



California Geologic Energy Management Division

2021 State Review Report

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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 criteria of 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 provide recommendations for program improvement. Today the State Review process exists to document and share the successes of states in regulating oil and gas development and to assist states with the evaluation and continuous improvement of their oil and gas environmental regulatory programs with the goal of enhancing protection of human health and the environment.

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 (STRONGER). STRONGER updated and expanded the Guidelines in June 2000 as “Guidelines for the Review of State Oil and Natural Gas Environmental Regulatory Programs” (the “2000 Guidelines”). Since 2000, STRONGER has expanded the scope of the Guidelines to address additional topics such as Stormwater Management, Hydraulic Fracturing, Air Quality, and Reused and Recycled Fluids.

California volunteered for an Initial Review in [1993](#). In September 2020 the California Geologic Energy Management Division (CalGEM) contacted STRONGER to request a review of the Division’s well stimulation treatment (WST) program. The focus of this review was to document CalGEM’s WST program, which regulates hydraulic fracturing, acid stimulation and acid matrix stimulation, in relation to the STRONGER Guidelines to identify program strengths, and to provide recommendations for continuous improvement.

The Review Team included Tom Hill, Ohio Department of Natural Resources, representing the state stakeholders; Anie Gardner, Chevron, representing the industry stakeholders; and John Walliser, Pennsylvania Environmental Council, representing the environmental stakeholders. Kurt Klappkowski, Pennsylvania Department of Environmental Protection, Trent Rosenlieb, California Independent Petroleum Association, and Andrew Grinberg, Clean Water Action, participated as Official Observers.

All State Reviews follow the same process in three phases. First, the questionnaire phase; second, the interview phase; third, the report development phase. In the first

phase, a questionnaire based on Sections 3 (General Criteria), 9 (Hydraulic Fracturing), and 11 (Reused and Recycled Fluids) of the 2019.2 Edition Guidelines was sent to May Soe and Siavash Nadimi at CalGEM. The questionnaire was intended to capture the status of CalGEM's WST program relative to the criteria of the Guidelines. CalGEM staff prepared a response to the questionnaire, which was then returned to the Review Team. Additional state agencies with jurisdiction over criteria covered in the Guidelines were invited to participate in the review but declined due to lack of staff availability.

The questionnaire phase was completed in May 2021. In the interview phase the Review Team and Official Observers typically travel to the state under review to meet with program staff, ask additional questions, and receive clarification on the nuances of the program. However, by mid-2021 the COVID-19 pandemic was still limiting travel and in-person meeting. In July the decision was made to not have an in-person interview and a virtual interview between the Review Team and CalGEM staff was held instead. Following the virtual interview, and after review of the written materials provided by CalGEM, the Review Team developed this report.

This report contains the Review Team's findings and recommendations based on their analysis of the questionnaire and information gained during the virtual interview. This report is intended to capture a "snapshot in time" of CalGEM's well stimulation treatment program as of the time of this review. Note: while the report proper refers to oil and gas activity as "oil and gas", the questionnaire used the terms "E&P" (exploration and production) and "O&G" (oil and gas) interchangeably. Similarly, "CalGEM", "the Division", "the program", "CA", or "California" are used throughout to refer to the Division and the state.

Topic headings, findings, and recommendations are noted in a numbered format that corresponds to the relevant section of the Guidelines. Multiple findings and/or recommendations under a single subject are denoted ".a, .b", etc. For example, report section "9.2 Standards" contains "Finding 9.2.1.b / 5.9" and "Recommendation 9.2.1.b / 5.9"; all of which pertain to Section 9.2.1 of the 2019.2 Edition STRONGER Guidelines. A "/" indicates a cross-reference in the Guidelines. For example, "Finding 9.2.1.b / 5.9" indicates a cross-reference to Section 5.9 in Section 9.2.1.

Unlike previous Hydraulic Fracturing State Reviews, the Questionnaire for this Review specifically included the elements of the Guidelines that are cross-referenced in Section 9 and Section 11. Other state agencies that did not participate in the Review have jurisdiction over many elements covered in the cross-referenced Guidelines Sections. On some questions outside of CalGEM's jurisdiction, no information was provided in the questionnaire. As this Review focused exclusively on CalGEM's regulations, the Review Team relied on information provided by CalGEM in their assessment. Every effort was undertaken to develop only Findings and Recommendations that pertain to the Guidelines criteria under CalGEM's jurisdiction. Information provided by CalGEM on questions pertaining to Guidelines criteria outside of their jurisdiction was included in this report with the intent of capturing as broad a picture of the regulatory landscape for hydraulic fracturing in California as possible. Every effort was undertaken to not develop

Findings or Recommendations for state agencies that did not officially participate in this Review. The Review Team encourages California to volunteer for a follow-up review with participation from all agencies having jurisdiction over hydraulic fracturing and adjacent activities related to unconventional oil and gas development to conduct a more holistic and thorough review in the future.

Appendix A contains a glossary of acronyms used in this report. Appendix B contains CalGEM's response to the questionnaire. Appendix C contains CalGEM's May 2021 Corrective Action Plan. Appendix D contains the 2019.2 Edition Guidelines.

Executive Summary

A multi-stakeholder Review Team has completed an in-depth review of the California Geologic Energy Management Division's well stimulation treatment regulatory program against the criteria of Section 3 - General Criteria, Section 9 – Hydraulic Fracturing, and Section 11 – Reused and Recycled Fluids of the 2019.2 Edition STRONGER Guidelines. Review Team members and Official Observers were granted full access to staff of CalGEM, and all questions were answered in a responsive and open manner.

The Review Team finds that CalGEM administers a regulatory program that is professional, well-managed, and generally meets the criteria of the 2019.2 Edition Guidelines. The Review Team identified a number of program strengths that warrant special recognition. The Review Team also identified specific recommendations for improvements to the program based on the Guidelines.

Key Findings and Recommendations

Finding 9.2.1.f

The Review Team finds that CalGEM's WST standards for permitting are robust and demonstrate strong adherence to the STRONGER Guidelines. The Review Team also recognizes that California has incorporated broader climate and public health considerations into its permitting process, objectives which are beyond the scope of this review. However, CalGEM has not provided clear guidance or criteria to operators on how they might meet those objectives. As a result, permit applications that appear to meet controlling regulations have been denied.

Recommendation 9.2.1.f

The Review Team understands the state's broader objectives, which are beyond the scope of this review, but encourages CalGEM to provide guidance on what criteria will be applied in such decisions. Without clear guidance, permit denials on the basis of these broader goals can appear arbitrary and create significant uncertainty for operators.

Finding 9.2.2

The Review Team finds that the Division's code demonstrates strong adherence to the criteria of this section of the Guidelines. Notably, CCR §1783.2 goes beyond CalGEM notification and provides the public with sufficient notification of well stimulation activities.

Finding 9.2.3.b / 4.3.2

CalGEM reports they have sufficient funding for the program; however, assessment rates determined on an annual basis may be susceptible to unexpected market fluctuations.

Recommendation 9.2.3.b / 4.3.2

The Review Team recommends CalGEM consider whether the assessment rate being determined on a three to five-year basis may offer increased budget stability for CalGEM, and stability for industry.

Background Information

STRONGER Guidelines Section 3.1

California oil and gas exploration and production began in the mid-1800s. The earliest commercial explorations occurred in the southern portion of the state. Natural gas exploration and production has occurred commensurate with oil exploration from the mid-1800's to the early 1900's. By the mid-1920's commercial natural gas exploration and production increased as gas captured from oil production began to be commercially/industrially utilized. Gas fields have been discovered and produced in the regions explored for oil production (southern California, southern San Joaquin Valley), as well as extensively within the northern/central portion of the state's Central Valley.

Regulation of E&P activities began in 1915 with the legislated creation of what is currently known as the Geologic Energy Management Division. CalGEM is currently the primary regulatory authority for upstream O&G operations within California. Early regulatory efforts focused on the responsible development and recovery of energy resources. In more recent times, regulatory emphasis has shifted from development and recovery management towards the protection of public health and safety and the environment during energy resource production operations. CalGEM's regulatory authority extends from onshore to three miles offshore. Today, the state has jurisdiction over more than 242,000 O&G related wells, including 101,300 wells classified as "Active" or "Idle" oil producers.

CalGEM's mandate pursuant to Public Resources Code §3106 requires the supervision of drilling, operation, maintenance, and abandonment of wells and the operation, maintenance, and removal or abandonment of tanks, facilities attendant to oil and gas production, and regulated pipelines, so as to prevent, as far as possible, damage to life, health, property, and natural resources; damage to underground oil and gas deposits from infiltrating water and other causes; loss of oil, gas, or reservoir energy, and damage to underground and surface waters suitable for irrigation or domestic purposes by the infiltration of, or the addition of, detrimental substances. CalGEM's mission also includes protecting public health and safety and environmental quality, including reduction and mitigation of greenhouse gas emissions associated with the development of hydrocarbon and geothermal resources in a manner that meet the energy needs of the state¹.

Well Stimulation Treatments have been occurring in the California for more than 50 years. Interim regulation of WSTs began in 2014, with permanent regulations becoming effective in 2015 under Title 14 of the California Code of Regulations [CCR] §1780-1789². CalGEM's WST unit oversees the review of well stimulation applications, permitting, monitoring, and witnessing during stimulations, as well as the review of the final disclosures of post stimulation reports. In 2013, prior to the implementation of the regulations, an independent scientific study was conducted by the California Council on Science & Technology (CCST) in collaboration with Lawrence Berkeley National

¹ See Pub. Resources Code § 3011

² 14 Cal. Code Regs., §1780-1789

Laboratory to evaluate the hazards and risks that well stimulation treatments pose to natural resources and public, occupational, and environmental health and safety.³

Other state agencies that have regulatory authority over WSTs include: the State Water Resources Control Board (SWRCB) and Regional Water Quality Control Boards (RWQCBs), the California Air Resources Board (CARB), the Department of Toxic Substances Control (DTSC), the California Coastal Commission, and the Department of Resources Recycling and Recovery (CalRecycle). CalGEM has Memorandum of Agreements (MOAs)⁴ in place with each agency as well as local and regional air quality management agencies that govern the joint management of all WST activity.

Finding 3.1

The Review Team finds CalGEM meets the criteria of this section of the Guidelines.

Background Information and General Criteria STRONGER Guidelines Sections 9.1 - 9.2

Operators are required to obtain a permit from CalGEM prior to conducting drilling, well stimulation, or injection activities anywhere in the state.⁵ Prior to issuing a well permit, CalGEM must determine whether issuing the permit would be consistent with its legal obligations, including the duty to protect public health and the environment.⁶ CalGEM may issue or deny a drilling permit based on any number of factors, including but not limited to environmental impacts, health and safety considerations, the financial stability of the applicant, and whether the applicant has a history of regulatory violations. Effective January 2020, CalGEM must also assess whether the applicant has sufficient bonds to properly plug and abandon the well and remediate the well site.

In addition to the geologic, health, and safety analyses that are performed of each WST permit application for compliance with CalGEM regulations, pursuant to the California Environmental Quality Act⁷ (CEQA), California state and local agencies are also required to disclose, analyze, and mitigate a project's environmental harms before approving permits for oil and gas operations.⁸ Permit applications to CalGEM for WSTs must include, among other things, documentation of an adequate CEQA review and in limited circumstances CalGEM may serve as the lead CEQA agency, although it not common.

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³ [2013 Report Link](#)

⁴ https://www.conservation.ca.gov/calgem/for_operators/Pages/mou_moa.aspx

⁵ Pub. Resources Code, §§ 3000 et seq

⁶ Pub. Resources Code §§ 3106, subd. (a), 3011

⁷ Pub. Resources Code, §§ 21000 et seq.

⁸ 14 Cal. Code Regs., § 15063, subd. (a))

⁹ Pub. Resources Code, § 21002.1, subd. (d); 14 Cal. Code Regs., § 15096.

Under CEQA, where a lead agency determines after an initial study that the project may have a significant impact on the environment, or if the project contributes to cumulative impacts, the lead agency must prepare an Environmental Impact Report (EIR).¹⁰ An EIR must also identify, and the permitting agency must adopt, feasible mitigation measures in order to substantially lessen or avoid otherwise significant environmental effects.¹¹ Alternatively, if an agency determines that a proposed project would not have a significant impact on the environment, it may adopt a Negative Declaration.¹²

Where a local agency (city or county, for example) elects to serve as the lead agency for a project and CalGEM acts as a responsible agency, CEQA still requires CalGEM to independently review the adequacy of any existing lead agency environmental documents.¹³ If a responsible agency finds any feasible alternative or feasible mitigation measures within its powers that would substantially lessen or avoid any significant effect the project would have on the environment it may adopt alternatives¹⁴

While the CEQA process continues to evolve in compliance with court mandates, review of the scientific process of permit evaluation was also conducted. In November 2019 scientific review was performed by the Lawrence Livermore National Laboratory (LLNL) of pending well stimulation permit applications to evaluate whether the state's technical standards for public health, safety, and environmental protection are being met prior to approval of each permit. CalGEM has a dedicated webpage for LLNL review reports and documentation.

LLNL assessed CalGEM's permit review process and evaluated the completeness of select operator application materials and CalGEM's engineering and geologic analyses processes to gauge adherence to the California Code of Regulations. LLNL's review of permit applications and process – with respect to WSTs – found that the permitting process met statutory and regulatory requirements. LLNL found, however, that CalGEM could improve its evaluation of the technical models used in the permit approval process. In addition, LLNL recommended written field narratives to accompany permit reviews to make the evaluation process more standardized and transparent. CalGEM now requires all operators to provide an Axial Dimensional Stimulation Area (ADSA) Narrative Report for each oilfield and fracture interval which must be validated by LLNL and conform to the new CalGEM permitting process; and develops field narratives as recommended by LLNL.

In addition to LLNL's reviews, the Department of Finance Office of Audits and Evaluation (OSAE) completed a broader audit¹⁵ of CalGEM's permitting process for well stimulation as well as underground injection control in November 2020. CalGEM

¹⁰ 14 Cal. Code Regs., § 15064, subds. (f) & (h)

¹¹ Pub. Resources Code, §§ 21002, 21081, subd. (a); 14 Cal. Code Regs., § 15126.4, subd. (a)

¹² Pub. Resources Code, §§ 21064, 21080, subd. (c)

¹³ Pub. Resources Code, § 21002.1, subd. (d); 14 Cal. Code Regs., § 15096.

¹⁴ 14 Cal. Code Regs., § 15096, subd. (g)(1).

¹⁵ [Audit Report & Response](#)

submitted a Corrective Action Plan¹⁶ to OSAE in May 2021 that details how CalGEM has implemented, or is working to implement, the audit's constructive recommendations.

In April 2021, Governor Newsom directed CalGEM to initiate regulatory action to phase-out the issuance of new permits for hydraulic fracturing by 2024³. CalGEM has released pre-rulemaking draft regulations¹⁷ for the purpose of receiving public input on the development of a rule that ends permitting for well stimulation treatments in 2024. CalGEM accepted public comments on the draft regulations until July 4, 2021.

Further detailed discussion of CalGEM's permitting process is contained in Standards under STRONGER Guidelines Section 9.2.1.

Finding 9.1 - 9.2

The Review Team finds CalGEM meets the criteria of this section of the Guidelines.

Standards

STRONGER Guidelines Section 9.2.1

Hydraulic fracturing, a type of well stimulation treatment (WST) used in the state of California, is regulated under the California Code of Regulations (CCR) §§1780-1789 to satisfy statutes under Public Resources Code §§ 3150-3160. The standards set by the WST program of the California Geologic Energy Management Division complement existing rules on well construction and operating standards and were put in place to satisfy the requirements and mandates of Senate Bill 4 (Chapter 313, Statutes of 2013) (SB4) by enacting further safeguards specific to well stimulation practices to protect public health, safety, and the environment.

In general, WST standards set the requirements to ensure integrity of wells, to ensure geologic and hydrologic isolation of the formation being treated, and to prevent contamination of groundwater and surface water during and following well stimulation operations. These standards are enforced through a well stimulation treatment permitting process that lays down rigorous WST requirements as specified in CCR §§1780-1789, including well construction (drilling and completion) requirements under CCR §1744.1-1744.6. A well stimulation treatment may not commence without a valid permit approved by CalGEM and a written approval by the State and Regional Water Boards (CCR §1783) and must be performed in accordance with the conditions of CalGEM's approval. CCR §1783.1 and §1784 outline the information that the operators are required to submit with a WST permit application.

CalGEM does not have jurisdiction over groundwater monitoring, rather that authority rests with the State and Regional Water Boards. Per the requirements of California's WST regulations, the Water Boards must develop model criteria for groundwater

¹⁶ See Appendix C

¹⁷ <https://www.conservation.ca.gov/index/Documents/Discussion%20Draft-WST%20phase-out%20final.pdf>

monitoring in areas of oil and gas well stimulation¹⁸. Most well stimulation is conducted where extensive oil and gas exploration has already been conducted and protected water source locations are generally known. Depending on location and depth, the existing “baseline” will be a combination of natural constituents mixed with variable legacy impacts from a variety of oil and gas activities.

The WST program has provision for casing and cementing standards to meet anticipated pressures to protect resources and the environment. These are provided for in CCR §1722.2 Casing Program, §1722.3 Casing Requirements, §1722.4 Cementing Casing (Onshore), and §1744.3 Cementing Casing (Offshore). In addition, operators are required to conduct pressure testing not more than 30 days before commencing well stimulation treatment and after all operations that could affect well integrity or the integrity of equipment, are complete. All cemented casing strings and all tubing strings to be utilized in the well stimulation treatment operations must be pressure tested for at least 30 minutes at a pressure equal to at least 100% of the maximum surface pressure anticipated during the well stimulation treatment, but not greater than the API rated minimum internal yield of the tested casing. Surface casing must be cemented with sufficient cement to fill the annular space from the shoe to the surface. Intermediate and production casings, if not cemented to the surface, must be cemented with sufficient cement to fill the annular space to at least 500 feet above oil and gas zones, and anomalous pressure intervals. Sufficient cement must also be used to fill the annular space to at least 100 feet above the base of the freshwater zone, either by lifting cement around the casing shoe or cementing through perforations or a cementing device placed at or below the base of the freshwater zone.

The WST program has requirements for performance and submittal of diagnostic logs to determine well integrity as provisioned by CCR §1784.2 by requiring operators to run a radial cement evaluation log or other cement evaluation method in advance of conducting well stimulation treatment, but at least 48 hours after cement placement.

The program also addresses the identification of potential conduits for fluid migration in the area of hydraulic fracturing and the management of the extent of fracturing where appropriate. CalGEM and the collective waterboards (the State Water Resources Control Board and the Regional Water Quality Control Boards) conduct rigorous engineering and geologic reviews of the well proposed for hydraulic fracturing and the offset wells within the axial dimensional stimulation area to ensure geologic and hydrologic isolation of oil and gas formations and to prevent contamination of surface water and groundwater of the State. In addition, operators are required to submit an ADSA Narrative Report that describes the technical basis of the induced fracture dimensions that are then validated by LLNL and CalGEM.

The WST program requires monitoring and recording of annular pressures during hydraulic fracturing operations as outlined in CCR §1785 Monitoring During Well

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https://www.waterboards.ca.gov/water_issues/programs/groundwater/sb4/area_specific_monitoring/docs/model_criteria_final_070715.pdf

Stimulation Treatment Operations. In addition to monitoring injection and annulus pressures, the operator is also required to continuously monitor and record other parameters during the well stimulation treatment, such as slurry rate, proppant concentration, and fluid rate.

The program also addresses 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. CCR §1785 (b) specifies the thresholds at which the operator must terminate the well stimulation treatment, report to CalGEM and perform diagnostic testing. The program explicitly requires the operator to terminate the well stimulation treatment immediately, shut-in the well and isolate the perforated interval, and report the incident to CalGEM and the Regional Water Board in the event of a well breach.

The WST program has requirements for pits and tanks. Storage and handling of fluids for hydraulic fracturing are outlined in CCR §1786 Storage and Handling of Well Stimulation Treatment Fluids and Wastes. The CCR explicitly requires fluids to be stored in “containers” and not in in sumps or pits as provided for in §1786(a)(4). Since hydraulic fracturing is a short duration operation, tanks or production facilities that are in place for less than 30 days are not required to have secondary containment as provisioned in CCR §1786(a)(1). However, operators are required to submit a spill contingency plan that accounts for the facilities and fluids on-site in the event of an unauthorized release. In addition, there is provision for requirements on testing, inspection and maintenance of production facilities used in the well stimulation operation.

The program also has provisions for contingency planning and spill risk management. All operators are required to submit a Spill Contingency Plan as part of the WST permit application per CCR §1783.1(a)(19). In the event of an unauthorized release, the operator is required to implement the Spill Contingency Plan, notify the Regional Water Quality Control Board and any other appropriate response entities, and perform clean up and remediation of the area, and dispose of any cleanup or remediation waste, as required by all applicable federal, state, and local laws and regulations including as specified in CCR §1786(a)(5). Within 5 days of the spill, the operator is required to submit a written report to CalGEM per the reporting requirements outlined in CCR §1786(a)(6). This includes a corrective action plan and measures to be implemented to prevent the event from happening again.

The WST program has adequate provision for waste characterization requirements as outlined in CCR §1786(a)(8). In general, regulation of any activity or factor(s) that may affect the handling, treatment, and/or disposal of hazardous waste are under the legal authority of the Department of Toxic Substances Control. In addition, the State Water Board has jurisdiction related to water quality regulations which includes regulating discharge of waste that may affect the quality of the “waters of the State”. Both agencies entered a Memorandum of Agreement with CalGEM to regulate well stimulation treatments in California.

Consistent with the MOAs, waste generated in the course of conducting well stimulation activities as defined by Health and Safety Code section 25124 and California Code of Regulations, title 22, section 66261.2, must be characterized, sampled and tested according to the methods set forth in CCR, title 22, division 4.5, chapter 11, article 3 (section 66261.20 et seq.), or according to an equivalent method approved by DTSC pursuant to CCR, title 22, section 66260.21, except where the operator has determined that the waste is excluded from regulation under CCR, title 22, section 66261.4 or Health and Safety Code section 25143.2. Testing results and compositional analysis for hazardous waste determinations under the requirements of the DTSC are required to be disclosed publicly. The program also specifically provides the requirements for sampling, testing and disclosure of the composition of water recovered from the well after the well stimulation treatment. These are all outlined in CCR §1788(a)(12)(B) through (G).

Tracking of waste (including hydraulic fracturing waste) disposed at commercial or centralized facilities is under the authority of DTSC and the Department of Transportation. DTSC's Hazardous Waste Tracking System (HWTS) for issues and tracks ID numbers, registering transporters, and providing information to analyze hazardous waste activities for policy purposes and enforcement. The system generates reports from 1993 to the present on hazardous waste shipments for generators, transporters, and treatment, storage and disposal facilities (TSDFs). With DTSC not participating in this review, it is difficult to assess if the current waste tracking system has the following elements: (a) multi-part form documentation, (b) maintenance of waste tracking information for a period of 3 years after shipment date, (c) certification of no illegal dumping by the hauler, (d) reporting discrepancies and (e) permitting of waste haulers.

The WST program has process requirements for the receipt of complaints related to well stimulation treatments as outlined in CalGEM's Manual of Instruction. All complaints will be investigated, and appropriate action taken when it is justified. Complaints on hydraulic fracturing are forwarded to the WST unit for review and investigation. Depending on the nature of the complaint, the WST unit may respond to the complaint within the next day or within a week. The response time varies based on the type of complaint received and the amount of time it takes the unit to investigate the complaint.

The WST Permit Application Process is shown below in Figure 1: CalGEM's WST Permitting Flowchart. Currently, WST applications are submitted through CalGEM's web-based application, Well Statewide Tracking and Reporting System (WellSTAR). The application, along with supporting documentation, is initially reviewed for completeness. Once an application is deemed complete, it triggers a 45-day review period where applications are sent to the various MOA agencies for review and comment. CalGEM's WST engineer, along with CalGEM's CEQA Unit, conduct engineering/risk assessment and CEQA reviews in parallel. Once these reviews are completed and the application satisfies all the requirements of the WST regulations, a final review from the WST Unit Supervisor is conducted. Following the WST Unit supervisor's review of the draft permit, it then goes to the California State Oil and Gas Supervisor for final approval and signature.

Review of all documentation related to CEQA is done concomitantly with the technical

reviews to ensure that the well stimulation treatment is compliant with CEQA requirements. CalGEM's CEQA Unit conducts these reviews to comply with CEQA when CalGEM undertakes an activity or makes a discretionary decision during issuance of permits or approving projects as discussed in the previous section.

While the permit process serves as a regulatory mechanism to ensure that well stimulation treatments are done prudently and responsibly, the process of obtaining permits and authorizations should also include prompt consideration and response to applications. While the current permitting process workflow shows that the program aims for a review period of 60 to 90 days, a review of WST permit cycle times¹⁹ of permits issued from May through December 2020 indicated an approximate average cycle time of 17 months since the LLNL review was implemented. It is worth mentioning that at the time the LLNL review was imposed by CalGEM, there was no clear guidance provided in advance to operators as to what the scope and requirements of the LLNL review were. The additional prerequisite of an approved ADSA Narrative Report as part of the permitting process clearly added a significant time burden to the issuance of permits resulting from multiple resubmissions of the report to the technical satisfaction of LLNL.

By the time the LLNL reviews on permit applications had been completed and the ADSA Narrative Reports had been approved, the operators were requested to submit updated information on the wells within the 2X ADSA for the WST Engineer to conduct a "repeat risk assessment" with the justification that status on some of these wells may have gone "stale". This requirement was applied to applications that have not been permitted six months or more, after they had originally been submitted.

An additional cause of delay to the issuance of permits was the linear review of the CEQA documents. As provided for in the permitting flowchart, the CEQA reviews are expected to be done in parallel with the technical reviews, however, this seems to be done after the risk assessments for most, if not all the recent permits processed and issued by CalGEM.

Granted that delays associated with conducting the technical and CEQA reviews are considered normal parts of the permitting process, there seems to be further delay in the issuance of permits even after completion of said reviews and satisfaction of all the necessary requirements of the application. There is no transparency for the operator applying for permits nor the public in general, as to what would be considered timely processing of permit applications in the permit process flowchart and there appears to be no predictable cadence of permit issuance.

Information requirements outlined in CCR §1784 (Well Stimulation Treatment Area Analysis and Design) are used to assess the potential subsurface risks pose by the treatment within the proposed stimulation area, referred to as Axial Dimensional Stimulation Area (ADSA). CalGEM conducts an analysis of all wells within two times of the ADSA (2X ADSA) which consists of review of the current well status as well as review

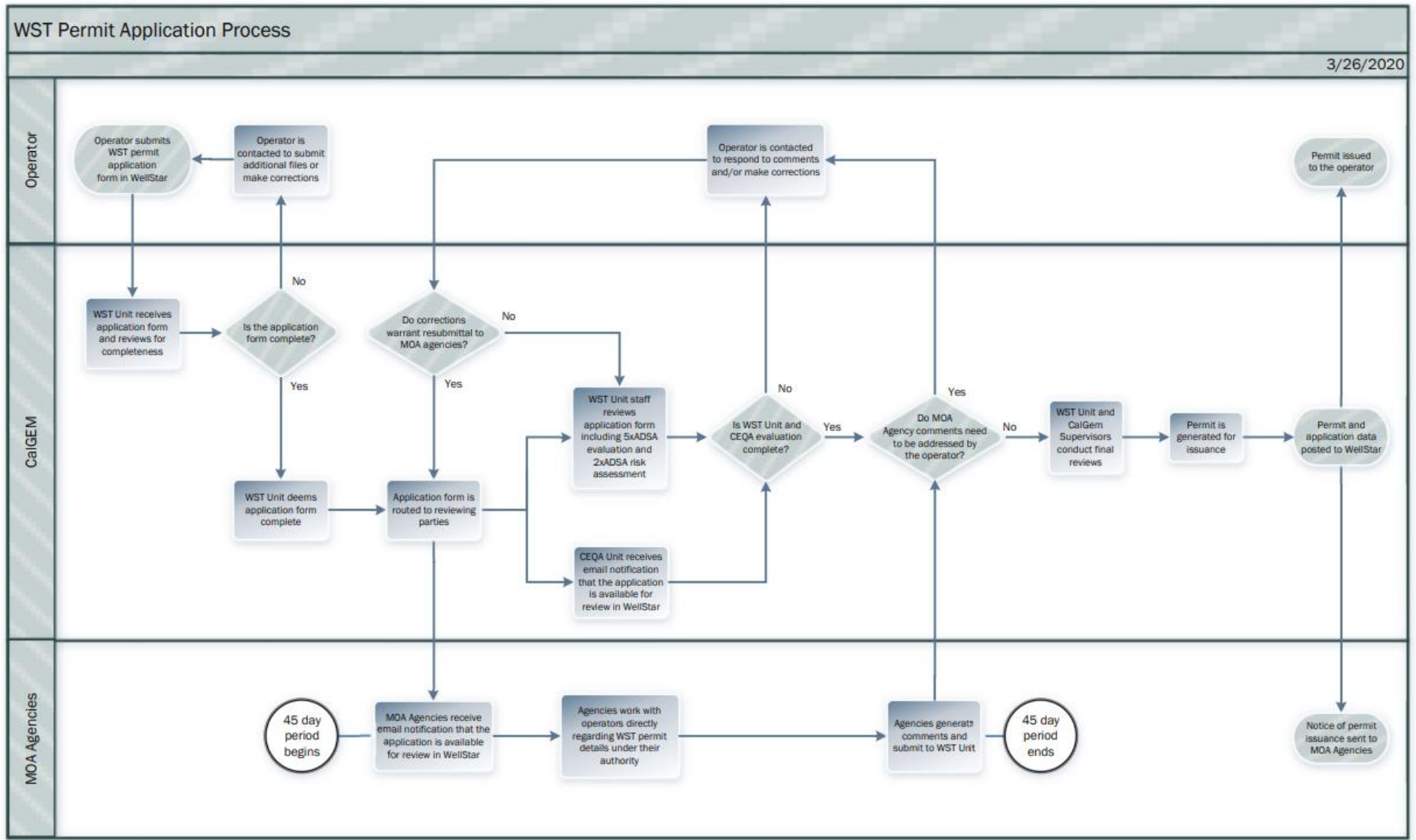
¹⁹ Cycle time is calculated from the date when a permit application is submitted to the date when a permit is issued.

of well historical activities from construction of the well to all other well activities, including prior stimulation and up through abandonment. In addition, identification of all geologic features, typically faults, within five times of the proposed stimulation zone (5X ADSA) is also conducted. Both these reviews determine whether the wells and geological features may pose migration pathway risks from the well stimulation activities.

In addition to CalGEM's ADSA reviews, the application is sent to the State Water Board for additional ADSA regulatory review to ensure WST treatment fluids will not pose fluid migration risk to the groundwater that is present within the proposed stimulation area. The overarching objective is for operators to demonstrate that that well stimulation fluids will be confined to the targeted treatment zone and that they remain geologically and hydrologically isolated within the hydrocarbon formation targeted for treatment.

There have been 12 permits issued to date in 2021, all of which were issued prior to April 2021. CalGEM has issued formal denials on 109 WST permit applications with 50 permits denied through the exercise of the State Oil and Gas Supervisor's discretionary power under Public Resources Code § 3160(d)(3)(c), citing denial of permits "to prevent, as far as possible, damage to life, health, property, and natural resources" (id. § 3106(a)) and to "protect public health and safety and environmental quality, including [the] reduction and mitigation of greenhouse gas emissions associated with the development of hydrocarbon . . . resources" (id. § 3011(a))⁵. These 50 permits were denied under discretionary authority despite satisfaction of the stringent regulatory requirements of the WST program.

Figure 1. California Geologic Energy Management Division's WST Permitting Flowchart



Finding 9.2.1.a

The Review Team finds that CalGEM's WST program standards demonstrates strong adherence to STRONGER's guidelines on hydraulic fracturing, and CalGEM's WST risk assessment review process exceeds the STRONGER guidelines criteria in certain cases. The Review Team identified the following areas in which CalGEM's WST permitting program exceeds STRONGER Guidelines criteria:

- As part of addressing the identification of potential conduits for fluid migration, multiple risk assessment reviews are conducted not only by CalGEM Engineers but also by the State and Regional Water Quality Control Boards to ensure treatment is confined in the intended reservoir and that it does not migrate to groundwaters (aquifers) of the state.
- Operators are not only required to monitor and record annular pressures during hydraulic fracturing, but they are also required to monitor parameters such as injection pressures, fluid rate, slurry rate, and proppant concentration during treatment.
- A requirement for neighbor notification prior to commencement of a well stimulation treatment, with the notification performed by an independent third party. (CCR §1783.2)
- Seismic evaluation and monitoring during and after WST. (CCR § 1785.1)
- Comprehensive post-stimulation reports and public disclosures. (CCR §1788 and 1789)

Finding 9.2.1.b / 5.9

Although, the program does not have specific tank requirements for well stimulation treatments, other sections in the CCR (§1773.1, §1773.2 and §1773.4) provide the general requirements and criteria for tank construction, leak detection, tank maintenance and inspections.

Recommendation 9.2.1.b / 5.9

The Review Team recommends CalGEM consider providing a reference to these sections in the WST regulations.

Finding 9.2.1.c / 4.2.1

As part of the Review, CalGEM provided the Review Team with a document called "The California State Oil Spill Contingency Plan" that outlines how all state and local agencies should carry out spill response activities. In addition, the California Code of Regulations has specific Spill Contingency Plan Requirements under CCR §1722.9. However, the 14 sections of the WST regulations in CCR § 1780-1789 do not specifically reference these requirements for spill reporting and remediation in the Operator's Spill Contingency Plan for well stimulation treatments.

Recommendation 9.2.1.c / 4.2.1

Recognizing that there are numerous federal, state and local requirements for reporting

spills and remediating them that are applicable to well stimulation treatment, the Review Team recommends that CalGEM should consider directing operators to reference CCR §1722.9 in their spill contingency plan to meet the standards and requirements of the state.

Finding 9.2.1.d / 5.3

The current WST program does not specifically promote a hierarchy of waste management practices with the preferred order of source reduction, recycling, treatment and proper disposal.

Recommendation 9.2.1.d / 5.3

The Review Team recommends that CalGEM consider adopting a waste management hierarchy program to promote waste minimization that further support protecting health, safety and the environment.

Finding 9.2.1.e / 4.1.1

CalGEM's current permitting process workflow shows that the program aims for a staff review period of 60-90 days from permit submittal to completion of permit review. Review of WST permit cycle times of permits issued from May through December 2020 indicated an approximate average cycle time of 17 months since the LLNL review was implemented. Visibility and clarity on the timeframe from the completion of permit review by CalGEM staff to approval or denial by the Oil and Gas Supervisor is unclear.

Recommendation 9.2.1.e / 4.1.1

The Review Team recommends CalGEM assess its permitting workflow process to ensure that operators are provided clear timeframes for the completion of permit reviews and permit approval or denial.

Finding 9.2.1.f

The Review Team finds that CalGEM's WST standards for permitting are robust and demonstrate strong adherence to the STRONGER Guidelines. The Review Team also recognizes that California has incorporated broader climate and public health considerations into its permitting process, objectives which are beyond the scope of this review. However, CalGEM has not provided clear guidance or criteria to operators on how they might meet those objectives. As a result, permit applications that appear to meet controlling regulations have been denied.

Recommendation 9.2.1.f

The Review Team understands the state's broader objectives, which are beyond the scope of this review, but encourages CalGEM to provide guidance on what criteria will be applied in such decisions. Without clear guidance, permit denials on the basis of these broader goals can appear arbitrary and create significant uncertainty for operators.

Reporting

STRONGER Guidelines Section 9.2.2

CalGEM's rules require notification of neighbors and ongoing communications with CalGEM to ensure that well stimulation treatments are transparent and safe. For communities, CCR §1783.2 requires that an operator of any oil and gas well receiving a permit to conduct well stimulation treatment from CalGEM provide all surface property owners and tenants within 1500-foot radius of the wellhead being stimulated or within 500 feet of the surface representation of the horizontal path of the subsurface parts of such well a notice at 30 days prior to the WST. The notice shall include a copy of the approved Well Stimulation Treatment permit and a Well Stimulation Treatment Neighbor Notification Form, record of which the operator's independent third-party notifier shall compile and mail to CalGEM as a declaration of notice.

Ongoing communication with CalGEM is regularly required. CCR §1783(d) requires the operator to notify CalGEM at least 72 hours prior to commencing well stimulation and to confirm between three to fifteen hours prior to commencing so that CalGEM may witness the WST. CCR §1783(e) requires that when providing the 72-hour notice under subdivision (d) the operator must indicate what, if any variance there was from the original notice of intent to drill, redrill, or rework the well. CCR §1784.1(b) requires notification to CalGEM at least 24 hours prior to commencement of pressure testing and the charting of the pressure test to be provided no less than 12 hours prior.

CCR §1784.2(b) requires that cement evaluation results be provided to CalGEM 72-hours before commencement of well stimulation and allows CalGEM 72-hours to evaluate the cement quality. This provides CalGEM a mechanism to prevent the WST from proceeding if CalGEM identifies concerns with the cement evaluation. CalGEM has taken on the duty of relaying notification of well stimulation to the Regional Water Board, DTSC, CARB, and the local air district where the well stimulation treatment may occur. The notification requirements of CCR §1783 are sufficient to allow for the presence of field staff to witness and monitor activities.

Per CCR §1783.1, CalGEM's permit process requires an operator to provide a complete list of chemicals and additives to be used during well stimulation. The permit process also requires that an operator disclose the source, amount, and composition of the base fluids to be used during well stimulation. Section §1722 contains a list of all chemicals that require a Material Safety Data Sheet and the location of the Material Safety Data Sheet (MSDS). PRC §3160(j)(10) requires CalGEM to develop a timely procedure to provide trade secret information to a health professional in the event of an emergency. Public Resources Code section 3160(j) describes the treatment of claims of trade secrets. CCR§1783.1(b)(20) states that if the contents of a permit application contain a claim of a trade secret, the claim will be addressed in a manner outlined in 3160(j). The code further details what information that shall not be protected as a trade secret, required information to be provided to CalGEM to review the claim, and the process if the claim is disallowed. CalGEM allows operators to claim trade secrets on additives

²⁰ 14 Cal. Code Regs., § 1783.1 subd. (b)

when entering information into WellStar. However, trade secret protection is not an available option in WellStar for chemical constituents.

CalGEM's requirements in CCR §1789 Post-Well Stimulation Treatment Report require the operator to submit a report to CalGEM within 60 days after the end of a well stimulation treatment. The report requires documentation of the pressure recorded during well stimulation and pressure recorded during the first 30 days of production. The report also requires documentation on how the actual well stimulation treatment varied from the anticipated well stimulation treatment design that was prepared under CCR§1784(b).

CCR §1788 also requires that within 60 days after completion of well stimulation treatment, the operator publicly disclose their name, well information including API number, location, formation, measured true vertical depth and formation. The section also requires disclosure of trade names, supplier, concentrations, and a brief description of the intended purpose of each additive, total volumes of base fluids used, and source and volume of all water used in well stimulation. These reports are posted to www.wellstar.conservation.ca.gov and <https://www.fracfocus.org/>.

Finding 9.2.2

The Review Team finds that the Division's code demonstrates strong adherence to the criteria of this section of the Guidelines. Notably, CCR §1783.2 goes beyond CalGEM notification and provides the public with sufficient notification of well stimulation activities.

Staffing and Training **STRONGER Guidelines Section 9.2.3**

CalGEM's Well Stimulation Treatment program currently consists of eight staff members, of which four are Associate Oil and Gas Engineers, one is a Senior Oil & Gas Engineer (Supervisor), two are Engineering Geologists, and one is a Staff Services Analyst from the Program Support Unit. CalGEM indicates that staffing levels are sufficient to meet program requirements.

Technical staffing in the WST program has been reported as sufficient to review and process all applications. The unit has two Engineering Geologists both of which are certified Professional Geologists with numerous years of experience to review and evaluate proposed stimulation activities. The engineering geologist reviews the geologic evaluation for the proposed WST, the post well stimulation public disclosure documents, and chemical disclosure indexes.

The program also employs four Associate Oil and Gas Engineers whose duties include evaluation of well stimulation applications, notices, notifications, permit approvals, and post well stimulation public disclosure documents, as well as issuing well stimulation permits, and coordination of the review process between MOA agencies.

The WST unit's Staff Services Analyst duties involve tracking applications and post stimulation reports, including total count of each item. Additionally, the position includes maintaining correspondence and uploading information into CalGEM's WellSTAR database. Support staff has received training by the WST unit to understand the terminology and basic processes of the WST operational processes.

Field inspections related to permits issued by the Well Stimulation Treatment Unit in CalGEM's headquarters are conducted by local district staff. Associate Oil & Gas Engineers and Engineering Geologists from the district offices are responsible for the performance of field reviews including witnessing of WSTs, evaluation of pressure tests, and conducting chemical checks on site.

The Department of Conservation has an in-house legal office with two attorneys dedicated to supporting the WST unit. Requests for legal support are routed through the in-house attorneys who attend a biweekly meeting with the WST program manager and the State Oil and Gas Supervisor to oversee the operation of the program.

CalGEM is funded through an assessment on oil and gas produced in California. The assessment is levied pursuant to Article 7 of Chapter 1 of Division 3 of the Public Resources Code. The assessment rate is established in June of each year for the ensuing fiscal year. The rate is based on CalGEM's estimated budget and the total amount of assessable oil and gas produced during the calendar year. The rate is imposed on each barrel of oil (bbl) and each 10 thousand cubic feet (MCF) of natural gas produced.

The current assessment rate for fiscal year 2021/22 is \$0.5958077 per bbl or 10 MCF of gas. CalGEM indicated during the review that the sources and level of funding are adequate to meet their program mandate. From the beginning of the WST program in 2014 to the time of this report CalGEM was able to increase program staff from five to eight with the addition of two Associate Oil and Gas Engineers and one program support staff. The increase in staff was necessary in 2016 to address the increasing workload with the implementation of the permanent WST regulations.

Well Stimulation Treatment Unit staff are expected to be familiar with regulations regarding WST and stay informed of the most updated policies and regulatory criteria. CalGEM has internal training modules available to all CalGEM staff. Some of the available training modules include Introduction to Oil Operations, Integrity Explorer Cement Evaluation, High Speed Radial Cement Bond Log, Facility and Environmental Modules and Professional Licensing in California, Wellbore Design & Cementing, Well Control and blowout preventer equipment (BOPE) Testing, Environmental Lease Inspections, and Abandonment Operations.

Finding 9.2.3.a / 4.3.1

The Review Team finds CalGEM meets the criteria for this section of the Guidelines. The program has sufficient legal support, and the Review Team commends CalGEM for having dedicated legal staff for the program. The WST Unit has sufficient technical

expertise to accomplish their program mandates. Administrative staff is sufficient for the program. Personnel from the local districts complete field inspections.

Finding 9.2.3.b / 4.3.2

CalGEM reports they have sufficient funding for the program; however, assessment rates determined on an annual basis may be susceptible to unexpected market fluctuations.

Recommendation 9.2.3.b / 4.3.2

The Review Team recommends CalGEM consider whether the assessment rate being determined on a three to five-year basis may offer increased budget stability for CalGEM, and stability for industry.

Review Findings 9.2.3 / 4.3.1

The Review Team finds CalGEM meets the criteria for this section of the Guidelines. CalGEM reports that staffing levels have been sufficient to receive, record, and respond to complaints related to hydraulic fracturing. CalGEM's expectations are that staff stay current on regulations and policies. The Review Team commends CalGEM for their broad range of formal training modules.

Public Information

STRONGER Guidelines Section 9.2.4

CalGEM's guiding statutes contain numerous public notice, engagement, and information requirements for both permitting and reporting.²¹ WST permit applications and supporting documents are uploaded to CalGEM's WellSTAR database system.²² As of December 2020, the public has been able to use the WellSTAR system to find information about well stimulation treatment permits, well stimulation disclosures, well maintenance data, well records, and underground injection control (UIC) projects. CalGEM has also provided online video instruction²³ for use of the site.

The WellSTAR platform also provides links to current laws and regulation, active rulemakings, reports and publications, information regarding regional issues, as well as file/record search capability. There is a dedicated Public Outreach and Community Engagement section of CalGEM's website²⁴ that provides information on past and upcoming public meetings, virtual trainings, and more. Contact information is provided on the website.

Pursuant to state law,²⁵ CalGEM also produces a Well Stimulation Treatment Annual

²¹ <https://www.conservation.ca.gov/index/Documents/CALGEM-SR-1%20Web%20Copy.pdf>

²² https://www.conservation.ca.gov/calgem/for_operators/Pages/WellSTAR.aspx

²³ https://www.youtube.com/playlist?list=PLErBtDSML9r5xhyJJ1hvPQlhc_T9u5afr

²⁴ <https://www.conservation.ca.gov/calgem/Pages/PublicOutreachandCommunityEngagement.aspx>

²⁵ Senate Bill 4 (Ch. 313, Stats. of 2013)

Report and program assessment.²⁶ The most recent report, dated June 2021, addresses the 2019 calendar year.

As noted in previous sections, assessments and reports conducted by the Lawrence Livermore National Laboratory²⁷ and the Department of Finance Office of Audits and Evaluation, as well as CalGEM's corrective action plans, are available online.²⁸

Finding 9.2.4

The Review Team finds CalGEM meets the criteria of this section of the STRONGER Guidelines.

Coordination Among Agencies STRONGER Guidelines Section 9.2.5

As discussed in other sections, CalGEM shares oversight responsibility over well stimulation treatments with the State Water Resources Control Board and Regional Water Quality Control Boards, the California Air Resources Board, the Department of Toxic Substances Control, the California Coastal Commissions, and the Department of Resources Recycling and Recovery. CalGEM has Memorandum of Agreements in place with each agency as well as local and regional air quality management agencies.²⁹

Finding 9.2.5.a

The Review Team finds that CalGEM meets the criteria of this section of the Guidelines. This STRONGER review only covered CalGEM's authority and actions related to hydraulic fracturing.

Recommendation 9.2.5.a

To ensure a full evaluation of the State of California's hydraulic fracturing oversight and interagency coordination, the Review Team recommends that STRONGER encourage the state of California to conduct a review that includes all state agencies with hydraulic fracturing oversight responsibilities, should the state not move forward with the proposed phase-out of WST permits by 2024.

Water & Waste Management STRONGER Guidelines Section 9.3

CalGEM is tasked with reviewing hydraulic fracturing applications, permitting, and monitoring during well stimulations, and reviewing the final disclosures of post

²⁶ https://www.conservation.ca.gov/calgem/pubs_stats/annual_reports/Pages/annual_reports.aspx

²⁷ <https://www.conservation.ca.gov/calgem/Pages/Well-Stim-National-Lab-Scientific-Review.aspx>

²⁸ <https://www.conservation.ca.gov/calgem/Pages/Well-Stim-National-Lab-Scientific-Review.aspx>

²⁹ <https://www.conservation.ca.gov/calgem/Pages/WSTOtherAgencies.aspx>

stimulation reports. With respect to Water and Waste Management, CalGEM shares oversight responsibility with the State Water Resources Control Board and Regional Water Quality Control Boards, the Department of Toxic Substances Control, the California Coastal Commissions, and the Department of Resources Recycling and Recovery. CalGEM has Memorandum of Agreements with these agencies.³⁰

Standards for CalGEM's hydraulic fracturing oversight are discussed under Section 9.2.1, above. To manage water and waste disposal relating to hydraulic fracturing, operators, as part of their permit application to CalGEM, are required to provide water management plans that:

- Provide information regarding the source and/or supplier of water to be used for well stimulation, including estimated volumes of water to be used.³¹
- Describe disposal methods for waste fluids generated from well stimulation.³²

Permit applications must also include a description of anticipated procedures to comply with California's Hazardous Waste Control Law.³³ Section § 3160(3)(A) of the California Public Resources Code further requires that, as part of permit review for hydraulic fracturing, additive and water transport to and from the well site, mixing and handling of well stimulation treatment fluids and additives onsite, the use of or reuse of treated or produced water, and the handling, treatment, and disposal of flowback fluids must also be evaluated.

Prior to disposal, all generated wastes (liquid or solid) are required to be tested for the presence of any hazardous substances in accordance with sampling and testing methods established by the California Department of Toxic Substances Control.³⁴ Wastes determined by the operator to be hazardous are required to be managed in compliance with requirements established by the Department of Toxic Substances Control. 14 CCR §1788 requires waste characterization for radioactivity.

Finding 9.3

Because CalGEM has limited authority with respect to Guidelines Section 9.3, no formal finding is made.

Reused and Recycled Fluids Definitions STRONGER Guidelines Section 11.1

The term "recycled water" is defined statutorily under the authority of the California Water Resources Control Board Code §13050(n))³⁵. CalGEM does not have a

³⁰ <https://www.conservation.ca.gov/calgem/Pages/WSTOtherAgencies.aspx>

³¹ 14 CCR §1783.1(a)(23)(D)

³² 14 CCR §1783.1(C)

³³ Health and Safety Code §25124 and §25143.2

³⁴ 14 CCR §1786(a)(8); 22 CCR §66261 *et seq.*

³⁵ "Recycled water" means water which, as a result of treatment of waste, is suitable for a direct beneficial use or a controlled use that would not otherwise occur and is therefore considered a valuable resource.

definition or jurisdiction to define reused or recycled fluids.

Finding 11.1

Because CalGEM has limited authority with respect to Guidelines Section 11.1, no formal finding is made.

Water Management Planning STRONGER Guidelines Section 11.2

As part of the permit application requirements for well stimulation treatments, Operators are required to submit a water management plan in accordance with CCR §1783.1(23)(A) through (E). The water management plan should include:

- (A) An estimate of the amount of water to be used in the well stimulation treatment;
- (B) An estimate of water to be recycled following the well stimulation treatment;
- (C) A description of how and where the water from a well stimulation treatment will be recycled, including a description of any treatment or reclamation activities to be conducted prior to recycling or reuse;
- (D) The anticipated source of the water to be used in the treatment; and
- (E) The anticipated disposal method that will be used for the recovered water in the flowback fluid from the treatment that is not produced water.

These requirements are consistent with the STRONGER guidelines that require water management plans to address all aspects of water management from acquisition through final disposition.

CalGEM did not specifically address whether the current WST program has evaluated barriers that would limit the operators' reuse and recycling of fluids nor whether operators are encouraged to use freshwater alternatives where available sources are feasible and where environmental risks can be adequately identified and controlled.

With regards to interagency coordination between multiple state agencies in the management of reused and/or recycled fluids, CalGEM works with various state and local regulatory agencies that have jurisdiction over the location of the well stimulation activities (see CCR §1786(a)(7)). These interagency agreements are outlined in the Memorandum of Agreement (MOA) developed between CalGEM and these various agencies prior to the permanent regulation of well stimulation activities in 2015.

Finding 11.2

The Review Team finds that CalGEM generally meets the criteria of this section of the Guidelines. However, CalGEM does not encourage operators to use freshwater alternatives.

Recommendation 11.2:

The Review Team recommends CalGEM consider evaluating potential barriers to reuse and recycling of fluids and including a provision in the WST program to encourage use of

freshwater alternatives (e.g. "recycled water" such as produced water from wells or treated wastewater) for the drilling and completion of wells where available sources are feasible.

Reused and Recycled Fluids Waste Management STRONGER Guidelines Section 11.3

The contents of an application for a permit to perform well stimulation treatment requires, pursuant to CCR §1783.1(23)(A) through (C)³⁶, that an application for a permit to perform well stimulation include a water management plan that includes an estimate of water to be recycled following well stimulation. The section also includes requirements for a description of how and where the water from a well stimulation will be recycled, description of any treatment or reclamation activities, and the source of the water to be treated. (See Pub. Resources Code § 3160(a)(3)(A)³⁷) It requires that all aspects and effects of well stimulation treatments, including the potential for the use of recycled water in well stimulation treatments, as well as appropriate water quality requirements and available treatment technologies shall be evaluated. §1775(a)&(b)³⁸ details that oilfield wastes shall be disposed of in a manner that does not cause damage to life, health, property, freshwater aquifers, or surface waters. The section defines prohibitions regarding the dumping of harmful chemicals into freshwater, drilling mud disposal, cement slurry, and dry cement.

Finding 11.3

Because CalGEM is not the agency with primary jurisdiction³⁹ over this topic of the Guidelines, no formal finding is made.

Pipelines for Reused and Recycled Fluids - Scope and Definition STRONGER Guidelines Section 11.4.1.1

CalGEM regulates produced water pipelines greater than 1" nominal diameter in size within the boundaries of the oil and gas lease. Produced water pipelines are regulated within the lease from separation, through treatment, and to disposal at an injection well, outfall, or surface water discharge point. In general, a CalGEM regulated pipeline is defined in Title 14 CCR §1760(q) which states that "Pipeline" means a tube, usually cylindrical, with a cross sectional area greater than 0.8 square inches (1-inch nominal diameter), through which crude oil, liquid hydrocarbons, combustible gases, and/or

³⁶ 14 California Code of Regulations (CCR) § 1783.1(23)(a)(b)(c)

³⁷ Pub. Resources Code, §3160 subd. (3)(a)

³⁸ 14 California Code of Regulations (CCR) § 1775 (a) & (b)

³⁹ CCR §1786 (7) "Operators shall conduct all activities that relate to storage and management of fluids in compliance with all applicable requirements of the Regional Water Board, the Department of Toxic Substances Control, the Air Resources Board, the Air Quality Management District or Air Pollution Control District, the Certified Unified Program Agency, and any other state or local agencies with jurisdiction over the location of the well stimulation activities."

produced water flows from one point to another within the administrative boundaries of an oil or gas field. Pipelines under the State Fire Marshall jurisdiction, as specified by the Elder Pipeline Safety Act of 1981 (commencing with § 51010 of the Government Code, and the regulations promulgated thereunder) are exempt from this definition.

CalGEM has provided an adequate definition of a regulated pipeline for produced water in terms of size (greater than 1" nominal diameter) and scope (where in the oil and gas processing facility they are expected to be encountered). However, the risk profile associated with these pipelines was not considered in the current definition (for example, there is no provision in the pipeline definition for risk associated with the constituent of the fluid, potential release quantity and potential impact to the environment in the event of a pipeline failure).

Finding 11.4.1.1

The Review Team finds that CalGEM's definition for pipelines meets the minimum criteria of this section of the Guidelines. However, CalGEM's definition does not consider the potential risk profile of the fluid(s) being transported in such pipelines. Instead, risk ranking of pipelines is based upon size and location, with lines near environmentally sensitive areas required to be identified and mapped by operators in a pipeline management plan. CalGEM has a dedicated Pipeline Management Unit that was not part of this review, therefore no formal recommendation is made.

Pipelines for Reused and Recycled Fluids - Siting, Permitting, and Financial Assurance **STRONGER Guidelines Section 11.4.1.2**

CalGEM stated in the response to the STRONGER questionnaire that there are no specific permitting requirements for produced water pipelines, but that they are covered under CCR §1774.2 Testing and Pipeline Management Plans. A listing of information on each pipeline including, but not limited to pipeline type, grade, actual or estimated installation date of pipeline, design and operating pressures, and any available leak, repair, inspection, and testing history should be included in the plan. The requirements under CCR §1774.2 however, did not ask for pipeline siting design requirements that would minimize or avoid impact on natural habitats and wildlife in sensitive or protected areas. For buried pipelines, there is a specific requirement for utilization of pipeline coating or external wrapping to minimize external corrosion (CCR §1774 (b)). CalGEM states that the implementation of "good oilfield practice measures" in §1774 (a), (b), & (d) can increase design life and improve pipeline integrity and maintainability for all pipelines regardless of location. Such measures in §1774(c) decrease spill response time and help to limit the impact of spills.

Finding 11.4.1.2

The Review Team finds that CalGEM generally meets the criteria for this section of the Guidelines. Because the Pipeline Management Unit did not participate in this review, no formal finding is made.

Pipelines for Reused and Recycled Fluids - Construction and Operational Requirements

STRONGER Guidelines Section 11.4.1.3

Requirements for construction and maintenance of pipelines used for well stimulation treatments are covered and outlined as part of the general pipeline requirements in CCR §1774 which states that newly installed pipelines shall be designed, constructed, and all pipelines shall be tested, operated, and maintained in accordance with good oil field practice and applicable standards in California Code of Regulations, title 8, section 6533, or other methods approved by the State Oil and Gas Supervisor. The Supervisor may require design or construction modifications, and/or additional testing and maintenance if they determine that good oil field practice and applicable standards have not been used.

Requirements for integrity testing on pipelines are provided under CCR §1774.1 Pipeline Inspection and Testing. Under CCR §1774.1(f), The operator shall perform periodic mechanical integrity testing on all active environmentally sensitive pipelines that are gathering lines, and all urban pipelines over 4" in diameter, and all active gas pipelines in sensitive areas. The mechanical integrity testing shall be conducted every two years, or at an alternative frequency approved by the Supervisor based on demonstrated wall thickness and remaining service life over a period of at least two years. The testing frequencies shall be specified in the operator's Pipeline Management Plan.

Under CCR §1774.1(d), operators shall conduct pressure testing in accordance with Subdivision 1774.1(f)(2) on any pipeline that has had a leak resulting in the release of a fluid in a quantity that triggers reporting of the release under any regulatory, statutory, or other legal requirement. The pipeline shall not be returned to service unless the pressure testing has been successfully completed and test results shall be provided to the Division for review within seven days following the test. Pipelines less than 10 years old are exempt from the testing requirements of this subdivision. Subject to review and approval by the Division, the operator shall identify effective mechanical integrity testing methods based on pipeline type and use. The mechanical integrity testing methodology for compliance with this subdivision shall be specified in the operator's Pipeline Management Plan.

Finding 11.4.1.3

The Review Team finds that CalGEM meets the criteria for this section of the Guidelines.

Pipelines for Reused and Recycled Fluids - Spill Response and Remediation

STRONGER Guidelines Section 11.4.1.4

Spill response and remediation requirements resulting from releases from pipelines used for well stimulation treatments are covered under the Spill Contingency plan requirements in CCR §1722.9. In addition, the WST Regulations under CCR §1786(a)(5) and (6) outline the necessary procedure that an operator must do in the event of an unauthorized release or spill.

Finding 11.4.1.4

The Review Team finds that CalGEM meets the criteria for this section of the Guidelines.

**Reused and Recycled Fluids Transported by Truck
STRONGER Guidelines Section 11.4.2**

CalGEM did not provide specific truck transportation requirements for well stimulation treatment fluids and waste but instead referenced CCR §1786 Storage and Handling of Well Stimulation Fluids and Wastes loosely as an answer. This is because handling of WST waste is under the regulatory responsibilities of the collective Water Boards and CalRecycle as outlined in the MOA between CalGEM and these agencies.

Finding 11.4.2

Because CalGEM is not the agency with primary jurisdiction over this topic of the Guidelines, no formal finding is made.

Recommendation 11.4.2

Consistent with Recommendation 9.2.5 of this Report, the Review Team encourages the inclusion of all state agencies with oversight of hydraulic fracturing and adjacent activities in future reviews to provide a more wholistic review of unconventional oil and gas development in California.

**Treatment and Storage of Reused and Recycled Fluids
STRONGER Guidelines Section 11.5**

The current WST program requires operators to include in the permit application, a description of how and where well stimulation treatment fluids will be recycled, including a description of any treatment or reclamation activities to be conducted prior to recycling or reuse as outlined in CCR §1783.1.

The STRONGER Guideline on storage of reused or recycled fluids recommends a streamlined permitting process that should be minimized for activities deemed to be of low risk. This has not been directly answered by CalGEM, so it is unclear if the current WST regulation has a provision consistent with this specific guideline or if this is covered by one of the agencies with whom CalGEM has an MOA that has jurisdiction on this subject.

As earlier presented on the review of CalGEM's WST program against STRONGER Standards for hydraulic fracturing in CCR §9.2, the reporting and tracking of reused or recycled fluids are under the authority of the DTSC and DOT. Based on the response received from CalGEM in the STRONGER questionnaire, it is difficult to assess if the

waste tracking system employed by DTSC and DOT includes the 5 elements recommended by the STRONGER Guideline in Section 5.10.2.3.

The STRONGER Guidelines recommend that the state regulatory program should differentiate between centralized and commercial wastewater treatment facilities. From CalGEM's response to the questionnaire, they do not differentiate between the size of produced water treatment plants within the boundary of the oil and gas lease. CalGEM only regulates privately-owned produced water treatment plants located on the lease for the purpose of treating produced water from wells at the lease or an adjacent lease.

The STRONGER Guidelines recommend regulating the waste generated during treatment of reused or recycled fluids in accordance with the technical criteria outlined in STRONGER Guidelines Section 5, addressing waste characterization, waste management hierarchy, pits, land application, tanks and centralized and commercial facilities. CalGEM did not directly respond to this question, so it is not clear if the current WST regulation has provision for this specific guideline or this is covered under by one of the agencies with whom CalGEM has entered an MOA, and that has jurisdiction on this subject.

The STRONGER Guidelines recommends that state programs should include a methodology for the determination of whether Naturally Occurring Radioactive Material (NORM) is present to the extent that it should be regulated. NORM is currently regulated by the California Department of Public Health, which did not participate in this Review.

Finding 11.5

Because CalGEM is not the agency with primary jurisdiction over this topic of the Guidelines, no formal finding is made.

Recommendation 11.5

Consistent with Recommendation 9.2.5 of this Report, the Review Team encourages the inclusion of all state agencies with oversight of hydraulic fracturing and adjacent activities in future reviews to provide a more wholistic review unconventional oil and gas development in California.

Appendix A – Glossary of Acronyms

ADSA	Axial Dimensional Stimulation Area
API	American Petroleum Institute
bbbl	Barrel of Oil
BOPE	Blowout Preventer Equipment
CA	California
CalGEM	California Geologic Energy Management Division
CalRecycle	California Department of Resources Recycling and Recovery
CARB	California Air Resources Board
CCR	California Code of Regulations
CCST	California Council on Science & Technology
CEQA	California Environmental Quality Act
DTSC	Department of Toxic Substances Control
E&P	Exploration & Production
EIR	Environmental Impact Report
EPA	United States Environmental Protection Agency
HWTS	Hazardous Waste Tracking System
IOCC	Interstate Oil Compact Commission
IOGCC	Interstate Oil & Gas Compact Commission
LLNL	Lawrence Livermore National Laboratory
MCF	Thousand Cubic Feet of Natural Gas
MOA	Memorandum of Agreement
NORM	Naturally Occurring Radioactive Material
O&G	Oil & Gas
OSAE	Department of Finance Office of Audits and Evaluation
RWQCB	Regional Water Quality Control Boards
STRONGER	State Review of Oil & Natural Gas Environmental Regulations
SWRCB	State Water Resources Control Board
TSDf	Treatment, Storage and Disposal Facilities
UIC	Underground Injection Control
WellSTAR	Well Statewide Tracking and Reporting System
WST	Well Stimulation Treatment

Appendix B – Questionnaire Response



Questionnaire for State Reviews: 2019.2 Edition

Guidelines Section(s): Hydraulic Fracturing, Reused & Recycled Fluids

State: California

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INSTRUCTIONS: This questionnaire is based on the [Guidelines for the Review of State Oil and Natural Gas Environmental Regulatory Programs, 2019.2 Edition](#). The purpose of this questionnaire is to obtain information that will provide an accurate characterization of a state's regulatory program. It is strongly recommended to have the Guidelines close at hand when completing this questionnaire. Terms used in this questionnaire have meanings consistent with those contained in the Guidelines. Citations in brackets following each question refer to the applicable section of the Guidelines (e.g., [5.3]). Certain sections of the Guidelines contain cross-references to other sections. Where other Guidelines sections are cross-referenced within a question, the cross-referenced questions are included in italics (e.g., Question 16: Briefly describe how surface controls associated with hydraulic fracturing, such as dikes, pits or tanks, meet Sections 5.5 (*Questions 17-46*) and 5.9 (*Questions 47-49*) of the guidelines. [9.2.1]). These cross-referenced questions are provided primarily for context; however, the state may find it easier to provide a complete picture of the program by responding to them.

Multiple agencies within a state may have jurisdiction over different aspects of oil and gas regulation. The intent of the review process is to develop as complete a picture of a state's oil and gas environmental regulatory environment as possible; however, not all agencies with jurisdiction of all the issues covered in this questionnaire may be participating in the review. If a question requires a response from an agency not participating in the review, indicate the agency with jurisdiction, but do not answer on their behalf.

Please respond in a manner that sufficiently addresses the criteria of the relevant Guidelines section and describes the state's program or requirements but does not go into excessive detail. During the interview the Review Team will ask for additional detail or clarification on points which they feel merit further discussion. To the extent possible, provide hyperlinks to state websites where the Review Team can reference statutes, rules, policies, guidance, reports, and other related information used to support the state's responses.

BACKGROUND INFORMATION

1. Please provide a brief history or description of the oil and natural gas industry in your state, its regulation by state agencies, and recent industry trends.

Answer 1: California oil and gas (O&G) exploration and production (E&P) began in the mid-1800s. The earliest commercial explorations occurred in the southern portion of the state. The beginning of the 20th century saw oil E&P expand northward into the central coastal area of the state as well as into the southern San Joaquin Valley region. Today, oil production continues to occur in the near coastal inland areas of the southern portion of the state (primarily the Los Angeles Basin), the southern portion of the San Joaquin Valley, and offshore of the state's southern coastline.

Natural gas E&P has occurred commensurate with oil exploration from the mid-1800's to the early 1900's. By the mid-1920's commercial natural gas exploration and production increased as gas captured from oil production began to be commercially/industrially utilized. Gas fields have been discovered and produced in the regions explored for oil production (southern California, southern San Joaquin Valley), as well as extensively within the northern/central portion of the state's Central Valley.

Regulation of O&G E&P began in 1915 with the legislated creation of what is currently known as the Geologic Energy Management Division (CalGEM). CalGEM is currently the primary regulatory authority of O&G operations within California. Early regulatory efforts focused on the responsible development and recovery of energy resources. In more recent time, regulatory emphasis has shifted from development and recovery management towards the protection of public health and safety and the environment during energy resource production operations. CalGEM's regulatory authority extends from onshore to three miles offshore. Today, the state has jurisdiction over more than 242,000 O&G related wells, including 101,300 wells classified as "Active" or "Idle" oil producers.

Hydraulic fracturing is referred to in California statute and regulation as a well stimulation treatment (WST) and is discussed as such in CalGEM's responses to this questionnaire. WSTs also include acid fracturing and acid matrix stimulation operations. WSTs became permanently regulated in 2015 under 14 California Code of Regulations [CCR] §1780-1789. WSTs have been occurring in the state for more than 30 years.

Other state agencies that have regulatory authority over WSTs include: the State Water Resources Control Board (SWRCB) and Regional Water Quality Control Boards (RWQCBs), the Air Resources Board (CARB), the Department of Toxic Substances Control (DTSC), the California Coastal Commission, and the Department of Resources Recycling and Recovery (CalRecycle). CalGEM has Memorandum of Agreements (MOAs) in place with each agency as well as local and regional air quality management

agencies.

Industry trends within the state include O&G production declines since the 1980's, E&P operations shifting from conventional to unconventional methods, and, most recently, working to achieve California's goal of becoming carbon-neutral by 2045 through carbon reduction efforts like carbon capture and sequestration.



Intro to Oil Gas
Geoth.pdf

2. Please include the following documents⁴⁰:

- a) Organization chart(s) showing the structure of all agencies responsible for the management of hydraulic fracturing.

The Geologic Energy Management Division (CalGEM, formerly DOGGR) is only one public entity whose authority extends to regulating well stimulation treatment (WST) and WST-related activities. CalGEM is in charge of reviewing hydraulic fracturing applications, permitting, monitoring and witnessing during stimulations and reviewing the final disclosures of post stimulation reports.

Senate Bill 4 (Chapter 313, Statutes of 2013) (SB 4) directed CalGEM to enter into formal agreements with certain state and local agencies respecting WST and WST-related activities. For more information, please visit the following website. MOA agreement documents can be provided if needed.

<https://www.conservation.ca.gov/calgem/Pages/WSTOtherAgencies.aspx>

- b) All statutes, rules, regulations and orders applicable to the management of hydraulic fracturing.

Answer 2b: All CalGEM statutes and regulations are viewable at:

<https://www.conservation.ca.gov/index/Documents/CALGEM-SR-1%20Web%20Copy.pdf>

Hydraulic fracturing related statutes are: 3150-3161 (pg 39-50)

Hydraulic fracturing related regulations are: 1780-1789 (pg 307-326)

- c) Any memoranda of understanding or similar agreements between state agencies or between the state and any other governmental entities (BLM, EPA, Indian Tribes, local jurisdictions) pertaining to the management of hydraulic fracturing.

Answer 2c: CalGEM has MOAs in place for WSTs with the following state and local

⁴⁰ These documents may be included as appendices at the end of this questionnaire, or as hyperlinks. If included as appendices, please indicate a reference on this page. For example, "Organizational chart – see appendix A, Rules and Regulations – see table in Appendix B."

government agencies:

- State Water Resources Control Board (SWRB) and Regional Water Quality Control Boards (RWQCBs)
- California Department of Toxic Substances Control (DTSC)
- California Department of Resources Recycling and Recovery (CalRecycle)
- California Air Resources Board (CARB) and San Joaquin Valley Air Pollution Control District
- California Coastal Commission
- California Air Resources Board (CARB) and Local Air Districts

MOAs can be reviewed at:

<https://www.conservation.ca.gov/calgem/Pages/WSTOtherAgencies.aspx>

d) Any written mission statement(s), goals, objectives and policies applicable to hydraulic fracturing.

Answer 2d: CalGEM does not have a mission statement specific to hydraulic fracturing. CalGEM’s primary mandate, however, applies to all operations regulated by the Division. Public Resources Code (PRC) § 3106 states:

“(a) The supervisor shall so supervise the drilling, operation, maintenance, and abandonment of wells and the operation, maintenance, and removal or abandonment of tanks and facilities attendant to oil and gas production, including pipelines not subject to regulation pursuant to Chapter 5.5 (commencing with Section 51010) of Part 1 of Division 1 of Title 5 of the Government Code that are within an oil and gas field, so as to prevent, as far as possible, damage to life, health, property, and natural resources; damage to underground oil and gas deposits from infiltrating water and other causes; loss of oil, gas, or reservoir energy, and damage to underground and surface waters suitable for irrigation or domestic purposes by the infiltration of, or the addition of, detrimental substances.”

CalGEM also has a mission statement contained within code. PRC §3011 states:

“(a) The purposes of this division include protecting public health and safety an environmental quality, including reduction and mitigation of greenhouse gas emission associated with the development of hydrocarbon and geothermal resources in a manner that meets the energy needs of the state.”

CalGEM also displays on its website landing page the following mission statement:

“The California Geologic Energy Management Division (CalGEM) prioritizes protecting public health, safety, and the environment in its oversight of the oil, natural gas, and geothermal industries, while working to help California achieve its climate change and clean energy goals. To do that, CalGEM uses science and sound engineering practices to regulate the drilling, operation, and permanent closure of energy resource wells.”

Though there was no specific mission statement for well stimulation program, the pdf below is the statement of reason written when the regulations were developed.



12-30-14 Final
Statement of Reasons

3. Please also include on a separate page any other relevant practices, program measures, guidelines or controls applicable to your state.

Answer 3: To review CalGEM's WST application review processes please see the documents listed under the "Well Stimulation Permit Review Process" heading, found here:

<https://www.conservation.ca.gov/calgem/Pages/WST.aspx>

WST overall review process:

<https://www.conservation.ca.gov/calgem/Documents/WST/WST-Review-Process-ADA.pdf>

Risk assessment:

<https://www.conservation.ca.gov/calgem/Documents/WST/2xADSA-Risk-Assessment-ADA.pdf>

<https://www.conservation.ca.gov/calgem/Documents/WST/5xADSA-Evaluation-ADA.pdf>

GENERAL CRITERIA (Guidelines Section 3)

4. What is the statutory authority upon which your E&P environmental regulatory program is based? What powers and duties are provided in the statute(s)? [3.1.a]

Answer 4: Statutory authority for the regulation of WSTs is granted by PRC §3160. Powers and duties provided by PRC §3160 include, but are not limited to:

- PRC §3160 (b)(1)(A) requires CalGEM to adopt WST regulations including the authority to revise existing O&G regulations: "On or before January 1, 2015, the division....shall adopt rules and regulations specific to well stimulation treatments. The rules and regulations shall include, but are not limited to, revisions, as needed, to the rules and regulations governing construction of wells and well casings to ensure integrity of wells, well casings, and the geologic and hydrologic isolation of the oil and gas formation during and following well stimulation treatments, and full disclosure of the composition and disposition of well stimulation fluids, including, but not limited to, hydraulic fracturing fluids, acid well stimulation fluids, and flowback fluids."

- PRC §3160 (c)(2) requires CalGEM to collaborate with other state agencies to determine roles and responsibilities in the regulation of WSTs: “On or before January 1, 2015, the division shall enter into formal agreements with the Department of Toxic Substances Control, the State Air Resources Board, any local air districts where well stimulation treatments may occur, the State Water Resources Control Board, the Department of Resources Recycling and Recovery, and any regional water quality control board where well stimulation treatments may occur, clearly delineating respective authority, responsibility, and notification and reporting requirements associated with well stimulation treatments and well stimulation treatment-related activities, including air and water quality monitoring, in order to promote regulatory transparency and accountability.”

5. Does this statutory authority include authority for the promulgation of rules and regulations? Please provide reference to the appropriate section(s). [3.1.b]

Answer 5: Yes, statute provides the authority, in general, for CalGEM to implement rules and regulations relative to O&G operations. As PRC §3013 states: “This division shall be liberally construed to meet its purposes, and the director and the supervisor, acting with the approval of the director, shall have all powers, including the authority to adopt rules and regulations, which may be necessary to carry out the purposes of this division.”

Additionally, as detailed in Answer 4, PRC §3160 (b)(1)(A), states the division shall adopt WST rules and regulations which shall include revisions, as needed, to rules and regulations governing well construction, well casing, and geologic/hydrologic isolation of oil and gas formations.

6. Do the statutes and regulations contain definitions of terms as necessary for program implementation? Please provide reference to the appropriate sections. [3.1.c]

Answer 6: Yes, definitions of terms related to WSTs can be found in statute in PRC §3150-3159 and in regulation in 14 CCR §1781.

7. Are the levels of funding and staff provided adequate for full E&P environmental regulatory program implementation? Please provide funding levels and total staff complement for E&P environmental regulatory activities for the past 3 years. Please differentiate between UIC and non-UIC program funding and staffing levels if such differentiation is applicable to your program. [3.1.d, 4.3.2]

Answer 7: Under CalGEM, WST program is funded separately from the UIC program. WST unit has the following staff:

1 – Senior Oil & Gas Engineer (Supervisor)

4 – Associate Oil & Gas Engineer

2 – Engineering Geologists

1 – Program support staff

8. Discuss mechanisms in place in your state for the coordination of E&P environmental regulatory program activities among the public, government agencies and the regulated industry. [3.1.e, 4.4]

Answer 8: The California Department of Conservation (DOC) maintains publicly available webpages related to CalGEM which can be accessed through <https://www.conservation.ca.gov/calgem/Pages/Index.aspx>. Through this portal, pages for each of the division’s regulatory programs can be accessed. Users can also view online data, maps, laws and regulations, and request division files.

CalGEM hosts in-person and virtual Community Meetings to gather public input to update public health and safety protections in future rulemakings. The division also provides subscription access to an electronic mailing list (List Serv) that provides notification of updates or changes to CalGEM regulations. CalGEM representatives have also attended local government public meetings regarding O&G.

CalGEM meets with MOA agencies (Waterboard, CARB, ...) on a regular basis to coordinate on our respective E&P programs.

CalGEM district offices and headquarters office provide mandated technical review and/or field inspection/oversight of O&G operations and maintain regular day-to-day contact with the regulated industry. In 2017 CalGEM implemented the Well Statewide Tracking and Reporting System (WellSTAR) electronic database to better handle data collection and ensure operator adherence to O&G regulations. WellSTAR data for Well Stimulation Treatment (WST) operations is available for review public review at <https://wellstar-public.conservation.ca.gov/>.

CalGEM periodically issues Notice to Operators (NTO) which detail important notifications to all operators the division has record of at the time of the notice. Notices are sent through the postal service as well as posted online.

With respect to WSTs, CalGEM issues annual reports to the legislature which discusses the WST permits issued and stimulations completed during the previous calendar year.

WST annual reports can be found here:

https://www.conservation.ca.gov/calgem/pubs_stats/Pages/legislative_reports.aspx#wst-annual-report.

9. What are the goals or objectives of the E&P environmental regulatory program? How do the goals and objectives of your E&P environmental regulatory program relate to protection of human health and the environment? Please provide reference to the appropriate document(s). [3.2]

Answer 9: The goals and objectives of CalGEM’s regulation of WSTs are stated within

PRC §3011 (a): “The purposes of this division include protecting public health and safety an environmental quality, including reduction and mitigation of greenhouse gas emission associated with the development of hydrocarbon and geothermal resources in a manner that meets the energy needs of the state,” and PRC § 3106(a): “The supervisor shall so supervise the drilling, operation, maintenance, and abandonment of wells... so as to prevent, as far as possible, damage to life, health, property, and natural resources; damage to underground oil and gas deposits from infiltrating water and other causes; loss of oil, gas, or reservoir energy, and damage to underground and surface waters suitable for irrigation or domestic purposes by the infiltration of, or the addition of, detrimental substances.”

10. Does your program provide for flexibility in determining the criteria applicable to E&P environmental regulation (e.g., variation in criteria dependent on region of the state or other factors; authorization of site-specific waivers for good cause shown and consistent with program goals and objectives)? If so, please provide reference to the appropriate document(s). [3.3]

Answer 10: Each WST application is reviewed and processed in a manner that disregards which region of the state stimulation occurs. Each application is reviewed on a case-by-case basis, and all risk factors are reviewed prior to permit issuance. Waivers are not issued by CalGEM and each application must satisfy all regulatory requirements before a WST permit will be issued.

HYDRAULIC FRACTURING (Guidelines Section 9)

11. Has the state evaluated potential risks associated with hydraulic fracturing, taking into account factors such as depth of the reservoir to be fractured, proximity of the reservoir to freshwater resources, well completion practices, well design, and volume and nature of fluids? [9.2]

Answer 11: Yes, potential risks related to WSTs were evaluated prior to implementation of permanent regulations and are evaluated during the review of each WST application. Prior to the implementation of permanent WST regulations, an independent scientific study was conducted to evaluate the hazards and risks and potential hazards and risks that well stimulation treatments pose to natural resources and public, occupational, and environmental health and safety. This report was completed by the California Council on Science & Technology (CCST) in collaboration with Lawrence Berkeley National Laboratory. This report can be reviewed here:

<https://ccst.us/wp-content/uploads/2015SB4summary.pdf>

Each WST permit application must include the features specified in 14 CCR §1783.1 and §1784, which CalGEM uses to assess risks posed by the treatment. Subsurface risk factors identified in the CCST report include:

- Assessing nearby wells for migratory pathways for WST-related fluids
- Ensuring groundwater protection from shallow WSTs by identifying groundwater sources and requiring operators to adhere well construction regulations protective of any groundwater resource.
- Requiring operators to demonstrate that proposed WSTs will not intersect usable groundwater resources
- Monitoring of seismic activity by operators in the areas where WSTs are being performed, both during and after treatment

The states WST regulations address these identified risk factors. Each WST permit application must include the features specified in 14 CCR §1783.1 and §1784, which CalGEM uses to assess risks posed by a WST. These features include:

- Well identification and location information [§1783.1(a)(5-10)]
- Treatment design information [§1783.1(a)(11-18); including all requirements of §1784]; which includes:
 - An estimate of the size/extent of the treatment area
 - Identification and review of all well bores located completely or partially within two times the treatment area
 - A review of all geologic features, including known faults (active or inactive), within five times treatment area

The review processes applied to all WST applications can be found on CalGEM's WST webpage, under the "Well Stimulation Permit Review Process" heading, here: <https://www.conservation.ca.gov/calgem/Pages/WST.aspx> .



The WST Review
Process.docx



2xADSA Risk
Assessment.docx



5xADSA
Evaluation.docx

12. Has the state developed standards to prevent the contamination of groundwater and surface water from hydraulic fracturing? [9.2]

Answer 12: Yes, the state has developed standards to prevent contamination of water resources. Starting with the drilling and completion of a well, all O&G wells must satisfy well construction specifications designed to protect water resources, as specified in 14 CCR §1744.1-1744.6.

WST applicants must adhere to §1744.1-1744.6 during the construction of any well, which includes a well proposed for stimulation. Additionally, these specifications must be identified for all wells within two times the proposed treatment area and shall be depicted on the casing diagram submitted for each well. Casing diagrams must depict all features listed under 14 CCR §1784(a)(2)(A), which include:

- (i) Sizes and weights of casing;
- (ii) Depths of shoes, stubs, and liner tops;
- (iii) Depths of perforation intervals, water shutoff holes, cement port, cavity shots, cuts, casing damage, and top of junk or fish left in well;
- (iv) Diameter and depth of hole;
- (v) Cement plugs inside casings, including top and bottom of cement plug, with indication of method of determining;
- (vi) Cement fill behind casings, including top and bottom of cement fill, with indication of method of determining;
- (vii) Type and weight (density) of fluid between cement plugs;
- (viii) Depths and names of the formations, zones, and sand markers penetrated by the well, including the top and bottom of the zone where well stimulation treatment will occur;
- (ix) All steps of cement yield and cement calculations performed;
- (x) All information used to calculate the cement slurry (volume, density, yield), including but not limited to, cement type and additives, for each cement job completed in each well.

Applicants must adhere to the general WST requirements listed under §1782(a) which includes, but is not limited to, the following:

- Sufficiently anchored treatment well casing;
- Geologic and hydrologic isolation of the treatment formation during and after stimulation;
- Isolation of all zones necessary to prevent vertical fluid or gas migration behind casing;
- WST fluids are directed to the zone(s) of interest;
- Treatment will not damage the well or degrade the wells mechanical integrity during treatment.

Prior to receiving a WST permit, applicants must provide an analysis of the area to be affected by the proposed WST (as required in 14 CCR §1784). 14 CCR §1784 states: “As part of an application for a permit to conduct well stimulation, the operator shall conduct a well stimulation treatment area analysis to ensure the geologic and hydrologic isolation of the oil and gas formation during and following well stimulation treatment.”

As mentioned in the response to Question 11, this analysis includes identification of the well features (construction, damage, prior stimulation, etc) of all wells within two times the proposed stimulation zone area, and identification of all geologic features (typically faults) within five times the proposed stimulation zone, that may pose WST-related fluid migration pathway risks from the stimulated reservoir. Operators must demonstrate that that well stimulation fluids will be confined to the targeted treatment zone and are mandated by 14 CCR §1784(b) to “design the well stimulation treatment so as to ensure that the well stimulation treatment fluids or hydrocarbons do not migrate and remain geologically and hydrologically isolated to the hydrocarbon formation.”

Additionally, pressure testing of the treatment well /surface equipment and logging of cement competency are required prior to conducting a WST, to ensure the integrity of the well and related treatment equipment, as detailed in 14 CCR §1784.1 and §1784.2. This testing includes:

- §1784.1(a)(1): “All cemented casing strings and all tubing strings to be utilized in the well stimulation treatment operations shall be pressure tested for at least 30 minutes at a pressure equal to at least 100% of the maximum surface pressure anticipated during the well stimulation treatment, but not greater than the API rated minimum internal yield of the tested casing.”
- In order to provide additional protection, 14 CCR §1784(b) limits the maximum pressure that can be applied to any casing string: “A well stimulation treatment shall not be designed to employ pressure exceeding 80% of the API rated minimum internal yield on any casing string in communication with the well stimulation treatment.
- §1784.1(a)(2): “All surface equipment to be utilized for well stimulation treatment shall be rigged up as designed. The pump, and all equipment downstream from the pump, shall be pressure tested at a pressure equal to 125% of the maximum surface pressure anticipated during the well stimulation treatment, but not greater than the manufacturer's pressure rating for the equipment being tested.”
- §1784.2(a): “In advance of conducting well stimulation treatment, but at least 48 hours after cement placement, the operator shall run a radial cement evaluation log or other cement evaluation method that is approved by the Division” in order to demonstrate the following:
 - The casing is cemented according to all regulatory requirements
 - Cement quality is sufficient to ensure geologic and hydrologic isolation of the O&G formation.

Furthermore, during the WST, operators are required to monitor the treatment well, any required monitoring wells surrounding the treatment well, and any seismic activity in the area in order to prevent contamination of groundwater and surface water (14 CCR §1785).

Operators must also satisfy the requirements of Water Code (WC) §10783, prior to

stimulation, which requires the establishment of a regional groundwater program and identification of all water resources in the WST area. The requirements of WC §10783 are regulated by the SWRCB.

13. Describe how state standards for casing and cementing meet anticipated pressures associated with hydraulic fracturing to protect other resources and the environment. [9.2.1]

Answer 13: 14 CCR §1722.2 requires: “Each well shall have casing designed to provide anchorage for blowout prevention equipment and to seal off fluids and segregate them for the protection of all oil, gas, and freshwater zones. All casing strings shall be designed to withstand anticipated collapse, burst, and tension forces with the appropriate design factor provided to obtain a safe operation..”

Prior to conducting a WST, an applicant must test casing to 100% of the maximum anticipated surface treatment pressure per 14 CCR §1784.1. This ensures all casing strings have sufficient integrity to withstand maximum treatment pressures. However, may only apply pressure to the casing that is no greater than 80% of the maximum internal for any casing string in communication with the treatment [14 CCR §1784(b)]

14 CCR §1784.2 requires that prior to conducting the stimulation an operator must run an acceptable cement log that demonstrates;

“(1) The well was and continues to be cemented in accordance with the requirements of Section 1722.4 if it is an onshore well, or Section 1744.3 if it is an offshore well” and;

“(2) The quality of the cement is sufficient to ensure the geologic and hydrologic isolation of the oil and gas formation during and following well stimulation treatment.”

14. Discuss how the program identifies and, where deemed appropriate, manages risks associated with potential conduits for fluid migration in the area of hydraulic fracturing. [9.2.1]

Answer 14: The program identifies risk by reviewing the submitted data required by 14 CCR §1784. The reviewing engineer evaluates all fluid migration risks via nearby O&G wells or geologic features (for example, faults). If nearby wells pose a risk, the engineer will require the well(s) to be pressure monitored during stimulation or abandoned to division standards prior to stimulation, depending on the condition, location, and risk posed by the well.

If geologic features exist that pose a fluid migration risk the reviewing geologist will review the applicant’s documentation of why the features do or do not pose a fluid migration risk and determine, based upon review of additional data sources, whether there is a fluid migration risk and whether it can be mitigated. If it is determined in any case that the risk cannot be mitigated, the application will be denied or the applicant may propose a redesign of the treatment that mitigates the risk.

For a better understanding of the WST application review processes conducted prior to permit issuance please review the items listed under the “Well Stimulation Permit Review Process” heading found here: <https://www.conservation.ca.gov/calgem/Pages/WST.aspx>.

15. Describe program requirements that address actions to be taken in response to unanticipated operational or mechanical changes encountered during hydraulic fracturing that may cause concern. [9.2.1]

Answer 15: 14 CCR §1785 requires operators to monitor the listed parameters during treatment and details specific monitoring instances that require immediate termination of the stimulation as these occurrences indicate operational and/or mechanical changes that are cause for concern. This section also details the necessary steps an operator must take following any of the unanticipated changes detailed in the section. The monitoring requirements to be completed during stimulation include instances where the stimulation must be terminated immediately. These include the following:

- A pressure changes in the annulus between the tubing or casing through which well stimulation treatment fluid is conducted and the next larger tubular or casing more than 20% or greater than the calculated pressure increase due to pressure and/or temperature expansion;
- Pressure exceeding 90% of the API rated minimum internal yield on any casing string in communication with the well stimulation treatment, if the pressure testing under Section 1784.1(a)(1) was done at a pressure equal to 100% of the API rated minimum internal yield of the tested casing;
- Pressure exceeding 80% of the API rated minimum internal yield on any casing string in communication with the well stimulation treatment, if the pressure testing under Section 1784.1(a)(1) was done at a pressure equal to less than 100% of the API rated minimum internal yield of the tested casing;
- The operator has reason to suspect a potential breach in the cemented casing strings, the tubing strings utilized in the well stimulation treatment operations, or the geologic or hydrologic isolation of the formation.
- If any operational/design changes are required prior to conducting the stimulation, an operator must submit a change request form to CalGEM before stimulating. Change request forms can be submitted before or after permit issuance, however all requested changes must be approved and/or included in the issued permit or supplemental permit (if requested after initial permit issuance) prior to stimulation.

16. Briefly describe how surface controls associated with hydraulic fracturing, such as dikes, pits or tanks, meet Sections 5.5 (*Questions 17-46*) and 5.9 (*Questions 47-49*) of the guidelines. [9.2.1]

Answer 16: The California Regional Water Quality Control Boards has jurisdiction for the regulation of these disposal practices and issues permits (also known as waste discharge requirements or WDRs) for them (if appropriate) in accordance with the Water Code.

However, fluids used for hydraulic fracturing are required to be stored only in secondary containers and cannot be stored in sumps or pits pursuant to the regulatory requirements specified in 14 CCR §1786 (a) as stated below:

- 14 CCR §1786 (a) (1): “Fluids shall be stored in compliance with the secondary containment requirements of Section 1773.1, except that secondary containment is not required under this section for production facilities that are in one location for less than 30 days. The operator’s Spill Contingency Plan shall account for all production facilities outside of secondary containment and include specific steps to be taken and equipment available to address a spill outside of secondary containment”.
- 14 CCR §1786 (a) (4): “Fluids shall be stored in containers and shall not be stored in sumps or pits”.

17. Do you have specific technical criteria in place in your state for the following types of pits? If so, please cite the reference for such criteria. [5.5.1]

<u>Yes/No</u>	<u>Type</u>	<u>Reference</u>
_____	Reserve pits	_____
_____	Production pits	_____
_____	Skimming/settling pits	_____
_____	Produced water pits	_____
_____	Percolation pits	_____
_____	Evaporation pits	_____
_____	Special purpose pits	_____
_____	Blowdown pits	_____
_____	Flare pits	_____
_____	Emergency pits	_____
_____	Basic sediment pits	_____
_____	Workover pits	_____
_____	Other	_____

Answer 17: WST regulations does not allow for the storage of hydraulic fracturing fluids in pits or sumps as specified in 14 CCR §1786 (a) (4).

14 CCR §1786 (a) (4): “Fluids shall be stored in containers and shall not be stored in sumps

or pits”.

To ensure proper management and disposal of all wastes generated during well stimulation treatment, operators are required to provide water management plan, and describe anticipated disposal method for well stimulation treatment waste fluids in their application for a permit to conduct well stimulation treatment pursuant to 14 CCR §1783.1 as stated below:

- ✓ 14 CCR §1783.1 (a): An application for a permit to perform a well stimulation treatment shall include the following:
 - (23) A water management plan that includes all of the following:
 - (A) An estimate of the amount of water to be used in the treatment;
 - (B) An estimate of water to be recycled following the well stimulation treatment;
 - (C) A description of how and where the water from a well stimulation treatment will be recycled, including a description of any treatment or reclamation activities to be conducted prior to recycling or reuse;
 - (D) The anticipated source of the water to be used in the treatment, including any of the following:
 - (i) The well or wells, if commingled, from which the water will be produced or extracted;
 - (ii) The water supplier, if it will be purchased from a supplier;
 - (iii) The point of diversion of surface water; and
 - (E) The anticipated disposal method that will be used for the recovered water in the flowback fluid from the treatment that is not produced water that would be reported pursuant to Section 3227;
 - (26) The estimated amount of treatment-generated waste materials that are not addressed by the water management plan, and the anticipated disposal method for the waste materials.

Treatment-generated waste fluid disposals may include Class II injection into a wastewater disposal injection well under the CalGEM’s Underground Injection Control (UIC) program. Prior to disposal, all well stimulation treatment generated wastes are required to be tested for the presence of any hazardous substances in accordance to applicable state laws and regulations pursuant to regulatory requirements specified in 14 CCR §1786 (a) (8) as shown below.

- 14 CCR §1786 (a) (8): An operator who generates a waste, as defined in Health and Safety Code section 25124 and California Code of Regulations, title 22, section 66261.2, in the course of conducting well stimulation activities, including but not limited to well stimulation treatment fluid, additives, produced water from a well, solids separated from well stimulation treatment fluid, remediation wastes, or any other wastes generated from the processing, treatment or management of these wastes, shall determine if the waste is a hazardous waste by sampling and testing the waste according to the methods

set forth in California Code of Regulations, title 22, division 4.5, chapter 11, article 3 (section 66261.20 et seq.), or according to an equivalent method approved by the Department of Toxic Substances Control pursuant to California Code of Regulations, title 22, section 66260.21, except where the operator has determined that the waste is excluded from regulation under California Code of Regulations, title 22, section 66261.4 or Health and Safety Code section 25143.2. Notwithstanding any other section in this article, wastes that are determined by the operator to be hazardous wastes shall be managed in compliance with all hazardous waste management requirements of the Department of Toxic Substances Control.

***Question 18-48 were addressed based on the Well Stimulation Regulations only and not other regulations under CalGEM.**

18. Describe how pits are permitted in your state. If any types of pits are distinguished or defined separately in the permitting process (e.g., reserve pits, production pits, emergency pits), describe how permit application differs for the different types. [5.5.2]
- a. Are pits permitted by rule in your state? If so, what requirements or limitations (e.g., geographic, geologic, topographic) are included? Give reference to the applicable statutory or regulatory sections. [5.5.2.b]
 - b. Are pits permitted individually and/or as part of facility, operational or general permits? Give reference to the applicable statutory or regulatory sections. [5.5.2.c]
 - c. What notification is required prior to construction and operation of rule-authorized pits? [5.5.2.d]
 - d. Briefly describe any provisions concerning the issuance and use of emergency permits for pits. Give reference to the applicable statutory or regulatory sections. [5.5.2.e]

Answer 18: Please refer to Answer 16 and 17. As related to WST regulation, 14 CCR §1786 (a) (4): “Fluids shall be stored in containers and shall not be stored in sumps or pits”. CalGEM shares jurisdiction over pits and sumps with the State Water Resources Control Board and the Regional Water Quality Control Boards (collectively, “Water Boards”). CalGEM and the Water Boards coordinate their regulation under a Memorandum of Agreement (MOA) that was updated in 2018. The MOA can be found here:

https://www.conservation.ca.gov/calgem/for_operators/Documents/MOU-MOA/2018.07.31_Revised_MOA_with_the_State_Water_Board.pdf

19. What requirements are included in statewide regulations regarding the size, depth, berm height and other construction parameters for pits? What is the permit review process to assure that these requirements are met? Give reference to the applicable regulatory sections. [5.5.3.a]

Answer 19: Please refer to Answer 16 and 17.

20. What requirements are in place to assure that there is no adverse impact to ground water or surface waters from use of the pit? Give reference to the applicable statutory or regulatory sections. [5.5.3.b]

Answer 20: Please refer to Answer 16 and 17.

21. What requirements are in place to assure structural integrity of pits? Give reference to the applicable statutory or regulatory sections. [5.5.3.c]

Answer 21: Please refer to Answer 16 and 17.

22. In what ways do construction requirements assure that pits are designed to accommodate fluids which are intended to be contained in them such as oil-based drilling muds or cuttings from salt sections? [5.5.3.d]

Answer 22: Please refer to Answer 16 and 17.

23. Do construction standards for pits differ depending on the waste characteristics of materials they are to receive? If so, describe the circumstances under which variances or special conditions are used. [5.5.3.e]

Answer 23: Please refer to Answer 16 and 17.

24. Under what conditions are pit liners required or tanks required in lieu of pits? What are the requirements for liner construction and installation? Give reference to the applicable statutory or regulatory sections. [5.5.3.e]

Answer 24: Please refer to Answer 16 and 17.

25. Describe the conditions under which a variance to liner requirements would be granted, and how the agency ensures that such a variance would not harm water, soil, or air. [5.5.3.e.vi]

Answer 25: Please refer to Answer 16 and 17.

26. What are the requirements for fencing, netting and caging of pits? Give reference to the applicable statutory or regulatory sections. [5.5.3.f]

Answer 26: Please refer to Answer 16 and 17.

27. What are the requirements for the placement of reserve pits relative to drilling equipment? [5.5.3.g]

Answer 27: Please refer to Answer 16 and 17.

28. What restrictions are placed on the type and characteristics of wastes that can be placed in pits? Please specify the requirements by type of pits. Give reference to the applicable statutory or regulatory sections. [5.5.4.a]

Answer 28: Please refer to Answer 16 and 17. Waste from WSTs cannot be placed in pits (14 CCR 1786).

29. What security guidelines or requirements are in place regarding pits? Give reference to the applicable statutory or regulatory sections. [5.5.4.b]

Answer 29: Please refer to Answer 16 and 17.

30. What are the requirements for maintaining a freeboard level in pits and how is this level calculated? Give reference to the applicable statutory or regulatory sections. [5.5.4.c]

Answer 30: Please refer to Answer 16 and 17.

31. How is liner integrity maintained and assured in lined pits? [5.5.4.d]

Answer 31: Please refer to Answer 16 and 17.

32. What routine inspections or monitoring are required by the operator to assure that pit operational and structural integrity requirements are being met? Are results of these inspections reported? [5.5.4.e]

Answer 32: Please refer to Answer 16 and 17.

33. What are the requirements for removal/disposal/recycling of hydrocarbons that accumulate in pits? Give reference to the applicable statutory or regulatory sections. [5.5.4.f]

Answer 33: Please refer to Answer 16 and 17.

34. What are the requirements for removal of separated oil or wastes from unlined skimming/settling pits? [5.5.4.g]

Answer 34: Please refer to Answer 16 and 17.

35. Are produced water pits allowed in your state? If so, what are the requirements for disposal of the water? [5.5.4.h]

Answer 35: Please refer to Answer 16 and 17.

36. Describe any restrictions concerning the use of percolation pits, and requirements for such pits to ensure that their contents do not contain constituents that may harm water, soil, or

air. [5.5.4.i]

Answer 36: Please refer to Answer 16 and 17.

37. Describe maintenance requirements for evaporation pits. Give reference to the applicable statutory or regulatory sections. [5.5.4.j]

Answer 37: Please refer to Answer 16 and 17.

38. What restrictions are placed on the use of emergency pits? Are notification of the regulatory agency and removal of fluids required when they are used? [5.5.4.k]

Answer 38: Please refer to Answer 16 and 17.

39. Describe the conditions under which unlined sediment pits may be used, and requirements to ensure that their contents do not contain constituents that may harm water, soil, or air. Give reference to the applicable statutory or regulatory sections. [5.5.4.l]

Answer 39: Please refer to Answer 16 and 17.

40. Is there a prohibition against the use of unlined basic sediment pits for oily wastes? [5.5.4.m]

Answer 40: Please refer to Answer 16 and 17.

41. What limitations are placed on the operation of workover pits? [5.5.4.n]

Answer 41: Please refer to Answer 16 and 17.

42. What time limit is placed on the closure of reserve pits? Give reference to the applicable statutory or regulatory sections. [5.5.5.a]

Answer 42: Please refer to Answer 16 and 17.

43. What testing of pit liquids is required before pit closure? When is on-site disposal of pit liquids authorized and what criteria apply to such disposal? Give reference to the applicable statutory or regulatory sections. [5.5.5.b]

Answer 43: Please refer to Answer 16 and 17.

44. Under what conditions must pit liquids be removed before closure? What are the requirements for disposal of these liquids? [5.5.5.c]

Answer 44: Please refer to Answer 16 and 17.

45. What are the requirements for closure and reclamation of pit sites? Give reference

to the applicable statutory or regulatory sections. [5.5.5.e]

Answer 45: Please refer to Answer 16 and 17.

46. What records are kept of pit sites and what is their availability to the public? Give reference to the applicable statutory or regulatory sections. [5.5.5.f]

Answer 46: Please refer to Answer 16 and 17.

47. Describe any requirements pertaining to the location, use, capacity, age and construction of E&P waste tanks, including registration, inventories, etc. [5.9.2.a]

Answer 47: Please refer to Answer 16 and 17.

48. Describe any state program pertaining to pollution prevention requirements relating to tanks. [5.9.2.c]

Answer 48: Please refer to Answer 16 and 17.

49. Briefly discuss each of the following operational requirements as they apply to E&P tanks (give reference to any statutory or regulatory requirements): [5.9.3]

- a. Corrosion protection
- b. Structural integrity
- c. Protection against overtopping
- d. Secondary containment/leak detection
- e. Covers or measures to prevent entry of wildlife
- f. Hydrogen sulfide emission control
- g. Describe any tank removal and closure requirements and provide reference to statutory or regulatory requirements. [5.9.4]

Answer 49: Please refer to Answer 16 and 17.

50. Briefly describe how contingency planning and spill risk management procedures related to hydraulic fracturing meet Section 4.2.1 (Questions 51-61) of the guidelines. [9.2.1]

Answer 50: California has adopted a contingency plan for O&G-related spills and releases. The California State Oil Spill Contingency Plan is an independent document regarding discharges of oil to all marine or inland surface waterways of California, and for oil spills to land. All state and local agencies must carry out spill response activities consistent with this Plan and other applicable federal, state, or local spill response plans. The plan can be found here:

<https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=172767&inline>

Prior to receiving a WST permit, operators are required to submit a spill contingency plan

for all O&G operations regulated by CalGEM and must include documentation of an operators handling of WST fluids and additives [14 CCR §1783.1(a)(19)].

51. Has the state adopted a state contingency plan for response to spills and releases? If so, briefly describe, including volumes that trigger a response, time in which notification and clean-up is to occur, and criteria (i.e., cleanup standards) used to assure that remediation was accomplished. Please provide reference to applicable portions of the state plan. [4.2.1.1.a]

Answer 51: Per the California State Oil Spill Contingency Plan of 2019, (<https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=172767&inline>) , Pg 64-65:

**DOGGR = CalGEM*

Responsibilities: The Division of Oil, Gas, and Geothermal Resources (DOGGR), within the Department of Conservation, is the lead state agency responsible for the supervision and regulation of well drilling and production operations within California. DOGGR's mandates include preventing damage to natural resources that could result from oil, gas, and geothermal drilling, production, or plugging and abandonment operations. DOGGR maintains records of the operator, location, production and injection data, and construction details for all oil, gas, and geothermal wells, plus location and capacity information for tanks associated with oil production operations.

Notification Requirements: Blowouts, fires, serious accidents, and significant gas or water leaks resulting from or associated with oil or gas drilling or producing operations, or related facilities, must be promptly reported to the appropriate DOGGR district office [14 CCR §1722(h)(i)].

However, regarding spills in oil fields in the San Joaquin Valley, there is a unique field rule regarding oil spills that must be reported:

- Spills of any amount that threaten state waters
- 5 bbls or more which are uncontained (state waters not threatened)
- 10 bbls or more within containment (state waters not threatened)
- Any spill involving a fire or explosion
- An operator who spills oil in amounts less than the San Joaquin Valley Oil Spill field rule volumetric thresholds is exempt from all other applicable state and local reporting requirements [PRC §3233]
- Capabilities and Limitations: Regarding a pollution incident resulting from a drilling or production facility, DOGGR can help determine the owner/operator, and advise on appropriate actions necessary to control and secure the source.

Please review CalGEM's related regulation regarding spill, 14CCR§ 1722.9. Spill Contingency Plan Requirements.

<https://www.conservation.ca.gov/index/Documents/CALGEM-SR-1%20Web%20Copy.pdf>

52. Describe any funding provisions to enable the state to respond to spills and releases in the event a responsible operator cannot be located or is unwilling or unable to respond, and any provisions for reimbursement of the state for monies so expended. [4.2.1.1.b]

Answer 52: The OSPR Administrator has the primary authority to direct prevention, removal, abatement, response, containment, and cleanup efforts with regard to all aspects of any oil spill into marine and inland surface waters of the state, but not ground waters [GC §8670.7(a), §8670.62; FGC §5655(d)]. OSPR’s planning, preparedness, and financial responsibility programs expanded from marine waters to include inland waters in 2014 through the implementation of Senate Bill 861 (Ch. 35, Statutes of 2014).

53. Describe any mechanisms provided by the state for the operators or public to report spills and releases. Please indicate if these mechanisms include telephone access 24 hours a day, 7 days a week, a 1-800 telephone number and telephone answering capabilities. [4.2.1.2]

Answer 53: please see: § 1722.9. Spill Contingency Plan Requirements.

A spill contingency plan shall be designed to prevent and respond to unauthorized releases.

54. Describe any interagency coordination of actions between agencies having jurisdiction for response to spills and releases, including clear designation of on-site spill responsibilities. [4.2.1.3]

Answer 53: please see the answer to questions 51 and 52.

The section 3 “SECTION 3 – Primary Authority for Oil Spill Response” of the California

State Oil Spill (<https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=172767&inline>) Contingency Plan sets forth the roles and responsibilities of those State agencies with primary authority for oil spills in California. Oil spill incidents often involve a response from multiple agencies having different jurisdictional authorities, capabilities, and functions. In some circumstances, the jurisdictional mandates of several agencies may overlap. Use of the Standardized Emergency Management System (SEMS) and the National Incident Management System (NIMS) to organize spill response ensures that inter-agency responsibilities are collectively addressed.

55. Describe any requirements for operators to take measures prevent and respond to spills and releases at E&P facilities. Indicate if these requirements are spelled out in regulations or guidance or if they are included in operator-specific or site-specific plans. [4.2.1.4]

Answer 55: please see: § 1722.9. Spill Contingency Plan Requirements.

A spill contingency plan shall be designed to prevent and respond to unauthorized releases.

56. Describe any general state contingency program elements, including those that address:
- a. Facilities, materials and equipment that may pose a significant threat to

human health or the environment. [4.2.1.4.1.a]

- b. The various environments at risk, including surface and groundwater and land (environmentally sensitive areas, special soil or geologic conditions, urban areas, cultural and special resource areas). [4.2.1.4.1.b]
- c. Measures to address public and responder safety concerns, including training for response personnel. [4.2.1.4.1.c]
- d. The operator's incident command structure, including emergency contact information for key personnel. [4.2.1.4.1.d]
- e. Equipment, manpower and contracted services to respond to spills and releases.[4.2.1.4.1.e]
- f. Opportunities for coordination of joint response actions. [4.2.1.4.1.f]
- g. Procedures for communication with impacted or threatened parties. [4.2.1.4.1.g]
- h. Methods of containment of spills and unauthorized releases. [4.2.1.4.1.h]
- i. Methods of disposal of materials of concern. [4.2.1.4.1.i]

Answer 56: please check the answer to question 51 or the online pdf files for further information:

(<https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=172767&inline> and <https://www.conservation.ca.gov/index/Documents/CALGEM-SR-1%20Web%20Copy.pdf>)

57. Describe any spill prevention measures, including those that may include:

- a. Secondary containment measures such as dikes, berms, firewalls or equivalent measures. [4.2.1.4.2.a]
- b. Tertiary containment or monitoring systems in high risk areas. [4.2.1.4.2.b]

- c. Inspection, testing and maintenance schedules and procedures for facilities and equipment. [4.2.1.4.2.c]
- d. Site security measures as necessary. [4.2.1.4.2.d]

Periodic review of opportunities to reduce future spills and releases.
[4.2.1.4.2.e]

Answer 57: please check the answer to question 51 or the online pdf files for further information:

(<https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=172767&inline> and <https://www.conservation.ca.gov/index/Documents/CALGEM-SR-1%20Web%20Copy.pdf>)

58. *Describe any spill response measures, including those that may include:*

- a. *Agencies and parties to be notified in the event of a spill or unauthorized release. [4.2.1.4.3.a]*
- b. *Type of reporting (verbal, written) required. [4.2.1.4.3.b]*
- c. *Reporting time requirements. [4.2.1.4.3.c]*
- d. *Reporting thresholds. [4.2.1.4.3.d]*
- e. *Type of information to be reported, such as operator name, a description of the incident including date and time of 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 and land, and weather conditions. [4.2.1.4.3.e]*

Any requirements for final incident reporting, site monitoring, and necessary agency approvals. [4.2.1.4.3.f]

Answer 58: The California State Oil Spill Contingency Plan addresses the response measures and reporting requirements for oil spill and release.

<https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=172767&inline>

59. *Describe any state guidance for containment, abatement and remediation of spills and releases including:*

Answer 59: Please see Cal. Code of Regs., tit. 14, §§ 1722(b), 1786(a), 1783.1(a)(19).

§ 1722.9. Spill Contingency Plan Requirements. Operators are required to submit their Spill Contingency Plan for every WST operation.

Also, in §1786. (5): In the event of an unauthorized release, the operator shall immediately implement the Spill Contingency Plan; notify the Regional Water Board and any other appropriate response entities for the location and the type of fluids involved, as required by all applicable federal, state, and local laws and regulations; and shall perform clean up and remediation of the area, and dispose of any cleanup or remediation waste, as required by all applicable federal, state, and local laws and regulations.

a. *Clean-up standards. [4.2.1.4.3.g]*

Answer 59a: § 1722.9. (e)

b. *Required sampling and analyses. [4.2.1.4.3.h]*

Answer 59b: §1786. (8) An operator who generates a waste, as defined in Health and Safety Code section 25124 and California Code of Regulations, title 22, section 66261.2, in the course of conducting well stimulation activities, including but not limited to well stimulation treatment fluid, additives, produced water from a well, solids separated from well stimulation treatment fluid, remediation wastes, or any other wastes generated from the processing, treatment or management of these wastes, shall determine if the waste is a hazardous waste by sampling and testing the waste according to the methods set forth in California Code of Regulations, title 22, division 4.5, chapter 11, article 3 (section 66261.20 et seq.), or according to an equivalent method approved by the Department of Toxic Substances Control pursuant to California Code of Regulations, title 22, section 66260.21, except where the operator has determined that the waste is excluded from regulation under California Code of Regulations, title 22, section 66261.4 or Health and Safety Code section 25143.2.

c. *Any approved non-mechanical response actions. [4.2.1.4.3.i]*

60. *Describe any follow-up actions by the state for the failure of an operator to report or respond to spills and unauthorized releases, including enforcement, assessment of damages, and reimbursement of costs for responding to spills and releases. [4.2.1.5]*

Answer 60: §1786. (6) Within 5 days of the occurrence of an unauthorized release, the operator shall provide the Division a written report that includes:

- (A) A description of the activities leading up to the release;
- (B) The type and volumes of fluid released;
- (C) The cause(s) of release;
- (D) Action taken to stop, control, and respond to the release; and
- (E) Steps taken and any changes in operational procedures implemented by the operator to prevent future releases.

61. Describe any database that includes information on spills and releases, and indicate whether such database is analyzed as part of a program effectiveness evaluation [4.2.1.6]

Answer 63. Cal Office of Emergency Services database for spill and releases:

[https://w3.calema.ca.gov/operational/mal haz.nsf/\\$defaultview](https://w3.calema.ca.gov/operational/mal haz.nsf/$defaultview)

62. Briefly discuss how hydraulic fracturing waste characterization requirements, including, as appropriate, testing of fracturing fluids, are consistent with Section 5.2 (*Question 63*) of the guidelines. [9.2.1]

Answer 62: Per California WST regulation, operators shall adhere to the requirements regarding hydraulic fracturing waste management included in regulations, section §1786, § 1788.

§1786. (8) An operator who generates a waste, as defined in Health and Safety Code section 25124 and California Code of Regulations, title 22, section 66261.2, in the course of conducting well stimulation activities, including but not limited to well stimulation treatment fluid, additives, produced water from a well, solids separated from well stimulation treatment fluid, remediation wastes, or any other wastes generated from the processing, treatment or management of these wastes, shall determine if the waste is a hazardous waste by sampling and testing the waste according to the methods set forth in California Code of Regulations, title 22, division 4.5, chapter 11, article 3 (section 66261.20 et seq.), or according to an equivalent method approved by the Department of Toxic Substances Control pursuant to California Code of Regulations, title 22, section 66260.21, except where the operator has determined that the waste is excluded from regulation under California Code of Regulations, title 22, section 66261.4 or Health and Safety Code section 25143.2.

§ 1788. (D) Composition of water recovered from the well following the well stimulation treatment, sampled after a calculated wellbore volume has been produced back but before three calculated wellbore volumes have been produced back, and then sampled a second time after 30 days of production after the first sample is taken, with both samples taken prior to being placed in a storage tank or being aggregated with fluid from other wells;

§ 1788. (E) Composition of water recovered from the well following the well stimulation treatment shall be determined by testing the samples taken under paragraph (D) for all of the following: appropriate indicator compound(s) for the well stimulation treatment fluid; total dissolved solids; metals listed in California Code of Regulations, title 22, section 66261.24, subdivision (a)(2)(A); benzene, toluene, ethyl benzene, and xylenes; major and minor cations (including sodium, potassium, magnesium, and calcium); major and minor anions (including nitrate, chloride, sulfate, alkalinity, and bromide); and trace elements (including lithium, strontium, and boron); radium-226, gross alpha-beta, radon 222,

fluoride, iron (redox), manganese (redox), H₂S (redox), nitrate+nitrite (redox), strontium, thallium, mercury, and methane; (G) Sampling and testing conducted under subdivision (a)(12) is separate from and in addition to any sampling or testing that may be required to make hazardous waste determinations under the requirements of the Department of Toxic Substances Control;

§ 1788. (15) Any radiological components or tracers injected into the well as part of the well stimulation treatment, a description of the recovery method, if any, for those components or tracers, the recovery rate, and specific disposal information for recovered components or tracers;

§ 1788. (16) The radioactivity of the recovered well stimulation fluids, and a brief description of the equipment and method used to determine the radioactivity.

63. Describe any waste characterization requirements, including sampling, analysis, frequency, and quality control procedures. Discuss the purpose and use of the information resulting from the characterizations. Provide reference to any statutory, regulatory, guidance or policy basis for waste characterization requirements. [5.2.2, 5.2.3]

Prior to disposal, all well stimulation treatment generated wastes are required to be tested for the presence of any hazardous substances in accordance to applicable state laws and regulations pursuant to regulatory requirements specified in 14 CCR §1786 (a) (8) as shown below.

- 14 CCR §1786 (a) (8): An operator who generates a waste, as defined in Health and Safety Code section 25124 and California Code of Regulations, title 22, section 66261.2, in the course of conducting well stimulation activities, including but not limited to well stimulation treatment fluid, additives, produced water from a well, solids separated from well stimulation treatment fluid, remediation wastes, or any other wastes generated from the processing, treatment or management of these wastes, shall determine if the waste is a hazardous waste by sampling and testing the waste according to the methods set forth in California Code of Regulations, title 22, division 4.5, chapter 11, article 3 (section 66261.20 et seq.), or according to an equivalent method approved by the Department of Toxic Substances Control pursuant to California Code of Regulations, title 22, section 66260.21, except where the operator has determined that the waste is excluded from regulation under California Code of Regulations, title 22, section 66261.4 or Health and Safety Code section 25143.2. Notwithstanding any other section in this article, wastes that are determined by the operator to be hazardous wastes shall be managed in compliance with all hazardous waste management requirements of the Department of Toxic Substances Control.

64. Briefly describe how the waste management hierarchy contained in Section 5.3 (*Questions 65-68*) of the guidelines (source reduction, recycling, treatment and disposal), including the provisions relating to toxicity reduction, are promoted for hydraulic fracturing. [9.2.1]

Answer 64: Please refer to Answer 17. Please see § 1722.9, § 1786, and § 1788.

Operators are required to submit their plan for using chemical in hydraulic fracturing alongside the application. Also, there are storage and handling of Treatment Fluids and Wastes regulation in place. For more information please check the following sections in the WST regulation:

- Section 1783.1 (24-30) “Contents of Application for Permit to Perform Well Stimulation Treatment.”
- 1786. Storage and Handling of Well Stimulation Treatment Fluids and Wastes

§1783.1. Contents of Application for Permit to Perform Well Stimulation Treatment:

- (C) A description of how and where the water from a well stimulation treatment will be recycled, including a description of any treatment or reclamation activities to be conducted prior to recycling or reuse.
- Also, § 3160: (3) (A) Evaluate all aspects and effects of well stimulation treatments, including, but not limited to, the well stimulation treatment, additive and water transportation to and from the well site, mixing and handling of the well stimulation treatment fluids and additives onsite, the use and potential for use of nontoxic additives and the use or reuse of treated or produced water in well stimulation treatment fluids, and flowback fluids and the handling, treatment, and disposal of flowback fluids and other materials, if any, generated by the treatment. Specifically, the potential for the use of recycled water in well stimulation treatments, including appropriate water quality requirements and available treatment technologies, shall be evaluated. Well stimulation treatments include, but are not limited to, hydraulic fracturing and acid well stimulation treatments.

CHAPTER 6.5. Hazardous Waste Control explains about the methods and procedure to reduce waste; however, it is general about oil and gas operation, not specific to hydraulic fracturing. § 25159.10.(C): “State-of-the-art design and operation safeguards of injection wells without adequate groundwater monitoring, specific geological information, and other system safeguards cannot guarantee that migration of hazardous wastes into underground sources of drinking water will not occur.”

§ 25159.12. (h): “A facility may consist of several waste management units, including, but not limited to, surface impoundments, landfills, underground or aboveground tanks, sumps, pits, ponds, and lagoons that are associated with an injection well.”

For more information, also see:

- § 1748.1. Waste Disposal. All discharges into the ocean shall conform to the requirements of the appropriate Regional Water Quality Control Board.

- § 1775. Oilfield Wastes and Refuse.

65. Describe any programs promoting a hierarchy of waste management practices, including the following in preferred order: [5.3]

- a. Source reduction to reduce the quantity and/or toxicity of waste. [5.3.a]
- b. Recycling or reuse to reclaim waste. [5.3.b]
- c. Treatment to reduce the volume or toxicity of the waste. [5.3.c]
- d. Proper disposal of remaining waste. [5.3.d]

No answer provided.

66. Describe any E&P waste source reduction opportunities promoted by the state, such as equipment modifications, procedure changes, product substitution, reduction in use of fresh water, good housekeeping and preventative maintenance, planning, training, and selection of contractors. [5.3.1]

No answer provided.

67. Describe any E&P waste recycling or reuse opportunities promoted by the state. [5.3.2]

No answer provided.

68. Describe any program elements that encourage E&P waste source reduction and recycling through policy, training, technical assistance or incentives. [5.3.3]

No answer provided.

69. Briefly describe how the tracking of hydraulic fracturing waste disposed at commercial or centralized facilities meets the requirements of Section 5.10.2.3 (Questions 70-71) of the guidelines. [9.2.1]

Answer 69: Please see answer to question 62 and the following statutes related to waste disposal.

- § 25159.10 to § 25159.25. (Health and Safety Code - CHAPTER 6.5. Hazardous Waste Control)
- § 1748.1. Waste Disposal
- § 1775. Oilfield Wastes and Refuse
- § 1786. Storage and Handling of Well Stimulation Treatment Fluids and Wastes

70. Describe the waste tracking requirements of commercial or centralized disposal facilities. [5.10.2.3]

No answer provided.

71. Are operators who transport waste via pipeline required to report waste quantities? If so, with what frequency? [5.10.2.3.1]

Answer: CalGEM receives monthly reports from each operator for the amount of water produced and the amount water injected at the operation.

72. Briefly describe how procedures in place for receipt of complaints related to hydraulic fracturing are consistent with Section 4.1.2.c (*Question 73*) of the guidelines. [9.2.1]

Answer 72: Complaints related to hydraulic fracturing are treated the same as any complaints receive by CalGEM. The Division’s Manual of Instruction clearly states, “All complaints will be investigated, and appropriate action taken when it is justified. Every effort will be made to resolve a valid problem and satisfy a complainant, or the complainant will be informed why a matter is not within our jurisdiction, if that is the case. Complaints may be classified as informal or formal.” Any complaints CalGEM receives about hydraulic fracturing are forwarded to the WST unit for review and investigation. Depending on the content of the complaint, the WST unit may reach out to legal for support or utilize CalGEM staff in the regional offices for on-site evaluations of WST operations.

73. Briefly describe your compliance evaluation program with regard to the following activities (give reference to any statutory or regulatory requirements for each):

- a. *Public complaint and follow-up, including response times. [4.1.2.c]*

Please refer to Answer 72. Depending on the nature of the complaint, the WST may respond to the complaint the next day or within a week. The response time varies based on the type of complaint received and the amount of time it takes the unit to investigate the complaint.

74. Describe any required notification prior to, and reporting after, completion of hydraulic fracturing operations. [9.2.2]

Answer 74: Operators are required to apply for a permit to conduct well stimulation prior to conducting the operation. The application shall include all the information listed in §1783.1.

§1783.2. Neighbor Notification: (a) The operator of any oil or gas well receiving a permit to conduct well stimulation treatment from the Division shall hire an independent third party to perform the following action:

- (1) Identify surface property owners and tenants, other than the operator of the well subject to well stimulation treatment, of legally recognized parcels of land situated

- within a 1500-foot radius of the wellhead receiving well stimulation treatment, or within 500 feet of the surface representation of the horizontal path of the subsurface parts of such well;
- (2) Provide all surface property owners and tenants so identified, or their duly authorized agents, with neighbor notification that shall include and must be limited to both of the following:
 - (A) A copy of the approved well stimulation treatment permit; and
 - (B) A completed Well Stimulation Treatment Neighbor Notification Form (7/15 version), hereby incorporated by reference; and
 - (3) Compile and mail to the Division a declaration of notice pursuant to subdivision (i).

§1783.d. The operator shall notify the Division at least 72 hours prior to commencing well stimulation so that Division staff may witness. Between three and fifteen hours prior to commencing, the operator shall confirm with the Division that the well stimulation treatment is proceeding.

§1784.1(b) The operator shall notify the Division at least 24 hours prior to conducting the pressure testing required under subdivision (a) so that Division staff may witness. The charting of pressure testing required under subdivision (a)(1) shall be provided to the Division not less than 12 hours before commencing well stimulation treatment.

Within 60 days after the cessation of a well stimulation treatment, the operator shall publicly disclose all of the information in “§1788. Required Public Disclosures.

§1789. Post-Well Stimulation Treatment Report: (a) Within 60 days after the cessation of a well stimulation treatment, the operator shall submit a report to the Division describing the items in §1789.

75. Is notification sufficient to allow the presence of field staff to monitor hydraulic fracturing activities? [9.2.2]

Answer 75: §1783.d. The operator shall notify the Division at least 72 hours prior to commencing well stimulation so that Division staff may witness. Between three and fifteen hours prior to commencing, the operator shall confirm with the Division that the well stimulation treatment is proceeding.

§1784.1(b) The operator shall notify the Division at least 24 hours prior to conducting the pressure testing required under subdivision (a) so that Division staff may witness. The charting of pressure testing required under subdivision (a)(1) shall be provided to the Division not less than 12 hours before commencing well stimulation treatment.

76. Describe reporting requirements for hydraulic fracturing activities and whether they include the identification of materials used, aggregate volumes of fracturing fluids and proppant used, and fracture pressures recorded. [9.2.2]

Answer 76: The report includes materials used, aggregate volumes of fracturing fluids and

proppant used, and fracture pressures recorded which are posted to www.wellstar.conservacion.ca.gov and <https://www.fracfocus.org/> .

Please see §1789. Post-Well Stimulation Treatment Report:

(a) Within 60 days after the cessation of a well stimulation treatment, the operator shall submit a report to the Division describing:

- (1) The pressures recorded during monitoring required under Section 1785(a) during the well stimulation treatment;
- (2) The pressures recorded during the first 30 days of production pressure monitoring under Section 1787(d)(1);
- (3) The date and time that each stage of the well stimulation treatment was performed;
- (4) How the actual well stimulation treatment differs from what was anticipated in the well stimulation treatment design that was prepared under Section 1784(b);
- (5) How the actual location of the well stimulation treatment differs from what was indicated in the permit application under Section 1783.1(a)(15); and
- (6) A description of hazardous wastes generated during the well stimulation activities and their disposition, including copies of all hazardous waste manifests used to transport the hazardous wastes offsite to an authorized facility.

(b) If information found in a report submitted under this section is found in a well record that the Division has determined is not public record, pursuant to Public Resources Code section 3234, then the Division will provide the information to other state agencies as needed for regulatory purposes and in accordance with a written agreement with the other state agency regarding sharing of confidential information.

NOTE: Authority cited: Sections 3013 and 3160, Public Resources Code. Reference: Sections 3106, 3160 and 3215, Public Resources Code.

77. Describe any mechanisms for disclosure of information on chemical constituents used in hydraulic fracturing fluids to the state in the event of an investigation or to medical personnel in the event of a medical emergency. [9.2.2]

Answer 77: As part of the initial well stimulation application, operators are required to disclose any anticipated chemical constituents to be used in the hydraulic fracturing fluids per §1783.1. Specifically, the following addresses the chemical constituents.

- (25) The anticipated source, amount, and composition of the base fluids to be used in the treatment, including pH, flash point, and any constituents listed in California Code of Regulations, title 22, section 66261.24, subdivision (a)(2)(A) and (B);...
- (28) A complete list of the names, Chemical Abstract Service numbers, and estimated concentrations, in percent by mass, of each and every chemical constituent of the well stimulation fluids anticipated to be used in the treatment (if a Chemical Abstract Service number does not exist for a chemical constituent, another unique identifier may be used, if available);

- (29) Whether it is anticipated that radiological components or tracers will be injected during the well stimulation treatment;...

If an investigation is to occur for well stimulation operation, the initial information disclosed by the operators in the application will provide the proposed additives/chemicals in the hydraulic fracturing fluid. The operators are also required to test flowback fluid after stimulation. These data can be used in an investigation.

§ 1722.9. Spill Contingency Plan Requirements:

(g) A list of all chemicals for which a Material Safety Data Sheet is required, and the location of the Material Safety Data Sheets for those chemicals.

78. Briefly describe how hydraulic fracturing information submitted that is of a confidential business nature, is treated consistent with Section 4.2.2.1 (*Question 79*) of the guidelines. [9.2.2]

Answer 78: CalGEM's well stimulation application and disclosure information are posted on WellSTAR website for public review. www.wellstar.conservation.ca.gov

Any claim for confidential business nature will be treated as started under §1783.1 (b): (b) A claim of trade secret protection for the information required under this section shall be handled in the manner specified under Public Resources Code section 3160, subdivision (j). (Pg 46)

<https://www.conservation.ca.gov/index/Documents/CALGEM-SR-1%20Web%20Copy.pdf>

PRC 3160, subdivision (k) also states that "A well granted confidential status pursuant to Section 3234 shall not be required to disclose well stimulation treatment fluid information pursuant to subdivision (g) until the confidential status of the well ceases. Notwithstanding the confidential status of a well, it is public information that a well will be or has been subject to a well stimulation treatment."

79. Describe the availability of agency records for public review and procedures to protect confidential business information. [4.2.2.1]

Answer 79. Please see answer for question 78 above.

80. Briefly discuss if, in addition to the personnel and funding recommendations found in Section 4.3 (*Questions 81-86*) of the guidelines, state staffing levels sufficient to receive, record and respond to complaints of human health impacts and environmental damage resulting from hydraulic fracturing. [9.2.3]

Answer 80: To date, state staffing level in the WST unit has been sufficient to receive,

record, and respond to complaints related to hydraulic fracturing. There has been little to no complaint received related to WST to date.

81. *Describe the administrative support assigned to the E&P environmental regulatory program. If some of these personnel are also responsible for non-E&P program activities, please provide the percent of time or equivalent full-time support related to E&P matters. Include the number, classifications, functions and duties, and minimum experience and training requirements for these positions. Describe any additional training that is made available to them. Indicate whether this level of administrative staffing is considered adequate. [4.3.1, 4.3.1.1]*

Answer 81: WST unit has one full time staff service analyst (SSA) from CalGEM's Program Support Unit assigned to assist with administrative and data management. The main responsibilities for the SSA include tracking the applications and post stimulation reports, providing total count of each item (application and disclosure reports submitted) weekly to the supervisor, uploading information into the new CalGEM database for WST unit, keeping updated on any outstanding service tickets submitted by WST unit to the IT department, mailing the annual neighbor notification audit letters and maintaining the well stimulation inbox for any outside correspondence. The staff was trained by the WST unit to understand the terminology and basic understanding of the WST operations. As part of the CalGEM division, the staff has all the training resources available as shown below in answer for question #83.

The requirement for the SSA position can be found here: <https://www.calhr.ca.gov/state-hr-professionals/Pages/5157.aspx>

82. *Describe how legal support is provided to the E&P environmental regulatory program (e.g., in-house lawyers, state attorney general, independent counsel). Indicate the level of support provided and compare it to the level of support considered necessary. [4.3.1.2]*

Answer 82: The Department of Conservation has an in-house legal office, with several attorneys on staff. Two attorneys are dedicated to supporting the WST unit. All requests for legal support are routed through these attorneys, and the attorneys attend a biweekly meeting with the WST program manager and the Oil and Gas Supervisor to oversee the operation of the program. The level of legal support provided to the WST unit meets the unit's needs and is satisfactory for its operations.

83. *Describe the technical staff assigned to provide geological or engineering support to the E&P environmental regulatory program. If some of these personnel are also responsible for non-E&P program activities, please provide the percent of time or equivalent full-time support related to E&P matters. Include the number, classifications, functions and duties and minimum experience and training requirements for these positions. Describe any additional training that is made available to them. Indicate whether this level of technical staffing is considered adequate. [4.3.1.3]*

Answer 83:To date, the level of technical staffing in WST unit has been sufficient to review and process all WST applications. The WST unit currently has two engineering geologists assigned to review and evaluate the geological review of the proposed stimulation activities. Both are certified Professional Geologists and have numerous years of experience. Part of the job description for the engineering geologist states: The incumbent will assist in the evaluation of required well stimulation documents, disclosures and public notification and compliance with the WSP implementation strategies. This position performs assignments that require a high degree of knowledge and skill in reviewing and analyzing geologic reports, perform engineering work and calculations. This position also requires independent and teamwork, communication, and data management.

The requirement for Engineering Geologist position can be found here: <https://www.calhr.ca.gov/state-hr-professionals/Pages/3756.aspx>

The WST unit also have four Associate Oil and Gas Engineers. Their job functions include: conduct evaluations of well stimulation applications, notices, notifications, permit approvals, post well stimulation public disclosure documents, and chemical disclosure indexes to ensure compliance with the Division's Permanent Well Stimulation regulations, statewide processes and procedures and statutory and regulatory requirements. Two of the engineers are assigned to review the well stimulation applications and issue permits. Their permitting responsibilities include reviewing the applications to verify completeness of technical information related to the stimulation, evaluating the risk associated with the proposed stimulations including the geological assessment conducted by the engineering geologists and ensuring that all data required by the regulations are met prior to issuing permits. Another engineer is dedicated to coordinating the review process between different MOA agencies and WST unit for the applications. An associate engineer, along with the two engineering geologists, are assigned to review the post stimulation disclosure data for chemicals used during the stimulation, recovered fluid data and analytical data.

The requirements for the Associate Oil & Gas Engineer position can be found here: <https://www.calhr.ca.gov/state-hr-professionals/Pages/3783.aspx>

CalGEM currently has internal trainings available for all its staff related to oil field operations, project management, professional licensing and regulatory process. Below are some of the current training modules available to all CalGEM staff.

General Oil & Gas Information

- [Introduction to Oil Operations](#)

Casing Integrity & Cement Evaluation

- [Ultrasonic Imager Tool \(USIT\) Application](#)
- [Integrity Explorer Cement Evaluation](#)
- [High Speed Radial Cement Bond Log](#)

Facilities & Environmental

- [Pipelines - AB 1420 Regulations and Compliance](#)
- [Pipelines - Witnessing and Evaluating Pressure Tests and Guided Wave Tests](#)
- [CalGEM Oil, & Gas Pipeline, Facilities, and CA Regulatory Requirements - SPE Western Regional Meeting 2019](#)
 - [SPE Course - Introduction](#)
 - [SPE Course - Pipelines](#)
 - [SPE Course - Pipeline Management Plan](#)
 - [SPE Course - Pipeline Mapping GIS](#)
 - [SPE Course - Tanks](#)
 - [SPE Course - Sumps](#)
 - [SPE Course - Spill Contingency Plans](#)
 - [SPE Course - Out-of-Service Facilities](#)
 - [SPE Course - CalGEM Pipeline & Facilities Program](#)
 - [SPE Course - Conclusion](#)

Professional Licensing in California

- [Licensing Mentor List & CalGEM Policy](#)
- [Licensure Requirements in California](#)
- [BPELSG Additional Licensing References](#)

Regulatory Information

- [Rule Making Process - Office of Administrative Law](#)

- Introduction to CalGEM, CA Geology, & Groundwater
 - Module 1 Lesson 1 - *Petroleum Geology* is a PETEX e-Learning course and prerequisite that is provided before attending class
 - [Module 1 Lesson 2 - Introduction to CalGEM, CA Geology, & Groundwater](#)
 - [Module 1 Lesson 3 - Groundwater Regulation in California](#)
- Wellbore Design & Cementing
 - Module 2 Lesson 1 - *Primer of Oilwell Drilling* is a PETEX e-Learning course and prerequisite that is provided before attending class
 - [Module 2 Lesson 2 - Wellbore Design & Completion](#)
 - [Module 2 Lesson 3 - Cementing](#)
- Well Control & BOPE Testing
 - [Module 3 Lesson 1 – Well Control](#)
 - [Module 3 Lesson 2 – BOPE Inspection & Testing](#)
 - [Module 3 Lesson 3 – Testing Scenarios, Protocols & Safety](#)
- Abandonment Operations
 - [Module 4 Lesson 1 – Basics of Plugging & Abandonment](#)
 - [Module 4 Lesson 2 – Considerations for Different Well Types](#)
- Underground Injection Control Testing
 - [Module 5 Lesson 1 – Basics of Injection Wells](#)
 - [Module 5 Lesson 2 – Underground Injection Control](#)
 - [Module 5 Lesson 3 – Mechanical Integrity Tests](#)
- Environmental Lease Inspection
 - [Module 6 Lesson 1 – Production Facilities](#)
 - [Module 6 Lesson 2 – Environmental Concerns](#)
 - [Module 6 Lesson 3 – Contingency Plans & Lease Inspections](#)
 - [Module 6 Lesson 4 – Well Site & Lease Restoration](#)
- [Pipelines - Witnessing and Evaluating Pressure Tests and Guided Wave Tests](#)
- **Field Enforcement Practices & Policies** – Field Engineers are the first line of Division enforcement. The information provided below is to give direction to field staff on necessary steps to building an enforcement case. Often, enforcement starts with properly documented field observations. The links provided below are tools staff should use to help management build a case when one is warranted.
 - [Violations Summary Template](#) – This template includes what is required when a Field Engineer documents violations that need to be communicated to upper management. The PowerPoint could warrant a technical write up by an Associate Engineer or Senior Engineer that would lead to an enforcement order.
 - [Violation Summary Example](#) – This is an excellent example of presentation to request an enforcement order that was made by Eric Heaton, Engineering Geologist.
- **Field Safety Program** – The Division is currently working on a Hazard Awareness Plan to ensure field staff are aware of hazards and how to mitigate their risk of exposure while working in oil, gas, and geothermal fields. The Hazard Awareness Plan will identify the mandated safety training Division field staff are required to take.
 - [2020 CalGEM Field Safety Program](#)

84. *Describe the field personnel assigned to conduct inspections and assure compliance with the E&P environmental regulatory program. If some of these personnel are also responsible for non-E&P program activities, please provide the percent of time or equivalent full time support related to E&P matters. Include the number, classifications, functions and duties and minimum experience and training requirements for these positions. Describe any additional training that is made available to them. Indicate whether this level of field staffing is considered adequate. [4.3.1.4]*

Answer 84: WST permits are issued by the WST unit in CalGEM headquarters. The field assignments related to WST are then carried out by the local district staff. Associate Oil & Gas Engineers and Engineering Geologists from the district offices are responsible for review and evaluation of pressure tests, witnessing stimulations, and conducting chemical checks on site for WST related activities. There is no set number of staff assigned to WST as local district staff oversee handling various projects. All pressure test results are reviewed by district engineers for approval prior to the WST.

85. *Describe the training requirements for agency personnel on the regulations, policies and criteria applicable to E&P environmental regulatory matters. [4.3.1.5]*

Answer 85: All CalGEM staff working in the WST unit are expected to be familiar with DOC's regulations regarding WST, and to stay informed of the most updated policies and regulatory criteria in the performance of their duties.

86. *Describe the methods used for funding the E&P environmental regulatory program in your state (general appropriations, special funds, fees, etc.). If you feel that current funding levels are inadequate, describe the levels of funding needed and the activities that would be conducted. [4.3.2]*

Answer 86: There is a small statewide assessment on oil and gas produced in California. This assessment supports CalGEM, and is levied pursuant to Article 7, Division 3, of the Public Resources Code.

The assessment rate is established in June of each year and is based on CalGEM's estimated budget for the ensuing fiscal year and the total amount of assessable oil and gas produced during the prior calendar year. This rate is then imposed on each barrel of oil and each 10,000 cubic feet of natural gas produced.

87. Describe staff training to stay current with new and developing hydraulic fracturing technology. [9.2.3]

Answer 87.

- Holding internal and external DOC trainings
- Attending seminars/webinars and lectures held by SPE,
- Collaborating with National Labs to review the state's technical standards and legal requirements for public health, safety, and environmental protection are met prior to approval of each permit. In November 2019, the Department of Conservation asked experts at the Lawrence Livermore National Laboratory (LLNL) to assess CalGEM's permit review process. LLNL also evaluated the completeness of operators' application materials and CalGEM's engineering and geologic analysis.

88. Briefly describe how the state agency provides 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 (*Question 89*) of the guidelines. 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. [9.2.4]

Answer 88: The Division has held public workshops across the state on both of these topics. Information is also on our website for public review and education. Additionally, the Department of Conservation is currently evaluating the education materials that exist and exploring opportunities to further educate the public on key topics of interest.

89. Describe the agency's public outreach and education efforts. [4.2.2.2]

Answer 89: The Department of Conservation is committed to public transparency, engaging with the public, providing data online, and being responsive to community needs as we conduct our work. Specifically, we contemplate best practices for both outreach and engagement.

Examples of activities and principles considered in our department engagement efforts include:

- one-on-one phone calls with stakeholders;
- in-person (pre-covid) or digital meetings with stakeholders to discuss ongoing issues (i.e. enforcement) or upcoming regulatory efforts;
- in-person (pre-covid) and digital public engagement workshops or meetings that have:
 - Stakeholder co-designed agenda elements;
 - Language access with an emphasis of the top languages other than English spoken in a given county or region in meeting notifications (flyers);
 - Spanish language interpretation at all major public meetings; consideration of Spanish led meetings (for example in-person in Arvin Ca 2/18/20 or on-line 5/28/20)
 - Handouts or reference materials that consider various learning styles;

- Options to submit or provide feedback that accommodate public preferences; such as verbally, hand-written, digitally (through email, survey or a polling tool) or through tactile means for in person meetings; as well as anonymous or name/organization notation options.
- Consideration of a welcoming environment for all including kids (in-person)
- Consideration of how to ensure various points of view are heard by all (by rotating speakers based on self-selected affinity grouping)
- Consideration of how pre-meeting materials (including video) may help interested persons have the information they need on the topic at hand.
- Consideration of stakeholder fatigue and efforts to avoid exacerbating those issues.
- A meeting environment that welcomes all points of view and emphasizes the need for all to feel “safe” in sharing their perspective
- Ensuring adequate outreach has been done so interested stakeholders know when a given meeting, workshop or effort is happening. Consideration of the ‘branding’ or look and feel of materials for any given effort to help members of the public differentiate what might be multiple related efforts happening at any given time.
- Report outs that summarize comments received.
- Clarity on how public input or feedback will be considered by the Department in any given process.

Examples of outreach efforts include more traditional and less traditional elements such as: information on the Department’s website, list serv email blasts, social media communication, direct email communication and phone calls. The department keeps a ‘grass tops’ approach in mind when trying to spread the word about community meetings; encouraging a wide variety of stakeholders to use their own communication channels to help DOC push out notification of meetings, resources and grant opportunities. The department always strives to have community partners help amplify our outgoing communications.

90. Fundamental differences exist from state to state, and between regions within a state, in terms of geology and hydrology. Describe how the state evaluated and addressed, 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. [9.3]

Answer 90: In 2015, The California Council on Science and Technology (CCST) organized and led an independent scientific study to assess current and potential future well stimulation practices, including the likelihood that these technologies could enable extensive new petroleum production in the state; the impacts of well stimulation technologies (including hydraulic fracturing, acid fracturing and matrix acidizing) and the gaps in data that preclude this understanding; potential risks associated with current practices; and alternative practices that

might limit these risks (Source: An Independent Scientific Assessment of Well Stimulation in California Summary Report⁴¹)

- Conclusion 1.3. Hydraulic fracturing in California does not use a lot of fresh water compared to other states and other human uses.
- Hydraulic fracturing represents less than 0.2% of all human water uses in regions where stimulation occurs.

91. Describe how the availability and use of alternative water sources for hydraulic fracturing, including recycled water, is encouraged. [9.3]

Answer 91: There has not been any reported use of produced water for hydraulic fracturing. Oil and gas operators have used their own water wells as the water source for stimulations.

92. Briefly describe how waste associated with hydraulic fracturing is managed consistent with Section 4.1.1 (*Questions 93-94*) and Section 7 (*Questions 95-96*) of the guidelines. [9.3]

Answer 92: An application for a permit to perform a well stimulation treatment shall include (§1783.1.25) a description of anticipated procedures to comply with the Hazardous Waste Control Law (Health and Safety Code §§ 25100 et seq.) and implementing regulations pertaining to the activities and information provided under this article; (§1783.1.26) The estimated amount of treatment-generated waste materials that are not addressed by the water management plan, and the anticipated disposal method for the waste materials.

Also, please see: §1786. Storage and Handling of Well Stimulation Treatment Fluids and Wastes.

93. *Briefly describe the permitting requirements for E&P facilities. Give reference to any statutory or regulatory requirements, including the permit terms and renewal procedures and the authority to refuse to issue or reissue permits or authorizations. Indicate whether the waste management practices listed in the matrix at the beginning of this questionnaire are authorized by individual permit, by rule, by general permit, through registrations or notices, verbally, or not at all. [4.1.1]*

94. *Do E&P related permits provide notice of the permittee's obligation to comply with other federal, state or local requirements? If so, please provide a copy of (or hyperlink to) the form(s). [4.1.1]*

95. *Discuss any activities the state has undertaken to determine the occurrence and need for regulation of NORM. [7.2]*

⁴¹ <https://ccst.us/wp-content/uploads/2015SB4summary.pdf>

96. *Briefly discuss each of the following program elements as they apply to the NORM regulatory program (give reference to any statutory or regulatory requirements): [7.3]*

- a. Definitions [7.3.1]*
- b. Action levels [7.3.2]*
- c. Surveys [7.3.3]*
- d. Worker protection [7.3.4]*
- e. Licensing/permitting [7.3.5]*
- f. Removal/remediation [7.3.6]*
- g. Storage [7.3.7]*
- h. Transfer of land and equipment for continued use [7.3.8]*
- i. Release of sites, materials, and equipment [7.3.9]*
- j. Disposal [7.3.10]*
- k. Interagency coordination [7.3.11]*
- l. Public participation [7.3.12]*

97. *Discuss how the state encourages the efficient development of adequate capacity and infrastructure for the management of hydraulic fracturing fluids, including the transportation, recycling, treatment and disposal of source water and hydraulic fracturing wastes. [9.3]*

98. *Discuss how the state encourages the efficient development of adequate capacity and infrastructure for the management of hydraulic fracturing fluids, including the transportation, recycling, treatment and disposal of source water and hydraulic fracturing wastes. [9.3]*

REUSED AND RECYCLED FLUIDS (Guidelines Section 11)

99. Please provide definitions used by the state to differentiate between “reused fluids” and “recycled fluids”. [11.1]

Answer 99: Definition of Recycled Water: “water which, as a result of treatment of waste, is suitable for a direct beneficial use or a controlled use that would not otherwise occur and is therefore considered a valuable resource” (Wat. Code § 13050(n))
(https://www.waterboards.ca.gov/water_issues/programs/water_recycling_policy/)

100. Discuss how operators are encouraged to develop water management plans that consider reuse and recycling options. [11.2]

Answer 100: Based on “1783.1. Contents of Application for Permit to Perform Well Stimulation Treatment”, the operators shall include a water management plan that includes all items mentioned in §1783.1. (21).

“§1786. (7) Operators shall conduct all activities that relate to storage and management of fluids in compliance with all applicable requirements of the Regional Water Board, the Department of Toxic Substances Control, the Air Resources Board, the Air Quality Management District or Air Pollution Control District, the Certified Unified Program Agency, and any other state or local agencies with jurisdiction over the location of the well stimulation activities.”

101. **Have barriers to reuse and recycling options been identified at the state level, and if so, how has the state sought to reduce those barriers?** [11.2]
102. How has the state pursued interagency coordination where jurisdictional issues exist between multiple state agencies, river basin commissions, and other parties involved in the management of reused and/or recycled fluids? [11.2]

Answer 102: The division has entered into formal agreements with the Department of Toxic Substances Control, the State Air Resources Board, any local air districts where well stimulation treatments may occur, the State Water Resources Control Board, the Department of Resources Recycling and Recovery, and any regional water quality control board where well stimulation treatments may occur, clearly delineating respective authority, responsibility, and notification and reporting requirements associated with well stimulation treatments and well stimulation treatment-related activities, including air and water quality monitoring, in order to promote regulatory transparency and accountability.

103. **Does the state have a regulatory process to designate fluids as a non-waste when the fluid is**

treated to a satisfactory level and reused and/or recycled? [11.3]

104. Section 11.4.1 describes regulatory criteria a state program should consider for pipelines transporting produced water and/or reused/recycled/treated water. Discuss how the state defines such pipelines, including any risk assessment procedure(s) utilized in the generation of that definition. [11.4.1.1]

Answer: CalGEM regulates produced water pipelines greater than 1” nominal diameter in size within the boundaries of the oil and gas lease. Produced water pipelines are regulated within the lease from separation, through treatment, and to disposal at an injection well, outfall, or surface water discharge point. A CalGEM regulated pipeline is defined in Title 14 CCR 1760(q). Also note that California DOC/CalGEM considers steam derived from produced water as constituting or containing produced water and would be handled accordingly.

105. Describe the state’s siting, permitting, and financial assurance requirements for such pipelines. [11.4.1.2]

Answer 105: There is no current requirement to permit produced water pipelines. A list of pipelines with attributes and a map that shows locations of all pipelines is required in Title 14 CCR 1774.1(b) under Pipeline Management Plan Requirements.

- a. Does the state differentiate between requirements for buried and above ground pipelines? [11.4.1.2.d]

Answer 105a: please see Title 14 CCR § 1774. Pipeline Construction and Maintenance
The regulating is the same but there are some different requirements. An example of a specific requirement for buried pipelines is utilization of cathodic protection.

106. Describe the state’s construction and operational requirements for such pipelines. [11.4.1.3]

Answer 106: Please see Title 14 CCR § 1774. Pipeline Construction and Maintenance and § 1774.1. Pipeline Inspection and Testing.

- b. Describe the state’s requirements for integrity testing of such pipelines. [11.4.1.3.c, d, e]

Answer 106b: Title 14 CCR § 1774.1. Pipeline Inspection and Testing.

107. Describe the state’s spill response and remediation requirements for releases from such pipelines. [11.4.1.4]

Answer 107: § 1722 (b) The operator for a facility or group of related facilities shall develop a spill contingency plan.

§1783.1. Contents of Application for Permit to Perform Well Stimulation Treatment.

§1786. Storage and Handling of Well Stimulation Treatment Fluids and Wastes.

108. Does the state encourage operators to utilize smart truck routing for truck transportation of produced water and/or reused/recycled/treated water? [11.4.2]

Answer 107: § 1722 (b) The operator for a facility or group of related facilities shall develop a spill contingency plan.

§1783.1. Contents of Application for Permit to Perform Well Stimulation Treatment.

§1786. Storage and Handling of Well Stimulation Treatment Fluids and Wastes.

109. Describe the state’s rules for the treatment and storage of fluids to be reused and/or recycled. [11.5]

Answer 109: As a part of WST permitting requirements (§ 1783.1. (C)) the following item should be included: “A description of how and where the water from a well stimulation treatment will be recycled, including a description of any treatment or reclamation activities to be conducted prior to recycling or reuse.”

Also, see § 1786. Storage and Handling of Well Stimulation Treatment Fluids and Wastes.

110. Describe the state’s permitting process for facilities used for the storage of reused and/or recycled fluids. [11.5]

111. Discuss how the state’s waste management requirements (including tracking and reporting) apply to fluids to be reused and/or recycled. [11.5]

Answer 111: § 1786. Storage and Handling of Well Stimulation Treatment Fluids and Wastes.

(a) Operators shall adhere to the following requirements for the storage and handling of well stimulation treatment fluid, additives, and produced water from a well that has had a well stimulation treatment:

- (1) Fluids shall be stored in compliance with the secondary containment requirements of Section 1773.1, except that secondary containment is not required under this section for production facilities that are in one location for less than 30 days. The operator’s Spill Contingency Plan shall account for all production facilities outside of secondary containment and include specific steps to be taken and equipment available to address a spill outside of

secondary containment.

- (2) Operators shall be in compliance with all applicable testing, inspection, and maintenance requirements for production facilities containing well stimulation treatment fluids.
- (3) Fluids shall be accounted for in the operator's Spill Contingency Plan.
- (4) Fluids shall be stored in containers and shall not be stored in sumps or pits.

112. Describe how the state differentiates between centralized and commercial wastewater treatment facilities, and any special requirements for facilities that process fluids to be reused and/or recycled. [11.5]

Answer 112: CalGEM does not differentiate between the size of produced water treatment plants within the boundary of the oil and gas lease. CalGEM only regulates privately-owned produced water treatment plants located on the lease for the purpose of treating produced water from wells at the lease or an adjacent lease. Other state and local agencies may also regulate these privately-owned produced water treatment plants. CalGEM does not regulate publicly owned water treatment plants, if any exist within the boundaries of the oil and gas lease.

113. Describe how the state regulates waste generated during the treatment of fluids to be reused and/or recycled. [11.5]

114. Describe the conditions under which the state requires groundwater monitoring. [11.5]

Answer 114. California State Water Resources Board is in charge of groundwater monitoring. More information can be found at:
https://www.waterboards.ca.gov/water_issues/programs/groundwater/sb4/regional_monitoring/

§1783. (27) Documentation from either the State Water Board or the Regional Water Board that the well subject to the well stimulation treatment is covered by a regional groundwater monitoring program pursuant to Water Code section 10783, subdivision (h)(1), or indication that the operator is working with the State Water Board or the Regional Water Board to ensure that the well subject to well stimulation treatment is covered in accordance with Water Code section 10783;

115. Describe how the state's methodology for the determination of the presence of NORM applies to fluids to be reused and/or recycled. [11.5]

116. Has the state evaluated whether air emissions at facilities used for the storage and/or treatment of fluids to be reused and/or recycled require an air quality permit, authorization, or

exemption? [11.5]

Answer 116: § 1786. (7) Operators shall conduct all activities that relate to storage and management of fluids in compliance with all applicable requirements of the Regional Water Board, the Department of Toxic Substances Control, the Air Resources Board, the Air Quality Management District or Air Pollution Control District, the Certified Unified Program Agency, and any other state or local agencies with jurisdiction over the location of the well stimulation activities.

§ 1782. (9) Well stimulation treatment operations are conducted in compliance with all applicable requirements of the Regional Water Board, the Department of Toxic Substances Control, the Air Resources Board, the Air Quality Management District or Air Pollution Control District, the Certified Unified Program Agency, and any other local agencies with jurisdiction over the location of the well stimulation activities.

Appendix C – CalGEM May 2021 Corrective Action Plan

DOF OSAE Finding	DOF OSAE Recommendations	Implementation Task	Implementation start date	Finish	Current Status
Well Stimulation Treatment (WST) Program					
Finding 6 – Strengthen ADSA Review Documentation	A - Update WST SOP to include documentation requirements for verification of operator's 2xADSA data, determination of ADSA locations, addressing high risk abandoned wells, and selection of monitoring wells.	Update the WST permitting process flowchart and SOP to include all the recommendations from DOF report. (SOP – Risk assessment section)	Tues 9/1/2020	Wed 3/31/2021	SOP drafted and under review currently.
	B - Update the risk assessment template to incorporate WST SOP updates noted in Recommendation A above.	Update the WST risk assessment template to include the verification of 2xADSA, mitigation measure of the high risk P/A wells and reason on selection of monitoring wells. (SOP – Risk assessment section)	Thurs 7/30/2020	Tues 9/1/2020	Risk assessment template has been updated (Figure 1 and Figure 3). Please see the Appendix section for a more detailed explanation of the update.

	C - Include all wells within the 2xADSA (penetrating or non-penetrating) in the risk assessment and identify the wells that do not require evaluation including documentation of the reasons why.	Update the WST risk assessment template to include all wells within the 2xADSA circle including the non-penetrating wells. (SOP – Risk assessment section)	Thurs 7/30/2020	Tues 9/1/2020	Risk assessment template has been updated (See Figure 1 and 4). Please see the Appendix section for a more detailed explanation of the update.
	D - Ensure sufficient review documentation and files are retained to support the evaluation of risk for the WST. The audit trail should facilitate the tracing of ADSA Narrative review determinations to source files and documents completed by permit engineers.	Update the SOP and the risk assessment template to ensure ADSA Narrative determination review process is consistent for all applications including those without any 2xADSA wells. Create the risk assessment template for each application and retain it for documentation.	Thurs 7/30/2020	Tues 9/1/2020	Risk assessment template has been updated (See Figure 1 and 2). Please see the Appendix section for a more detailed explanation of the update.

Appendix:

The new WST risk assessment template as shown in Figure 1 includes the updates recommended by DOF OSAE audit. More detail explanation of each new section is provided below. These updates have been incorporated into our standard operating procedure (SOP).

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	
	API#	Well Name	Well Design	Well Sta	Previously Stimulated	ADSA Location	Damaged To	Damaged Location	Perforation Location	Damaged Location	USOP Pre	Notes	Abandoned To Standard	Abandoned	Is this an offset well monitored by a conditions	
1	040295905	Water Flood	518N-28	Plugged & Abandoned	Yes	B	None	None	C	None&A&Bo veCODepth	false	C/O @ 1150'; diatomite @584'	True	08/24/1998	False	
2	040297053	Steamflood	618P-28	Plugged & Abandoned	Yes	A	None	None	A	None&A&Bo veCODepth	false	C/O @656'	True	04/23/2004	False	
3	040300598	Oil & Gas	518P1-28	Plugged & Abandoned	Yes	C	Parted Casing or Hole	In Zone	C	None&A&Bo veCODepth	false	C/O @618'; parted casing @608'; diatomite @583'	True	04/20/2010	False	
4	0403005961	Oil & Gas	518S1-28	Plugged & Abandoned	Yes	A	Dogleg	In Zone	A	None&A&Bo veCODepth	false	C/O @1185'; dogleg @1088'; diatomite @588'	True	06/20/2019	False	
5	0403012527	Water Flood	518W-28	Plugged & Abandoned	Yes	C	Parted Casing or Hole	In Zone	C	BelowCODepth	false	C/O @729'; casing damage @700' & 787'; diatomite @583'	False	09/22/2011	False	
6	0403022416	Oil & Gas	918V-28	Active	Yes	B	None	None			false	OG well, no MIT to determine mechanical integrity. Lies within fracture azimuth selected for pressure monitoring during proposed stimulation of well 03067616.	False		True	
7	0403022418	Oil & Gas	918X-28	Plugged & Abandoned	Yes	B	Dogleg	In and Out of Zone	NotinADSA	BelowCODepth	false	C/O @699'; dogleg @520' & 710'; diatomite @571'	True	05/03/2010	False	
8	0403041202	Steamflood	718D1-28	Active	Yes	C	None	None			false		False		False	
9	0403041208	Steamflood	718D2-28	Active	Yes	B	None	None			false		False		False	
10	0403041385	Steamflood	718H1-28	Active	Yes	C	None	None			false		False		False	
11	0403041385	Steamflood	718H2-28	Active	Yes	C	None	None			false		False		False	
12	0403042426	Steamflood	718W1-28	Active	Yes	C	None	None			false		False		False	
13	Notes															
14	Selected for pressure monitoring															
15	WST Application Group 052-0060: Well 03067616 (First/Bottom Stage) – South Belridge															
16	CalGEM's 2xADSA Map															
17	Aera's 2xADSA Map															
18	Well(s) not intersecting the 2x-ADSA of the proposed well															
19	API#	Well Name	Reasons													
20	02931881	18A-28	Does not penetrate													
21	03015788	918K-28	Does not penetrate													
22	03019644	918P-28	Does not penetrate													
23	03067616	518S2-28	New - Proposed WST Well, Not Drilled													
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Figure 1: New risk assessment template
 A. Verification of 2xADSA data/maps:

In the figure 2 below, the map on the left is generated by the WST engineer using CalGEM's GIS map layer. The map on the right is submitted by the operator. This step incorporate the verification and documentation of the 2xADSA data and map recommended under part A of the report. The WST engineer then inserted the proposed fracture azimuth path along with the ADSA location zones (A,B and C) onto the map. These new

figures captured the documentation to support the assignment of the ADSA location zones in the same file. As these steps was previously completed outside of the risk assessment template, the documents were not retained. This new procedure will ensure document retention and verification steps in the same risk assessment file going forward.

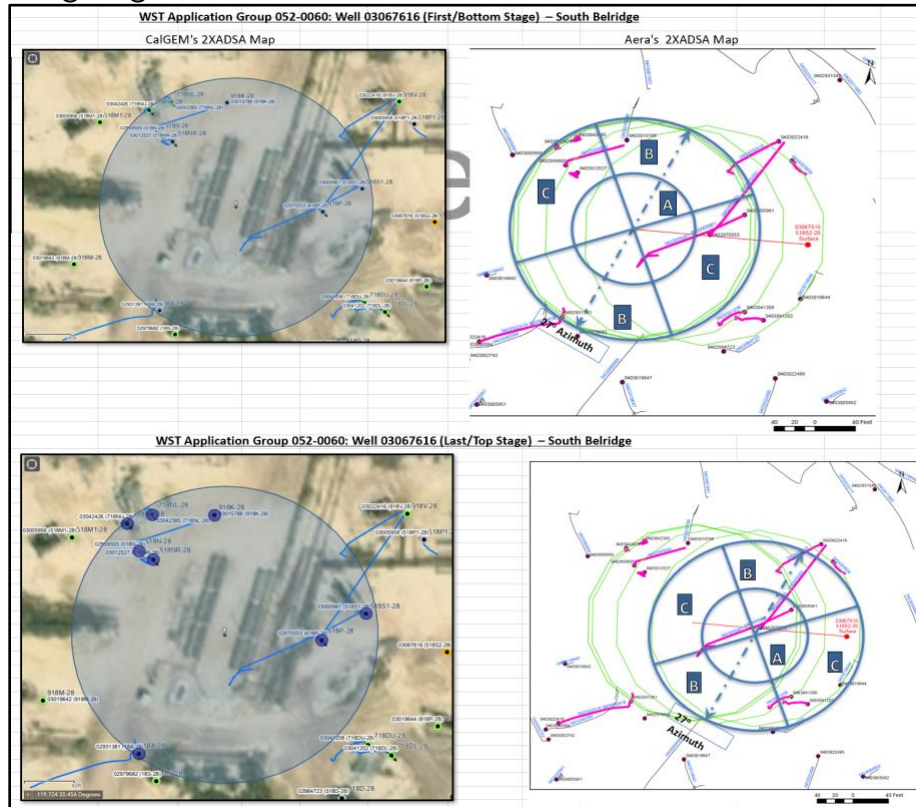


Figure 2: CalGEM Map and Operator (Aera) Map side by side comparison with ADSA location zones

B. Abandoned and non-abandoned wells risk assessment:

This section of the risk assessment has been updated with the new WellSTAR process. The wells in the 2xADSA are identified in the WellSTAR application system by the operator. WST review engineers verify the wells as shown in previous steps and review the well records as part of their risk assessment. Their review notes are added into the WellSTAR under each ADSA well. The engineer will include the reason for monitoring well selection as recommended by the audit under the note section. The engineer download the ADSA wells review into the Excel template as shown below in Figure 3 to be added into the risk assessment file.

API	Well Type	Well Designation	Well Status	Previously Stimulated	ADSA Location	Damage Type	Damage Location	Perforation Location	Damage Location	USDW Present	Notes	Abandoned To Standards	As of	Is this an offset well monitored by permit conditions?
0402959505	Water Flood	518N-28	Plugged & Abandoned	Yes	B	None	None	C	NoneAtOrAboveCODepth	false	C/O @ 1150'; diatomite @584'	True	08/24/1998	False
0402970553	Steamflood	618P-28	Plugged & Abandoned	Yes	A	None	None	A	NoneAtOrAboveCODepth	false	C/O @656'	True	04/23/2004	False
0403005958	Oil & Gas	518P1-28	Plugged & Abandoned	Yes	C	Parted Casing or Hole	In Zone	C	NoneAtOrAboveCODepth	false	C/O @618'; parted casing @608'; diatomite @593'	True	04/20/2010	False
0403005961	Oil & Gas	518S1-28	Plugged & Abandoned	Yes	A	Dogleg	In Zone	A	NoneAtOrAboveCODepth	false	C/O @1185'; dogleg @1088'; diatomite @588'	True	06/20/2019	False
0403012527	Water Flood	518NR-28	Plugged & Abandoned	Yes	C	Parted Casing or Hole	In Zone	C	BelowCODepth InZone	false	C/O @729'; casing damage @730' & 787'; diatomite @ 583'	False	09/22/2011	False
0403022416	Oil & Gas	918V-28	Active	Yes	B	None	None			false	OG well; no MIT to determine mechanical integrity. Lies within fracture azimuth; selected for pressure monitoring during proposed stimulation of well 03067616.	False		True
0403022418	Oil & Gas	918X-28	Plugged & Abandoned	Yes	B	Dogleg	In and Out of Zone	NotInADSA	BelowCODepth InZone	false	C/O @699'; dogleg @520' & 716'; diatomite @571'	True	05/03/2010	False
0403041202	Steamflood	718DL-28	Active	Yes	C	None	None			false		False		False
0403041208	Steamflood	718DU-28	Active	Yes	B	None	None			false		False		False
0403042385	Steamflood	718NL-28	Active	Yes	C	None	None			false		False		False
0403042426	Steamflood	718NU-28	Active	Yes	C	None	None			false		False		False
Note:	Selected for pressure monitoring													

Figure 3: Risk assessment of wells in the 2xADSA with selected monitoring well highlighted

True = Yes False = No

C. Wells not intersecting the 2xADSA zone but are within the 2xADSA surface map:

Previously, if there were no wells penetrating the 2xADSA zone, the risk assessment template was not generated although the WST engineer conducted the verification steps. Per DOF's recommendation, a new section is

added for wells not intersecting the 2xADSA but are shown within the surface map as shown in Figure 4. This will provide the additional verification and documentation of the reason on why the wells are not evaluated as part of the risk assessment.

Well(s) not intersecting the 2x-ADSA of the proposed well		
API#	Well Name	Reasons
02931381	18A-28	Does not penetrate
03015788	918K-28	Does not penetrate
03019644	918P-28	Does not penetrate
03067616	518S2-28	New - Proposed WST Well, Not Drilled

Figure 4: New section to show wells not in the 2xADSA

Appendix D – 2019.2 Edition STRONGER Guidelines

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Appendix A – Glossary of Acronyms

ADSA	Axial Dimensional Stimulation Area
API	American Petroleum Institute
bbbl	Barrel of Oil
BOPE	Blowout Preventer Equipment
CA	California
CalGEM	California Geologic Energy Management Division
CalRecycle	California Department of Resources Recycling and Recovery
CARB	California Air Resources Board
CCR	California Code of Regulations
CCST	California Council on Science & Technology
CEQA	California Environmental Quality Act
DTSC	Department of Toxic Substances Control
E&P	Exploration & Production
EIR	Environmental Impact Report
EPA	United States Environmental Protection Agency
HWTS	Hazardous Waste Tracking System
IOCC	Interstate Oil Compact Commission
IOGCC	Interstate Oil & Gas Compact Commission
LLNL	Lawrence Livermore National Laboratory
MCF	Thousand Cubic Feet of Natural Gas
MOA	Memorandum of Agreement
NORM	Naturally Occurring Radioactive Material
O&G	Oil & Gas
OSAE	Department of Finance Office of Audits and Evaluation
RWQCB	Regional Water Quality Control Boards
STRONGER	State Review of Oil & Natural Gas Environmental Regulations
SWRCB	State Water Resources Control Board
TSDf	Treatment, Storage and Disposal Facilities
UIC	Underground Injection Control
WellSTAR	Well Statewide Tracking and Reporting System
WST	Well Stimulation Treatment

Appendix B – Questionnaire Response



Questionnaire for State Reviews: 2019.2 Edition

Guidelines Section(s): Hydraulic Fracturing, Reused & Recycled Fluids

State: California

State Contact: May Soe & Siavash Nadimi

Email: may.soe@conservation.ca.gov; siavash.nadimi@conservation.ca.gov

INSTRUCTIONS: This questionnaire is based on the [Guidelines for the Review of State Oil and Natural Gas Environmental Regulatory Programs, 2019.2 Edition](#). The purpose of this questionnaire is to obtain information that will provide an accurate characterization of a state's regulatory program. It is strongly recommended to have the Guidelines close at hand when completing this questionnaire. Terms used in this questionnaire have meanings consistent with those contained in the Guidelines. Citations in brackets following each question refer to the applicable section of the Guidelines (e.g., [5.3]). Certain sections of the Guidelines contain cross-references to other sections. Where other Guidelines sections are cross-referenced within a question, the cross-referenced questions are included in italics (e.g., Question 16: Briefly describe how surface controls associated with hydraulic fracturing, such as dikes, pits or tanks, meet Sections 5.5 (*Questions 17-46*) and 5.9 (*Questions 47-49*) of the guidelines. [9.2.1]). These cross-referenced questions are provided primarily for context; however, the state may find it easier to provide a complete picture of the program by responding to them.

Multiple agencies within a state may have jurisdiction over different aspects of oil and gas regulation. The intent of the review process is to develop as complete a picture of a state's oil and gas environmental regulatory environment as possible; however, not all agencies with jurisdiction of all the issues covered in this questionnaire may be participating in the review. If a question requires a response from an agency not participating in the review, indicate the agency with jurisdiction, but do not answer on their behalf.

Please respond in a manner that sufficiently addresses the criteria of the relevant Guidelines section and describes the state's program or requirements but does not go into excessive detail. During the interview the Review Team will ask for additional detail or clarification on points which they feel merit further discussion. To the extent possible, provide hyperlinks to state websites where the Review Team can reference statutes, rules, policies, guidance, reports, and other related information used to support the state's responses.

BACKGROUND INFORMATION

1. Please provide a brief history or description of the oil and natural gas industry in your state, its regulation by state agencies, and recent industry trends.

Answer 1: California oil and gas (O&G) exploration and production (E&P) began in the mid-1800s. The earliest commercial explorations occurred in the southern portion of the state. The beginning of the 20th century saw oil E&P expand northward into the central coastal area of the state as well as into the southern San Joaquin Valley region. Today, oil production continues to occur in the near coastal inland areas of the southern portion of the state (primarily the Los Angeles Basin), the southern portion of the San Joaquin Valley, and offshore of the state's southern coastline.

Natural gas E&P has occurred commensurate with oil exploration from the mid-1800's to the early 1900's. By the mid-1920's commercial natural gas exploration and production increased as gas captured from oil production began to be commercially/industrially utilized. Gas fields have been discovered and produced in the regions explored for oil production (southern California, southern San Joaquin Valley), as well as extensively within the northern/central portion of the state's Central Valley.

Regulation of O&G E&P began in 1915 with the legislated creation of what is currently known as the Geologic Energy Management Division (CalGEM). CalGEM is currently the primary regulatory authority of O&G operations within California. Early regulatory efforts focused on the responsible development and recovery of energy resources. In more recent time, regulatory emphasis has shifted from development and recovery management towards the protection of public health and safety and the environment during energy resource production operations. CalGEM's regulatory authority extends from onshore to three miles offshore. Today, the state has jurisdiction over more than 242,000 O&G related wells, including 101,300 wells classified as "Active" or "Idle" oil producers.

Hydraulic fracturing is referred to in California statute and regulation as a well stimulation treatment (WST) and is discussed as such in CalGEM's responses to this questionnaire. WSTs also include acid fracturing and acid matrix stimulation operations. WSTs became permanently regulated in 2015 under 14 California Code of Regulations [CCR] §1780-1789. WSTs have been occurring in the state for more than 30 years.

Other state agencies that have regulatory authority over WSTs include: the State Water Resources Control Board (SWRCB) and Regional Water Quality Control Boards (RWQCBs), the Air Resources Board (CARB), the Department of Toxic Substances Control (DTSC), the California Coastal Commission, and the Department of Resources Recycling and Recovery (CalRecycle). CalGEM has Memorandum of Agreements (MOAs) in place with each agency as well as local and regional air quality management

agencies.

Industry trends within the state include O&G production declines since the 1980's, E&P operations shifting from conventional to unconventional methods, and, most recently, working to achieve California's goal of becoming carbon-neutral by 2045 through carbon reduction efforts like carbon capture and sequestration.



Intro to Oil Gas
Geoth.pdf

2. Please include the following documents⁴⁰:

- a) Organization chart(s) showing the structure of all agencies responsible for the management of hydraulic fracturing.

The Geologic Energy Management Division (CalGEM, formerly DOGGR) is only one public entity whose authority extends to regulating well stimulation treatment (WST) and WST-related activities. CalGEM is in charge of reviewing hydraulic fracturing applications, permitting, monitoring and witnessing during stimulations and reviewing the final disclosures of post stimulation reports.

Senate Bill 4 (Chapter 313, Statutes of 2013) (SB 4) directed CalGEM to enter into formal agreements with certain state and local agencies respecting WST and WST-related activities. For more information, please visit the following website. MOA agreement documents can be provided if needed.

<https://www.conservation.ca.gov/calgem/Pages/WSTOtherAgencies.aspx>

- b) All statutes, rules, regulations and orders applicable to the management of hydraulic fracturing.

Answer 2b: All CalGEM statutes and regulations are viewable at:

<https://www.conservation.ca.gov/index/Documents/CALGEM-SR-1%20Web%20Copy.pdf>

Hydraulic fracturing related statutes are: 3150-3161 (pg 39-50)

Hydraulic fracturing related regulations are: 1780-1789 (pg 307-326)

- c) Any memoranda of understanding or similar agreements between state agencies or between the state and any other governmental entities (BLM, EPA, Indian Tribes, local jurisdictions) pertaining to the management of hydraulic fracturing.

Answer 2c: CalGEM has MOAs in place for WSTs with the following state and local

⁴⁰ These documents may be included as appendices at the end of this questionnaire, or as hyperlinks. If included as appendices, please indicate a reference on this page. For example, "Organizational chart – see appendix A, Rules and Regulations – see table in Appendix B."

government agencies:

- State Water Resources Control Board (SWRB) and Regional Water Quality Control Boards (RWQCBs)
- California Department of Toxic Substances Control (DTSC)
- California Department of Resources Recycling and Recovery (CalRecycle)
- California Air Resources Board (CARB) and San Joaquin Valley Air Pollution Control District
- California Coastal Commission
- California Air Resources Board (CARB) and Local Air Districts

MOAs can be reviewed at:

<https://www.conservation.ca.gov/calgem/Pages/WSTOtherAgencies.aspx>

d) Any written mission statement(s), goals, objectives and policies applicable to hydraulic fracturing.

Answer 2d: CalGEM does not have a mission statement specific to hydraulic fracturing. CalGEM’s primary mandate, however, applies to all operations regulated by the Division. Public Resources Code (PRC) § 3106 states:

“(a) The supervisor shall so supervise the drilling, operation, maintenance, and abandonment of wells and the operation, maintenance, and removal or abandonment of tanks and facilities attendant to oil and gas production, including pipelines not subject to regulation pursuant to Chapter 5.5 (commencing with Section 51010) of Part 1 of Division 1 of Title 5 of the Government Code that are within an oil and gas field, so as to prevent, as far as possible, damage to life, health, property, and natural resources; damage to underground oil and gas deposits from infiltrating water and other causes; loss of oil, gas, or reservoir energy, and damage to underground and surface waters suitable for irrigation or domestic purposes by the infiltration of, or the addition of, detrimental substances.”

CalGEM also has a mission statement contained within code. PRC §3011 states:

“(a) The purposes of this division include protecting public health and safety an environmental quality, including reduction and mitigation of greenhouse gas emission associated with the development of hydrocarbon and geothermal resources in a manner that meets the energy needs of the state.”

CalGEM also displays on its website landing page the following mission statement:

“The California Geologic Energy Management Division (CalGEM) prioritizes protecting public health, safety, and the environment in its oversight of the oil, natural gas, and geothermal industries, while working to help California achieve its climate change and clean energy goals. To do that, CalGEM uses science and sound engineering practices to regulate the drilling, operation, and permanent closure of energy resource wells.”

Though there was no specific mission statement for well stimulation program, the pdf below is the statement of reason written when the regulations were developed.



12-30-14 Final
Statement of Reasons

3. Please also include on a separate page any other relevant practices, program measures, guidelines or controls applicable to your state.

Answer 3: To review CalGEM's WST application review processes please see the documents listed under the "Well Stimulation Permit Review Process" heading, found here:

<https://www.conservation.ca.gov/calgem/Pages/WST.aspx>

WST overall review process:

<https://www.conservation.ca.gov/calgem/Documents/WST/WST-Review-Process-ADA.pdf>

Risk assessment:

<https://www.conservation.ca.gov/calgem/Documents/WST/2xADSA-Risk-Assessment-ADA.pdf>

<https://www.conservation.ca.gov/calgem/Documents/WST/5xADSA-Evaluation-ADA.pdf>

GENERAL CRITERIA (Guidelines Section 3)

4. What is the statutory authority upon which your E&P environmental regulatory program is based? What powers and duties are provided in the statute(s)? [3.1.a]

Answer 4: Statutory authority for the regulation of WSTs is granted by PRC §3160. Powers and duties provided by PRC §3160 include, but are not limited to:

- PRC §3160 (b)(1)(A) requires CalGEM to adopt WST regulations including the authority to revise existing O&G regulations: "On or before January 1, 2015, the division....shall adopt rules and regulations specific to well stimulation treatments. The rules and regulations shall include, but are not limited to, revisions, as needed, to the rules and regulations governing construction of wells and well casings to ensure integrity of wells, well casings, and the geologic and hydrologic isolation of the oil and gas formation during and following well stimulation treatments, and full disclosure of the composition and disposition of well stimulation fluids, including, but not limited to, hydraulic fracturing fluids, acid well stimulation fluids, and flowback fluids."

- PRC §3160 (c)(2) requires CalGEM to collaborate with other state agencies to determine roles and responsibilities in the regulation of WSTs: “On or before January 1, 2015, the division shall enter into formal agreements with the Department of Toxic Substances Control, the State Air Resources Board, any local air districts where well stimulation treatments may occur, the State Water Resources Control Board, the Department of Resources Recycling and Recovery, and any regional water quality control board where well stimulation treatments may occur, clearly delineating respective authority, responsibility, and notification and reporting requirements associated with well stimulation treatments and well stimulation treatment-related activities, including air and water quality monitoring, in order to promote regulatory transparency and accountability.”

5. Does this statutory authority include authority for the promulgation of rules and regulations? Please provide reference to the appropriate section(s). [3.1.b]

Answer 5: Yes, statute provides the authority, in general, for CalGEM to implement rules and regulations relative to O&G operations. As PRC §3013 states: “This division shall be liberally construed to meet its purposes, and the director and the supervisor, acting with the approval of the director, shall have all powers, including the authority to adopt rules and regulations, which may be necessary to carry out the purposes of this division.”

Additionally, as detailed in Answer 4, PRC §3160 (b)(1)(A), states the division shall adopt WST rules and regulations which shall include revisions, as needed, to rules and regulations governing well construction, well casing, and geologic/hydrologic isolation of oil and gas formations.

6. Do the statutes and regulations contain definitions of terms as necessary for program implementation? Please provide reference to the appropriate sections. [3.1.c]

Answer 6: Yes, definitions of terms related to WSTs can be found in statute in PRC §3150-3159 and in regulation in 14 CCR §1781.

7. Are the levels of funding and staff provided adequate for full E&P environmental regulatory program implementation? Please provide funding levels and total staff complement for E&P environmental regulatory activities for the past 3 years. Please differentiate between UIC and non-UIC program funding and staffing levels if such differentiation is applicable to your program. [3.1.d, 4.3.2]

Answer 7: Under CalGEM, WST program is funded separately from the UIC program. WST unit has the following staff:

1 – Senior Oil & Gas Engineer (Supervisor)

4 – Associate Oil & Gas Engineer

2 – Engineering Geologists

1 – Program support staff

8. Discuss mechanisms in place in your state for the coordination of E&P environmental regulatory program activities among the public, government agencies and the regulated industry. [3.1.e, 4.4]

Answer 8: The California Department of Conservation (DOC) maintains publicly available webpages related to CalGEM which can be accessed through <https://www.conservation.ca.gov/calgem/Pages/Index.aspx>. Through this portal, pages for each of the division’s regulatory programs can be accessed. Users can also view online data, maps, laws and regulations, and request division files.

CalGEM hosts in-person and virtual Community Meetings to gather public input to update public health and safety protections in future rulemakings. The division also provides subscription access to an electronic mailing list (List Serv) that provides notification of updates or changes to CalGEM regulations. CalGEM representatives have also attended local government public meetings regarding O&G.

CalGEM meets with MOA agencies (Waterboard, CARB, ...) on a regular basis to coordinate on our respective E&P programs.

CalGEM district offices and headquarters office provide mandated technical review and/or field inspection/oversight of O&G operations and maintain regular day-to-day contact with the regulated industry. In 2017 CalGEM implemented the Well Statewide Tracking and Reporting System (WellSTAR) electronic database to better handle data collection and ensure operator adherence to O&G regulations. WellSTAR data for Well Stimulation Treatment (WST) operations is available for review public review at <https://wellstar-public.conservation.ca.gov/>.

CalGEM periodically issues Notice to Operators (NTO) which detail important notifications to all operators the division has record of at the time of the notice. Notices are sent through the postal service as well as posted online.

With respect to WSTs, CalGEM issues annual reports to the legislature which discusses the WST permits issued and stimulations completed during the previous calendar year.

WST annual reports can be found here:

https://www.conservation.ca.gov/calgem/pubs_stats/Pages/legislative_reports.aspx#wst-annual-report.

9. What are the goals or objectives of the E&P environmental regulatory program? How do the goals and objectives of your E&P environmental regulatory program relate to protection of human health and the environment? Please provide reference to the appropriate document(s). [3.2]

Answer 9: The goals and objectives of CalGEM’s regulation of WSTs are stated within

PRC §3011 (a): “The purposes of this division include protecting public health and safety an environmental quality, including reduction and mitigation of greenhouse gas emission associated with the development of hydrocarbon and geothermal resources in a manner that meets the energy needs of the state,” and PRC § 3106(a): “The supervisor shall so supervise the drilling, operation, maintenance, and abandonment of wells... so as to prevent, as far as possible, damage to life, health, property, and natural resources; damage to underground oil and gas deposits from infiltrating water and other causes; loss of oil, gas, or reservoir energy, and damage to underground and surface waters suitable for irrigation or domestic purposes by the infiltration of, or the addition of, detrimental substances.”

10. Does your program provide for flexibility in determining the criteria applicable to E&P environmental regulation (e.g., variation in criteria dependent on region of the state or other factors; authorization of site-specific waivers for good cause shown and consistent with program goals and objectives)? If so, please provide reference to the appropriate document(s). [3.3]

Answer 10: Each WST application is reviewed and processed in a manner that disregards which region of the state stimulation occurs. Each application is reviewed on a case-by-case basis, and all risk factors are reviewed prior to permit issuance. Waivers are not issued by CalGEM and each application must satisfy all regulatory requirements before a WST permit will be issued.

HYDRAULIC FRACTURING (Guidelines Section 9)

11. Has the state evaluated potential risks associated with hydraulic fracturing, taking into account factors such as depth of the reservoir to be fractured, proximity of the reservoir to freshwater resources, well completion practices, well design, and volume and nature of fluids? [9.2]

Answer 11: Yes, potential risks related to WSTs were evaluated prior to implementation of permanent regulations and are evaluated during the review of each WST application. Prior to the implementation of permanent WST regulations, an independent scientific study was conducted to evaluate the hazards and risks and potential hazards and risks that well stimulation treatments pose to natural resources and public, occupational, and environmental health and safety. This report was completed by the California Council on Science & Technology (CCST) in collaboration with Lawrence Berkeley National Laboratory. This report can be reviewed here:

<https://ccst.us/wp-content/uploads/2015SB4summary.pdf>

Each WST permit application must include the features specified in 14 CCR §1783.1 and §1784, which CalGEM uses to assess risks posed by the treatment. Subsurface risk factors identified in the CCST report include:

- Assessing nearby wells for migratory pathways for WST-related fluids
- Ensuring groundwater protection from shallow WSTs by identifying groundwater sources and requiring operators to adhere well construction regulations protective of any groundwater resource.
- Requiring operators to demonstrate that proposed WSTs will not intersect usable groundwater resources
- Monitoring of seismic activity by operators in the areas where WSTs are being performed, both during and after treatment

The states WST regulations address these identified risk factors. Each WST permit application must include the features specified in 14 CCR §1783.1 and §1784, which CalGEM uses to assess risks posed by a WST. These features include:

- Well identification and location information [§1783.1(a)(5-10)]
- Treatment design information [§1783.1(a)(11-18); including all requirements of §1784]; which includes:
 - An estimate of the size/extent of the treatment area
 - Identification and review of all well bores located completely or partially within two times the treatment area
 - A review of all geologic features, including known faults (active or inactive), within five times treatment area

The review processes applied to all WST applications can be found on CalGEM’s WST webpage, under the “ Well Stimulation Permit Review Process” heading, here: <https://www.conservation.ca.gov/calgem/Pages/WST.aspx> .



The WST Review
Process.docx



2xADSA Risk
Assessment.docx



5xADSA
Evaluation.docx

12. Has the state developed standards to prevent the contamination of groundwater and surface water from hydraulic fracturing? [9.2]

Answer 12: Yes, the state has developed standards to prevent contamination of water resources. Starting with the drilling and completion of a well, all O&G wells must satisfy well construction specifications designed to protect water resources, as specified in 14 CCR §1744.1-1744.6.

WST applicants must adhere to §1744.1-1744.6 during the construction of any well, which includes a well proposed for stimulation. Additionally, these specifications must be identified for all wells within two times the proposed treatment area and shall be depicted on the casing diagram submitted for each well. Casing diagrams must depict all features listed under 14 CCR §1784(a)(2)(A), which include:

- (i) Sizes and weights of casing;
- (ii) Depths of shoes, stubs, and liner tops;
- (iii) Depths of perforation intervals, water shutoff holes, cement port, cavity shots, cuts, casing damage, and top of junk or fish left in well;
- (iv) Diameter and depth of hole;
- (v) Cement plugs inside casings, including top and bottom of cement plug, with indication of method of determining;
- (vi) Cement fill behind casings, including top and bottom of cement fill, with indication of method of determining;
- (vii) Type and weight (density) of fluid between cement plugs;
- (viii) Depths and names of the formations, zones, and sand markers penetrated by the well, including the top and bottom of the zone where well stimulation treatment will occur;
- (ix) All steps of cement yield and cement calculations performed;
- (x) All information used to calculate the cement slurry (volume, density, yield), including but not limited to, cement type and additives, for each cement job completed in each well.

Applicants must adhere to the general WST requirements listed under §1782(a) which includes, but is not limited to, the following:

- Sufficiently anchored treatment well casing;
- Geologic and hydrologic isolation of the treatment formation during and after stimulation;
- Isolation of all zones necessary to prevent vertical fluid or gas migration behind casing;
- WST fluids are directed to the zone(s) of interest;
- Treatment will not damage the well or degrade the wells mechanical integrity during treatment.

Prior to receiving a WST permit, applicants must provide an analysis of the area to be affected by the proposed WST (as required in 14 CCR §1784). 14 CCR §1784 states: “As part of an application for a permit to conduct well stimulation, the operator shall conduct a well stimulation treatment area analysis to ensure the geologic and hydrologic isolation of the oil and gas formation during and following well stimulation treatment.”

As mentioned in the response to Question 11, this analysis includes identification of the well features (construction, damage, prior stimulation, etc) of all wells within two times the proposed stimulation zone area, and identification of all geologic features (typically faults) within five times the proposed stimulation zone, that may pose WST-related fluid migration pathway risks from the stimulated reservoir. Operators must demonstrate that that well stimulation fluids will be confined to the targeted treatment zone and are mandated by 14 CCR §1784(b) to “design the well stimulation treatment so as to ensure that the well stimulation treatment fluids or hydrocarbons do not migrate and remain geologically and hydrologically isolated to the hydrocarbon formation.”

Additionally, pressure testing of the treatment well /surface equipment and logging of cement competency are required prior to conducting a WST, to ensure the integrity of the well and related treatment equipment, as detailed in 14 CCR §1784.1 and §1784.2. This testing includes:

- §1784.1(a)(1): “All cemented casing strings and all tubing strings to be utilized in the well stimulation treatment operations shall be pressure tested for at least 30 minutes at a pressure equal to at least 100% of the maximum surface pressure anticipated during the well stimulation treatment, but not greater than the API rated minimum internal yield of the tested casing.”
- In order to provide additional protection, 14 CCR §1784(b) limits the maximum pressure that can be applied to any casing string: “A well stimulation treatment shall not be designed to employ pressure exceeding 80% of the API rated minimum internal yield on any casing string in communication with the well stimulation treatment.
- §1784.1(a)(2): “All surface equipment to be utilized for well stimulation treatment shall be rigged up as designed. The pump, and all equipment downstream from the pump, shall be pressure tested at a pressure equal to 125% of the maximum surface pressure anticipated during the well stimulation treatment, but not greater than the manufacturer's pressure rating for the equipment being tested.”
- §1784.2(a): “In advance of conducting well stimulation treatment, but at least 48 hours after cement placement, the operator shall run a radial cement evaluation log or other cement evaluation method that is approved by the Division” in order to demonstrate the following:
 - The casing is cemented according to all regulatory requirements
 - Cement quality is sufficient to ensure geologic and hydrologic isolation of the O&G formation.

Furthermore, during the WST, operators are required to monitor the treatment well, any required monitoring wells surrounding the treatment well, and any seismic activity in the area in order to prevent contamination of groundwater and surface water (14 CCR §1785).

Operators must also satisfy the requirements of Water Code (WC) §10783, prior to

stimulation, which requires the establishment of a regional groundwater program and identification of all water resources in the WST area. The requirements of WC §10783 are regulated by the SWRCB.

13. Describe how state standards for casing and cementing meet anticipated pressures associated with hydraulic fracturing to protect other resources and the environment. [9.2.1]

Answer 13: 14 CCR §1722.2 requires: “Each well shall have casing designed to provide anchorage for blowout prevention equipment and to seal off fluids and segregate them for the protection of all oil, gas, and freshwater zones. All casing strings shall be designed to withstand anticipated collapse, burst, and tension forces with the appropriate design factor provided to obtain a safe operation..”

Prior to conducting a WST, an applicant must test casing to 100% of the maximum anticipated surface treatment pressure per 14 CCR §1784.1. This ensures all casing strings have sufficient integrity to withstand maximum treatment pressures. However, may only apply pressure to the casing that is no greater than 80% of the maximum internal for any casing string in communication with the treatment [14 CCR §1784(b)]

14 CCR §1784.2 requires that prior to conducting the stimulation an operator must run an acceptable cement log that demonstrates;

“(1) The well was and continues to be cemented in accordance with the requirements of Section 1722.4 if it is an onshore well, or Section 1744.3 if it is an offshore well” and;

“(2) The quality of the cement is sufficient to ensure the geologic and hydrologic isolation of the oil and gas formation during and following well stimulation treatment.”

14. Discuss how the program identifies and, where deemed appropriate, manages risks associated with potential conduits for fluid migration in the area of hydraulic fracturing. [9.2.1]

Answer 14: The program identifies risk by reviewing the submitted data required by 14 CCR §1784. The reviewing engineer evaluates all fluid migration risks via nearby O&G wells or geologic features (for example, faults). If nearby wells pose a risk, the engineer will require the well(s) to be pressure monitored during stimulation or abandoned to division standards prior to stimulation, depending on the condition, location, and risk posed by the well.

If geologic features exist that pose a fluid migration risk the reviewing geologist will review the applicant’s documentation of why the features do or do not pose a fluid migration risk and determine, based upon review of additional data sources, whether there is a fluid migration risk and whether it can be mitigated. If it is determined in any case that the risk cannot be mitigated, the application will be denied or the applicant may propose a redesign of the treatment that mitigates the risk.

For a better understanding of the WST application review processes conducted prior to permit issuance please review the items listed under the “Well Stimulation Permit Review Process” heading found here: <https://www.conservation.ca.gov/calgem/Pages/WST.aspx>.

15. Describe program requirements that address actions to be taken in response to unanticipated operational or mechanical changes encountered during hydraulic fracturing that may cause concern. [9.2.1]

Answer 15: 14 CCR §1785 requires operators to monitor the listed parameters during treatment and details specific monitoring instances that require immediate termination of the stimulation as these occurrences indicate operational and/or mechanical changes that are cause for concern. This section also details the necessary steps an operator must take following any of the unanticipated changes detailed in the section. The monitoring requirements to be completed during stimulation include instances where the stimulation must be terminated immediately. These include the following:

- A pressure changes in the annulus between the tubing or casing through which well stimulation treatment fluid is conducted and the next larger tubular or casing more than 20% or greater than the calculated pressure increase due to pressure and/or temperature expansion;
- Pressure exceeding 90% of the API rated minimum internal yield on any casing string in communication with the well stimulation treatment, if the pressure testing under Section 1784.1(a)(1) was done at a pressure equal to 100% of the API rated minimum internal yield of the tested casing;
- Pressure exceeding 80% of the API rated minimum internal yield on any casing string in communication with the well stimulation treatment, if the pressure testing under Section 1784.1(a)(1) was done at a pressure equal to less than 100% of the API rated minimum internal yield of the tested casing;
- The operator has reason to suspect a potential breach in the cemented casing strings, the tubing strings utilized in the well stimulation treatment operations, or the geologic or hydrologic isolation of the formation.
- If any operational/design changes are required prior to conducting the stimulation, an operator must submit a change request form to CalGEM before stimulating. Change request forms can be submitted before or after permit issuance, however all requested changes must be approved and/or included in the issued permit or supplemental permit (if requested after initial permit issuance) prior to stimulation.

16. Briefly describe how surface controls associated with hydraulic fracturing, such as dikes, pits or tanks, meet Sections 5.5 (*Questions 17-46*) and 5.9 (*Questions 47-49*) of the guidelines. [9.2.1]

Answer 16: The California Regional Water Quality Control Boards has jurisdiction for the regulation of these disposal practices and issues permits (also known as waste discharge requirements or WDRs) for them (if appropriate) in accordance with the Water Code.

However, fluids used for hydraulic fracturing are required to be stored only in secondary containers and cannot be stored in sumps or pits pursuant to the regulatory requirements specified in 14 CCR §1786 (a) as stated below:

- 14 CCR §1786 (a) (1): “Fluids shall be stored in compliance with the secondary containment requirements of Section 1773.1, except that secondary containment is not required under this section for production facilities that are in one location for less than 30 days. The operator's Spill Contingency Plan shall account for all production facilities outside of secondary containment and include specific steps to be taken and equipment available to address a spill outside of secondary containment”.
- 14 CCR §1786 (a) (4): “Fluids shall be stored in containers and shall not be stored in sumps or pits”.

17. Do you have specific technical criteria in place in your state for the following types of pits? If so, please cite the reference for such criteria. [5.5.1]

<u>Yes/No</u>	<u>Type</u>	<u>Reference</u>
_____	Reserve pits	_____
_____	Production pits	_____
_____	Skimming/settling pits	_____
_____	Produced water pits	_____
_____	Percolation pits	_____
_____	Evaporation pits	_____
_____	Special purpose pits	_____
_____	Blowdown pits	_____
_____	Flare pits	_____
_____	Emergency pits	_____
_____	Basic sediment pits	_____
_____	Workover pits	_____
_____	Other	_____

Answer 17: WST regulations does not allow for the storage of hydraulic fracturing fluids in pits or sumps as specified in 14 CCR §1786 (a) (4).

14 CCR §1786 (a) (4): “Fluids shall be stored in containers and shall not be stored in sumps

or pits”.

To ensure proper management and disposal of all wastes generated during well stimulation treatment, operators are required to provide water management plan, and describe anticipated disposal method for well stimulation treatment waste fluids in their application for a permit to conduct well stimulation treatment pursuant to 14 CCR §1783.1 as stated below:

- ✓ 14 CCR §1783.1 (a): An application for a permit to perform a well stimulation treatment shall include the following:
 - (23) A water management plan that includes all of the following:
 - (A) An estimate of the amount of water to be used in the treatment;
 - (B) An estimate of water to be recycled following the well stimulation treatment;
 - (C) A description of how and where the water from a well stimulation treatment will be recycled, including a description of any treatment or reclamation activities to be conducted prior to recycling or reuse;
 - (D) The anticipated source of the water to be used in the treatment, including any of the following:
 - (i) The well or wells, if commingled, from which the water will be produced or extracted;
 - (ii) The water supplier, if it will be purchased from a supplier;
 - (iii) The point of diversion of surface water; and
 - (E) The anticipated disposal method that will be used for the recovered water in the flowback fluid from the treatment that is not produced water that would be reported pursuant to Section 3227;
 - (26) The estimated amount of treatment-generated waste materials that are not addressed by the water management plan, and the anticipated disposal method for the waste materials.

Treatment-generated waste fluid disposals may include Class II injection into a wastewater disposal injection well under the CalGEM’s Underground Injection Control (UIC) program. Prior to disposal, all well stimulation treatment generated wastes are required to be tested for the presence of any hazardous substances in accordance to applicable state laws and regulations pursuant to regulatory requirements specified in 14 CCR §1786 (a) (8) as shown below.

- 14 CCR §1786 (a) (8): An operator who generates a waste, as defined in Health and Safety Code section 25124 and California Code of Regulations, title 22, section 66261.2, in the course of conducting well stimulation activities, including but not limited to well stimulation treatment fluid, additives, produced water from a well, solids separated from well stimulation treatment fluid, remediation wastes, or any other wastes generated from the processing, treatment or management of these wastes, shall determine if the waste is a hazardous waste by sampling and testing the waste according to the methods

set forth in California Code of Regulations, title 22, division 4.5, chapter 11, article 3 (section 66261.20 et seq.), or according to an equivalent method approved by the Department of Toxic Substances Control pursuant to California Code of Regulations, title 22, section 66260.21, except where the operator has determined that the waste is excluded from regulation under California Code of Regulations, title 22, section 66261.4 or Health and Safety Code section 25143.2. Notwithstanding any other section in this article, wastes that are determined by the operator to be hazardous wastes shall be managed in compliance with all hazardous waste management requirements of the Department of Toxic Substances Control.

***Question 18-48 were addressed based on the Well Stimulation Regulations only and not other regulations under CalGEM.**

18. Describe how pits are permitted in your state. If any types of pits are distinguished or defined separately in the permitting process (e.g., reserve pits, production pits, emergency pits), describe how permit application differs for the different types. [5.5.2]
- a. Are pits permitted by rule in your state? If so, what requirements or limitations (e.g., geographic, geologic, topographic) are included? Give reference to the applicable statutory or regulatory sections. [5.5.2.b]
 - b. Are pits permitted individually and/or as part of facility, operational or general permits? Give reference to the applicable statutory or regulatory sections. [5.5.2.c]
 - c. What notification is required prior to construction and operation of rule-authorized pits? [5.5.2.d]
 - d. Briefly describe any provisions concerning the issuance and use of emergency permits for pits. Give reference to the applicable statutory or regulatory sections. [5.5.2.e]

Answer 18: Please refer to Answer 16 and 17. As related to WST regulation, 14 CCR §1786 (a) (4): “Fluids shall be stored in containers and shall not be stored in sumps or pits”. CalGEM shares jurisdiction over pits and sumps with the State Water Resources Control Board and the Regional Water Quality Control Boards (collectively, “Water Boards”). CalGEM and the Water Boards coordinate their regulation under a Memorandum of Agreement (MOA) that was updated in 2018. The MOA can be found here:

https://www.conservation.ca.gov/calgem/for_operators/Documents/MOU-MOA/2018.07.31_Revised_MOA_with_the_State_Water_Board.pdf

19. What requirements are included in statewide regulations regarding the size, depth, berm height and other construction parameters for pits? What is the permit review process to assure that these requirements are met? Give reference to the applicable regulatory sections. [5.5.3.a]

Answer 19: Please refer to Answer 16 and 17.

20. What requirements are in place to assure that there is no adverse impact to ground water or surface waters from use of the pit? Give reference to the applicable statutory or regulatory sections. [5.5.3.b]

Answer 20: Please refer to Answer 16 and 17.

21. What requirements are in place to assure structural integrity of pits? Give reference to the applicable statutory or regulatory sections. [5.5.3.c]

Answer 21: Please refer to Answer 16 and 17.

22. In what ways do construction requirements assure that pits are designed to accommodate fluids which are intended to be contained in them such as oil-based drilling muds or cuttings from salt sections? [5.5.3.d]

Answer 22: Please refer to Answer 16 and 17.

23. Do construction standards for pits differ depending on the waste characteristics of materials they are to receive? If so, describe the circumstances under which variances or special conditions are used. [5.5.3.e]

Answer 23: Please refer to Answer 16 and 17.

24. Under what conditions are pit liners required or tanks required in lieu of pits? What are the requirements for liner construction and installation? Give reference to the applicable statutory or regulatory sections. [5.5.3.e]

Answer 24: Please refer to Answer 16 and 17.

25. Describe the conditions under which a variance to liner requirements would be granted, and how the agency ensures that such a variance would not harm water, soil, or air. [5.5.3.e.vi]

Answer 25: Please refer to Answer 16 and 17.

26. What are the requirements for fencing, netting and caging of pits? Give reference to the applicable statutory or regulatory sections. [5.5.3.f]

Answer 26: Please refer to Answer 16 and 17.

27. What are the requirements for the placement of reserve pits relative to drilling equipment? [5.5.3.g]

Answer 27: Please refer to Answer 16 and 17.

28. What restrictions are placed on the type and characteristics of wastes that can be placed in pits? Please specify the requirements by type of pits. Give reference to the applicable statutory or regulatory sections. [5.5.4.a]

Answer 28: Please refer to Answer 16 and 17. Waste from WSTs cannot be placed in pits (14 CCR 1786).

29. What security guidelines or requirements are in place regarding pits? Give reference to the applicable statutory or regulatory sections. [5.5.4.b]

Answer 29: Please refer to Answer 16 and 17.

30. What are the requirements for maintaining a freeboard level in pits and how is this level calculated? Give reference to the applicable statutory or regulatory sections. [5.5.4.c]

Answer 30: Please refer to Answer 16 and 17.

31. How is liner integrity maintained and assured in lined pits? [5.5.4.d]

Answer 31: Please refer to Answer 16 and 17.

32. What routine inspections or monitoring are required by the operator to assure that pit operational and structural integrity requirements are being met? Are results of these inspections reported? [5.5.4.e]

Answer 32: Please refer to Answer 16 and 17.

33. What are the requirements for removal/disposal/recycling of hydrocarbons that accumulate in pits? Give reference to the applicable statutory or regulatory sections. [5.5.4.f]

Answer 33: Please refer to Answer 16 and 17.

34. What are the requirements for removal of separated oil or wastes from unlined skimming/settling pits? [5.5.4.g]

Answer 34: Please refer to Answer 16 and 17.

35. Are produced water pits allowed in your state? If so, what are the requirements for disposal of the water? [5.5.4.h]

Answer 35: Please refer to Answer 16 and 17.

36. Describe any restrictions concerning the use of percolation pits, and requirements for such pits to ensure that their contents do not contain constituents that may harm water, soil, or

air. [5.5.4.i]

Answer 36: Please refer to Answer 16 and 17.

37. Describe maintenance requirements for evaporation pits. Give reference to the applicable statutory or regulatory sections. [5.5.4.j]

Answer 37: Please refer to Answer 16 and 17.

38. What restrictions are placed on the use of emergency pits? Are notification of the regulatory agency and removal of fluids required when they are used? [5.5.4.k]

Answer 38: Please refer to Answer 16 and 17.

39. Describe the conditions under which unlined sediment pits may be used, and requirements to ensure that their contents do not contain constituents that may harm water, soil, or air. Give reference to the applicable statutory or regulatory sections. [5.5.4.l]

Answer 39: Please refer to Answer 16 and 17.

40. Is there a prohibition against the use of unlined basic sediment pits for oily wastes? [5.5.4.m]

Answer 40: Please refer to Answer 16 and 17.

41. What limitations are placed on the operation of workover pits? [5.5.4.n]

Answer 41: Please refer to Answer 16 and 17.

42. What time limit is placed on the closure of reserve pits? Give reference to the applicable statutory or regulatory sections. [5.5.5.a]

Answer 42: Please refer to Answer 16 and 17.

43. What testing of pit liquids is required before pit closure? When is on-site disposal of pit liquids authorized and what criteria apply to such disposal? Give reference to the applicable statutory or regulatory sections. [5.5.5.b]

Answer 43: Please refer to Answer 16 and 17.

44. Under what conditions must pit liquids be removed before closure? What are the requirements for disposal of these liquids? [5.5.5.c]

Answer 44: Please refer to Answer 16 and 17.

45. What are the requirements for closure and reclamation of pit sites? Give reference

to the applicable statutory or regulatory sections. [5.5.5.e]

Answer 45: Please refer to Answer 16 and 17.

46. What records are kept of pit sites and what is their availability to the public? Give reference to the applicable statutory or regulatory sections. [5.5.5.f]

Answer 46: Please refer to Answer 16 and 17.

47. Describe any requirements pertaining to the location, use, capacity, age and construction of E&P waste tanks, including registration, inventories, etc. [5.9.2.a]

Answer 47: Please refer to Answer 16 and 17.

48. Describe any state program pertaining to pollution prevention requirements relating to tanks. [5.9.2.c]

Answer 48: Please refer to Answer 16 and 17.

49. Briefly discuss each of the following operational requirements as they apply to E&P tanks (give reference to any statutory or regulatory requirements): [5.9.3]

- a. Corrosion protection
- b. Structural integrity
- c. Protection against overtopping
- d. Secondary containment/leak detection
- e. Covers or measures to prevent entry of wildlife
- f. Hydrogen sulfide emission control
- g. Describe any tank removal and closure requirements and provide reference to statutory or regulatory requirements. [5.9.4]

Answer 49: Please refer to Answer 16 and 17.

50. Briefly describe how contingency planning and spill risk management procedures related to hydraulic fracturing meet Section 4.2.1 (Questions 51-61) of the guidelines. [9.2.1]

Answer 50: California has adopted a contingency plan for O&G-related spills and releases. The California State Oil Spill Contingency Plan is an independent document regarding discharges of oil to all marine or inland surface waterways of California, and for oil spills to land. All state and local agencies must carry out spill response activities consistent with this Plan and other applicable federal, state, or local spill response plans. The plan can be found here:

<https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=172767&inline>

Prior to receiving a WST permit, operators are required to submit a spill contingency plan

for all O&G operations regulated by CalGEM and must include documentation of an operators handling of WST fluids and additives [14 CCR §1783.1(a)(19)].

51. Has the state adopted a state contingency plan for response to spills and releases? If so, briefly describe, including volumes that trigger a response, time in which notification and clean-up is to occur, and criteria (i.e., cleanup standards) used to assure that remediation was accomplished. Please provide reference to applicable portions of the state plan. [4.2.1.1.a]

Answer 51: Per the California State Oil Spill Contingency Plan of 2019, (<https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=172767&inline>) , Pg 64-65:

**DOGGR = CalGEM*

Responsibilities: The Division of Oil, Gas, and Geothermal Resources (DOGGR), within the Department of Conservation, is the lead state agency responsible for the supervision and regulation of well drilling and production operations within California. DOGGR's mandates include preventing damage to natural resources that could result from oil, gas, and geothermal drilling, production, or plugging and abandonment operations. DOGGR maintains records of the operator, location, production and injection data, and construction details for all oil, gas, and geothermal wells, plus location and capacity information for tanks associated with oil production operations.

Notification Requirements: Blowouts, fires, serious accidents, and significant gas or water leaks resulting from or associated with oil or gas drilling or producing operations, or related facilities, must be promptly reported to the appropriate DOGGR district office [14 CCR §1722(h)(i)].

However, regarding spills in oil fields in the San Joaquin Valley, there is a unique field rule regarding oil spills that must be reported:

- Spills of any amount that threaten state waters
- 5 bbls or more which are uncontained (state waters not threatened)
- 10 bbls or more within containment (state waters not threatened)
- Any spill involving a fire or explosion
- An operator who spills oil in amounts less than the San Joaquin Valley Oil Spill field rule volumetric thresholds is exempt from all other applicable state and local reporting requirements [PRC §3233]
- Capabilities and Limitations: Regarding a pollution incident resulting from a drilling or production facility, DOGGR can help determine the owner/operator, and advise on appropriate actions necessary to control and secure the source.

Please review CalGEM's related regulation regarding spill, 14CCR§ 1722.9. Spill Contingency Plan Requirements.

<https://www.conservation.ca.gov/index/Documents/CALGEM-SR-1%20Web%20Copy.pdf>

52. Describe any funding provisions to enable the state to respond to spills and releases in the event a responsible operator cannot be located or is unwilling or unable to respond, and any provisions for reimbursement of the state for monies so expended. [4.2.1.1.b]

Answer 52: The OSPR Administrator has the primary authority to direct prevention, removal, abatement, response, containment, and cleanup efforts with regard to all aspects of any oil spill into marine and inland surface waters of the state, but not ground waters [GC §8670.7(a), §8670.62; FGC §5655(d)]. OSPR’s planning, preparedness, and financial responsibility programs expanded from marine waters to include inland waters in 2014 through the implementation of Senate Bill 861 (Ch. 35, Statutes of 2014).

53. Describe any mechanisms provided by the state for the operators or public to report spills and releases. Please indicate if these mechanisms include telephone access 24 hours a day, 7 days a week, a 1-800 telephone number and telephone answering capabilities. [4.2.1.2]

Answer 53: please see: § 1722.9. Spill Contingency Plan Requirements.

A spill contingency plan shall be designed to prevent and respond to unauthorized releases.

54. Describe any interagency coordination of actions between agencies having jurisdiction for response to spills and releases, including clear designation of on-site spill responsibilities. [4.2.1.3]

Answer 53: please see the answer to questions 51 and 52.

The section 3 “SECTION 3 – Primary Authority for Oil Spill Response” of the California

State Oil Spill (<https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=172767&inline>) Contingency Plan sets forth the roles and responsibilities of those State agencies with primary authority for oil spills in California. Oil spill incidents often involve a response from multiple agencies having different jurisdictional authorities, capabilities, and functions. In some circumstances, the jurisdictional mandates of several agencies may overlap. Use of the Standardized Emergency Management System (SEMS) and the National Incident Management System (NIMS) to organize spill response ensures that inter-agency responsibilities are collectively addressed.

55. Describe any requirements for operators to take measures prevent and respond to spills and releases at E&P facilities. Indicate if these requirements are spelled out in regulations or guidance or if they are included in operator-specific or site-specific plans. [4.2.1.4]

Answer 55: please see: § 1722.9. Spill Contingency Plan Requirements.

A spill contingency plan shall be designed to prevent and respond to unauthorized releases.

56. Describe any general state contingency program elements, including those that address:
- a. Facilities, materials and equipment that may pose a significant threat to

human health or the environment. [4.2.1.4.1.a]

- b. The various environments at risk, including surface and groundwater and land (environmentally sensitive areas, special soil or geologic conditions, urban areas, cultural and special resource areas). [4.2.1.4.1.b]
- c. Measures to address public and responder safety concerns, including training for response personnel. [4.2.1.4.1.c]
- d. The operator's incident command structure, including emergency contact information for key personnel. [4.2.1.4.1.d]
- e. Equipment, manpower and contracted services to respond to spills and releases.[4.2.1.4.1.e]
- f. Opportunities for coordination of joint response actions. [4.2.1.4.1.f]
- g. Procedures for communication with impacted or threatened parties. [4.2.1.4.1.g]
- h. Methods of containment of spills and unauthorized releases. [4.2.1.4.1.h]
- i. Methods of disposal of materials of concern. [4.2.1.4.1.i]

Answer 56: please check the answer to question 51 or the online pdf files for further information:

(<https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=172767&inline> and <https://www.conservation.ca.gov/index/Documents/CALGEM-SR-1%20Web%20Copy.pdf>)

57. Describe any spill prevention measures, including those that may include:

- a. Secondary containment measures such as dikes, berms, firewalls or equivalent measures. [4.2.1.4.2.a]
- b. Tertiary containment or monitoring systems in high risk areas. [4.2.1.4.2.b]

- c. Inspection, testing and maintenance schedules and procedures for facilities and equipment. [4.2.1.4.2.c]
- d. Site security measures as necessary. [4.2.1.4.2.d]

Periodic review of opportunities to reduce future spills and releases.
[4.2.1.4.2.e]

Answer 57: please check the answer to question 51 or the online pdf files for further information:

(<https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=172767&inline> and <https://www.conservation.ca.gov/index/Documents/CALGEM-SR-1%20Web%20Copy.pdf>)

58. Describe any spill response measures, including those that may include:

- a. Agencies and parties to be notified in the event of a spill or unauthorized release. [4.2.1.4.3.a]
- b. Type of reporting (verbal, written) required. [4.2.1.4.3.b]
- c. Reporting time requirements. [4.2.1.4.3.c]
- d. Reporting thresholds. [4.2.1.4.3.d]
- e. Type of information to be reported, such as operator name, a description of the incident including date and time of 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 and land, and weather conditions. [4.2.1.4.3.e]

Any requirements for final incident reporting, site monitoring, and necessary agency approvals.
[4.2.1.4.3.f]

Answer 58: The California State Oil Spill Contingency Plan addresses the response measures and reporting requirements for oil spill and release.

<https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=172767&inline>

59. Describe any state guidance for containment, abatement and remediation of spills and releases including:

Answer 59: Please see Cal. Code of Regs., tit. 14, §§ 1722(b), 1786(a), 1783.1(a)(19).

§ 1722.9. Spill Contingency Plan Requirements. Operators are required to submit their Spill Contingency Plan for every WST operation.

Also, in §1786. (5): In the event of an unauthorized release, the operator shall immediately implement the Spill Contingency Plan; notify the Regional Water Board and any other appropriate response entities for the location and the type of fluids involved, as required by all applicable federal, state, and local laws and regulations; and shall perform clean up and remediation of the area, and dispose of any cleanup or remediation waste, as required by all applicable federal, state, and local laws and regulations.

a. *Clean-up standards. [4.2.1.4.3.g]*

Answer 59a: § 1722.9. (e)

b. *Required sampling and analyses. [4.2.1.4.3.h]*

Answer 59b: §1786. (8) An operator who generates a waste, as defined in Health and Safety Code section 25124 and California Code of Regulations, title 22, section 66261.2, in the course of conducting well stimulation activities, including but not limited to well stimulation treatment fluid, additives, produced water from a well, solids separated from well stimulation treatment fluid, remediation wastes, or any other wastes generated from the processing, treatment or management of these wastes, shall determine if the waste is a hazardous waste by sampling and testing the waste according to the methods set forth in California Code of Regulations, title 22, division 4.5, chapter 11, article 3 (section 66261.20 et seq.), or according to an equivalent method approved by the Department of Toxic Substances Control pursuant to California Code of Regulations, title 22, section 66260.21, except where the operator has determined that the waste is excluded from regulation under California Code of Regulations, title 22, section 66261.4 or Health and Safety Code section 25143.2.

c. *Any approved non-mechanical response actions. [4.2.1.4.3.i]*

60. *Describe any follow-up actions by the state for the failure of an operator to report or respond to spills and unauthorized releases, including enforcement, assessment of damages, and reimbursement of costs for responding to spills and releases. [4.2.1.5]*

Answer 60: §1786. (6) Within 5 days of the occurrence of an unauthorized release, the operator shall provide the Division a written report that includes:

- (A) A description of the activities leading up to the release;
- (B) The type and volumes of fluid released;
- (C) The cause(s) of release;
- (D) Action taken to stop, control, and respond to the release; and
- (E) Steps taken and any changes in operational procedures implemented by the operator to prevent future releases.

61. Describe any database that includes information on spills and releases, and indicate whether such database is analyzed as part of a program effectiveness evaluation [4.2.1.6]

Answer 63. Cal Office of Emergency Services database for spill and releases:

[https://w3.calema.ca.gov/operational/mal haz.nsf/\\$defaultview](https://w3.calema.ca.gov/operational/mal haz.nsf/$defaultview)

62. Briefly discuss how hydraulic fracturing waste characterization requirements, including, as appropriate, testing of fracturing fluids, are consistent with Section 5.2 (*Question 63*) of the guidelines. [9.2.1]

Answer 62: Per California WST regulation, operators shall adhere to the requirements regarding hydraulic fracturing waste management included in regulations, section §1786, § 1788.

§1786. (8) An operator who generates a waste, as defined in Health and Safety Code section 25124 and California Code of Regulations, title 22, section 66261.2, in the course of conducting well stimulation activities, including but not limited to well stimulation treatment fluid, additives, produced water from a well, solids separated from well stimulation treatment fluid, remediation wastes, or any other wastes generated from the processing, treatment or management of these wastes, shall determine if the waste is a hazardous waste by sampling and testing the waste according to the methods set forth in California Code of Regulations, title 22, division 4.5, chapter 11, article 3 (section 66261.20 et seq.), or according to an equivalent method approved by the Department of Toxic Substances Control pursuant to California Code of Regulations, title 22, section 66260.21, except where the operator has determined that the waste is excluded from regulation under California Code of Regulations, title 22, section 66261.4 or Health and Safety Code section 25143.2.

§ 1788. (D) Composition of water recovered from the well following the well stimulation treatment, sampled after a calculated wellbore volume has been produced back but before three calculated wellbore volumes have been produced back, and then sampled a second time after 30 days of production after the first sample is taken, with both samples taken prior to being placed in a storage tank or being aggregated with fluid from other wells;

§ 1788. (E) Composition of water recovered from the well following the well stimulation treatment shall be determined by testing the samples taken under paragraph (D) for all of the following: appropriate indicator compound(s) for the well stimulation treatment fluid; total dissolved solids; metals listed in California Code of Regulations, title 22, section 66261.24, subdivision (a)(2)(A); benzene, toluene, ethyl benzene, and xylenes; major and minor cations (including sodium, potassium, magnesium, and calcium); major and minor anions (including nitrate, chloride, sulfate, alkalinity, and bromide); and trace elements (including lithium, strontium, and boron); radium-226, gross alpha-beta, radon 222,

fluoride, iron (redox), manganese (redox), H₂S (redox), nitrate+nitrite (redox), strontium, thallium, mercury, and methane; (G) Sampling and testing conducted under subdivision (a)(12) is separate from and in addition to any sampling or testing that may be required to make hazardous waste determinations under the requirements of the Department of Toxic Substances Control;

§ 1788. (15) Any radiological components or tracers injected into the well as part of the well stimulation treatment, a description of the recovery method, if any, for those components or tracers, the recovery rate, and specific disposal information for recovered components or tracers;

§ 1788. (16) The radioactivity of the recovered well stimulation fluids, and a brief description of the equipment and method used to determine the radioactivity.

63. *Describe any waste characterization requirements, including sampling, analysis, frequency, and quality control procedures. Discuss the purpose and use of the information resulting from the characterizations. Provide reference to any statutory, regulatory, guidance or policy basis for waste characterization requirements. [5.2.2, 5.2.3]*

Prior to disposal, all well stimulation treatment generated wastes are required to be tested for the presence of any hazardous substances in accordance to applicable state laws and regulations pursuant to regulatory requirements specified in 14 CCR §1786 (a) (8) as shown below.

- 14 CCR §1786 (a) (8): An operator who generates a waste, as defined in Health and Safety Code section 25124 and California Code of Regulations, title 22, section 66261.2, in the course of conducting well stimulation activities, including but not limited to well stimulation treatment fluid, additives, produced water from a well, solids separated from well stimulation treatment fluid, remediation wastes, or any other wastes generated from the processing, treatment or management of these wastes, shall determine if the waste is a hazardous waste by sampling and testing the waste according to the methods set forth in California Code of Regulations, title 22, division 4.5, chapter 11, article 3 (section 66261.20 et seq.), or according to an equivalent method approved by the Department of Toxic Substances Control pursuant to California Code of Regulations, title 22, section 66260.21, except where the operator has determined that the waste is excluded from regulation under California Code of Regulations, title 22, section 66261.4 or Health and Safety Code section 25143.2. Notwithstanding any other section in this article, wastes that are determined by the operator to be hazardous wastes shall be managed in compliance with all hazardous waste management requirements of the Department of Toxic Substances Control.

64. Briefly describe how the waste management hierarchy contained in Section 5.3 (*Questions 65-68*) of the guidelines (source reduction, recycling, treatment and disposal), including the provisions relating to toxicity reduction, are promoted for hydraulic fracturing. [9.2.1]

Answer 64: Please refer to Answer 17. Please see § 1722.9, § 1786, and § 1788.

Operators are required to submit their plan for using chemical in hydraulic fracturing alongside the application. Also, there are storage and handling of Treatment Fluids and Wastes regulation in place. For more information please check the following sections in the WST regulation:

- Section 1783.1 (24-30) “Contents of Application for Permit to Perform Well Stimulation Treatment.”
- 1786. Storage and Handling of Well Stimulation Treatment Fluids and Wastes

§1783.1. Contents of Application for Permit to Perform Well Stimulation Treatment:

- (C) A description of how and where the water from a well stimulation treatment will be recycled, including a description of any treatment or reclamation activities to be conducted prior to recycling or reuse.
- Also, § 3160: (3) (A) Evaluate all aspects and effects of well stimulation treatments, including, but not limited to, the well stimulation treatment, additive and water transportation to and from the well site, mixing and handling of the well stimulation treatment fluids and additives onsite, the use and potential for use of nontoxic additives and the use or reuse of treated or produced water in well stimulation treatment fluids, and flowback fluids and the handling, treatment, and disposal of flowback fluids and other materials, if any, generated by the treatment. Specifically, the potential for the use of recycled water in well stimulation treatments, including appropriate water quality requirements and available treatment technologies, shall be evaluated. Well stimulation treatments include, but are not limited to, hydraulic fracturing and acid well stimulation treatments.

CHAPTER 6.5. Hazardous Waste Control explains about the methods and procedure to reduce waste; however, it is general about oil and gas operation, not specific to hydraulic fracturing. § 25159.10.(C): “State-of-the-art design and operation safeguards of injection wells without adequate groundwater monitoring, specific geological information, and other system safeguards cannot guarantee that migration of hazardous wastes into underground sources of drinking water will not occur.”

§ 25159.12. (h): “A facility may consist of several waste management units, including, but not limited to, surface impoundments, landfills, underground or aboveground tanks, sumps, pits, ponds, and lagoons that are associated with an injection well.”

For more information, also see:

- § 1748.1. Waste Disposal. All discharges into the ocean shall conform to the requirements of the appropriate Regional Water Quality Control Board.

- § 1775. Oilfield Wastes and Refuse.

65. Describe any programs promoting a hierarchy of waste management practices, including the following in preferred order: [5.3]

- a. Source reduction to reduce the quantity and/or toxicity of waste. [5.3.a]
- b. Recycling or reuse to reclaim waste. [5.3.b]
- c. Treatment to reduce the volume or toxicity of the waste. [5.3.c]
- d. Proper disposal of remaining waste. [5.3.d]

No answer provided.

66. Describe any E&P waste source reduction opportunities promoted by the state, such as equipment modifications, procedure changes, product substitution, reduction in use of fresh water, good housekeeping and preventative maintenance, planning, training, and selection of contractors. [5.3.1]

No answer provided.

67. Describe any E&P waste recycling or reuse opportunities promoted by the state. [5.3.2]

No answer provided.

68. Describe any program elements that encourage E&P waste source reduction and recycling through policy, training, technical assistance or incentives. [5.3.3]

No answer provided.

69. Briefly describe how the tracking of hydraulic fracturing waste disposed at commercial or centralized facilities meets the requirements of Section 5.10.2.3 (Questions 70-71) of the guidelines. [9.2.1]

Answer 69: Please see answer to question 62 and the following statutes related to waste disposal.

- § 25159.10 to § 25159.25. (Health and Safety Code - CHAPTER 6.5. Hazardous Waste Control)
- § 1748.1. Waste Disposal
- § 1775. Oilfield Wastes and Refuse
- § 1786. Storage and Handling of Well Stimulation Treatment Fluids and Wastes

70. Describe the waste tracking requirements of commercial or centralized disposal facilities. [5.10.2.3]

No answer provided.

71. *Are operators who transport waste via pipeline required to report waste quantities? If so, with what frequency? [5.10.2.3.1]*

Answer: CalGEM receives monthly reports from each operator for the amount of water produced and the amount water injected at the operation.

72. Briefly describe how procedures in place for receipt of complaints related to hydraulic fracturing are consistent with Section 4.1.2.c (*Question 73*) of the guidelines. [9.2.1]

Answer 72: Complaints related to hydraulic fracturing are treated the same as any complaints receive by CalGEM. The Division’s Manual of Instruction clearly states, “All complaints will be investigated, and appropriate action taken when it is justified. Every effort will be made to resolve a valid problem and satisfy a complainant, or the complainant will be informed why a matter is not within our jurisdiction, if that is the case. Complaints may be classified as informal or formal.” Any complaints CalGEM receives about hydraulic fracturing are forwarded to the WST unit for review and investigation. Depending on the content of the complaint, the WST unit may reach out to legal for support or utilize CalGEM staff in the regional offices for on-site evaluations of WST operations.

73. *Briefly describe your compliance evaluation program with regard to the following activities (give reference to any statutory or regulatory requirements for each):*

- a. Public complaint and follow-up, including response times. [4.1.2.c]*

Please refer to Answer 72. Depending on the nature of the complaint, the WST may respond to the complaint the next day or within a week. The response time varies based on the type of complaint received and the amount of time it takes the unit to investigate the complaint.

74. Describe any required notification prior to, and reporting after, completion of hydraulic fracturing operations. [9.2.2]

Answer 74: Operators are required to apply for a permit to conduct well stimulation prior to conducting the operation. The application shall include all the information listed in §1783.1.

§1783.2. Neighbor Notification: (a) The operator of any oil or gas well receiving a permit to conduct well stimulation treatment from the Division shall hire an independent third party to perform the following action:

- (1) Identify surface property owners and tenants, other than the operator of the well subject to well stimulation treatment, of legally recognized parcels of land situated

within a 1500-foot radius of the wellhead receiving well stimulation treatment, or within 500 feet of the surface representation of the horizontal path of the subsurface parts of such well;

- (2) Provide all surface property owners and tenants so identified, or their duly authorized agents, with neighbor notification that shall include and must be limited to both of the following:
 - (A) A copy of the approved well stimulation treatment permit; and
 - (B) A completed Well Stimulation Treatment Neighbor Notification Form (7/15 version), hereby incorporated by reference; and
- (3) Compile and mail to the Division a declaration of notice pursuant to subdivision (i).

§1783.d. The operator shall notify the Division at least 72 hours prior to commencing well stimulation so that Division staff may witness. Between three and fifteen hours prior to commencing, the operator shall confirm with the Division that the well stimulation treatment is proceeding.

§1784.1(b) The operator shall notify the Division at least 24 hours prior to conducting the pressure testing required under subdivision (a) so that Division staff may witness. The charting of pressure testing required under subdivision (a)(1) shall be provided to the Division not less than 12 hours before commencing well stimulation treatment.

Within 60 days after the cessation of a well stimulation treatment, the operator shall publicly disclose all of the information in “§1788. Required Public Disclosures.

§1789. Post-Well Stimulation Treatment Report: (a) Within 60 days after the cessation of a well stimulation treatment, the operator shall submit a report to the Division describing the items in §1789.

75. Is notification sufficient to allow the presence of field staff to monitor hydraulic fracturing activities? [9.2.2]

Answer 75: §1783.d. The operator shall notify the Division at least 72 hours prior to commencing well stimulation so that Division staff may witness. Between three and fifteen hours prior to commencing, the operator shall confirm with the Division that the well stimulation treatment is proceeding.

§1784.1(b) The operator shall notify the Division at least 24 hours prior to conducting the pressure testing required under subdivision (a) so that Division staff may witness. The charting of pressure testing required under subdivision (a)(1) shall be provided to the Division not less than 12 hours before commencing well stimulation treatment.

76. Describe reporting requirements for hydraulic fracturing activities and whether they include the identification of materials used, aggregate volumes of fracturing fluids and proppant used, and fracture pressures recorded. [9.2.2]

Answer 76: The report includes materials used, aggregate volumes of fracturing fluids and

proppant used, and fracture pressures recorded which are posted to www.wellstar.conservacion.ca.gov and <https://www.fracfocus.org/> .

Please see §1789. Post-Well Stimulation Treatment Report:

(a) Within 60 days after the cessation of a well stimulation treatment, the operator shall submit a report to the Division describing:

- (1) The pressures recorded during monitoring required under Section 1785(a) during the well stimulation treatment;
- (2) The pressures recorded during the first 30 days of production pressure monitoring under Section 1787(d)(1);
- (3) The date and time that each stage of the well stimulation treatment was performed;
- (4) How the actual well stimulation treatment differs from what was anticipated in the well stimulation treatment design that was prepared under Section 1784(b);
- (5) How the actual location of the well stimulation treatment differs from what was indicated in the permit application under Section 1783.1(a)(15); and
- (6) A description of hazardous wastes generated during the well stimulation activities and their disposition, including copies of all hazardous waste manifests used to transport the hazardous wastes offsite to an authorized facility.

(b) If information found in a report submitted under this section is found in a well record that the Division has determined is not public record, pursuant to Public Resources Code section 3234, then the Division will provide the information to other state agencies as needed for regulatory purposes and in accordance with a written agreement with the other state agency regarding sharing of confidential information.

NOTE: Authority cited: Sections 3013 and 3160, Public Resources Code. Reference: Sections 3106, 3160 and 3215, Public Resources Code.

77. Describe any mechanisms for disclosure of information on chemical constituents used in hydraulic fracturing fluids to the state in the event of an investigation or to medical personnel in the event of a medical emergency. [9.2.2]

Answer 77: As part of the initial well stimulation application, operators are required to disclose any anticipated chemical constituents to be used in the hydraulic fracturing fluids per §1783.1. Specifically, the following addresses the chemical constituents.

- (25) The anticipated source, amount, and composition of the base fluids to be used in the treatment, including pH, flash point, and any constituents listed in California Code of Regulations, title 22, section 66261.24, subdivision (a)(2)(A) and (B);...
- (28) A complete list of the names, Chemical Abstract Service numbers, and estimated concentrations, in percent by mass, of each and every chemical constituent of the well stimulation fluids anticipated to be used in the treatment (if a Chemical Abstract Service number does not exist for a chemical constituent, another unique identifier may be used, if available);

- (29) Whether it is anticipated that radiological components or tracers will be injected during the well stimulation treatment;...

If an investigation is to occur for well stimulation operation, the initial information disclosed by the operators in the application will provide the proposed additives/chemicals in the hydraulic fracturing fluid. The operators are also required to test flowback fluid after stimulation. These data can be used in an investigation.

§ 1722.9. Spill Contingency Plan Requirements:

(g) A list of all chemicals for which a Material Safety Data Sheet is required, and the location of the Material Safety Data Sheets for those chemicals.

78. Briefly describe how hydraulic fracturing information submitted that is of a confidential business nature, is treated consistent with Section 4.2.2.1 (*Question 79*) of the guidelines. [9.2.2]

Answer 78: CalGEM's well stimulation application and disclosure information are posted on WellSTAR website for public review. www.wellstar.conservation.ca.gov

Any claim for confidential business nature will be treated as started under §1783.1 (b): (b) A claim of trade secret protection for the information required under this section shall be handled in the manner specified under Public Resources Code section 3160, subdivision (j). (Pg 46)

<https://www.conservation.ca.gov/index/Documents/CALGEM-SR-1%20Web%20Copy.pdf>

PRC 3160, subdivision (k) also states that "A well granted confidential status pursuant to Section 3234 shall not be required to disclose well stimulation treatment fluid information pursuant to subdivision (g) until the confidential status of the well ceases. Notwithstanding the confidential status of a well, it is public information that a well will be or has been subject to a well stimulation treatment."

79. Describe the availability of agency records for public review and procedures to protect confidential business information. [4.2.2.1]

Answer 79. Please see answer for question 78 above.

80. Briefly discuss if, in addition to the personnel and funding recommendations found in Section 4.3 (*Questions 81-86*) of the guidelines, state staffing levels sufficient to receive, record and respond to complaints of human health impacts and environmental damage resulting from hydraulic fracturing. [9.2.3]

Answer 80: To date, state staffing level in the WST unit has been sufficient to receive,

record, and respond to complaints related to hydraulic fracturing. There has been little to no complaint received related to WST to date.

81. *Describe the administrative support assigned to the E&P environmental regulatory program. If some of these personnel are also responsible for non-E&P program activities, please provide the percent of time or equivalent full-time support related to E&P matters. Include the number, classifications, functions and duties, and minimum experience and training requirements for these positions. Describe any additional training that is made available to them. Indicate whether this level of administrative staffing is considered adequate. [4.3.1, 4.3.1.1]*

Answer 81: WST unit has one full time staff service analyst (SSA) from CalGEM's Program Support Unit assigned to assist with administrative and data management. The main responsibilities for the SSA include tracking the applications and post stimulation reports, providing total count of each item (application and disclosure reports submitted) weekly to the supervisor, uploading information into the new CalGEM database for WST unit, keeping updated on any outstanding service tickets submitted by WST unit to the IT department, mailing the annual neighbor notification audit letters and maintaining the well stimulation inbox for any outside correspondence. The staff was trained by the WST unit to understand the terminology and basic understanding of the WST operations. As part of the CalGEM division, the staff has all the training resources available as shown below in answer for question #83.

The requirement for the SSA position can be found here: <https://www.calhr.ca.gov/state-hr-professionals/Pages/5157.aspx>

82. *Describe how legal support is provided to the E&P environmental regulatory program (e.g., in-house lawyers, state attorney general, independent counsel). Indicate the level of support provided and compare it to the level of support considered necessary. [4.3.1.2]*

Answer 82: The Department of Conservation has an in-house legal office, with several attorneys on staff. Two attorneys are dedicated to supporting the WST unit. All requests for legal support are routed through these attorneys, and the attorneys attend a biweekly meeting with the WST program manager and the Oil and Gas Supervisor to oversee the operation of the program. The level of legal support provided to the WST unit meets the unit's needs and is satisfactory for its operations.

83. *Describe the technical staff assigned to provide geological or engineering support to the E&P environmental regulatory program. If some of these personnel are also responsible for non-E&P program activities, please provide the percent of time or equivalent full-time support related to E&P matters. Include the number, classifications, functions and duties and minimum experience and training requirements for these positions. Describe any additional training that is made available to them. Indicate whether this level of technical staffing is considered adequate. [4.3.1.3]*

Answer 83: To date, the level of technical staffing in WST unit has been sufficient to review and process all WST applications. The WST unit currently has two engineering geologists assigned to review and evaluate the geological review of the proposed stimulation activities. Both are certified Professional Geologists and have numerous years of experience. Part of the job description for the engineering geologist states: The incumbent will assist in the evaluation of required well stimulation documents, disclosures and public notification and compliance with the WSP implementation strategies. This position performs assignments that require a high degree of knowledge and skill in reviewing and analyzing geologic reports, perform engineering work and calculations. This position also requires independent and teamwork, communication, and data management.

The requirement for Engineering Geologist position can be found here: <https://www.calhr.ca.gov/state-hr-professionals/Pages/3756.aspx>

The WST unit also have four Associate Oil and Gas Engineers. Their job functions include: conduct evaluations of well stimulation applications, notices, notifications, permit approvals, post well stimulation public disclosure documents, and chemical disclosure indexes to ensure compliance with the Division's Permanent Well Stimulation regulations, statewide processes and procedures and statutory and regulatory requirements. Two of the engineers are assigned to review the well stimulation applications and issue permits. Their permitting responsibilities include reviewing the applications to verify completeness of technical information related to the stimulation, evaluating the risk associated with the proposed stimulations including the geological assessment conducted by the engineering geologists and ensuring that all data required by the regulations are met prior to issuing permits. Another engineer is dedicated to coordinating the review process between different MOA agencies and WST unit for the applications. An associate engineer, along with the two engineering geologists, are assigned to review the post stimulation disclosure data for chemicals used during the stimulation, recovered fluid data and analytical data.

The requirements for the Associate Oil & Gas Engineer position can be found here: <https://www.calhr.ca.gov/state-hr-professionals/Pages/3783.aspx>

CalGEM currently has internal trainings available for all its staff related to oil field operations, project management, professional licensing and regulatory process. Below are some of the current training modules available to all CalGEM staff.

General Oil & Gas Information

- [Introduction to Oil Operations](#)

Casing Integrity & Cement Evaluation

- [Ultrasonic Imager Tool \(USIT\) Application](#)
- [Integrity Explorer Cement Evaluation](#)
- [High Speed Radial Cement Bond Log](#)

Facilities & Environmental

- [Pipelines - AB 1420 Regulations and Compliance](#)
- [Pipelines - Witnessing and Evaluating Pressure Tests and Guided Wave Tests](#)
- [CalGEM Oil, & Gas Pipeline, Facilities, and CA Regulatory Requirements - SPE Western Regional Meeting 2019](#)
 - [SPE Course - Introduction](#)
 - [SPE Course - Pipelines](#)
 - [SPE Course - Pipeline Management Plan](#)
 - [SPE Course - Pipeline Mapping GIS](#)
 - [SPE Course - Tanks](#)
 - [SPE Course - Sumps](#)
 - [SPE Course - Spill Contingency Plans](#)
 - [SPE Course - Out-of-Service Facilities](#)
 - [SPE Course - CalGEM Pipeline & Facilities Program](#)
 - [SPE Course - Conclusion](#)

Professional Licensing in California

- [Licensing Mentor List & CalGEM Policy](#)
- [Licensure Requirements in California](#)
- [BPELSG Additional Licensing References](#)

Regulatory Information

- [Rule Making Process - Office of Administrative Law](#)

- Introduction to CalGEM, CA Geology, & Groundwater
 - Module 1 Lesson 1 - *Petroleum Geology* is a PETEX e-Learning course and prerequisite that is provided before attending class
 - [Module 1 Lesson 2 - Introduction to CalGEM, CA Geology, & Groundwater](#)
 - [Module 1 Lesson 3 - Groundwater Regulation in California](#)
- Wellbore Design & Cementing
 - Module 2 Lesson 1 - *Primer of Oilwell Drilling* is a PETEX e-Learning course and prerequisite that is provided before attending class
 - [Module 2 Lesson 2 - Wellbore Design & Completion](#)
 - [Module 2 Lesson 3 - Cementing](#)
- Well Control & BOPE Testing
 - [Module 3 Lesson 1 – Well Control](#)
 - [Module 3 Lesson 2 – BOPE Inspection & Testing](#)
 - [Module 3 Lesson 3 – Testing Scenarios, Protocols & Safety](#)
- Abandonment Operations
 - [Module 4 Lesson 1 – Basics of Plugging & Abandonment](#)
 - [Module 4 Lesson 2 – Considerations for Different Well Types](#)
- Underground Injection Control Testing
 - [Module 5 Lesson 1 – Basics of Injection Wells](#)
 - [Module 5 Lesson 2 – Underground Injection Control](#)
 - [Module 5 Lesson 3 – Mechanical Integrity Tests](#)
- Environmental Lease Inspection
 - [Module 6 Lesson 1 – Production Facilities](#)
 - [Module 6 Lesson 2 – Environmental Concerns](#)
 - [Module 6 Lesson 3 – Contingency Plans & Lease Inspections](#)
 - [Module 6 Lesson 4 – Well Site & Lease Restoration](#)
- [Pipelines - Witnessing and Evaluating Pressure Tests and Guided Wave Tests](#)
- **Field Enforcement Practices & Policies** – Field Engineers are the first line of Division enforcement. The information provided below is to give direction to field staff on necessary steps to building an enforcement case. Often, enforcement starts with properly documented field observations. The links provided below are tools staff should use to help management build a case when one is warranted.
 - [Violations Summary Template](#) – This template includes what is required when a Field Engineer documents violations that need to be communicated to upper management. The PowerPoint could warrant a technical write up by an Associate Engineer or Senior Engineer that would lead to an enforcement order.
 - [Violation Summary Example](#) – This is an excellent example of presentation to request an enforcement order that was made by Eric Heaton, Engineering Geologist.
- **Field Safety Program** – The Division is currently working on a Hazard Awareness Plan to ensure field staff are aware of hazards and how to mitigate their risk of exposure while working in oil, gas, and geothermal fields. The Hazard Awareness Plan will identify the mandated safety training Division field staff are required to take.
 - [2020 CalGEM Field Safety Program](#)

84. *Describe the field personnel assigned to conduct inspections and assure compliance with the E&P environmental regulatory program. If some of these personnel are also responsible for non-E&P program activities, please provide the percent of time or equivalent full time support related to E&P matters. Include the number, classifications, functions and duties and minimum experience and training requirements for these positions. Describe any additional training that is made available to them. Indicate whether this level of field staffing is considered adequate. [4.3.1.4]*

Answer 84: WST permits are issued by the WST unit in CalGEM headquarters. The field assignments related to WST are then carried out by the local district staff. Associate Oil & Gas Engineers and Engineering Geologists from the district offices are responsible for review and evaluation of pressure tests, witnessing stimulations, and conducting chemical checks on site for WST related activities. There is no set number of staff assigned to WST as local district staff oversee handling various projects. All pressure test results are reviewed by district engineers for approval prior to the WST.

85. *Describe the training requirements for agency personnel on the regulations, policies and criteria applicable to E&P environmental regulatory matters. [4.3.1.5]*

Answer 85: All CalGEM staff working in the WST unit are expected to be familiar with DOC's regulations regarding WST, and to stay informed of the most updated policies and regulatory criteria in the performance of their duties.

86. *Describe the methods used for funding the E&P environmental regulatory program in your state (general appropriations, special funds, fees, etc.). If you feel that current funding levels are inadequate, describe the levels of funding needed and the activities that would be conducted. [4.3.2]*

Answer 86: There is a small statewide assessment on oil and gas produced in California. This assessment supports CalGEM, and is levied pursuant to Article 7, Division 3, of the Public Resources Code.

The assessment rate is established in June of each year and is based on CalGEM's estimated budget for the ensuing fiscal year and the total amount of assessable oil and gas produced during the prior calendar year. This rate is then imposed on each barrel of oil and each 10,000 cubic feet of natural gas produced.

87. *Describe staff training to stay current with new and developing hydraulic fracturing technology. [9.2.3]*

Answer 87.

- Holding internal and external DOC trainings
- Attending seminars/webinars and lectures held by SPE,
- Collaborating with National Labs to review the state’s technical standards and legal requirements for public health, safety, and environmental protection are met prior to approval of each permit. In November 2019, the Department of Conservation asked experts at the Lawrence Livermore National Laboratory (LLNL) to assess CalGEM’s permit review process. LLNL also evaluated the completeness of operators’ application materials and CalGEM’s engineering and geologic analysis.

88. Briefly describe how the state agency provides 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 (*Question 89*) of the guidelines. 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. [9.2.4]

Answer 88: The Division has held public workshops across the state on both of these topics. Information is also on our website for public review and education. Additionally, the Department of Conservation is currently evaluating the education materials that exist and exploring opportunities to further educate the public on key topics of interest.

89. Describe the agency’s public outreach and education efforts. [4.2.2.2]

Answer 89: The Department of Conservation is committed to public transparency, engaging with the public, providing data online, and being responsive to community needs as we conduct our work. Specifically, we contemplate best practices for both outreach and engagement.

Examples of activities and principles considered in our department engagement efforts include:

- one-on-one phone calls with stakeholders;
- in-person (pre-covid) or digital meetings with stakeholders to discuss ongoing issues (i.e. enforcement) or upcoming regulatory efforts;
- in-person (pre-covid) and digital public engagement workshops or meetings that have:
 - Stakeholder co-designed agenda elements;
 - Language access with an emphasis of the top languages other than English spoken in a given county or region in meeting notifications (flyers);
 - Spanish language interpretation at all major public meetings; consideration of Spanish led meetings (for example in-person in Arvin Ca 2/18/20 or on-line 5/28/20)
 - Handouts or reference materials that consider various learning styles;

- Options to submit or provide feedback that accommodate public preferences; such as verbally, hand-written, digitally (through email, survey or a polling tool) or through tactile means for in person meetings; as well as anonymous or name/organization notation options.
- Consideration of a welcoming environment for all including kids (in-person)
- Consideration of how to ensure various points of view are heard by all (by rotating speakers based on self-selected affinity grouping)
- Consideration of how pre-meeting materials (including video) may help interested persons have the information they need on the topic at hand.
- Consideration of stakeholder fatigue and efforts to avoid exacerbating those issues.
- A meeting environment that welcomes all points of view and emphasizes the need for all to feel “safe” in sharing their perspective
- Ensuring adequate outreach has been done so interested stakeholders know when a given meeting, workshop or effort is happening. Consideration of the ‘branding’ or look and feel of materials for any given effort to help members of the public differentiate what might be multiple related efforts happening at any given time.
- Report outs that summarize comments received.
- Clarity on how public input or feedback will be considered by the Department in any given process.

Examples of outreach efforts include more traditional and less traditional elements such as: information on the Department’s website, list serv email blasts, social media communication, direct email communication and phone calls. The department keeps a ‘grass tops’ approach in mind when trying to spread the word about community meetings; encouraging a wide variety of stakeholders to use their own communication channels to help DOC push out notification of meetings, resources and grant opportunities. The department always strives to have community partners help amplify our outgoing communications.

90. Fundamental differences exist from state to state, and between regions within a state, in terms of geology and hydrology. Describe how the state evaluated and addressed, 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. [9.3]

Answer 90: In 2015, The California Council on Science and Technology (CCST) organized and led an independent scientific study to assess current and potential future well stimulation practices, including the likelihood that these technologies could enable extensive new petroleum production in the state; the impacts of well stimulation technologies (including hydraulic fracturing, acid fracturing and matrix acidizing) and the gaps in data that preclude this understanding; potential risks associated with current practices; and alternative practices that

might limit these risks (Source: An Independent Scientific Assessment of Well Stimulation in California Summary Report⁴¹)

- Conclusion 1.3. Hydraulic fracturing in California does not use a lot of fresh water compared to other states and other human uses.
- Hydraulic fracturing represents less than 0.2% of all human water uses in regions where stimulation occurs.

91. Describe how the availability and use of alternative water sources for hydraulic fracturing, including recycled water, is encouraged. [9.3]

Answer 91: There has not been any reported use of produced water for hydraulic fracturing. Oil and gas operators have used their own water wells as the water source for stimulations.

92. Briefly describe how waste associated with hydraulic fracturing is managed consistent with Section 4.1.1 (*Questions 93-94*) and Section 7 (*Questions 95-96*) of the guidelines. [9.3]

Answer 92: An application for a permit to perform a well stimulation treatment shall include (§1783.1.25) a description of anticipated procedures to comply with the Hazardous Waste Control Law (Health and Safety Code §§ 25100 et seq.) and implementing regulations pertaining to the activities and information provided under this article; (§1783.1.26) The estimated amount of treatment-generated waste materials that are not addressed by the water management plan, and the anticipated disposal method for the waste materials.

Also, please see: §1786. Storage and Handling of Well Stimulation Treatment Fluids and Wastes.

93. *Briefly describe the permitting requirements for E&P facilities. Give reference to any statutory or regulatory requirements, including the permit terms and renewal procedures and the authority to refuse to issue or reissue permits or authorizations. Indicate whether the waste management practices listed in the matrix at the beginning of this questionnaire are authorized by individual permit, by rule, by general permit, through registrations or notices, verbally, or not at all. [4.1.1]*

94. *Do E&P related permits provide notice of the permittee's obligation to comply with other federal, state or local requirements? If so, please provide a copy of (or hyperlink to) the form(s). [4.1.1]*

95. *Discuss any activities the state has undertaken to determine the occurrence and need for regulation of NORM. [7.2]*

⁴¹ <https://ccst.us/wp-content/uploads/2015SB4summary.pdf>

96. *Briefly discuss each of the following program elements as they apply to the NORM regulatory program (give reference to any statutory or regulatory requirements): [7.3]*

- a. Definitions [7.3.1]*
- b. Action levels [7.3.2]*
- c. Surveys [7.3.3]*
- d. Worker protection [7.3.4]*
- e. Licensing/permitting [7.3.5]*
- f. Removal/remediation [7.3.6]*
- g. Storage [7.3.7]*
- h. Transfer of land and equipment for continued use [7.3.8]*
- i. Release of sites, materials, and equipment [7.3.9]*
- j. Disposal [7.3.10]*
- k. Interagency coordination [7.3.11]*
- l. Public participation [7.3.12]*

97. *Discuss how the state encourages the efficient development of adequate capacity and infrastructure for the management of hydraulic fracturing fluids, including the transportation, recycling, treatment and disposal of source water and hydraulic fracturing wastes. [9.3]*

98. *Discuss how the state encourages the efficient development of adequate capacity and infrastructure for the management of hydraulic fracturing fluids, including the transportation, recycling, treatment and disposal of source water and hydraulic fracturing wastes. [9.3]*

REUSED AND RECYCLED FLUIDS (Guidelines Section 11)

99. Please provide definitions used by the state to differentiate between “reused fluids” and “recycled fluids”. [11.1]

Answer 99: Definition of Recycled Water: “water which, as a result of treatment of waste, is suitable for a direct beneficial use or a controlled use that would not otherwise occur and is therefore considered a valuable resource” (Wat. Code § 13050(n)) (https://www.waterboards.ca.gov/water_issues/programs/water_recycling_policy/)

100. Discuss how operators are encouraged to develop water management plans that consider reuse and recycling options. [11.2]

Answer 100: Based on “1783.1. Contents of Application for Permit to Perform Well Stimulation Treatment”, the operators shall include a water management plan that includes all items mentioned in §1783.1. (21).

“§1786. (7) Operators shall conduct all activities that relate to storage and management of fluids in compliance with all applicable requirements of the Regional Water Board, the Department of Toxic Substances Control, the Air Resources Board, the Air Quality Management District or Air Pollution Control District, the Certified Unified Program Agency, and any other state or local agencies with jurisdiction over the location of the well stimulation activities.”

101. **Have barriers to reuse and recycling options been identified at the state level, and if so, how has the state sought to reduce those barriers?** [11.2]
102. How has the state pursued interagency coordination where jurisdictional issues exist between multiple state agencies, river basin commissions, and other parties involved in the management of reused and/or recycled fluids? [11.2]

Answer 102: The division has entered into formal agreements with the Department of Toxic Substances Control, the State Air Resources Board, any local air districts where well stimulation treatments may occur, the State Water Resources Control Board, the Department of Resources Recycling and Recovery, and any regional water quality control board where well stimulation treatments may occur, clearly delineating respective authority, responsibility, and notification and reporting requirements associated with well stimulation treatments and well stimulation treatment-related activities, including air and water quality monitoring, in order to promote regulatory transparency and accountability.

103. **Does the state have a regulatory process to designate fluids as a non-waste when the fluid is**

treated to a satisfactory level and reused and/or recycled? [11.3]

104. Section 11.4.1 describes regulatory criteria a state program should consider for pipelines transporting produced water and/or reused/recycled/treated water. Discuss how the state defines such pipelines, including any risk assessment procedure(s) utilized in the generation of that definition. [11.4.1.1]

Answer: CalGEM regulates produced water pipelines greater than 1” nominal diameter in size within the boundaries of the oil and gas lease. Produced water pipelines are regulated within the lease from separation, through treatment, and to disposal at an injection well, outfall, or surface water discharge point. A CalGEM regulated pipeline is defined in Title 14 CCR 1760(q). Also note that California DOC/CalGEM considers steam derived from produced water as constituting or containing produced water and would be handled accordingly.

105. Describe the state’s siting, permitting, and financial assurance requirements for such pipelines. [11.4.1.2]

Answer 105: There is no current requirement to permit produced water pipelines. A list of pipelines with attributes and a map that shows locations of all pipelines is required in Title 14 CCR 1774.1(b) under Pipeline Management Plan Requirements.

- a. Does the state differentiate between requirements for buried and above ground pipelines? [11.4.1.2.d]

Answer 105a: please see Title 14 CCR § 1774. Pipeline Construction and Maintenance
The regulating is the same but there are some different requirements. An example of a specific requirement for buried pipelines is utilization of cathodic protection.

106. Describe the state’s construction and operational requirements for such pipelines. [11.4.1.3]

Answer 106: Please see Title 14 CCR § 1774. Pipeline Construction and Maintenance and § 1774.1. Pipeline Inspection and Testing.

- b. Describe the state’s requirements for integrity testing of such pipelines. [11.4.1.3.c, d, e]

Answer 106b: Title 14 CCR § 1774.1. Pipeline Inspection and Testing.

107. Describe the state’s spill response and remediation requirements for releases from such pipelines. [11.4.1.4]

Answer 107: § 1722 (b) The operator for a facility or group of related facilities shall develop a spill contingency plan.

§1783.1. Contents of Application for Permit to Perform Well Stimulation Treatment.

§1786. Storage and Handling of Well Stimulation Treatment Fluids and Wastes.

108. Does the state encourage operators to utilize smart truck routing for truck transportation of produced water and/or reused/recycled/treated water? [11.4.2]

Answer 107: § 1722 (b) The operator for a facility or group of related facilities shall develop a spill contingency plan.

§1783.1. Contents of Application for Permit to Perform Well Stimulation Treatment.

§1786. Storage and Handling of Well Stimulation Treatment Fluids and Wastes.

109. Describe the state’s rules for the treatment and storage of fluids to be reused and/or recycled. [11.5]

Answer 109: As a part of WST permitting requirements (§ 1783.1. (C)) the following item should be included: “A description of how and where the water from a well stimulation treatment will be recycled, including a description of any treatment or reclamation activities to be conducted prior to recycling or reuse.”

Also, see § 1786. Storage and Handling of Well Stimulation Treatment Fluids and Wastes.

110. Describe the state’s permitting process for facilities used for the storage of reused and/or recycled fluids. [11.5]

111. Discuss how the state’s waste management requirements (including tracking and reporting) apply to fluids to be reused and/or recycled. [11.5]

Answer 111: § 1786. Storage and Handling of Well Stimulation Treatment Fluids and Wastes.

(a) Operators shall adhere to the following requirements for the storage and handling of well stimulation treatment fluid, additives, and produced water from a well that has had a well stimulation treatment:

(1) Fluids shall be stored in compliance with the secondary containment requirements of Section 1773.1, except that secondary containment is not required under this section for production facilities that are in one location for less than 30 days. The operator’s Spill Contingency Plan shall account for all production facilities outside of secondary containment and include specific steps to be taken and equipment available to address a spill outside of

secondary containment.

- (2) Operators shall be in compliance with all applicable testing, inspection, and maintenance requirements for production facilities containing well stimulation treatment fluids.
- (3) Fluids shall be accounted for in the operator's Spill Contingency Plan.
- (4) Fluids shall be stored in containers and shall not be stored in sumps or pits.

112. Describe how the state differentiates between centralized and commercial wastewater treatment facilities, and any special requirements for facilities that process fluids to be reused and/or recycled. [11.5]

Answer 112: CalGEM does not differentiate between the size of produced water treatment plants within the boundary of the oil and gas lease. CalGEM only regulates privately-owned produced water treatment plants located on the lease for the purpose of treating produced water from wells at the lease or an adjacent lease. Other state and local agencies may also regulate these privately-owned produced water treatment plants. CalGEM does not regulate publicly owned water treatment plants, if any exist within the boundaries of the oil and gas lease.

113. Describe how the state regulates waste generated during the treatment of fluids to be reused and/or recycled. [11.5]

114. Describe the conditions under which the state requires groundwater monitoring. [11.5]

Answer 114. California State Water Resources Board is in charge of groundwater monitoring. More information can be found at:
https://www.waterboards.ca.gov/water_issues/programs/groundwater/sb4/regional_monitoring/

§1783. (27) Documentation from either the State Water Board or the Regional Water Board that the well subject to the well stimulation treatment is covered by a regional groundwater monitoring program pursuant to Water Code section 10783, subdivision (h)(1), or indication that the operator is working with the State Water Board or the Regional Water Board to ensure that the well subject to well stimulation treatment is covered in accordance with Water Code section 10783;

115. Describe how the state's methodology for the determination of the presence of NORM applies to fluids to be reused and/or recycled. [11.5]

116. Has the state evaluated whether air emissions at facilities used for the storage and/or treatment of fluids to be reused and/or recycled require an air quality permit, authorization, or

exemption? [11.5]

Answer 116: § 1786. (7) Operators shall conduct all activities that relate to storage and management of fluids in compliance with all applicable requirements of the Regional Water Board, the Department of Toxic Substances Control, the Air Resources Board, the Air Quality Management District or Air Pollution Control District, the Certified Unified Program Agency, and any other state or local agencies with jurisdiction over the location of the well stimulation activities.

§ 1782. (9) Well stimulation treatment operations are conducted in compliance with all applicable requirements of the Regional Water Board, the Department of Toxic Substances Control, the Air Resources Board, the Air Quality Management District or Air Pollution Control District, the Certified Unified Program Agency, and any other local agencies with jurisdiction over the location of the well stimulation activities.

Appendix C – CalGEM May 2021 Corrective Action Plan

DOF OSAE Finding	DOF OSAE Recommendations	Implementation Task	Implementation start date	Finish	Current Status
Well Stimulation Treatment (WST) Program					
Finding 6 – Strengthen ADSA Review Documentation	A - Update WST SOP to include documentation requirements for verification of operator's 2xADSA data, determination of ADSA locations, addressing high risk abandoned wells, and selection of monitoring wells.	Update the WST permitting process flowchart and SOP to include all the recommendations from DOF report. (SOP – Risk assessment section)	Tues 9/1/2020	Wed 3/31/2021	SOP drafted and under review currently.
	B - Update the risk assessment template to incorporate WST SOP updates noted in Recommendation A above.	Update the WST risk assessment template to include the verification of 2xADSA, mitigation measure of the high risk P/A wells and reason on selection of monitoring wells. (SOP – Risk assessment section)	Thurs 7/30/2020	Tues 9/1/2020	Risk assessment template has been updated (Figure 1 and Figure 3). Please see the Appendix section for a more detailed explanation of the update.

	C - Include all wells within the 2xADSA (penetrating or non-penetrating) in the risk assessment and identify the wells that do not require evaluation including documentation of the reasons why.	Update the WST risk assessment template to include all wells within the 2xADSA circle including the non-penetrating wells. (SOP – Risk assessment section)	Thurs 7/30/2020	Tues 9/1/2020	Risk assessment template has been updated (See Figure 1 and 4). Please see the Appendix section for a more detailed explanation of the update.
	D - Ensure sufficient review documentation and files are retained to support the evaluation of risk for the WST. The audit trail should facilitate the tracing of ADSA Narrative review determinations to source files and documents completed by permit engineers.	Update the SOP and the risk assessment template to ensure ADSA Narrative determination review process is consistent for all applications including those without any 2xADSA wells. Create the risk assessment template for each application and retain it for documentation.	Thurs 7/30/2020	Tues 9/1/2020	Risk assessment template has been updated (See Figure 1 and 2). Please see the Appendix section for a more detailed explanation of the update.

Appendix:

The new WST risk assessment template as shown in Figure 1 includes the updates recommended by DOF OSAE audit. More detail explanation of each new section is provided below. These updates have been incorporated into our standard operating procedure (SOP).

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	
	API#	Well Name	Well Design	Well Sta	Previously Stimulated	ADSA Loc	Damaged TI	Damaged Local	Perforation Local	Damaged Local	USOW Pre	Notes	Abandoned To Standard	Abandoned	Is this an offset well monitored by a conditions	
1	040295905	Water Flood	518N-28	Plugged & Abandoned	Yes	B	None	None	C	NoneAtADBo veCODepth	false	C/O @ 1150'; diatomite @584'	True	08/24/1998	False	
2	040297053	Steamflood	618P-28	Plugged & Abandoned	Yes	A	None	None	A	NoneAtADBo veCODepth	false	C/O @656'	True	04/23/2004	False	
3	040300598	Oil & Gas	518P1-28	Plugged & Abandoned	Yes	C	Perfed Casing or Hole	In Zone	C	NoneAtADBo veCODepth	false	C/O @618'; parted casing @608'; diatomite @593'	True	04/20/2010	False	
4	0403005961	Oil & Gas	518S1-28	Plugged & Abandoned	Yes	A	Dogleg	In Zone	A	NoneAtADBo veCODepth	false	C/O @1185'; dogleg @1088'; diatomite @588'	True	06/20/2019	False	
5	0403012527	Water Flood	518NR-28	Plugged & Abandoned	Yes	C	Perfed Casing or Hole	In Zone	C	BelowCODepth hinZone	false	C/O @729'; casing damage @720' & 787'; diatomite @583'	False	09/22/2011	False	
6	0403022416	Oil & Gas	918V-28	Active	Yes	B	None	None			false	OG well; no MIT to determine mechanical integrity. Lies within fracture azimuths selected for pressure monitoring during proposed stimulation of well 03067616.	False		True	
7	0403022418	Oil & Gas	918K-28	Plugged & Abandoned	Yes	B	Dogleg	In and Out of Zone	NotinADSA	BelowCODepth hinZone	false	C/O @699'; dogleg @520' & 716'; diatomite @571'	True	05/03/2010	False	
8	0403041202	Steamflood	718DU-28	Active	Yes	C	None	None			false		False		False	
9	0403041208	Steamflood	718DU-28	Active	Yes	B	None	None			false		False		False	
10	0403042385	Steamflood	718NL-28	Active	Yes	C	None	None			false		False		False	
11	0403042426	Steamflood	718NU-28	Active	Yes	C	None	None			false		False		False	
12	0403042426	Steamflood	718NU-28	Active	Yes	C	None	None			false		False		False	
13	Notes															
14	Selected for pressure monitoring															
15	WST Application Group 052-0060- Well 03067616 (First/Bottom Stage) – South Belridge															
16	CalGEM's 2xADSA Map															
17	Aera's 2xADSA Map															
18	Well(s) not intersecting the 2x-ADSA of the proposed well															
19	API#	Well Name	Reasons													
20	02931381	18A-28	Does not penetrate													
21	03015788	918K-28	Does not penetrate													
22	03019644	918P-28	Does not penetrate													
23	03067616	518S2-28	New - Proposed WST Well, Not Drilled													
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Figure 1: New risk assessment template
 A. Verification of 2xADSA data/maps:

In the figure 2 below, the map on the left is generated by the WST engineer using CalGEM's GIS map layer. The map on the right is submitted by the operator. This step incorporate the verification and documentation of the 2xADSA data and map recommended under part A of the report. The WST engineer then inserted the proposed fracture azimuth path along with the ADSA location zones (A,B and C) onto the map. These new

figures captured the documentation to support the assignment of the ADSA location zones in the same file. As these steps was previously completed outside of the risk assessment template, the documents were not retained. This new procedure will ensure document retention and verification steps in the same risk assessment file going forward.

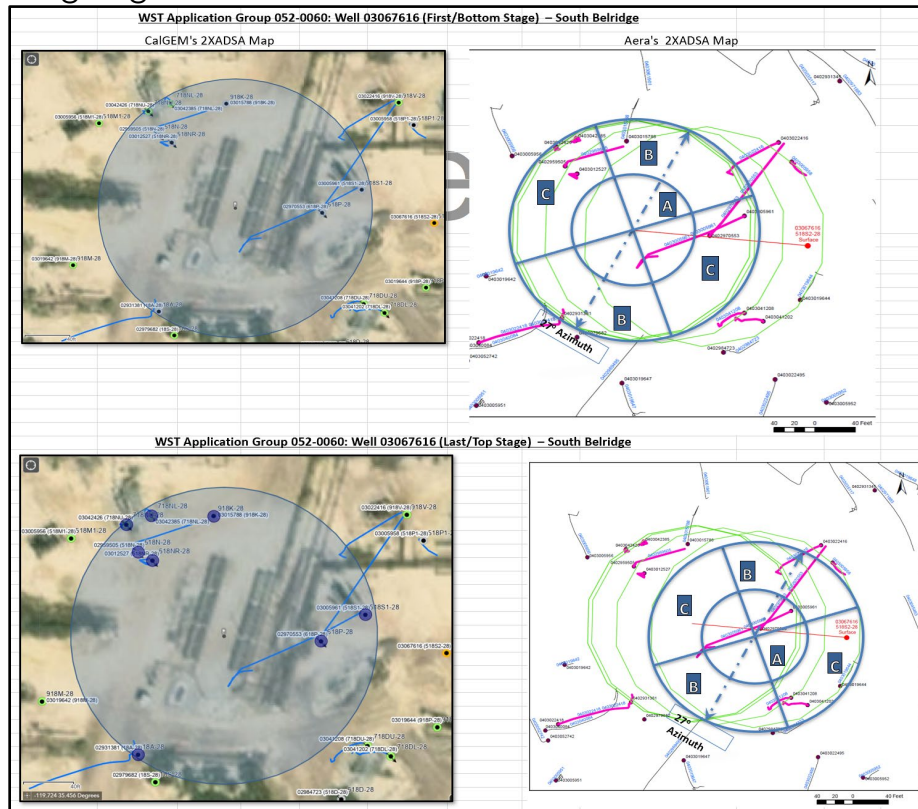


Figure 2: CalGEM Map and Operator (Aera) Map side by side comparison with ADSA location zones

B. Abandoned and non-abandoned wells risk assessment:

This section of the risk assessment has been updated with the new WellSTAR process. The wells in the 2xADSA are identified in the WellSTAR application system by the operator. WST review engineers verify the wells as shown in previous steps and review the well records as part of their risk assessment. Their review notes are added into the WellSTAR under each ADSA well. The engineer will include the reason for monitoring well selection as recommended by the audit under the note section. The engineer download the ADSA wells review into the Excel template as shown below in Figure 3 to be added into the risk assessment file.

API	Well Type	Well Designation	Well Status	Previously Stimulated	ADSA Location	Damage Type	Damage Location	Perforation Location	Damage Location	USDW Present	Notes	Abandoned To Standards	As of	Is this an offset well monitored by permit conditions?
0402959505	Water Flood	518N-28	Plugged & Abandoned	Yes	B	None	None	C	NoneAtOrAboveCODepth	false	C/O @ 1150'; diatomite @584'	True	08/24/1998	False
0402970553	Steamflood	618P-28	Plugged & Abandoned	Yes	A	None	None	A	NoneAtOrAboveCODepth	false	C/O @656'	True	04/23/2004	False
0403005958	Oil & Gas	518P1-28	Plugged & Abandoned	Yes	C	Parted Casing or Hole	In Zone	C	NoneAtOrAboveCODepth	false	C/O @618'; parted casing @608'; diatomite @593'	True	04/20/2010	False
0403005961	Oil & Gas	518S1-28	Plugged & Abandoned	Yes	A	Dogleg	In Zone	A	NoneAtOrAboveCODepth	false	C/O @1185'; dogleg @1088'; diatomite @588'	True	06/20/2019	False
0403012527	Water Flood	518NR-28	Plugged & Abandoned	Yes	C	Parted Casing or Hole	In Zone	C	BelowCODepth InZone	false	C/O @729'; casing damage @730' & 787'; diatomite @ 583'	False	09/22/2011	False
0403022416	Oil & Gas	918V-28	Active	Yes	B	None	None			false	OG well; no MIT to determine mechanical integrity. Lies within fracture azimuth; selected for pressure monitoring during proposed stimulation of well 03067616.	False		True
0403022418	Oil & Gas	918X-28	Plugged & Abandoned	Yes	B	Dogleg	In and Out of Zone	NotInADSA	BelowCODepth InZone	false	C/O @699'; dogleg @520' & 716'; diatomite @571'	True	05/03/2010	False
0403041202	Steamflood	718DL-28	Active	Yes	C	None	None			false		False		False
0403041208	Steamflood	718DU-28	Active	Yes	B	None	None			false		False		False
0403042385	Steamflood	718NL-28	Active	Yes	C	None	None			false		False		False
0403042426	Steamflood	718NU-28	Active	Yes	C	None	None			false		False		False
Note:														
Selected for pressure monitoring														

Figure 3: Risk assessment of wells in the 2xADSA with selected monitoring well highlighted

True = Yes False = No

C. Wells not intersecting the 2xADSA zone but are within the 2xADSA surface map:

Previously, if there were no wells penetrating the 2xADSA zone, the risk assessment template was not generated

although the WST engineer conducted the verification steps. Per DOF's recommendation, a new section is added for wells not intersecting the 2xADSA but are shown within the surface map as shown in Figure 4. This will provide the additional verification and documentation of the reason on why the wells are not evaluated as part of the risk assessment.

Well(s) not intersecting the 2x-ADSA of the proposed well		
API#	Well Name	Reasons
02931381	18A-28	Does not penetrate
03015788	918K-28	Does not penetrate
03019644	918P-28	Does not penetrate
03067616	518S2-28	New - Proposed WST Well, Not Drilled

Figure 4: New section to show wells not in the 2xADSA

Appendix D – 2019.2 Edition STRONGER Guidelines

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Guidelines for the Review of State Oil and Gas Environmental Regulatory Programs

2019.2 Edition

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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, and updated the Air Quality Guidelines to address methane emissions in 2019. 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. In 2017 STRONGER developed additional reused and recycled fluids guidance pertaining to pipelines used to transport produced water. In 2019 the STRONGER Board of Directors updated the Administrative and Technical Criteria.

Since 1990, 41 initial, follow-up, and single-topic state reviews have been conducted against the guidelines criteria: 12 under the 1990 edition guidelines, 5 under the 1994 edition guidelines, 11 under the 2000 edition guidelines, 2 under the 2005 edition guidelines, 7 single-topic reviews on hydraulic fracturing, 3 single-topic reviews on air quality, and 1 follow-up review under the 2015 edition guidelines. These states have implemented many of the recommendations from their respective state reviews, 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 oil and gas exploration and production (E&P) environmental regulatory program. Such environmental regulatory programs 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

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 Enforcement Tools

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

- 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.
- i. In some states, enforcement remedies include authorities to cause cessation of production or transportation of product, and/or seizure of illegal product.

4.1.3.2 Penalty Guidance

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, 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 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.

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, 7 days 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

State contingency programs should address the following:

- a. 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;
- b. 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
- c. Public and responder safety concerns, including training for response personnel.

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

- d. The operator's incident command structure, including emergency contact information for key personnel;
- e. Equipment, manpower, contracted services, and other logistical support necessary for response to spills and unauthorized releases;
- f. Opportunities for coordination of joint response actions, manpower or equipment, with nearby well sites or other facilities of the operator or other operators;
- g. Procedures for identification of and communication with parties impacted or threatened by spills or unauthorized releases;
- h. Acceptable methods of containment of spills and unauthorized releases; and
- i. Acceptable disposal methods, such as on-site remediation, approved disposal facilities, and waste haulers, for materials of concern.

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 the following:

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

4.2.1.4.3 Response Measures

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

- a. Agencies and parties to be notified with contact information;
- b. The type of reporting (verbal, written) required for various incidents;
- c. Reporting time requirements;
- d. Reporting thresholds;
- e. 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; and
- f. The state should specify any requirements for final reporting, site monitoring, and necessary agency approvals. Any final report should identify the incident cause and actions taken to prevent or minimize the likelihood of a recurrence.

States should provide guidance for containment, abatement, and remediation, including the following:

- g. Cleanup standards;
- h. Required sampling and analyses;
- i. 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; and

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

The affected public should be provided with adequate notice of the agency's consideration to issue a permit or license for appropriate E&P activities. Such efforts should balance efficient permit processing with meaningful opportunity for input from the affected public. The agency should establish guidance on determining the degree of public input for different types of permits or licenses. Where public input is sought, the agency should utilize communication methods that will most effectively reach the affected public, including options for non-English speakers where necessary. The agency should consider methods to enhance the responsiveness of its public participation such as responding to comments and sharing how the program considered comments in its decision making. Where possible, notice should be coordinated with the requirements of other concurrently applicable state or federal programs. The agency may also require operators to provide written notice to adjacent landowners of record for such areas and in such manner as may be prescribed by the agency.

Agency records related to this program should generally be available for review by the public in accordance with applicable state and federal laws and agency practices. 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

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. This 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.

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.

4.2.3.3 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 do the following:

- a. Be quantitative, whenever possible;
- b. Allow consistent evaluation across time;
- c. Be available to program personnel, the industry, and the public;
- d. Document significant trends;
- e. 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].
- f. Include identification and priority of outstanding environmental threats, so as to aid the program in



targeting its efforts;

- g. Enable evaluation of whether the program's responses to violations encourage compliance.

Evaluation of performance may include, as an example:

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

4.2.3.4 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.

4.2.3.5 Examples of Program Evaluation

4.2.3.5.1 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).



Examples of possible impact indicators could include the following:

- a. The area or other measure of contaminated or affected ground or surface water, tracked periodically over time.
- b. 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.
- c. A histogram of the number of releases of a given material versus the approved time to completion of remediation.
- d. 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.
- e. Analysis of activities and results
- f. Activity and results analysis comprise 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:

- g. 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.
- h. The development of a program promoting use of the waste management hierarchy [Section 5.3].
- i. 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.
- j. 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.
- k. Evaluation of the results of surveys to determine the satisfaction of permit recipients and other customers with program implementation.
- l. 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.
- m. 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].
- n. Evaluation of the results of a training, educational, or outreach program [Section 4.2.2].
- o. 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:



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

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 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 may include the following:

- a. Surety bonds;
- b. Self-bonding;
- c. Letters of credit;
- d. Certificates of deposit;
- e. Cash,
- f. Federal, state, or municipal bonds; and
- g. 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 TE/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 5.10.2.2.4.)

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. 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, public data access, and data security to the extent they are appropriate to the State's regulatory program.

Web-based maps available to the public should include appropriate information (i.e. permits, enforcement activities, and information from co-regulators to the extent possible). In developing such maps, state programs should balance publicly available information with contemplation of possible safety and security issues associated with mapped facilities.

4.2.7.3 Retention and Access

An agency's data management program 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 TE/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/impoundments, land applications, tanks, and centralized and commercial facilities. In most cases, these criteria are general in scope. 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, surface water, soil, and air with the goal of, protecting public health and safety, the environment, and preventing 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 municipal solid waste 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 within a 100-year flood plain or areas where other surface drainage issues may impact surface impoundment in the event of a significant storm event.
 - iii. Where necessary to protect human health, 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. Siting requirements should consider factors such as depth to and quality of groundwater; proximity to wetlands, floodplains, water bodies; proximity to drinking water supplies; topography, geology, geologic hazards; and other environmentally sensitive areas as designated by the appropriate governmental authority.
 - 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. Waste characterization requirements should include appropriate testing of E&P wastes prior to disposal. Testing should be appropriate for the type of waste, method of disposal, and the potential for adverse health and/or environmental effects associated with potential exposure. State waste management programs should establish criteria for ongoing testing to detect changes in the chemical composition of wastes as necessary. Waste management practices and regulatory requirements may be improved by obtaining a more complete knowledge through sampling and analysis of the range of hazardous and toxic constituents in E&P wastes. Potential waste characteristics include radionuclides, metals, organic content, pH, salinity, sulfur compounds including hydrogen sulfide content, and other potentially hazardous compounds as required by the state. At a minimum, 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. Testing and sampling data conducted as part of waste characterization should be available to the public consistent with the provisions of Section 4.2.2.1.
- c. State requirements for the assessment of E&P wastes for TE/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.
- d. 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 freshwater use is the use of produced water for EOR whenever possible (See Section 11 for additional discussion of fluid reuse and recycling). 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 TE/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 leftover 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 the following:

- 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 protections described in Section 5.1.a, and in the goals statement of Section 3.2.

5.5 Technical Criteria for Pits

5.3.1 Definitions

The terms “pit” and “impoundment” are used to describe earthen depressions constructed to contain fluids or other materials. For the purpose of these Guidelines, the term “pit” is used to describe such structures. The following are generally accepted definitions for different types of pits and their uses:

- a. Reserve Pits:
 - i. Store additional drilling fluids for use in drilling operations; and/or
 - ii. Dispose of wastes generated by drilling operations and initial completion procedures.
- b. Production Pits



- iii. Skimming/Settling: Pits used to provide retention time for settling of solids and separation of residual oil.
 - iv. Produced Water: Pits used for storage of produced water prior to injection for enhanced recovery or disposal, off-site transport, or surface-water discharge.
 - v. Percolation: Pits used to dispose of waste liquids via drainage or seepage through the bottom and/or sides of the pits into surrounding soils.
 - vi. 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 contemplate the following:

- 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 has sufficient separation between base of impoundment and shallow-most water bearing zone (seasonal high), 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. Pits should be sited consistent with the provisions of Section 5.1.e.
 - 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. The use of production pits is declining nationally due to changes in industry practice and 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 5.5.3.e.v.
 - v. Blowdown, flare and emergency pits may be unlined where the removal requirement of Section 5.5.4.k. will prevent adverse groundwater quality impacts.
 - vi. Variances to the above liner requirements should only be provided, and percolation pits should only be used, where it is clearly demonstrated that pit contents do not contain constituents that may harm water, soil or air.
 - vii. Liners may consist of natural or synthetic materials, should meet accepted engineering practices, and should be compatible with expected pit contents.
 - viii. State programs should have the ability to specify additional construction requirements such as double-liners and leak detection and notification technology where deemed



necessary.

- 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.
- 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 a 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 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 when it is clearly demonstrated that pit contents do not contain constituents that may harm water, soil or air, 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 only be used when it is clearly demonstrated that pit contents do not contain constituents that may harm water, soil or air.
- m. Unlined basic sediment pits should not be used for storage of oily wastes; they should be replaced by lined pits or tanks.
- n. Workover pits should be open only for the duration of workover operations and should be closed within 120 days after workover operations are complete.
- o. 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, vegetated, and remediated where necessary, in accordance with applicable state or area regulations to ensure ground support stability, prevent erosion and ponding, and protect the environment.
- f. Records should be permanently kept by the regulatory agency of all pit locations.

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 TE/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. 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 to the extent possible 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. Generally, materials that will harm soil, water, or air should not be roadspread.

5.8.2 Regulatory Requirements

When roadspreading is used, it should be conducted consistent with 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

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. The regulatory agency may adjust or exempt from the requirements of this section small-capacity tanks. Except as provided in Section 5.9.3.b., this section does not apply to:

- a. Condensate and crude oil tanks;
- b. 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
- c. Tanks used temporarily in drilling and workover operations.

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 be sited consistent with applicable local land-use



requirements, and should not be located within the 100-year flood plain or areas where other surface drainage issues may impact surface impoundment in the event of a significant storm event, unless the tanks have adequate floodproofing in accordance with state requirements.

- c. Tanks should be subject to spill-prevention, preventive maintenance and inspection requirements.

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.d.
- 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 TE/NORM. When regulatory action levels are exceeded, TE/NORM and the equipment containing TE/NORM should be managed in accordance with the state's NORM regulatory program. See Section 7 for full TE/NORM criteria.



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:
 - i. Used exclusively by one owner or operator; or
 - ii. used by more than one operator under an operating agreement, and
 - iii. 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.
 - iv. 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 TE/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 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 5.10.2.1. 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

The regulatory agency should authorize off-site commercial and centralized disposal facilities for E&P wastes by permit. 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). 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.

5.10.2.1.1 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.

5.10.2.1.2 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 5.10.2.2.3.f., g. For determining radiological content, refer to Sections 7.3.3 and 5.2.2.

5.10.2.2 Permitting Requirements

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 this section in light of the volume and characteristics of wastes received by the facility.

5.10.2.2.1 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:



- d. 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;
- e. 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;
- f. 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;
- g. Average annual precipitation and evaporation rate at the disposal site;
- h. 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;
- i. Proof that all public notice requirements have been met; and
- j. 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.

5.10.2.2.2 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 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.

5.10.2.2.3 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 TE/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:

- a. 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.);

- b. 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;
- c. 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
 - i. The volatilization of organic materials in the waste;
 - ii. Particulate matter (dust) carried by the wind; and
 - iii. Chemical reactions (e.g., production of hydrogen sulfide from sulfur-bearing wastes) should be considered.
- d. Monitoring to ensure organic wastes are treated effectively should also be required for landfarming operations.
- e. 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;
- f. 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;
- g. Plan for periodic removal and subsequent handling of free oil;
- h. Security plan for the facility;
- i. 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;
- j. A community relations or public information plan should be considered; and
- k. 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.

5.10.2.2.4 Closure Plan

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. 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.

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.

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.

5.10.2.3.1 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).

States that have not implemented a Federal OSHA-Approved State Plan cannot enforce Federal OSHA standards for worker protection. In such “non-agreement” states, Federal OSHA administers job safety and health programs. States with Federal OSHA jurisdiction should be aware of the limitations this may place on worker protection programs implemented by the state and should communicate with Federal OSHA to ensure that any worker protection program implemented by the state is enforceable under Section 18 of the OSH Act.

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 freshwater 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 freshwater 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, concerns about air emissions from the oil and gas sector have become more focused. The criteria of this Guidelines section are focused on air emissions from upstream oil and gas exploration and production (E&P) operations. The term “upstream” is used throughout to describe the full array of operations, activities, facilities, and sources in this sector.

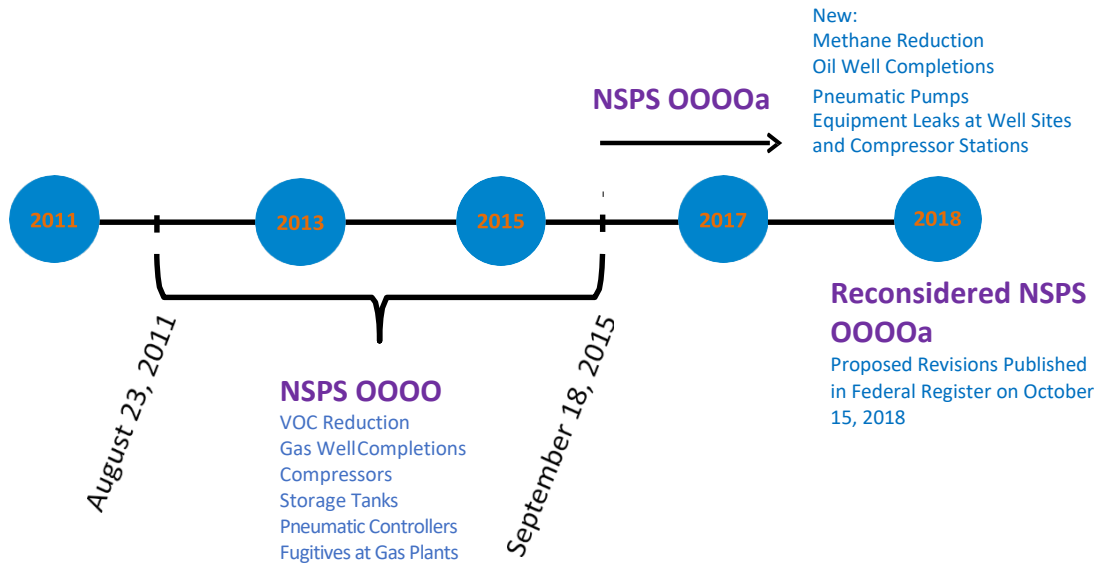
On August 16, 2012, EPA published three final rules for the Oil and Natural Gas Sector: NSPS OOOO for the control of VOC and SO₂ emissions; and NESHAP HH/HHH for the control of hazardous air pollutant emissions. For VOC sources, NSPS OOOO applies to affected sources that are new, modified or reconstructed on or after August 23, 2011, and on or before September 18, 2015. NSPS OOOO 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 NSPS Subpart VVa leak detection and repair (LDAR) programs at natural gas processing plants. NSPS OOOO also revised SO₂ emissions maximum control requirements for sweetening units affected facilities from 99.8 percent to 99.9 percent.

The NESHAP HH/HHH rules amended provisions to previously 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.

EPA published minor amendments to NSPS OOOO on September 23, 2013 and December 31, 2014. In response to petitions for administrative reconsideration of certain provisions in NSPS OOOO and in the amendments, EPA granted reconsideration for certain issues and subsequently proposed revisions to the rule on September 18, 2015. In the proposed rule, EPA revised the regulated pollutant to be both methane and VOC across the oil and natural gas source category (i.e., production, processing, transmission and storage). EPA also added control requirements for completion flowback emissions from hydraulically fractured and refractured oil wells, emissions from pneumatic pumps, and fugitive emissions from well sites and compressor station sites (LDAR). On June 6, 2016, EPA published a final NSPS OOOOa. The initial compliance date was August 2, 2016.



NSPS OOOO/OOOOa Applicability Timeline



New petitions for administrative reconsideration of certain provisions in NSPS OOOOa were filed and, after additional input from public and industry stakeholders, EPA published proposed revisions to NSPS OOOOa on October 15, 2018. EPA has not proposed removing any of the current regulated sources. EPA requested public comments on the proposed revisions and for questions the agency has asked in the preamble. A final revised NSPS OOOOa will likely be published in the second quarter of 2019.

10.2 Administrative

While state oil and gas regulatory agencies have many environmental responsibilities, air quality programs are typically administered by state environmental protection or health agencies and are given statutory and regulatory powers as described below.

Recognizing the local and regional differences discussed in Section 3.3, states should have standards to prevent the contamination of air from pollutants such as nitrogen oxides (NO_x), volatile organic compounds (VOC), carbon monoxide (CO), methane, hydrogen sulfide (H₂S); and air toxics or hazardous air pollutants (HAP) such as sulfur dioxide (SO₂), benzene, normal hexane (N-Hexane), and formaldehyde.

10.2.1 Scope of Authority

An effective state program for the regulation of air emissions from upstream operations should include, at a minimum:

1. Statutory authority that adequately details the powers and duties of the respective regulatory body or bodies;
2. Statutory authority that grants the regulatory body or bodies the power to oversee air emissions from upstream operations such as 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;

3. 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 (for example, additional requirements on new and/or existing facilities or sources within ozone nonattainment areas);
4. Authority to accept delegation and authority for implementation of federal air quality programs specific to upstream operations;
5. 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;
6. Statutes and implementing regulations which adequately and clearly define necessary terminology;
7. Provisions to ensure adequate funding for the staff and program to carry out its objectives and duties;
8. Mechanisms for coordination among stakeholders (including the public, federal and state agencies, and the regulated industry); and
9. Technical criteria for air emission controls that are flexible and forward-looking to encourage and accommodate advancements in technology.

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 upstream oil and gas exploration and production 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 (NAAQS). 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 (NSPS). Even if a state does not accept delegation to implement and enforce a particular federal requirement, EPA retains responsibility for implementing and enforcing that requirement. Part of EPA's role is to ensure a level playing field across the country, therefore where a state accepts delegation of federal regulations, EPA continues to provide oversight to ensure adequate programmatic and compliance efforts across states.



Within states that accept delegation from EPA, jurisdiction over air quality issues related to upstream operations 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. Because states do not have jurisdiction over air pollution sources on tribal lands, EPA or the tribes hold responsibility for implementation and enforcement of air quality requirements for upstream operations on these lands.

Where multiple state, federal or tribal authorities have jurisdiction over air quality issues in the same landscape, mechanisms should be in place to avoid duplication, regulatory gaps, or inconsistent air quality requirements or enforcement of such requirements. Consistent with EPA and state agency authority, 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 or agencies have jurisdiction over a particular area, or responsibility for enforcing a given set of air quality requirements.

10.2.3 Permits, Authorizations and Exemptions

The Clean Air Act prohibits the construction of a major source without a permit. State permits should clearly establish what performance standards and/or emission control requirements are required for each covered source. State programs should establish 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 consider mechanisms that allow operators to construct and operate certain source types for a limited but sufficient period of time to determine actual facility emissions prior to permitting (similar to federal rules such as the storage vessel provisions of OOOO and OOOOa that allow an established period for emissions determination before requiring control). Such mechanisms should be designed to ensure that permit conditions, including emission control requirements and Federal applicability, are properly informed, but that regulatory emissions thresholds are not exceeded during the evaluation period. States should have flexibility to re-visit emissions calculations as necessary.

States with approved Clean Air Act permitting authority should adopt a program for upstream emission sources that:

1. Is designed to protect human health and the environment;
2. Is legally and practicably enforceable;
3. Harmonizes with federal requirements to avoid confusing and duplicative requirements for operators; and



4. Allows the state to develop additional requirements beyond federal requirements to address state-specific air quality issues.

The permitting process should be efficient. Therefore, state air quality permitting programs should be:

5. Straightforward for operators to understand and implement;
6. Administratively efficient for the regulatory agency to minimize cost in time and resources; and
7. Transparent for public understanding.

To accomplish this, states are encouraged to simplify the application process by providing:

8. Accepted emission estimation methods and supporting documentation;
9. Guidance on air quality modeling requirements; and
10. Permit application assistance tools.

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 integrate 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, should be used to track compliance.
2. Inspection and monitoring procedures that are independent of information supplied by regulated entities 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 assist with the evaluation of operational compliance;



- b. The authority to obtain information from regulated entities and investigate information obtained regarding potential violations of applicable program and permit requirements; and
 - c. The capability to conduct regular inspections of regulated facilities and activities at a frequency that is commensurate with state priorities based on the protection of health, safety and the environment.
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 operations 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.
 - a. Operators and the state should presume that all records submitted to the state are public. It is the operator's obligation to identify which information is confidential business information, to take adequate steps to safeguard that information, and to demonstrate to the state that the release of such information would cause substantial harm.
 7. Authority to require regulated persons to conduct stack testing or other measurements to establish or verify compliance with applicable requirements; to provide for state presence at 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;
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.

Complementing the enforcement tools identified above, state programs should have incentives (such as penalty mitigation and auditing/self-disclosure policies) to encourage operators to voluntarily disclose and correct violations.

10.2.5.2 Penalties

States should develop clear guidance for calculations of penalties that include factors such as the economic benefit resulting from noncompliance, 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 deter noncompliance by other operators. States should evaluate their enforcement options and policies to assure that the full range of actions available to them are applied effectively and consistently.

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 initial and on-going training to stay current with federal and state air regulatory requirements, state airshed goals, and industry production practices and technology, especially new and developing emissions estimation methods, air pollution control and monitoring technology (e.g., gas detection technologies). This training should include an oil and gas industry overview to familiarize state agency staff with the equipment and processes typical to industry operations, the sources of air pollutants, and the pollution control equipment and monitoring equipment they will be regulating and inspecting. Training programs to accomplish these goals could include:

1. Training courses or resource materials available through 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 state and EPA air regulatory programs;
4. Conference attendance; and
5. Coordination and frequent discussions with other state and federal agencies regulating oil and gas operations, including state oil and gas 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:

6. Maintaining competitive salary levels;
7. Creation of new technical positions (air specialists, oil and gas sector specialists, etc.) in the permitting and enforcement programs; and
8. 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 as efficiently as possible. The air quality program should have electronic access to an inventory that includes the level of detail (locations of oil and gas facilities and a unique identifier for the regulated activity such as API well number) necessary to conduct an effective program. Some of the data gathered may be required to be reported electronically, e.g., EPA Central Data Exchange (CDX).

Emissions data and other information should be made available in user-friendly



electronic formats after thorough and appropriate quality assurance.

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.

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. The inventory should be comprehensive; however, it should not capture inconsequential (de minimis) sources that do not impact air quality.

10.3.2 Source-Specific Requirements

A state's air quality program should identify emission source types that must be represented in applications for air quality permits or authorizations. Source types and activities may include stationary engines and turbines, well completions or recompletions, handling of associated gas from oil wells, venting and leaking gas from compressors, gas-powered pneumatic devices, dehydration units, gas processing plants, storage vessels and other hydrocarbon fluids handling, wellbore liquids unloading, produced water management facilities, sweetening units, flares, fugitive emissions from components at well sites, compressor stations and gas processing plants, and emissions from all other maintenance activities.

The state requirements for these emission source types should be as stringent as the Federal requirements, where such requirements exist, unless the state deems it necessary to establish additional, alternative, or more stringent requirements. When specific air issues demand more stringent requirements, states may consider adopting, as consistently as possible, provisions by other states or the EPA that have been successfully implemented to address similar air quality issues, 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, abnormal process conditions or malfunctions, wellbore liquids unloading, well maintenance, third party equipment downtime, changes in third party product gathering pipeline capacity or business agreements, and equipment failure. The programs should require incident reporting and corrective actions where possible, to ascertain root causes and avoid incident recurrence. However, the state should also consider safety aspects when developing new requirements for unplanned emissions.

The state air quality regulator should coordinate with the state oil and gas conservation regulator to develop a process to quantify and minimize the flaring, and prohibit the venting of, associated gas from oil wells. Such a process should contemplate both the air quality concerns and financial loss to the state, royalty owners, and operators of wasted gas from drilling operations.

In addition to regulatory efforts, there are several voluntary programs that provide best practices and information sharing. 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. In 2016, EPA



updated this program to include the [Methane Challenge](#). The oil and gas industry has developed programs as well, including [The Environmental Partnership](#), [ONE Future](#), and the [Oil and Gas Climate Initiative](#). The Environmental Council of the States (ECOS) has also developed an online [Methane and Air Toxics Reduction Information Exchange \(E-MATRIX\)](#) that provides information on state best practices and cost-effective technologies that reduce emissions at points along oil and gas systems. The state should encourage awareness of the programs.

10.3.3 Air Quality Monitoring Networks

Air quality monitoring is an essential tool both to determine compliance with NAAQS 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 NAAQS. 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 oil and gas development 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 existing, or anticipated increases in, oil and gas activity.

States should have appropriate monitoring equipment necessary to support emergency response activities as discussed in Section 10.3.5. Monitoring data should be made available consistent with the criteria of 10.2.7.



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. 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. Consistent calculations methods, based on the gas and oil/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 demonstrating attainment through air quality modeling.

States should consider using the EPA's oil and gas emissions tool(s) for computing nonpoint emissions sources. 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. States that have developed emissions estimation techniques beyond those currently available from EPA are encouraged to share their methods with EPA and other states and tribes through channels such as the National Oil and Gas Emission Inventory Committee and the ECOS Shale Gas Caucus.

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. Projections which consider emissions under a range of alternative future conditions, such as the effect of changing industry practices, regulations, and crude oil and gas pricing, 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.



10.3.5 Corrective Actions & Emergency Response

State air quality programs should establish clear criteria for the emergency reporting of significant, non-routine releases. 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 operators and 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.

10.3.6 Long-Term Planning, Prioritization & Evaluation

The state should develop procedures for regular evaluation and consideration of the appropriateness and adequacy of its air quality regulatory program.

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 stakeholders (including oil and gas producers, environmental and citizen groups, and local governments) in the planning and evaluation processes. Periodic analyses should be completed to ensure that air quality remain protective of public health and the environment, in accordance with state and federal statutes and regulations, as the oil and gas 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 EPA for implementation. In most states, these federal regulations become the basis of the state air regulatory program. 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 important to ensure that 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 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 the following:

1. The development and implementation of an effective stakeholder outreach and education program;
2. 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;
3. The development and posting of guidelines, policies and report templates that result in efficiencies in the permitting and compliance assurance processes while encouraging good practice;
4. The creation of voluntary programs that recognize operators adopting additional air pollution measures; and
5. 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 metrics that is most applicable to its goal and then determine a 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

11.4.1.1 *Scope and Definition*

- a. The term, “pipeline” is used in this section to describe pipelines used to transport produced water and/or reused/recycled/treated water to or from various oil and gas facilities after separation from the oil and gas product. Such facilities may include, but are not limited to, the following:
 - i. Water loading point
 - ii. Point of discharge to a pit
 - iii. Injection/disposal wellhead
 - iv. Reuse/recycling/treatment facility
 - v. Oil and natural gas well sites
 - vi. CWA/NPDES/state permitted point of discharge to surface water
- b. Where appropriate, states may consider adopting a definition for such pipelines that is consistent with the risk profile of the fluids being transported. States may consider several factors when determining a fluid’s risk profile, such as constituents of the fluid, potential release quantity, and potential impact to the environment.

11.4.1.2 *Siting, Permitting, and Financial Assurance*

- a. States may address pipelines in facility and infrastructure permitting.
- b. States should require operators to maintain information on the location, purpose, capacity, age, and material type of pipelines.
- c. Pipeline siting should be designed to minimize or avoid impact on natural habitats and wildlife designated sensitive or protected.
- d. Where appropriate, states should provide requirements for buried and aboveground pipelines, including requirements for repurposing.
- e. States should ensure that their financial assurance requirements are sufficient to cover pipelines. For pipelines that would not be covered by existing facility and infrastructure permitting and financial assurance, states should add such pipelines to these existing programs, or create a separate program for those pipelines.



11.4.1.3 Construction and Operational Requirements

- a. States should provide requirements for aboveground/overland/temporary lines and buried/permanent lines, including permanent and non-permanent buried lines.
- b. Pipelines should be constructed, operated, and maintained in compliance with the manufacturer's specifications, the state's mechanical code, and other applicable industry standards.
- c. Pipelines should be subjected to pre-operational hydrostatic integrity testing. Additional hydrostatic integrity testing should be required if the pipeline is moved, altered, repaired, or repurposed.
- d. States should require integrity testing for pipelines after an appropriate duration of service, based on criteria such as the type and material of the pipeline, and the fluid being transported. The method of integrity testing should be appropriate for the type of pipeline. Testing methods include, but not limited to, the following:
 - i. Hydrostatic
 - ii. Data metering
 - iii. Visual inspection
 - iv. Non-destructive testing
- e. States should require operators to maintain documentation of integrity testing and provide documentation upon request.
- f. States should consider requiring depressurization and duration limits for pipelines not in continuous operation.
- g. Pipelines left in place should be purged, physically disconnected, and capped when abandoned. Buried lines left in place should be cut off below ground.
- h. States should ensure applicable OneCall legislation and damage prevention programs (to prevent damage to pipelines from excavators) are followed.

11.4.1.4 Spill Response and Remediation

- a. There should be a means of accounting for and reporting leaks in accordance with state and EPA requirements.



- b. Contingency planning and spill risk management should be addressed in accordance with the criteria of Section 4.2.1.
- c. Site remediation should be addressed in accordance with state and EPA requirements.

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.



APPENDIX A | References

REFERENCES

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APPENDIX B | 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, HCl, dissociates in water to produce hydrogen ions - H⁺, and chloride ions, Cl⁻.

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.

$$\text{ESP} = \frac{\text{exchangeable sodium}}{\text{cation exchange capacity}} \times 100$$

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 products 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 H₂S 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 be 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.

$$SAR = \frac{Na^+}{\sqrt{Ca^{2+} + Mg^{2+}}}$$

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.

