California Department of Conservation

Underground Injection Control and Well Stimulation Treatment Programs

Report No. 20-3480-030
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Transmitted via e-mail

November 23, 2020

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Final Report—California Department of Conservation, Underground Injection Control and Well Stimulation Treatment Programs, Performance Audit

The California Department of Finance, Office of State Audits and Evaluations, has completed its audit of the California Department of Conservation's (DOC) Underground Injection Control and Well Stimulation Treatment programs.

DOC's response to the report findings is incorporated into this final report. The DOC agreed with our findings. We appreciate DOC's assistance and cooperation during this engagement, and its willingness to implement corrective actions. This report will be placed on our website.

A detailed Corrective Action Plan (CAP), addressing the findings and recommendations, is due within 60 days from receipt of this letter. The CAP should include milestones and implementation dates. The CAP should be sent to: OSAEReports@dof.ca.gov. After the initial CAP is submitted, DOC should update it every six months thereafter, until all planned actions have been implemented.

If you have any questions regarding this report, please contact Rick Cervantes, Manager, or Cindie Lor, Supervisor, at (916) 322-2985.

Sincerely,

Original signed by:

Cheryl L. McCormick, CPA
Chief, Office of State Audits and Evaluations

cc: On following page

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EXECUTIVE SUMMARY

In accordance with Government Code sections 13070, and 13293 through 13295, the California Department of Finance, Office of State Audits and Evaluations, conducted a performance audit of the California Department of Conservation (DOC), California Geologic Energy Management Division (CalGEM). Specifically, the audit objectives were to:

1. Evaluate the Underground Injection Control (UIC) program's project approval letter (PAL) and individual well permit process to determine compliance with UIC statutes and regulations.
2. Evaluate the Well Stimulation Treatment (WST) program's permit approval process to determine compliance with WST statutes and regulations.

DOC administers a variety of programs vital to California's public safety, environment, and economy. Its mission is to balance today's needs with tomorrow's challenges and to foster intelligent, sustainable, and efficient use of California's energy, land, and mineral resources. CalGEM, formerly known as the Division of Oil, Gas, and Geothermal Resources, oversees the oil, natural gas, and geothermal industries in California, regulates the drilling, operation, and permanent closure of energy resource wells, and oversees enhanced recovery projects intended to maximize production from the state's oil reservoirs.

Our audit included CalGEM's processes and procedures related to the review and approval of UIC project PALs for the period April 1, 2019 through October 31, 2019, and UIC and WST well permits for the period January 1, 2019 through October 31, 2019. We reviewed 9 PALs issued for UIC projects by CalGEM's Coastal and Inland Districts. Additionally, we reviewed 74 UIC well permits issued by the Coastal and Inland Districts and 33 WST permits issued by CalGEM's Headquarters. We also selected additional well permits to review CalGEM's use of placeholder projects and issuance of infill well permits. Our audit did not include wells used for underground gas storage or an evaluation of CalGEM's scientific reviews conducted for UIC project and WST permit applications.

Based upon the procedures performed on the items selected, CalGEM's UIC project and well permit, and WST permit processes generally complied with UIC and WST statutes and regulations. However, instances of non-compliance and areas of improvement were identified during our review of CalGEM's operational practices and administration of the UIC and WST programs. The audit objectives and findings are summarized on the following page.

Summary of Findings

Objective 1 – Evaluate the UIC program's PAL and individual well permit process to determine compliance with UIC statutes and regulations.	
Sub-Objective	**Findings**
Evaluate CalGEM's UIC project approval process to determine compliance with UIC statutes and regulations effective April 1, 2019.	• UIC project and permit review policies and procedures have not been updated to implement new UIC regulations effective April 1, 2019, and to provide direction on approval authorizations. • UIC projects were not always forwarded to CalGEM Headquarters for review as required. • Opportunities exist for CalGEM to ensure review determinations are documented consistently and to improve its UIC project transparency.
Evaluate CalGEM's approval of UIC well permits to determine compliance with UIC statutes and regulations.	• Instances of non-compliance were identified for project modification and expansion through the infill well approval process. • Well permits were issued under placeholder projects that did not have a valid PAL. • Opportunities exist for CalGEM to ensure issued permits consistently include key well and project detail, and project files include sufficient review files to support approval of permits.
Objective 2 – Evaluate the WST program's permit approval process to determine compliance with WST statutes and regulations.	
Evaluate CalGEM's approval of WST well permits to determine compliance with WST statutes and regulations.	Improvement is needed for CalGEM to ensure review determinations are supported and documented consistently for the Axial Dimensional Stimulation Area review and risk assessment determination.

The Findings and Recommendations noted within this report are intended to assist CalGEM in strengthening the management and oversight of the UIC and WST programs. Although the Findings are specific to processes, procedures, and practices observed at CalGEM's Headquarters and Coastal and Inland Districts, the Recommendations can be applicable to all CalGEM's UIC and WST programmatic operations.

BACKGROUND, SCOPE, AND METHODOLOGY

BACKGROUND

In summer of 2019, watchdog groups and news outlets began reporting concerns about the increase in the number of oil and gas well permits approved by the California Department of Conservation's (DOC), California Geologic Energy Management Division, (CalGEM). The increase in approved well permits raised concerns that CalGEM's permit review processes were insufficient and possibly circumvented. Further, a concern was raised about the potential conflicts between DOC's responsibility to regulate activities within the oil and gas industry and DOC officials having vested interests in the same industry.

In response, in November 2019, Governor Newsom approved new oil and gas initiatives to strengthen CalGEM's mission to protect public health and safety while safeguarding the environment and reducing climate impacts associated with oil production.[1] Specifically, the following initiatives were approved:

- Implementing a moratorium for approvals of new oil extraction wells that use high-pressure steam to break oil formations below the ground.
- Updating and strengthening rules for public health and safety protections near oil and gas extraction facilities.
- Requiring pending applications to conduct hydraulic fracturing and other well stimulation practices to be independently reviewed.

In connection with the third action above, the Governor's Office requested the California Department of Finance, Office of State Audits and Evaluations, to conduct an audit to determine if CalGEM's review and approval processes for underground injection control and well stimulation complied with oil and gas statutes and regulations. In addition to our audit, DOC contracted with Lawrence Livermore National Laboratory (LLNL) to conduct scientific reviews of all pending hydraulic fracturing permits and well injection project applications, as of November 2019, to ensure the state's technical standards for public health, safety, and environmental protection are met prior to approval.[1]

California Department of Conservation

Through the administration of a variety of programs vital to California's public safety, environment, and economy, DOC's mission is to balance today's needs with tomorrow's challenges and to foster intelligent, sustainable, and efficient use of California's energy, land, and mineral resources. DOC is comprised of five divisions, including Land Resource

[1] Excerpts from Department of Conservation website https://www.conservation.ca.gov/index/Pages/News/California-Establishes-Moratorium-on-High-Pressure-Extraction.aspx.

Protection, Mine Reclamation, California Geological Survey, State Mining and Geology Board, and CalGEM.[2] Principal functions of DOC are to:[3]

- Regulate the oil and gas industry by overseeing the drilling, operations, maintenance, and plugging of oil, natural gas, and geothermal wells.
- Protect agricultural farmland and open space through various projects and financial mechanisms.
- Oversee local lead agencies implementation of the Surface Mining Reclamation Act of 1975, which requires mine operators to obtain reclamation plans and financial assurances to ensure mine sites are remediated to a beneficial use.
- Compile an inventory of the state's abandoned mines and conduct remediation of the sites when funding is available.
- Identify, evaluate, and map the state's geology, geologic, and seismologic induced hazards such as earthquakes, landslides, tsunami and volcanic eruption threats, and hazardous mineral exposure.
- Analyze critical facility sites such as, reservoirs, bridges, and hospital sites for seismic safety.
- Operate the world's largest Strong Motion Instrumentation networks to provide seismic information to various state and local entities and to inform development of improved building codes.

California Geological Energy Management Division

Created by the Legislature in 1915, CalGEM, formerly known as the Division of Oil, Gas, and Geothermal Resources, ensures the safe development and recovery of California's energy resources by prioritizing the protection of 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. CalGEM is tasked with advancing California's goal to become carbon-neutral by 2045. CalGEM currently holds jurisdiction over more than 242,000 wells, including nearly 101,300 active or idle wells.[4]

[2] Excerpts from https://www.conservation.ca.gov/about-us.
[3] Excerpts from https://www.conservation.ca.gov/index/Documents/SLAAReport.pdf.
[4] Excerpts from https://www.conservation.ca.gov/calgem/Pages/Oil-and-Gas.aspx.

District Offices

CalGEM operates within four district offices located throughout California: Northern, Coastal, Inland, and Southern (Districts). See Figure 1 for a map of the areas covered by each District. Districts are responsible for:

- Reviewing and processing all notices to drill, rework, and/or plug and abandon wells.
- Testing and inspecting blowout prevention equipment, well cementing and plugging operations, and other production and injection activities.
- Collecting and maintaining well records other than monthly production and injection reports for activities within the District.
- Distributing information, publications, maps, and division forms.[5]

Figure 1: **Map of areas covered by each District**

Source: DOC CalGEM WellFinder[6]

CalGEM's Headquarters (HQ) office, located in Sacramento, oversees the administrative and overall program oversight of the UIC and WST programs. Districts receive and review applications for UIC projects and individual well permits, and have approval authority over individual well permits. UIC project applications are approved through a multi-level review and approval process that includes HQ and the California State Water Resources Control Board (State Water Board) and Regional Water Quality Control Boards (Regional Water Boards). Applications for WST permits are received, reviewed, and approved by HQ, State Water Board, Regional Water Boards, and the California Air Resources Board (CARB). The Districts are responsible for overseeing all WST activities subsequent to permit issuance.

Underground Injection Control

In 1974, the United States Congress passed the Safe Drinking Water Act, which required the United States Environmental Protection Agency (EPA) to develop requirements for underground injection practices to protect public health and prevent the contamination of underground sources of drinking water (USDW). Because California's oil fields are mature, many wells need stimulation, such as injection, to extract the remaining resources. UIC projects involve the injection of oil and gas production fluids through wells into underground geologic formations for enhanced oil recovery or disposal of water

[5] Excerpts from California Department of Conservation Drilling and Operating Oil and Gas Wells in California, Publication No. PR6S, 2002.
[6] Excerpts from https://maps.conservation.ca.gov/doggr/wellfinder/#.

extracted from oil and gas production. Injection may only be permitted in an aquifer that does not qualify as USDW.

In 1983, the EPA delegated primary responsibility to California for implementing and regulating the injection wells related to oil and gas operations (UIC Class II) within the state. Within the realm of Class II wells, the two most commonly occurring categories are: (1) well used to inject fluids, such as water or steam for purposes of enhanced recovery of oil or gas, and; (2) wells used to inject briny groundwater and other fluids brought to surface in connection with oil or gas production back underground for purposes of disposal. CalGEM's UIC program administers federal and state regulations for the permitting, drilling, inspecting, testing, and sealing of these wells. Approximately 55,000 injection wells are used for cyclic steam, steam flood, water disposal, and water flood. A third category of Class II wells, consisting of injection wells used for storage of hydrocarbons which are liquid at standard temperature and pressure, are subject to separate regulations and were not reviewed under this audit.[7]

UIC statutes and regulations require CalGEM and the oil and gas well operators (operators) to ensure that injection fluids be confined to the approved injection zone and will not migrate into a zone where it could degrade USDW or hydrocarbon resources (natural gas, oil, and coal). In April 2019, updated UIC state regulations were implemented, requiring new standards for the data necessary to evaluate projects, reporting requirements for operators, monitoring, risk mitigation measures, and specified occurrence protocols.

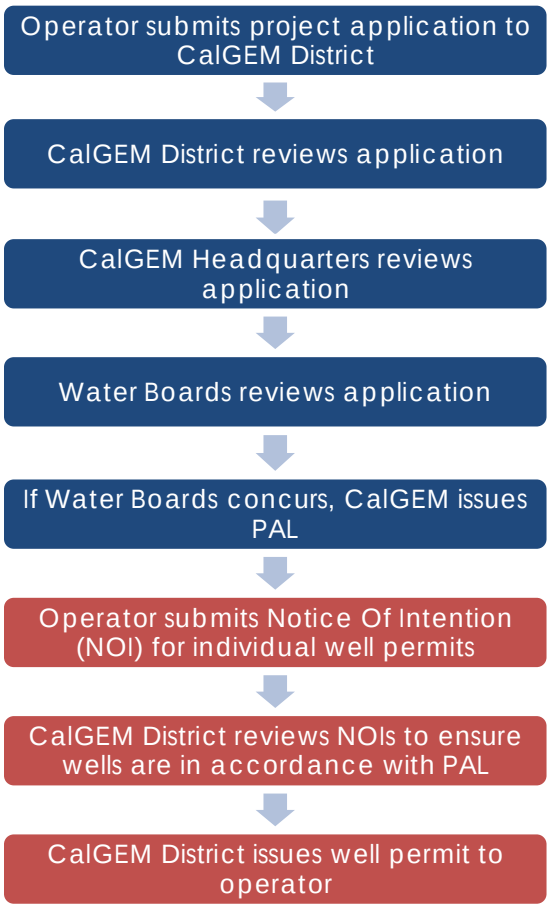
California State Water Resources Control Board/Regional Water Quality Control Boards

Pursuant to a 1988 Memorandum of Agreement, revised in 2018, between CalGEM and the State Water Board, CalGEM is to consult with the State Water Board and Regional Water Boards (collectively referred to as Water Boards) during its review of UIC projects. The Water Boards' review is focused on ensuring that injection will not adversely impact USDW.

Project Approval Letters

Operators are required to obtain UIC project approval by submitting an application to CalGEM. See Figure 2 for a chart of the approval process for UIC projects and individual well permit process. The proposed

Figure 2 - UIC Project and Individual Well Permit Approval Process



[7] Excerpts from https://www.conservation.ca.gov/calgem/general_information/Pages/UndergroundinjectionControl(UIC).aspx.

UIC project is evaluated by CalGEM to ensure the low risk of fluid migration outside the approved injection zone and reviewed by the Water Boards to ensure USDW is not adversely impacted. CalGEM engineers evaluate the geologic and engineering information, solicit public comments, and may hold a public hearing, if necessary. CalGEM approves the UIC project by issuing a Project Approval Letter (PAL), which includes specific conditions applicable to the UIC project, such as approved injection zone, allowable injection pressures, and testing requirements. After the PAL has been issued for a UIC project, operators must request individual well permits from CalGEM.[8]

Individual Well Permits

Before commencing work on a well, operators are required to submit a Notice of Intention (NOI) to CalGEM for approval and issuance of a well permit. Permitted well work consists of new drilling, reworking (e.g. deepening or redrilling), abandoning, or any operation permanently altering the casing of the well. CalGEM is required to provide a written response to the NOI within 10 business days from the date of receipt. Failure to respond will result in the automatic approval of the NOI. CalGEM approval is communicated through the issuance of a well permit to the operator. Permitted well work must commence within 24 months of permit issuance or the permit expires.

Well Stimulation Treatment

Since the 1950's, oil and gas operators have utilized hydraulic fracturing in California. CalGEM has the authority to regulate the oil and gas industry's use of WST and related activities. Well stimulation refers to treatment processes performed on oil and gas wells to increase production. The various treatments enhance the permeability of the geologic formation containing oil and gas. CalGEM oversees WST in California and is responsible for safeguarding public health and the environment while working to reach state climate and carbon-neutral objectives.

Chapter 313, Pavley 2013 (Senate Bill 4 (SB 4)) created permanent WST regulations effective July 2015, to increase operational transparency including reporting requirements, and public notification and disclosure of certain data. SB 4 required CalGEM and oil and gas operators to conduct extensive engineering reviews and well integrity evaluations for groundwater protection and seismic monitoring. The State Water Board reviews all proposed projects to determine whether groundwater monitoring is required.

Memoranda of Agreement Agencies

In accordance with SB 4, CalGEM entered into formal agreements with the following state and local agencies regarding WST and related activities:

- CARB/San Joaquin Valley Air Pollution Control District
- CARB/Local Air Districts
- California Coastal Commission

[8] Excerpts from https://www.conservation.ca.gov/calgem/general_information/Pages/class_injection_wells.aspx.

- California Department of Resources Recycling and Recovery
- California Department of Toxic Substances Control
- State Water Board

These Memoranda of Agreements (MOA) outlined each agency's authority, responsibilities, and notification and reporting requirements; specified the agencies responsible for air and water quality monitoring and the safe and lawful disposal of materials in landfills; addressed trade secret handling protocols; and provided for public access to information regarding WST and related activities. Additionally, the agencies (referred to as the MOA agencies) participated, in some or all, WST permitting reviews, monitoring and investigating, training and enforcement coordination, information sharing, and other agency actions.[9]

SCOPE

In accordance with Government Code sections 13070 and13293 through13295, the California Department of Finance, Office of State Audits and Evaluations, conducted a performance audit of CalGEM. Our audit objectives were to:

1. Evaluate the UIC program's PAL and individual well permit process to determine compliance with UIC statutes and regulations.
2. Evaluate the WST program's permit approval process to determine compliance with WST statutes and regulations.

Our audit was limited to CalGEM's processes and procedures related to the review and approval of UIC project PALs for the period April 1, 2019 through October 31, 2019 and UIC and WST well permits for the period January 1, 2019 through October 31, 2019. The UIC projects and well permits reviewed were issued by the Coastal and Inland Districts and WST permits reviewed were issued by HQ. As previously noted, our audit does not include wells used for underground gas storage.

A separate scientific review of UIC project and WST permit applications is being conducted by LLNL and its results will be issued in a separate report. Therefore, our audit results will not conclude on CalGEM's scientific reviews conducted for UIC project and WST permit applications.

In performing our audit, we considered internal controls significant to the audit objectives. See Appendix B for a list of significant internal control components and underlying principles.

METHODOLOGY

In planning the audit, we gained an understanding of areas significant to UIC PALs and well permits and WST permits. We identified program requirements by reviewing applicable statutes and regulations, CalGEM policies and procedures, and CalGEM's website. We reviewed prior audit reports and interviewed key personnel to gain an understanding of CalGEM's operations and information technology systems used.

[9] Excerpts from https://www.conservation.ca.gov/calgem/Pages/WSTOtherAgencies.aspx.

We conducted a risk assessment, including evaluating whether CalGEM's key internal controls significant to our audit objectives were properly designed, implemented, and operating effectively. Internal controls evaluated focused on CalGEM's organizational structure, external and internal communication, processes and procedures established for reviewing and approving applications for UIC projects and well permits, and WST permits, and information systems used. Our assessment included conducting interviews with CalGEM personnel, reviewing policies and procedures, and observing key processes related to review and approval activities. Deficiencies in internal controls identified during our audit and determined to be significant within the context of our audit objectives are included in the results section of this report.

Additionally, we assessed the reliability of data in the UIC and WST well permit lists generated from CalGEM's comprehensive electronic database, Well Statewide Tracking and Reporting system (WellSTAR) and the UIC projects spreadsheet provided by CalGEM for the purpose of our audit objectives. Specifically, we reviewed existing information and gained an understanding of relevant WellSTAR modules by observing key processes related to system operations and review and approval protocols, and traced a selection of data to source documentation to test for accuracy and completeness. We determined that the data was sufficiently reliable to address the audit objectives.

Based on the results of our planning, we developed specific methods for gathering evidence to address the audit objectives. Our methods are detailed in the Table of Methodologies in Appendix A.

Except as discussed in the following paragraph, we conducted this performance audit in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

Finance and DOC are both part of the State of California's Executive Branch. As required by various statutes within the California Government Code, Finance performs certain management and accounting functions. Under generally accepted government auditing standards, performance of these activities creates an organizational impairment with respect to independence. However, Finance has developed and implemented sufficient safeguards to mitigate the organizational impairment so reliance can be placed on the work performed.

CONCLUSION

CalGEM issued 9 UIC PALs, and 7,120 well permits during the period April 1, 2019 through October 31, 2019. Additionally, CalGEM issued 213 WST well permits during the period January 1, 2019 through October 31, 2019.

We selected all 9 PALs issued for UIC projects; 1 PAL was issued by the Coastal District and 8 PALS were issued by the Inland District. Additionally, we reviewed 74 UIC well permits issued by the Coastal and Inland Districts and 33 WST permits issued by HQ. We also selected additional well permits to review CalGEM's use of placeholder projects and issuance of infill well permits.

Based on the procedures performed on the items selected, CalGEM's UIC project and well permit, and WST permit processes generally complied with UIC and WST statutes and regulations. However, instances of non-compliance and areas of improvement were identified during our audit, as detailed in the Findings and Recommendations section. See Table 1 for a summary of our audit objectives and findings.

Table 1: Summary of Audit Objectives and Findings

Objective 1 – Evaluate the UIC program's PAL and individual well permit process to determine compliance with UIC statutes and regulations.	
Sub-Objective	**Findings**
Evaluate CalGEM's UIC project approval process to determine compliance with UIC statutes and regulations effective April 1, 2019.	• UIC project and permit review policies and procedures have not been updated to implement new UIC regulations effective April 1, 2019, and to provide direction on approval authorizations. • UIC projects were not always forwarded to HQ for review as required. • Opportunities exist for CalGEM to ensure review determinations are documented consistently and to improve its UIC project transparency.
Evaluate CalGEM's approval of UIC well permits to determine compliance with UIC statutes and regulations.	• Instances of non-compliance were identified for project modification and expansion through the infill well approval process. • Well permits were issued under placeholder projects that did not have a valid PAL. • Opportunities exist for CalGEM to ensure UIC well permits issued consistently include key well and project detail, and project files include sufficient review files to support approval of permits.
Objective 2 – Evaluate the WST program's permit approval process to determine compliance with WST statutes and regulations.	
Evaluate CalGEM's approval of WST well permits to determine compliance with WST statutes and regulations.	Improvement is needed for CalGEM to ensure review determinations are supported and documented consistently for the Axial Dimensional Stimulation Area review and risk assessment determination.

FINDINGS AND RECOMMENDATIONS

The Findings and Recommendations detail CalGEM's programmatic administration of the UIC and WST programs as it relates to the review and approval of UIC projects during the period April 2019 through October 2019, and UIC and WST well permits during the period January 2019 through October 2019; and include opportunities for CalGEM to strengthen its management and oversight of the UIC and WST programs. Although our Findings are specific to processes, procedures, and practices observed at HQ, and the Coastal and Inland Districts, the Recommendations can be applicable to all CalGEM's UIC and WST programmatic operations. This section is organized by audit objective as previously detailed.

UNDERGROUND INJECTION CONTROL

Evaluate CalGEM's UIC Project Approval Process to Determine Compliance with UIC Statutes and Regulations Effective April 1, 2019.

A UIC project entails the sustained or recurring injection of fluid into one or more wells over an extended period of time into an approved injection zone for the purpose of enhanced oil recovery (EOR), disposal, storage of liquid hydrocarbons, pressure maintenance, or subsidence mitigation. An injection zone is a three-dimensional space with fixed boundaries where fluid injected into a well is anticipated to occupy or otherwise be located.[10] The common UIC project types, described in Table 2, include cyclic steam, steam flood, water disposal, and water flood.

Table 2: UIC Project Types

Type	Description
Cyclic Steam	A well is injected with steam and then subsequently put back into production. The process includes three stages: (1) Injection, during which a slug of steam is introduced into the reservoir; (2) Soak, in which the well is shut in for several days to allow uniform heat distribution to thin the oil; and (3) Production, in which the thinned oil is produced through the same well. Cyclic steam injection is used extensively in heavy oil reservoirs, tar sands, and in some cases, to improve injectivity prior to steam flood operations.
Steam Flood	Steam generated at the surface is injected into the reservoir through specially distributed injection wells, heating up the crude oil and reducing its viscosity. The hot water that condenses from the steam and the steam itself generate an artificial drive that sweeps oil toward producing wells.
Water Disposal	A well, often a depleted oil or gas well, into which waste fluids can be injected for safe disposal (also referred to as a disposal well).
Water Flood	Water is injected into the reservoir formation to displace residual oil. The water from injection wells physically sweeps the displaced oil to adjacent production wells.

Source: https://www.glossary.oilfield.slb.com/

[10] California Code of Regulations, title 14, section 1720.1.

Project Review and PAL Process

Operators seeking to use underground injection techniques must obtain a PAL before injection can begin. To obtain a PAL, the operator must submit a project application, with required data and documents, to the respective CalGEM District for review and approval. Once the District completes its review, the reviewed project application and corresponding review files (project review) are forwarded to HQ and the Water Boards for review and approval. Once all reviewing parties have approved the project, the District will issue a PAL to the operator.

Key project application data and information evaluated during the project review process are the engineering and geologic studies, and injection plan.

- Engineering study – CalGEM evaluates the project's reservoir and fluid characteristics of each injection zone, the planned well drilling, and the plugging and abandonment program to complete the project. The engineering study must also include casing diagrams for all idle, plugged and abandoned, and deeper-zone producing wells within the project area. The casing diagrams are evaluated to determine and ensure the wells in the area will not adversely affect the project or cause damage to life, health, property, or natural resources.
- Geologic study – CalGEM reviews structural, isopach, and cross section maps, and electric logs that identifies all geologic elements, formations, freshwater aquifers, and oil or gas zones.
- Injection plan – CalGEM requires operators to submit a map showing all injection facilities; maximum anticipated injection pressure and volumes; monitoring system used to ensure that injection fluid is confined to the intended zone or zones of injection; method of injection; corrosion protective measures; the source, analysis, and treatment of the injection fluid; and the location and depth of water-source wells to be used in conjunction with the project.[11]

In accordance with UIC regulations, CalGEM evaluates UIC projects for zonal isolation to ensure containment and confinement of the injected fluid to the formation or zone approved, and protection of USDW from contamination of harmful substances threatening fresh waters. CalGEM accomplishes this through its review of the operator's proposed Area of Review (AOR) and wells within the AOR. The AOR analysis is a required component of the project's engineering study and is the area around each injection well, which determines the boundary of the project's area that is reviewed by CalGEM. The AOR boundary may be reduced or expanded based on the review of pertinent well history, geologic, and injection information.

Although CalGEM has a UIC project application review process in place, review policies and procedures have not been updated to implement new UIC requirements effective April 1, 2019, and to establish PAL and well permit approval authorizations, as noted in Finding 1. As a result, not all UIC projects approved during the period April 1, 2019 through October 31, 2019 were forwarded to HQ for review as required, and review files

[11] Excerpts from https://www.conservation.ca.gov/calgem/general_information.

were inconsistently completed and retained to support review determinations. However, project application reviews selected for testing included evidence of review by the appropriate CalGEM review staff and PAL condition of approvals agreed to CalGEM's and the Water Boards' review determinations. Although, as noted in Finding 2, opportunities exist for CalGEM to strengthen its project review documentation and transparency.

Finding 1 – Improve UIC Program Controls

Several weaknesses were observed with CalGEM's UIC program internal controls. According to Government Code sections 13402 and 13403 (b), state agency heads are responsible for the establishment and maintenance of a system of internal control (as described in Figure 3), and effective and objective ongoing monitoring of the internal controls within its agency. Elements of an adequate system of internal control include, but are not limited to:

Figure 3 - Internal Control

A process, including a continuous built-in component of operations, effected by a state agency's oversight body, management, and other personnel that provide reasonable assurance that the state agency's objectives will be achieved.

Source: Government Code section 13403 (a)

- A system of policies and procedures adequate to provide compliance with applicable laws, criteria, standards, and other requirements.
- An established system of practices to be followed in performance of duties and functions.
- An effective system of internal review.

An inadequate system of internal control may adversely impact CalGEM's ability to timely assess the performance of its programs and promptly resolve weaknesses that may emerge. We identified several internal control weaknesses during our audit, as detailed below. Maintaining an adequate system of internal control will strengthen CalGEM's UIC project and well permit program.

A. Ensure All UIC Project Reviews are Forwarded to HQ

CalGEM did not consistently forward UIC projects to HQ for review as required by CalGEM's internal policy for PALs issued during the period April 1, 2019 through October 31, 2019. During this time, CalGEM issued 9 PALs, approving 7 new projects and the expansion of 2 existing projects. According to CalGEM's November 2010 Memorandum of Expectations (MOE), section D, paragraph 25, the Districts are required to forward project reviews to the UIC program manager for review (i.e. HQ). Of the 9 project reviews, 3 were not forwarded to HQ as required, as noted in Table 3.

Table 3 – UIC Project Reviews

Project Number	Project Detail	PAL Date	District	HQ Reviewed	Review Time at HQ[12]	Total Review Time*
19018007	N, WF	8/14/2019	Inland	**No**	0	566
62806004	E, WF	9/11/2019	Inland	**No**	0	194
62809023	E, WF	9/25/2019	Inland	**No**	0	299
15000069	N, SF	5/15/2019	Inland	Yes	161	588
22203017	N, SF/SC	4/5/2019	Inland	Yes	42	360
33800126	N, SF/SC	6/17/2019	Inland	Yes	1	1,754
44800005	N, SC	10/4/2019	Coastal	Yes	Unknown	1,415
00000036	N, WD	8/7/2019	Inland	Yes	1	582
03200008	N, SF	10/24/2019	Inland	Yes	21	1,479

E=Expansion; N=New; SC=Cyclic Steam; SF=Steam Flood; WD=Water Disposal; WF=Water Flood;
*=Calendar days

According to interviews with project review staff, due to operator frustrations with the lengthy review time, verbal direction was given by HQ executive management to stop forwarding project reviews to HQ to reduce review time. HQ confirmed verbal direction was provided, but HQ and the Districts could not provide the exact time period this occurred. As presented in Table 3 above, the three projects HQ did not review had three of the four lowest review times (calculated from the application submittal to the PAL date). The average review time was 804 days (26 months). However, based upon our analysis of available project review tracking sheets, the majority of the review time for projects forwarded to HQ was spent at the District, and not HQ.

In addition to the Districts' review, HQ's review ensures project reviews and draft PALs comply with UIC requirements. For example, in HQ's review of project 22203017, HQ identified the operator's application did not include maps showing the wellbore paths of the proposed wells, which was specified as required information in CalGEM's project review checklist (i.e. MOA Checklist). It is important for HQ to establish a proactive role in monitoring UIC project review activities at the Districts and to ensure required review practices are consistently implemented. Inadequate monitoring may lead to reduced accountability and due diligence.

B. *Update UIC Project and Well Permitting Review Policies and Procedures*

Although new UIC regulations became effective April 1, 2019, UIC project and well permitting review policies and procedures have not been updated. Specifically, existing policies and procedures are documented in a 2010 MOE and a Manual of Instructions (MOI) with various sections noting revision dates ranging from 1989 to 2009. Further, CalGEM completes a MOA checklist, a review tool to ensure review and verification of project data, information, and documents provided in the operator's application. However, procedures outlining how the MOA checklist should be completed was not available. As a result, the MOA checklist has been

[12] Calendar days calculated based on Inland District's UIC project application tracking spreadsheet. Coastal District did not track review time spent at HQ.

completed inconsistently by the Districts. See Finding 2A for detail related to inconsistent completion of the MOA checklist. Further, due to the lack of updated review policies and procedures, inconsistencies in Coastal and Inland Districts' review processes, documentation, and retention of key project files were observed, as noted in Findings 2 through 5.

Additionally, well permits are issued through CalGEM's review of NOI submitted by operators. Existing NOI review procedures were documented in well permitting training presentations; however, the training was outdated because it did not reflect current processes and referenced CalGEM's old database system, which was replaced with WellSTAR in 2018.

According to HQ, the Districts are expected to comply with the MOE. However, during interviews with District project review staff, they were either not aware of the MOE or considered it outdated; and therefore, felt they were not required to adhere to its expectations. While the MOE provides general staff expectations and program requirements and conditions, it also outlines review practices that are no longer applicable. Further, upon inquiry about training provided to staff, given the lack of updated policies and procedures, the Districts explained that staff were also provided on-the-job training and job shadowing, and were directed by management to use UIC regulations as guidance for completing reviews.

The lack of updated MOE, MOI, and MOA checklist review policies and procedures and training presentations increases review inconsistencies and could negatively impact the review of UIC projects and wells permits, compromising the protection of USDW.

C. Ensure PALs and Well Permits are Approved by Authorized Staff

The PALs and well permits were inappropriately approved by position levels that were not in compliance with UIC regulations or CalGEM policies and procedures. Specifically, we verified the PALs and well permits were approved by authorized positions and noted the following:

- Of the 9 PALs reviewed, 2 PALs were properly approved by the District deputy or supervising engineer. The remaining 7 PALs were approved by senior engineers.

  According to the California Code of Regulations, title 14, (CCR) section 1724.6, operators should obtain approval for each UIC project through issuance of a PAL from CalGEM. CalGEM's MOE, section D, paragraph 25, states the District reviewing engineer and District deputy are required to sign off on the project approval checklist, and then provide the checklist, application, and draft approval letter to the UIC Program Manager (HQ supervising engineer) for review. The UIC Program Manager will sign off on the project review and draft approval letter, as appropriate. According to CalGEM, District deputies or supervising engineers at the Districts have the authority to approve a UIC project and will issue the PAL, once HQ completes its review of the project.

- Of the 74 well permits reviewed, 10 well permits were properly approved by a District deputy. The remaining 64 permits were approved by supervising,

senior, or associate engineers. Because well permits are reviewed and approved in WellSTAR, we reviewed the Coastal and Inland Districts' user groups established in WellSTAR to verify staff authorized to approve well permits. We noted that the user groups included associate engineers and other engineering classifications. System permission levels are designed to ensure approval authority is assigned to appropriate staff.

Public Resources Code (PRC) section 3203 (a), states that before commencing the work of drilling a well, the operator is required to submit a NOI to CalGEM for approval by the State Oil and Gas Supervisor or District deputy. According to CalGEM, the District senior and supervising engineers are authorized to approve well permits, which is not consistent with PRC requirements.

The lack of updated or clear review policies results in inconsistent application of UIC requirements. Further, without policies identifying the assignment of approval authority and adequate system controls governing the approval process, there is a risk PALs and well permits may be approved by unauthorized individuals, compromising the integrity of the UIC project.

Recommendations

A. Forward all UIC project reviews to HQ for review and approval.

B. Update the MOA checklist, MOI, and MOE policies and procedures for the review of UIC projects and well permits to be consistent with current statutes and regulations. Communicate updated policies and procedures to the Districts and monitor implementation.

C. Ensure authorized position levels approve UIC projects and well permits in accordance with statutes and regulations. Establish policies to document approval authority, communicate those policies to the Districts, and monitor implementation. As needed, consider legislative action to ensure assignment of approval authority is in compliance with statutes and regulations.

D. Update WellSTAR user groups to ensure permission levels are appropriately assigned to individuals designated for the approver role.

Finding 2 - Strengthen UIC Project Review Documentation and Transparency

Inconsistencies exist in CalGEM's UIC project review documentation and determinations were not always transparent. Key project review files obtained to support the review of UIC project applications were the MOA checklist and AOR review files. The AOR review files generally consisted of a document evaluating the integrity of wells located within the AOR (well review file) and a document calculating the zone of endangering influence (ZEI). While the MOA checklists and AOR review files were completed for the majority of projects reviewed, the extent of completion and template versions used varied. Further, the well review file was not available for one project.

UIC regulations effective April 1, 2019, clarified the requirement that approved UIC projects should receive a PAL issued by CalGEM that specifies the location, nature, and conditions specific to the project. In our review of the 9 PALs issued during the audit

period, we noted inconsistencies in the identification of a project's approved injection wells and the quality of maps included to provide additional project detail, as described below.

Without complete files containing key project information, there may be uncertainty of the adequacy and completeness of the projects reviewed. Maintaining consistent project review documents demonstrates CalGEM exercised due diligence in reviewing UIC projects. Further, properly documented project review files increases project transparency and supports CalGEM's review determinations.

A. Ensure Project Review Files are Consistently Completed and Retained

Project review files lacked a uniform process due to variations and inconsistencies in the Districts' completion of MOA checklists and AOR review files. The MOA checklist is used to document the review and verification of all required project data and information, and assists CalGEM in facilitating consistency among the Districts. However, as previously noted in Finding 1B, CalGEM does not have documented procedures to provide guidance on the completion of the checklist. As a result, Coastal and Inland Districts' completion of MOA checklists varied in detail and template versions used. For example, the checklist for Coastal District's project 44800005 included one tab with the MOA checklist, which contained minimal review comments that mainly referenced page numbers in the project application. In contrast, Inland District MOA checklists were more extensive and included tabs for the review engineer's analysis, though the extent of review comments among Inland District project reviews varied. Additionally, Inland District MOA checklists did not always include HQ review comments.

In our review of the AOR review files, while sufficient documentation was available to support ZEI calculations, completed well review files varied. Specifically, it was not clear if CalGEM or the Districts had a specific template for review engineers to use because the well review files were all different. We found that not all data fields in the review table were completed for wells listed, some tabs were left blank, or there were multiple versions of the well review files with different information reviewed.

Additionally, for project 44800005, the well review file was not available. According to the Coastal District, the project was reviewed in WellSTAR by completing the designated AOR review tasks; however, the well review file was not retained. Although screenshots of the WellSTAR AOR completed review tasks were provided, they were not sufficient to support the evaluation of AOR wells. For example, the review of an AOR well was indicated as completed by selecting "confirmed" under the review column in WellSTAR. However, there was no documentation in the project review file to support what information was reviewed by the review engineer including well cement records. Although the Coastal District may have implemented the use of WellSTAR to review and approve UIC projects, documentation was not retained to support its determinations.

CCR section 1724.7 (a), states the UIC project should be supported by data filed with CalGEM, consisting of the engineering study, geologic study, and injection plan, and shall demonstrate to CalGEM's satisfaction that injected fluid will not

migrate outside of the approved injection zone. CCR section 1724.8 (a), requires all wells within the AOR to be evaluated for the potential to allow fluid to migrate outside of the approved injection zone. CalGEM's evaluation will include evaluation of the cementing records or cement evaluation log, and to confirm wells which may require integrity testing, well logging, or monitoring in order to provide the requisite assurances that such wells will not act as conduits for fluid migration.

B. Increase UIC Project Transparency Through Additional PAL Details

PALs issued by CalGEM inconsistently referenced approved injection wells and included project maps that were not always clear. In accordance with CCR sections 1724.6 (b) and 1724.7 (b), the PAL should specify the location, nature, and conditions of approval for the UIC project, and a summary list of approved injection wells should be referenced by the PAL. Our review of the 9 PALs issued identified the PALs included key project information, such as the project number and location, injection zone, oil field, and maximum pressure/volume allowed. Additionally, PAL conditions agreed to CalGEM and the Water Boards review determinations. However, language referencing the approved injection wells were not consistent among the PALs and the maps included with the PALs were not always clear and properly labeled.

- *Approved Injection Wells* – The list of approved injection wells were inconsistently identified in the 9 PALs reviewed as described in Table 4. The approval of a UIC project through the issuance of a PAL may consist of one or hundreds of proposed injection wells at the time of PAL issuance. When an operator submits a project application, they identify proposed injection wells for the project. These proposed wells provide CalGEM a basis for identifying the project area and for completing the AOR review to evaluate the risk of fluid migration and whether the wells are suitable for injection. Once the project is approved, CCR section 1724.7 (b), requires the list of approved injection wells to be referenced in the PAL.

Table 4: Inconsistent Reference to Approved Injection Wells

Approved Injection Wells	Project Number(s)
No reference in PAL	22203017
PAL referenced to WellSTAR for approved wells	62809023, 62806004, 44800005, 15000069, 19018007, 03200008
No reference in PAL but included a map identifying approved well	33800126
PAL specified approval of a single well and included a map identifying approved well	00000036

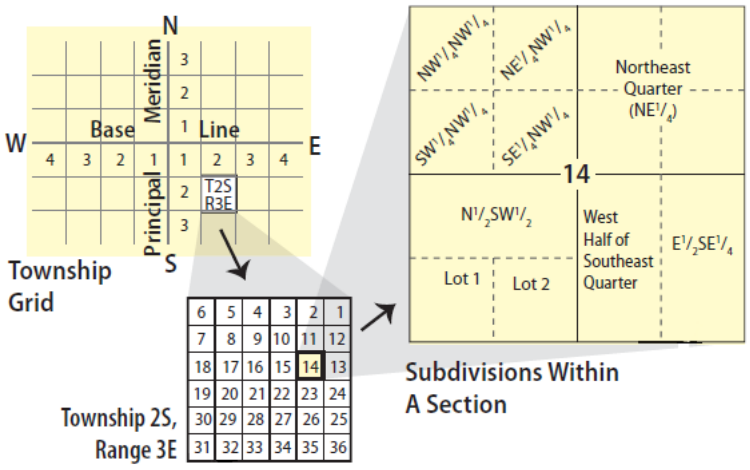
According to CalGEM, because the list of actual injection wells may change over the project life, the PAL will generally include a reference to WellSTAR for the list of approved injection wells. The PAL will not include an actual list of approved proposed injection wells because any subsequent changes to the list of wells would require a modification or revision to the PAL. A current list of approved and permitted injection wells for a UIC project can be accessed through WellSTAR by the operator and CalGEM. However, WellSTAR does not include public access to approved UIC

project and injection well information. Although CalGEM provides a list of UIC project application reviews in progress on its website, CalGEM can improve the transparency of UIC project activities by providing public access to approved project information.

- *Project Maps* – UIC project maps included with the PAL contained unclear and inconsistent levels of detail. CalGEM's new practice for approval of projects in 2019 was to include a project map with the PAL to increase transparency of the project by providing a visual depiction of the extent of the project area and location, and proposed injection wells. Of the 9 PALs reviewed, 7 included a map of the project area and proposed injection wells. For the PALs that had maps, projects 33800126 and 00000036 maps were properly labeled to clearly identify the project area and location, and proposed injection well location and name. However, the maps for projects 19018007, 62806004, 62809023, 15000069, and 03200008 were not labeled to clearly identify project area and location, and proposed injection wells.

  CalGEM identifies the project location using the Public Land Survey System (PLSS). The PLSS identifies sections of townships and ranges to indicate areas and location. The sections represent one square mile and comprise the larger township and range which consist of 36 sections or 6 square miles. The township and range are identified by its location in relation to a base line and principal meridian that acts as a starting point.[13] See Figure 4 for an example.

Figure 4: Example of PLSS mapping[14]



Due to the nature of UIC projects, the project's boundary is defined by the AORs of proposed injection wells and may not always cover entire sections, townships, and ranges. Therefore, the project location using PLSS may include areas that are not part of the project's AOR boundary; and a properly labeled map identifying the project area, location, and proposed

[13] Excerpts from U.S. Geological Survey website https://www.usgs.gov/faqs/do-us-topos-and-national-map-have-a-layer-shows-public-land-survey-system-plss?qt-news_science_products=0#qt-news_science_products.
[14] Image from Geography website, https://geography.name/what-are-some-other-coordinate-systems/.

injection wells will provide additional detail and increase project transparency.

Recommendations

A. Update review policies and procedures to address the completion and retention of MOA checklists and AOR review files. Develop standardized templates to facilitate consistent documentation among the Districts and monitor consistency of implementation. Retain project review files to support review determinations.

B. Determine a standard method to reference the list of approved injection wells in the PAL and ensure the reference is consistent among all PALs. Consider updating regulations as needed.

C. Consistently include clearly labeled project maps in the PAL. Ensure maps clearly identify the entire project location, area, proposed injection wells, and other pertinent information.

D. Consider providing public access to PALs and approved injection wells in WellSTAR to increase transparency of approved UIC projects.

Evaluate CalGEM's Approval of UIC Well Permits to Determine Compliance with UIC Statutes and Regulations.

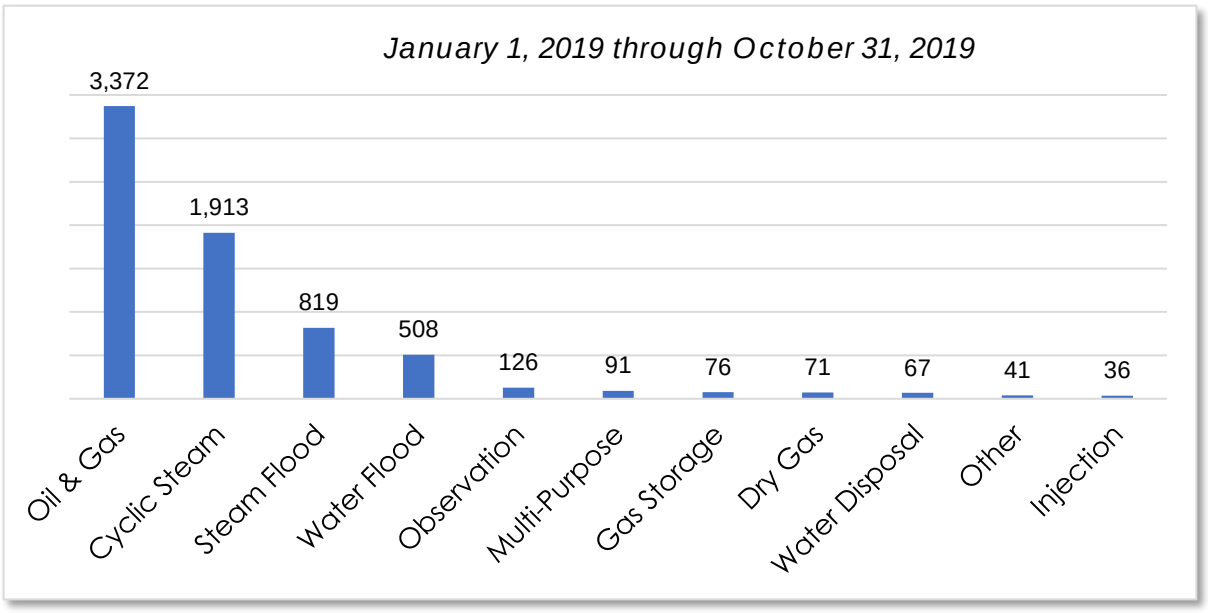
Once a PAL has been issued to approve a UIC project, the operator may submit a NOI to CalGEM for the review and issuance of a well permit to authorize well work for an injection well. CalGEM's system, WellSTAR, is used by the operator to complete and submit NOIs, and by CalGEM to review NOIs and issue well permits. The NOI identifies pertinent information required by CalGEM, such as but not limited to, well information, type of well work to be performed, and the associated UIC project number. For the approval of a permit for an injection well, CalGEM reviews the NOI and verifies the associated UIC project number, confirms a valid PAL exists for the project, verifies the well location is within the approved project location specified on the PAL, and reviews the work plan for the well to ensure it complies with well construction requirements. These requirements include general laws and regulations regarding the protection of underground and surface water, and specific regulations regarding the integrity of the well casing, cement used to secure the well casing inside the bore hole, and cement and equipment used to seal off the well from underground zones bearing fresh water and other hydrocarbon resources.[15]

An NOI will be deemed approved if CalGEM does not respond to the NOI within 10 working days. However, CalGEM may send a letter of abeyance to the operator if CalGEM needs additional time to complete its review. Well permits expire if construction work has not been completed within 24 months of the permit issuance date. NOIs must be submitted before a new well is drilled, an existing well is reworked, or when wells are sidetracked, deepened, or abandoned. NOIs allow CalGEM to track a well's work history and identify changes in well conditions over time.

[15] California Well Constructions Standards excerpt from https://www.conservation.ca.gov/calgem/general_information.

During the period January 1, 2019 through October 31, 2019, CalGEM issued 7,120 well permits for UIC projects. See Figure 5 for well permits issued by well type.

Figure 5: Well Permits Issued



Source: CalGEM

Our review of well permits focused on the review processes for the issuance of permits for cyclic steam, steam flood, water disposal, and water flood UIC well types. However, because UIC projects may include several well types, our test selection included permits issued for other well types, except for gas storage and dry gas. Of the 7,120 permits issued, we reviewed 74 well permits issued by the Coastal and Inland Districts.

As noted in Finding 1, CalGEM has not updated well permitting review policies and procedures to implement applicable UIC requirements effective April 1, 2019. As a result, the Coastal and Inland Districts have different processes for the review and issuance of permits for injection wells. Based upon the selection of well permits reviewed, and except as noted in Findings 3 and 4, CalGEM's well permit process complied with UIC statutes and regulations. Findings 3 and 4 detail instances of non-compliance with UIC regulations. Specifically, CalGEM improperly approved a project expansion and modifications, and issued permits for injection wells under placeholder projects that did not have valid PALs. Finding 5 identifies opportunities for CalGEM to improve its review and documentation of well permitting to support review determinations.

Finding 3 – Ensure Project Modifications or Expansions Are Not Approved Through Infill Well Reviews

Through the issuance of separate approval letters for its review of infill wells, CalGEM improperly approved an expansion for one project and modifications to two projects and did not issue a revision or addendum for the associated PAL. Further, infill well review processes at the Coastal and Inland Districts were inconsistent.

An infill well occurs when an operator seeks to change the location of an active injection well or add a new injection well not previously identified in the project application. CalGEM issues a separate approval letter for its review of infill wells to communicate its AOR review results and determinations. According to CCR section 1724.6 (c), any subsequent modification of an underground injection project requires the prior approval of CalGEM and shall be memorialized in either an addendum to the PAL or a revised PAL. Further, the Water Boards MOA, section (IV)(B)(2), states that in conjunction with the review of an existing project or application for a modified project, CalGEM is to provide the applicable project documents for the Water Boards to review and consult with CalGEM, as needed, regarding the evaluation of potential impacts to water quality.

To comply with UIC requirements, CalGEM will issue a revised PAL once it reviews and approves an operator's project application to expand or modify an existing UIC project. CalGEM considers infill wells to be non-expansion approvals that do not require a revised PAL because the reviews do not increase the project's area and maximum number of injection wells approved (expansion) or do not change a project's PAL conditions of approval (modification). CalGEM does not have written policies and procedures established to provide guidance on what is considered an infill well, and how to review, track, and document the permitting of the infill wells to ensure it complies with current PAL conditions and UIC requirements. As a result, the infill well review process implemented at the Coastal and Inland Districts varied.

Before an infill well is approved for an existing UIC project, an approval letter is issued based upon review processes detailed in Table 5 for the Coastal and Inland Districts:

Table 5: Infill Well Review Processes

Coastal District	Inland District
• Conducts AOR reviews for proposed injection wells and issues approval letters. This process applies to all operators. • Operator's AOR Letter and/or NOI identifies proposed infill well and operator provides information and documents as needed. *If operator submits NOIs for wells noted in the AOR letter, then NOIs are reviewed concurrently.* • **Engineer conducts an AOR review for proposed wells and issues approval letter.** • Operator submits NOI for infill wells in accordance with approval letter, if not already submitted. • Water Boards are not notified of the infill well review or the approval letter issuance.	• Conducts infill application reviews and issues approval letters. This process only applies to certain operators. All other infill wells are reviewed through the NOI process, in which an AOR review is not completed. • Infill application identifies proposed infill wells and operator provides information and documents as needed. • **Engineer conducts an AOR review for proposed wells and issues approval letter.** • Operator submits NOI for infill wells in accordance with approval letter. • Water Boards are not notified of the infill application review, but receive a copy of the approval letter issued.

During the AOR review, the reviewing engineer determines if the operator's infill well request is in accordance with PAL conditions of approval, such as if the well is within the project location and the well does not increase the project area or maximum number of injection wells, pressure, and/or volume approved. As noted in Table 5, infill wells were approved based on receipt of different forms of operator requests and the review procedures established at the Coastal and Inland Districts were not always consistent.

The only procedure the Districts both performed consistently was the review engineer AOR reviews and the issuance of the approval letter, as highlighted in Table 5. Further, CalGEM was not properly notifying the Water Boards of infill well reviews in accordance with MOA requirements. Because CalGEM's infill well reviews did not track the subsequent well permits issued, it is unknown exactly how many infill well permits were approved. For the Coastal District, because approval letters were issued for each NOI review, we selected 7 permits issued for injection wells on or after April 1, 2019 and reviewed a total of 3 approval letters. For the Inland District, from a list of 13 approval letters issued on or after April 1, 2019, we selected 5 infill well approval letters for review. Based on our review of the selected approval letters, the following non-compliance issues were identified:

- *Project Expansion* – CalGEM improperly approved the expansion of the Kern Front 33800001 project, which added a new PLSS section, section 22, and increased the project area by 640 acres. Further, the April 25, 2019 approval letter approved the addition of 100 new injection wells and 300 production wells for the project. CalGEM did not require the operator to submit a UIC project application and did not issue an addendum or revision to the project's existing PAL.

  According to CalGEM, the December 24, 2013 PAL did not require revision because it did not reference the project location by section, township, and range, and only specified the oil field name. Therefore, at the time of the infill well review, it was determined to be consistent with PAL conditions of approval. However, CalGEM acknowledged that based on current standards, it should have been treated as a project expansion because it proposed new injection wells in an area not surrounded by existing injection wells.

- *Project Modifications* – CalGEM improperly approved modifications to projects Cymric 19024021, and Kern River 34000013 WIR 071, VED 784, and WIR 52. Specifically, the approval letters issued for these projects included changes to project terms that required the remediation of several identified problem wells before injection could be approved for multiple infill wells. CalGEM did not require the operator to submit a UIC project application and did not issue an addendum or revision to the projects' PALs. Remediation conditions are significant project changes because they are requirements noted as conditions for PAL approval which require additional follow-up actions by the operator and by CalGEM to ensure compliance with AOR review determinations.

  According to CalGEM, the infill wells were properly evaluated to be consistent with the existing PAL conditions of approval. The additional remediation requirements were specific to a particular proposed injection well, and was not applicable to the project as a whole; therefore, an addendum or revision to the PAL was not necessary. However, we noted that CalGEM's NOI review process only includes a review of compliance with conditions noted in the PAL and does not include review of infill well approval letters. Therefore, without the issuance of a revised PAL, there is an increased risk that all conditions of approval for a project may not be reviewed for compliance prior to approving a permit for an injection well.

Currently, CalGEM does not have existing policies or procedures to provide guidance on what constitutes a significant change requiring revision or addendum to the PAL, or

minor changes that do not require revision or addendum to the PAL. The PAL is the governing document for a UIC project; therefore, by not updating the PAL to reflect significant changes to conditions of approval, such as an updated project area, an increase in the number of approved injection wells, or remediation requirements, CalGEM cannot ensure the UIC project is appropriately monitored for compliance with UIC requirements.

Recommendations

A. Update review policies and procedures to address infill well review, tracking, and documentation. Communicate updated review policies and procedures to the Districts and monitor implementation.

B. Notify and provide relevant key infill project documents to the Water Boards for review and comment; and ensure the Water Boards are consistently notified of approval letters issued aside from the UIC project review process.

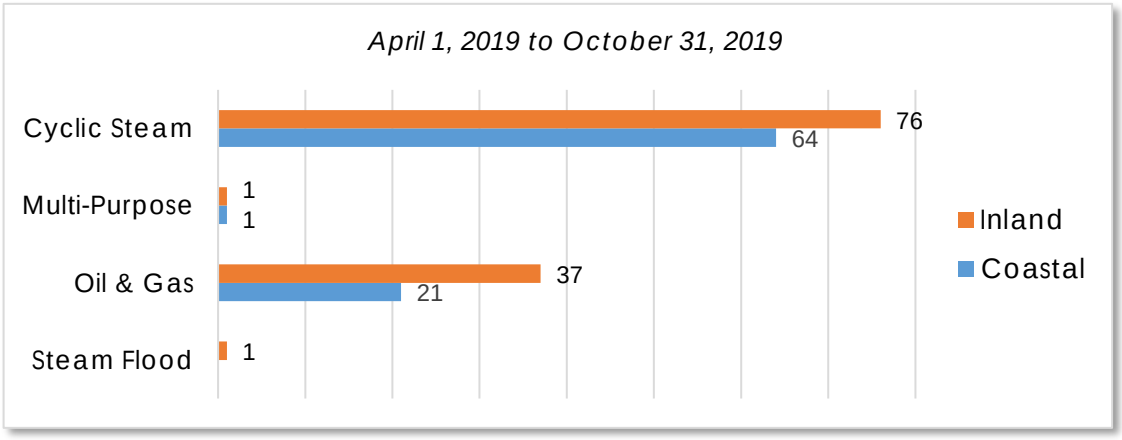
C. Define significant and minor project changes to establish a basis for determining when an addendum or revision to the PAL is required in accordance with UIC requirements.

D. Conduct periodic reviews of infill well approval letters issued by Districts. Periodic reviews should be conducted by HQ using a risk-based approach to ensure adequate oversight of well permitting activities at the Districts.

Finding 4 – Discontinue Use of Placeholder Projects and Issuance of Associated Well Permits

CalGEM's use of placeholder projects to issue permits for injection wells is not in accordance with CCRs effective April 1, 2019. Specifically, a total of 33 placeholder projects (i.e. dummy projects) were in use by CalGEM to track and issue permits for cyclic steam wells. These placeholder projects were not reviewed and approved through the UIC project review process and did not have valid PALs. Therefore, during the period April 1, 2019 through October 31, 2019, a total of 201 well permits, including 140 for cyclic steam injection wells, were issued under 14 placeholder projects at the Coastal and Inland Districts, as displayed in Figure 6. According to CalGEM, placeholder projects were established to group and track permits issued for cyclic steam injection wells located in the same injection zone and geographic area of existing UIC projects. However, as indicated in Figure 6, permits were also issued for placeholder projects pertaining to other well types such as multi-purpose, oil and gas, and steam flood.

Figure 6 - Placeholder Project Well Permits Issued



Source: CalGEM

The approval of cyclic steam injection wells was previously authorized under CCR section 1724.8, which only required the operator to submit a letter to CalGEM of its intention to conduct cyclic steam injection operations on a specific lease, reservoir, or in a particular well. However, effective April 1, 2019, requirements under CCR section 1724.8 were replaced, and the cyclic steam injection authorization was moved to CCR section 1720.1 (p). CCR section 1720.1 (p) defines an underground injection project to include cyclic steam injections. Further, CCR section 1724.6 (a), requires operators to obtain a PAL from CalGEM for the approval of each underground injection project before injection can occur.

Consequently, effective April 1, 2019, CalGEM's continued use of placeholder projects for the issuance of permits for cyclic steam injection wells was not in accordance with UIC regulations because a valid PAL should be on file for the associated UIC project. To determine if CalGEM complied with UIC requirements effective April 1, 2019, we selected six placeholder projects to review existing project files and review documentation, and inquired with CalGEM about any corrective actions it implemented to be in compliance with updated UIC requirements. Our review of the six placeholder projects noted the following:

- *Project Files and PALs Not Available* – All six placeholder projects did not have project review files available to demonstrate the project was reviewed in accordance with current UIC requirements. Further, except for project 64403022, a PAL was not available for the projects. Based on our review of project 64403022, a complete project application, CalGEM review files, and evidence of the Water Boards' review to approve the project were not available although a PAL was issued. According to the Coastal District, the PAL for project 64403022 should not have been issued because the project is a placeholder project.
- *Corrective Actions Taken* – Corrective actions taken to ensure compliance with updated UIC requirements effective April 1, 2019 were not implemented timely and did not effectively stop injection activities for the placeholder projects. Table 6 identifies corrective actions taken for the selected projects reviewed. However, based on our review of the projects' status in WellSTAR, as of April 2020, all six projects were still listed as active, with active and permitted injection wells; demonstrating injection activity has not ceased.

Table 6: Corrective Action Taken

Placeholder Project(s)	Corrective Actions Taken
46400401, 02806006, 64403022, 64403023	No corrective action implemented.
46400400	A notice to suspend injection was issued to the operator August 9, 2019, with an attachment of associated well permits issued in 2019.
05200054	A letter was issued on August 30, 2019, notifying the operator that well permits issued in 2019 under the placeholder project were reassigned to existing steam flood project 05200010.

Additionally, in reviewing corrective actions for project 46400400, we identified placeholder project 46400406, which was not included in CalGEM's placeholder projects list provided. According to CalGEM, project 46400406 had an application submitted by the operator, and although well permits were issued under the project, a PAL has not been issued. Currently, the operator's project application is pending review and approval by CalGEM. Therefore, although CalGEM provided a list of 32 placholder projects, our review identified one additional project, for a total of 33 placeholder projects. Because CalGEM does not have a mechanism to track or easily identify placeholder projects, additional placeholder projects may exist but not be readily known to CalGEM.

CalGEM does not have updated review policies and procedures to address implementation of new UIC requirements, as noted in Finding 1, such as the approval of permits for cyclic steam injection wells. As a result, injection wells may not be properly evaluated to ensure zonal isolation and protection of USDW. According to CalGEM, prior to the April 1, 2019 UIC regulations, cyclic steam injection wells were not explicitly classified as UIC type wells required to be approved under an existing UIC project with a valid PAL. Operators regularly used cyclic steam wells as an EOR method or as part of the regular maintenance of production wells within UIC projects. CalGEM plans to include placeholder projects in its "Project-by-Project" (PxP) reviews, in which all existing UIC projects will be re-evaluated to ensure the projects and PALs are in compliance with current UIC requirements. As appropriate, and based on the results of the PxP reviews, the placeholder projects will be issued a PAL or combined with an existing UIC project.

Recommendations

A. Consider ceasing injection for all well permits approved under placeholder projects that cannot be merged with an existing UIC project with a valid PAL, until the projects can be properly reviewed under a PxP review.

B. Discontinue the use of placeholder project numbers to issue permits for injection wells. Consider rescinding permits for injection wells that are operating under placeholder project numbers that cannot be merged with an existing UIC project with a valid PAL.

C. Identify the entire population of placeholder projects, and prioritize the evaluation of these placeholder projects through the PxP review process. As needed, require operators to submit UIC project applications for review, approval, and issuance of a valid PAL.

D. Conduct periodic reviews of permits issued for injection wells by Districts for compliance with UIC requirements. Periodic reviews should be conducted by HQ using a risk-based approach to ensure adequate oversight of well permitting activities at the Districts.

Finding 5 – Improve Well Permit Detail and Review Documentation

Areas of improvement were identified to assist CalGEM in ensuring adequate management and oversight of well permitting. Specifically, permits issued for injection wells did not consistently include pertinent well and UIC project information, and corresponding UIC project review files lacked sufficient AOR review files. As noted in Finding 1, CalGEM does not have updated policies and procedures for well permitting. Therefore, the well permit review processes implemented at the Coastal and Inland Districts varied. The Coastal District conducts separate AOR reviews for proposed injection wells during its review of the NOIs if the associated UIC project's AOR review was completed more than one year prior. However, the Coastal District does not consistently retain review files. For the Inland District, in its review of NOIs, a separate AOR review is not conducted for proposed injection wells, unless the review is completed concurrently with an infill application review, as noted in Finding 3. In our review of 74 well permits, we noted the following areas of improvement:

A. Consistently Include Key Well and UIC Project Details on Well Permits

Permits issued for injection wells did not consistently include key project and well information. A well permit generally provides conditions of approval regarding the work approved to be completed by the operator, such as the well location, type, and work authorized, relevant UIC project information, and other applicable well specifications. Of the 74 permits reviewed, we observed the following:

- *Well Type Missing* – The well type was not specified on 35 permits reviewed. Identifying the UIC well type, such as cyclic steam or steam flood, will assist in clarifying the authorized operations of a well once work on the well has been completed by the operator. The well type is a required field to be completed by the operator on the NOI submitted to CalGEM. According to CalGEM, current policies and procedures do not require the permit to specify the well type and is not an automatic data field entered on the permit template. Further, the well type can generally be assumed based on the UIC project type indicated on the permit. However, CalGEM is working on standardizing language and required data fields for permits generated in WellSTAR. Without consistently identifying the well type on the permit, it is not clear what type of operation the well is approved for when construction is complete, reducing the transparency of authorized well activities and increasing the risk for unauthorized use of the well.

- *UIC Project Number Missing* – The associated UIC project number was missing on 9 well permits reviewed. Without the project number, it is not clear what UIC project the injection was authorized under and the permit may not be properly tracked and monitored for compliance with UIC monitoring requirements.

According to CalGEM, a limitation in WellSTAR has prevented its ability to properly update the UIC project number for a permitted well. For example, when an operator submits an NOI for an existing well, WellSTAR does not allow the operator or CalGEM to update the UIC project associated with the well if a number has already been recorded for the well. Without the ability to accurately associate wells with its current authorized well type or UIC project, the risk of inaccurate well data increases and may cause errors in the assignment and tracking of permitted injection wells.

- *Associated PALs Missing Project Numbers* - Of the permits selected for testing, 25 permits were associated with 9 PALs that did not specify the assigned project number on the PAL. According to CalGEM, the assignment of project numbers to UIC projects is a recent practice that will not be reflected in older PALs. Therefore, although current permits issued for injection wells may reference a UIC project number, the older PALs were not updated to specify the subsequent project number assigned. Through its PxP reviews, CalGEM intends to issue updated PALs as necessary to include all relevant project information. The lack of sufficient detail on key project documents, such as the permit and PAL, increases the risk of unauthorized approvals and prevents CalGEM from accurately tracking and monitoring UIC activities.

PRC section 3203 (a), states the operator is to provide pertinent data required on CalGEM's forms, such as the NOI that requires identification of the well type and UIC project number. CalGEM should capture the pertinent data required on the NOI and consistently include it on key UIC project documents, such as permits issued for injection wells and PALs.

B. Document and Retain AOR Review Files for Approved UIC Projects

In our review of project files associated with the 74 permits, project review documentation was not consistently retained to support completion of the AOR review. Specifically, in reviewing CalGEM's permitting process, we verified if the approved permit was associated with a UIC project that had a valid PAL and sufficient AOR review files were available to support CalGEM evaluated the project for proper zonal isolation and protection of USDW. As a result, we noted the following:

- *Insufficient AOR review files* – AOR review files were not available for 56 well permits reviewed, which were associated with 21 UIC projects. The Coastal District issued 26 permits and the Inland District issued 30 permits. Within the project files, documentation was not available to support completion of an AOR review, such as the MOA checklist and ZEI calculation, or comparable documents that demonstrated the review of wells within the AOR. Without evidence that an AOR review was completed, it is not clear if the project was properly evaluated to ensure there was no risk of fluid migration, and to support the subsequent approval of permits for injection wells. According to CalGEM, because these were older projects reviewed under prior UIC requirements, the extent of the AOR review and retention of documentation varied. Through CalGEM's PxP reviews, these older UIC

projects will be reviewed to ensure compliance with current UIC requirements.

- *Permit well location did not agree to PAL project location* – The well location identified on two permits did not agree to the associated project's location identified on the PAL. Due to CalGEM's past practice to only specify the oil field name as the project's location on older PALs, most permitted well locations agreed to the PAL's oil field. However, in the instances where the PAL specified the projects' section, township, and range, two permits' well locations did not agree as follows:
    - Permit 7011997 – The well was located in section 28 and the PAL identified the project location to be in section 29.
    - Permit 7003956-01 – The well was located in section 17 and the PAL identified the project location to be in section 15.

  The approval of injection outside of an authorized project area increases the risks for potential fluid migration and contamination of USDW because a thorough AOR evaluation may not have been completed.

CCR section 1724.8, requires all wells within the AOR to be evaluated for the potential to allow fluid to migrate outside of the approved injection zone. CalGEM's evaluation will include evaluation of the cementing records or cement evaluation log and to confirm wells which may require integrity testing, well logging, or monitoring in order to provide the requisite assurances that such wells will not act as conduits for fluid migration.

Recommendations

A. Update review policies and procedures to address permits issued for injection wells, and documentation requirements including retention of key project review files to support review determinations.

B. Identify pertinent well and UIC project data to be included on all permits issued for injection wells, such as but not limited to, well type and project number.

C. Ensure project files contain documentation and evidence to support completion of AOR review for the project and/or proposed injection well.

D. Verify proposed injection wells are within the approved existing UIC project area. Reject the NOI if the well is located outside the project area (i.e. section, township, and range).

E. Conduct periodic reviews of permits issued for injection by the Districts. Periodic reviews should be conducted by HQ using a risk-based approach to ensure adequate oversight of well permitting activities at the Districts.

Evaluate the WST Program's Permit Approval Process to Determine Compliance with WST Statutes and Regulations.

WST is an enhanced oil recovery method used to improve oil and gas production or recovery by increasing the permeability of the reservoir formation. WST is a short term and non-continual process. Well stimulation does not include steam flooding, water flooding, or cyclic steaming.[16] Table 7 describes the well stimulation types.

Table 7: Well Stimulation Types

Type	Description
Acid Fracturing	Treatment that, in whole or in part, includes the pressurized injection of acid into an underground geologic formation in order to fracture the formation.
Acid Matrix	Acid treatment conducted at pressures lower than the applied pressure necessary to fracture the underground geologic formation.
Hydraulic Fracturing	Treatment that, in whole or in part, includes the pressurized injection of one or more base fluids mixed with physical and chemical additives into an underground geologic formation in order to fracture the formation. Also known as fracking or hydro fracturing.

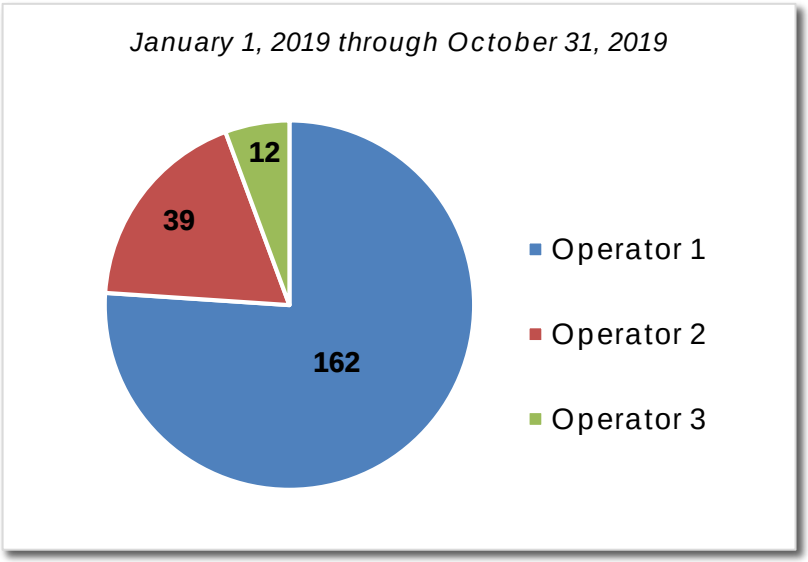
Source: WST Glossary[17]

Beginning July 1, 2015, in accordance with SB 4, oil and gas operators are required to obtain a permit before conducting well stimulation in California. Operators submit permit applications to CalGEM for review and approval. Well stimulation cannot be performed on any well without a valid WST permit issued by CalGEM.

During January 1, 2019 through October 31, 2019, CalGEM issued a total of 213 WST permits, all for hydraulic fracturing, to three oil and gas operators as shown in Figure 7. In July 2019, CalGEM stopped the issuance of WST permits, and in November 2019, Governor Newsom issued a moratorium requiring all pending WST permit applications to be forwarded to LLNL for review.[18]

[16] Public Resources Code, section 3157.
[17] Excerpts from https://www.conservation.ca.gov/calgem/faqs/Pages/Glossary.aspx.
[18] See CalGEM's WST website for LLNL reports, https://www.conservation.ca.gov/calgem/Pages/Well-Stim-National-Lab-Scientific-Review.aspx.

Figure 7: Well Stimulation Permits Issued



Source: WellSTAR

WST statutes and regulations require testing and evaluation before, during, and after WST operations to ensure well integrity and geologic formations remain adequate and USDW is not contaminated. Operators are required to evaluate the casing, tubing, and cement lining of the wellbore to ensure the well's construction is more than adequate to withstand WST. In addition, operators are required to analyze the faults, natural fracture zones, and other wells in the area to ensure WST will not cause the migration of fluid to other zones. Operators are also required to monitor and test the well during and after WST to verify that well failure has not occurred.[19] In accordance with WST regulations, CalGEM will evaluate the quantifiable risk of the proposed WST.

Permit Review Process

During January 1, 2019 through October 31, 2019, WST permit applications approved were submitted electronically via Box.com and were not received or reviewed through WellSTAR. Therefore, the process described below is the application review process in place during our audit period and will not include tasks completed in WellSTAR.[20]

Upon receipt of an application, the WST unit support staff conducts a preliminary evaluation to determine if the application package is complete. If incomplete, the operator is contacted to provide the missing application information or documentation. Once complete, the application review is assigned to a permit engineer to conduct an engineering review and to an engineering geologist to conduct the geologic review. Concurrently, CalGEM's California Environmental Quality Act (CEQA) unit and MOA agencies are notified by email that a new application is available for download and review. This notification starts the 45-day review and comment period for the MOA agencies in accordance with the MOA.

[19] CalGEM Frequently Asked Questions, https://www.conservation.ca.gov/calgem/faqs.
[20] During May 2019, CalGEM released the WST module in its new WellSTAR system to receive and review WST permit applications.

The MOA agencies review the application information and documents. The engineering review, also known as the Axial Dimensional Stimulation Area (ADSA) review, is conducted solely by CalGEM and the Water Boards. Final MOA agencies' comments are emailed to CalGEM by the end of the 45-day comment period.

The ADSA review includes completion of a risk assessment of wells within two times the proposed ADSA area (2xADSA) and verification of the proposed 2xADSA. The permit engineer also completes the following tasks:

- Verify application is complete, review documents/information to ensure compliance with WST regulation requirements, and request any missing documents or information from the operator.
- Work with CalGEM's CEQA Unit to ensure compliance with the CEQA requirements.
- Prepare the ADSA Narrative to summarize application review determinations and email ADSA Narrative to the Water Boards for review and comment.
- Work with MOA agencies to address any comments or concerns raised during the MOA comment period.

In accordance with CCR 1784 (a), the geologic review evaluates the geologic conditions within five times the ADSA area (5xADSA) to ensure the geologic and hydrologic isolation of oil and gas formation during and following well stimulation. The engineering geologist prepares a 5xADSA Memorandum, detailing the 5xADSA review results, and forwards the memorandum to the permit engineer for inclusion in the ADSA Narrative.

Once the application review process is complete, the permit engineer generates a draft WST permit and forwards it to the supervising engineer for review and approval. Once approved, the WST permit is forwarded to the State Oil and Gas Supervisor for final approval and signature. The WST permit is posted on WellSTAR for public accessibility, and the operator and MOA agencies are sent notification of the permit's availability. CalGEM's CEQA unit is also notified and obtains a State Clearinghouse number for the WST within five days of the permit issuance date. Each WST permit expires one year from the date of issuance.

CalGEM has an established permit application review process in place, with documented review procedures and templates to assist staff in conducting permit application reviews. Review files included operator submitted documents and information, and CalGEM and MOA agency review files and correspondences. Permits were reviewed and approved by appropriate CalGEM staff and permit conditions agreed to CalGEM's and MOA agencies' review determinations. Overall, based on our review of 33 WST permits, CalGEM's WST permit approval process complied with WST statutes and regulations. However, as noted in Finding 6, opportunities exist for CalGEM to strengthen its ADSA review by ensuring review determinations are supported and documented consistently.

Finding 6 – Strengthen ADSA Review Documentation

ADSA review documentation was not always available to support verification of the operator's data and did not include sufficient detail to support CalGEM's review determinations. The ADSA review evaluates the proposed WST to ensure oil and gas zones are isolated and that no conduits exist to allow fluid migration out of the intended stimulation zone. According to CalGEM's WST Standard Operating Procedures (SOP), section 1.2.1, the verification of the operator's 2xADSA (i.e. fracture orientation, height, and length, and ADSA dimension) is completed by reviewing the operator's data to ensure it reasonably represents fracture orientation that can be applied to the proposed WST. This review step also verifies the operator has generated its ADSA and 2xADSA based on the data provided and the ADSA dimensions match the modeled data. However, as detailed below, documentation was not available to support verification of the operator's 2xADSA data for all 33 WST permits reviewed.

A risk assessment is also completed and used as a tool to evaluate the integrity of wells within the 2xADSA and their risks of being potential conduits. Each well is assessed by applying a series of different risk factors based on two categories of wells, non-abandoned or abandoned. The risk factors have defined assigned risk values which are selected by permit engineers based on their review of each well's summary (e.g. work/status history) and application data (e.g. casing diagrams, 2xADSA map, cement plan/calculation, operation program, fracture model, proposed fracture dimension, directional survey). Based on the completion of the risk factors, a point total is automatically calculated (0 to 14) to identify low, medium, and high risk wells. Wells with a point total of 12 to 14 are consider high risk, and may require additional actions by the operator to resolve the issue, such as but not limited to, repair or plug the well, modify the perforation interval, adjust the fluid volume so that the frack fluid will not reach the well, or the permit will not be approved. As detailed below, supporting documentation was not available or detail was not included to support certain risk assessment determinations. Further, risk assessments were not consistently completed or retained to support evaluation of the WST wells.

According to PRC section 3160 (d) (3) (c), the State Oil and Gas Supervisor is required to evaluate the quantifiable risk of the WST. Insufficient review files and documentation of review detail reduces CalGEM's ability to demonstrate that WST permits were approved based on an adequate evaluation of the WST risk. Additionally, inconsistent documentation increases the risk of non-compliance with WST statutes and regulations and the risk of fluid migration to USDW.

A. Retain Documentation for Verification of Operator's 2xADSA

Documentation was not available to support CalGEM verification of the operator's 2xADSA data for the 33 permits reviewed. CalGEM acknowledged that a specific format has not been established to document this review step. Additionally, CalGEM clarified that although documentation was not retained, the permit engineers remapped the 2xADSA based on data provided by using a geographic information system, reviewed well files/records, verified operator data/information, and followed-up with the operator, as needed. Further, the completion of this review step is evidenced by the identification and listing of wells to be evaluated in the risk assessment. Although the Water Boards' review

includes a similar verification and may serve as a second level review, ultimately CalGEM is responsible for retaining documentation to support its review and verification of operator provided data. Lack of adequate review documentation increases the risk of an inaccurate 2xADSA area map that may exclude wells from the well review.

B. Retain Documentation and Include Clarification for Risk Assessment Determinations

1. *Ensure Wells Evaluated Include All Wells Within the 2xADSA Map*

   The total number of wells evaluated in the risk assessment did not always agree to the total number of wells identified in the operator's 2xADSA map. For example, the operator's 2xADSA map for WST well 403064624 identified six wells, of which three wells were labeled as penetrating the 2xADSA. However, the permit application listed four wells as penetrating. All four wells were evaluated in the risk assessment, which included a well that was labeled as non-penetrating in the operator's map. The risk assessment did not include details resolving the discrepancy between the operator's application and 2XADSA map; and to support why the other two non-penetrating wells were excluded from evaluation.

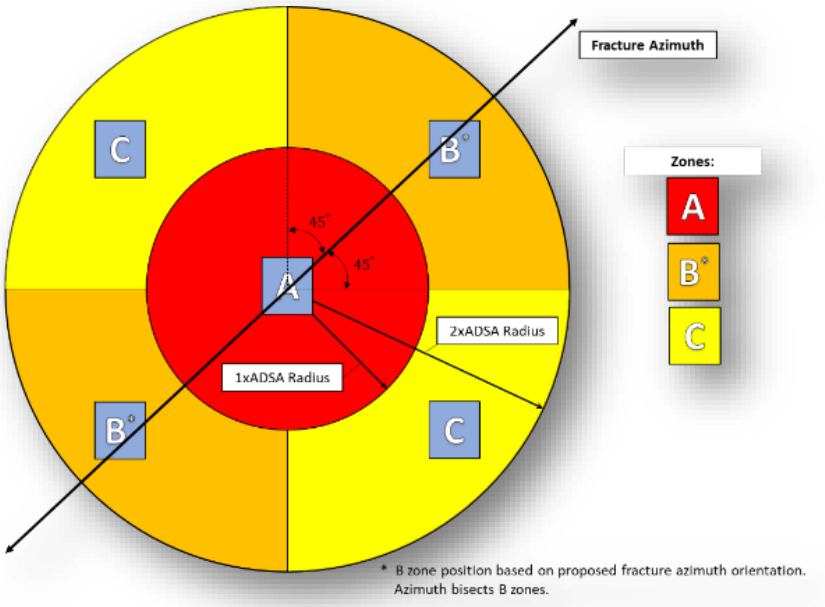
   CalGEM WST SOP section 1.2.2, requires evaluation of wells that penetrate the 2xADSA. Inconsistencies between review documentation may not demonstrate CalGEM evaluated all factors impacting the 2xADSA wells, and that the risk assessment properly identified all wells within the 2xADSA.

2. *Retain Documentation to Support Assignment of ADSA Location*

   For the 33 permits reviewed, a corresponding ADSA zone diagram or comparable document was not available to support the ADSA locations assigned to wells in the risk assessment. Therefore, the locations could not be verified for accuracy. The ADSA location is one of the risk factors used in CalGEM's risk assessment worksheet to evaluate the risk level of a well. For example, Figure 8 and the description below provides an example of the assignment of the ADSA locations based on a proposed fracture orientation of 45 degrees (i.e. azimuth):

   - Zone A: All wells within the circle radius of the 1xADSA and center in the WST perforation is assigned high risk.
   - Zone B: The zone from 45 degrees plus the fracture azimuth and 45 degrees minus the fracture azimuth located between the 1xADSA and 2xADSA is assigned medium risk.
   - Zone C: Any other zone outside Zones A and B will be considered low risk.

Figure 8: Example of ADSA Zones



Source: WST Standard Operating Procedures

According to CalGEM, the mapping of ADSA zones are usually completed in hardcopy format, in which the proposed fracture orientation is drawn by hand to determine the zones. This document was not available because it was not retained or saved in electronic format. The lack of corroborating evidence, such as additional documents or diagrams prepared by permit engineers, prevents CalGEM from demonstrating it properly completed risk factors and accurately calculated total points.

3. *Document Actions Taken to Resolve Abandoned Wells Identified as High Risk*

Abandoned wells identified as high risk in the risk assessment did not include detail to support reasons why the well or additional requirements were not included in the permit conditions. Specifically, the risk assessments for four WST wells (403065452, 403065461, 403065152, and 403063926) identified abandoned wells as high risk based on point total or were identified as poorly abandoned. The corresponding ADSA Narrative did not identify these abandoned wells as high risk wells requiring monitoring or remedial action. Review comments noted on the risk assessment did not include detail to support exclusion of the wells from the ADSA Narrative and to clarify if any subsequent actions were taken or if other factors were considered to resolve the risk identified.

According to CalGEM, further action from the operators was not required. The re-abandonment of these wells would have required the drilling out of a thick cement layer that was previously pumped into the well and other procedures that may have compromised the integrity of the wells and the formation around it. Therefore, as an alternative, CalGEM selected wells in between the WST and poor abandonment wells to be monitored. Although it appears alternative monitoring requirements were chosen to resolve the high risk wells, the lack of sufficient detail and clarification in the risk assessment prevents

CalGEM from demonstrating that high risk wells were properly evaluated and resolved prior to permit issuance.

4. *Include Clarification for the Selection of Monitoring Wells*

   It was not clear how CalGEM selected wells for additional monitoring for 15 WST permits reviewed. Overall, non-abandoned wells identified in the risk assessment as high risk were properly carried forward to the ADSA Narrative and permit conditions as monitoring wells. However, the risk assessments for 15 WST permits also included low and medium risk wells as monitoring wells. Review comments documented in the risk assessment did not include detail to clarify why the wells were selected. According to CalGEM, the total points calculated is used as a reference to assess each well and the decision to select monitoring wells is subject to the permit engineer's professional judgement. Without established factors or conditions to be considered by permit engineers, the risk of review inconsistencies increases and CalGEM may not be able to demonstrate a clear basis for its selection of monitoring wells.

5. *Consistently Complete Risk Assessments*

   Three WST wells (403065755, 403065679, and 4030633394) did not have a risk assessment review file available. The ADSA Narratives for these wells identified that CalGEM's evaluation of well documents indicated no wellbores intersected the 2xADSA or there was minimal risk that the wells within the 2xADSA would serve as a conduit for fluid migration. CalGEM WST SOP section 1.2.2, requires a review of all wells penetrating the 2XADSA in the risk assessment. According to CalGEM, during review of the WST wells, there were no wells existing in the 2xADSA or the wells in the 2xADSA were not penetrating the proposed WST zone. Therefore, in place of completing a risk assessment, the permit engineer conducted a cursory review and did not retain any documentation that may have been in hardcopy format. Inconsistent retention or completion of key review documentation prevents CalGEM from demonstrating it adequately evaluated the WST risk prior to permit issuance.

Recommendations

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

B. Update the risk assessment template to incorporate WST SOP updates noted in Recommendation A above.

C. Include all wells within the 2xADSA map (penetrating or non-penetrating) in the risk assessment and identify the wells that do not require evaluation including documentation of the reasons why.

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.

APPENDIX A

Table of Methodologies

Objective 1 – Evaluate the UIC program's PAL process and individual well permit process to determine compliance with UIC statutes and regulations.	
Sub-Objective	**Methods**
A. Evaluate CalGEM's UIC project approval process to determine compliance with UIC statutes and regulations effective April 1, 2019.	• Identified relevant statutory and regulatory requirements for the review and approval of UIC projects. • Obtained a list of UIC projects approved April 1, 2019 through October 31, 2019 from CalGEM. • Selected to review Coastal and Inland Districts' UIC project review and approval processes since only these two Districts issued PALs during the audit period. • Interviewed UIC staff at HQ, and Coastal and Inland Districts to gain an understanding of processes and procedures established for tracking, reviewing, and approving UIC projects. • Reviewed the MOA with the Water Boards, MOE, MOI, review templates, and UIC project application tracking sheet to gain an understanding of established UIC project review procedures and requirements. • Selected all 9 UIC projects approved April 1, 2019 through October 31, 2019 and determined if the projects were reviewed and approved in accordance with UIC statutes and regulations. o Reviewed project application files submitted by the operator to verify significant documents and information was provided as required. o Reviewed AOR review files and HQ correspondences to determine if CalGEM verified the AOR and evaluated the risk of the project by completing an AOR review of existing wells and proposed injectors, MOA checklist, ZEI calculation, and that CalGEM's review determinations were properly incorporated into the PAL conditions. o Reviewed the MOA checklists, and correspondences and concurrence letters between Coastal and Inland Districts, Water Boards, and HQ to verify project applications were reviewed and approved by appropriate District personnel, and that approval was obtained from HQ and Water Boards. o Reviewed the PALs issued and Water Boards' correspondence and concurrence letters to verify the PAL was properly approved by the District deputy, the PAL properly included key UIC project information, and that PAL conditions accurately incorporated the Water Boards' review determinations.

Objective 1 – Evaluate the UIC program's PAL process and individual well permit process to determine compliance with UIC statutes and regulations.	
Sub-Objective	**Methods**
B. Evaluate CalGEM's approval of UIC well permits to determine compliance with UIC statutes and regulations.	• Identified applicable statutory and regulatory requirements for the issuance of UIC well permits. • Interviewed UIC staff at HQ, and Coastal and Inland Districts to gain an understanding of processes and procedures established for tracking, reviewing and approving individual well permits, placeholder project permits, and infill well permits. • Reviewed the MOI, NOI forms, infill applications, review templates, and permit review tracking sheets to gain an understanding of established UIC permit procedures and requirements. • Obtained a list of UIC well permits issued January 1, 2019 through October 31, 2019 from CalGEM. • Reviewed permits issued for project numbers associated with the nine UIC projects reviewed under audit sub-objective 1A to determine if permits were approved in accordance with UIC statutes and regulations. o Selected 11 permits from 3 projects for review. o Reviewed permits and PALs issued in 2019 to verify the permit was approved prior to the PAL. ▪ If permit was approved prior to the PAL's issuance date, then project review files were reviewed to determine if mitigating actions were implemented to ensure injection approval was held in abeyance until the PAL was issued. o For PALs issued in 2019 for a project expansion, reviewed the permits, prior PALs, and prior project application documents to verify the well location agreed to the prior PAL's project location. • Selected 74 UIC well permits for testing based on significant qualitative and quantitative factors using the list of UIC well permits issued January 1, 2019 through October 31, 2019. Well permits were selected from Coastal and Inland Districts, which issued the largest number of permits. From each District's permit list, excluding permits issued for well abandonment and pressure maintenance, a total of 6 projects and their associated permits (31 Coastal District and 43 Inland District) were selected for review. • Determined if the 74 UIC well permits selected were reviewed and approved in accordance with UIC statutes and regulations. o Reviewed WellSTAR permit review milestones to verify the permit's NOI was reviewed and approved by appropriate CalGEM personnel. o Reviewed abeyance letters to verify CalGEM timely responded to operators within 10 working days for permits that required more than 10 working days to approve. o Reviewed permits to verify they were approved by the District deputy, and the permits included key UIC project details (e.g. NOI type, well type, well location, and project number and type (cyclic steam, steam flood, water disposal, or water flood)). o Reviewed project files and PALs associated with the permits to verify the permit was issued for an existing UIC project with a

Objective 1 – Evaluate the UIC program's PAL process and individual well permit process to determine compliance with UIC statutes and regulations.	
Sub-Objective	**Methods**
	valid PAL, and the well's location agreed to the PAL's project location. o Reviewed AOR review files to determine if CalGEM properly evaluated the risk of the project or individual well permit prior to permit approval. • For infill well permits, we obtained a list of 13 infill application approval letters issued by the Inland District April 1, 2019 through October 31, 2019. • For Coastal District, testing of infill well permits were selected from the 74 permits selected. o Coastal District selection – Selected 2 permits from each well type resulting in 7 permits for testing. A total 3 approval letters associated with the selected permits were reviewed. o Inland District selection – Reviewed each infill application approval letter and selected 5 approval letters from 3 projects for testing. o Reviewed project files, PALs, project applications, permits, and Water Boards' correspondences and letters to verify the well location agreed to the PAL's project location, and to determine if CalGEM completed an AOR review, if the approval resulted in a project modification or expansion, and if an addendum to the PAL or revised PAL was issued. • For placeholder project permits, we obtained a list of placeholder projects used by Coastal and Inland Districts from CalGEM, which identified a total of 32 projects. o Performed analytical procedures to determine if the list was reasonably complete (e.g. selecting similar project numbers and projects with significant number of permits issued to confirm a PAL was issued for the project). o Reviewed the list of UIC well permits issued April 1, 2019 through October 31, 2019 and determined the total count of permits issued for each placeholder project during April 1, 2019 to October 31, 2019. o Determined if the six placeholder projects selected were approved in accordance with UIC statutes and regulations, and if CalGEM implemented appropriate corrective actions, if any. ▪ Reviewed project files or obtained email confirmation from the Districts to verify if the projects had a valid PAL and project files. ▪ Reviewed CalGEM notices or letters to operator or obtained email confirmation from CalGEM to determine if corrective actions taken were appropriate and timely. ▪ Reviewed WellSTAR UIC project data to determine the current status of the project and if it accurately reflects any corrective actions taken by CalGEM.

Objective 2 – Evaluate the WST program's permit approval process to determine compliance with WST statutes and regulations.	
Sub-Objective	**Methods**
A. Evaluate CalGEM's approval of WST permits to determine compliance with WST statutes and regulations.	• Identified relevant statutory and regulatory requirements for the review and approval of WST permits. • Interviewed WST staff at HQ to gain an understanding of processes and procedures established for tracking, reviewing and approving WST permits. • Reviewed MOA, WST SOP, review templates, and WST tracking sheet to gain an understanding of established WST review procedures and requirements. • Obtained a list of WST permits approved January 1, 2019 through October 31, 2019 from WellSTAR. • Selected 33 WST permits for testing based on significant qualitative and quantitative factors. Specifically, permits were selected from each of the three operators and from each oil field with 10 or more permits issued. • Determined if the 33 WST permits selected were reviewed and approved in accordance with WST statutes and regulations. o Reviewed application package files submitted by the operator to verify significant information and documents was provided as required. o Reviewed engineering review files to determine if CalGEM verified the 2xADSA area and evaluated the risk of the WST by completing a risk assessment and ADSA Narrative. o Reviewed geologic review files to determine if CalGEM reviewed the geologic and hydrologic isolation of the WST by completing the 5xADSA Memorandum. o Reviewed permits issued, and MOA correspondence and comment letters to verify permit was properly approved by the State Oil and Gas Supervisor, and that permit conditions accurately incorporated MOA agencies' and CalGEM's monitoring requirements. o Accessed WellSTAR to verify the permit was available to the public.

APPENDIX B

We considered the following internal control components and underlying principles significant to the audit objectives:

Internal Control Component	Internal Control Principles
Control Environment	• Management has established an organizational structure, assigned responsibility, and delegated authority to achieve the entity's objectives. • Management demonstrates commitment to recruit, develop, and retain competent individuals.
Control Activities	• Management designs control activities to achieve objectives and respond to risks. • Management designs the entity's information system and related control activities to achieve objectives and respond to risks. • Management implements control activities through policies.
Information and Communication	• Management uses quality information to achieve the entity's objectives. • Management internally communicates necessary quality information to achieve the entity's objectives. • Management externally communicates necessary quality information to achieve the entity's objectives.

APPENDIX C

List of Acronyms

ADSA – Axial Dimensional Stimulation Area
AOR – Area of Review
CalGEM – California Geologic Energy Management Division (Division of DOC)
CARB – California Air Resources Board
CCR - California Code of Regulations title 14
CEQA - California Environmental Quality Act
DOC – California Department of Conservation
EOR – Enhanced Oil Recovery
EPA – United States Environmental Protection Agency
HQ – CalGEM Headquarters
LLNL - Lawrence Livermore National Laboratory
MOA – Memorandum of Agreement
MOE – Memorandum of Expectations
MOI - Manual of Instructions
NOI – Notice of Intention
PAL – Project Approval Letter
PLSS - Public Land Survey System
PRC - Public Resources Code
PxP - Project-by-Project
Regional Water Boards - Regional Water Quality Control Boards
SB – Senate Bill
SOP - Standard Operating Procedures
State Water Board – State Water Resources Control Board
UIC – Underground Injection Control
USDW - Underground Sources of Drinking Water
Water Boards - State Water Resources Control Board and Regional Water Quality Control Boards
WellSTAR - Well Statewide Tracking and Reporting System
WST – Well Stimulation Treatment
ZEI – Zone of Endangering Influence

November 6, 2020

VIA EMAIL

Ms. Cheryl L. McCormick, Chief
Department of Finance
Office of State Audits and Evaluations
915 L Street, 6th Floor
Sacramento, CA 95814
OSAEReports@dof.ca.gov

Dear Ms. McCormick:

CALIFORNIA GEOLOGIC ENERGY MANAGEMENT DIVISION, UNDERGROUND INJECTION CONTROL AND WELL STIMULATION TREATMENT PROGRAMS, PERFORMANCE AUDIT—DEPARTMENT OF CONSERVATION RESPONSE TO DRAFT AUDIT REPORT

On behalf of the Department of Conservation (DOC) and its California Geologic Energy Management Division (CalGEM), please accept our thanks for the diligent efforts your staff devoted to completing this performance audit of CalGEM's Underground Injection Control (UIC) and Well Stimulation Treatment (WST) programs. DOC and CalGEM acknowledge and agree with the overarching conclusion of the Office of State Audits and Evaluations (OSAE) as stated in the draft report shared with DOC on October 2, 2020: i.e., that, during the evaluation period, CalGEM's practices and processes for UIC project approvals, UIC well permits, and WST permits generally were consistent with applicable statutes and regulations. And, of course, we appreciate that the findings of this audit must be evaluated within the context of the audit's scope, which straddles a period during which CalGEM undertook by far the most substantial rulemaking and regulatory implementation effort its UIC program has experienced at any point during the past thirty years. As a result of the findings and recommendations provided in the draft report, CalGEM will create a Corrective Action Plan (CAP) within 60 days following the report finalization. This CAP will be a detailed step by step plan of action developed to achieve targeted outcomes for resolution of the identified recommendations. Regarding the various recommendations for improvement identified in the draft report, as requested in your cover letter accompanying the draft report, we respectfully submit the following responses.

Underground Injection Control (UIC) Program

UIC Project Review and PAL Process

Finding 1 – Improve UIC Program Controls

DOF Recommendations A: Forward all UIC project reviews to HQ for review and approval.

CalGEM Response: CalGEM agrees that consistent and substantive oversight engagement from UIC program staff based in the Sacramento headquarters office is an important component of the currently contemplated approval process, and that it is a point where improvements can be made. Since the period covered by the audit, a notable improvement effort undertaken by CalGEM on this issue is the development of a "UIC WellSTAR Project Review Process" policy that will encode headquarters-level review into the normal workflow structure of the WellSTAR data program used by CalGEM for processing UIC approvals and many recordkeeping functions. Development of this WellSTAR functionality remains in progress but CalGEM anticipates completion around February of 2021.

DOF Recommendations B: Update the MOA checklist, MOI, and MOE policies and procedures for the review of UIC projects and well permits to be consistent with current statutes and regulations. Communicate updated policies and procedures to the Districts and monitor implementation.

CalGEM Response: CalGEM agrees that maintaining a clearly documented collection of its policies and standard administrative procedures in a consistent, durable, and broadly accessible format is an important part of the process for ensuring its regulatory functions are implemented effectively statewide. CalGEM also agrees this is an area where it can improve. The "Manual of Instruction," or "MOI," and the "Memorandum of Expectations," or "MOE," are, as is evident from their discussion in the report, in many ways outdated and do not fully reflect current CalGEM policy and practice. CalGEM intends to embark on a far-reaching effort to update its policy and procedure documentation, particularly through the development of "Standard Operating Procedure" documents, or "SOPs" and will be documented in CalGEM's CAP. CalGEM anticipates SOP development will be an ongoing, ultimately routinized effort for years to come—as is necessary to ensure documentation remains current. To facilitate this endeavor in the realm of UIC functions, CalGEM has organized a team of UIC subject matter experts, including representatives from each of its district offices and its headquarters program staff, to meet on a roughly monthly basis for the purpose of

evaluating practices and developing proposals for standardized policy decisions and procedures, which may then be presented to and approved by CalGEM senior management. CalGEM refers to this team as the "UIC Roundtable."

Regarding the checklist that accompanies the memorandum of agreement between CalGEM and the State Water Resources Control Board (State Water Board), CalGEM and the State Water Board have completed work on an updated checklist that, among other things, reflect revisions to CalGEM's UIC regulations made after the memorandum of agreement was signed.

DOF Recommendations C: Ensure authorized position levels approve UIC projects and well permits in accordance with statutes and regulations. Establish policies to document approval authority, communicate those policies to the Districts, and monitor implementation. As needed, consider legislative action to ensure assignment of approval authority is in compliance with statutes and regulations.

CalGEM Response: CalGEM agrees it is important that approval functions within its UIC program activities are completed by staff with appropriate and suitably documented authority. CalGEM agrees this is an area where it can improve. Regarding approval authority assigned by statute or regulation to particular officials, such as the State Oil and Gas Supervisor or district deputies, DOC and CalGEM recognize these officials may elect to delegate this authority to one or more subordinates. DOC and CalGEM acknowledge that, as a matter of policy and procedure, usually the best practice is to ensure such delegations are documented in a clear, consistent, durable, and broadly accessible format. CalGEM intends to update its practices regarding documentation of approval authority delegation and determine whether any new or revised delegations and documentation are necessary. Details regarding documentation of approval authority and timing of evaluation will be included in the CAP. More generally, as discussed above, in the time since the audit CalGEM has continued development of a "UIC WellSTAR Project Review Process" that will encode its policies for review and approval activities into the normal workflow structure of the WellSTAR system used by CalGEM for processing UIC approvals and many recordkeeping functions.

DOF Recommendations D: Update WellSTAR user groups to ensure permission levels are appropriately assigned to individuals designated for the approver role.

CalGEM Response: CalGEM agrees that revisions to some approval-related permission levels in the current build of WellSTAR are warranted. The current build of WellSTAR includes an approval workflow design featuring one workgroup per district office for tasks involving UIC approvals and the review and approval of district office staff work

more generally. The intent is for the members of that workgroup to consist of the senior engineers, the supervising engineers, and the district deputy, in accordance with the specific review and approval functions assigned to those positions. WellSTAR has flexibility to assign authority as reviewer only or both as reviewer and approver. This authority in WellSTAR will be assigned on basis of approval authority policy documentation.

Finding 2 - Strengthen UIC Project Review Documentation and Transparency

DOF Recommendations A: Update review policies and procedures to address the completion and retention of MOA checklists and AOR review files. Develop standardized templates to facilitate consistent documentation among the Districts and monitor consistency of implementation. Retain project review files to support review determinations.

CalGEM Response: CalGEM agrees that consistent documentation of the review work done during the UIC approval process is important for many reasons, including fostering greater governmental transparency and facilitating periodic review of approved underground injection projects. CalGEM also agrees that this is an area where it can improve. As discussed above, CalGEM anticipates that an updated version of the memorandum of agreement checklist featuring more precise itemization of the current regulatory standards for UIC project supporting data is near completion. Once that is done, CalGEM plans to make uploading a completed copy of this standardized checklist a part of the routine workflow process for UIC approvals within WellSTAR.

Additionally, as mentioned above, CalGEM plans for its UIC Roundtable team to undertake development of SOPs pertaining to increased standardization for various components of UIC review and approval. CalGEM anticipates these SOPs will include, among other things, policies and procedures applicable to documentation standards for elements of the engineering study, the geologic study, the injection plan, and "area of review" analysis related to those data sources.

DOF Recommendations B: Determine a standard method to reference the list of approved injection wells in the PAL and ensure the reference is consistent among all PALs. Consider updating regulations as needed.

CalGEM Response: CalGEM agrees that documenting the association of specific injection wells to the related PAL in a consistent manner is important. CalGEM agrees this is an area for improvement. As part of the SOP development efforts mentioned above, CalGEM anticipates addressing policies and procedures for staff to document

in a consistent manner the approval status of injection wells and the association of certain wells with a specific PAL. Relatedly, CalGEM has been developing a standardized format for UIC PALs that prominently features a reference to a summary list of approved injection wells associated with the underground injection project, as described in regulation, CalGEM now has a WellSTAR's user interface that includes a listing of wells associated with the underground injection project, and key information about those wells, as part of a standardized and readily accessible display. As such, regulation updates are not needed to reference a list of injection wells in the PAL.

DOF Recommendations C: Consistently include clearly labeled project maps in the PAL. Ensure maps clearly identify the entire project location, area, proposed injection wells, and other pertinent information.

CalGEM Response: CalGEM agrees that clarity and a fundamental level of consistency are important facets of project data supporting a PAL. CalGEM agrees improvements to its documentation practices in this area are possible. As part of the SOP development efforts mentioned above, CalGEM anticipates addressing policies and procedures pertaining to the normally expected minimum contents and precision of various required map components of the data supporting an underground injection project. Relatedly, CalGEM will consider issuing guidance on this same topic to operators and, perhaps, revising its regulations to add additional specificity regarding certain map-related requirements.

DOF Recommendations D: Consider providing public access to PALs and approved injection wells in WellSTAR to increase transparency of approved UIC projects.

CalGEM Response: CalGEM agrees that providing the public with access to PALs and other records related to injection operations is important. Providing a robust online interface for user-directed public access to project data, well records, and other related documents has been envisioned as one of the main benefits of WellSTAR since its early development. Although the current build version of WellSTAR provides only a minimal public-facing component, CalGEM anticipates a much more fully featured public access version will be rolled out in December 2020. UIC record keeping existed outside of CalGEM's legacy database prior to WellSTAR. Therefore, existing PALs and other application documents will be converted into WellSTAR on an ongoing basis over time.

Approval of UIC Well Permits

Finding 3 – Ensure Project Modifications or Expansions Are Not Approved Through Infill Well Reviews

DOF Recommendations A: Update review policies and procedures to address infill well review, tracking, and documentation. Communicate updated review policies and procedures to the Districts and monitor implementation.

CalGEM Response: CalGEM agrees that different policy and procedure considerations may apply when evaluating the addition of injection wells to an existing underground injection project, depending at least in part on whether the additional wells represent a comparatively minor change to the scope of the existing project ("infill") or a more substantial change (expansion or modification). While the nuances of such considerations may necessitate case-by-case treatment, and CalGEM's regulations are specifically tailored to enable project-specific application of professional engineering and geological analysis when appropriate, CalGEM agrees that there is room for improvement in the documentation and consistent application of policies and procedures for how staff engage with these considerations, both internally and in coordination with regulatory partners at the State Water Board and the regional water quality control boards. As part of the SOP development efforts mentioned above, CalGEM anticipates addressing policies and procedures pertaining to this issue.

CalGEM identified this shortcoming and the current build of WellSTAR accommodates adding "infill" wells to a project in a standalone workflow for project modifications that do not expand the parameters of the project. Further, CalGEM is already deeply engaged in collaboration with the Water Boards to develop documented policies and procedures for interagency evaluation of injection well additions to existing underground injection projects based on recognized distinctions between "infill" or similarly non-expansive additions of wells versus additions of wells that implicate more substantial changes to the existing project. CalGEM anticipates this already well-underway interagency effort will inform development of its internal SOPs on similar issues.

DOF Recommendations B: Notify and provide relevant key infill project documents to the Water Boards for review and comment; and ensure the Water Boards are consistently notified of approval letters issued aside from the UIC project review process.

CalGEM Response: CalGEM agrees that close coordination with regulatory partners at the Water Boards is important. As mentioned above, CalGEM is in the final stages of

collaboration with the Water Boards to update the memorandum of agreement checklist documenting expectations for interagency review of underground injection project data. The checklist is expected to be complete by July 2021. CalGEM and the Water Boards are also deeply engaged in development of policies and procedures regarding "infill" additions to existing underground injection projects as compared to other additions of injection wells. CalGEM anticipates these coordinated policy development efforts, in combination with its own internal SOP development as mentioned above, will result in documentation of standardized procedures for when and how interagency notifications occur relating to various review and approval process milestones. The current build of WellSTAR enables on-demand access for Water Boards staff to examine documentation. This access for Water Boards staff extends to all types of records in WellSTAR, not merely records related to UIC regulation.

DOF Recommendations C: Define significant and minor project changes to establish a basis for determining when an addendum or revision to the PAL is required in accordance with UIC requirements.

CalGEM Response: While the two options are substantively equivalent for compliance and enforcement purposes, CalGEM agrees that from a workflow perspective it would be beneficial to have improved consistency regarding when and how staff will document changes to a PAL via an addendum to the existing PAL rather than via the issuance of a revised PAL.

DOF Recommendations D: Conduct periodic reviews of infill well approval letters issued by Districts. Periodic reviews should be conducted by HQ using a risk-based approach to ensure adequate oversight of well permitting activities at the Districts.

CalGEM Response: CalGEM's longstanding policy, reflected by commitments made in its regulations, is to review approved underground injection projects on a periodic basis. These periodic reviews evaluate the adequacy of the current project approval conditions and supporting project data in comparison with current and foreseeable project operations, potentially leading to changes in project approval conditions, issuance of various directives to the operator, or enforcement action as appropriate. CalGEM's policy is that all wells associated with an underground injection project are considered within the context of a periodic review—including any wells that may have been added (or are in the process of being added) via an "infill" type approval process. CalGEM agrees that a risk-based approach to oversight review by its headquarters UIC program staff is an effective use of staff resources. As part of the ongoing SOP development process mentioned above, CalGEM anticipates developing documented policies and procedures for periodic review functions as well as

documented policies and procedures pertaining to risk-based oversight review by headquarters program staff for various functions normally handled at the district staff level. Details regarding documented policies and procedures for periodic review functions will be included in the CAP.

Finding 4 – Discontinue Use of Placeholder Projects and Issuance of Associated Well Permits

DOF Recommendations A: Consider ceasing injection for all well permits approved under placeholder projects that cannot be merged with an existing UIC project with a valid PAL, until the projects can be properly reviewed under a PxP review.

CalGEM Response: CalGEM agrees that clear documentation of injection approval is important, and that it is a central part of how CalGEM's UIC regulatory regime is intended to function.

Review of injection wells approved under placeholder projects has been completed and the majority of wells identified will be merged with an existing steam injection UIC project with a valid PAL. As mentioned in the report, injection approval has been rescinded to all wells identified that cannot be merged with existing UIC projects approved after the onset of the new regulations April 1, 2019.

At the time of the rulemaking, CalGEM understood there would be a grace period necessary for projects, specifically the cyclic steam placeholder projects, to be brought into compliance with the new regulations. Documentation of accurate, updated supporting data of the types described in CalGEM's UIC regulations is a requirement for an operator to obtain and retain injection approval. To that end, CalGEM is engaged in a systematic review of all approved underground injection projects to identify and address potential data gaps relative to current requirements. Details regarding scope of the review and timeline will be included in the CAP.

DOF Recommendations B: Discontinue the use of placeholder project numbers to issue permits for injection wells. Consider rescinding permits for injection wells that are operating under placeholder project numbers that cannot be merged with an existing UIC project with a valid PAL.

CalGEM Response: CalGEM agrees that "placeholder" project numbers, as described in the report, are not substitutes for a properly documented PAL with supporting data. As mentioned above, prioritized review of these injection wells will be completed to issue a valid PAL.

CalGEM does not intend for this type "placeholder" project number practice to resume. Clarifying and confirming the absence of injection approval for any injection well not associated to a PAL with appropriate supporting data is CalGEM's path forward. As part of the ongoing SOP development process mentioned above, CalGEM anticipates implementing updated, documented policies and procedures that will improve standardization in processes and forms of PALs and other UIC approvals.

DOF Recommendations C: Identify the entire population of placeholder projects, and prioritize the evaluation of these placeholder projects through the PxP review process. As needed, require operators to submit UIC project applications for review, approval, and issuance of a valid PAL.

CalGEM Response: As of the date of this letter, CalGEM has identified the entire population of "placeholder" project numbers in its records. Clarifying and confirming the absence of injection approval for any injection well not associated to a PAL with appropriate supporting data is CalGEM's path forward. CalGEM is engaged in a systematic review of all approved underground injection projects to identify and address potential data gaps relative to current requirements. In the context of such review, the apparent relative incompleteness of any required supporting documentation will be an important factor affecting CalGEM's prioritization.

DOF Recommendations D: Conduct periodic reviews of permits issued for injection wells by Districts for compliance with UIC requirements. Periodic reviews should be conducted by HQ using a risk-based approach to ensure adequate oversight of well permitting activities at the Districts.

CalGEM Response: CalGEM agrees that more consistently leveraging a comprehensive engagement of its UIC program staff, district staff, and other subject matter experts in the processes for issuance and review of PALs and other UIC approvals is an area for improvement. As mentioned above, CalGEM plans for its UIC Roundtable team to undertake development of SOPs pertaining to increased standardization for various components of UIC project review and approval. CalGEM anticipates these SOPs will include, among other things, policies and procedures applicable to prioritization of certain staff activities in keeping with risk-based ranking methods.

Finding 5 – Improve Well Permit Detail and Review Documentation

DOF Recommendations A: Update review policies and procedures to address permits issued for injection wells, and documentation requirements including retention of key project review files to support review determinations.

CalGEM Response: As mentioned above, CalGEM plans for its UIC Roundtable team to undertake development of SOPs pertaining to increased standardization for various components of UIC project review and approval. CalGEM anticipates these SOPs will include, among other things, policies and procedures applicable to approvals for underground injection projects and individual injection wells, as well as documentation standards for review of such approvals. In general, CalGEM intends WellSTAR to be the cornerstone of its document and data management system for the regulation of underground injection projects.

DOF Recommendations B: Identify pertinent well and UIC project data to be included on all permits issued for injection wells, such as but not limited to, well type and project number.

CalGEM Response: The current version of WellSTAR provides for manual entry of information such as well type and UIC project code by CalGEM staff within the interfaces for approval of a "notice of intention" to drill, rework, plug and abandon or otherwise permanently alter the casing of a well. CalGEM will consider options for streamlining and standardizing this data entry function, likely in conjunction with the SOP development process being undertaking by its UIC Roundtable team, as mentioned above.

DOF Recommendations C: Ensure project files contain documentation and evidence to support completion of AOR review for the project and/or proposed injection well.

CalGEM Response: As mentioned above, CalGEM plans for its UIC Roundtable team to undertake development of SOPs pertaining to increased standardization for various components of UIC project review and approval. CalGEM anticipates these SOPs will include, among other things, policies and procedures applicable to AOR evaluation and related documentation. Within the WellSTAR system, entry of information regarding AOR evaluation is coded as a mandatory step that must be completed to progress through the approval process. Also, a recent version update to WellSTAR added functionality for uploading additional commonly used document types, including certain documents pertinent to AOR evaluation. CalGEM intends WellSTAR to be the cornerstone of its document and data management system for the regulation of underground injection projects.

DOF Recommendations D: Verify proposed injection wells are within the approved existing UIC project area. Reject the NOI if the well is located outside the project area (i.e. section, township, and range).

CalGEM Response: CalGEM agrees that evaluating and appropriately documenting approval of a notice of intention to drill an injection well entails coordination with the underground injection project data to which the new well will be associated. The location of wells relative to AOR information on file for the associated underground injection project and the general description of the underground injection project location are among the data points to consider in that evaluation and documentation. As mentioned above, CalGEM plans for its UIC Roundtable team to undertake development of SOPs pertaining to increased standardization for various components of UIC project review and approval. CalGEM anticipates these SOPs will include, among other things, policies and procedures addressing consistent documentation of how various related UIC approvals are coordinated, including the PAL, approval of a notice of intention to drill a well, and approval to commence injection into a well.

DOF Recommendations E: Conduct periodic reviews of permits issued for injection by the Districts. Periodic reviews should be conducted by HQ using a risk-based approach to ensure adequate oversight of well permitting activities at the Districts.

CalGEM Response: CalGEM agrees that more consistently leveraging a comprehensive engagement of its UIC program staff, district staff, and other subject matter experts in the processes for issuance and review of PALs and other UIC approvals is an area for improvement. As mentioned above, CalGEM plans for its UIC Roundtable team to undertake development of SOPs pertaining to increased standardization for various components of UIC project review and approval. CalGEM anticipates these SOPs will include, among other things, policies and procedures applicable to prioritization of certain staff activities in keeping with risk-based ranking methods.

Well Stimulation Treatment (WST) Program

Finding 6 – Strengthen ADSA Review Documentation

DOF Recommendation 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.*

CalGEM Response: CalGEM agrees that evaluating and appropriately documenting verification and findings related to the 2xADSA review was an area of improvement. CalGEM updated its WST approval process SOP, which now incorporates document retention requirements for verification of operator's 2xADSA data and determination of ADSA locations. The updated SOP will be provided with the CAP.

DOF Recommendation B: Update the risk assessment template to incorporate WST SOP updates noted in Recommendation A above.

CalGEM Response: As part of the updated SOP mentioned above, the WST Unit developed an updated risk assessment template to include the recommended data and analyses. The template includes determination of ADSA locations, addresses high risk wells, and explains the selection of monitoring wells. Additionally, the template includes an image showing all wells present within the 2xADSA area using CalGEM's GIS well finder map. The new graphic shows the proposed azimuth and the 1xADSA and 2xADSA circles that provide rationale for the determined ADSA locations. Please see the figure below for an example. Please see the Appendix for more details regarding the changes made to the risk assessment template.

DOF Recommendation 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.

CalGEM Response: CalGEM agrees identifying and documenting wells that do not require evaluation increases transparency of the CalGEM review and was an area to improve. The updated risk assessment template described in our response to DOF Recommendation B, above, addresses this recommendation. CalGEM added a spreadsheet to the template listing all wells within the 2xADSA, along with supporting details on why some wells which appear in the 2xADSA are not evaluated as part of the risk assessment. Please see the attached Appendix for more details regarding the changes made to the risk assessment template.

DOF Recommendation 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.

CALGEM Response: CalGEM agrees that documenting and retaining files to support the evaluation of risk for the WST in a consistent and traceable manner is important. The WST program implemented a more rigorous document retention process to address this recommendation. This process is included in the revised SOP, which will be provided with the CAP.

Please feel free to contact Emily Reader (Emily.Reader@conservation.ca.gov) or Yuvaraj Sivalingam (Yuvaraj.Sivalingam@conservation.ca.gov) if you would like to discuss these responses or other matters pertaining to the performance audit.

Sincerely,

Original signed by

David Shabazian
Director

Original signed by

Uduak-Joe Ntuk
State Oil and Gas Supervisor

cc: Wade Crowfoot, Secretary, California Natural Resources Agency

Rick Cervantes, Manager, California Department of Finance, Office of State Audit and Evaluations

Cindie Lor, Supervisor, California Department of Finance, Office of State Audit and Evaluations

Clayton Haas, Acting Chief Deputy Director, Assistant Director, Division of Administration, California Department of Conservation

Emily Reader, Chief Deputy of Programs, California Geological Energy Management Division

Yuvaraj Sivalingam, Deputy Supervisor for Policy and Administration, California Geological Energy Management Division

Bill Bartling, Chief Deputy, Field Operations, California Geological Energy Management Division

Amit Garg, Senior Oil and Gas Engineer, Underground Injection Control, California Geological Energy Management Division

May Soe, Senior Oil and Gas Engineer, Well Stimulation Treatment, California Geological Energy Management Division

Chris Jones, Acting District Deputy, Inland District, California Geological Energy Management Division

Baldev Gill, District Deputy, Inland District, California Geological Energy Management Division

Charlene Wardlow, Gill, District Deputy, Northern District, California Geological Energy Management Division

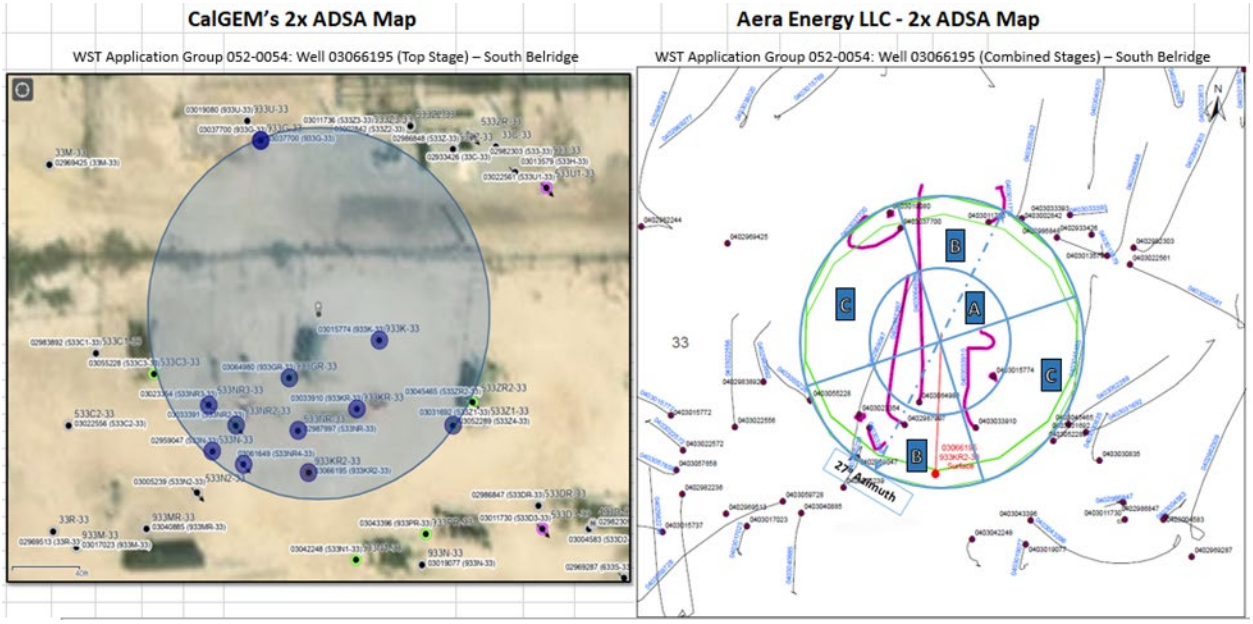
Patricia Abel, District Deputy, Coastal District, California Geological Energy Management Division

Appendix:

The new WST risk assessment template includes the following sections shown below. These updates are being incorporated into our standard operating procedure (SOP) at the moment.

2xADSA maps:

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. The WST engineer inserted the proposed fracture azimuth path along with the ADSA location zones (A,B and C) onto the map. This step incorporate the verification and documentation recommended under part A of the report. As this step 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 file going forward.



Abandoned and non-abandoned wells risk assessment:

This section has new added comments to include the reason for monitoring well selection as recommended under part A.

Non-Abandoned Wells

API	Well Number	Well Type	Previously Stimulated	Damage Type	Damage Location	ADSA Location	USDW Present	Point Total	Comments
03033391	533NR2-33	Injector Well	Stimulated	None	None	B	NO	4	Permit to P&A issued on 04/24/2019.
03064980	Unspecified 933GR-33	Other Active Well	Stimulated	None	None	A	NO	4	Very close to proposed WST well and within fracture azimuth

Notes:

Poorly abandoned well(s)

Selected monitoring well(s)

Abandoned Wells

API	Well Number	Abandonment Info (c/o Depth)	Damage Location	USDW Present	Perforation Location	Location in ADSA	Points	Average	Comments
02987997	533NR-33	Above (<20 ft) Stimulation Formation w/ >1x Cement Pumped	Below C/O Depth out of zone	NO	B	B	9	5.571429	Ret @568'; dogleg @577'; perfs @630' - 2380'; diatomite @579'
03011736	533Z3-33	Into Top Perforation	Above C/O Depth	NO	B	B	5	5	C/o @764'; dogleg @600'; perfs @635' - 2130'; diatomite @575'
03015774	933K-33	Bottom Perforation	Above C/O Depth	NO	A	A	7	5	C/o @1515'; dogleg @574'; perfs @620' - 1426'; diatomite @581'
03019080	933U-33	Into Stimulated Formation	Above C/O Depth	NO	C	C	4	4.5	C/o @610'; dogleg @560'; perfs @615' - 1441'; diatomite @579'
03023354	533NR3-33	Into Top Perforation	Above C/O Depth	NO	B	B	5	4.666667	C/o @960'; dogleg @578'; perfs @675' - 1471'; diatomite @580'
03033910	933KR-33	Into Top Perforation	No Damage	NO	A	C	5	4.5	C/o @1019'; perfs @920' - 1441'; diatomite @577'
03037700	933G-33	Bottom Perforation	Above C/O Depth	NO	C	B	4	4	C/o @1447'; dogleg @ 608'; perfs @640' - 1411'; diatomite @577'

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. This new added section on wells not intersecting the 2xADSA but are shown within the surface map, 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**
02959047	533N-33	Does not penetrate
03052289	533Z4-33	Does not penetrate
03061649	533NR4-33	Cancelled Well
03005239	533N2-33	Does not penetrate
03045465	533ZR2-33	Does not penetrate
03066195	933KR2-33	New - Proposed WST Well, Not Drilled