

SB 463: CHEMICAL INVENTORY AND ROOT CAUSE ANALYSIS REGULATIONS

INITIAL 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, 1726.3.3, and 1726.4.3.

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Division regulates the injection of natural gas into large underground reservoirs for storage before the gas is later withdrawn for sale to residential, commercial, and industrial customers and natural gas power plants.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 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 and production. 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 mud from a relief well intersecting the bottom of the leaking well. A 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 on the 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.

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

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".

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

neighboring communities. Previously, the California Council on Science and Technology³ 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.

Operator 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 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.

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/>

Proposed Regulations

The amendments and additions to the Division's existing UGS regulations proposed in this package implement the requirements of SB 463 and lessons learned by Division regulatory professionals as they have applied the dedicated UGS regulations which became effective in 2018.

The proposed regulations address requirements in several important topical areas: the development, submittal, and updating of chemical inventory contents and data; and regulatory updates necessary to respond to the Blade Report findings and to prevent damage to life, health, property, and natural resources - corrosion evaluation, mitigation, and monitoring, including consideration of cathodic protection, requirements to include well-specific well control planning in an emergency response plan, and the investigation, tracking, and reporting of leaks and other off-normal occurrences.

Stakeholder Input and Public Health Consultation Preceding This Rulemaking

The Division developed these 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, emails, and faxes, 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.

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 modernize, 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 quantitatively developed 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 with an increased emphasis on mitigation strategies 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 (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 has determined that expressly requiring investigation, corrective action and reporting of potential and actual leak and other integrity incidents or risks, and the availability of such data, will support better risk management planning and mitigation and benefit the public by helping ensure that operators are actively monitoring and timely responding to risks at underground gas storage facilities.

Existing Public Resources Code section 1726.9 requires operators to report a "reportable" leak, as defined. However, not every leak is a reportable leak and the Division's existing regulations contemplate but do not expressly require investigation as to the cause of every leak, whether reportable or not. PHMSA has regulations that require reporting of certain safety-related conditions, but those regulations do not cover all "near-miss" situations and certain reporting is not required if the issue can be corrected within five days. (49 C.F.R., § 191.25.)

This proposed new subdivision incorporates into risk management plan requirements a new requirement for operators to develop protocols to investigate, track and report "off-normal occurrences" to the Division. It includes a cross-reference to proposed section 1726.3.3, which is discussed further below and defines and details the specific requirements relating to off-normal occurrences.

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 would be 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 would be 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 off-normal occurrence investigation and reporting.

Each of these changes 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 evaluation, 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 Report, Main Report (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

This regulation, included as a new subdivision (c)(5), adds a requirement for quantitatively developed well-specific well control plans that include an IPR and the data or transient modeling the relationship is 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.

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.

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 would be unchanged.

Section 1726.3.1, subdivision (c)(16). Public Resources Code section 3181.5 directs operators to submit to the Division a chemical inventory and the Division has proposed new regulations, found primarily at proposed Section 1726.4.3, to implement this mandate. This proposed subdivision defines a "chemical of concern" and adds a requirement for the identification of monitoring, sampling, and testing methods utilized to detect and, if possible, quantify chemicals of concern at the Division's request in the event of a reportable leak. Chemicals of concern include hydrogen sulfide, benzene, toluene, ethylbenzene, xylenes, formaldehyde, radon-222, and metals including arsenic, silver, barium, beryllium, copper, cadmium, cobalt, chromium (total), chromium-6, mercury, molybdenum, nickel, lead, selenium, titanium, vanadium, and zinc, and other constituents that the Division requires testing for under section 1726.4.3, subdivision (c), and are harmful to public and environmental health. Including monitoring, sampling, and testing methods as part of the emergency response plan benefits public health and the environment by expediting the detection of chemicals of concern, thereby allowing for mitigation measures to begin earlier. Additionally, public health professionals advised that it is a best practice to know ahead of time which tests will be utilized in an emergency as identifying the appropriate test could delay capturing relevant information.

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 no less often than every twelve 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. Shortening 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 case 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). The introductory language of this provision makes clear that corrosion evaluation, corrosion risk mitigation strategies, and corrosion monitoring protocols are still required elements of a facility's risk management plan, and tie into amended section 1726.3, subdivision (d)(4), despite the substantive corrosion-related requirements having been moved to a standalone section. The subdivisions of section 1726.3.2, subdivision (a), discussed below, contain more detailed requirements for

corrosion evaluation, risk mitigation strategies, and monitoring, all needed to improve the likelihood 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 a key factor in determining the corrosion risk for each well.

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 and corrosion potential of its casings. Because of high pressures and extreme temperatures, tubes that show compromise to their integrities are at risk of failure, and the connection configurations and grade of material of each tube and casing have varying impacts on risk of corrosion due to their chemical composition.

Section 1726.3.2, subdivision (a)(1)(B). This addition requires consideration of the well's corrosion rate, as determined under the Mechanical Integrity Testing requirement (Public Resources Code section 1726.6 (a)(2)), which is calculated by comparing the results of casing wall thickness inspections. Casing wall thickness is inversely proportional to corrosion risk, as the thinner the wall, the greater the risk of loss of integrity. 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). Current regulation Section 1726.3, subdivision (d)(4)(A), proposed for deletion as part of the Division's updating and enhancement of its corrosion evaluation requirements as proposed in Section 1726.3.2, requires operators to identify defects caused by corrosion or other chemical or mechanical damage. This proposed new regulation requires that an evaluation of a well's corrosion risk must include consideration of all anomalies identified in logs or tests that are run on the well, including anomalies identified with noise and temperature logging required under existing Section 1726.6, subdivision (a)(1). Anomalies in temperature and noise logs and other tests 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, maintenance, including drilling, completion, location and quality of cement, mitigations and repair history, replacements, and current use. Depending on a well's properties, including construction and history, metal loss and other integrity changes may be significant and should be monitored. Thus, these well properties

can be important to calculating the impact and likelihood of metal loss. Degradation of well components occur naturally over time and varying levels of wear and tear will occur depending on frequency and 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 fluctuating pressures and temperatures.

Section 1726.3.2, subdivision (a)(1)(E)(ii). This subdivision requires consideration of the composition and 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.

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 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 location of the well with respect to other wells. If impressed current cathodic protection is used, a sacrificial pipe is placed in parallel close to the actual well. A rectifier is used to convert an AC current into a DC current, creating an electrical loop between the sacrificial pipe and the well, which makes the sacrificial pipe corrode instead of the well. If the sacrificial pipe is too close to a neighboring well, the DC current may flow into the well, corroding it instead of the sacrificial pipe.

Section 1726.3.2, subdivision (a)(1)(E)(vi). This subdivision requires consideration of the history of other environmental factors that may contribute to corrosivity such as the geology of the surrounding rock and additives used in the well. There are additional

⁹ Blade Main Report, pg. 232.

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). After undertaking an evaluation of corrosion and corrosion risk factors, it is important that operators develop prevention and mitigation protocols for each gas storage well. This subdivision requires that such protocols include corrosion risk mitigation strategies for each well. Implementing strategies that inhibit or even eliminate sources of corrosion provides more time for detection of conditions that might lead to loss of containment and allow for timely response in repairing or replacing compromised parts or components. The minimum required risk mitigation strategies are listed in subdivisions (A) through (C) of this subdivision.

Section 1726.3.2, subdivision (a)(2)(A). This subdivision requires the corrosion risks to be mitigated be prioritized. A factor that has a greater potential to cause corrosion should be prioritized over a factor that has a lesser impact on corrosion risk to reduce the probability of loss of containment.

Section 1726.3.2, subdivision (a)(2)(B). This subdivision requires strategies to 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. These are common strategies employed to mitigate corrosion, but their individual effects may differ from well to well due to environmental and historical factors. Evaluation of each strategy and its anticipated effectiveness can inform the best course of action for a given scenario.

Section 1726.3.2, subdivision (a)(2)(C). The Blade Main Report recommended that cathodic protection be implemented as appropriate.¹⁰ This subdivision requires that, in the event cathodic protection is implemented as a corrosion mitigation strategy, the evaluation of the cathodic protection shall include references to industry standards used to define the protection criteria and a description of how the cathodic protection is used. This is necessary to evaluate and ensure that a proper cathodic protection method is employed. If cathodic protection is not implemented, the documentation shall include an explanation of why cathodic protection was not selected.

Section 1726.3.2, subdivision (a)(2)(C)(i). 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.

¹⁰ Blade Main Report, pg. 233.

Section 1726.3.2, subdivision (a)(2)(C)(ii). This subdivision requires references to 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 (a)(3). Having evaluated corrosion and sources of corrosion and developed strategies to prevent or mitigate corrosion, it is important to monitor whether corrosion is occurring, or worsening, and evaluate whether prevention and mitigation strategies are working as expected. This subdivision requires that the prevention and mitigation protocols include corrosion monitoring protocols for each gas storage well. 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 monitoring, evaluation, and reevaluation requirements and timing.

Section 1726.3.2, subdivision (a)(3)(A). This subdivision requires a plan for monitoring and evaluating the effectiveness of each corrosion risk mitigation strategy used. Environmental factors may alter the efficacy of selected corrosion mitigation strategies to be different than expected and thus should be monitored and evaluated to ensure they are effective.

Section 1726.3.2, subdivision (a)(3)(B). This subdivision requires the operator to reevaluate its corrosion risk mitigation strategies every time a casing wall thickness inspection is conducted pursuant to Section 1726.6, subdivision (a)(2), and any time 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 (a)(3)(C). If, upon reevaluation of the effectiveness of a corrosion risk mitigation strategy, the operator determines that a risk mitigation strategy needs modification, the monitoring plan must be updated within 30 days after changes to mitigation strategies. Timely updates to the monitoring plan will help ensure that the most current and appropriate strategies are being used to prevent or mitigate corrosion.

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

SS-25 was originally an oil well that was converted to a gas storage well in 1973. Since then and until the leak was discovered on October 23, 2015, the well's integrity was intermittently monitored for temperature, noise, and pressure, none of which showed an anomaly. However, other wells in the Aliso Canyon field experienced casing leaks and parted casings, and two wells had underground blowouts from parted casings in 1984 and 1990. Blade found no documentation that the causes were ever investigated, formally or informally.¹¹ The Blade Main Report recommended that casing failures and all failures of pressure equipment should be formally investigated, along with an analysis of the failures, as a minimum requirement.¹² Ideally, the corrosion in the casings around SS-25 would have been detected earlier and the problem addressed before the catastrophic failure that resulted in the gas leak.

Consistent with the recommendation in the Blade Main Report, Public Resources Code section 3186.3, subdivision (c), directs the Division to consider requirements for investigating and reporting leaks and other pressure integrity incidents that present a risk of leaks. Corrosion would be considered an “off-normal” occurrence that could lead to a hazardous condition. The proposed requirements in this new section would improve early recognition and comprehensive investigation of any situation or occurrence which could potentially lead to an emergency scenario and help inform needed updates to a UGS facility's risk management plan. Formal investigation and documentation of “near-miss” situations and well failures and other loss of containment would not only improve awareness and effectiveness of a response to future events of the same nature, but it would also benefit operators by illustrating patterns and providing information regarding previously poorly understood conditions and scenarios. To achieve this level of safety and effectiveness, it is necessary to require investigation into off-normal occurrences and measures to prevent reoccurrence. With these goals in mind, the following sections are necessary to implement Public Resources Code section 3186.3.

Section 1726.3.3, subdivision (a). This subdivision outlines the key elements of the Division's new risk management plan requirements for prevention and mitigation protocols to define, investigate, track and report off-normal occurrences. “Off-normal occurrence” is defined for clarity, and thirteen examples of off-normal occurrences are provided in the enumerated subdivisions. Although gas storage operators should already be developing risk assessment and prevention and mitigation protocols under the Division's current risk management regulations, this requirement makes express the expectation that situations, conditions, and events that occur and did lead or could have led to harm are

¹¹ Blade Main Report, pg. 238.

¹² Blade Main Report, pgs. 232-233, citing the American Petroleum Institute Recommended Practice 585.

to be formally investigated and remediated and reported to the Division. These requirements are necessary to understand what occurred and why, and will benefit the operator and public by reducing the risk of a similar issue becoming recurrent, thus reducing the frequency of scenarios that could lead to hazardous situations occurring. Providing a list of examples will reduce confusion regarding reporting requirements for operators and ensure a greater rate of compliance.

Section 1726.3.3, subdivision (a)(1). Multiple casing failures had occurred before the SS-25 gas storage well blowout, but no data was provided to show that they were investigated. "Understanding and interpreting failures are critical to defining the propensity or risk of such failures field wide."¹³ A more comprehensive investigation is needed if the cause appears systemic or potential consequences severe so that necessary mitigation steps are taken. Loss of containment or failure of a well casing is a potentially significant off-normal occurrence that can result in exposure to toxic chemicals for both employees and the public, and damage to property and natural resources.

Section 1726.3.3, subdivision (a)(2). Damage to a wellhead or other surface or subsurface equipment is given as an example because damaged equipment may not work as intended and may result in a loss of well containment.

Section 1726.3.3, subdivision (a)(3). Another example of an off-normal occurrence is a crack or other material defect that impairs the structural integrity of a well or wells. This example is necessary because such a defect may lead to a loss of well containment.

Section 1726.3.3, subdivision (a)(4). Well work activities including drilling, reworking, testing, replacing a wellhead, and more can cause damage ranging from minor to catastrophic. Even when minor damage is caused to a component of a well, that occurrence can lead to a condition or situation that poses a risk to the facility and the communities around it.

Section 1726.3.3, subdivision (a)(5). Different gas storage facilities in California are prone to varying degrees of risk of movement or abnormal loading from environmental causes and geologic conditions. Earthquakes, landslides, wildfires, and floods are appropriate examples of off-normal occurrences because they can cause unintended changes in well orientation or operation and cause damage to well components, which could lead to a loss of well containment.

Section 1726.3.3, subdivision (a)(6). Requires investigation and reporting when a well's maximum allowable operating pressure is exceeded. Extremely high pressures can damage well components and cause the well to operate differently than intended or lead to a loss of well containment.

¹³ Blade Main Report, pg. 232.

Section 1726.3.3, subdivision (a)(7). Anomalous annular pressure above the approved alarm set point described in Section 1726.7, subdivisions (d)(2) and (d)(3) is an off-normal occurrence because sudden changes in annular pressure can indicate a new issue. Investigation of these types of issues and accounting for them in future updates to risk management planning supports the overall understanding of the risks and conditions of each UGS facility and informs opportunities to mitigate such risks.

Section 1726.3.3, subdivision (a)(8). Installation of improper or incorrect equipment or components and their subsequent use could result in a well operating differently than intended and result in unexpected occurrences, including a loss of containment.

Section 1726.3.3, subdivision (a)(9). Damage to a tank or vessel attendant to the underground gas storage project can be an off-normal occurrence because damaged components may not work as intended and could result in a loss of containment.

Section 1726.3.3, subdivision (a)(10). An off-normal occurrence can arise when a standard, procedure, or process was correctly applied during a work activity, but the activity nonetheless resulted in a situation or condition that threatened or caused harm or damage. An activity that is performed correctly according to an approved standard, procedure or process, yet results in a harmful situation, should be evaluated and amended to utilize a standard, procedure or process that does not result in a harmful situation of similar origin.

Section 1726.3.3, subdivision (a)(11). Requires investigation and reporting of situations where failure to follow procedures could have resulted or did result in a potentially hazardous condition. Actions that circumvent or contradict standard operating procedures may result in hazardous situations to both workers and the public.

Section 1726.3.3, subdivision (a)(12). Unauthorized entry and other malfeasance by any person would be an off-normal occurrence to be investigated and reported and addressed as appropriate to the situation. Examples are provided and include trespassing, arson, destruction of property, or removal of fencing. Activities performed within areas of gas storage operations by unauthorized or ill-intentioned individuals could result in damage to equipment or well components, which could lead to hazardous situations to both workers and the public, and damage to the environment and natural resources.

Section 1726.3.3, subdivision (a)(13). Misuse and accidental operation of equipment necessary to the safe operation of an underground gas storage project or well, and operation of equipment outside of the manufacturer's specifications or an approved policy or procedure, may result in hazardous situations to both workers and the public.

Provision of the above examples of off-normal occurrences is necessary to avoid ambiguity about the kinds of conditions and situations that trigger applicable requirements.

Section 1726.3.3, subdivision (b). This subdivision would add the requirement that the operator report any off-normal occurrence to the Division within 30 days of the discovery of the occurrence and specifies that the report shall include findings from the investigation, a description of measures implemented to correct or remediate the occurrence, as well as measures taken to prevent a reoccurrence. Requiring investigation and documentation of off-normal occurrences, and in a timely manner, will keep the Division informed of patterns of issues, bring more attention to occurrences which could potentially lead to hazardous situations, and enable the Division to effectively evaluate that issues and practices are corrected before they lead to harm to the gas storage facility, health and safety, the environment or natural resources. Additionally, tracking off-normal occurrences supports gathering data to inform future updates to risk management plans based on documented, known risks at each facility.

Section 1726.3.3, subdivision (c). If the operator has not fully investigated or remediated an occurrence when it is reported to the Division under Section 1726.3.3, subdivision (b), this subdivision requires the operator to provide supplemental reports about the occurrence and investigation and remediation at least once every 30 days until the occurrence is fully investigated and remediated to the Division's satisfaction. This requirement helps ensure that an off-normal occurrence will not go uninvestigated and unreported in the event of a lengthy investigation and will be timely remediated.

Section 1726.3.3, subdivision (d). In addition to promoting timely investigation and resolution of conditions, situations, and events that did or could harm the underground gas storage facility, the off-normal occurrences requirements will help operators to understand the implications of practices and procedures, effectiveness of mitigation and prevention protocols, and to identify where, for example, additional training or security measures are needed. This subdivision would add the express requirement that the data and findings from an operator's off-normal occurrence investigations be used to inform their updates and improvements to their risk management plan methodology. Integrating the results of off-normal occurrence investigations into risk management plan methodology will help prevent future occurrences of a similar nature, which should benefit the operator, the public, natural resources and the environment.

Section 1726.3.3, subdivision (e). This subdivision is added to declare that nothing in these off-normal occurrence reporting requirements supersedes, removes or relieves other relevant requirements for spill and incident reporting. This is necessary to iterate that all other requirements regarding spill and incident reporting remain unchanged and are still applicable.

Section 1726.3.3, Authority and Reference Citation. This section cites Public Resources Code sections 3013, 3106 and 3180 as authorities cited, and 3011, 3106, 3180, 3181, 3183, 3184, 3186.3, 3220 and 3403.5 as authorities referenced.

These requirements for off-normal occurrence prevention and mitigation protocols are consistent with, and necessary to implement, Public Resources Code section 3186.3, subdivision (c).

Section 1726.4.3 – Gas Storage Well Chemical Inventory

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 the materials helps ensure a greater rate of compliance by operators by reducing confusion and speculation. The 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 materials listed are taken directly from section 3181.5 but repeated in the more expansive section 1726.4.3 list for clarity and to avoid confusion by having potential inventory elements listed in different locations. Subdivision (A) lists “formation fluids” as materials that may be emitted from a well. Formation fluids can contain chemicals that are potentially deleterious to both public health and the environment.

Subdivision (a)(1)(B) lists “gas in the storage reservoir” as a material that may be emitted from a well. Natural gas contains chemicals that are potentially deleterious to both public health and the environment.

Subdivision (a)(1)(C) lists “wellbore-produced fluids” as materials that may be emitted from a well. Wellbore-produced fluids can contain chemicals that are potentially deleterious to both public health and the environment.

Section 1726.4.3, subdivision (a)(1)(D). Materials described in section 3181.5 include “well maintenance and control” materials, including well kill fluids. This section makes clear the expectation that the inventory should include the composition of “materials placed in the well for any purpose” as materials that may be emitted from a well. All materials, including fluids, that are deleterious to public health and the environment may be placed in the well and need to be accounted for in the event of a loss of containment. To clarify the breadth of this requirement, 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. 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 Inventory 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 shall be provided.

Section 1726.4.3, subdivision (c). This provision requires that the Gas Storage Well Chemical Inventory 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.

Initial tests are required in order to establish presence and, and if possible, quantification of chemical constituents, and testing for radon-222 to be conducted at the end of an injection season is required to best estimate peak concentration.

This section also notes that the Division may require testing and analysis for additional constituents per reservoir. Accurate measurements of concentrations of the chemical constituents present can help with determining exposure risk and may help with remediation in the event of a loss of containment.

Section 1726.4.3, subdivision (d). To be accurate and informative to public health officials, the Gas Storage Well Chemical Inventory is expected to be updated periodically and submitted to the Division. Having previously established the requirement for the creation of the inventory, this provision requires the operator to develop and adhere to a protocol for maintaining and providing the inventory to the Division and lists additional requirements for the protocol. Development of a standard operating procedure helps ensure consistent compliance by and between 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 placed in the well, 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.

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 ensure that the chemicals were actually placed in the well, and not only planned to be, and also can help identify chemicals added 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, to be included in the Gas Storage Well Chemical Inventory. The volume of each 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.

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 on a given date, within a 10 percent margin of error, to be included in the Gas Storage Well Chemical Inventory. The cumulative volume of each 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.

Section 1726.4.3, subdivision (d)(2). This element of operator Gas Storage Well Chemical Inventory protocols requires the protocol to include procedures to be implemented in the event of a reportable well leak. First, in the event of a reportable leak, the operator must provide a current and complete Gas Storage Well Chemical Inventory to the Division promptly. Timely and accurate information should be available to communities potentially affected by a reportable leak as soon as possible. The protocol must also ensure that within five days of using a kill fluid the operator will provide the Division an updated Gas Storage Well Chemical Inventory that includes each chemical constituent of the kill fluid. These reporting requirements are required by Public Resources Code section 3181.5, subdivision (b).

If a chemical supplier believes the chemical information is proprietary or 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 within. 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.

Lastly, this subdivision requires the procedures developed in the event of a reportable leak to be incorporated into the operator's emergency response plan, required under risk management plan requirements.

Section 1726.4.3, subdivision (d)(3). 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 each 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)(4). Public Resources section 3181.5, subdivision (a)(1) allows the Division to determine the frequency for operators to submit their Gas Storage Well Chemical Inventory, but not less than annually. This subdivision (d)(4) requires the protocol to establish procedures for submittal, in a digital format, of the Gas Storage Well Chemical Inventory within 6 months of the effective date of these proposed regulations. The protocols also require that the operator provide an updated Gas Storage Well Chemical Inventory every twelve months thereafter and the submittal of an updated Gas Storage Well Chemical Inventory after key changes occur, along with well summaries for permitted work. Examples of key changes are provided for clarity. An updated inventory must be provided within 60 days of placement if added to the well outside of permitted work. A current and accurate chemical inventory 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)(5). The proposed addition requires the protocol to include a workplan for completing the 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, which results in less deviation in sampling and analysis, and allows for more timely completion of testing and analysis and effective review by the division.

Section 1726.4.3, subdivision (d)(6). The final subdivision to this section requires that the protocol be submitted to the Division for review and approval within three months of the effective date of this section and when the protocol is updated. 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 identify 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 it is 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 limiting the off-normal occurrence reporting to leak related incidents only. Other entities such as the Federal Aviation Administration log undesirable events and their processes used as a gold standard for risk identification. Gathering data about near miss and events that occurred and widening the scope to include other activities relevant to risk management planning supports better understanding of relevant risks and mitigation measures at each UGS facility.

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,¹⁴ 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

¹⁴ 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.

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.
- 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.

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)
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- Department of Conservation, Geologic Energy Management. "WellSTAR Data Dashboard Glossary". [WellSTAR Data Dashboard Glossary](#). (last accessed August 2, 2023)
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- *Methyl Mercaptan*; SDS No. 001037 (Online); Airgas USA: Radnor, PA, May 20, 2015. <https://www.airgas.com/msds/001037.pdf> (accessed August 2, 2023).
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