SB 463: CHEMICAL INVENTORY AND ROOT CAUSE ANALYSIS REGULATIONS

FINAL STATEMENT OF REASONS

REGARDING

TITLE 14. NATURAL RESOURCES
DIVISION 2. DEPARTMENT OF CONSERVATION
CHAPTER 4. DEVELOPMENT, REGULATION, AND CONSERVATION OF OIL AND GAS RESOURCES

The Department of Conservation (Department), through its Geologic Energy Management Division (Division), proposes to add and amend various sections within the California Code of Regulations, title 14, division 2, chapter 4, subchapter 1, article 5. Specifically, the Division proposes to amend sections 1726.1, 1726.3, 1726.3.1, 1726.4.4, and 1726.6.1, and add new sections 1726.3.2, and 1726.4.3. Originally proposed section 1726.3.3 has been deleted.

Unless otherwise specified, references in this document to a "section" are references to a section of California Code of Regulations, title 14, as it would be added by this rulemaking.

INTRODUCTION AND BACKGROUND

Regulation of Underground Natural Gas Storage Facilities

The Division supervises the drilling, operation, maintenance, and plugging and abandonment of onshore and offshore oil, gas, and geothermal wells. The Division carries out its regulatory authority to encourage the wise development of oil and gas resources while preventing damage to life, health, property, and natural resources. (Pub. Resources Code, § 3106.) The Division's duties include the protection of public health and safety and environmental quality, including reduction and mitigation of greenhouse gas emissions associated with the development of hydrocarbon resources. (Pub. Resources Code, § 3011.) The Division regulates the injection of natural gas into large underground depleted oil and gas reservoirs for storage before the gas is later withdrawn for sale to residential, commercial, and industrial customers and natural gas power plants. The Division supervises underground gas storage (UGS) facilities to ensure that the drilling of new wells is conducted properly, to ensure the integrity of gas storage wells and reservoirs, and to prevent damage to public health and the environment. (Pub. Resources Code, §§ 3011, 3106, 3180, 3181, 3181.5, 3183, 3184, 3186.3, 3220 and 3403.5.) UGS projects are subject to a set of existing requirements that apply specifically to underground gas storage facilities. (Cal. Code Regs., tit. 14, §§ 1726 to 1726.10.)

The Division's staff is comprised of engineers and geologists with education and experience in the field of oil and gas exploration, production, and regulation of underground gas storage projects. Many of the Division's staff are licensed in their respective fields, and most have extensive regulatory and industry backgrounds. The range and depth of expertise within the Division facilitates a thorough and comprehensive approach to regulating all aspects of oil and gas production operations, including underground natural gas storage operations. The Division has utilized this depth of knowledge and expertise to develop these proposed new regulations to ensure that legislative intent is implemented clearly and effectively, and that the regulations do not duplicate or conflict with the Division's existing UGS regulations.

Aliso Canyon Natural Gas Storage Facility 2015 Leak and Investigation

On October 23, 2015, a natural gas leak was discovered from an injection and withdrawal well, Standard Sesnon 25 (SS-25) in the Aliso Canyon Natural Gas Storage Facility in Los Angeles County. For 111 days, the well leaked gas despite seven separate well kill attempts and presented a significant threat to the public peace, health, safety, and general welfare. It resulted in the relocation of thousands of people from the areas proximal to the facility and, according to the California Air Resources Board, released 109,000 metric tons of methane. On February 11, 2016, the operator controlled the leak by injecting well control fluid from a relief well intersecting the bottom of the leaking well. The permanent seal of the well was announced on February 18, 2016.

In response to the Aliso Canyon incident, the Division promulgated emergency regulations on February 5, 2016, imposing requirements on all UGS facilities in the state. The Legislature also responded to the incident, and, effective January 1, 2017, Senate Bill 887 (Pavley, Chapter 673 statutes of 2016) (SB 887) established significant new statutory requirements for UGS facilities. Consistent with the statutory requirements of SB 887, the Division promulgated a set of regulations specific to UGS facilities which became effective on October 1, 2018.

An independent root cause analysis of the SS 25 blowout incident was performed by Blade Energy Partners (Blade), who was selected by the California Public Utilities Commission (CPUC) in consultation with the Division and the federal Pipeline and Hazardous Materials Safety Administration (PHMSA). On May 17, 2019, Blade released a report on its root cause analysis into the 2015 leak at the Aliso Canyon natural gas storage facility as a main report with four supplementary volumes (Blade Report)[1] intended to inform parallel investigations by the Division and the CPUC.

[1] Throughout this document, the phrase "Blade Report" will refer to the main report and all four supplementary volumes as a whole. When the main report is referenced directly, this analysis will reference the "Blade Main Report".

Simultaneously, local public health officials,[2] private health professionals, and community groups were reaching out to the Legislature and the Division, concerned that there was insufficient information regarding the chemical makeup of the materials that had been released during the Aliso Canyon event to properly evaluate public health impacts on neighboring communities. Previously, the California Council on Science and Technology[3] had recommended that improved oversight of natural gas storage facilities should include improved tracking and disclosure of the chemicals used in, and composition of gas in, those facilities.

Chemical Inventory and Root Cause Analysis Evaluation Requirements

In response to this leak and uncertain public health impact concerns, the Legislature passed Senate Bill 463 (Stern, Chapter 773 statutes of 2019) (SB 463) which added and amended several sections of the California Public Resources Code.

Public Resources Code section 3181.5 requires operators to provide to the Division "a complete chemical inventory of the materials of any phase, including the composition of well kill fluids, that may be emitted from the gas storage well in the event of a reportable leak…no less than annually." The information contained in an operator's chemical inventory is to be provided with sufficient accuracy and precision necessary as determined by the Division, in consultation with the Office of Environmental Health Hazard Assessment (OEHHA) and other public health experts, to inform the determination of public health impacts from the release of chemicals and other materials from a well into the environment.

Gas storage well chemical inventories are to be updated and current, and the Division is authorized to require a chemical supplier to provide information about a chemical to the Division if the supplier refuses to provide the information to the operator. Operator violation of the chemical inventory reporting requirement is a misdemeanor, and the Division must post reportable leaks and chemical inventory information related to reportable leaks on the Division's website.

SB 463 also amended Public Resources Code section 3183 to require the Division, in consultation with the California Air Resources Control Board, to review and, if necessary, revise the Division's regulations related to reportable leaks at least every 10 years.

Finally, SB 463 added section 3186.3 to the Public Resources Code, requiring the Division to review, and if necessary, revise, its natural gas storage policy and regulations to address the root causes identified by the Blade Report. Although the Division's regulations

[2] Aliso Canyon Disaster Health Research Study, Los Angeles County Department of Public Health, http://publichealth.lacounty.gov/eh/healthresearch/

[3] Long-Term Viability of Underground Natural Gas Storage in California: An Independent Review of Scientific and Technical Information, California Council on Science and Technology, https://ccst.us/reports/natural-gas-storage/publications/

that became effective in 2018 addressed many of the identified root causes, section 3186.3 requires the Division to evaluate and consider, at minimum, the following: cathodic protection for well casings on a well-by-well or field-by-field basis, well control plans, and requirements for operators to investigate and report on leaks and other pressure equipment integrity incidents that present a risk of leaks.

Stakeholder Input and Public Health Consultation Preceding This Rulemaking

The Division developed the proposed regulations following input and discussion with stakeholders and public health professionals. Beginning in February 2020, the Division held informal meetings with environmental groups and UGS operators to discuss the requirements of SB 463 and to identify and understand concerns that could be addressed by regulation. The regulation development team conducted outreach to public health officials in the California counties where UGS facilities are located and met with Los Angeles County Public Health, OEHHA, and the California Department of Public Health to understand and inform the details needed in the proposed requirements for chemical inventory content and reporting.

On September 28, 2021, the Division released a pre-rulemaking "Discussion Draft" of the proposed regulations to solicit public input. The Division received letters, phone calls, and emails, and their content was considered in the Division's refinement of the proposed regulations. Additionally, the Division reached out to the first responders identified in operator-submitted emergency response plans to discuss the impacts of requiring updates to the emergency response plans annually.

On April 19, 2024, CalGEM initiated the formal rulemaking process for the regulations. A first public comment period on proposed regulations was held from April 19, 2024, through June 5, 2024, pursuant to the Notice of Proposed Action mailed to interested parties and duly published in the California Regulatory Notice Register on April 19, 2024 (Register 2024, Number 16-Z, April 19, 2024). During that public comment period one public hearing was conducted virtually on June 4, 2024. After reviewing the comments received, CalGEM held two fifteen-day comment periods; the first from September 5 through September 20, 2024 and the second December 5 through December 20 to receive input on revised text of the proposed regulations.

Proposed Regulations

The amendments and additions to the Division's existing UGS regulations proposed in this package implement requirements of SB 463 including well chemical inventory requirements and findings of the Blade Report.

The proposed regulations address requirements in several important topical areas: the development, submittal, and updating of chemical inventory contents and data including baseline testing for chemicals of concern; and regulatory updates necessary

to respond to the Blade Report findings and to prevent damage to life, health, property, and natural resources – requirements for evaluation of occurrences that potentially impact risk and safety, and corrosion risk evaluation, mitigation, and monitoring, including consideration of cathodic protection, and requirements for well-specific well control plans.

SPECIFIC PURPOSE AND BENEFIT OF, AND RATIONALE FOR, EACH PROPOSED OR AMENDED REGULATION

The anticipated benefits of each proposed section or amendment to an existing section are discussed specifically below. In general, this rulemaking action will enhance, clarify, and augment the regulatory standards applicable to UGS projects in California to reduce threats to life, health, property, and natural resources, and protect stored resources, surface and underground waters, and the public welfare. The proposed chemical inventory regulations will provide needed transparency and information about the chemicals to which the public may be exposed in the event of a release from a gas storage well. The other proposed regulations and amendments will enhance the Division's existing UGS regulations to support and facilitate operator detection, investigation, evaluation, and mitigation of well integrity issues. This action will increase transparency regarding the Division's regulatory standards and expectations for UGS projects and is necessary to effectuate the Division's statutory mandates under Public Resources Code sections 3011, 3106, 3180, 3181, 3181.5, 3183, 3186.3, 3220, and 3403.5.

Section 1726.1 – Definitions

Section 1726.1, subdivision (a)(7). Public Resources Code section 3181.5 requires the Division to collect from each operator, a complete chemical inventory of the materials that may be emitted from a gas storage well in the event of a reportable leak. The inventory requirement and submittal process is new to the Division's UGS regulations and there is no existing definition or reference to a well chemical inventory. The proposed regulation defines a "Gas Storage Well Chemical Inventory" as "a list of all chemical constituents that may be emitted from a gas storage well in the event of a reportable leak as defined in section 1726.9, subdivision (a)." This definition is necessary to give specific meaning to the term's usage elsewhere in the regulations, such as in proposed section 1726.4.3, and makes clear that the chemical inventory requirement applies to gas storage wells, and that all chemical constituents must be included in the inventory if there is any possibility that the chemical constituent may be emitted by a gas storage well during a reportable leak. The definition provides a reference to the section of the regulations where a reportable leak is defined and is necessary to implement the mandate of Public Resources Code section 3181.5. Clarity of definition ensures that both operators and the public can understand the requirements of the regulation and how those requirements will be applied.

Section 1726.1, subdivision (a)(8). Public Resources Code section 3186.3 directed the Division to consider the inclusion of well control plan requirements that include the range of flow properties possible in the event of an uncontrolled well release. After review, the Division has proposed a new requirement for well-control plans that use an Inflow Performance Relationship. This definition gives specific meaning to the term used in the well control plan requirement so that both operators and the public can understand the expectations around well control plan development requirements.

Section 1726.1, Reference Citation. Public Resources Code sections 3011, 3181.5, 3183, and 3186.3 are added to the authorities referenced by this section. Section 3011 confirms that the Division's purposes include the protection of public health and safety and environmental quality, including the reduction and mitigation of greenhouse gas emissions. Section 3181.5 directs operators to submit a gas storage well chemical inventory. Section 3183 required the Division's adoption, in consultation with the California Air Resources Board, regulations defining what constitutes a reportable leak, and requirements for posting information about a reportable leak. Public Resources Code section 3186.3 directs and authorizes the Division to consider requirements for well control plans for a gas storage field, including the range of flow properties possible in the event of an uncontrolled well release.

Section 1726.3 – Risk Management Plans

Risk management planning requirements were a prominent addition to the Division's UGS regulations in 2018 and were necessary to improve safety practices and well management in UGS facilities. Public Resources Code section 3181 requires the operator of a gas storage well to develop and maintain a risk management plan that identifies and plans for mitigation of all threats and hazards associated with gas storage well operation. Risk management plan requirements, including emergency response requirements, are a cornerstone in the Division's UGS regulatory program to ensure internal and external mechanical integrity of gas storage wells.

The Blade Report was issued after the Division's 2018 UGS regulations took effect, so the Division did not have the benefit of the Blade Report root cause analysis during the prior rulemaking. The Division, on its own, and in response to Public Resources Code section 3186.3, reviewed the Blade Report for recommended policies and requirements that were not previously addressed by the current regulations. These proposed regulations strengthen the Division's existing risk management plan requirements and related UGS regulations and are therefore necessary to implement the Division's statutory mandates under Public Resources Code sections 3011, 3106, 3180, 3181, 3181.5, 3183, 3186.3, 3220, and 3403.5.

Section 1726.3, subdivision (a)(1). As operators make changes to their risk management plan, language has been added to require documentation of changes to be submitted with the plan for review. This record of changes requirement will help validate that the

operator is addressing actual risks in a timely manner. The tracking of changes and evolution of the plan over time will allow both the operator and Division to evaluate the changes' effectiveness in mitigating risk.

Section 1726.3, subdivision (d)(4). The Blade Report found that a well casing rupture due to microbial corrosion was the direct cause of the Aliso Canyon well leak. The existing regulations require all risk management plans to include risk assessment and prevention and mitigation protocols, including corrosion monitoring, evaluation, and mitigation, taking into consideration prescribed criteria. The Division has determined that additional improvements to corrosion detection, evaluation, mitigation, and monitoring requirements will decrease the likelihood of another significant corrosion-related event like the Aliso Canyon well leak and are necessary to respond to the mandate of Public Resources Code section 3186.3.

Proposed amendments to section 1726.3, subdivision (d)(4) would replace the existing corrosion-related requirements with a provision indicating that corrosion strategies are still required elements of a risk management plan, with a direct reference to the enhanced corrosion-related requirements in proposed section 1726.3.2, "Corrosion Evaluation, Mitigation, and Monitoring," discussed in more detail below. Current corrosion evaluation requirements were incorporated into the proposed corrosion section. Risk management planning is complex, and the existing regulations are extensive. The Division determined that corrosion requirements will be more clearly understood and followed if moved to a standalone section commensurate with their importance in risk management.

Section 1726.3, subdivision 1726.3 (d)(5). The proposed amendment replaces the phrase "corrosive potential" with "corrosivity." "Corrosive potential" is specific to cathodic protection processes. "Corrosivity" is the term for the ways in which a substance causes damage as a function of the substance's chemical makeup. Corrosivity is the more appropriate term for the concern addressed by this section, namely, to prevent corrosion damage to wells. More accurate terminology will reduce the potential for confusion and is necessary to prevent operators from misunderstanding this regulatory requirement.

Section 1726.3, subdivision (d)(7). Among other findings, the Blade Report found that the Southern California Gas Company had not conducted detailed follow-up inspections or analyses after previous leaks, and that there had been more than 60 casing leaks since the 1970s at Aliso Canyon before the 2015 leak.

Consistent with the findings in the Blade Report, Public Resources Code section 3186.3, subdivision (c) directs the Division to consider requirements for operators to investigate leaks and other pressure equipment integrity incidents that present a risk of leaks. The Division is also required to consider reporting requirements for such incidents. The Division initially proposed protocols for investigating, tracking and reporting any off normal occurrence. Upon review of public comments and reevaluation of existing state and federal requirements, the Division determined that the proposed reporting scheme was

in part duplicative of existing requirements. The final proposed regulation eliminates the duplicative identification and reporting requirements, and instead leverages existing reporting requirements to require that operators evaluate any reported or reportable risk-related condition, address such risks in their risk management plan, and retain related records for the life of the facility.

Section 1726.3, subdivisions (d)(8)-(d)(12). Due to the addition of proposed subdivision (d)(7), existing subdivisions (d)(7)-(11) are renumbered accordingly to (d)(8)-(12). Other than new numbering, the text of these requirements are unchanged.

Section 1726.3, subdivision (d)(13). Existing subdivision (d)(12) lists, in paragraph form, human factors that operators must assess in operating and maintenance procedures. This format has caused confusion about whether each specific factor must be considered independently.

The proposed amendment to subdivision (d)(12), which is renumbered to (d)(13), makes non-substantive formatting changes only. New subdivisions (A) and (B) are added and each human factor consideration is moved to its own numbered subdivisions so that operators will recognize and address each item as a separate requirement, rather than in a consolidated and more general analysis. Focused attention on each factor helps reduce risk and ensure that mitigation measures are developed for each factor.

Section 1726.3, subdivisions (d)(14)-(d)(17). Due to the addition of proposed section 1726.3, subdivision (d)(7), subsequent subdivisions have been renumbered. Existing section 1726.3, subdivisions (d)(13)-(16) are renumbered accordingly to (d)(14)-(17). Other than new numbering, the text of these requirements are unchanged.

Section 1726.3, Reference Citation. Public Resources Code sections 3011 and 3186.3 are added to the authorities referenced by this section. Public Resources Code section 3011 confirms that the Division's purpose includes protection of public health and safety and environmental quality, including the reduction and mitigation of greenhouse gas emissions associated with the development of hydrocarbon resources. Public Resources Code section 3186.3 directs and authorizes the Division to consider requirements for cathodic protection and investigation and reporting of leak and other equipment integrity incidents.

Each change to the UGS risk management plan regulations is necessary to improve the quality and completeness of UGS risk management planning, to effectively evaluate, mitigate, and monitor for hazards that may affect the integrity of a gas storage well or UGS project, and to comply with the Public Resources Code section 3186.3 mandate to expressly consider cathodic protection and leak and other integrity incident investigation and reporting requirements.

Section 1726.3.1 – Emergency Response Plan

The Division proposes to revise its emergency response planning requirements in two key areas: addition of well control planning requirements and requirements for monitoring, sampling and testing methods for chemicals of concern that may be released from a gas storage well in the event of a reportable leak.

During the Aliso Canyon incident, seven "kill" (stop) operations were attempted and failed. The Blade Main Report found that each attempt made the situation worse, and that a successful kill on the first attempt, if based on transient modeling or well deliverability data, would have stopped the flow of gas within a few days.[4] The Blade Main Report specifically identifies the lack of a well-specific well control plan as a root cause of the uncontrolled release of hydrocarbons for 111 days. [5]

Public Resources Code section 3181 requires that the risk management plan include a specific emergency response plan that provides for immediate control of the full range of leaks possible at the facility. Newly added Public Resources Code section 3186.3 directs the Division to consider more specific requirements for a well control plan for a gas storage field, that include the range of flow properties possible in the event of an uncontrolled well release. The purpose of a well control plan is to plan for and effectively respond to a well control incident, to prevent gas or fluids from flowing to the environment during a blowout. The Blade Main Report recommended, at minimum, a well-specific Inflow Performance Relationship (IPR) curve, an understanding of this deliverability based on pressure, and a well-specific control plan, quantitatively developed for various scenarios.

Each well control plan should consider the specific circumstances affecting the conditions of the well, including site geology and well configuration. This amended regulation will enhance the effectiveness of an operator's response to an emergency well incident, and the amendments are therefore necessary to implement the mandate of Public Resources Code sections 3181 and 3186.3, as well as the Division's broad regulatory mandates under section 3011, 3106, and 3403.5.

Section 1726.3.1, subdivision (c)(5). The Blade Main Report noted that SS-25 well kills were unsuccessful due to insufficient kill fluid density and pump rates, because "transient kill modeling was not performed"[6] and "gas flow rates from the well were not estimated or used in engineering the kill attempts."[7] One of the root causes of the gas leak the Blade Main Report identified was the "lack of a real-time, continuous pressure monitoring system for well surveillance" to "prevent an immediate identification of the SS-25 leak and accurate estimation of the gas flow rate."[8]

[4] Blade Energy Partners, "Root Cause Analysis of the Uncontrolled Hydrocarbon Release from Aliso Canyon," Main Report, May 16, 2019 (Blade Main Report), pg. 144, 208, and 238.
[5] Blade Main Report, pg. 5.
[6] Ibid. pg. 237-240
[7] Ibid.
[8] Ibid.

This regulation, included as a new subdivision (c)(5), adds a requirement for well-specific well control plans that include an IPR based upon for the current configuration of the well. The absence of this information exacerbated the gas leak of SS-25 and caused the leak to persist for an unnecessarily long duration of time. Having this information calculated prior to an actual event would provide an operator with the data needed to successfully kill the well on the first attempt, reducing the duration of a leak and benefitting public health. The well control plan and use of the IPR methodology is, therefore, necessary to implement Public Resources Code section 3186.3. Data and models supporting these well-specific well control plans shall be made available to the Division upon request so that they can be evaluated and verified as needed.

Section 1726.3.1, subdivisions (c)(6)-(c)(15). Due to the addition of proposed section 1726.3.1, subdivision (c)(5), the existing (c)(5) and subsequent subdivisions have been renumbered. Existing section 1726.3.1, subdivisions (c)(5) through (c)(14) are renumbered accordingly to (c)(6) to (c)(15). Other than new numbering, the text of these requirements is unchanged.

Section 1726.3.1, subdivision (c)(16). This proposed subdivision adds a requirement to emergency response plan regulations. It requires that operators identify monitoring, sampling, and testing methods to detect, and if possible quantify, chemicals of concern. Public health professionals felt that advance planning was a best practice to avoid unnecessary delay in sampling and testing during an emergency and potential loss of important chemical information. Monitoring, sampling and testing results for a well must be submitted to the Division and incorporated into the operator's relevant Gas Storage Well Chemical Inventory. Gas Storage Well Chemical Inventory requirements are addressed in more detail in Section 1726.4.3.

The methods required by this subdivision must also include procedures for prompt operator engagement with the Division when the operator's emergency response plan is triggered. This ensures that appropriate testing is done in a timely way, benefitting public health and the environment by expediting the detection of chemicals of concern, thereby allowing for mitigation measures to begin earlier.

Section 1726.3.1, subdivision (c)(16)(A). This addition defines chemicals of concern and other constituents that also require testing under section 1726.4.3, subdivision (c). The chemicals of concern were identified in collaboration with public health professionals including California Department of Toxic Substances Control and Los Angeles Department of Public Health.

Section 1726.3.1, subdivision (c)(16)(B). This subdivision makes clear that the required testing is not a reason to delay repair of the leak.

Section 1726.3.1, subdivision (d). Existing subdivision (d) requires an operator to review and update the emergency response plan after key personnel changes, but no less often than once every three years. The proposed amendment requires more frequent review and updating of emergency response plans to at least once per calendar year, no less often than every fifteen months. Given the critical importance of emergency response preparedness, plans should be reviewed more regularly to ensure they reflect existing conditions and contain accurate and current information. The time frame also enables operators to consider and account for the gas storage well chemical inventory content and risks such materials pose in the development of their emergency response planning in the event of an uncontrolled leak.

Section 1726.3.1, Reference Citation. Public Resources Code sections 3011, 3181.5, 3186.3, and 3220 are added to the authorities referenced by this section. Public Resources Code section 3011 confirms that the Division's purpose includes the protection of public health and safety and environmental quality, including the reduction and mitigation of greenhouse gas emissions. Public Resources Code section 3181.5 directs operators to submit a gas storage well chemical inventory. Public Resources Code section 3186.3 directs and authorizes the Division to consider requirements for well control plans for a gas storage field. Public Resources Code section 3220 requires operators to properly construct each well with water-tight and adequate casing and to use every effort and endeavor to prevent damage to life, health, property, and natural resources.

Section 1726.3.2 – Corrosion Evaluation, Mitigation, and Monitoring

Public Resources Code section 3181, effective January 1, 2017, established the first formal and comprehensive California risk management planning requirements for intrastate underground gas storage facilities. Among other elements, section 3181 required the operator of a gas storage well to submit a plan for corrosion monitoring and evaluation for the State Oil and Gas Supervisor's approval. The regulation implementing the risk management plan requirement, effective in 2018, identified the minimum considerations for such plans in section 1726.3, subdivision (d)(4).

The Blade Report, released the following year, highlighted the significance of and need for corrosion monitoring and mitigation, noting that unmitigated groundwater and microbial corrosion was the root cause for a wellbore failure which caused the Aliso Canyon gas leak. The Blade Report recommended that the causes and associated risks of corrosion need to be formally evaluated and understood. Had the corrosion on the casings in SS-25 been detected earlier, the mechanical integrity issue could have been addressed and the leak prevented from occurring.

In enacting SB 463, the Legislature declared that "review of existing regulations in consideration of this root cause analysis is warranted to help ensure that the communities surrounding the State's underground gas storage facilities are protected from future leaks to the maximum extent possible." Public Resources Code section 3186.3 directs the

Division to review and, if necessary, revise its well policy and regulations to address the root causes identified in the Blade Report. The Division has thus reviewed its existing requirements for corrosion monitoring, evaluation, and mitigation, and determined that given their importance, and given the density of the requirements for risk management planning contained in section 1726.3, it is necessary for clarity, transparency and consistency purposes to highlight its importance in a standalone corrosion-focused section. New section 1726.3.2 incorporates and expands on current corrosion protocol provisions, to more effectively address the root causes identified in the Blade Report and is therefore necessary to implement Public Resources Code sections 3181 and 3186.3, as well as the Division's broad regulatory mandates under sections 3011, 3106, and 3403.5.

Section 1726.3.2, subdivision (a). Section 1726.3.2 adds a new corrosion-specific section which is incorporated into risk management planning through section 1726.3, subdivision (d)(4)17. Section 1726.3.2's framework is to require corrosion risk evaluation, protocols for risk mitigation strategies where risk is established, monitoring, protocol updates and record-keeping.

Subdivision (a) of section 1726.3.2 requires a risk management plan protocol to evaluate corrosion and establish of corrosion risk. The subdivisions of section 1726.3.2, subdivision (a), discussed below, detail requirements for corrosion evaluation to improve the identification and understanding of corrosion risk, with the goal of preventing, or if necessary, mitigating corrosion.

Section 1726.3.2, subdivision (a)(1). Each gas storage well's corrosion risk must be evaluated using, at a minimum, the considerations specified in subdivisions (a)(1)(A) through (a)(1)(E). Each consideration is an important factor in determining the corrosion risk for each well and the need for mitigation and monitoring.

Section 1726.3.2, subdivision (a)(1)(A). Natural gas is held underground under pressure. This subdivision requires evaluation of each gas storage well's components, including tubular integrity, and the configuration of its casings. Because of high pressures and extreme temperatures, components with integrity issues are at risk of failure. The well configurations and grade of material of each tubular may impact a risk of corrosion due to the innate properties of the materials used and their exposure to corrosive materials based on location within the well and location of cement behind casing.

Section 1726.3.2, subdivision (a)(1)(B). This addition requires consideration of the well's corrosion rate and detected anomalies, as determined under the existing casing wall thickness inspection requirement in section 1726.6 (a)(2), which is calculated by comparing the results of casing wall thickness inspections. Corrosion growth rate is a key factor in determining corrosion risk and the effectiveness of corrosion mitigation measures.

Section 1726.3.2, subdivision (a)(1)(C). This proposed new regulation requires that an evaluation of a well's corrosion risk must include consideration of anomalies identified in logs or tests that are run on the well. Anomalies in logs and other tests, such as temperature and noise logs need to be explained and understood because anomalies indicate the need for further investigation to determine the source, cause and extent of the anomaly, and whether an actionable risk level exists.

Section 1726.3.2, subdivision (a)(1)(D). Each gas storage well presents a unique situation and is at different risk for corrosion, based on the specifics of the well itself and other conditions. This provision requires each gas storage well's corrosion risks to be evaluated and specifies that the risk assessment of each well must consider, at least the well's age, construction, history of use and maintenance, including drilling, completion, location and quality of cement, uncemented casing, mitigations and repair history, replacements, and current use. A well's construction, history and condition should be evaluated. Degradation of well components occurs naturally over time and varying levels of wear and tear will occur depending on well construction, nature of operation, and well intervention.

Section 1726.3.2, subdivision (a)(1)(E). Each gas storage well may be subjected to varying environmental factors that can increase risk of corrosion and these factors need to be evaluated on a well-by-well basis to determine their impacts on corrosion risk for the well. This provision requires evaluation of the primary environmental conditions that could be pertinent to each well and lists those conditions in its subdivisions.

Section 1726.3.2, subdivision (a)(1)(E)(i). This subdivision requires consideration of the composition and anticipated corrosivity of wellbore fluids and solids and the impact of operating pressures and temperatures. Risk of corrosion is directly impacted by the amounts and types of chemicals and substrates present, and corrosive activity and opportunity may be increased by high pressures and temperatures present in gas storage wells.

Section 1726.3.2, subdivision (a)(1)(E)(ii). This subdivision requires consideration of the composition and anticipated corrosivity of all formation fluids, including fluids in formations above the storage zone. This language was in the original text of the regulations and has been brought over to the new corrosion section. The word anticipated was added to clarify that measurements of corrosivity are expected using a variety of methods. Direct sampling may not always be available in fields with no recent drilling activity. Operators are not expected to drill a well or to damage their wells by perforating the casing to collect a sample. Measurements from electric logs, mud logs, and other sources should be used to calculate information about shallower zones until a new well is drilled, allowing for direct sample collection and testing.

Section 1726.3.2, subdivision (a)(1)(E)(iii). The extent of groundwater and its access to the surface and production casing at Aliso Canyon were not understood before the SS-25

well blowout.[9] This subdivision requires for each well, consideration of the surface and near surface hydrology. Surface water can potentially be corrosive and depending on site-specific conditions, may contribute significantly to risk of corrosion.

Section 1726.3.2, subdivision (a)(1)(E)(iv). This subdivision requires consideration of surface and near surface soil conditions. Soil properties such as electrical resistivity, chloride content, and pH level can affect the risk of pitting corrosion or stress-corrosion cracking.

Section 1726.3.2, subdivision (a)(1)(E)(v). This subdivision requires consideration of the observed corrosion of other wells in the field. These observed corrosion levels are good indicators of what is going on the field and provide data that should be considered for each well. Known corrosion in a field can help determine mitigation measures appropriate for a new well drilled in that field.

Section 1726.3.2, subdivision (a)(1)(E)(vi). This subdivision requires consideration of the other environmental factors that may contribute to corrosivity such as the geology of the surrounding rock. There are additional environmental variables affecting corrosion risk that may be uncommon but still warrant consideration on a well-to-well basis. This catch all item is meant to track other environmental factors that operators may be aware of due to their time overseeing the gas storage project or because of the specifics of the facility.

Section 1726.3.2 subdivision (a)(2). This section requires that corrosion risk be reevaluated after each casing wall thickness test and any time other data indicates a need for reevaluation. This reassessment of risk will help ensure that operators are regularly reassessing the need for corrosion mitigation and monitoring based on well specific data and factors.

Section 1726.3.2, subdivision (b). After establishing that a corrosion risk exists, it is important that operators develop a corrosion risk mitigation protocol. Implementing strategies that inhibit or even eliminate sources of corrosion help ensure well integrity and prevention of loss of containment. The minimum required risk mitigation strategies are listed in subdivisions (b)(1) and (b)(2) of this subdivision.

Section 1726.3.2, subdivision (b)(1). This subdivision requires strategies to prevent and/or mitigate each corrosion risk and the anticipated effectiveness of each strategy. At minimum, the strategies which must be evaluated for each well shall include cathodic protection, coatings, inhibitors, and material selection or replacement. Evaluation of these common strategies will inform which strategy will be most effective for a given well considering environmental factors and the well's history.

[9] Blade Main Report, pg. 232.

Section 1726.3.2, subdivision (b)(2). The Blade Main Report recommended that cathodic protection be implemented as appropriate.[10] This subdivision and its subparts require that an operator evaluate cathodic protection as a possible corrosion mitigation strategy. If cathodic protection is not implemented, the documentation shall include an explanation of why cathodic protection was not selected. If cathodic protection is implemented, specified documentation is required to evaluate and ensure that a proper cathodic protection method is employed.

Section 1726.3.2, subdivision (b)(2)(A). This subdivision requires a description of how the cathodic protection system is used to mitigate corrosion risks. A detailed description of the system will help ensure sound methods were used and could help inform if the system is not functioning to the expected efficacy.

Section 1726.3.2, subdivision (b)(2)(B). This subdivision requires the operator to reference the industry standards used to define the cathodic protection criteria. These standards are comprised of known effective methods historically used in situations with multiple variables, and thus are more likely to have a substantial mitigating impact on corrosion.

Section 1726.3.2, subdivision (c). An important third step in effective corrosion prevention and mitigation is monitoring whether corrosion is occurring or worsening, and whether prevention and mitigation strategies are working as expected. This subdivision requires that the prevention and mitigation protocols include a plan for monitoring the effectiveness of the corrosion mitigation strategies employed for each gas storage well. The efficacy of selected corrosion mitigation strategies may be different than expected and thus should be monitored and evaluated routinely to ensure they are effective. Effective monitoring of corrosion allows for earlier detection and more timely employment of prevention or mitigation strategies, or revision to strategies if they are not adequate to prevent or mitigate corrosion. The subdivisions to this subdivision detail the minimum requirements for the plan to monitor and evaluate mitigation strategies employed.

Section 1726.3.2, subdivision (c)(1) and (c)(2). These subdivisions require the operator to reevaluate its corrosion risk mitigation strategies employed every time a casing wall thickness inspection is conducted on a well with mitigation measures in place pursuant to Section 1726.6, subdivision (a)(2), and any time other data indicates a need for reevaluation. Further, it also requires that newly developed corrosion mitigation technologies and practices be considered when corrosion risk mitigation strategies are reevaluated. Regular reevaluation of corrosion mitigation strategies is important to ensure the most effective strategies are being employed to prevent loss of containment.

Section 1726.3.2, subdivision (d). If, upon reevaluation of the effectiveness of a corrosion risk mitigation strategy, the operator determines that a risk mitigation strategy needs

[10] Blade Main Report, pg. 233.

modification, then the risk mitigation protocols must be updated. Timely updates to the monitoring plan will help ensure that the most current and appropriate strategies are being used to prevent or mitigate corrosion. Operators will provide updates to the Division during regular Risk Management Plan submissions and on request of the Division.

Section 1726.3.2, subdivision (e). This subdivision specifies that corrosion records are essential records as defined in Section 1726.4.4 (formerly 1726.4.3) and must be maintained for the lifetime of the project. This will ensure that the Division has access to all calculations and data regarding corrosion evaluation, mitigation, and monitoring and can review the operators' implementation of required protocols and ensure that corrosion is being mitigated appropriately. Record retention additionally ensures that if a UGS project changes ownership, the new operator has the benefit of historical corrosion data to support the continued safe operation of the storage field.

Section 1726.3.2, Authority and Reference Citation. This section renumbers some corrosion requirements previously contained within the risk management plan requirements of Section 1726.3, and other similar concepts. Section 1726.3 cites Public Resources Code sections 3013, 3106, and 3180 as authority, and 3106, 3180, 3181, 3220, and 3403.5 as reference, and each of those is repeated here. Public Resources Code sections 3011 and 3186.3 are newly added to the authorities referenced by this section. Public Resources Code section 3011 confirms that the Division's purpose includes protection of public health and safety and environmental quality, including the reduction and mitigation of greenhouse gas emissions. Section 3186.3 directs and authorizes the Division to consider revisions to its regulations to address the root causes identified in the Blade Report, which included corrosion as a significant root cause, and to consider requirements for cathodic protection measures for well casings.

Section 1726.3.3 – Investigating, Tracking, and Reporting Off-Normal Occurrences

This proposed section has been deleted. After release of the initial regulation language, operators indicated that the creation of a new scheme of "off-normal" occurrence tracking would be duplicative of other safety related event reporting requirements to CalGEM and other local, state, and federal entities. It was determined that "off-normal" occurrence reporting would create confusion by duplicating these existing reporting requirements. However, two new sections previously discussed above, 1726.3(a)(1) and (d)(7), were created to require evaluation of risk-related occurrences reported to a federal, state or local agency and tracking and addressing risks related to the reported safety related events.

Section 1726.4.3 – Gas Storage Well Chemical Inventories

The natural gas released to the atmosphere during the Aliso Canyon blowout was composed mostly of methane, a greenhouse gas with a warming potential 86 times greater than carbon dioxide over a 20-year time frame. The gas was also composed of

odorants such as tert-butyl mercaptan, tetrahydrothiophene, and methyl mercaptan, and benzene. According to its safety data sheet (SDS), methyl mercaptan has inhalation toxicity and can cause headache, nausea, and vomiting, among other symptoms. Benzene is a known carcinogenic compound, exposure to which can acutely cause headaches, vomiting, dizziness, and increase the exposed individual's risk of developing cancer.

Many residents of the Porter Ranch community, located near the Aliso Canyon facility, reported suffering from unexplained illnesses up to a week before the discovery of the gas leak, reporting symptoms such as headaches, nausea, vomiting, skin rashes, and severe nosebleeds, which also occurred in school-aged children. Schools were temporarily closed and nearly 10,000 families displaced. Knowing precisely what chemicals have been released from a leak gives public health professionals, including local health departments and emergency responders, a higher probability of mitigating damage to both the environment and public health, which benefits the operator and the public impacted.

The following sections have been added to the California Code of Regulations and are necessary to implement the Public Resources Code section 3181.5 gas storage well chemical inventory requirement:

Section 1726.4.3, subdivision (a). This provision memorializes the requirement for operators to maintain a "Gas Storage Well Chemical Inventory" that lists all chemical constituents that may be emitted from a gas storage well in the event of a reportable leak. Gas Storage Well Chemical Inventory is not defined in statute, so it is defined in proposed regulation 1726.1, subdivision (a)(7). Understanding and tracking what chemicals are present in the event of a leak will help to inform the determination of public health impacts from the release of these materials to the environment.

Section 1726.4.3, subdivision (a)(1). Public Resources Code section 3181.5 includes a general non-exhaustive list of the types of materials that an operator should include in its chemical inventory of the materials that may be emitted from a well. This proposed section elaborates on those examples, identifying more specific materials commonly found in or added to a gas storage well. Listing materials reduces the need for operator speculation and facilitates compliance. Materials that may be emitted from a well are listed in the subdivisions of this section.

Section 1726.4.3, subdivision (a)(1)(A) through (a)(1)(C). The first three listed categories of materials are taken directly from section 3181.5 but repeated in the section 1726.4.3 list for clarity and to avoid confusion by having potential inventory elements listed in different locations. The materials in subdivisions (A) through (C) can contain chemicals that are potentially deleterious to both public health and the environment.

Section 1726.4.3, subdivision (a)(1)(D). The inventory should include the composition of "materials intentionally placed in the well for any purpose" as they may be deleterious to public health and the environment and need to be accounted for in the event of a loss of containment. Materials described in section 3181.5 include "well maintenance and control" materials." A non-exhaustive list of well maintenance and control materials is provided in this part to improve operator and public understanding of the types of such materials that should be included in the Gas Storage Well Chemical Inventory.

Section 1726.4.3, subdivision (a)(2). The term materials includes fluids, and this provision clarifies that the definition of fluids include suspended or entrained solids, such as materials included in mud slurry or formation materials. Suspended and entrained solids are materials that may be deleterious to public health and the environment in the event of a loss of containment.

Section 1726.4.3, subdivision (b). Public Resources Code section 3181.5, subdivision (c) directs that the chemical information in the Gas Storage Well Chemical Inventories be provided with sufficient accuracy and precision to inform the determination of public health impacts in the events of a release. In consultation with OEHHA and other relevant health experts, the Division determined that the operator inventory must include the Chemical Abstract Service Number of each chemical constituent identified, and that requirement is set forth in this subdivision. Many chemicals have multiple names, and a Chemical Abstract Service Number helps with identification and in the event of a loss of containment may help with determining the best course of remediation to the environment or treatment for exposed individuals. In the event a chemical does not have a Chemical Abstract Service Number, then other available identification information, such as the chemical's proprietary name and Safety Data Sheet, shall be provided.

Section 1726.4.3, subdivision (c). Initial tests are required to establish a baseline for presence, and if possible, quantification of chemical constituents. This provision and its subdivisions require that the Gas Storage Well Chemical Inventories include analytical test results and analysis of the chemical constituents present in the reservoir, and lists the chemicals that, at a minimum, shall be tested for.

Section 1726.4.3, subdivision (c)(1). This subsection requires analytical testing of chemicals of concern to establish a baseline of existing chemicals that may be emitted from a well. Other sections address chemicals added after the initial baseline testing. The chemicals of concern were identified in collaboration with public health professionals including California Department of Toxic Substances Control and Los Angeles Department of Public Health.

Section 1726.4.3, subdivision (c)(1)(A). Sampling for radon-222 is required to be completed at the end of an injection season so that the maximum inventory is present to estimate peak radon-222 concentration and understand risk.

Section 1726.4.3, subdivision (c)(1)(B). This section clarifies that metals in chemicals of concern shall be tested for in liquid if possible. If metals are present in the native formation, they are more likely to be detected in liquid samples, however, some gas reservoirs may not produce enough liquid to make sampling in liquid practical. In such cases the operator would propose another method to determine presence and possible quantification including testing in air where possible and historically available information where testing is not possible.

Section 1726.4.3, subdivision (c)(2). Lab reports and analysis shall be provided to the Division including chain of custody documentation. This requirement will ensure the complete laboratory report is included with the test results.

Section 1726.4.3, subdivision (c)(3). Baseline testing shall result in entries to the Gas Storage Well Chemical Inventories and should be completed as soon as practicable, but no later than twelve months from the effective date of the regulation. This requirement will facilitate prompt identification of materials from the reservoir in the Gas Storage Well Chemical Inventory after testing

Section 1726.4.3, subdivision (c)(4). This section notes that the Division may require testing and analysis for additional constituents per reservoir. This ensures that site specific chemical hazards are included in the chemical inventory when indicated.

Section 1726.4.3, subdivision (d). To be accurate and informative to public health officials if needed, Gas Storage Well Chemical Inventories are expected to be updated periodically and submitted to the Division. Having previously established the requirement for the creation of the inventories, this provision requires the operator to develop and adhere to a protocol for maintaining and providing the inventories to the Division. Development of a standard operating procedure encourages consistent compliance by each operator and makes the procedure reviewable for deficiencies. The minimum requirements for the protocol are listed in the subsections of this subdivision.

Section 1726.4.3, subdivision (d)(1). This subdivision requires the protocol to include procedures to ensure that whenever material is intentionally placed in the well, (except for storage gas) all the chemical constituents of the material are identified and promptly included in the Gas Storage Well Chemical Inventory. Standardizing procedures helps ensure a greater rate of compliance and helps reduce omissions in reporting due to improvisation. Standardization of procedures also improves the utility and benefit of the inventory by public health officials and first responders when the inventory development, record-keeping and update process and content are known and predictable. Procedures that need to be tracked in the protocol are included in the subsections of this subdivision and enhance the likelihood that the Gas Storage Well Chemical Inventory is as up to date as possible in the event of an incident.

Section 1726.4.3, subdivision (d)(1)(A). The operator's protocol should require the dates when a chemical constituent is placed into a well to be included in the Gas Storage Well Chemical Inventory. This helps inform which chemicals were added most recently that may be near the wellbore and most likely to be ejected during a loss of containment event.

Section 1726.4.3, subdivision (d)(1)(B). This provision requires that the protocol also include procedures to track the volume of each chemical constituent placed in a well on a given date, within a 10 percent margin of error. The volume of a constituent is to be included in the Gas Storage Well Chemical Inventory and knowing the volume present in a well may help inform remediation of the environment and treatment of exposed individuals in the event of a loss of containment.

Section 1726.4.3, subdivision (d)(1)(C). In addition to tracking each time a chemical is added to a well, this requires the cumulative volume of each chemical constituent placed in a well within a 10 percent margin of error, to be included in the Gas Storage Well Chemical Inventory. The cumulative volume of each non-storage gas constituent present in a well may help inform remediation of the environment and treatment of exposed individuals in the event of a loss of containment. Information about stored gas is discussed immediately below.

Section 1726.4.3, subdivision (d)(2). Operators inject storage gas directly into the reservoir and thus is it an element that must be included in the Gas Well Storage Inventory as a chemical that may be emitted from the reservoir during a reportable leak. However, because operators inject gas year around and the chemical inventory would become crowded with entries for storage gas, the exception for storage gas allows it to be reported annually consistent with existing data requirements of 1726.4(a)(6)(E). Thus operators should ensure that the gas constituents are tested at least once per year and appear on the inventory consistent with their inclusion in the reservoir.

Section 1726.4.3, subdivision (d)(3). Public Resources Code section 3181.5, subdivision (b), prescribes inventory requirements on an operator in the event of a reportable leak. This subdivision implements that requirement by requiring an operator to develop a protocol to promptly provide a current and complete Gas Storage Well Chemical Inventory to the Division or confirm that the one on file is current. The protocol must also ensure that within five days of using a well control fluid to kill a well, the operator will provide the Division an updated Gas Storage Well Chemical Inventory that includes each chemical constituent of the kill fluid. Timely and accurate information should be available to communities potentially affected by a reportable leak as soon as possible.

Section 1726.4.3, subdivision (d)(4). This requirement specifies that the protocol to identify, record, maintain, and report the chemical information in the Gas Storage Well Chemical Inventory will be reported individually for each gas storage well. Different chemicals may be used in the development and operation of an individual well and an accurate

chemical inventory well-by-well will help inform remediation of the environment and treatment of exposed individuals in the event of a loss of containment.

Section 1726.4.3, subdivision (d)(5). If a chemical supplier believes its chemical composition information is proprietary or the supplier otherwise does not provide chemical information to the operator, then the operator is required to immediately notify the Division with the name and contact information of the supplier, as well as any available information about the well kill fluids or chemicals therein. An accurate chemical inventory should help inform remediation of the environment and the determination of public health impacts from the release of these materials to the environment.

Section 1726.4.3, subdivision (d)(6). Public Resources section 3181.5, subdivision (a)(1) allows the Division to determine the frequency for operators to submit their Gas Storage Well Chemical Inventories, no less than annually. This subdivision (d)(6) requires the protocol to establish procedures for submittal, in a digital format, of the Gas Storage Well Chemical Inventories within twelve months of the effective date of these proposed regulations. The protocols also require that the operator provide updated Gas Storage Well Chemical Inventories every twelve months thereafter and along with well summaries for permitted well work in accordance with Section 1724.1. Current and accurate chemical inventories will benefit the public by helping inform remediation of the environment and treatment of exposed individuals in the event of a loss of containment.

Section 1726.4.3, subdivision (d)(7). The proposed addition requires the protocol to include a workplan for completing the baseline analytical testing and analysis requirements referenced in subdivision (c) of this section. Analytical testing and analysis workplans being included in the protocol standardizes the procedure, reduces the likelihood of deviation in sampling and analysis, and supports more effective review by the division.

Section 1726.4.3, subdivision (d)(8). The final subdivision to this section requires that the protocol be submitted to the Division for review along with the next Gas Storage Well Chemical Inventory submission. When the protocol is updated, it shall be resubmitted, again, with the Gas Storage Well Chemical Inventory submission. Early review of the protocol by the Division will help ensure that the procedures outlined in the protocol will lead to Gas Storage Well Chemical Inventories developed and maintained with sufficient accuracy and precision to inform the determination of public health impacts in the event of a leak.

Section 1726.4.3, Authority and Reference Citation. This section cites Public Resources Code sections 3013, 3106, and 3180 as authorities cited, and 3011, 3106, 3180, 3181, 3181.5, 3183, 3220 and 3403.5 as authorities referenced. Each of these proposed regulations are necessary to implement the important tracking and disclosure provisions of Public Resources Code section 3181.5 Gas Storage Well Chemical Inventory requirements. These regulations provide for clarity and a common understanding of their

applicability, will improve consistency in compliance and benefit local public health officials, first responders and the public by making available important information about potential hazards in the case of a reportable leak from a gas storage well.

Section 1726.4.4 – Records Management.

Section 1726.4.4. With the addition of new section 1726.4.3 (Gas Storage Well Chemical Inventory), the existing section 1726.4.3 (Records Management) will be renumbered to 1726.4.4. No substantive changes are proposed.

Section 1726.6.1 – Pressure Testing Parameters.

Section 1726.6.1. This existing section contains a typo because two existing subdivisions under subdivision (a) are both numbered (2). Through this proposed regulation, the second (2) will be renumbered to (3) and the subsequent parts will be renumbered accordingly. No substantive changes are proposed.

ALTERNATIVES CONSIDERED

While developing the proposed regulations, the Division considered various alternative approaches and suggestions included in the stakeholder comments. The Division also considered information collected pursuant to its existing regulations when determining what information satisfies the chemical inventory requirement. No alternative considered by the Division would be more effective in carrying out the purposes of the proposed regulations or would be equally effective but less burdensome to affected private persons and small businesses than the proposed regulations. The alternatives considered include the following:

- The Division considered but rejected operator reliance on Safety Data Sheets (SDS) to satisfy the well chemical inventory requirement. Although SDS can be helpful to first responders and provide some information about a chemical to be included in the inventory, the public health responders indicated that they would not be a primary source of information for a public health study. SDS provide information from the manufacturer and some health data, but they are not updated at any regular frequency, do not consider at-risk members of the public in their formulation, may be incomplete by not including all chemicals or precise concentrations, and may be subject to manufacturer bias.

- The Division considered but rejected requiring operators to submit a hierarchy of data based on the toxicity of the chemical being reported. Thus, chemicals with high levels of toxicity would require more detailed information than chemicals of low toxicity. During discussions with public health experts, it was determined that a hierarchy of toxicity could not be reliably established. A threshold of 10 percent margin of error for

the volume of the chemical applied was deemed sufficiently accurate to inform the determination of public health impacts in the event of the release of these materials.

- The Division considered but rejected requiring operators to perform or otherwise fund a public health study to determine potential impacts from chemicals in use because such a study is outside the scope of Public Resources Code section 3181.5 and this rulemaking. Additionally, updating a study each time a new chemical is introduced would be cost prohibitive, and if not regularly updated, such a study could become quickly outdated and unreliable if the types and quantities of chemicals used change over time. The most useful data to help inform the determination of public health impacts from the release of materials to the environment would come from an up-to-date and accurate well chemical inventory at the time of an actual reportable leak.

- The Division considered but rejected requiring operators to provide an analysis of all potential chemical products that could be created as a result of reactions that could occur between chemicals known to be in the well. It was determined after careful study that the number of potential products could be an overwhelming amount of data and prevent effective tracking of chemicals of concern and utility of the information to public health officials trying to evaluate the impacts of exposure in the event of a reportable leak from a gas storage well.

- The Division considered but rejected requiring cathodic protection for all UGS wells. The requirement to evaluate cathodic protection for each well ensures that is it considered for each well but allows for the specific needs and well configuration to be the primary driving factor. Whether cathodic protection will or will not be used, the analysis for each well is required to be provided to the Division. This well specific approach is consistent with the overall approach to the risk management plan regulations.

- The Division considered but rejected creating a new scheme for the reporting of all "off normal occurrences" including incidents not currently reported under PHMSA and CPUC regulatory schemes. This was rejected because it was duplicative and overly burdensome. The requirement to evaluate and retain records of incidents and safety related conditions has been limited to those that are already reported to existing oversight agencies so as to avoid duplication and confusion.

- The Division considered but rejected requiring information on materials potentially coproduced with gas when originally produced out-of-state. This idea was rejected because the gas emplaced in interstate pipelines is "pipeline quality gas" which has had the majority of impure constituents removed for transport.

- The Division considered but rejected requiring submission of chemical inventories at the reservoir level rather than at the well level. The empowering statute requires a "well" chemical inventory and thus it must be reported by well. To the extent that

reservoir data applies to multiple wells, the shared information may be reported on multiple well chemical inventories.

- The Division considered but rejected specifying detection levels and testing methodology for chemical constituents required for testing and analysis. Instead, the regulations provide performance standards that may be met by any valid testing methodology. Detection limits vary from testing method to testing method and we do not want to exclude any valid methods, including those that may become available in the future. Operators should figure out the most effective way to do this testing using the laboratory resources that are available to them and include that information in their testing protocols.

- The Division considered but rejected requiring subsurface safety valves as a default requirement. The existing regulations require that all wells have no single point of failure construction which is the most effective method for preventing leaks. Subsurface safety valves are considered for each well, however they are added equipment in a well which can lead to increased well interventions and ultimately increase risk to the well. Thus, they should only be applied when the risk evaluation indicates that a subsurface safety valve is an appropriate mitigation measure.

CONSISTENCY WITH COMPARABLE FEDERAL REGULATION OR STATUTE

In June 2016, Congress enacted the "Securing America's Future Energy: Protecting our Infrastructure of Pipelines and Enhancing Safety Act of 2016" or "Safe Pipes Act." Of significance to UGS projects, the Safe Pipes Act added a new section entitled "Standards for Underground Natural Gas Storage Facilities." (49 U.S.C. § 60141.) That section authorizes states to adopt additional or more stringent safety standards for intrastate underground natural gas storage facilities if such standards are "compatible" with federal minimum standards implementing the Safe Pipes Act. (49 U.S.C. § 60141, subd. (e).)

PHMSA is the federal agency primarily responsible for pipeline regulation and safety (49 USC, § 108, (b), (f)). It adopts regulations that prescribe minimum pipeline safety standards for the pipeline transportation of natural gas, as well as regulations that prescribe minimum standards for underground gas storage facilities. The Division's 2018 regulations for California UGS facilities were based on the same industry standards as PHMSA's safety rules and complement, rather than conflict, with those standards.

The proposed regulations do not unnecessarily duplicate or conflict with federal regulations contained in the Code of Federal Regulations addressing the same issues; they complement and extend corresponding PHMSA requirements. For example, PHMSA requires reporting of "safety-related conditions" within five to ten working days (49 CFR §§ 191.23 and 191.25 (a)), while the proposed regulations would require reporting of "off-normal occurrences" within 30 days. The term "safety-related condition" is not defined in 49 CFR, but reportable conditions are listed in §191.23 and

are similar in severity and level of urgency to the off-normal occurrences listed in the proposed regulations.

Unlike the PHMSA rule which does not require reporting of certain conditions corrected within five or ten working days, the proposed regulations require reporting of all off-normal occurrences, even if they have been repaired before the deadline for the filing of the report. This proposed requirement is consistent with the recommendation of the California Council on Science and Technology, which recommends an off-normal occurrence database as a source of learning and collaboration for operators and regulators,[11] requiring all events to be included, even if corrected.

SB 463 directs the Division to collect an inventory of the chemicals that may be emitted from a well in the event of a reportable leak. (Pub. Resources Code, § 3181.5.) There is no equivalent existing requirement under federal law. SB 463 also directs the Division to consider requirements for cathodic protection, well control, and off-normal incident reporting, to mitigate threats to life, health, property, the climate, or natural resources. (Pub. Resources Code, § 3186.3; see also Pub. Resources Code, § 3403.5 [charging the Division with responsibility to ensure that no damage occurs to the environment by reason of injection and withdrawal of gas at underground storage facilities].) The Division's proposed regulations are necessary to achieve California's statutory goals of greater protection of health and safety and are generally consistent with, compatible with or stricter than the federal standards.

ECONOMIC IMPACTS

The Department has completed an Economic Impact Analysis for the proposed rulemaking action, which is included in this Initial Statement of Reasons as "Attachment A". The Department has made an initial determination that the adoption of these regulations may have a significant statewide adverse economic impact directly affecting business. However, as discussed above, each of these requirements is necessary to accomplish the statutory goals of Public Resources Code sections 3160, 3181.5, 3183, and 3186.3. No alternative considered by the Department would be more effective in carrying out the purposes of the proposed regulations or would be as effective but less burdensome to affected private persons than the proposed regulations.

The Department has made the following determinations:

- The proposed regulations may affect the creation of new jobs within the State of California.
- The proposed regulations will not create new business nor eliminate businesses within the State of California.

[11] California Council of Science & Technology. Long-Term Viability of Underground Natural Gas Storage in California. Pg. 330-332. 2018. https://ccst.us/wp-content/uploads/Full-Technical-Report-v2_max.pdf.

- The proposed regulations will not affect expansion of businesses currently doing business within the State of California.
- The proposed regulations will benefit the health and welfare of California residents, worker safety, and the environment.
- The proposed regulations will most likely not affect the ability of businesses within California to compete with businesses in other states.

In addition to satisfying the statutory goals, the Department has determined that the proposed regulations will result in nonmonetary benefits, such as the protection of public health and safety, worker safety, and the environment, and transparency in business and government. Specifically, the benefits of these regulations are:

- Using clearer language and formatting leads to less speculation by operators which in turn leads to a higher rate of compliance.
- Expanding emergency response plans will result in a more expedient and more effective emergency response.
- Increased requirements for corrosion evaluation, mitigation, and monitoring will reduce the risk of a loss of containment, thereby making workers and the public safer.
- Greater operator oversight regarding "off-normal" occurrences will lead to fewer hazardous situations for both workers and the public.
- Accurate gas storage well chemical inventories will increase transparency and better inform mitigation response and more effective treatment for exposed individuals.

LOCAL MANDATE DETERMINATION

The adoption of this rulemaking does not impose a mandate on local agencies or school districts.

DOCUMENTS RELIED UPON

The Department relied upon the following documents in proposing this rulemaking action:

- The Department's Economic Impact Analysis and STD 399 for the proposed regulations.
- 49 C.F.R. § 191.23 Reporting safety-related conditions. Effective: May 16, 2022
- American Petroleum Institute Recommended Practice 585, "Pressure Equipment Integrity Incident Investigation," First Edition April 2014.

- ANSI/API Recommended Practice 1173 "Pipeline Safety Management Systems," First Edition, July 2015.
- *Benzene*; SDS No. 001062 (Online); Airgas USA: Radnor, PA, May 20, 2015. https://www.airgas.com/msds/001062.pdf (last accessed August 2, 2023).
- Blade Energy Partners. "Root Cause Analysis of the Uncontrolled Hydrocarbon Release from Aliso Canyon SS-25," Main report and Volumes 1-4. May 16, 2019.
- *CAF Construction Site Safety Certificate Program* [PowerPoint Slides]. Occupational Safety and Health Administration, U.S. Department of Labor. https://www.slideserve.com/mikkel/caf-construction-site-safety-certificate-program-powerpoint-ppt-presentation (last accessed August 2, 2023)
- California Public Utilities Commission, "General Order No. 112-F State of California Rules Governing Design, Construction, Testing, Operation, and Maintenance of Gas Gathering, Transmission, and Distribution Piping Systems," June 25, 2015. https://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M163/K327/163327660.PDF (last accessed August 2, 2023)
- Department of Conservation, Geologic Energy Management. "WellSTAR Data Dashboard Glossary". WellSTAR Data Dashboard Glossary. (last accessed August 2, 2023)
- Department of Conservation. "Underground Gas Storage Regulations Standardized Regulatory Impact Assessment". 2016. (last accessed August 2, 2023)
- Department of Conservation. "Underground Natural Gas Storage". https://www.conservation.ca.gov/calgem/Pages/UndergroundGasStorage.aspx (last accessed August 2, 2023)
- Employment Development Department, State of California. OEWS Employment and Wage Statistics, May 2022 State Occupational Employment and Wage Statistics (OEWS) survey. https://www.bls.gov/oes/current/oes_ca.htm#top. (last accessed August 2, 2023)
- Energy Information Administration. "Natural gas explained, Delivery and storage of natural gas". https://www.eia.gov/energyexplained/natural-gas/delivery-and-storage.php (last accessed August 2, 2023)
- Energy Information Administration. "The Basics of Underground Natural Gas Storage". https://www.eia.gov/naturalgas/storage/basics/. (last accessed August 2, 2023)
- Ground Water Protection Council and Interstate Oil and Gas Compact Commission. *Underground Gas Storage Regulatory Considerations: A Guide for State and Federal Regulatory Agencies*. May, 2017. 122 pages. https://www.gwpc.org/publications/underground-gas-storage-regulatory-considerations/ (last accessed August 2, 2023)
- Johnson, Ashley. "Examining the foundation: Were Heinrich's theories valid, and do they still matter?" Safety+Health Magazine, October 1, 2011.
- Long, Jane C.S. et al. (2018). *Long-Term Viability of Underground Natural Gas Storage in California*. California Council on Science and Technology.

https://ccst.us/reports/long-term-viability-of-underground-natural-gas-storage-in-california-an-independent-review-of-scientific-and-technical-information/ (last accessed August 2, 2023)
- Los Angeles County Department of Public Health (May 13, 2016) "ALISO CANYON GAS LEAK Community Assessment for Public Health Emergency Response (CASPER). http://publichealth.lacounty.gov/media/docs/CASPERFinalReport.pdf (last accessed August 2, 2023)
- *Methyl Mercaptan*; SDS No. 001037 (Online); Airgas USA: Radnor, PA, May 20, 2015. https://www.airgas.com/msds/001037.pdf (accessed August 2, 2023).
- Miles, J. "Methods of radon measurement and devices." Czech Republic: 2004.
- Silfies, Trace. "API RP 585 Pressure Equipment Integrity Incident Investigation, AFPM Maintenance and Reliability Conference," The Equity Engineering Group, Inc., Austin, Texas, May 19, 2015. https://www.scribd.com/document/477772166/API-RP-585-Pressure-Equipment-Integrity-Incident-Investigation-AFPM-2015-Presentation-1 (last accessed August 2, 2023)
- State of California. "SB-463 Natural gas storage wells: well stimulation treatments: chemical composition: leaks: regulation." https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201920200SB463 (last accessed August 2, 2023)