



**Annual Report Number 5**  
**Recommendations for Improvements Related to**  
**Safety and Leak Prevention**  
**July 2023 – June 2024**

**Report Date: August 31, 2024**

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## Table of Contents

**Overview ..... 3**

*I. Recommendations of the WSOC for Safety Improvements at the Facility ..... 5*

*II. Recommendations of the Safety Ombudsman for Safety Improvements at the Facility ..... 5*

**Part A: Recommendations Made During the July 2023 – June 2024 Period ..... 5**

**Part B: SoCalGas Progress Responding to Prior Recommendations ..... 8**

**Part B-1 ..... 8**

**Part B-2 ..... 8**

**Part B-3 ..... 13**



## Overview

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SoCalGas (Defendant) and the State Attorney General, City Attorney for the City of Los Angeles, County Counsel for the County of Los Angeles, and the County of Los Angeles (collectively referred to as Government Plaintiffs) entered a Consent Decree to resolve claims raised by the Government Plaintiffs associated with the natural gas leak that occurred at the Aliso Canyon natural gas storage Facility (Facility) in October 2015. The terms and conditions of the Consent Decree required SoCalGas to, among other things, form an internal safety committee, and select and retain a third-party subsurface gas storage industry expert (Safety Ombudsman) who shall act as a safety advocate for the Facility. A copy of the Consent Decree may be accessed via this link: [Click Here](#)

Section 4.2 of the Consent Decree outlines the requirements for SoCalGas to establish a Well and Storage Operations Safety Committee (WSOC). The duties of the WSOC include but are not limited to the following:

- Meet quarterly to review safety issues at the Facility.
- Review operational safety issues and promote safe operations at the Facility consistent with applicable laws, rules, regulations, and orders.
- Review Facility-related information, materials, or work product to assess safety at the Facility.
- Make recommendations to SoCalGas for repairs, improvements, policies, and/or upgrades to the Facility or infrastructure therein.
- Facilitate the role of, and work in cooperation with, the Safety Ombudsman.
- In coordination with the Safety Ombudsman, conduct periodic safety audits or safety-related Strengths, Weaknesses, Opportunities, Threats (“SWOT”) analyses of the Facility.
- Review California Public Utilities Commission (CPUC) and California Department of Conservation Geologic Energy Management Division (CalGEM) audit reports of the Facility.

Section 4.3 of the Consent Decree outlines the requirements for SoCalGas to select and retain a Safety Ombudsman and the duties associated with that role. The duties of the Safety Ombudsman include the following:

- Participate in all Well and Storage Operations Safety Committee (WSOC) meetings.
- Have access to all non-privileged materials, information, records, and work product in SoCalGas’ possession, custody, and control necessary to accomplish the tasks required of the Safety Ombudsman.
- Review CPUC and CalGEM audit reports of the Facility.
- Review and evaluate all incidents reported to the public and State and local agencies pursuant to Section 4.1 of the Consent Decree.
- Review and advise on the WSOC’s efforts, findings, and recommendations for improvements.
- Serve as a non-exclusive repository for safety-related concerns reported by the public with respect to the Facility.
- Serve as a point of contact to receive safety complaints or concerns relating to the Facility from anyone who wishes to remain anonymous and provide any anonymous reports of safety concerns to SoCalGas.

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- Maintain the privacy of the person or member of the public confidentially making safety complaints or concerns relating to the Facility.
- Generate annual reports (Annual Reports) that detail the following:
  - The work of the Safety Ombudsman.
  - The work of the WSOC.
  - Recommendations, if any, for improvements related to safety and prevention of leaks at the Facility.
- Provide the Annual Reports to the Attorney General, the City Attorney, County Counsel, the CPUC and CalGEM. The Annual Reports shall also be made public via the Aliso Canyon Website and the local community shall be provided with an opportunity to comment on the Annual Reports. The Safety Ombudsman shall schedule at least one public meeting each year to explain and respond to questions regarding the Annual Reports.

This report has been prepared in accordance with the requirements outlined in Section 4.3, (b), (ix), (2) of the Consent Decree, and summarizes the recommendations for improvement made by the WSOC and/or the Safety Ombudsman during the period of July 2023 – June 2024. It is the fifth such annual report. [Section I](#) of this report summarizes recommendations developed by the WSOC. [Section II](#) includes recommendations of the Safety Ombudsman.

The Safety Ombudsman maintains a compendium of all recommendation topics by the WSOC and/or the Ombudsman over the years during which the Consent Decree has been active. This report provides a summary of the new recommendations as well as the status of prior recommendations. The summary of past and current recommendations and the progress of SoCalGas in response to the recommendations is contained in a Microsoft Excel file which can be found at the following link: [Click Here](#).



## I. Recommendations of the WSOC for Safety Improvements at the Facility

No new recommendations were made by the WSOC during the 2023-2024 meeting cycle. Prior WSOC recommendations remaining open are described in Section II, Part B-1 of this Report.

## II. Recommendations of the Safety Ombudsman for Safety Improvements at the Facility

### **Part A: Recommendations Made During the July 2023 – June 2024 Period**

The Safety Ombudsman developed the recommendations listed below during the July 2023 – June 2024 period for consideration of the WSOC.

From the 2023 Annual Report Number 4, released to the public in September 2023, the Ombudsman recommended that SoCalGas could improve its storage well emergency action plans to identify flow capability of each well and implement improvements in emergency action plans for gas storage well incidents using heat flow, noise, pollutant flow, and precautionary distancing measures.

*Discussion:* Based on the Ombudsman's review of SoCal responses to DR#16 and DR#16A recommendations for improvement in the well emergency action plans could include:

- Identification of maximum flow capability (absolute open flow, tubing flow constrained, at maximum operating pressure) at surface for each well;
- Identification of downhole rupture flow potential through casing (tubing-casing annulus constrained; variable with depth);
- Determination of the relationship of maximum flow at surface to heat flux and to noise flux;
- Determination of the relationship of heat and noise flux to emergency planning initial isolation zones, emergency action zones, and emergency planning zones;
- Characterization of the nature of well flow and other fluid/pollutant/toxin transport (fluids other than natural gas) – use flow stream composition information to differentiate the potential fluid composition from wells;
- Identification of potential collector and transport zones above (shallower than) the storage intervals – identification of rock properties, native pressures, native fluid contents – prioritize by shallowest/best/etc. Make periodic observation of these zones directly or by comparison of neutron or other logs over time;
- Characterization of how downhole leaks might spread in the subsurface and/or modeling of potential pathways, including identification and characterization of how downhole uncontrolled hydrocarbon and other fluid releases could be detected and controlled, how such releases might spread, and what receptors could be affected.

**SoCalGas Response:** SoCalGas is performing a study of precautionary distances in the event of a potential well failure based on storage inventory and inflow performance relationship (IPR). SoCalGas anticipates updating the Blowout Contingency Plan, as appropriate, in Q1 2025, after the completion of the study.

After review and analysis of SoCalGas responses to Data Requests #19 and #20 and additional risk assessment discussions with WSOC members (refer to Annual Report Number Five – Work of the Safety

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Ombudsman, found at this link: [Click Here](#)), the Ombudsman identified recommendations in June 2024, as listed below. As the Ombudsman delivered these new recommendations at the end of the July 2023-June 2024 cycle, SoCalGas actions in response to the recommendations will be treated in the next report covering the July 2024 – June 2025 cycle.

1. Update the "...finite element analysis previously performed at Aliso Canyon" (Note – SoCalGas, in its response to DR#20 Q1, stated that "Evaluation of the fault displacement threat leverages public models for earthquake frequency, surface expression likelihood, and fault displacement amplitude. The probability that a given fault displacement amplitude will result in a well failure is estimated leveraging finite element analysis previously performed at Aliso Canyon.")

*Discussion:* Pursuant to SoCalGas responses to DR#19 and DR#20, this recommendation seeks clarification on the ability of SoCalGas to update the analysis with additional information.

2. Part 1: Model the change in resistance and resilience of the dual-casing-string wells to show the difference between before- and after-state of risk at the facility wells in regard to failure due to mass earth movement.

Part 2: Define how the tubular failure frequencies for current wellbore completions with tubing/packer and/or new and additional cemented casing strings compare in an updated finite element analysis with the failure frequency over a 10-year period for each well in the previous analysis, stated to be in the range  $2.9e-3$  to  $3.9e-3$  per year. Is that likelihood different if the period is different than 10 years – for example, what would be the failure probability over 50-year and 100-year periods?

*Discussion:* Part 1: A similar recommendation was made in Annual Report Number Four – Work of the Safety Ombudsman, and Annual Report Number Four – Recommendations for Improvements, pursuant to DR#17, #18, and #18A, where the Ombudsman noted that each well with a new inner string is, potentially, more resistant to, and resilient against, the potential impact of earth mass movements due to seismic activity and/or landslides. The new well tubulars have greater mechanical strength than the original production casing, including greater collapse resistance, greater internal yield, and increased joint strength at the threaded connections. This recommendation builds on the September 2023 recommendation, in that SoCalGas reported differences in failure rates for such wells in response to DR#20, Q2, but it is not clear how these differences are more fully represented in the individual well risk assessments.

Part 2 seeks clarification on how the relative risk information is presented by SoCalGas.

- SoCalGas Actions: For Part 1 of this recommendation, refer to the Annual Report Number Five, Work of the Ombudsman and see response 2 from DR #20 for risk benefit of dual barrier construction and inner string additions.
3. Part 1: Show the difference in risk profile or risk envelope, as defined in Part 2 of Recommendation #2 above, for wells re-completed since 2016 where additional tubular strings were added to the wellbore profile.

Part 2: Show how additional tubular strings are handled in the probabilistic evaluation/equation, as independent barriers vulnerable to their individual failure likelihood in relation to a single fault displacement source event, or as redundant or partially redundant barriers.



Part 3: Show how secondary effects and co-dependent barrier elements (such as wellbore cement) are addressed in the probability chain.

Part 4: Use a P90/P90+ potential leak scenario stemming from tubular failure at deep seated fault displacement with gas flow to the surface, when coupled with a longer-than-10-year review period for fault displacement tubular failure. (\*Is SoCal addressing scenarios higher than P50, such as P90/P90+ consequence scenarios in their well integrity risk assessments? – Recommendation made here is to develop and show the full risk potential envelope (or profile) for the range of failure likelihood and consequence scenarios).

*Discussion:* Parts 1, 2, 3: Analysis and graphical visualization of risk envelope and/or risk profile helps to see the difference with and without various mitigations, as well as the full probability-severity spectrum of likelihood and consequence. Full view of a risk envelope or risk profile might have impact on risk-informed decision-making depending on the context of the organization's and stakeholders' risk perception and risk tolerance.

Part 4 seeks clarification on characterization of the modeling of the high-end range of potential consequences.

4. Taking into evaluation the well deliverability, well siting, proximity to greatest perceived threat of fault displacement, and SoCal's progress on "evaluating the wells at Aliso Canyon for the installation of subsurface safety valves as measures to mitigate landslide and/or seismic threats"\*, as well as SoCal's past experience with reliability of deep-set subsurface safety valve systems, and after review and consultation with subsurface safety valve system manufacturers, select one well for demonstration installation of a current-technology deep subsurface safety valve system. Develop maintenance, inspection, and testing practices for the system, then monitor the performance reliability of the installation over a period sufficient to demonstrate the potential range of reliability and the net risk change. Note\*: SoCalGas stated in response to DR#20, Q4 and Q5 that "SoCal is in the process of evaluating the wells at Aliso Canyon for the installation of subsurface safety valves, as measures to mitigate landslide and/or seismic threats."

*Discussion:* SINTEF data and other more recent information over the past 20-30 years indicates that reliability of SSSV systems have improved with new designs and experience since 1995-2000. The SoCalGas experience with deep-set SSSV, which shows dismal reliability for deep-set systems but relatively high reliability for shallow-set systems, precedes the modern era of experience given the SINTEF data (which comes mostly from the North Sea offshore UK and Norway).

5. With respect to reservoir risk assessment and its qualitative treatment of threats affecting the reservoir – geologic uncertainty, third-party activity, incorrect operations, and outside forces, the Ombudsman recommends: a) clarify the definition of a reservoir risk event; b) add pressure-volume-inventory as a threat and, specific to Aliso Canyon, identify the sensitivity of gas volume per psi as a tool to monitor for reservoir events; and c) evaluate interaction of the pressure-volume-inventory threat with the geologic uncertainty threat.

*Discussion:* The SoCalGas reservoir risk assessment model is recent and likely will undergo further development and improvement. The Ombudsman offers this set of recommendations for SoCalGas' consideration in the ongoing development and improvement of its reservoir risk assessment model.



## **Part B: SoCalGas Progress Responding to Prior Recommendations**

### **Part B-1**

The following recommendations made by the WSOC are closed:

1. Develop a Company Gas Standard outlining the process for taking wells out of service/returning wells to service.
2. Review and address the PHMSA audit letter dated May 28, 2020 prior to the next scheduled PHMSA audit of Aliso Canyon.
3. Improvements recommended to Gas Standard 224.106 Casing and Tubing Inspection Field Procedures
4. Improvements recommended to Gas Standard 224.119 Pressure Monitoring - Storage Wells and Reservoirs

### **Part B-2**

The following recommendations made by the Safety Ombudsman are closed, with SoCalGas responses briefly summarized below:

1. The Ombudsman made thirty-two (32) recommendations for improving the SIMP in 2020. SoCalGas reviewed each recommendation and provided the Ombudsman with a response and most recommendations were included in the revised RMP-SIMP submitted to CalGEM on April 1, 2022.
2. In October 2020, the Ombudsman recommended that SoCalGas develop and implement procedures for analysis of apparent corrosion rate and corrosion defect characterization to facilitate identification of wells requiring immediate action to address potential integrity issues which could pose a threat to the safety of the Facility. SoCalGas retained a third-party expert to complete a corrosion study of SoCalGas' storage wells, including developing a methodology for calculating corrosion rates of well casings, consideration of inspection tool defect sizing accuracy and reporting thresholds for both MFL and UT casing inspection platforms, and direct examination of portions of casing which have been removed from wells to aid in validation of the inspection tool results/accuracy.

SoCalGas implemented procedures for analysis of apparent corrosion rate and corrosion defect characterization in Gas Standard 224.125 Well Casing Anomaly Matching which was published to the Document Library. The stated purpose reads as follows:

“The purpose of this standard is to describe the process of estimating corrosion growth rate from well casing inspections.”

This Gas Standard is periodically reviewed and updated as these procedures continue to evolve as inspections are completed.

3. Initiate an internal audit of compliance with its Gas Standards associated with well intervention activities, specifically Well Workover, Casing Inspection, and Management of Change, and periodically assess other well intervention standards over the next 2-3 years.





SoCalGas started audits of its gas storage integrity management Gas Standards with the audit of Gas Standard 224.106, Casing and Tubing Inspection Field Procedure, in March 2021, Gas Standard 224.119 Pressure Monitoring - Storage Wells in 2022-2023, and ongoing with the Management of Change, SIMP 6. There is currently a standing WSOC agenda item to discuss progress on audits and upon completion of one audit make a selection of a procedure for the next audit.

4. The Ombudsman recommended in Q4 2020 that SoCalGas initiate an investigation of possible subsurface accumulation(s) of gas behind well casing in the area surrounding the SS-25 well, including baseline and subsequent gas detection logs. This investigation could be accomplished as part of California's Requirements for Underground Gas Storage Projects – specifically Section 1726.7.e, which mandates that operators develop a program to conduct baseline and subsequent gas detection logs on each gas storage well to detect gas behind casing. An investigation may reveal whether residual gas associated with the SS-25 leak exists at depth, and if so, enable accurate mapping of the gas. This, in turn, may aid SoCalGas, CalGEM, and the CPUC in assessment of the risk associated with remnant gas accumulations, and whether a recovery plan is feasible and advisable.

NOTE: Although this recommendation is closed, it is subject to periodic requests for update from the Ombudsman.

SoCalGas has collected field screening data at various monitoring locations on and around the SS-25 well pad since the well was plugged in February 2016. A leak survey report that analyzed data from nested soil vapor probes from April to December 2016 found that significant reductions in methane concentrations had been observed in the subsurface. Data also indicated that natural degradation processes had assisted in bulk methane reduction, and at some locations had allowed complete attenuation prior to reaching the surface. Additional monitoring performed through August 2018 using nested soil vapor probes found no detectable methane.

Separately, per the requirements of CalGEM regulation 14 CCR §1726.7(e), SoCalGas is developing a program to “conduct baseline and subsequent gas detection logs on each storage well to detect gas indications behind casing.” Gas detection logs have been run on all gas storage wells. Further program definition will be added around types of tools to utilize, frequency of logging, and comparison of subsequent logs to each other and to the baseline.

- 2024 SoCalGas update: Given that there are no open hole neutron logs to provide a true baseline, SoCalGas has identified the following logging program elements:
  - Compensated neutron logs (CNL) with combination of ultrasonic imaging tool / cement bond log (USIT/CBL) were run on wells post-inner string installations.
  - Comparison of original cased hole logs with subsequent logs may provide qualitative indications of gas (void) behind casing, depending on specific well configurations.
  - Logging frequency is typically every 18-24 months unless a well has been approved for a longer assessment interval.

SoCalGas reviewed the annular pressures of surrounding wells within a 1/4-mile radius of SS-25 for the last 4 years and did not identify any anomalously high pressures.



5. SoCalGas conducts a community meeting annually with residents and other parties to address questions related to the Aliso Canyon Facility – the Aliso Canyon Community Meeting. The Safety Ombudsman should be included in the notice of this meeting and be afforded the opportunity to join the meeting. Participation by the Safety Ombudsman will facilitate transparency and may serve to aid in addressing questions of a broader nature concerning how safety and well integrity are addressed by the storage industry at large.

SoCalGas will notify the Safety Ombudsman of the annual Aliso Canyon Community Meeting so that the Safety Ombudsman has the opportunity to attend.

6. The WSOC issues minutes from each quarterly meeting with the Safety Ombudsman. Prior to late 2021, the minutes had not been distributed until the next scheduled quarterly meeting. The Safety Ombudsman previously requested that the minutes be issued within a reasonable time after each quarterly meeting as opposed to waiting until the next meeting. Also, the Safety Ombudsman should have an opportunity to review and comment on the draft meeting minutes prior to formal approval by the voting members of the WSOC.

The WSOC meeting minutes have been distributed within a reasonable time after each quarterly meeting since late 2021, including during the July 2023 – June 2024 period.

7. In mid-late 2019 and through 2020, the Safety Ombudsman recommended that SoCalGas review and evaluate adaptation of relevant practices contained in ISO Standard 16530 (Petroleum and Natural Gas Industries – Well Integrity) such as Well Barriers, Well Monitoring and Surveillance, Annulus Pressure Management, and Well Intervention.

SoCalGas completed its review and presented its recommended adaptations at the September 2022 WSOC meeting. SoCalGas continues to review and implement elements of ISO 16530 as appropriate, as well as revise and update STOR-002. SoCalGas is working to determine the ability to document and highlight well barriers within WellView. In addition, the Company pressure monitoring gas standard 224.119 has been updated to more clearly document the justification for the tubing-casing annulus pressure upper threshold.

- 2024 SoCalGas update: An evaluation of third parties for a Well Integrity Management System (WIMS) solution to provide integration of well operations data, well barrier schematics, monitoring and status of well barriers, and other potential functions to support management of well integrity, is currently underway. SoCalGas anticipates implementation of any potential solutions in the 2025-2026 timeframe.

8. Improve Well Handover procedures, review STOR-002 vs. ISO 16530 for potential changes and additions.

SoCalGas continues to review and implement elements of ISO 16530 as appropriate, as well as revise and update STOR-002. STOR-002 UGS O&M Request Work Instructions is a System Instruction document, with the purpose as follows: “This local system instruction document provides guidelines for requesting Storage Operations and Maintenance (O&M) support to prepare for well drilling, well workovers, coiled tubing, wireline, servicing, testing and commissioning activities.”

- 2024 SoCalGas update: SoCalGas reviewed the information in ISO 16530-1:2017, table J.1 and have determined that the majority of this information is collected when conducting well



- work and made available in WellView. This information is currently available to the resident Storage Field Engineer (SFE) managing the day-to-day activities related to the storage wells. SoCalGas continues to review the remaining items and develop processes to acquire the information where applicable. One additional improvement identified from this process is the formalization of the SIMP engineer “pre-spud” meeting and checklist that can then be retained in the well workover file.
- Roles and responsibilities are currently addressed in GS 224.123, WellView Data Collection and Gathering. SoCalGas will continually review and make updates to this standard through our annual review process.
  - SoCalGas will update its written process (STOR-002) to remind the resident SFE of the presence of this information in WellView during the well handover process to operations after well work is completed.
9. Revise the applicable pressure monitoring procedural standard (GS 224.119) to include: a) trend monitoring for parameters such as well casing pressure, well tubing pressure, annulus pressure from all applicable annular spaces, and methane readings, for conditions under which adverse trends might occur within specified “normal operating levels;” b) detail on how to identify deviations from normally expected pressures and methane levels and how to analyze trends of pressure, volume, rate, or methane concentration; c) detail on how to analyze trends of each type of pressure or volume information, with the thresholds of normal operation only serving to define required actions under the abnormal operating condition procedural standard but that unexpected trends occurring at levels below thresholds also should be analyzed; d) integration of pressure and methane monitoring data to identify occurrences when multiple types of information might point to an issue requiring further investigation; e) requirements for frequency of monitoring and reviews of the monitoring practices; f) requirements for more frequent monitoring in areas where anomalous behaviors occur and evaluation of the benefits of additional sample collection and analysis to identify soil and annular space gases; and g) clarity of role responsibility for trend monitoring, internal reporting, and investigation.

SoCalGas reported that GS 224.119 Pressure Monitoring - Storage Wells and Reservoirs has been updated and addresses recommendations from the Safety Ombudsman: d) Pressure and Methane monitoring data is visually displayed in the operations room allowing for integration of data visually. Both pressure and methane monitoring systems have alerts that allow for anomalies identified on a given well to be further investigated. e) There is continuous pressure and methane monitoring. Operators within the operations room monitor the display screens multiple times in a shift and respond to alerts as needed. f) When anomalous conditions are observed, corrective work-orders are created and the anomalous condition is investigated. Additionally, SoCalGas clarified with the Ombudsman the recommendations pertaining to annulus pressure trend analysis, roles and responsibilities of personnel managing and executing the pressure monitoring program, and integration of pressure monitoring data with other monitoring or well integrity information. The Pressure Monitoring gas standard underwent detailed review, including a), b), c) Review additional steps on pressure readings that are within 10% of an AOC. d), f) Review written guidance on actions to take in the event of a relevant situation and the appropriate contact. And e), g) Additional written updates of tasks being performed by specific roles as well as listing specific roles and responsibilities by position instead of by group.



10. Implement within the SIMP applicable recommendations from the CPUC-sponsored report by 2EC “Independent Safety Culture Assessment of SoCalGas and Sempra Energy”. The WSOC should work with the SoCalGas Safety Culture Improvement Plan to allow the SIMP to be one organizational area of focus and leverage the strengths of the SIMP.

During the Q1 WSOC meeting, held on March 23, 2023, SoCalGas provided an overview of the Safety Forward program to WSOC. Safety Forward is a companywide commitment to enhance SoCalGas’ safety culture while living its safety values. The 2EC Report did not analyze system integrity practices and, therefore, no recommendations were made related to SoCalGas’s SIMP. The 2EC Report presents opportunities to improve safety culture through efforts such as engagement, training, and dialogues. Accordingly, SoCalGas prepared a Safety Culture Improvement Plan to realize improvement opportunities.

11. Pursuant to Data Requests #15 and #15A regarding the fence-line methane monitoring system, the Ombudsman recommended tracking the reliability of safety systems, specifically the fence-line methane monitoring system daily percent availability and reliability, including for those instances of non-availability or non-reliability the causal factor; the percentage of time a monitoring station was considered to be “on and reporting” with the information available via the weblink, the percentage of time a monitoring station was off for routine planned/scheduled repair and/or maintenance, the percentage of time a monitoring station was off for non-routine or corrective (unplanned) repair and/or maintenance, and the percentage of time a monitoring station was off and/or not reporting and awaiting investigation as to the cause of the status; and extend the concept of reliability tracking to other safety systems, such as well safety valve reliability, including failed closures on demand or on test, failures in control systems, and false closures, well pressure and flow and annulus pressure monitoring equipment accuracy and reliability.

SoCalGas responded that they continuously monitor the fence line methane monitoring system and by virtue of the continuous monitoring system, track the availability of the system. SoCalGas has not identified a recurring problem with the reliability of the system. SoCalGas has not determined a need to track reliability or to establish a reliability metric. Well safety valves are inspected and tested semi-annually during which any testing exceptions are recorded; the design of the valve will automatically fail close. Well pressure and annulus pressure monitoring equipment (transmitters) are checked on a weekly basis during which fidelity is already being tracked. Additional tracking for reliability is being evaluated for inclusion in system records.

12. At the December 2022 WSOC meeting, the Ombudsman reviewed the responsibilities of the committee per the charter and recommended that in the 2023-2024 WSOC cycle, a strengths-weaknesses-opportunities-threats (SWOT) exercise should be conducted. The SWOT boundaries would be defined to include the SIMP and its related technical-human-organizational-fundamental hazards and barriers. The purpose of the SWOT would be to elicit WSOC recommendations for safety improvement at the facility.

The WSOC selected a SWOT for Management of Change: SIMP.6 during the 12/14/2023 meeting. The SWOT subcommittee met twice in February 2024 to review the current version of SIMP.6 and discuss with the Safety Ombudsman how to proceed with analysis and to frame the scope of the analysis and set up working sessions with key stakeholders. SoCalGas initiated the SWOT exercise through the WSOC in March 2024. The initial SWOT workshop with key stakeholders took place in



Q2, with other workshops to be scheduled as needed. SoCal expects to complete the SWOT by the end of Q3 2024 and make recommendations during the 2024-2025 WSOC meeting cycle.

13. At the December 2022 WSOC meeting, the Ombudsman recommended that each WSOC meeting begin with a risk-based safety topic presented by WSOC members, and that PHMSA incident reports and National Transportation Safety Board (NTSB) and/or Chemical Safety Board (CSB) investigation reports on major accidents related to storage be reviewed.

SoCalGas initiated an addition to the WSOC agenda at the March 2023 meeting, incorporating a safety moment during the quarterly WSOC meetings and including reviewing industry lessons learned. In addition, SoCalGas reviews NTSB and PHMSA incident and investigatory reports related to storage. At the June 2023 WSOC meeting the Ombudsman provided the WSOC with a review of 2017-May 2023 PHMSA incident reports involving gas storage. The Ombudsman recommended that SoCalGas continue to review occasional updates of such information and/or incident reports and focus on questions such as: Where do we have control and can take preventative measures? Which incidents can we anticipate and prepare mitigation? How do we address the importance of “human error” as an underlying cause?

14. In June 2022, the Ombudsman recommended that SoCalGas develop a plan for reservoir integrity risk assessment.

SoCalGas developed a framework for managing reservoir integrity and risk, including development of new, or implementing enhancements to existing, processes and procedures, such as GS 224.132 – Reservoir Integrity Assessment and continues to work on integration of data from various monitoring activities, such as semi-annual inventory shut-ins. SoCalGas conducted a Reservoir and Caprock Threat Workshop and continues to build on that effort. WSOC members updated the Ombudsman on progress with the reservoir risk assessment model at the June 2024 WSOC meeting and follow up late June 2024 risk discussion meeting, including discussion of:

- Quantitative risk framework for gas storage wells:
  - Utilizes threat-specific probability of failure models
  - Accounts for well-specific configuration, monitoring, and mitigations in place
  - Aggregates failures over multiple barriers to understand probability and inflow performance relationship (IPR)
  - Includes evaluation of safety and environmental consequence
- Qualitative risk framework for gas storage reservoirs that evaluates and differentiates threats based on established prevention and mitigation measures

SoCalGas had a follow-up meeting with the Aliso Canyon Safety Ombudsman on 6/25/24 and provided additional context and details about its quantitative risk assessment (QRA).

### **Part B-3**

Ten (10) recommendations made by the Safety Ombudsman remain open. Six of the ten open recommendations were made in the 2023-2024 cycle and are presented in [Section II, Part A](#), of this Report



and are not repeated here. SoCalGas progress on the remaining four open recommendations is summarized below.

1. The Safety Ombudsman made the following recommendations in July 2021 to increase the adequacy and effectiveness of Gas Inventory Analysis and resolve year-to-year discrepancies and/or inconsistencies:
  - a. Apply consistent methodology for calculating average reservoir pressure in the inventory verification process and consistent with Gas Standard GS 224.070 Reservoir Integrity and Inventory Assessment;
  - b. The report format should be consistent from year to year, and the report should discuss elements influencing average reservoir pressure calculations, such as any operational changes, changes to the estimate of gas dissolved in the oil phase, influence from the aquifer, and any other aspects that affect the analysis;
  - c. Changes to the average reservoir pressure evaluation method should be updated in the relevant Gas Standard, GS 224.070 Reservoir Integrity and Inventory Assessment, assuming that has not been completed;
  - d. The change in the July 5, 2018, weighted average reservoir pressure, P/Z, and Z factor reported in the 2018 report versus what is reported in the 2020 version needs to be explained, including all assumptions made in arriving at the revised figure in the 2020 report;
  - e. SoCalGas should retain a third-party independent reservoir engineering expert with expertise in gas storage operations to perform an annual independent review of the results of its inventory verification analysis of Aliso Canyon; and
  - f. Include in the inventory assessment an address of fuel, use, and fugitive loss and how these are accounted for in the inventory verification process.
- SoCalGas Response: SoCalGas is in the process of retaining the services of a third party to review the gas inventory analysis and provide further recommendations. SoCalGas reviewed recommendations *a.* through *f.* above and responded as follows, in order:
  - The methodology for calculating reservoir pressure is consistent across the storage fields, and, where differences exist, they are pointed at in GS 224.070 (Section 4.3.4.1.1). SoCalGas plans to develop field-specific appendices, providing greater granularity on the changes in the well population used for the calculation over time.
  - SoCalGas plans to develop a more comprehensive annual report on inventory verification addressing the items identified in the recommendations.
  - See SoCalGas' response to *a.* above.
  - This recommendation refers to an inadvertent typo in the 2020 report, which has been fixed.
  - This recommendation is already implemented and detailed in GS 224.070 as the "Validation" step of the Inventory Assessment Process Workflow. As discussed with the Safety Ombudsman, a 3-to-5-year independent review may be more appropriate.



- SoCalGas plans to include a section in the proposed comprehensive annual report which reviews the data obtained from the Measurement Group regarding fuel usage and fugitive losses.
- 2024 SoCalGas update: The third-party consultant is anticipated to begin towards the end of Q4 2024. This effort will include:
  - Review the methodology for calculating average reservoir pressure in the inventory verification process.
  - Evaluate changes to the average reservoir pressure evaluation method and provide feedback.
  - Perform a review of the results of the inventory verification analysis of Aliso Canyon.
  - In addition, SoCalGas accounts for the inventory review relative to the monthly storage balance ledger which is published internally every month.
- 2. Through mid-late 2019 and 2020, the Ombudsman made an ongoing recommendation that SoCalGas periodically review its human and organizational capacity and effectiveness with respect to the SIMP, identify potential gaps in technical expertise, include supervisory protocols to ensure adequate oversight for both company and contractor personnel, assess the adequacy and competence of resources to meet the needs of the organization, and verify that those engaged in SIMP activities are trained in and aware of the associated regulatory compliance requirements. While in part this original 2019-2020 recommendation is closed, it is an ongoing recommendation to which the new Ombudsman added similar specific recommendations as noted in [Section II, Part A](#), and thus the study of human and organizational factors and reliability remains an open recommendation, subject to periodic evaluation of the Company's continual improvement.
  - SoCalGas Response: Thus far SoCalGas has added detail to Section 7.2.1 of SIMP.8 Quality Assurance Plan to describe the status of the Human Factors Assessment. The description in SIMP.8 is supplemented in the updated April 1, 2022 RMP with Appendix D: Human Factors Assessment Overview. During the Q1 WSOC meeting, held on March 23, 2023, SoCalGas provided an overview of the Safety Forward program to WSOC. Safety Forward is a company-wide commitment to enhance SoCalGas' safety culture while living its safety values. Under the SIMP, the Internal Audit and Human Factors Assessment programs provide structures for detailed procedural reviews, including observations of field execution, to understand the appropriateness and effectiveness of SIMP processes. They also allow for an understanding of how the systems in place support personnel in their comprehension of procedural requirements and execution of tasks. The employee training program in place includes awareness training of procedures pertinent to an individual's job responsibilities. The contractor onboarding process supports the effort to bring trained and qualified individuals to job sites.
  - 2024 SoCalGas update: SoCalGas' Human Factors Assessment program, as part of SIMP, is executed on individual operations and maintenance processes to evaluate the interactions between humans and the systems in place to support their execution of tasks and procedures. Three human factors assessments have been completed. SoCalGas plans to complete at least two additional human factors assessments in 2024.



3. The Ombudsman recommended in March 2022 that SoCalGas develop risk metrics that can be tracked and trended. Metrics could be developed with respect to:
  - a. Procedural robustness, adequacy, and continual improvement.
  - b. Risk management effectiveness through:
    - i. Metrics regarding risk management activities (prevention, mitigation, planning, analysis, plan implementation).
    - ii. Metrics regarding risk reduction and whether it occurs with respect to some or all of prevention, mitigation, knowledge gap closure, or other aspects of risk.
    - iii. Metrics regarding risk decisions executed and effects monitored.
  - c. Safety culture improvements, including those with respect to human and organizational risk management.
    - SoCalGas response: Continued analysis, monitoring, and assessment data, along with quantitative risk assessment, will enhance SoCalGas' ability to better determine appropriate and meaningful performance metrics. SoCalGas is reviewing the recommended performance metrics and the existing metrics used for SIMP and storage to determine potential updates or modifications. SoCalGas anticipates determination of whether any potential metrics will be added by the end of Q4 2024.
4. The Ombudsman recommended in March 2023 that SoCalGas' risk reduction at the Aliso Canyon facility since 2016 be documented, including the knowledge gained through ongoing monitoring, the preventive and mitigation (P&M) efforts employed or planned, and the perceived efficacy and effectiveness of those P&M measures. Risk reduction could be itemized for each of the following categories and subcategories:
  - a. Reduction in footprint (number of active wells and well sites)
  - b. General reduction in environmental and safety impact potential
  - c. Reduced reservoir pressure and volume (reduces consequence potential)
  - d. Increased mechanical integrity and resilience of wells
  - e. Design / materials improvements (liners, other tubulars, cement, wellhead)
  - f. Two passive physical/technical barriers (tubulars)
  - g. Additional wellhead barriers
  - h. Treatment for prevention/mitigation of other hazards
  - i. Plugged well integrity
  - j. Increased human and organizational awareness and discipline
  - k. High-quality procedural and engineering/material standards
  - l. Remote/electronic/continuous monitoring, with alarm/warning management
  - m. Additional downhole and wellhead testing, inspection, analysis





- n. WSOC and other aspects related to safety management
- o. SIMP organizational acumen
  - SoCalGas Response: SoCalGas developed a framework and approach to managing the integrity of underground storage assets in its SIMP plan, including processes for data collection and integration, threat evaluation and risk assessment, integrity assessment, and implementation of prevention and mitigation protocols. The processes described and referenced in the SIMP plan detail the mitigations implemented to reduce the risk of a well or reservoir failure. SoCalGas developed and is executing a quantitative risk assessment for storage wells. The risk assessment framework will allow for various mitigation scenarios to be evaluated, demonstrating the risk benefit of certain implemented or proposed P&M measures.
  - SoCalGas implemented various measures at Aliso Canyon that support management and mitigation of risk, including:
    - Dual barrier well construction and operation (tubing-only flow)
    - Metal loss and mechanical integrity testing of well tubulars (e.g., MFL, UT, noise/temp, pressure testing)
    - Well abandonments or remediations (e.g., inner string installations)
    - Annulus pressure monitoring
    - Surface and subsurface safety valves
    - Emergency response drills
    - Governance plans and procedures
    - Risk assessments
  - The QRA framework developed for storage wells enables SoCalGas to quantify the benefit of many of these risk reduction measures. To date, 35 Aliso Canyon gas storage wells have been assessed with the QRA. The remaining gas storage wells are anticipated to have their baseline risk assessments completed by early 2025. As results of the QRA are finalized and more wells are evaluated, SoCalGas will make efforts to quantify, where possible, the risk benefit of implemented measures to manage well integrity.