production regulatory program, and

to compare various state programs against the guidelines developed by STRONGER and for the protection of public health, safety and the environment.

In 1999, STRONGER established five committees to review and update the 1994 version of the Guidelines. STRONGER incorporated the consensus recommendations of the committees, including a new section on performance measures in the 2000 Guidelines update. STRONGER again initiated revision and updating of the Guidelines in 2004, which resulted in the 2005 Guidelines. The 2005 Guidelines incorporate spill prevention and performance measures into the administrative criteria section, and were expanded to include a new section on stormwater management. In 2009 STRONGER formed a workgroup that developed guidelines for hydraulic fracturing that were finalized in 2010, and updated in 2013. STRONGER adopted guidelines for Air Quality in 2014. In 2015 STRONGER adopted guidelines for Reused & Recycled Fluids, as well as making minor updates to the General Criteria, Administration, Technical Criteria, NORM, and Hydraulic Fracturing sections.

Since 1990, 38 initial and follow-up state reviews have been conducted against the guideline standards: 12 under the 1990 guidelines, 5 under the 1994 revised guidelines, 11 under the 2000 guidelines, 2 under the 2005 guidelines, and 6 focused on hydraulic fracturing. These states represent over 94% of all domestic, onshore oil and gas production. The states have implemented many of the recommended improvements, as documented in STRONGER's report entitled "A Report and History on the STRONGER State Review Process" (June, 2015).

1.2 EPA's Regulatory Determination for E&P Waste

The 1980 amendments to the RCRA required EPA to conduct a study of the environmental and potential human health impacts associated with E&P wastes and their associated waste management practices. EPA completed its two-year study in 1987. Based on the findings in the Report to Congress, and on oral and written comments received during public hearings in the spring of 1988, on June 30, 1988, EPA decided not to recommend federal regulation of E&P wastes as hazardous wastes under Subtitle C of RCRA (EPA 1988). The Agency gave the following reasons for its determination:

a. "Subtitle C does not provide sufficient flexibility to consider costs and avoid the serious economic impacts that regulation would create for the industry's exploration and production operations;

b. "Existing state and federal regulatory programs are generally adequate for controlling oil, gas, and geothermal wastes. Regulatory gaps in the Clean Water Act and UIC (Underground Injection Control) program are already being addressed, and the remaining gaps in state and federal regulatory programs

can be effectively addressed by formulating requirements under Subtitle D of RCRA and by working with the States;

c. "Permitting delays would hinder new facilities, disrupting the search for new oil and gas deposits;

d. "Subtitle C regulation of these wastes could severely strain existing Subtitle C facility capacity;

e. "It is impractical and inefficient to implement Subtitle C for all or some of these wastes because of the disruption and, in some cases, duplication of state authorities that administer programs through organizational structures tailored to the oil and gas industry; and

f. "It is impractical and inefficient to implement Subtitle C for all or some of these wastes because of the permitting burden that the regulatory agencies would incur if even a small percentage of these sites were considered Treatment, Storage, and Disposal Facilities (TSDFs)." (53 FR 25456, July 6, 1988).

In the determination, EPA found that "existing state and federal regulations are generally adequate...Certain regulatory gaps do exist and enforcement of existing regulation in some states is inadequate." To address those concerns, EPA announced a three-pronged approach that consists of:

- "Improving federal programs under existing statutory authorities in RCRA Subtitle D, the Clean Water Act, and the Safe Drinking Water Act;
- "Working with states to encourage improvements in the states' regulations and enforcement of existing programs; and
- "Working with Congress to develop any additional statutory authority that may be required."

1.3 State and Federal Relations

Periodic evaluations of state and federal E&P waste management programs have proven useful in improving the effectiveness of those programs and increasing cooperation between federal and state regulatory agencies. Stakeholder review mechanisms have demonstrated the need for establishment of a performance baseline against which E&P waste management programs can be evaluated. Those mechanisms have led to the identification of strategies that will improve communication and program understanding between the states and the federal government.

1.3.1 Strategies for Maintaining a Successful Relationship Between State and Federal Agencies

As stated in EPA's regulatory determination for E&P waste, "…existing state and federal regulations are generally adequate to control the management of oil and gas wastes. Certain regulatory gaps do exist, however, and enforcement of existing regulations in some states is inadequate." The key is that overall state programs are adequate, and have improved since 1990 through adoption of recommendations from reviews, information sharing among the states and self-initiated program improvements. To address remaining gaps and build upon the success of the state review program, the focus of future efforts should be to utilize information developed from the reviews already conducted, augmented by new information developed by the stakeholders, to improve the performance of state regulatory programs.

The stakeholders — oil and gas producing states, public interest representatives, and industry representatives — have identified ten related strategies that enhance state and federal relationships.

a. Commitment to Work Cooperatively. The states and federal agencies should maintain a commitment to work cooperatively to improve the design, implementation, and enforcement of state and federal programs for managing E&P wastes. State and federal agencies should take steps to encourage open communications among state and federal agencies, the regulated industry, and other interested parties pertaining to the management and regulation of E&P wastes.

b. Recognition of Different Priorities. States should recognize the interest of federal agencies in achieving national goals and objectives and assuring adherence to federal statutory and regulatory requirements. At the same time, federal agencies should recognize the authorities, responsibilities, and capabilities of states to regulate certain activities within their borders.

c. Recognition of Different Statutory Objectives. Several of the federal statutes governing protection of the environment (*e.g.,* RCRA, Clean Water Act (CWA), Safe Drinking Water Act (SDWA), Clean Air Act (CAA)) provide for state implementation of certain elements with federal oversight. The objectives of and authorities granted by each statute differ. As such, it should be recognized that federal and state authorities and implementation approaches may differ.

d. Recognition of Regional Diversity. As discussed in the Report to Congress and the legislative history of the SDWA, variable approaches to the management of E&P wastes are necessary. These variable approaches are partly a result of the different geologic, hydrologic, or historic conditions in states and areas

within a state, the diverse characteristics of oil and gas activities, and differences in state government structures among the producing states. Guidelines or criteria, whether issued by a federal agency such as EPA or as advocated by STRONGER, should be sufficiently flexible to permit states to take into account these varying conditions.

e. Baseline of Performance. The criteria adopted by STRONGER should be used by federal or state agencies that are responsible for any portion of an E&P waste management program. These criteria should serve as a baseline of performance by which the effectiveness of programs can be judged. The criteria provide states flexibility to address unique conditions while accomplishing the goals set forth in Section 3.

f. State Responsibility for Enforcement. Enforcement is a critical component of a state E&P waste management program. Federal government involvement should occur only if the state agency fails to enforce the requirements or requests federal assistance.

g. State Program Review Process. The state program review process should continue to provide states with an independent evaluation of their E&P waste management programs using criteria adopted by the IOGCC and STRONGER.

h. Resolving Conflicts/Building Consensus. Where there are unresolved national issues or concerns regarding E&P waste management, a task force should be created which is similar in makeup and form to that established for the EPA's Office of Drinking Water Mid-Course Evaluation of Class II UIC programs. The creation of this task force would bring knowledgeable federal and state regulators together to discuss issues, to ascertain whether problems associated with these issues are real or perceived, and to decide how best to address the issues. This process should be based on the best available information and could be initiated by either the federal government or the states.

i. Effective Multi-Agency Coordination. Coordination among the state agencies is addressed in more detail in section 4.4. However, each state should recognize that coordination among various agencies is necessary for building and maintaining trust between the state agencies and the federal agency that has oversight responsibilities.

j. Technical and Financial Assistance. The federal government should provide technical and financial assistance to states to improve the design, implementation, and enforcement of state E&P waste management programs. Such assistance may be in the areas of training, enforcement, and data management.

SECTION 2 | Scope of the Criteria

2.1 General

a. These criteria are intended to guide states in assessing and improving their regulatory programs for E&P waste management, abandoned sites, naturally occurring radioactive materials (NORM), storm water management, hydraulic fracturing, air quality, and reused & recycled fluids. This document, therefore, sets out the elements of an effective program using "should" rather than the mandatory "shall", and “are encouraged to” for elements which are desirable, but which are not necessary for an effective program.

b. These criteria address waste management practices that are unique to E&P operations and wastes that were determined by EPA to be exempt from the hazardous waste management requirements of Subtitle C of RCRA. These narrowly defined wastes include drilling muds and cuttings, produced water and other wastes associated with E&P activities. The chemical and radiological characteristics of these wastes and the management practices associated with the storage, treatment, and disposal of these wastes are covered by these criteria. Wastes that are uniformly regulated by RCRA hazardous waste management requirements, as well as general industrial wastes such as solvents, off-specification chemicals, commercial products, household wastes, and office refuse are not addressed by these criteria.

c. These criteria apply to all new and currently operating E&P waste management facilities. In addition, the criteria in Section 6 apply to abandoned sites, the criteria in Section 7 apply to NORM, the criteria in Section 8 apply to storm water management, the criteria in Section 9 apply to hydraulic fracturing, the criteria in Section 10 apply to air quality, and the criteria in Section 11 apply to reused and recycled fluids.

d. These criteria do not address disposal of E&P wastes by injection or surface discharge when those waste management practices are regulated by EPA or by the states under authority of the federal SDWA and federal CWA, respectively. Brief descriptions of the regulatory frameworks authorized by those laws follow in Sections 2.2. and 2.3.

e. In addition to a review of provisions of the SDWA and CWA that are applicable to E&P wastes, this section also contains federal definitions of solid wastes and hazardous wastes and reviews EPA's waste mixture rule; lists examples of exempt and non-exempt E&P wastes; and describes general requirements for the management of non-exempt wastes. States may have different definitions

for solid and hazardous wastes.

2.2 Class II Injection Wells

The SDWA is the primary federal statute that governs injection wells. The SDWA required the EPA to promulgate regulations to protect drinking water sources from contamination through underground injection, but directed the Agency not to prescribe requirements that would impede oil and gas production. EPA established five classes of injection wells, categorized by purpose, potential for endangering drinking water, depth of injection, and characteristics of their injectate quality. Class II injection wells are broadly defined as related to oil and gas injection activities. Activities in this class relate to the disposal of fluids associated with oil and gas exploration and production, enhanced recovery operations, and the storage of liquid hydrocarbons.

Enhanced recovery describes all efforts to increase ultimate production of oil and gas from a reservoir, and this terminology will be considered to encompass other nomenclature in common usage such as pressure maintenance, secondary recovery, and tertiary recovery. All enhanced recovery techniques include methods for supplementing natural reservoir forces and energy, or otherwise increasing ultimate recovery. Such techniques include water injection, gas injection, gas cycling, and miscible chemicals and thermal processes.

Class II UIC programs are administered by the States where EPA has approved primary enforcement authority (primacy), or are directly implemented by EPA where the States have not sought or received approval for their UIC program. Amendments to the SDWA in 1980 further allowed a State with an existing regulatory program to obtain primary enforcement authority from EPA as long as the State was able to demonstrate that its program was effective in protecting underground sources of drinking water (USDWs), rather than adopting the complete set of Federal requirements. States with UIC program primacy receive federal funding for program implementation.

In general, EPA determines which fluids may be injected into Class II wells in direct implementation UIC programs. Primacy States follow their EPA-approved primacy agreements in ascertaining whether specific fluids are qualified for injection into their Class II wells.

Among the minimum requirements for Class II wells are:

a. Only approved fluids may be injected,

b. No injection may endanger a USDW,

c. No well may be used for injection without a permit, unless authorized by rule.

d. All injection wells must demonstrate mechanical integrity at least once every 5 years.

2.3 NPDES-Permitted Discharges

All point-source discharges of pollutants to surface waters of the United States must comply with the requirements of permits issued under the National Pollutant Discharge Elimination System (NPDES). The NPDES program is administered by EPA under the authority of the federal CWA or by the states through programs delegated by EPA. NPDES permits establish effluent limitations and monitoring requirements for discharges. Effluent limits are based upon the more stringent of levels which can be achieved through the use of available technology, and levels necessary to meet EPA-approved state water quality standards.

The CWA requires NPDES permits for E&P waste discharges to surface water. Currently, effluent guidelines prevent most discharge to surface waters except the following categories:

a. Discharges to certain coastal areas;

b. Discharges of low-salinity produced waters which are of beneficial use in arid regions west of the 98th meridian; and

c. Discharges from stripper oil wells in certain areas.

2.4 Federal Definition of Solid Waste

a. In simplest terms, a solid waste is any material that is discarded or intended to be discarded. According to RCRA, solid wastes may be solid, semi-solid, liquid, or contained gaseous material. Commercial products are not solid wastes unless, and until, they are discarded. Commercial products and their releases may also be regulated under other statutes such as the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA), the Toxic Substances Control Act (TSCA), Superfund Amendments and Reauthorization Act (SARA), and the Occupational Safety and Health Act (OSHA).

b. EPA has also determined that produced water injected for enhanced recovery is not a waste for purposes of RCRA Subtitle C or D, since produced water used in enhanced recovery is beneficially recycled and is an integral part of some crude oil and natural gas production processes.

2.5 Hazardous Waste

Under RCRA, a solid waste may be designated as hazardous waste if it is specifically listed as a hazardous waste or if it exhibits one or more of the characteristics of hazardous wastes. (See 40 CFR 261).

2.5.1 Listed Hazardous Waste

a. EPA has listed numerous types or classes of solid wastes as hazardous waste because they typically exhibit one or more of the characteristics of hazardous waste, or have been shown to exceed certain human toxicity criteria, or contain any one of the chemical compounds or substances that are listed as hazardous constituents. (see 40 CFR 261 APP VIII.)

b. EPA's regulations contain four lists of hazardous wastes: 1) hazardous waste from non-specific sources; 2) hazardous waste from specific sources; 3) commercial chemical products that become acutely hazardous waste when disposed; and 4) commercial chemical products that become toxic wastes when disposed.

2.5.2 Characteristically Hazardous Waste

a. EPA considers any solid waste to be a hazardous waste if it exhibits any one of the characteristics of ignitability, corrosivity, reactivity, or toxicity.

b. The toxicity characteristic is determined by the toxicity characteristic leaching procedure (TCLP). The list of constituents includes eight heavy metals and thirty-two organic compounds

2.6 EPA's Identification of Exempt Exploration and Production Wastes

The list below identifies many, but not all, exempt wastes. In general, E&P exempt wastes are generated in "primary field operations" and are unique or intrinsic to exploration and production activities (e.g., drilling for, producing, and purifying crude oil and natural gas), and not as a result of maintenance or transportation activities.

All wastes generated in transportation and refining are non-exempt. EPA's regulatory determination for E&P wastes (see 53 FR 25453, July 6, 1988) found that the following wastes are exempt from RCRA hazardous waste management requirements:

- "Produced water;
- "Drilling fluids;
- "Drill cuttings;
- "Rig wash;
- "Drilling fluids and cuttings from offshore operations disposed of onshore;
- "Well completion, treatment, and stimulation fluids;
- "Basic sediment and water, and other tank bottoms from storage facilities that hold product and exempt waste;
- "Accumulated materials such as hydrocarbons, solids, sand, and emulsion from production separators, fluid treating vessels, and production impoundments;
- "Pit sludges and contaminated bottoms from storage or disposal of exempt wastes;
- "Workover wastes;
- "Gas plant sweetening wastes for sulfur removal, including amine, amine filters, amine filter media, backwash, precipitated amine sludge, iron sponge, and hydrogen sulfide scrubber liquid and sludge;
- "Cooling tower blowdown;
- "Spent filters, filter media, and backwash (assuming the filter itself is not hazardous and the residue in it is from an exempt waste stream);
- "Packing fluids;
- "Produced sand;
- "Pipe scale, hydrocarbon solids, hydrates, and other deposits removed from piping and equipment prior to transportation;
- "Hydrocarbon-bearing soil;
- "Pigging wastes from gathering lines;
- "Wastes from subsurface gas storage and retrieval, except for the listed non-

exempt wastes;

- "Constituents removed from produced water before it is injected or otherwise disposed of;
- "Liquid hydrocarbons removed from the production stream but not from oil refining;
- "Gases removed from the production stream, such as hydrogen sulfide and carbon dioxide, and volatilized hydrocarbons;
- "Materials ejected from a producing well during the process known as blowdown;
- "Waste crude oil from primary field operations and production; and
- "Light organics volatilized from exempt wastes in reserve pits or impoundments or production equipment."

On March 22, 1993, EPA provided "clarification" regarding the scope of the E&P waste exemption. (see 58 FR 15284-15287.) EPA clarified the concept of primary field operations for crude oil and natural gas production. To fall under the scope of the exemption, an E&P waste must be generated in primary field operations and be unique or intrinsic to the production process. In addition, EPA stated that certain waste streams generated by oil and gas service companies may be "uniquely associated" with primary field operations and as such are within the scope of the RCRA Subtitle C exemption. EPA further clarified that an exempt waste remains exempt regardless of the waste's custody transfer, and that the residual waste from the treatment of an exempt waste remains exempt (e.g., residual sediment and water from crude oil reclamation from exempt tank bottoms). EPA's clarification cautioned, however, that exempt crude oil reclamation and service-company wastes may not remain exempt if they are mixed with non-exempt materials or wastes. States should carefully review EPA's clarification along with EPA publication EPA530-K-01-004 (October 2002). (found at http://www.epa.gov/epaoswer/other/oil/oil-gas.pdf). EPA periodically issues interpretive letters regarding the oil and gas exemption. One such letter was issued in November 1993 and is referred to in EPA publication EPA530-K-01-004.

2.7 EPA's Identification of Non-exempt Exploration and Production Wastes

Non-exempt wastes include wastes that are not unique to E&P and wastes generated by transportation (pipeline and trucking) and service activities. While the following wastes are non-exempt, their regulatory status as "hazardous wastes" is dependent upon whether they are listed as hazardous waste or they exhibit a hazardous waste characteristic. Non-exempt wastes should be managed as described under Section 2.8. EPA's 1988 regulatory determination lists the

following wastes as non-exempt:

- "Unused fracturing fluids or acids;
- "Gas plant cooling tower cleaning wastes;
- "Painting wastes;
- "Oil and gas service company wastes, such as empty drums, drum rinsate, vacuum truck rinsate, sandblast media, painting wastes, spent solvents, spilled chemicals, and waste acids;
- "Vacuum truck and drum rinsate from trucks and drums transporting or containing non-exempt waste;
- "Refinery wastes;
- "Liquid and solid wastes generated by crude oil and tank bottom reclaimers;
- "Used equipment lubrication oils;
- "Waste compressor oil, filters, and blowdown;
- "Used hydraulic fluids;
- "Waste solvents;
- "Waste in transportation pipeline-related pits;
- "Caustic or acid cleaners;
- "Boiler cleaning wastes;
- "Boiler refractory bricks;
- "Incinerator ash;
- "Laboratory wastes;
- "Sanitary wastes;
- "Pesticide wastes;
- "Radioactive tracer wastes; and Drums, insulation, and miscellaneous solids."

EPA did not specifically address, in its 1988 regulatory determination, the status of hydrocarbon-bearing material that is recycled or reclaimed by re-injection into a crude stream. However, under existing EPA regulations, recycled oil, even if it were otherwise hazardous, could be reintroduced into the crude steam, if it is from normal operations and is to be refined along with normal process streams at a petroleum refinery facility. Regulations addressing an exclusion for used oil are at 40 C.F.R 261.6(a)(4), and regulations addressing an exclusion for recovered oil are at 40 C.F.R. 261.4(a)(12) as revised.

2.8 Requirements for Non-exempt Wastes

a. EPA's hazardous waste regulations require that a hazardous waste determination be made for any non-exempt E&P waste. The determination may find the non-exempt waste either to be listed as a hazardous waste or to exhibit a hazardous waste characteristic. If a non-exempt waste is found not to be listed as a hazardous waste or not to exhibit a hazardous waste characteristic, it is a non-exempt non-hazardous waste.

b.If a non-exempt waste is not a listed hazardous waste, it should be tested whenever there is reason to believe it may exhibit one or more of the hazardous waste characteristics. Alternatively, a hazardous waste determination may be made based on knowledge of the process by which the waste is produced. Although there is no requirement that a non-exempt waste be tested to determine if it is hazardous, civil and criminal penalties may be imposed if the waste is not managed in a safe manner and according to regulations.

c. Depending on the actual hazardous waste quantity generated and accumulated on-site, RCRA hazardous waste management standards for generators may apply. Additionally, treatment, storage, or disposal activities on-site may be subject to more stringent RCRA Subtitle C requirements, such as permitting and corrective action.

d. Non-exempt waste should also be segregated whenever possible from exempt waste. If the non-exempt waste was a listed hazardous waste, its mixture with an exempt waste could make the entire commingled waste stream subject to stringent RCRA Subtitle C requirements, including the requirement that the waste be disposed at a hazardous waste facility. When segregation is not practical, the non-exempt waste should be examined closely to assure that it is not a hazardous waste. See Section 2.9 for additional discussion of waste mixtures.

e. Some states have adopted hazardous waste regulations and have obtained authority from EPA to administer the federal hazardous waste regulations. Those state programs' regulations may differ from those that EPA has

promulgated; however, by law, the states' regulations must be at least as stringent as the federal programs.

2.9 Waste Mixtures

EPA's RCRA regulations provide that the commingling of any listed hazardous waste with a non-hazardous waste generally renders the entire mixture a hazardous waste. The intent of this mixture rule is to prevent avoidance of hazardous waste regulations through dilution. For example, discarding a listed hazardous waste (e.g., a half-empty container of a listed solvent) in a reserve pit could cause the otherwise exempt pit contents to become a hazardous waste and result in the expensive closing of the reserve pit under RCRA hazardous waste regulations. Likewise, the mixing of a characteristic hazardous waste with an exempt waste could render the entire mixture a hazardous waste. Also, in those cases where the mixture is no longer considered a hazardous waste, the process of rendering the hazardous waste non-hazardous could be considered treatment of a hazardous waste and RCRA Subtitle C would apply.

Unused commercial products are not exempt wastes when disposed and, if hazardous (or potentially hazardous), should not be disposed with exempt E&P waste. All reasonable efforts should be made to completely use commercial products, return them to their vendor if they are not fully used, or segregate them from other waste for management and disposal.

SECTION 3 | General Criteria

3.1 General

An effective program for the regulation of E&P activities should include, at a minimum:

a. Statutory authority that adequately details the powers and duties of the regulatory body;

b. Statutory authority to promulgate appropriate rules and regulations;

c. Statutes and implementing regulations which adequately define necessary terminology;

d. Provisions to adequately fund and staff the program;

e. Mechanisms for coordination among the public, government agencies, and regulated industry; and

f. Technical criteria for E&P environmental management practices.

3.2 Goals

An effective state program should contain a clear statement of the program's goals and objectives. Such goals should include, at a minimum, protecting human health and the environment from the mismanagement of E&P activities while recognizing the need for an economically viable oil and gas industry**.** When establishing regulations and policies for E&P waste management, states should use the waste management hierarchy set forth in Section 5.3 to encourage waste minimization and source reduction.

3.3 State/Regional Variations in Criteria

These criteria are intended to provide guidance to the states in the formulation, development, and evaluation of oil and gas environmental regulatory programs. Fundamental differences exist from state to state, and within regions within a state in terms of climate, meteorological patterns, air quality compliance status, hydrology, geology, economics, and method of operation, which may impact on the manner in which oil and gas exploration, development, and production is performed. State oil and gas programs can and should vary from state to state and within portions of a state. The process by which these criteria are

incorporated into state programs is a function of, and within the discretion of, the responsible state agency. It is recognized that state programs must vary in order to accommodate differences in climate, hydrology, geology, economics, and method of operation or to accommodate individual differences in state administrative procedures or law. Furthermore, in some instances, in order to accommodate regional, area-wide, or individual differences within a state, it is appropriate for site-specific waivers or variances to be allowed for good cause shown. All such variations should be consistent with the goals of Section 3.2.

SECTION 4 | Administrative Criteria

4.1 Basic Requirements

Various federal regulations applicable to the delegation to states of federal environmental programs provide a useful framework for the development of criteria for an effective state program. Environmental regulatory programs for E&P activities should, at a minimum, include provisions for permitting, compliance evaluation, and enforcement.

4.1.1 Permitting

A state should have a regulatory mechanism to assure that E&P activities are conducted in an environmentally responsible manner. A program to achieve that objective may rely on one or more mechanisms, including issuance of individual permits, issuance of permits by rule, establishment of regulatory requirements by rule, issuance of general permits, registration of facilities, and/or notification of certain activities undertaken pursuant to general regulations. State agencies should have authority to refuse to issue or reissue permits or authorizations if the applicant has outstanding, finally determined violations or unpaid penalties, or if a history of past violations demonstrates the applicant's unwillingness or inability to comply with permit requirements. Where the operator responsible for E&P activities changes, state requirements should address the new operator's financial responsibility and compliance history. An effective state program should provide that a state permit does not relieve the operator of the obligation to comply with federal, local, or other state permits or regulatory requirements.

Individual permits for specific facilities or operations should be issued for fixed terms. In the case of commercial or centralized facilities, permits generally should be reviewed and revised, if necessary, no less frequently than every five years. Where two or more regulatory programs mandate similar requirements, those requirements should be combined where feasible. The process for obtaining permits and other authorizations should also involve prompt consideration and response to applications while preserving the integrity of the permit review process, including appropriate public participation. For the purposes of these guidelines, the terms "license" or "licensing" as used in Section 7 of these guidelines, criteria for the management of E&P NORM, will be synonymous with the terms "permit" or "permitting" as they are used throughout these guidelines.

4.1.2 Compliance Evaluation

4.1.2.1

State programs should contain the following compliance evaluation capabilities:

a. Procedures for the receipt, evaluation, retention, and investigation for possible enforcement action of all notices and reports required of permittees and other regulated persons. Investigation for possible enforcement action should include determination of failure to submit these notices and reports. Effective data management systems as prescribed in Section 4.2.7. can be used to track compliance.

b. Inspection and surveillance procedures that are independent of information supplied by regulated persons and which allow the state to determine compliance with program requirements, including:

i. The capability to conduct comprehensive investigations of facilities and activities subject to regulation in order to identify a failure to comply with program requirements by responsible persons;

ii. The capability to conduct regular inspections of regulated facilities and activities at a frequency that is commensurate with the risk to the environment that is presented by each facility or activity; and

iii. The authority to investigate information obtained regarding violations of applicable program and permit requirements.

c. Procedures to receive and evaluate information submitted by the public about alleged violations and to encourage the public to report perceived violations. Such procedures should not only involve communications with the public to apprise it of the process to be followed in filing reports or complaints, but should also communicate how the state agency will assure an appropriate and timely response.

d. Authority to conduct unannounced inspections of any regulated site or premises where E&P activities are being conducted, including the authority to inspect, sample, monitor, or otherwise investigate compliance with permit conditions and other program requirements.

e. Authority to enter locations where records are kept during reasonable hours for purposes of copying and inspecting such records.

f. Investigatory procedures that will produce a paper trail to support evidence which may be admitted in any enforcement proceeding brought against an alleged violator, including clear inspection and inspection reporting procedures.

4.1.3 Enforcement

4.1.3.1

With respect to violations of the state program, the state agency should have effective enforcement tools, which may include the following actions[1]:

a. Issue a notice of violation with a compliance schedule;

b. Restrain, immediately and effectively, any person by order or by suit in state court from engaging in any impending or continuing unauthorized activity which is causing or may cause damage to public health or the environment;

c. Establish the identity of emergency conditions which pose an imminent and substantial human health or environmental hazard that would warrant entry and immediate corrective action by the state agency after reasonable efforts to notify the operator have failed;

d. Sue or cause suit to be brought in courts of competent jurisdiction to enjoin any impending or continuing violation of any program requirement, including any permit condition, without the necessity of a prior revocation of the permit;

e. Require, by administrative order or suit in state court, that appropriate action be undertaken to correct any harm to public health and the environment that may have resulted from a violation of any program requirement, including, but not limited to, establishment of compliance schedules;

f. Revoke, modify, or suspend any permit upon a determination by the state agency that the permittee has violated the terms and conditions of the permit, failed to pay an assessed penalty, or used false or misleading information or fraud to obtain the permit; or

g. Assess administrative penalties or seek, in court, civil penalties or criminal sanctions including fines and/or imprisonment.

h. Forfeiture of financial assurance instruments.

4.1.3.2

States should develop guidance for calculations of penalties that include factors such as the economic benefit resulting from the violation, willfulness, harm to the

[1] *In some states, enforcement remedies include authorities to cause cessation of production or transportation of product, and/or seizure of illegal product.*

environment and the public, harm to wildlife, fish or aquatic life or their habitat, expenses incurred by the state in removing, correcting or terminating the effects of the unauthorized activity, conservation of the resource, timeliness of corrective action, notification of appropriate authority, and history of violations. Benefits of guidance for calculation of penalties include consistency in the assessment of penalties and development of readily defensible assessments. Penalties should be such that an operator does not benefit financially from unlawful conduct, and should provide compliance incentive to other operators. States should evaluate their enforcement options and policies to assure that the full range of actions available are effectively used.

4.1.3.3

The right to appeal or seek administrative and/or judicial review of agency action should be available to any person having an interest which is or may be adversely affected, or who is aggrieved by any such action.

4.2 Additional Program Requirements

Beyond basic requirements, an effective state program should also include a variety of other administrative requirements as discussed below.

4.2.1 Contingency Planning and Spill Risk Management

4.2.1.1 State Contingency Program

a. The state should develop and adopt a state contingency program for preventing and responding to spills and unauthorized releases to land, water, or air from E&P facilities. The state program need not duplicate applicable federal regulations for contingency planning and spill risk management. The state's contingency program may include a state contingency plan, or may consist of a set of regulations or operator contingency plan requirements. The program should define the volume of a spill or release of a petroleum product or waste and the level of risk to various receiving environments that triggers implementation of the spill contingency plan and response requirements.

b. The state contingency program should also contain funding provisions which enable the state agency to undertake immediate response actions for significant spills or releases which constitute a threat to human health or the environment in the event that a responsible operator cannot be located or is unwilling or unable to respond to the spill or release in a timely manner.

4.2.1.2 Reporting capabilities

The state should provide mechanisms for operators or the public to report spills and unauthorized releases. These mechanisms should include telephone access 24 hours a day, 7days a week. A single point of contact_1-800 telephone number should be considered. Telephone answering capabilities should include provisions for the prompt notification of appropriate state agency personnel.

4.2.1.3 Interagency coordination

The state should provide for coordination of actions between appropriate agencies that have jurisdiction for the management of risks from spills and unauthorized releases from E&P facilities. This includes clear designation of onsite spill responsibilities.

4.2.1.4 Operator Prevention of, and Response to, Spills and Releases

The state agency should require an operator to take measures to prevent, and prepare to respond to, spills or unauthorized releases of petroleum products or waste that may occur at an E&P facility. These requirements can be spelled out in regulations or guidance, or they may be included in operator-specific or site-specific plans.

4.2.1.4.1 General

a. State contingency programs should address the following:

i. E&P facilities, equipment at those facilities, and materials found at E&P sites that may pose a significant threat to human health and/or the environment;

ii. The various types of receiving environments, including water (surface and groundwater) and land (environmentally sensitive areas, special soil or geological conditions, urban areas, cultural and special resource areas); and

iii. Public and responder safety concerns, including training for response personnel.

b. The state program should require the operator to identify the following:

i. The operator's incident command structure, including emergency_contact information for key personnel.

ii. Equipment, manpower, contracted services, and other logistical support

necessary for response to spills and unauthorized releases.

iii. Opportunities for coordination of joint response actions, manpower or equipment, with nearby well sites or other facilities of the operator or other operators.

iv. Procedures for identification of and communication with parties impacted or threatened by spills or unauthorized releases.

v. Acceptable methods of containment of spills and unauthorized releases.

vi. Acceptable disposal methods, such as on-site remediation, approved disposal facilities, and waste haulers, for materials of concern.

c. The State program should require responder training to assure that personnel are prepared to respond efficiently and effectively.

4.2.1.4.2 Prevention measures

Where spills and unauthorized releases pose a significant risk to human health and/or the environment, the State should require prevention measures that may include:

a. Secondary containment such as dikes, berms and firewalls, or equivalent measures.

b. Tertiary containment and/or monitoring systems in high-risk areas.

c. Inspection, testing, and maintenance schedules and procedures for facilities and equipment.

d. Site security measures as necessary.

e. Periodic review of spill histories to identify opportunities to reduce future spills and unauthorized releases.

4.2.1.4.3 Response Measures

a. A State program should include reporting and notification procedures to be used in the event of a spill or unauthorized release. These should include:

i. Agencies and parties to be notified with contact information.

ii. The type of reporting (verbal, written) required for various incidents.

iii. Reporting time requirements.

iv. Reporting thresholds.

v. Operator reporting information, such as the name of the operator and the operator's representative reporting the incident; a description of the incident, including the date and time of the incident and its discovery; the type and volume of material released; the location of the incident; the apparent extent of the release; damage or threat to groundwater, surface water, land, and/or air; and weather conditions.

b. States should provide guidance for containment, abatement, and remediation, including:

i. Cleanup standards;

ii. Required sampling and analyses; and

iii. Where appropriate, approved non-mechanical response actions, such as the use of dispersants and in-situ remediation, including identification of the agencies that must provide approval of these operations.

c. The state should specify any requirements for final reporting, site monitoring, and necessary agency approvals. Any final report required should identify the cause of the incident and actions taken to prevent or minimize the likelihood of a recurrence.

4.2.1.5 Follow-up actions

The state program should provide for enforcement, as described in Section 4.1.3. of these Guidelines, for the failure of an operator to report or respond to spills and unauthorized releases as required. The state program should also consider provisions for the assessment of damages caused by an incident. A state program should contain provisions allowing the state to pursue a responsible operator for reimbursement of state monies expended in responding to such a spill or release.

4.2.1.6 Database

The state data management program, as described in Section 4.2.7. of these Guidelines, should include information on spills and unauthorized releases. This data should be analyzed periodically as part of a program effectiveness evaluation as described in Section 4.2.3, Program Planning and Evaluation, of these Guidelines.

4.2.2 Public Participation

4.2.2.1 Notice and Records

State program legislation or regulations should require that the affected public be provided with adequate notice of the agency's intention to issue a permit or license that addresses E&P activities. The public should be provided with an appropriate opportunity to comment on a permit or license prior to issuance. Wherever possible, this notice should be coordinated with the notice requirements of other concurrently applicable state or federal programs. For commercial or centralized disposal facilities, the operator should also be required to provide written notice to adjacent landowners of record for such area and in such manner as may be prescribed by the state agency.

Agency records related to this program should generally be available for review by the public. Such records are to include waste disposal and pit locations and any required analytical data. Where information submitted by an operator is of a "confidential business" nature, an agency should have procedures for segregating that information and protecting it from disclosure. In all cases, spill and violation records should be available to the public. Agencies should establish a minimum record keeping time period of three years that should be automatically extended while any unresolved enforcement action regarding the regulated activity is pending.

4.2.2.2 Program Information

States should provide for the dissemination of program information to the regulated industry and the public. Such educational materials should include information or guidance on contingency planning, spill response, permitting, operating, monitoring and other requirements. Such efforts should be part of an ongoing process through which information is exchanged in an open forum. Because E&P environmental requirements are undergoing numerous changes, states have the obligation to inform the regulated industry and the public of changes. Industry associations and other organizations may provide a convenient and effective mechanism for dissemination of information. States should actively make use of seminars, newsletters, special mailings, association committees, incentive programs and other mechanisms.

4.2.2.3 Advisory Groups

States should use advisory groups of industry, government, and public representatives, or other similar mechanisms, to obtain input and feedback on the effectiveness of state programs for the regulation of E&P activities. Provision should be made for education or training as is appropriate to give such advisory

groups a sound basis for providing input and feedback.

4.2.3 Program Planning and Evaluation

4.2.3.1 Program Planning

States should have a sound regulatory development process which includes both short-term and long-term strategic planning for defining goals and objectives, setting priorities, and evaluating the clarity, efficiency, and effectiveness of the E&P environmental regulatory program. In formulating environmental regulatory programs, states should use the best available scientific and technical information and should consider the environmental, economic and energy impacts of the regulations.

4.2.3.2 Program Evaluation

a. General

Beyond the general, technical and administrative criteria set forth elsewhere in this guidance document, a program for the regulation of E&P activities should evaluate how well the program protects human health and the environment while recognizing the need for an economically viable oil and gas industry**.**

Program evaluation measures may be of a wide variety and include positive indicators (what's working) as well as negative indicators (what's not working). Some administrative aspects of program performance can be evaluated by examining how well the program enables the industry, the public, and the regulators themselves to function. Environmental aspects can be evaluated by assessing some combination of preventive measures, the qualities and characteristics of E&P wastes the severity of impact from a spill or unauthorized release, and the timeliness of remediation. While it is important for the program to have adequate rules, performance evaluation indicates to what extent the implementation of a rule or practice of the program brings about environmental protection.

Although a formal evaluation of program performance might occur at periodic intervals, the monitoring of activities and the modifications to the program form an ongoing, cyclic process as outlined in Figure 4.1. The process has no specific beginning or ending point. Rather, the steps in the process form a continuous progression that should be examined during performance review.

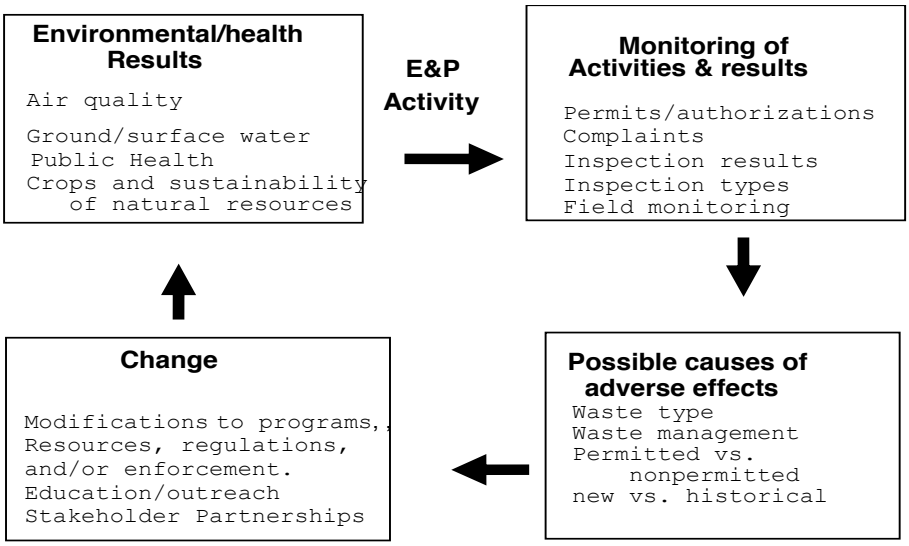

Figure 4.1. Performance review cycle.

A state should select parameters that are appropriate for use in measuring the effectiveness of its E&P regulatory program. Documentation of the selected parameters and the ability to acquire, assess, and present the relevant data are critically important to evaluation of performance. This requires establishing a definition of the parameters being evaluated and specifying the technical measurements to be made or the technical data to be examined. In addition, it requires installation and use of a data management system that facilitates review and evaluation. Program performance should be evaluated periodically, using measures that can be applied consistently from one evaluation period to another, although the measures may evolve and improve in time. If a database of releases, regulatory activities, remediation sites, or other information is used for performance evaluation, it should, if possible, extend backward in time so as to enable a measure of progress on historical problems.

b. Qualities of Performance Measures

In evaluating its performance, a program should have data management capabilities to enable assessment of program effectiveness and timeliness. Evaluation measures should:

- be quantitative, whenever possible;
- allow consistent evaluation across time;
- be available to program personnel, the industry, and the public;
- document significant trends;
- summarize an evaluation of the nature and extent of contamination [Section 5.2], abandoned wastes, and abandoned facilities [Section 6] as they occur across the state; NORM [Section 7], stormwater management [Section 8], hydraulic fracturing [Section 9], air quality [Section 10], and

reused & recycled fluids [Section 11].
- include identification and priority of outstanding environmental threats, so as to aid the program in targeting its efforts;
- enable evaluation of whether the program's responses to violations encourage compliance.

Evaluation of performance may include, as an example:

- Contamination: the state-wide nature and extent of environmental contamination by E&P wastes;
- Trends: whether the extent of contamination by E&P wastes is increasing or decreasing, and the reasons why;
- Prevention: the effectiveness of the program's efforts in preventing releases of E&P wastes to the environment;
- Timeliness: the timeliness of agency actions in controlling the impacts of E&P wastes released to the environment;
- Abatement: the effectiveness of agency actions in abating pollution by E&P wastes, or in causing pollution to be abated; and
- Enforcement: the effectiveness of the agency's administrative controls in the prevention or abatement of pollution by E&P wastes [Section 4.1].

c. Examples of program evaluation

i. Assessment of impacts

A state could identify documented cases that demonstrate reasonably clear links of cause and effect between operational practices and resulting environmental impacts. Such impacts might be human health effects, ecological effects, effects on wildlife or livestock, or effects on natural resources.

From examination of documented cases, a state could determine whether those cases were the result of violations of existing program requirements, insufficient programmatic enforcement of the requirements, other causes, or whether the cases suggest that the requirements should be revised.

A case could be documented if impacts are found to exist as part of the findings of a scientific study. Such studies could be formal investigations supporting litigation or a state enforcement action, or they could be the results of technical tests (such as monitoring of wells) if such tests (a) were conducted with state-approved quality control procedures, and (b) revealed contamination levels in excess of an applicable state or federal standard or guideline (such as a drinking water standard or water quality criteria).

Possible impact indicators might be:

- The area or other measure of contaminated or affected ground or surface water, tracked periodically over time.
- A histogram of the number of releases versus time, amount of produced resource and number of wells in the state. Releases might be grouped by material released, such as crude oil, produced water, etc.
- A histogram of the number of releases of a given material versus the approved time to completion of remediation.
- The time elapsed between an agency's receipt of a remediation proposal or related correspondence, and the agency's response to that proposal or correspondence.

ii. Analysis of activities and results

Activity and results analysis comprises administrative measures of program goals, plans, and operations. These measures focus on prevention of pollution, efficiency of operations, priorities, and the allocation of resources within the program.

The following are examples of activities:

- The development of a strategic plan with goals, milestones, and establishment of priorities [Sections 3.2, 4.2.3]. The plan should be based on anticipated threats and/or known impacts, as well as budget and administrative factors that may be beyond the control of the agency.
- The development of a program promoting use of the waste management hierarchy [Section 5.3].
- A review of the number of stream miles listed as impaired by oil and gas activities in the state biennial Integrated Water Quality Monitoring and Assessment Report required under Sections 305(b) and 303(d) of the federal Clean Water Act.
- An evaluation of the number of wells abandoned without being properly plugged compared to levels of financial assurance or other program measures to address orphan wells.
- Evaluation of the results of surveys to determine the satisfaction of permit recipients and other customers with program implementation.
- The development of a program, including time and activity tracking, to conduct efficiency studies of average time to issue permits, conduct inspections and perform other required activities.
- A documented process for obtaining input from within the agency, from the public, and/or from an advisory group for identification of program strengths and deficiencies [Section 4.2.2.3].
- Evaluation of the results of a training, educational, or outreach program

[Section 4.2.2].
- Evaluation of the effectiveness of the agency's enforcement program. [Sections 4.1.2, 4.1.3, 4.2.1.2].

The following are examples of results:

- The number of inspections by the agency.
- The number, type and causes of spills, accidents and safety incidents reported to the agency.
- The number of operations witnessed by the agency.
- The number, type, frequency and cause of violations detected by inspectors [Section 4.1.2].
- The number, type, frequency and cause of complaints by the public, and the time required to resolve those complaints [Section 4.2.2.1].
- The number of violations, the time to resolve those violations, and the number unresolved [Section 4.1.2].
- The number of actions going to hearing, enforcement, and/or fines [Section 4.1.3].

d. Baselines and Follow-up

A state agency should regularly evaluate its effectiveness in attaining the goals set forth in Section 3.2 in a way that will create a baseline against which to compare the program's performance in the future.

A state agency is encouraged to conduct periodic self-assessments in addition to the assessments conducted in the State Review Process. These self-assessments should document successes and should identify areas for improvement. This will allow continual improvement of a state's program while recording its successes

The utilization of performance evaluations and a continual improvement process will demonstrate the state's efforts to adapt to changes in technology, concerns of the public and regulated community, and to provide both for the documentation of successes and identification of areas requiring improvement.

4.2.4 Financial Assurance

All states should have an adequate financial assurance program to provide resources to the state to close or remediate a site should an operator fail to meet its obligations under the law. The goal of any financial assurance program should be to avoid passing on the responsibility for closure and remediation costs to the citizens of the state. An adequate financial assurance program should be supported by the following elements: frequent site inspections; strict permit enforcement; and appropriate regulations governing and monitoring "inactive

status" of covered facilities.

States should identify activities such as closure and remediation and other relevant activities for which criteria have been set forth in Section 5 that need to be covered by financial assurance. Some states require financial assurance for inactive wells, some for drilling and/or plugging, some for waste disposal facilities, and some for the life of the well.

States should determine the types of financial assurances that will provide reliable monetary resources to the state and will facilitate an operator's compliance with permit requirements. Types of financial assurance include surety bonds; self-bonding; letters of credit; certificates of deposit; cash, federal, state, or municipal bonds; and other forms of collateral. Some states require performance bonds and some states require penal bonds. Some states accept a nonrefundable fee to be paid into the well plugging fund in lieu of a bond. Some states allow phased payments of collateral into a fund so that small operators can develop a collateral bond over a specified period of time. States should develop financial assurance options that facilitate an operator's compliance with bonding requirements. In addition to single well bonds, many states allow blanket bonds. This allows operators to assure that an established minimum level of financial assurance is provided without the commitment of an unnecessary amount of operating funds.

States should periodically review the amount of assurance required to determine if the amount is adequate to provide incentive for proper plugging of a well and reclamation of a site, and to assure proper management of E&P wastes.

In the case of commercial and centralized facilities as defined in Section 5.10, including those that manage E&P NORM, state financial assurance requirements should be sufficient to cover the costs of appropriate facility decontamination, reclamation, and closure, and should extend through any post-closure care, monitoring, or control period. (see Section 5.10.2.2.e.)

States should develop appropriate procedures to access an operator's financial assurance when the operator does not meet the obligations covered by the financial assurance. These procedures should include provisions for notice, hearings, and forfeiture.

Some states have special funds, such as well-plugging funds, that are available for state use to correct problems where an operator does not comply with state requirements. Although the availability of such funds may be a consideration in some states when determining bond coverage amounts, special funds should be used to supplement rather than completely take the place of other forms of financial assurance provided by the operator. The use of special funds should be limited to instances where the responsible operator cannot be determined or is unavailable. These special funds can be generated by taxes, fines, forfeitures, or fees.

4.2.5 Waste Hauler Certification

The appropriate state agency should have authority to require the training of drivers of trucks that are involved in the commercial transportation of E&P waste to a commercial or centralized disposal facility. Such training should include, among other things, emphasis on proper record keeping, the need to deliver the waste to the designated facility and emergency response and notification procedures. The appropriate state agency should also have authority to require the registration of all vehicles used to commercially transport the waste and of all commercial waste haulers.

4.2.6 Location of Closed Disposal Sites

A state program should contain authority with respect to disposal site closure, including authority to identify the location of the disposal site and for such information to be permanently maintained by the state agency for public review. Whether the location of a waste disposal site is disclosed in the public land records is a matter that is within the discretion of the state.

4.2.7 Data Management

4.2.7.1 General

Effective data management systems should be maintained due to the amount of information that states compile. Such systems should include permitting, operating, spill, remediation, and monitoring information and should include those data elements that an individual state finds are necessary to make cost-effective, risk-based decisions. Data should be maintained on as detailed a level as is necessary for the agencies to conduct their regulatory reviews. States and the federal government should undertake efforts to facilitate the sharing of data among responsible agencies, the public, and other users. States should develop policies for data access, data dissemination, and the allocation of cost of services to governmental and non-governmental users.

4.2.7.2 Electronic Data Management

Electronic filing, permitting, imaging, geographic information systems and internet data transfer and access are technologies that can contribute to program efficiency and data accessibility, although they are not required for effective waste

management. However, because of the efficiencies of electronic data management and enhanced accessibility of electronic data to regulators, the industry and the public, agencies are encouraged to develop systems for the electronic submittal, storage and retrieval of agency data. States are encouraged to implement electronic data management systems to improve program efficiency, data access, and data security to the extent they are appropriate to the State's regulatory program.

4.2.7.3 Program Elements

Agencies should provide for the capture of data and images as appropriate, and for both protecting the quality of data collected and the long-term protection and backup of captured information through measures such as off-site duplicate storage, archiving, and/or data retention and destruction policies. Agencies should include public and industry access in their data management systems.

Most program data are available to the public under various sunshine rules. Some records may be retained as confidential files for a defined period of time. Certain confidential types of data may also be discoverable. States should develop policies that define data sets to be made available to the public and/or industry.

4.3 Personnel and Funding

4.3.1 Personnel

For a state program to function effectively, sufficient, properly trained personnel to accomplish the goals and objectives of the program are necessary.

In determining its personnel needs, a state agency should consider not only the number of activities that it must regulate and inspect, but also the accessibility of those activities to agency personnel. Accessibility will be heavily influenced by the size of the area to be regulated, the local terrain, and road conditions. In addition, a state agency should evaluate how its personnel needs will be affected by activities occurring in environmentally sensitive areas (e.g., in close proximity to surface water and groundwater).

Generally, personnel needs should be evaluated in each of the categories of administration, legal, technical, and field inspectors. In each case, a state agency should define the areas of responsibility for the position, as well as any prerequisite experience and background. In addition, the state agency should provide for the continuing training of personnel to keep them abreast of changes in regulations, policy and technical issues, and to increase professionalism. This training can be accomplished through such means as seminars and university

short courses. The following discussion addresses these issues in each of the major personnel categories:

4.3.1.1 Administration

The elements of the administration of a state program should include traditional administrative functions such as program planning and evaluation, budgeting, and personnel. In addition, administration should be responsible for such programmatic functions as permitting, licensing, financial assurance, and ownership transfer. Public involvement and data collection management are also key elements of program administration. The conduct public hearings, the coordination of enforcement activities, and the referral of cases to legal personnel for follow-up action should also be administrative functions.

4.3.1.2 Legal

Legal support for an E&P environmental regulatory program can be provided by in-house state agency lawyers through the support of the attorney general's office or through independent counsel. In any case, sufficient legal support should be provided to a state agency to assure that the regulatory program has an effective capability to pursue appropriate enforcement actions in a timely manner against violators of program requirements. A critical element of this capability is that the program's legal element be capable of directing the preparation of enforcement cases and providing guidance and direction to field inspectors and others involved in case preparation. The legal element of a program should also be involved in both the procedural and substantive aspects of rulemaking.

4.3.1.3 Technical

All program elements require adequate technical support. In supporting administrative functions, technical personnel should provide geologic and engineering evaluation, and technical specifications on such matters as cementing and casing. Technical support to the legal and field personnel is necessary for the development and implementation of rules and in the preparation of enforcement cases. In support of field inspectors, technical personnel should be capable of mapping hydrologically sensitive areas and areas containing treatable water, and provide support in determining pit construction requirements and guidance in waste handling. Key technical personnel should have a bachelor of science degree in geology, engineering, hydrology, earth science, environmental science, or a related field, or possess equivalent experience. Technical personnel should be subject to continuing education in such areas as ongoing development of rules, policies, and technological changes.

4.3.1.4 Field Personnel

Field personnel should be responsible for conducting routine inspections of regulated facilities and activities to assure compliance with program requirements. In addition, field personnel should be among the state agency's on-site representatives to witness critical regulated activities and to observe or supervise clean-up or remedial actions. Field personnel also should be involved in the assembly of evidence for enforcement actions and in the state agency's community relations. Field personnel generally should be high school graduates or have equivalent experience, and should otherwise be knowledgeable about oil and gas field-related work and waste management practices. The ongoing training of field personnel should emphasize the range of chemical and radiological constituents in E&P wastes and at E&P sites, sampling and investigative procedures associated with enforcement proceedings, and a thorough understanding of current rules and policies of the program, as well as sound environmental practices. Field personnel should be provided with training in NORM identification and management, where appropriate. In addition, field personnel should be skilled in the handling of hazardous materials and in all aspects of personnel safety. They should also be trained in the identification of abandoned sites and the abandoned site remediation program, storm water management practices and requirements, and hydraulic fracturing processes.

4.3.1.5 Training Requirements

State programs should provide for adequate and effective training of state agency personnel regarding the regulations, policies, and criteria applicable to E&P activities. These programs should include training for agency personnel on such issues as site maintenance, contingency planning and spill response, permitting requirements and standards, compliance requirements and criteria, data management, enforcement procedures, investigative procedures, court preparation, report writing, sampling and analysis, and such other issues relating to proper E&P environmental regulation as may be necessary. Training programs should be incorporated as an on-going activity to encourage consistent enforcement of regulation throughout the state.

4.3.2 Funding

An effective E&P environmental regulatory program should be funded at a level sufficient to allow it to accomplish its environmental protection goals and objectives. While many state agencies are funded through a general appropriation from that state's legislature, each state agency should evaluate other sources of funding such as user fees, special levies on production, the dedication of fees and penalties to special accounts, and grants from various sources.

4.4 Coordination Among Agencies

Many state programs regulating E&P activities have their roots in oil and gas conservation programs that were established during the early part of the last century. In most cases, these programs have evolved to accommodate other state and federal objectives such as protection of human health and the environment.

In most states, multiple agencies are involved in the management of E&P activities. Different agencies are often responsible for the regulation of oil and gas wells, pits and impoundments, disposal wells, surface water discharges, spill prevention and response, and disposal of drill cuttings and muds. Each agency has its own administrative requirements relating to permitting, operational requirements, and financial assurance, and develops its own budget priorities. Each has its own inspection and enforcement authorities. Unless a high level of formal interagency coordination exists, such unilateral program development and implementation can lead to duplication of personnel effort, duplication of regulation with sometimes conflicting standards for the industry, and duplication of funding. Duplication of programs often diminishes the effectiveness of spill response, permitting, inspection, enforcement, training, and other regulatory activities. Where multiple state agencies have jurisdiction over the management of E&P activities, budget development should be coordinated and the agencies should develop formal coordination procedures, such as the development of interagency Memoranda of Agreement, interagency task forces with periodic meetings, and/or interagency legislative and regulatory review panels to ensure jurisdictional clarity and regulatory consistency.

Additionally, states should review existing agreements to assure that they are current and effective. Finally, interagency mechanisms should be developed to facilitate the sharing of information among and between involved agencies so that each agency can carry out its program responsibilities.

SECTION 5 | Technical Criteria

5.1 General

These technical criteria for E&P waste management practices address waste characterization, waste management hierarchy, pits, land applications, tanks and centralized and commercial facilities. In most cases, these criteria are general in scope. The states should establish and implement specific performance standards and design specifications based on site-specific or regional differences in geology, hydrology, climate, and waste characteristics. State E&P waste management programs should include the following general provisions as requirements:

a. Facilities and sites used for the storage or disposal of wastes derived from the exploration and production of oil and natural gas should be operated and managed at all times to prevent contamination of groundwater and surface water, soil and air, protect public health, safety and the environment, and prevent property damage.

b. Facilities and sites operated specifically for the storage or disposal of exempt E&P wastes should not receive, collect, store, or dispose of any wastes that are listed or defined as hazardous wastes and regulated under Subtitle C of RCRA, except in accordance with state and federal hazardous waste laws and regulations.

c. Disposal of E&P wastes into landfills may be considered. If such disposal is allowed, it should only be allowed where the landfill is designed to contain such wastes, and the E&P wastes contain no free liquids and are not mixed with non-exempt wastes prior to disposal.

d. Technical criteria for siting, construction, and operation of E&P waste disposal facilities should be flexible enough to address site-specific or regional conditions based on findings by the regulatory agency.

e. Siting Criteria

i. States should incorporate siting requirements in statewide rules for pits, landspreading, landfilling and burial, and waste reclamation facilities. Area-wide rules or site-specific permits may contain additional siting conditions.

ii. No E&P waste management facility should be located in a flowing or intermittent stream.

iii. Where necessary to protect human health, new E&P waste management

facilities should not be located in close proximity to existing residences, schools, hospitals or commercial buildings. The need for minimum distance criteria from residences or other buildings to the boundary of E&P waste management facilities should be considered.

iv. Generally, applicable siting requirements should address such factors as depth to and quality of groundwater, wetlands, floodplains, topography, proximity to existing drinking water supplies and wells, geology, geologic hazards, and other environmentally sensitive areas.

v. Siting of E&P waste management facilities should be consistent with applicable land-use requirements.

5.2 Waste Characterization

5.2.1 Purposes

Waste characterization should support at least the following functions of a state's E&P waste management program:

a. ensuring E&P waste management practices are suited to the particular wastes involved and in compliance with applicable program requirements; and

b. ensuring commercial E&P waste facilities are managing only wastes they are authorized to handle.

5.2.2 Sampling and Analysis

a. State waste characterization requirements should include appropriate testing of E&P wastes prior to disposal for such characteristics as organic content, pH, salinity, and sulfur compounds, including hydrogen sulfide content. Testing must be appropriate for the type of waste, method of disposal, and the potential for adverse health and environmental effects. In addition, while nothing in these criteria mandates testing for every hazardous constituent in E&P wastes, it is recognized that waste management practices and regulatory requirements would be improved by obtaining a more complete knowledge, through sampling and analysis, of the range of hazardous and toxic constituents in E&P wastes. Accordingly, waste characterization requirements should provide data necessary to meet the purposes of waste characterization described in section 5.2.1 and to administer and enforce state program requirements effectively.

b. State requirements for the assessment of E&P wastes for Naturally Occurring Radioactive Material (NORM) should meet the criteria of this section and of

sections 7.3.3. and 7.3.9. Such requirements should address all types of radiation expected in E&P wastes.

c. These guidelines do not address all the details of a waste characterization program, such as testing methods, frequencies, or parameters. The details are expected to vary depending upon the waste, the proposed management practice, and other state program requirements.

5.2.3 Quality Control

a. State programs should contain provisions that any required waste sampling follow appropriate sampling procedures, and any required laboratory analysis be performed by qualified laboratories in order to produce valid and reliable results. A state may rely on field testing to satisfy waste characterization requirements where it can be determined that such testing will produce valid and reliable results.

b. Testing methods should produce data that are valid for the purpose intended. By example, EPA's Toxicity Characteristic Leaching Procedure (TCLP) may not accurately predict the leachability of oily E&P wastes.

5.3 Waste Management Hierarchy

As in any aspect of waste management, there are some general, sound practices that should be employed. These practices, which emphasize waste minimization, not only serve to protect human health and the environment, but also tend to protect waste generators from long-term liabilities associated with waste disposal. Additionally, waste minimization may reduce regulatory compliance concerns for E&P operators and result in cost savings. Generally, the choice of an E&P waste management option should be based upon the following hierarchy of preference:

a. Source Reduction: Reduce the quantity and/or toxicity of the waste generated;

b. Recycling: Reuse or reclaim as much of the waste generated as possible, and whenever possible, combine hydrocarbons with crude oil, condensate, or natural gas liquids;

c. Treatment: Employ techniques to reduce the volume or the toxicity of waste that has been unavoidably generated.

d. Proper Disposal: Dispose of remaining wastes in ways that minimize adverse impacts to the environment and that protect human health.

5.3.1 Source Reduction Opportunities

There are significant source reduction opportunities in E&P waste management. State programs have a variety of available resources which provide proven source reduction techniques. Categories of source reduction opportunities and examples include:

a. Equipment Modifications: Many technically and economically feasible equipment modifications are available. For example, retrofitting glycol dehydration units with volatile organic vapor recovery units can result in the recovery, in certain circumstances, of economically viable quantities of volatile hydrocarbons that would otherwise be released to the atmosphere. In addition, compliance concerns regarding air emission regulations may be reduced considerably.

b. Procedure Changes: Many times a simple change in the procedure used in an operation can result in significant source reduction. A simple example with significant results is the change one operator made in produced water filter replacements in an EOR project. The original procedure of bi-monthly filter replacements was changed to a procedure based on filter differential pressure. The result was a 98% reduction in the quantity of generated waste filters. At production sites where NORM-scale formation is expected, implementing a procedure of scale inhibitor injection may reduce its occurrence.

c. Product Substitution: The careful selection of chemical products used in exploration and production can reduce the toxicity of E&P wastes. Potential product substitution candidates include biocides, coagulants, dispersants, emulsion breakers, scale and corrosion inhibitors, gas sweetening and dehydration agents, catalysts, and pipe dope. In particular, many substitute drilling fluids have been developed to replace oil-based drilling fluids.

d. Reduction in the Use of Fresh Water: A significant example of the reduction of fresh water use is the use of produced water for EOR whenever possible. Another simple example is the use of high-pressure, low-volume nozzles on rig wash hoses.

e. Good Housekeeping and Preventive Maintenance: In addition to product substitution, source reduction can be achieved by minimizing the generation of clean-up wastes from production facilities and waste management facilities. An evaluation of potential spills and mitigation measures may identify effective spill and release prevention techniques. These techniques include good housekeeping practices, routine inspections of equipment, equipment innovations, and containment systems. Radiation surveys of equipment and sites can be helpful in preventing or minimizing the spread of above-background levels of E&P NORM that may be encountered during routine equipment maintenance and servicing and site cleanup.

f. Planning: The first opportunity to accomplish source reduction is in the planning stage of an operation. For example, careful planning of a well stimulation can result in the reduction of left over chemical that may be disposed. Also, careful planning of a drilling site's construction to control stormwater runoff may reduce the quantity of contaminated stormwater that may be generated as waste.

g. Training: Training is possibly the most important source reduction opportunity. Personnel in the E&P conduct the activities that generate waste. Training in waste identification, classification, and source reduction techniques provides the field personnel with the tools necessary to effectively reduce waste generation.

h. Selection of Contractors: Service companies perform a wide variety of functions in the E&P on behalf of E&P operators. An important source reduction opportunity for operators is the selection of service companies that implement source reduction opportunities as a business practice.

5.3.2 Recycling and Reduction Opportunities

Many opportunities now exist to recycle E&P wastes. State programs are encouraged to develop or coordinate with recycling programs developed by other agencies responsible for waste management. For example, many states' agencies provide listings of companies that recycle wastes common to E&P and, in some instances, operate waste exchange programs.

Wastes generated at E&P facilities that may be recycled include drilling fluids, used lubricating oil, used lubricating oil filters, antifreeze, wooden pallets, spent solvents, unused chemicals, liners, aggregate, and scrap metal. Also, recycling opportunities include the use of produced water for enhanced recovery, and the recovery of hydrocarbons in crude oil tank bottoms, skim oils, gas pipeline drips, slop oil emulsions solids and sludges, and other oily sludges.

Recycling also includes reuse of materials that would otherwise be managed as waste. For example, a natural gas company found that partially spent caustic sweetening solution was suitable for use as reagent in sulfur dioxide scrubber units at a natural gas processing plant.

See Section 11 for guidance specific to the reuse and recycling of fluids generated during the drilling, completion (e.g. hydraulic fracturing flowback), and production stages of a well.

5.3.3 State Program Elements

State programs should contain mechanisms to encourage waste management consistent with the hierarchy of this section. A variety of mechanisms may be used, such as:

a. Program requirements or policies that encourage source reduction and recycling;

b. Improved training of state personnel so they can identify source reduction opportunities;

c. Technical assistance or incentives to operators; and

d. Educational activities aimed at informing facility operators of the options available.

The waste management hierarchy should be integrated into the other elements of a state program. For example, spill and release prevention should be incorporated into facility management regulations. Similarly, state requirements should address the segregation of waste streams that have a higher pollution potential from those with a lower pollution potential. State information program elements should include a component related to hierarchy planning and implementation.

State program planning activities should include goals and objectives that provide for substantial progress in this area over a reasonable time. States should have sufficient information to evaluate whether the mechanisms used to encourage source reduction and recycling are achieving those goals and objectives. State program requirements should be reviewed for consistency with the waste management hierarchy and the established goals and objectives. State agencies should also coordinate their efforts with other agencies that are responsible for waste management.

5.4 Quantitative Elements

Specific quantitative guidelines have been included for some waste management practices. The numbers cited are considered to be conservative values for protection of human health and the environment. However, they are not intended to be the basis for nationwide standards. Regulatory agencies may approve either less stringent or more stringent requirements where circumstances warrant as long as they afford the protection described in Section 5.1.a, and in the goals statement of Section 3.2.

5.5 Technical Criteria for Pits

5.5.1 Definitions

a. Reserve Pits

Pits used: (a) to store additional drilling fluids for use in drilling operations; and/or (b) to dispose of wastes generated by drilling operations and initial completion procedures.

b. Production Pits

i. Skimming/Settling: Pits used to provide retention time for settling of solids and separation of residual oil.

ii. Produced Water: Pits used for storage of produced water prior to injection for enhanced recovery or disposal, off-site transport, or surface-water discharge.

iii. Percolation: Pits used to dispose of waste liquids via drainage or seepage through the bottom and/or sides of the pits into surrounding soils.

iv. Evaporation: Lined pits used to contain produced waters which evaporate into the atmosphere by natural thermal forces.

c. Special Purpose Pits

i. Blowdown: Pits used for collecting material resulting from the emptying or depressurization of wells or vessels.

ii. Flare Pits: Pits used exclusively for flaring gas.

iii. Emergency Pits: Pits used to contain liquids on a temporary basis due to process upset conditions.

iv. Basic Sediment: Lined pits used for temporary storage of production wastes from tank batteries or production vessels which may contain residual oil.

v. Workover: Pits used to contain liquids during the performance of remedial operations on a producing well in an effort to increase production.

5.5.2 Permitting

a. A permitting or review process should be in place for all pits. Pits may be

authorized by rule, general permit, individual permit, or as a part of an operational permit or program.

b. Pits may be permitted by rule based upon specific requirements in areas where geologic, topographic, hydrologic or other conditions are similar.

c. Authorization for a pit may be included in operational, facility, or other environmental permits (e.g., drilling, workover, gas plant, NPDES discharge). The permit application process may have to be expanded to include certain additional information concerning the pit (i.e., intake volume, soil type, fluid makeup, topography, geology, hydrology, climatology, and such other factors as may be necessary to protect human health and the environment).

d. Construction and use of rule-authorized pits should require prior notification of the appropriate regulatory agency to ensure that proper construction, operation, and closure methods are used to protect human health and the environment.

e. State programs should include provisions to accommodate approval of pits for emergency situations.

5.5.3 Construction

General standards for construction of pits should be included in area or statewide regulations and should address the following items:

a. Size should be sufficient to ensure adequate storage until closure, taking into account historical precipitation patterns.

b. Depth should be such that the bottom does not penetrate groundwater or such that the pit contents do not adversely impact groundwater or surface water. A review of available information or a study should be made of the area where the pit is to be located to determine if aquifers are present and should be protected.

c. Berm height, slope, and material should be such that the pit is structurally sound and that pit integrity is not compromised by terrain or breached by heavy rains, winds, seepage, or other natural forces.

d. If a salt section is anticipated or oil-based muds are used during a drilling program, reserve pits should be designed to accommodate those fluids.

e. Construction standards for pits may differ depending upon the wastes they receive, the length of time they are used, and site-specific conditions.

i. The use of production pits is declining nationally because of concerns about potential contamination of air, soils, and groundwater. In many instances,

equipment consolidation, process modifications, or tanks can be used in lieu of pits. The use of alternatives is generally encouraged. Where production pits are used, they should generally be lined, except as provided below in subsection 5.5.3.e.v.

ii. In the case of reserve and workover pits, liners should be required in certain instances based upon fluid type and site-specific characteristics (e.g., unconsolidated soils and/or hydro-geologic conditions that create a potential for adverse impact to surface water or groundwater, and proximity to environmentally sensitive areas).

iii. Special purpose pits and other pits such as dehydration, tank drain, pipeline drip collector, and compressor scrubber pits should be lined.

iv. Blowdown, flare and emergency pits may be unlined where the removal requirement of Section 5.5.4.k. will prevent adverse groundwater quality impacts.

v. Variances to the above liner requirements should only be provided, and percolation pits should only be used, where it is clearly demonstrated there is minimal potential to affect adversely groundwater quality.

vi. Liners can consist of natural or synthetic materials, should meet accepted engineering practices, and should be compatible with expected pit contents.

f. Requirements for fencing, netting, and caging, or any other method to secure a pit, should be set by area or statewide regulations, as necessary, to protect the public, domestic animals, and/or wildlife. Netting of a pit is recommended as the preferred method to protect wildlife in circumstances, among others, where pits have oil on the surface, where pits are used for long periods, and/or where pits are located in areas with arid climates.

g. Where feasible, reserve pits should be placed to directly receive the discharge from solids separation equipment and to collect rigwash water, spills, and leaks from drilling equipment.

5.5.4 Operational Requirements

a. Specific restrictions on the type of wastes that can be placed in the different types of pits should be included in area or statewide regulations. Restrictions should consider salinity, hydrocarbon content, pH, radionuclides associated with E&P NORM, or other characteristics that may be detrimental to the environment.

b. General security guidelines should protect the public, the environment, and

wildlife.

c. Liquids should be maintained at a freeboard level determined by the state that takes into account extreme precipitation events or other possibilities and prevents overtopping or un-permitted discharges.

d. Lined pits should be operated in a manner that ensures liner integrity.

e. Inspections and monitoring should be conducted at regular intervals or as necessary to ensure that pits meet all operating and structural integrity requirements and to ensure that pit contents do not adversely impact groundwater or surface water.

f. Hydrocarbons that inadvertently accumulate in an unlined reserve pit should be skimmed off the pit at the cessation of drilling and completion operations.

g. Separated oil or accumulated wastes should be periodically removed from unlined skimming/settling pits.

h. Produced water pits should be used only for storage of produced water prior to injection or off-site transport.

i. Percolation pits should be used only for disposal of produced waters and only when area or statewide restrictions established under Section 5.5.4.a. above are met.

j. Evaporation pits should be periodically inspected for compliance with permitted input volumes and liner integrity. Evaporation pits should be skimmed as necessary to maintain an optimum evaporation rate.

k. Blowdown, flare, and emergency pits should not be used for long-term storage or disposal. The regulatory agency should be notified promptly of the use of emergency pits. Fluids diverted to emergency pits should be removed as quickly as practical following the end of the emergency.

l. Unlined basic sediment pits should not be used for storage of oily wastes; they should be replaced by lined pits or tanks.

m. Workover pits should be open only for the duration of workover operations and should be closed within 120 days after workover operations are complete.

n. Pit wastes that exhibit oilfield NORM above regulatory action levels should be managed in accordance with the criteria of Section 7 and any other applicable criteria of these guidelines.

5.5.5 Closure

a. Pits should be closed in accordance with local, state, and federal regulations and, if on private property, consistent with lease obligations.

b. Reserve pits should be closed as soon as practical but no later than 12 months after cessation of drilling operations. However, the closure of reserve pits beyond 12 months after cessation of drilling operations may be allowed in unusual circumstances if good cause can be demonstrated.

c. Pit liquids should have free oil removed and, when appropriate, should be sampled prior to closure for salinity, hydrocarbon content, pH, radionuclides associated with E&P NORM, or other characteristics which may be detrimental to the environment. On-site disposal of pit contents should be conducted in accordance with the landspreading, burial, and landfilling criteria of Sections 5.6. and 5.7, or by NPDES or UIC permit.

d. Liquid and nonliquid materials not satisfying the on-site criteria for landspreading or burial (Sections 5.6. and 5.7.) should be disposed in federal or state approved disposal facilities.

e. Pit sites should be capped, compacted, contoured, and vegetated where necessary, and in accordance with applicable state or area regulations to ensure ground support stability and to prevent erosion and ponding.

f. Records should be permanently kept by the regulatory agency of all pit locations and should be available to the public for inspection and copying. A permit to drill may serve as adequate record keeping for the location of all pits within 200 feet of the well location.

5.6 Technical Criteria for Landspreading

5.6.1 Definition and Applicability

a. Landspreading is a method of treatment and disposal of low toxicity wastes in which the wastes are spread upon and sometimes mixed into soils to promote reduction of organic constituents and the dilution and attenuation of metals. Landfarming or multiple applications are covered under Section 5.10.

b. These criteria apply to waste disposal at or near E&P locations and do not apply to commercial disposal operations. Commercial facilities used for disposal of E&P wastes are covered in Section 5.10.

c. On-site landspreading of E&P wastes containing NORM above regulatory

action levels should be prohibited.

5.6.2 Regulatory Requirements

When landspreading practices are used at E&P sites, they should be conducted consistent with local, state, and federal regulations, and lease and landowner obligations. General standards for landspreading should be included in area or state regulations and should address the operational requirements of Section 5.6.3.

5.6.3 Operational Requirements

a. Free oil should be removed from the wastes by mechanical means such as skimming or filtration before the wastes are landspread.

b. Landspread liquids should have a pH of 6 to 10 S.U. Where needed, liquids should be neutralized to obtain this range.

c. Solid wastes should be spread evenly and disked into the soil.

d. E&P wastes should be subject to loading rates, location restrictions, and/or other appropriate requirements that promote biodegradation of organic constituents; will not result in waste pooling, ponding, or runoff; will prevent the contamination of groundwater or surface waters; and will protect air quality.

e. Where enhancement of biodegradation is desired, nitrogen and other nutrients should be added to the soil before disking. Nutrient application can be repeated over time.

f. Amounts of waste added to soil during landspreading are generally limited by the electrical conductivity (EC), exchangeable sodium percentage (ESP), and sodium absorption ratio (SAR). The state should determine its criteria based on site-specific and waste-specific conditions. For example, some plants tolerate higher or lower salt levels, higher rainfall areas encourage salt movement out of the root-zone, or shallow groundwater may severely limit application.

g. After landspreading of hydrocarbon containing waste, the waste-soil mixture should not exceed one percent by weight oil and grease, unless the state regulatory agency approves a less or more stringent requirement where circumstances warrant.

h. Salt- and hydrocarbon-loading criteria apply to the final waste-soil mixture and are not an application standard. The operator should be required to demonstrate that these criteria are met within 12 months of cessation of drilling

or production. If these criteria are not met, remediation will be required. Nothing in this paragraph is intended to delay any requirement for erosion control and/or site reclamation or re-vegetation.

i. Soil analyses should be performed prior to landspreading and again upon closure of the site. Upon site closure, waste constituents should not be present at levels that pose a significant risk to human health and the environment.

j. Enhanced techniques, such as repetitive disking and nutrient addition, may be needed to meet the salt and hydrocarbon criteria of the final waste-soil mixture.

k. Under special or abnormal conditions, additional limitations and analysis requirements should be considered for wastes that may contain toxic constituents derived from formation liquids, cuttings, drilling muds, or drilling-mud activities. Records should be permanently maintained by the agency of all waste analyses conducted pursuant to such additional requirements.

5.7 Technical Criteria for Burial and Landfilling

5.7.1 Definitions and Applicability

a. Burial of wastes involves placing the wastes in an excavation and covering the wastes with a layer of soil.

b. Landfilling of wastes involves placing the wastes on the ground and covering them with a layer of soil.

c. These criteria apply to waste disposal at or near E&P sites and do not apply to commercial disposal facilities. Criteria for commercial disposal facilities are contained in Section 5.10.

5.7.2 Regulatory Requirements

When burial or landfilling is used at E&P sites, either should be conducted consistent with lease and landowner obligations and with local, state, and federal regulations. General standards for burial or landfilling should be included in area or statewide regulations and should address the operational requirements in Section 5.7.3.

5.7.3 Operational Requirements

a. Wastes or waste-soil mixtures may be buried or landfilled without a protective

bottom liner only when they meet the landspreading criteria of Section 5.6 prior to burial. The contents of such waste or waste-soil mixtures should be limited to materials such as fresh water-based drilling muds, drill cuttings, spent iron sponge, gas plant catalyst, or molecular sieve. Closure should be consistent with Sections 5.5.5.a and 5.5.5.e.

b. A protective bottom liner, solidification, fixation, or encapsulation should be required for burial or landfilling of wastes whose salt and/or hydrocarbon content exceeds the landspreading criteria of Section 5.6.3. A protective bottom liner, solidification, fixation, or encapsulation should be required for burial or landfilling of E&P wastes containing NORM above regulatory action levels. The regulatory agency may grant a variance from this requirement for fields or portions of fields, upon a showing by the operator that groundwater either is not present beneath the waste site or is naturally protected from the threat of contamination.

c. Agency records should be permanently maintained for any required analytical data taken, sites used, and types and quantities of waste disposed. Site locations should be located on plat maps.

5.8 Technical Criteria for Roadspreading

5.8.1 Definition

Roadspreading is the placement on roads of E&P wastes that exhibit properties similar to commercial road oils, mixes, dust suppressants, or road compaction or deicing materials. Roadspreading of E&P wastes that do not exhibit such properties should be prohibited. Roadspreading of E&P wastes containing NORM above regulatory action levels should be prohibited.

5.8.2 Regulatory Requirements

When roadspreading is used, it should be conducted consistent with lease and landowner obligations and local, state, and federal regulations. General standards for roadspreading should be included in area or state regulations and address the operational requirements in Section 5.8.3.

5.8.3 Operational Requirements

a. Exempt wastes such as tank bottoms, emulsions, heavy hydrocarbons, and crude oil-contaminated soil may be used for road oil, road mix, or asphalt if they

are not ignitable and have a mixed density and metal content consistent with approved road oils or mixes.

b. Roadspreading should be subject to loading rates and/or other appropriate requirements that prevent pooling, ponding, or runoff; prevent the contamination of groundwater and surface water; and protect air quality.

c. Roadspreading should be subject to appropriate buffer zones established to protect waters of the state, water wells, and wetlands.

d. Produced water should be tested and should exhibit properties similar to commercial roadspreading products that are regulated by federal, state, or local agencies.

5.9 Technical Criteria for Tanks

5.9.1 Scope

a. This section applies to permanently installed E&P waste tanks and to produced water storage tanks located at enhanced recovery operations. Where some waste tanks are regulated under the Spill Prevention Control and Countermeasures (SPCC) requirements of the federal Clean Water Act, states may defer to the SPCC requirements for those tanks.

b. Except as provided in Section 5.9.3.b., this section does not apply to:

i. condensate and crude oil tanks;

ii. process vessels, such as separators, heater treaters, dehydrators or freewater knockouts, except that stacks or vents on such vessels should be equipped, where necessary, to protect migratory birds and other wildlife; and

iii. tanks used temporarily in drilling and workover operations.

c. The regulatory agency may adjust or exempt from the requirements of this section small-capacity tanks.

5.9.2 General Requirements

a. States should have information, where available, on the locations, use, capacity, age and construction materials (e.g., steel, fiberglass, etc.) of tanks as needed to administer and enforce state program requirements effectively. Such

information may be obtained through registrations, inventories, or other appropriate means.

b. Tanks covered by this section should not be located in a flowing or intermittent stream and should be sited consistent with applicable local land-use requirements.

c. Tanks should be subject to spill-prevention, preventive maintenance and inspection requirements, including those of Sections 5.3.1.c. and 5.3.3. of these guidelines.

5.9.3 Construction and Operation Standards

a. A principal goal of construction and operation standards for tanks is to minimize the occurrence of and the environmental impacts from spills and leaks.

i. New tanks should be constructed in a manner that provides for corrosion protection consistent with the intended use of the tanks. All tanks covered by this section should be operated in a manner that provides for corrosion protection consistent with the use of the tanks.

ii. Tanks should exhibit structural integrity consistent with their intended use. Wooden tanks should receive increased scrutiny in this regard.

iii. Tanks should be operated in a manner that protects against overtopping.

iv. Secondary containment systems or other appropriate means, such as leak detection, should be employed to minimize environmental impacts in the event of releases.

b. Covered tanks are preferred to open tanks. Open E&P waste and product tanks should be equipped to protect migratory birds and other wildlife in a manner consistent with the wildlife-protection criterion of Section 5.5.3.f.

c. Tanks located in populated areas where emissions of hydrogen sulfide can be expected should be equipped with appropriate warning devices.

5.9.4 Tank Removal and Closure

a. Tanks should be emptied prior to their retirement and the resulting materials should be managed properly.

b. Tanks and associated above ground equipment should be removed upon cessation of operations. For good cause, a state may allow tanks to be removed as soon as practical thereafter. Site reclamation should meet all

landowner and lease obligations and any other applicable requirements.

c. Prior to removal, closure, or release for unrestricted use, tanks and associated piping and equipment should be surveyed for NORM as provided for in Section 7. When regulatory action levels are exceeded, NORM and the equipment containing NORM should be managed in accordance with the state's NORM regulatory program (see Section 7 of these guidelines).

5.10 Technical Criteria for Commercial and Centralized Disposal Facilities

5.10.1 Definitions and Exemptions

a. Commercial Disposal Facility: A facility whose owner(s) or operator(s) receives compensation from others for the temporary storage, reclamation, treatment, and/or disposal of produced water, drilling fluids, drilling cuttings, completion fluids, and any other RCRA exempt E&P waste, and whose primary business objective is to provide these services. These facilities may, under certain circumstances, also accept non-exempt, non-hazardous wastes generated from E&P operations. This definition also includes facilities whose owner(s) or operator(s) receives compensation from others for E&P NORM-related storage, decontamination, treatment, or disposal.

b. Centralized Disposal Facility: A facility, other than a commercial disposal facility, that is: (1) used exclusively by one owner or operator; or (2) used by more than one operator under an operating agreement and which receives for collection, treatment, temporary storage, and/or disposal of produced water, drilling fluids, drill cuttings, completion fluids, and any other RCRA exempt E&P wastes that are generated from two or more production units or areas or from a set of commonly owned or operated leases. These facilities may, under certain circumstances, also accept non-exempt, non-hazardous wastes generated from E&P operations. This definition covers the surface storage and disposal facilities that are present at Class II disposal well sites. This definition also covers E&P NORM related storage, decontamination, treatment, or disposal.

c. Exemptions: The definitions and technical criteria of Section 5.10 do not apply to Class II injection wells or to enhanced oil recovery projects. The definitions and technical criteria of Section 5.10 are not intended to apply to emergency cleanup situations at a Class II injection facility. The regulatory agency may adjust or exempt from the standards and requirements of this section (Sections 5.10), centralized facilities that receive a limited number of substantially similar waste streams and limited volumes of wastes, or commercial or centralized tank-only facilities.

5.10.2 Technical Standards and Regulatory Requirements

Commercial and centralized off-site disposal facilities should meet the technical and regulatory requirements of this section and the general standards of Section 5.1 of these criteria. Compliance with these requirements should be demonstrated in the permit application required in subsection 5.10.2.a. Because commercial disposal facilities use advanced methods of *waste* treatment and disposal, the regulatory agency should establish, where applicable, numerical requirements for the design of pond liners and leachate collection systems, for landfarming operations (i.e., repeated land applications), and for E&P waste reclamation facilities. The requirements of this section are intended to furnish the regulatory agency with sufficient and meaningful information such that permitting decisions will lead to no environmental impact or public health impact once the facility has commenced operations and following its closure.

The regulatory agency may adjust or exempt from these requirements centralized facilities that receive a limited number of substantially similar waste streams and limited volumes of waste, such as the consolidated produced water disposal facilities in a large multi-operator field. Administrative criteria for centralized facilities also may be less extensive than those for commercial facilities.

5.10.2.1 Regulatory Agency Responsibilities in Permitting

a. Permits. The regulatory agency should authorize off-site commercial and centralized disposal facilities for E&P wastes by permit. A permit should be in force for a finite period to be determined by the agency. The agency should use the data and information required by the technical standards of this section to approve or deny applications for permits, to ensure compliance with permit conditions, to order corrective actions in order to prevent or abate violations of the standards, or for any other purpose deemed necessary by the agency.

b. Acceptable Wastes. The agency should prescribe the range of E&P wastes that can be disposed at commercial and centralized facilities and at municipal solid-waste landfills.

c. Waste Characteristics and Disposal. The agency should identify the chemical characteristics of wastes likely to be disposed at commercial and centralized facilities on the basis of published scientific data and on knowledge about regional or site-specific waste characteristics. The agency should consider the types of waste management appropriate for each waste type, and the extent to which additional protective measures (e.g., leachate collection) are needed to protect groundwater, surface water and air. The agency should prescribe these waste disposal facilities and waste stream relationships by rule or in the permitting process and ensure that operators of commercial or centralized facilities comply with them. For sampling and testing, refer to Section

5.10.2.2.c.v. and vi. For determining radiological content, refer to Sections 7.3.3 and 5.2.2.b.

5.10.2.2 Permitting Requirements

a. Any new or existing commercial or centralized facility should be required to obtain a permit from the regulatory agency to commence operation or to continue to operate. An individual permit should be required for E&P waste reclaimers and other commercial facilities where waste is placed on the land (e.g., in pits and in landfarms). A permit should be issued only upon compliance with the general requirements of Section 5.1 and the technical requirements of this section, and upon submittal and approval of an application that contains a Siting Plan, Construction Plan, Operating Plan, and Closure Plan. Operation of a facility should comply with the terms and conditions of the permit. The regulatory agency may tailor the technical requirements for all existing facilities and for centralized disposal facilities to the conditions present at the locations of such facilities. In the case of centralized facilities, the regulatory agency may adjust the requirements of Section 5.10.2.2.a. b. and c. in the light of the volume and characteristics of wastes received by the facility.

b. Siting Plan. The specific site for a commercial facility and, to the extent possible, the site for a centralized facility, should have natural features that prevent or minimize release of pollutants to waters, land, and air. Those natural features could include isolation from or considerable depths to groundwater, protection against flooding, the presence of low permeability soils, and topography conducive to protection against erosion. Additional safeguards may be required by the regulatory agency for centralized facilities that are located on sites that do not exhibit natural protective features or are located in close proximity to residences, schools, hospitals or commercial buildings. An application for a permit for a commercial or centralized facility should, at a minimum, contain the following information:

i. Names, addresses, and telephone numbers of owner(s) and the operator(s) of the facility, the owner(s) and occupant(s) of properties within close proximity of the site, or any nearby person who may reasonably be adversely affected by release from the site;

ii. Topographic map showing the location of the site and any highways or roads that abut or traverse the site and depicting all water courses, flood plains, water wells, pipelines, and dwellings located within one mile of the site;

iii. Geologic, hydrologic, engineering, chemical, and any other data or information that demonstrate disposal of wastes and operation of the facility will not contaminate fresh water, the surrounding soils or air, endanger public health, safety or the environment, or cause property damage;

iv. Average annual precipitation and evaporation rate at the disposal site;

v. Nature and permeability of vadose zone; description of the subsurface strata, identification of the areal extent of underlying aquifer(s), and depth to groundwater; direction of groundwater movement; baseline data on water quality of nearby surface waters, underlying aquifer(s) and soils prior to commencement of operations; and points of past or current use of surface water or groundwater;

vi. Proof that all public notice requirements have been met; and

vii. Certification by an authorized representative of the applicant that information submitted in the application is true, accurate, and complete to the best of the applicant's knowledge.

c. Construction Plan. In general, commercial and centralized disposal facilities should be constructed to prevent or minimize releases of wastes or waste byproducts to surface water, groundwater, soils, and air. Design should allow for the segregation, separation and containment of free oil to minimize emissions, where appropriate. The need for additional protective measures (e.g., barriers) at facilities in close proximity to residences, schools, hospitals, or commercial buildings should be considered. Pits at these facilities should at least meet the construction requirements of Section 5.5.3.e. In the case of E&P waste reclamation facilities, construction requirements to prevent or minimize releases should also apply to wastes stored before and after reclamation. For commercial facilities, detailed engineering drawings and diagrams of engineered disposal facilities should be required; for centralized or one-owner facilities, such extensive construction details may not be needed. Construction should follow guidelines and rules adopted by the regulatory agency.

d. Operating Plan. Applications for permits for existing or new facilities should be accompanied by an Operating Plan that describes the wastes that will be accepted at the facility and the methods by which those wastes will be managed and disposed. The need for groundwater, air, or other monitoring at commercial or centralized disposal facilities where wastes are placed on the land should be evaluated by the state as part of this program development and implementation, and should depend upon the nature and size of the disposal activities. At facilities that manage E&P NORM, monitoring should be sufficient to determine compliance with maximum permissible doses to workers and to members of the public in unrestricted areas. The Operating Plan should contain the following information:

i. Volume, rate of application, and type of material to be disposed at the facilities and the facilities that will be used to dispose of each waste stream (i.e., unlined or lined pits, above- or below-grade tanks, etc.);

ii. Contingency plan for reporting, responding to and cleaning up spills, leaks, and releases of wastes or waste byproducts, including provisions for notifying emergency response authorities and for taking operator-initiated emergency response actions;

iii. Plan for routine inspection, maintenance, and monitoring to ensure and demonstrate compliance with permit requirements. At commercial and centralized facilities where wastes are placed on the land, such as in pits or landfarms, groundwater monitoring should be required in the absence of site-specific or facility-specific conditions that minimize the potential for adverse impacts to groundwater. Specific plans for preventing or minimizing air emissions from sources such as (1) the volatilization of organic materials in the waste; (2) particulate matter (dust) carried by the wind; and (3) chemical reactions (e.g., production of hydrogen sulfide from sulfur-bearing wastes) should be considered. Monitoring to ensure organic wastes are treated effectively should also be required for landfarming operations.

iv. Waste acceptance policy for the facility that details the types of wastes that the facility will accept(exempt E&P wastes and/or non-exempt, non-hazardous wastes from E&P operations), how the facility will determine whether a shipment of wastes meets its acceptance criteria including whether on-site sampling and testing will be employed, and the procedures that will be followed if unacceptable wastes arrive at the facility;

v. Plan to characterize wastes received for disposal. Waste characterization requirements for small centralized facilities may be more limited, based on the limited types and volumes of wastes received. At a minimum, waste characterization should comply with the requirements of Section 5.2. States should determine additional minimum testing criteria applicable to their regions;

vi. Plan for periodic removal and subsequent handling of free oil;

vii. Security plan for the facility;

viii. In the case of landfarming operations, loading rates, location restrictions, and/or other appropriate requirements that ensure the treatment of organic constituents, prevent the contamination of groundwater or surface waters, and protect air quality. Operations should comply with the requirements of Section 5.6.3;

ix. A community relations or public information plan should be considered; and

x. Environmental, Health, and Safety Plan. Where applicable, an environmental, health, and safety plan should be developed for commercial

disposal facilities. Such plan should describe site sampling methods and procedures to determine the potential risks to human health and the environment posed by the site. State regulatory programs should take into consideration the size and nature (treatment and disposal processes) of each facility when determining whether or not this environmental, health, and safety plan is applicable.

e. Closure Plan.

i. Applications for permits for existing or new facilities should be accompanied by a Closure Plan that describes the methods to be used to reclaim the facility following the cessation of operations. Closure should comply with the general requirements of Section 5.1 and with any other requirements established by the regulatory agency.

ii. For commercial disposal facilities and centralized disposal facilities of comparable nature or size, the plan should describe the site sampling methods that will be used to determine the risks to human health and the environment posed by the site, if any, once closure is completed; and any further measures that may be necessary to address remaining site contamination at that time. The plan should also include post-closure monitoring and maintenance requirements where the wastes remaining on-site after closure may adversely affect groundwater or surface waters, or otherwise pose a significant risk to human health and the environment. The duration of the post-closure care period and the nature of the post-closure requirements should correspond to the continuing risks posed by the facility after closure.

iii. The plan should include a closure schedule, a cost estimate for reclamation, and a schedule for authorized financial assurance instrument. The cost estimate and authorized financial assurance instrument schedule should be used to establish a financial surety level for the facility prior to permit approval. The level of financial surety requested should cover the full estimated cost of facility closure and reclamation.

5.10.2.3 Waste Tracking Requirements

To assure that only acceptable wastes are disposed of at commercial or centralized facilities, a waste tracking system that documents the movement of wastes from the site of their origin to their final disposition should be implemented. The following elements should be included in the waste tracking system:

a. Multi-Part Form or Equivalent Documentation: State regulatory programs should require operators to use a multi-part form or equivalent documentation that contains the names, addresses, and phone numbers of the generator

(producer), hauler, and disposal facility operator; a description of the waste; the time and date it was collected, hauled, and deposited at the disposal facility; and the volume of the waste hauled.

b. Maintenance of Waste Tracking Information: The waste tracking information should be maintained by the generator, hauler, and operator of the disposal facility for inspection by the regulatory agency for a period of three years after the shipment date. This record retention period should be automatically extended for any person who is the subject of an unresolved enforcement action regarding the regulated activity from the date such person receives notice of the enforcement action until it is resolved.

c. Attest to No Illegal Dumping: The waste hauler should certify in writing that no unauthorized wastes were dumped illegally or at a location or facility not designated by the generator and that no unauthorized wastes were mixed with the exempt wastes during transport. The disposal facility operator should certify in writing that the facility is authorized to receive the waste for disposal.

d. Reporting of Discrepancies: The operator of the disposal facility should immediately report to the regulatory agency and the generator, any discrepancy in waste descriptions, volumes, or place of origin based on personal observations or documentation.

e. Permitting of Waste Haulers: Waste-hauling companies should be permitted by the regulatory agency based on a showing of basic knowledge about the regulatory requirements for disposition of E&P wastes transported from their point of generation to their final disposal site. The regulatory agency may issue permits to individual waste haulers or to waste hauling firms.

5.10.2.4 Applicability of Waste Tracking Criteria

These waste tracking requirements do not apply to wastes moved by pipeline. Operators who transport wastes by pipeline should periodically report waste quantities to the regulatory agency.

SECTION 6 | Abandoned Sites

6.1 Abandoned Oil and Gas Sites Introduction

States with current or historic oil and gas operations should develop and implement a program to inventory, prioritize, and remediate, as necessary, abandoned sites. The purpose of this section is to provide guidance for that program. It is not the intent of these guidelines to preclude an abandoned site from being returned to operation in accordance with state requirements.

6.2 Definition of "Oil and Gas Site" and "Abandoned Site"

The terms "Oil and Gas Site" and "Abandoned Site," as used herein, have the following meanings:

a. An **Oil and Gas Site** is land or equipment, including a wellbore, that is now or has been used primarily for oil or gas exploration or production, or for the management of oil and gas wastes from exploration and production.

b. An **Oil and Gas Site** is considered an **Abandoned Site** if the site:

i. Was not adequately plugged or closed at conclusion of operations such that it constitutes or may constitute a threat to public health or the environment; and

ii. Has no owner, operator, or other responsible person (hereinafter called "responsible party") who can be located, or such responsible party has failed or refused to undertake actions, where required by law, to abate the threat. A responsible party cannot be located, among other circumstances, where no liability for remedial actions is imposed by the state upon past or current owners and operators.

6.3 Identification of Abandoned Sites

A state should have a procedure for identifying sites that may constitute a threat to public health or the environment and for determining whether a responsible party exists. The state should develop and maintain an inventory of abandoned sites. Examples of elements that may be considered in identifying sites that may constitute a threat to public health or the environment include agency reviews or inspections, referrals by other agencies, or citizen or landowner inquiries. Classifications or rankings may be used to separate these sites into relative risk categories. Examples of elements that may be considered in determining whether

a responsible party exists include the failure to file required data or reports, the failure to respond to agency inquiries, tax defaults, information in public records, or landowner or public inquiries. In developing an inventory of abandoned sites, the state should have procedures for attempting to notify the last known responsible party, and providing legal notice.

Emergency protocols should be included, so that remedial action can be initiated prior to legal notice on sites that are judged to present an immediate threat to the public health or environment. Where there are agencies with overlapping jurisdiction for abandoned sites, inventory procedures should be coordinated among these agencies as further discussed in Section 4.4 of these guidelines.

6.4 Funding for Abandoned Site Remediation

An effective state program to address abandoned sites should have adequate funds available to permit the state to undertake any necessary assessment, plugging, closure, or remediation of such sites.

Adequate funding involves the development of a financial assurance program as provided in Section 4.2.4. To ensure the continuity of financial assurance in the event of a change of operator, notice to the state of any such change should be required. Any financial assurance provided by the previous operator should remain in effect until the new operator's compliance with the state's financial assurance program is verified.

Section 4.2.4 describes some of the types of financial assurance a state should consider in designing a program to provide it with the necessary economic resources while facilitating operator compliance. As part of a financial assurance program, a state should consider establishing a special purpose fund to plug, close, or remediate an abandoned site. The state should have the authority to recover costs from the responsible party, where such party exists. The state should evaluate its needs and establish such funding mechanisms as are appropriate to satisfy those needs. A wide variety of funding mechanisms have been employed to support existing special purpose funds in various states. Those mechanisms include bond forfeitures; legislative appropriations to the responsible state agency; a percentage of the taxes on oil and gas production; fines and penalty assessments; equipment salvage; and a host of fees, among them fees or charges based on the value of oil and gas, fees or charges based on units of production of oil and gas, operator fees, supplemental fees in lieu of bonds, inactive well fees, permit fees, and waste generation fees.

6.5 Criteria for Prioritizing Remediation

The state program should include criteria for determining whether an abandoned

site constitutes a threat to public health or the environment and the site's priority for remediation. Among other things, the following criteria may be used: (1) the occurrence of or potential for an imminent release from the site; (2) the nature, extent, and degree of contamination; (3) the proximity of the site to populated areas, surface water, and/or groundwater; (4) whether the site is in an environmentally sensitive area; and (5) wellbore lithology and condition. Where appropriate, the state should perform a more detailed site evaluation. The state agency should have flexibility and discretion to consider the factors associated with the individual sites, including cost savings associated with simultaneous remediation of multiple sites that otherwise would have different priorities or similar financial considerations, in assigning them a priority on the inventory of abandoned sites.

6.5.1 Goal for Remediation

A goal of the state program should be to remediate the abandoned sites on its inventory in a manner that assures that reasonable and measurable progress is made.

6.5.2 Liability for Remediation

The state should establish a liability scheme that will ensure that the goals of its abandoned sites program will be achieved. States should consider a range of options with respect to liability for remediation, which may include among others: (1) liability for all current and past owner(s) and operator(s); (2) liability for the owner(s) and operators(s) found to be responsible for the contamination at an abandoned site; or (3) no liability for past or current owner(s) and operator(s) should the state choose to finance the abandoned sites program.

Any liability scheme established by a state should clearly define the responsibility for remediation. A state should allow remediation of an abandoned site by a party that would not otherwise be responsible for the remediation.

6.6 Standards for Remediation

The state should ensure that abandoned sites, including well bores, be plugged or closed in a cost-effective manner that minimizes or removes the threat to public health and the environment and that restores the land to an environmentally stable condition.

6.6.1 Well bore Remediation

The state should consider existing rules and regulations when determining proper plugging procedures for abandoned sites. However, the state should have the flexibility to modify those plugging procedures, while maintaining mechanical integrity of the well bore adequate to ensure that public health and the environment are protected.

In carrying out well bore remediation, the state should use existing information from well records including depth of well, depth of any old plugs, presence of casing and tubing and depths set, perforations, existence of groundwater and hydrocarbon-bearing zones, existence of over-pressured zones, and any junk in the hole to determine the condition of the well and the proper plugging procedure. In the absence of the above information, data such as existing geological and engineering field studies, water well records, interviews with nearby landowners, corporate records, and historical literature can be reviewed.

6.6.2 Site Remediation

The extent of surface remediation of an abandoned site should be determined based on surface and subsurface resources and land use. Consultation by the state regulatory agency with the surface owner, surface tenant, and other federal, state and local agencies, as appropriate, should take place prior to remediation.

As appropriate, abandoned sites should be re-vegetated in accordance with state regulatory agency rules, and with consideration given to recommendations from the surface owner, surface tenant, and federal and local agencies. As appropriate, soil should be evaluated to determine if hydrocarbons, chemicals, or NORM were spilled or leaked, and to determine remediation.

Surface equipment or materials on an abandoned site should be removed, and salvaged when possible, unless the state determines otherwise. Procedures should be identified for handling NORM, if present. Due to the expense and potential damage to the land, there may be situations where equipment or materials would not be removed, e.g., a gathering system might be abandoned in place with appropriate protection. When reclaiming a pit, the state should determine the contents of the pit and how the pit can best be remediated. Once emptied, cleaned and tested as appropriate, pits should be backfilled and contoured to prevent erosion from or ponding of surface water. Monitoring wells at an abandoned site should be as necessary to protect groundwater resources. The state should develop additional remediation criteria for commercial disposal sites, as appropriate.

6.6.3 Record of Remediation

Once remediation of an abandoned site has been completed, reports on how the

site was remediated should be maintained by the regulatory agency.

6.7 Public Participation

The state abandoned sites program should provide for public participation. At a minimum, the public should have: (1) access to information about the program; (2) the opportunity to participate in any rulemakings associated with the program; and (3) a statutory or regulatory mechanism to petition the state agency to change a site's status on the inventory and/or the level of remediation required on a site.

6.7.1 Access to Information

The state should maintain and make available to the public, records related to the abandoned sites inventory, including: (1) the location of an abandoned site; (2) the extent and degree of contamination of the abandoned site; and (3) the method of remediation that has been or will be required for an abandoned site. In addition, the state should maintain public records on the state's progress with respect to implementing the abandoned sites program.

6.7.2 Participation in Rulemaking

The state program should provide an opportunity for the public to participate in any rulemakings associated with the program.

6.7.3 Participation Regarding Priority on the Inventory and Level of Remediation

The state program should include a mechanism by which an affected person could petition the state to: (1) add a site to the abandoned sites inventory; (2) change the priority for remediation of a site on the inventory; and (3) conduct or require additional remediation of a site.

6.8 Avoid Future Abandoned Site Problems

Since abandoned sites may constitute a threat to public health and the environment, the state should:

a. Establish and implement an abandoned site program consistent with the guidance in this section; and

b. Enforce its existing regulatory program, with modifications, if necessary,

consistent with this guidance.

c. Evaluate its programs for financial assurance, inspection, compliance tracking, and monitoring of inactive sites to determine whether or not the state should make adjustments to prevent an increase in abandoned sites.

SECTION 7 | Naturally Occurring Radioactive Materials

7.1 Background

Naturally occurring radioactive material (NORM) is present above background levels at some oil and gas E&P facilities and E&P service company locations. NORM found in E&P operations originates in subsurface oil and gas formations and is typically transported to the surface in produced waters. NORM may deposit in well tubulars, surface piping, vessels, tanks, pumps, valves, and other producing or processing equipment and may be found in scales, sludges, contaminated soil, and other associated E&P wastes. NORM is also referred to as Technologically Enhanced Naturally Occurring Radioactive Material or TENORM.

7.2 General

States should adopt an E&P NORM regulatory program that addresses identification, use, possession, transport, storage, transfer, decontamination, and disposal to protect human health and the environment. States may choose not to adopt such a program if they find, based on field monitoring data and other scientific information, that no NORM is present in oil and gas operations in the State, or that the levels of NORM present in oil and gas operations in the State do not present such a risk to human health or the environment to warrant a regulatory program. States that make such a finding should periodically reevaluate the basis for the determinations.

If a state determines that a regulatory program is necessary, it should tailor its program to NORM occurrence in the oil and gas E&P industry and an assessment of risks to human health and the environment. The program should include the elements listed in Section 7.3. E&P NORM should be managed in accordance with the pollution prevention and waste management hierarchy provisions of these guidelines. In addition, the other sections of these guidelines apply, where applicable, to NORM as a constituent of E&P waste.

7.3 Elements of an E&P NORM Program

7.3.1 Definition

States should develop a definition for NORM that is consistent with that which occurs in the oil and gas E&P industry. For purposes of these guidelines, NORM is defined as any naturally occurring radioactive materials (not including byproduct, source or special nuclear material, or low level radioactive waste) not subject to

regulation under the Atomic Energy Act, whose radionuclide concentrations have been enhanced by human activities such that potential risk to human health or the environment are increased.

7.3.2 Action Levels

States should establish risk-based numerical action levels above which NORM is regulated taking into consideration the risk of exposure to human health and the environment. Such action levels should also be used to regulate the transfer or release of equipment, materials, and sites.

7.3.3 Surveys

States should develop standards for survey instruments and procedures for identifying and documenting equipment, materials, and sites that may contain NORM above the action levels. States should consider the types of facilities to be surveyed, when surveys should be performed, when survey results should be reported to the state regulatory agency, and any necessary training of surveyors. State survey requirements should provide data necessary to meet the purposes described in Section 5.2.1 and to administer and enforce state program requirements effectively.

7.3.4 Worker Protection

State regulatory programs should include applicable state and federal standards for worker protection from exposure to radiation, including worker protection plans, and other standards necessary for the protection of workers from exposure to NORM. States should establish NORM training or certification requirements based upon E&P work related duties and their associated NORM exposure risk (i.e., NORM awareness training may be sufficient for many common E&P work activities).

7.3.5 Licensing/Permitting

a. General licensing/permitting: Persons who possess E&P NORM in concentrations or at exposure rates that exceed state-adopted action levels should be generally licensed or permitted.

b. Specific licensing/permitting: Specific licenses or individual permits should be required for commercial storage, removal, decontamination, remediation, treatment or disposal of E&P NORM. A state may require specific licenses or individual permits for the management of E&P NORM at centralized facilities as

defined in Section 5.10.

7.3.6 Removal/Remediation

States should consider performance standards for removal, decontamination, and remediation that are protective of human health and the environment.

7.3.7 Storage

States should establish standards for storage of NORM that are protective of human health and the environment. NORM storage facilities should be constructed to prevent or minimize releases. Tanks used to store E&P NORM should meet the requirements of Section 5.9. A state should consider adoption of limits on the amount of time NORM that exceeds action levels can be stored, depending on factors such as quantity, radioactivity, climate, proximity to the public, and protective controls.

7.3.8 Transfer for Continued Use

State regulatory programs should allow for the transfer of land and equipment containing NORM for continued operations in the production of crude oil and natural gas, with appropriate notification to affected parties.

7.3.9 Release of Sites, Materials, and Equipment

State regulatory programs should address the levels below which, and conditions under which, equipment, materials, and sites containing NORM may be released. State regulatory programs should authorize the release of equipment, materials, and sites for unrestricted use only if NORM is below action levels. Such regulations should provide for appropriate notification to affected persons.

7.3.10 Disposal

State regulatory programs should authorize disposal alternatives within the state's jurisdiction for various E&P wastes containing NORM, including contaminated equipment, and should include regulatory requirements for NORM disposal that are protective of human health and the environment. Landowner or other notification may be required as a condition of disposal. Commercial and centralized NORM disposal facilities should meet the criteria of Section 5.10.

7.3.11 Interagency Coordination

State radiation programs, oil and gas programs, and waste management programs are frequently distributed among separate agencies. Therefore, in many states, multiple agencies may regulate NORM. The various agencies should coordinate their regulatory and enforcement activities under the guidance given in Section 4.4 of these guidelines.

7.3.12 Public Participation

State regulatory programs for NORM should meet the public participation guidelines established in Section 4.2.2.

7.4 Regulatory Development and Research

The Conference of Radiation Control Program Directors has prepared suggested state regulations for NORM, and a number of states have developed or are in the process of developing NORM regulations. States that are developing their own NORM programs are encouraged to consult these sources as well as applicable federal radiation guidance and requirements for information and assistance. In addition, states should encourage and keep abreast of ongoing and future research on NORM, including risk assessment.

SECTION 8 | Stormwater Management

8.1 General

Stormwater can become contaminated from contact with spilled or stored materials, from contact with E&P waste, or from the erosion of soils. E&P waste management practices that have a potential of contaminating stormwater include land application, landfarming and roadspreading. States usually have statutory authority for stormwater management programs through general pollution prevention or water pollution control legislation. States should implement programs to minimize the potential for contamination of surface water from sediment and other E&P contaminants contained in stormwater.

Stormwater management requirements should be adapted to regional characteristics. These characteristics include variations in topography, rainfall (annual average, episodic and seasonal), major soil types, proximity to surface waters, floodplains, seasonal and permanent swamps, wetlands and marshes, and vegetative cover.

States should adopt a stormwater management program based on the potential effects on human health and the environment. States may choose not to adopt such a program if they find, based on field monitoring data and other scientific information, that stormwater runoff does not pose a significant risk to human health or the environment. States that make such a finding should periodically reevaluate the basis for the determination. The state program need not duplicate applicable federal regulations for stormwater management.

Stormwater management regulatory activities should be coordinated with activities of other interested parties including landowners, soil conservation agencies, land management agencies, agencies with NPDES jurisdiction, and agencies with spill response authority.

8.2 State Regulatory Elements

The state agency with stormwater management or erosion control_authority should require an operator to minimize environmental impacts caused by stormwater. These requirements should include a description of the action the operator will take to meet state program goals for the geographic location in which the activity will take place. These requirements may be spelled out in specific regulations or they may be required to be included in operator- or site-specific plans developed by operators. State program requirements should specify time frames when stormwater control measurements are to be in place and when any state notifications are to occur.

In regions where stormwater has a high potential for causing environmental degradation, states should consider the use of permits or other authorizations to assure that adequate measures will be put in place. Such permits or authorizations should conform to Section 4.1.1. (Permitting).

State stormwater management programs should contain compliance evaluation capabilities as outlined in Section 4.1.2. (Compliance Evaluation), contain enforcement capabilities as outlined in Section 4.1.3. (Enforcement), be applicable to responses to spills and releases as outlined in Section 4.2.1. (Contingency Planning and Spill Risk Management), and contain data management capabilities as described in Section 4.2.8. (Data Management).

States programs should provide for outreach and training on stormwater management requirements and practices for operators, landowners and the public. These activities should conform to Section 4.2.2.2. (Public Participation). Similarly, training should be provided for state agency personnel as outlined in Section 4.3.1.5. (Training Requirements). Where stormwater management and E&P regulatory authority reside in different agencies, oil and gas agency staff should be trained so that they can, as time and staffing patterns allow, provide information and referrals to operators.

State stormwater management programs should be evaluated periodically in accordance with Section 4.2.3 (Program Planning and Evaluation). Such evaluations should include an analysis of all aspects of the program, and procedures for making any necessary program changes identified during the evaluation.

8.3 State Agency Regulatory Program Criteria

8.3.1 Planning

Within the context of an E&P program, selection of the location for a well site, roadway, pipeline or other E&P facility is a critical component of a stormwater management program. Factors to be considered during the development of site requirements with respect to stormwater management include: minimization of the area to be disturbed, current land uses, site gradient, the type of facility to be constructed, springs and seeps, floodways, stream crossings, and the management of E&P wastes.

Other factors that should be considered in the development of stormwater management requirements include well density, distance between wells, existing roads, necessary temporary and permanent roads to be constructed, road alignment, slope, grade and length, the availability of vegetative filter strips, and

the management or disposal of trees and stumps to be removed during construction.

8.3.2 Construction

The construction of well sites, access roads, pipelines, stream crossings and crossings of wetlands, swamps and marshes can result in the contamination of stormwater and/or adjacent surface waters. Consequently, state agencies should develop standards or management practices appropriate for these activities. Similar practices may be necessary when responding to spills and releases when soils are disturbed or contaminants are mobilized by stormwater.

Standards or management practices should be appropriate for the region in which the construction activity will occur. Examples of such requirements include the construction of upgrade diversion channels and the collection of construction site runoff; the use of brush and other barriers and the stockpiling of topsoil and subsoil during clearing and grubbing; and the grading of cut and fill slopes, road embankments, road surfaces (crowned, insloping or outsloping) and roadside ditches to control water.

Similarly, requirements should be developed for bridges, causeways, cofferdams, fords and bank stabilization when surface waters are encountered. Requirements for temporary road or stream crossings and use of rock at construction entrances may be necessary.

Practices to be considered for stormwater controls during construction include drainage ditches, basins, sediment traps, berms, vegetative filter strips, sediment barriers, turnouts, culverts and cross-drains, broad-based dips and swales, waterbars, rock filters, straw bale barriers and fabric filter fence. Outlet protection should be provided for devices with outlets to surface waters.

Additional practices to be considered for pipeline construction include the use of ditchline barriers, timing of backfilling, materials used for trench backfill, location of staging areas, and the use of trench plugs. In fragile soil, wetland and marshy areas, and at stream crossings, construction mats, board roads or geo-textiles should be considered.

Criteria should be developed for temporary stabilization if permanent stabilization will be delayed. Temporary stabilization practices such as seeding with annual grasses and mulching, or seed/filter fabric combinations should be considered. Permanent stabilization can occur through the application of rock to well sites and roads, and achieving adequate growth of (or sodding with) permanent vegetation. Factors to be considered during revegetation include calculation of acreage, soil types and distribution, seed bed preparation, seed mixtures (temporary, permanent), soil amendments, and mulching and anchoring.

8.3.3 Operation and Maintenance

States should require that stormwater control measures be operated and maintained in a manner that will assure their effectiveness during site preparation, well drilling and production, and until the site is restored. These measures should be operated and maintained to control sediment as well as E&P waste and spills. Requirements regarding the frequency and type of inspection, preventative maintenance and repairs are appropriate.

8.3.4 Restoration and Reclamation

Where appropriate, states should incorporate stormwater management during the development of standards for site restoration and reclamation. These requirements should apply to the restoration of recently active sites, orphan sites, remediation sites, and sites where prior restoration efforts failed.

Where appropriate, stormwater management criteria should be developed for the removal of equipment, restoration of pits, disconnection and abandonment of pipelines, backfilling and grading, and access road reclamation.

SECTION 9 | Hydraulic Fracturing

9.1 Background

The practice of completing oil and gas wells through hydraulic fracturing, while not new, has evolved into a key technology in the development of unconventional oil and gas resources, such as coal bed methane or shale gas. This has resulted in questions about the potential impacts on water resources due to the volume of water needed for hydraulic fracturing, the potential impacts to groundwater by the hydraulic fracturing process, or the proper management or disposal of waste and other fluids associated with hydraulic fracturing.

9.2 General

States should evaluate potential risks associated with hydraulic fracturing, taking into account factors such as depth of the reservoir to be fractured, proximity of the reservoir to fresh water resources, well completion practices, well design, and volume and nature of fluids. Where necessary and recognizing the local and regional differences discussed in Section 3.3, states should have standards to prevent the contamination of groundwater and surface water from hydraulic fracturing. State programs for hydraulic fracturing should ensure establishment and maintenance of well control; protection of groundwater zones, other mineral resources.

9.2.1 Standards

State programs for hydraulic fracturing should include standards for casing and cementing to meet anticipated pressures and protect resources and the environment. The state should have the authority as necessary to require the performance and/or submittal of diagnostic logs or alternative methods of determining well integrity. The state program should address the identification of potential conduits for fluid migration in the area of hydraulic fracturing and the management of the extent of fracturing where appropriate. The program should require monitoring and recording of annular pressures during hydraulic fracturing operations. The program also should address actions to be taken by the operator in response to operational or mechanical changes that may cause concern, such as significant deviation from the fracture design and significant changes in annular pressures.

State programs for hydraulic fracturing should consider baseline groundwater monitoring protocols that address appropriate factors which may include distance/radius from the well, timing/frequency of testing, test parameters, reporting and management of and access to data, existing/new development or existing production in area, responsibility for sample collection, testing, cost, location/gradient, surface owner

consent, laboratory accreditation, and remedial actions.

Surface controls, such as dikes, pits or tanks, should meet the criteria in Sections 5.5 and 5.9. In addition to pit technical criteria for authorization, construction, operation, pit integrity monitoring, and closure contained in Section 5.5, states should address unique characteristics of impoundments associated with hydraulic fracturing, including the use of centralized and commercial facilities, operatorship, size, location, duration, closure, retention for other use, and characteristics of contained fluids. States should consider erosion and safety issues such as embankment integrity associated with fresh water impoundments associated with hydraulic fracturing.

Contingency planning and spill risk management procedures that meet Section 4.2.1 should be required. Waste characterization should be consistent with Section 5.2. The waste management hierarchy contained in Section 5.3 (source reduction, recycling, treatment and disposal), including the provisions relating to toxicity reduction, should be promoted. The tracking of waste disposed at commercial or centralized facilities should meet the requirements of Section 5.10.2.3. Procedures for receipt of complaints related to hydraulic fracturing should be consistent with Section 4.1.2.1.

9.2.2 Reporting

The regulatory agency should require appropriate notification prior to, and reporting after completion of, hydraulic fracturing operations. Notification should be sufficient to allow for the presence of field staff to monitor activities. Reporting should include the identification of materials used, aggregate volumes of fracturing fluids and proppant used, and fracture pressures recorded.

State programs should contain requirements for public disclosure of information on type and volume of base fluid and additives, chemical constituents, and actual or maximum concentration of each constituent used in fracturing fluids. States are encouraged to require disclosure of such information online. State programs should contain mechanisms for disclosure of chemical constituents used in fracturing fluids to the state in the event of an investigation and to medical personnel on a confidential basis for diagnosis and/or treatment of exposed individuals. Where information submitted is of a confidential nature, it should be treated consistent with Section 4.2.2.

9.2.3 Staffing and Training

In addition to the personnel and funding recommendations found in Section 4.3, state staffing levels should be sufficient to receive, record and respond to complaints of human health impacts and environmental damage resulting from hydraulic fracturing. Staff should receive adequate training to stay current with new and developing hydraulic fracturing technology.

9.2.4 Public Information

State agencies should provide for dissemination of educational information regarding well construction and hydraulic fracturing to bridge the knowledge gap between experts and the public as provided in Section 4.2.2.2. This is especially important in areas where development has not occurred historically and in areas where high volume water use for hydraulic fracturing is occurring.

9.2.5 Coordination

In addition to coordination as contained in Section 4.4, states should consider interstate coordination of regional multi-state issues such as source water, transportation and waste management related to hydraulic fracturing.

9.3 Water and Waste Management

Fundamental differences exist from state to state, and between regions within a state, in terms of geology and hydrology. The state should evaluate and address, where necessary, the availability of water for hydraulic fracturing in the context of all competing uses and potential environmental impacts resulting from the volume of water used for hydraulic fracturing. The use of alternative water sources, including recycled water, acid mine drainage and treated wastewater, should be encouraged.

Waste associated with hydraulic fracturing should be managed consistent with Sections 4.1.1 and 7.

States should encourage the efficient development of adequate capacity and infrastructure for the management of hydraulic fracturing fluids/wastes, including transportation (by pipeline or otherwise), recycling, treatment and disposal. State programs should address the integrity of pipelines for transporting and managing hydraulic fracturing fluids off the well pad.

SECTION 10 | Air Quality

10.1 Background

As a result of the increased development of oil and natural gas from shale formations in recent years, concerns about air emissions have become more focused. On August 16, 2012, EPA published 3 final rules for the Oil and Natural Gas Sector (NSPS OOOO, for the control of VOC and SO_2 emissions; and NESHAP HH/HHH, for the control of hazardous air pollutant emissions). The NSPS applies to sources that are new, modified or reconstructed since August 2011. It requires that companies reduce completion flowback emissions from hydraulically fractured and refractured gas wells by employing reduced emissions completions (aka "green completions"), control emissions from storage vessels by 95%, use low or no bleed pneumatic controllers in the production segment, use no bleed controllers at gas plants, replace reciprocating compressor seals every 26,000 hours of operation or three years, reduce wet seal centrifugal compressor emissions by 95%, and implement more stringent leak detection and repair programs at gas plants.

The NESHAP HH/HHH rules amended provisions to currently codified rules. In particular, the amendments set new standards for small glycol dehydrators, lowered the leak detection threshold at gas plants and amended the definition of "associated equipment" used in making major source determinations at well sites.

In response to petitions for administrative reconsideration of the 2012 rules, EPA is working on changes over the next several years to improve the effectiveness and practicability of programs.

10.2 Administrative

Where necessary, and recognizing the local and regional differences discussed in Section 3.3, states should have standards to prevent the contamination of air. While oil and gas regulatory agencies have many environmental responsibilities for oil and gas operations, the air programs are typically regulated by sister state environmental protection or health agencies and are given statutory and regulatory powers as described below. The state should develop procedures for regular evaluation and consideration of the appropriateness and adequacy of the regulatory program.

10.2.1 Scope of Authority

1. An effective state program for the regulation of air emissions from oil and gas exploration and production activities should include, at a minimum:

2. Statutory authority that adequately details the powers and duties of the respective regulatory body or bodies;

3. Statutory authority that grants the regulatory body (or bodies) the power to oversee air emissions from upstream oil and gas activities, including production, gathering, compression and processing. This authority should include the ability to promulgate appropriate rules and regulations and meet the state's obligations under federal law;

4. Statutory authority to promulgate specific requirements that are more stringent than required under the federal Clean Air Act or regulations where necessary and appropriate to protect public health and the environment;

5. Authority to accept delegation of federal air quality programs specific to oil and gas;

6. Authority to consider cost effectiveness in setting air emission standards when appropriate, as well as to exempt facilities or sources based on criteria such as de minimis emissions or by type of source or facility;

7. Statutes and implementing regulations which adequately and clearly define necessary terminology;

8. Provisions to ensure adequate funding for the staff and program to carry out its objectives and duties;

9. Mechanisms for coordination among stakeholders (including the public, federal and state agencies, and the regulated industry); and

10. Technical criteria for air emission controls.

10.2.2 Jurisdiction and Cooperation Between Agencies

The Clean Air Act establishes a dual federal/state system for establishing requirements to protect public health and the environment, and to oversee air pollution sources, including oil and gas exploration and production (E&P) operations. Under this framework, states are required to establish State Implementation Plans (SIPs) that contain sufficient requirements to attain and maintain compliance with National Ambient Air Quality Standards. Separate from the SIP process, states may, but are not required to, accept delegation of certain federal air quality requirements such as the preconstruction Prevention of Significant Deterioration (PSD) permitting program, the Title V permit program or

New Source Performance Standards. If a state does not accept delegation of a particular federal requirement, EPA retains responsibility for implementing and enforcing that requirement.

Within states that do accept delegation, jurisdiction over air quality issues related to E&P facilities may be split between the state air quality agency, local air quality agencies and/or the agency with jurisdiction over oil and gas drilling and production. Finally, because states have no jurisdiction over air pollution sources on tribal lands, responsibility for implementation and enforcement of air quality requirements for E&P sources on these lands is held by EPA or the tribes.

Where multiple state, federal or tribal authorities have jurisdiction over air quality issues, mechanisms should be in place to avoid duplication, regulatory gaps or inconsistent air quality requirements or enforcement of such requirements. Such mechanisms could include formal Memoranda of Understanding, established interagency task forces, regular periodic meetings between agency staff, and joint inspections of facilities. In addition to ensuring proper coordination, agencies should communicate with the regulated community and the public to make it clear which agency has jurisdiction over a particular area or is responsible for enforcing a given set of air quality requirements.

10.2.3 Permits, Authorizations and Exemptions

States with approved Clean Air Act permitting authority should adopt an air quality permitting program for emission sources in the oil and gas industry that is legally and practically enforceable and harmonizes with federal requirements to avoid confusing and duplicative requirements for operators. The program should allow the state to adopt additional air quality requirements beyond federal requirements to address state-specific air quality issues. State permits should clearly establish what performance standards and/or emission control requirements are required for each covered source.

State air quality permitting programs should be designed to protect human health and the environment while allowing oil and gas development to proceed promptly and efficiently to provide continued, responsible growth in US oil and natural gas production. Therefore, state air quality permitting programs should be straightforward for operators to understand and implement, and administratively efficient for the regulatory agency to minimize cost in time and resources. To accomplish this, states are encouraged to simplify the application process, make available accepted emission estimation methods, make permit application assistance tools available to the operator, establish and make clear permit exemption criteria, and employ construction general permits or permits by rule that also serve as final permits to operate.

When emissions are difficult to estimate due to uncertainty of source throughput and composition, states should also consider mechanisms, similar to some federal

rules (e.g., the storage vessel provisions of the Oil and Gas NSPS OOOO that allow an established period for emissions determination before requiring control), that allows operators to construct and operate certain source types for a limited but sufficient period of time to determine actual facility emissions prior to permitting to ensure that permit conditions, including emission control requirements and Federal applicability, are properly informed. States should consider requiring appropriate levels of control during this evaluation period to avoid exceeding regulatory emission thresholds. It is important to note that the construction of a major source without a permit is prohibited by the Clean Air Act.

10.2.4 Compliance Monitoring, Demonstration & Assurance

State programs should contain the following compliance monitoring, demonstration and assurance capabilities:

1. Procedures for the receipt, evaluation, retention, and investigation of all notices and reports required of permittees and other regulated persons. These procedures should ensure that the notices and reports submitted are adequate in both content and frequency to assess compliance with applicable requirements. States should consider integrating electronic reporting systems to improve efficiency and timeliness of data received. Duplicative or unnecessary reporting should be minimized. Investigation for possible enforcement action should include determination of failure to submit complete notices and reports in a timely manner. Effective data management systems, as described in Section 4.2.7, can be used to track compliance.

2. Inspection and monitoring procedures that are independent of information supplied by regulated persons and which allow the state to determine compliance with program requirements, including:

    a. The capability to conduct comprehensive investigations, that may include advanced monitoring techniques as appropriate, of facilities and activities subject to regulation in order to identify a failure to comply with program requirements by responsible persons;

    b. The capability to conduct regular inspections of regulated facilities and activities at a frequency that is commensurate with state priorities based on the risk to health, safety and the environment; and

    c. The authority to investigate information obtained regarding potential violations of applicable program and permit requirements.

3. Procedures to receive and evaluate information submitted by the public about alleged violations and to encourage the public to report perceived

violations. Such procedures should not only involve transparent communications with the public (to apprise it of the process to be followed in filing reports or complaints), but should also communicate how the state agency will assure an appropriate and timely response.

4. Authority to conduct unannounced inspections at a reasonable time of any regulated site or premises where oil and gas activities are being conducted, including the authority to inspect, sample, monitor, or otherwise investigate compliance with permit conditions and other program requirements, such as proper operation of control devices, process operating conditions and control device operating parameters.

5. Authority to enter locations where records are kept during reasonable hours for purposes of copying or obtaining electronic copies and inspecting such records.

6. Procedures to ensure that documents and other evidence are maintained and/or managed such that they can be admitted in any enforcement proceeding brought against an alleged violator, noting that some information may be entitled to confidential treatment (however, it is the source's obligation to identify which information is confidential business information).

7. Authority to require regulated persons to conduct stack testing or other measurements to establish or verify compliance with applicable emission standards, to allow the state to be present for such tests, be given adequate notice of the tests, and to conduct its own tests when deemed appropriate.

8. Authority to require, under statute, regulation or permit, regulated persons to:

    a. Establish and maintain records;
    b. Make reports;
    c. Install, use, and properly maintain monitoring equipment, and use audit procedures, or methods;
    d. Sample emissions in accordance with prescribed methods;
    e. Provide stack test protocols and test reports;
    f. Perform parametric monitoring where direct emissions measurement is impracticable;
    g. Submit compliance certifications; and
    h. Provide other information needed to determine compliance on a one-time, periodic or continuous basis.

10.2.5 Enforcement

10.2.5.1 Enforcement Tools

The state agency should have effective enforcement tools to address any violations of the state air program, which may include the following actions:

1. Issue a notice of violation with a compliance schedule;

2. Restrain, immediately and effectively, any person by order or by suit in state court from engaging in any impending or continuing unauthorized activity which is causing or may cause damage to public health or the environment;

3. Establish the identity of emergency conditions which pose an imminent and substantial human health or environmental hazard that would warrant entry and immediate corrective action by the state agency after reasonable efforts to notify the operator have failed;

4. Sue or cause suit to be brought in courts of competent jurisdiction to enjoin any impending or continuing violation of any program requirement, including any permit condition, without the necessity of a prior revocation of the permit;

5. Require, by administrative order or suit in state court, that appropriate action be undertaken to correct any harm to public health and the environment that may have resulted from a violation of any program requirement, including, but not limited to, establishment of compliance schedules or requiring the source to apply for and obtain permits for previously unpermitted emissions;

6. Encourage Beneficial Environmental Projects or Supplemental Environmental Projects to secure additional environmental benefits through enforcement settlements;

7. After administrative review, revoke, modify, or suspend any permit, or take other enforcement action deemed appropriate by the state, when the state agency determines that the permittee has violated the terms and conditions of the permit, failed to pay an assessed penalty, or used false or misleading information or fraud to obtain the permit;

8. Assess administrative penalties or seek, in court, civil penalties or criminal sanctions including fines and/or imprisonment; or

9. Resolve compliance issues informally, through mechanisms such as settlement agreements or warning letters, in lieu of a formal notice of violation, administrative order, or court order.

As an alternative to the enforcement tools identified above, state programs should have incentives (such as penalty mitigation and auditing/self disclosure policies) to encourage sources to voluntarily disclose and correct violations.

10.2.5.2 Penalties

States should develop guidance for calculations of penalties that include factors such as the economic benefit resulting from the violation, willfulness, harm to the environment and the public, duration of the violation, the operator's compliance history, and the operator's good faith efforts to comply. Some of the benefits of having guidance for calculation of penalties include: 1) an opportunity to encourage voluntary disclosure of violations; 2) providing consistency and transparency in the assessment of penalties; and 3) providing for the development of readily defensible assessments. Penalties should be such that an operator does not benefit financially from unlawful conduct, and should provide compliance incentive to other operators. States should evaluate their enforcement options and policies to assure that the full range of actions available are effectively used.

10.2.5.3 Right of Appeal

The right to appeal or seek administrative and/or judicial review of agency action should be available to any person having an interest which is or may be adversely affected, or who is aggrieved by any such action.

10.2.6 Staffing and Training

In addition to the general personnel and funding recommendations found in Section 4.3, state staffing levels should be sufficient to receive, record and respond to complaints of human health impacts and environmental damage resulting from air emissions. Staff should receive adequate training to stay current with federal and state air regulatory requirements, state airshed goals, and industry production practices and technology, especially new and developing air pollution control and monitoring technology. This training should include an oil and gas industry overview to familiarize state agency staff with the sources and monitoring equipment they will be regulating. Training programs to accomplish these goals could include:

1. Training courses or resource materials available through US EPA, multi-state air planning organizations, private sector, industry associations, consortiums and universities;

2. Field visits and tours to oil and gas facilities in the state;

3. Engagement with other states' air regulatory programs;

4. Conference attendance; and

5. Coordination and frequent discussions with other state agencies regulating oil and gas operations, including state oil conservation commissions and divisions.

Additionally, agencies should have a mechanism to assess and implement strategies designed to recruit and retain key agency staff such as:

1. Maintaining competitive salary levels;

2. Creation of new technical positions (air specialists, oil and gas sector specialists, etc.) in the permitting and enforcement programs; and

3. Increasing staff responsibilities via promotion of staff to higher positions (project leaders, team leaders, etc.).

10.2.7 Data Management

In addition to the data management recommendations found in Section 4.2.7, states should ensure that appropriate data is shared between agencies so that the air quality program has access to the inventory, which includes the level of detail needed to conduct an effective program (locations of oil and gas facilities and a unique identifier for the regulated activity (e.g., API well number)). as necessary to conduct an effective program. After appropriate quality assurance, public information, such as emissions data, should be made available to the public, air quality researchers and managers, in appropriate user-friendly electronic formats (e.g., data downloads, web services).

10.2.8 Public Involvement

State agencies should provide for the electronic dissemination of educational and other appropriate information regarding air emissions from oil and gas activities to bridge the knowledge gap between experts and the public. This should occur as part of an ongoing process through which information is exchanged in an open forum as provided in Section 4.2.2.2. This is especially important in areas where development has not occurred historically. The public should also have the ability to ask questions and receive responses through the agency website. States should also use advisory groups of industry, government, and public representatives, or other similar mechanisms, to obtain input and feedback on the effectiveness of state programs as provided in Section 4.2.2.3.

10.2.9 Outreach

In addition to the public participation provisions found in Section 4.2.2, states should take measures, such as web postings, FAQs, and distribution of fact sheets, to ensure that the industry, other state agencies and the public are aware of the delineation of responsibilities between the air quality program and the oil and gas program. Provisions should also be made for the availability of speakers to make presentations to interested groups.

10.2.10 Strategic Program and Resource Planning

State air programs for oil and gas will require adequate resources to fulfill state and federal mandates to ensure healthy air quality while providing adequate response time to permit applications and other needs from industry. As with other growing sectors, the oil and gas industry's potential for rapid growth in production basins can challenge the planning process for air programs, since large numbers of facilities can be deployed in production basins and cumulative emissions from new and existing facilities can potentially have significant impacts on air quality.

To address these challenges, and as set forth in these guidelines, states should have adequate resources to conduct necessary regulatory development, permitting, enforcement, monitoring, modeling, inventory development and public outreach activities. Additionally, states should have strategic planning capabilities to ensure that these resources remain adequate in light of dynamic growth in the oil and gas sector and rapid evolution in production technologies.

10.3 Air Program-Specific Elements

10.3.1 Delineation of Sources

States should consider developing an inventory of sources and activities not previously registered or permitted, for example grandfathered facilities and equipment, and non-permitted sources and activities, if information about emissions from those sources is critical for planning and analysis for agency priorities such as efficiently ensuring compliance with air quality standards.

This inventory should be comprehensive but straightforward and relatively simple to administer. However, the state or tribe should make efforts to avoid capture of inconsequential (de minimis) sources that do not impact air quality.

10.3.2 Source-Specific Requirements

These guidelines are developed with particular emphasis on VOC and HAP emissions, and control of these pollutants often reduces methane emissions as a co-benefit. However, there may be some sources that emit dry gas with little or no VOC or HAP content, but that emit methane emissions.. Since 1993, industry partners in the EPA voluntary Natural Gas STAR Program have developed and employed a variety of innovative techniques for mitigating methane emissions in the oil and gas sector. The state should be aware of which operators participate in EPA's Natural Gas STAR program and make others aware of the program. States should be aware of regulatory initiatives of other states to address methane/dry gas emissions.

A state's air quality program should identify oil and gas industry emission source types that must be represented in applications for air quality permits or authorizations. Oil and gas emissions source types and activities may include stationary engines and turbines, well completions or recompletions, venting and leaking gas from compressors, gas-powered pneumatic devices, dehydration units, gas processing plants, transmission and storage facilities, storage vessels and condensate handling, wellbore liquids unloading, produced water management facilities, sweetening units and flares.

The state requirements for these source types and activities should align with Federal requirements unless the state needs to establish additional or more stringent requirements. When specific air issues demand more stringent requirements, states may consider adopting, as consistently as possible, provisions by other states that have been implemented to address similar air quality issue, to minimize the impact on state resources.

State air quality programs may want to address unplanned and episodic emissions due to such things as fugitive air emissions upstream of gas processing plants, process upsets, wellbore liquids unloading, third party equipment downtime, and equipment failure. The programs should require incident reporting and corrective actions where possible, to avoid incident recurrence. However, the state should also consider safety aspects when developing new requirements for unplanned emissions.

Finally, because there is a growing concern over wasted gas from drilling operations, the state air quality regulator should consider coordination with the state oil and gas conservation regulator on a process to quantify and minimize the flaring or venting of associated gas from oil wells.

10.3.3 Air Quality Monitoring Networks

Air quality monitoring is an essential tool both to determine compliance with

National Ambient Air Quality Standards and to assess the impact of air pollution sources on air quality. State programs should have an air quality monitoring network in place that meets these needs. In developing an air quality monitoring network, states should consider several parameters, including but not limited to: the number of monitors, the types of pollutants to be monitored, the location of monitors, specific monitoring instrumentation to be used, frequency of monitoring, and appropriate QA/QC procedures. In placing air quality monitors, states should consider factors such as emission source location, population density, topography and meteorology.

Many of the air quality monitoring requirements for states are set forth in implementing regulations for the various National Ambient Air Quality Standards. Additionally, federal permitting requirements for major stationary sources include certain source specific monitoring requirements. States should have appropriate mechanisms in place to ensure that this source specific monitoring is conducted in accordance with established standards and methods.

States may also consider whether to conduct ambient air quality monitoring that goes beyond the standards established under federal law. While states should have considerable latitude in determining whether and how to conduct such additional monitoring, appropriate procedures should be established to ensure that such monitoring, if undertaken, accurately assesses ambient air quality levels. As part of this additional monitoring, states should consider, where possible, establishing baseline air quality levels in order to assess the impact of emission source changes.

Areas with significant oil and gas production activity may have few or no regulatory air quality monitors, because these areas may not meet typical criteria for siting of monitors, such as population density. States should consider whether to add monitors in these areas to assess emissions from present or anticipated increases in oil and gas activity.

Once it has gone through appropriate QA/QC procedures, air quality data should be publicly available. Options for making data available could include putting it on-line or publishing regular air quality reports. US EPA makes limited criteria air pollutant data from state air monitors available through federal websites, such as AIRNow.gov. Agencies should consider whether to make data additionally available through their own websites to allow greater context and address local issues and concerns.

10.3.4 Reporting, Emission Inventories & Recordkeeping

States should develop and periodically update accurate and robust emission inventories as necessary to conduct good air quality planning and program assessment. States should establish emission reporting requirements for air

pollution sources that adequately support their efforts to develop high quality emission inventories. For individually small sources of air pollution that don't report (commonly called nonpoint sources), states should use the best available methodologies to quantify emissions. As states review and update their inventories they should work with industry and other stakeholders to identify the types of oil and gas sources which can produce significant emissions, and determine when updates to inventories are needed due to new information, changes to emission inventory compilation methodologies, or changes in production or operational practices.

States should consider using the EPA's oil and gas emissions tool(s) for computing nonpoint sources of oil and gas emissions. EPA provides the tool, instructions, and other guidance for computing these emissions as part of its National Emissions Inventory (NEI) program available on the Clearinghouse for Inventories & Emissions Factors (CHIEF). The tool allows for local inputs to be added by states to improve their emissions estimates. EPA also develops projection methods available on the CHIEF Emissions Modeling Clearinghouse for use by states.

Every three years, states are required to submit to EPA all sources of emissions of criteria pollutants and their precursors (Air Emissions Reporting Requirements, 40 CFR Part 51, Subpart A). This includes both point and nonpoint sources for the oil and gas sector.

States should also develop well-founded emission projections, to ensure that air quality standards will continue to be met in the future. Best available data and methods should be used for these projections. As with other growing emission sectors, development of oil and gas can result in rapid increases in emissions in a given area, so states should develop programs that can keep pace Projections which consider emissions under a range of alternative future conditions, such as the effect of changing industry practices and regulations, will yield better results than those that are based on single factors.

After administrative review, emission inventories and projections and reported emission data should be readily available to the public, including documentation of methodology, data sources, and assumptions made in producing the inventory. The inventory development process should include stakeholder review so that the general public and the regulated community can provide input. Furthermore, consistent calculations methods, based on the gas and condensate compositions for specific formations and basins, should be applied. If included in SIPs, the public review process is a requirement for those current and projected inventories used for both nonattainment area inventories as well as modeling inventories.

10.3.5 Corrective Actions & Emergency Response

The states should establish clear criteria for the emergency reporting of significant,

non-routine releases to air. These criteria should consider factors such as the mass and type of constituents released and the proximity of the release to sensitive receptors.

Agencies responsible for receiving emergency notifications of reportable releases to air should be identified and be responsible for the coordination, as appropriate, of any necessary response action with the operator, state and local emergency responders, environmental and/or public health agency and any other agency responsible for public protection.

States should ensure that community residents are notified when potentially hazardous air releases occur and should ensure that companies, in addition to emergency responders, take necessary actions to minimize public exposure.

States should require operators to submit reports that contain information on the cause of the release, the type(s) and amount(s) of pollutants released and the corrective actions the company implemented, to aid in the prevention of incident recurrence.

State air regulators should have appropriate air monitoring equipment necessary to support emergency response activities.

10.3.6 Long-Term Planning, Prioritization & Evaluation

In addition to the program planning and evaluation provisions found in Section 4.2.3, states should have a good understanding of oil and gas operations, including exploration and production; gathering, boosting, processing, and transmission; and accurate inventories and projections of air emissions. Because emissions characteristics, operational requirements, and operational approaches can vary widely by basin, it is critical for regulators to involve interested stakeholders (including oil and gas producers and environmental and citizen groups) in the planning and evaluation processes., Periodic analyses should be completed to ensure that air quality will remain protective of public health and the environment, in accordance with state and federal statutes and regulations, as industry evolves and grows.

There are and will be a number of federal regulations applicable to oil and gas operations that must be assessed for state adoption, incorporated by reference into state regulations, or left to US EPA for implementation. In most states, these federal regulations become the base of the state air regulatory program. State air regulatory program planning must consider the air quality impacts of federal regulations. Airsheds with oil and gas basins that have measured or modeled concentrations of air pollutants near or above the NAAQS, considerable existing or planned development, and/or geographic conditions (topography and meteorology) that can create stagnant air, may require specific, specialized analyses to assess

the short-term and long-term status of compliance with the NAAQS. Collaboration with industry and other stakeholders is very important to ensure that the analyses are comprehensive, scientifically sound and adequately address the relevant questions and issues. Technical collaborations may be more successful when accomplished within a structured process that clearly defines the roles and responsibilities of participants, procedures for widely disseminating analysis design, solicitation of comments, processes for responding to comments, and other opportunities for feedback.

Analyses of criteria pollutant trends, comprehensive emissions trends, and projections of pollutant concentrations, visibility, and deposition are important indicators for evaluation of state air programs. In the process of developing a strategic plan, states may develop specific airshed goals to reduce the impacts of pollutants. The development of these goals should be based upon careful analysis of state needs, priorities, available resources, and applicable state and federal regulations.

Additional program goals could include (i) the development and implementation of an effective stakeholder outreach and education program; (ii) the development of incentives for additional pollution control, such as streamlined permitting programs, permits by rule, and other permitting options that simplify the application and review process while promoting air pollution control; (iii) the development and posting of guidelines, policies and templates that result in efficiencies in the permitting and enforcement processes while encouraging good practice; (iv) the creation of voluntary programs that recognize operators adopting additional air pollution measures; and (v) the development or improvement of an air monitoring network in areas with oil and gas activity, emissions inventories and calculation methods, and air modeling tools.

Regarding evaluation, performance metrics could include an evaluation of ambient pollutant concentrations, emissions trends, permit response time, appropriateness of permitting options, and clarity of conditions required for compliance. States should give consideration to the frequency of the evaluation of these types of metrics as well. Evaluation of emissions trends and modeling data may be more suited to an annual or periodic basis, whereas other metrics, such as stakeholder outreach and monitoring, may be done more frequently. The state agency should identify the set of measures that is most applicable to the goal and then determine the schedule for program evaluation.

SECTION 11 | Reused and Recycled Fluids

11.1 Definitions

State regulatory programs should define fluids that may be reused and recycled. For the purposes of these guidelines, these are fluids that are generated during the drilling, completion (e.g. hydraulic fracturing flowback), and production stages of a well. The term "reused fluids" is commonly used to refer to fluids that require only minimal processing to remove suspended solids. The term "recycled fluids" is commonly used to refer to fluids that typically require more advanced treatment or processing to reduce the salinity of the recycled fluid. Reused and/or recycled fluids are used for well drilling (generally below the base of protected water), well workover, and completion.

11.2 Water Management Planning

Operators should be encouraged to develop Water Management Plans that consider reuse and recycling options. Water Management Plans should address all aspects of water management from acquisition through final disposition. Plans should be tailored to particular projects. State programs should recognize barriers that would limit an operator's ability to reuse or recycle fluids generated during drilling, completion, and production such as technological limitations, fiscal constraints, lease or surface use constraints, stage of development, fluid quality, and agency approval timeframes. States should encourage the use of fresh water alternatives for the drilling and completion of wells where available sources are feasible and where environmental risks can be adequately identified and controlled. See Section 9.3 for additional information concerning water and waste management related to hydraulic fracturing.

Where jurisdictional issues exist between multiple state agencies, river basin commissions, and other parties involved in the management of reused and/or recycled E&P fluids, coordination should be pursued as discussed in Section 4.4.

11.3 Waste Management

Fluids that are to be reused or recycled should be managed and regulated as a waste up to the point the fluids are used in the drilling, workover, or completion of a well. State programs should consider having a regulatory process to designate fluids as a non-waste when they are treated to a level satisfactory to the State and the fluid is reused or recycled. Regulatory responsibility for the reused or recycled fluids should lie with the operator of the facility that is storing, transporting, or processing the fluids. See Sections 5.1 – 5.3 for information concerning technical

criteria of waste.

11.4 Transportation

The fluids to be reused or recycled are generally transported through pipelines or by truck.

11.4.1 Pipelines

Pipelines should be constructed of a material that is compatible with the fluid being transported. They should be constructed and operated in compliance with the manufacturer's specifications. Pipelines transporting fluids to be reused or recycled should be demarked so that personnel and inspectors can clearly identify the pipeline. Rules should differentiate between above ground temporary lines and buried lines. The location of buried lines should be made available to regulators.

Leak detection should be performed prior to and during the operation of pipelines. The leak detection program should account for the length of service, composition of fluid being transported, and pressure. There should be a means of accounting for and reporting waste quantities transported by pipeline and leaks as discussed in Section 5.10.2.4.

11.4.2 Trucks

Truck transportation of fluids to commercial or centralized facilities should be addressed in accordance with the waste tracking and reporting provisions of Section 5.10.2.3. States should encourage operators to utilize smart truck routing to minimize traffic through residential areas, damage to roadways, and to avoid problems associated with spill exposure and complaints.

11.5 Treatment and Storage

Rules for the treatment and storage of fluids to be reused and recycled should be based on the potential risk presented by the treatment or storage of the fluid. Risk factors to consider include location and duration of fluid treatment or storage, chemical content and characteristics of the fluid and waste resulting from the treatment process, the volume of the fluid stored or treated, type of storage structure to be used (i.e. pits, tanks, or modular aboveground storage structures).

Permit processes for the storage of reused or recycled fluids should be streamlined and minimized for activities deemed to be of low risk. For example, the temporary storage and reuse of fluids on an Operator's lease might be approved during the well permitting process, or by other authorization, while facilities used for long-term storage and treatment of fluids may require separate prior authorization by the

State.

Reporting requirements should include records of amounts of waste processed and, where appropriate, laboratory results for treated waste. See section 5.10.2.3 for more information on waste tracking requirements. Where appropriate, States should require groundwater monitoring consistent with the provisions of Section 9.2.1.

State regulatory programs should differentiate between centralized and commercial wastewater treatment facilities. See Section 5.10 for additional information regarding the permitting, construction, operation and closure of these facilities.

State regulatory programs should regulate the waste generated during the treatment of fluids in a manner as described in the technical criteria in Section 5. Those criteria address waste characterization, waste management hierarchy, pits, land application, tanks, and centralized and commercial facilities.

State regulatory programs should include a methodology for the determination of whether or not Naturally Occurring Radioactive Material (NORM) is present to the extent that it is regulated. See Section 7 for additional information on the identification, use, possession, transport, storage, transfer, documentation, and disposal of materials containing NORM.

States should evaluate air emissions at facilities used for the storage and treatment facilities of fluids to be reused or recycled and determine whether a permit or exemption is required. See Section 10.2.3 for additional information regarding air quality permits, authorizations and exemptions.

SECTION 12 | Recommendations for Future Work

1. Industry, the federal government, state-affiliated academic institutions, and public-interest groups are encouraged to conduct and support research into effective ways of minimizing and reusing wastes generated in the nation's oil and gas fields.

2. EPA is urged to continue to support and work with IOGCC, STRONGER, and all interested parties in advancing the state review process.

3. While these guidelines expressly provide for the protection of air quality, few specifics are now included in this area. Accordingly, these guidelines will continue to be reviewed for possible additional air quality recommendations.

4. These guidelines should be updated as state reviews progress and additional information and experience is gained in their application.

SECTION 13 | References

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APPENDIX A | Glossary of Terms

The following is a glossary of selected terms used in the Interstate Oil and Gas Compact Commission Environmental Guidelines for State Oil and Gas Regulatory Programs. The glossary is included only as an aid for the convenience of the reader. It is not intended as an exhaustive compilation of the terms used in the Report, nor are the definitions set forth intended to be preclusive of other potential meanings. Terms expressly defined in the text of the Report are not included in this glossary.

A

Acid: A chemical compound, one element of which is hydrogen, that dissociates in solution to produce free-hydrogen ions. For example, hydrochloric acid, HCI, dissociates in water to produce hydrogen ions - H^+, and chloride ions, CI^-.

Ambient Air Quality – The concentration of pollutants present in the portion of the atmosphere, external to buildings, to which the general public has access, measured in the form of mass of the pollutant per volume of air or as a certain number of parts of the pollutant per million (ppm) or per billion (ppb). *See generally* 40 C.F.R. § 50.1(e).

Aquifer: A geological formation, group of formations, or part of a formation that is capable of yielding water to a well or spring.

B

Barrel: A measure of volume for petroleum products. One barrel is equivalent to 42 U.S. gallons.

Basic Sediment and Water (BS&W): The water and other extraneous material present in crude oil.

Biodegradation: The process of breaking down matter into innocuous products by the action of living things, such as microorganisms.

Blowdown: The material discarded as a result of depressurizing a vessel or well.

Brackish Water: Water that contains relatively low concentrations of soluble solids. Brackish water has more total dissolved solids than fresh water, but considerably less than sea water.

Brine: Water that has a large quantity of salt, especially sodium chloride, dissolved in it; salt water and certain produced water are considered brines.

C

Characteristic Waste: Waste that is considered hazardous under RCRA because it exhibits any of four different properties: ignitability, corrosivity, reactivity, and toxicity.

Clean Air Act (CAA): The federal act that regulates air emissions from area, stationary, and mobile sources codified at 42 U.S.C. Ch. § 7401 *et seq*.

Clean Water Act (CWA): The act that sets the basic structure for regulating discharges of pollutants to surface waters of the United States. CWA imposes contaminant limitations or guidelines for all discharges of wastewater into the nation's waterways.

Climatology: The science that deals with climates (the prevailing influence or environmental conditions characterizing a group or period) and their phenomena.

Completion Fluid: A special fluid used when a well is being completed. It is selected, not only for its ability to control formation pressure, but also for its properties that minimize formation damage.

Completion Operations: Work performed in an oil or gas well after the well has been drilled to total depth. This work includes, but is not limited to, setting the casing, perforating, artificial stimulation, production testing, and equipping the well for production, all prior to the commencement of the actual production of oil or gas in paying quantities, or in the case of an injection or service well, prior to when the well is plugged and abandoned.

Corrosivity: The characteristic which identifies wastes that are acidic or basic (alkaline) and can readily corrode or dissolve flesh, metal, or other materials. The hazardous characteristic of corrosivity, for purposes of RCRA, is defined in 40 CFR 261.22, and generally includes aqueous solutions with a pH less than or equal to 2.0, or greater than or equal to 12.5, and/or liquids which corrode SAE 1020 steel at a rate greater than or equal to 6.35 mm per year.

Crude Oil: Unrefined liquid petroleum. It ranges in gravity from 9 to 55 API and in color from yellow to black, and it may have a paraffin, asphalt, or mixed base. If a crude oil, or crude, contains a sizable amount of sulfur or sulfur compounds, it is called a sour crude; if it has little or no sulfur, it is called a sweet crude. In addition, crude oils may be

referred to as heavy or light according to API gravity, the lighter oils having the higher gravities.

D

Delegated Authority – A state's assumption, after US EPA approval, of partial or complete responsibility for administering EPA's CAA programs.

De-listing: A site-specific petition process whereby a handler can demonstrate to EPA that a particular waste stream generated at its facility that meets a listing description does not pose sufficient hazard to warrant RCRA regulation. Owners and operators can also use the de-listing process for wastes that are hazardous under the mixture and derived-from rules that pose minimal hazard to human health and the environment.

Derived-from Rule: A rule that regulates residues from the treatment of listed hazardous wastes. This rule is found at 40 CFR 261.3.

Disking: The process of using a tractor-pulled set of disks to mix surface soil with waste for the purpose of treating and/or disposing of E&P wastes.

Disposal Well: A Class II well permitted under the SDWA which is employed for the injection of produced water and certain other E&P wastes into an underground formation.

Drill Cutting: The formation rock fragments that are created by the drill bit during the drilling process.

Drilling Fluid: The circulating fluid used in the rotary drilling of wells to clean and condition the hole and to counterbalance formation pressure. Drilling fluids are circulated down the drill pipe and back up the hole between the drill pipe and the walls of the hole usually to a surface tank. Drilling fluids are used to lubricate the drill bit, to lift cuttings, to seal off porous zones, and to prevent blowouts. A water-based drilling fluid is the conventional drilling mud in which water is the continuous phase and the suspended medium for solids, whether or not oil is present. An oil-based drilling fluid has diesel, crude, or some other oil as its continuous phase, with water as the dispersed phase. Synthetic drilling fluid has a synthetic material such as esters or olefins as the continuous phase and water as the dispersed phase. In some circumstances air or another gas is used as a drilling medium.

E

Electrical Conductivity (EC): A numerical expression of the ability of a material to carry a current; the reciprocal of resistivity; normally expressed in milliohm/meter. It is frequently used in soil analysis to evaluate a soil's ability to sustain plant growth.

Emulsion: A mixture in which a liquid, termed the dispersed phase, is uniformly distributed (usually as minute globules) in another liquid, called the continuous phase or dispersion medium. In an oil-water emulsion, the oil is the dispersed phase and the water the dispersion medium; in a water-oil emulsion, the reverse holds. For example emulsions occur during production processes where crude oil is prepared for pipeline transportation.

Exploration: The search for reservoirs of oil and gas, including aerial and geophysical surveys, geological studies, core testing, and the drilling of exploratory wells, also known as wildcats.

Exchangeable Sodium Percentage (ESP): The extent to which the absorption complex of a soil is occupied by sodium.

$$ESP = \frac{\text{exchangeable sodium}}{\text{cation exchange capacity}} \times 100$$

Where the units for both the numerator and denominator are in milliequivalents per 100 grams of soil.

F

FAQs – "Frequently Asked Questions" reference document created, updated, and made publically available by a state that clarifies issues involving the delineation of responsibilities between a state's air quality program and oil and gas program.

Field: A geographic area in which a number of oil or gas wells produce from a continuous reservoir. A field may refer to surface area only or to underground productive formations as well. In a single field, there may be several separate reservoirs at varying depths.

Formation: A bed or deposit composed throughout substantially the same kinds of rock; a lithologic unit. Each different formation is given a name, frequently as a result of the study of the formation outcrop at the surface and sometimes based on fossils found in the formation, and is sometimes based on electric or other bore-hole log characteristics.

Formation Water: The original water in place in a formation at the time production commences.

Fracturing: A method of stimulating production by increasing the permeability of the producing formation. Under hydraulic pressure, a fluid is pumped down the well and out into the formation. The fluid enters the formation and parts or fractures it.

Fracturing Fluids: The fluids used to hydraulically fracture a rock formation. In some cases, a proppant is deposited in the fractures by the fracturing fluid, which is subsequently pumped out and recovered.

G

Gas Processing Plant: A plant for the processing of natural gas, by other than solely mechanical means, for the extraction of natural gas liquids, and/or the fractionation of the liquids into natural gas liquid produces such as ethane, butane, propane, and natural gasoline.

Gas Treating Plant: A plant for the purification of natural gas (e.g., the removal of water and/or acid gases such as hydrogen sulfide) and recovery of condensate.

Generator: Any person whose act first creates or produces a waste.

Groundwater: Water below the land surface where there is sufficient water present to completely saturate the soil or rock.

Groundwater Monitoring: Sampling and analysis of groundwater for the purpose of detecting the release on contaminants.

H

Hazardous Waste: A waste with properties that make it dangerous or capable of having a harmful effect on human health and the environment. Under the RCRA program, hazardous wastes are specifically defined as wastes that meet a particular listing description or that exhibit a characteristic of hazardous waste.

Hydrocarbon: Organic compound of hydrogen and carbon, whose densities, boiling points, and freezing points increase as their molecular weights increase. Although composed of only two elements, hydrocarbons exist in a variety of compounds because of the strong affinity of the carbon atom for other atoms and for itself. The smallest molecules of hydrocarbons are gaseous; the largest are solid.

I

Ignitability (RCRA): The characteristic which identifies wastes that can readily catch fire and sustain combustion. The hazardous characteristic of ignitability for purposes of RCRA is defined in 40 CFR 261.21 and is generally a liquid with a flash point less than 140 F., a non-liquid that causes fire under a friction condition, an ignitable compressed gas, or is an oxidizer.

L

Land Disposal: For purposes of RCRA Subtitle C regulation, placement in or on the land, except in a corrective action unit, and includes, but is not limited to, placement in a landfill, surface impoundment, waste pile, injection well, land treatment facility, salt dome formation, salt bed formation. underground mine or cave, or placement in a concrete vault or bunker intended for disposal purposes.

Landfill: For purposes of RCRA Subtitle C, a disposal unit where non-liquid hazardous waste is placed in or on the land.

Lease: A legal document executed between a landowner (or a lessor) and a company or individual as lessee, that grants the right to exploit the premises for minerals or other products. The lease is sometimes referred to as the area where production wells, stock tanks, separators, and production equipment are located.

Legally and Practicably Enforceable – All terms or conditions included in a permit issued under a federally approved program – including delegated authority – authorizing EPA to enforce such terms or conditions. Federally enforceable programs under the CAA include, but are not limited to, the New Source Review program, the New Source Performance Standards program under Section 111 of the CAA, the Title IV acid rain program, the National Emission Standards for Hazardous Air Pollutants program under Section 112 of the CAA, the Title V program, and state permit programs approved by EPA in the state's SIP.

Liner: Continuous layer of natural or synthetic materials, beneath and on the sides of a surface impoundment, landfill, or landfill cell, which restricts the downward or lateral escape of waste, waste constituents, or leachate.

Listed wastes: Wastes that are considered hazardous under RCRA because they meet specific listing descriptions.

Loading Criteria: A numeric level, normally expressed in pounds per acre, below which a specific chemical compound may be applied to the soil.

Location: Place at which a well is to be or has been drilled.

M

Mixture Rule: A rule that is intended to ensure the regulation of mixture of listed wastes with non-hazardous solid wastes.

Molecular Sieve: Absorbents that are used to remove small amounts of H_2S and/or water from natural gas, capable of being regenerated.

Municipal Solid Waste: Durable goods (e.g. appliances, tires, batteries), non-durable goods (e.g. newspapers, books, magazines), containers and packaging, food wastes,

yard trimmings, and miscellaneous organic wastes from residential, commercial and industrial non-process sources.

N

National Ambient Air Quality Standards (NAAQS) – Nationwide air quality levels, promulgated pursuant to section 109 of the CAA ,42 U.S.C. § 7409, for six criteria pollutants – sulfur dioxide, particulate matter, nitrogen oxide, carbon monoxide, ozone, and lead – of which a state is responsible for achieving, maintaining, and enforcing pursuant to section 110 of the CAA, 42 U.S.C. § 7410, through its approved SIP for each given pollutant.

National Emissions Standards for Hazardous Air Pollutants – Nationally applicable standards under section 112(b) the CAA, 42 U.S.C. § 7412(b), for emissions of hazardous air pollutants listed under section 112(d) the CAA, 42 U.S.C. § 7412(d), that apply to major and area stationary sources as defined under section 112 of the CAA, 42 U.S.C. § 7412.

Natural Gas: Naturally occurring mixture of hydrocarbon and non-hydrocarbon gases found in geologic formations beneath the earth's surface. The principal hydrocarbon constituent is methane.

New Source Performance Standards – Nationwide technology-based emissions standards for new or modified stationary sources in specified industrial source categories promulgated pursuant to section 111 the CAA, 42 U.S.C. § 7411. The standards reflect the degree of emission limitation achievable through the application of the best system of emission reduction, taking into account the cost of achieving such reduction and any health and environmental impact and energy requirements, that EPA determines is adequately demonstrated.

O

Operator: The person or company, either proprietor, contractor, or lessee, actually operating a well, lease, or disposal facility.

P

Permeability: The ability of a formation to transmit fluids.

pH: A measure of acidity or alkalinity of a solution, numerically equal to 7 for neutral solutions, increasing with increasing alkalinity and decreasing with increasing acidity.

Plug and Abandon (P&A or Plugging): The placement into a well of a plug or plugs designed to restrict the vertical movement of fluids after abandonment.

Process Upsets – unintended mode of operation of a unit which could result in impaired functionality.

Produced Sand: The formation solids which flow into the wellbore with the produced formation fluids. In general, the lower the formation competency, the greater the produced sand volumes.

Produced Water: The fluid brought up from the hydrocarbon-bearing strata during the extraction of oil or gas. It can include formation water, injection water, and any chemicals added downhole or during the oil/water separation process.

Production: The phase of the petroleum industry that deals with bringing the well-fluids to the surface and separating them, and with storing, gauging, and otherwise preparing the product for sale.

Q

QA/QC – "Quality Assurance/Quality Control" are criteria and procedures that must satisfied to ensure the quality of data and the calibration, repair, and evaluation of air quality monitoring instruments.

R

Reactivity: The characteristic identifying wastes that readily explode or undergo violent reactions. The hazardous characteristic of reactivity for purposes of RCRA is defined in 40 CFR 261.23 and generally includes wastes with highly exothermic reactions or wastes which create toxic gases when mixed with water.

Reclaimed: For purposes of defining a material as a solid waste under RCRA Subtitle C, a material is reclaimed if it is processed to recover a usable product, or regenerated by processing it in a way that restores it to usable condition.

Reclamation: The process of returning a site or contaminated soil to an appropriate state of environmental acceptability.

Recycled: For purposes of defining a material as a solid waste under RCRA Subtitle C, a material is recycled if it is used or reused, or reclaimed.

Recycled Fluids: Commonly used to refer to fluids that typically require more advanced treatment or processing to reduce the salinity of the fluid prior to reuse in well drilling, workover, and completion.

Reused Fluids: Commonly used to refer to fluids that require only minimal processing to remove suspended solids prior to reuse in well drilling, workover, and completion.

Recycling: The separation and collection of wastes, their subsequent transformation or remanufacture into usable or marketable products or materials, and the purchase of products made from recyclable materials.

Reservoir: A subsurface, porous, permeable rock body in which oil or gas or both are stored. Most reservoir rocks are limestones, dolomites, sandstones, or a combination of these. The three basic types of hydrocarbon reservoirs are oil, gas, and condensate. An oil reservoir generally contains three fluids; gas, oil, and water-with-oil, the dominant product. In the typical oil reservoir, these fluids occur in different phases because of the variance in their gravities. Gas, the lightest, occupies the upper part of the reservoir rocks; water, the lower part; and oil, the intermediate section. In addition to occurring as a cap or in solution, gas may accumulate independently of the oil; if so, the reservoir is called a gas reservoir. Associated with the gas, in most instances, are salt water and some oil. In a condensate reservoir, the hydrocarbons may exist as a gas, but when brought to the surface, some of the heavier constituents condense to a liquid or condensate. At the surface, the hydrocarbons from a condensate reservoir consist of gas and a high-gravity crude (i.e., the condensate). Condensate wells are sometimes called gas-condensate reservoirs.

S

Safe Drinking Water Act (SDWA): The act designed to protect the nation's drinking water supply by establishing national drinking water standards (maximum contaminant levels, (MCL's), or specific treatment techniques), and by regulating UIC wells.

Salinity: The quantitative level of salt in an aqueous medium.

Salt Section: A formation, or part of a formation, which is predominately made up of salt; typically sodium chloride.

Sodium Absorption Ration (SAR): A ratio of the concentration of sodium to the square root of the sum of the concentrations of calcium and magnesium.

$$SAR = -\frac{Na+}{[Ca+ + Mg^{2}+]}$$

Where the cation concentrations are in millimoles per liter. It is a measurement frequently used in soil analysis to evaluate a soil's ability to sustain plant growth.

Solid Waste: Any garbage; refuse; sludge from a wastewater treatment plant, water supply treatment plant, or air pollution control facility; and other discarded material, including solid, liquid, semisolid or contained gaseous material resulting from industrial, commercial, mining, and agricultural operations and from community activities. For the purposes of hazardous waste regulation, a solid waste is a material that is discarded by being either abandoned, inherently waste-like, a certain waste military munition, or recycled.

Solids Separation Equipment: Equipment used in drilling and workover/completion operations to remove drill cutting or formation solids from the drilling or workover/completion fluid. May include liquid/solids separation devices such as shale shakers, hydrocyclones, centrifuges, and filtration units.

SPCC: Spill prevention Control and Countermeasures. Regulations establishing spill prevention procedures and equipment requirements for non-transportation related facilities with certain above-ground or underground storage capacities (e.g., crude oil tanks) that could reasonably be expected to discharge oil into or upon the navigable waters of the United States or adjoining shorelines.

Spent Materials: Materials that have been used and can no longer serve the purpose for which they were produced without processing.

State Implementation Plan (SIP) – The body of air quality rules including, but not limited to, enforceable source-specific emissions limitations, monitoring plans, and permit programs established by each state which are designed to either attain or maintain the NAAQS and to implement other requirements established by the Clean Air. Each state's SIP must include, at a minimum, the elements prescribed under CAA section 110(a)(2), 42 U.S.C. § 7410(a)(2), and must be approved by EPA before it becomes effective.

Subtitle C: That portion of the Resource Conservation and Recovery Act (RCRA) which defines and legislates the management of hazardous wastes.

Sweetening – The removal of hydrogen sulfide and other organosulfur compounds from "sour" natural gas. Natural gas is considered "sour" if it contains hydrogen sulfide in amounts greater than 5.7 milligrams per normal cubic meters.

T

Tank Bottoms: Produced sand, formation solids, and/or emulsions that settle-out in production operation process vessels.

Title V Permit Program – A federally mandated operating permit program under the CAA that requires implementation by the states. *See generally* 42 U.S.C. §§ 7661-7661f; 40 C.F.R. Parts 70 and 71. The Title V permit program applies to: all "major sources" as that term is defined in CAA section 501(2), 42 U.S.C. § 7661(2); sources subject to a standard or regulation under the NSPS program, 42 U.S.C. § 7411, or the NESHAP program, 42 U.S.C. § 7412; "affected" sources under the Acid Rain Program; sources required to have a PSD or NSR permit; and any other sources as designated by EPA. *See* 40 C.F.R. § 70.3 (applicability of Title V program). Title V permits consolidate all of these applicable CAA requirements into one legally enforceable document.

Topography: The physical features of a district or region, such as are represented on maps, taken collectively; especially the relief and contour of the land.

Toxicity: The characteristic which identifies wastes that are likely to leak dangerous concentrations of toxic chemicals into groundwater. The hazardous characteristic of toxicity for purposes of RCRA is defined in 40 CFR 261.24 and includes eight metal and thirty-one organic compounds. The toxicity characteristic is determined in accordance with a prescribed test procedure (the toxicity characteristic leaching procedure -TCLP).

Toxicity Characteristic Leaching Procedure (TCLP): A lab procedure designed to predict whether a particular waste is likely to leach chemicals into groundwater at dangerous levels.

Transporter: A person engaged in the off-site transportation of waste.

Treatment: Any method, technique, or process designed to physically, chemically, or biologically change the nature of a hazardous waste.

Treatment, Storage and Disposal Facilities: Facilities engaged in the treatment, storage, or disposal of hazardous waste. These facilities are the last link in the cradle-to-grave hazardous waste management system.

U

Underground Source of Drinking Water (USDW): An aquifer which supplies drinking water for human consumption or for any public water system, or contains fewer than 10,000 mg per liter total dissolved solids, and does not contain minerals or hydrocarbons that are commercially producible, and is situated at a depth or location which makes the recovery of water for drinking water purposes economically or technologically practical. While EPA defines an USDW as containing less than 10,000 mg per liter TDS, certain states, such as California and Texas, have adopted a 3,000 mg per liter TDS definition for the Class II UIC injection well programs.

Universal Wastes: Commonly referred to as recycled wastes with special management provisions intended to facilitate recycling. There are three categories of universal wastes; hazardous waste batteries; hazardous waste pesticides that have been recalled or collected in waste pesticide collection programs; and hazardous waste thermostats.

Used Oil: Any oil that has been refined from crude or synthetic oil that has been used, and as a result of such use, is contaminated by physical or chemical impurities.

V

Vadose Zone: A subsurface soil zone that contains suspended water. The vadose zone is above the zone of continuous water saturation.

W

Waste Minimization: The reduction, to the extent feasible, in the amount of waste generated prior to any treatment, storage, or disposal of the waste. Because waste minimization efforts eliminate waste before it is generated, disposal costs may be reduced, and the impact on the environment may be lessened.

Waterflood: A method used to enhance oil recovery in which water is injected into a reservoir to remove additional quantities of oil that have been left behind after the primary recovery. Usually, a waterflood involves the injection of water into strategically placed wells so that it sweeps through the reservoir and moves remaining oil to the producing wells.

Workover: One or more of a variety of remedial operations performed on a producing well to try to increase production. Examples of workover operations are deepening, plugging back, pulling and resetting the liner, squeeze-cementing, perforating additional horizons, etc.

Workover Fluid: A special fluid used to keep a well under control when it is being worked over. A workover fluid is composed carefully so it will not cause formation damage. Also used to stimulate a well to enhance productive capacity such as a frac fluid, acid, etc.

Workover Wastes: Wastes resulting from well workover operations. The wastes usually include workover fluids, similar to drilling fluids and could include various small volume wastes such as tubing scale, wax/paraffin, and cleaning or painting wastes.