

PUBLIC UTILITIES COMMISSION

505 VAN NESS AVENUE
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February 7, 2018

GI-2017-06-LGS37-08

Mr. Robert Russell, VP-Field Operations
Lodi Gas Storage, LLC.
P.O. Box 230
Acampo, CA 95220

Subject: SED's closure letter for the 2017 Transmission Integrity Management Program (TIMP) Safety Inspection

Dear Mr. Russell:

The Safety and Enforcement Division (SED) of the California Public Utilities Commission reviewed Lodi Gas Storage's (LGS) response letter dated September 1, 2017 for the findings identified during the Transmission Integrity Management Program inspection (TIMP) which was conducted from June 12, 2017 through June 16, 2017.

A summary of the inspection findings documented by the SED, LGS's response to SED's findings, and SED's evaluation of LGS's response taken for each finding are outlined for each identified violation, concern and recommendation.

This letter serves as the official closure of the 2017 LGS safety inspection.

For any questions related to this matter, please contact Paul Penney at (415) 703-1817 or by email at paul.penney@cpuc.ca.gov.

Sincerely,

A handwritten signature in blue ink that reads "Dennis Lee".

Dennis Lee, P.E.
Program and Project Supervisor
Gas Safety and Reliability Branch
Safety and Enforcement Division
California Public Utilities Commission

Enclosure: Summary of Inspection Findings

cc: Kenneth Bruno, SED
Kelly Dolcini, SED
Gregory Clark, LGS

Summary of Inspection Findings

I. Violations, Concerns and Recommendations Identified in Protocol Area A: Identify HCAs.

A.01.a— Verify the operators integrity management program includes documented processes on how to implement methods (1) and (2) in order to identify high consequence areas [§ 192.905(a)]

This is covered in LGSs IMP Procedure, Sections 1.2, 1.3 and 1.4.

Issues Identified:

The HCA method was restricted to method 1 per GO112F (page 3) for pipe greater than 12 inches, effective 1-1-17. Therefore, while not a violation, SED staff recommends that LGS include language in its IMP to restrict the use of method 2 to pipeline segments in its system with a diameter of 12 inches or less. The LGS system includes 12", 24" and 30" pipeline segments.

LGS Response:

LGS shall revise its procedure as recommended by SED during the next annual IMP review.

SED's Conclusion:

LGS's response sufficiently addresses this recommendation.

A.04.c. Verify the program includes as a high consequence area, any area in Class 1 and Class 2 piping locations where the potential impact circle contains an identified site. [§192.903 High Consequence Area (1)(iv)]

This protocol question is covered in LGSs IMP Procedure, Element #1, Section 1.3, page 4 of 14.

Issues Identified:

While reviewing the ArcGIS overhead view of Brannon Island with LGS personnel, we noted that the extent of the HCA at the Southern border of Brannon Island stopped at the shoreline. However, per 192.903 and LGSs IMP ...

"Where a potential impact circle is calculated under either method (1) or method (2) to establish a high consequence area, the length of the high consequence area extends axially along the length of the pipeline from the outermost edge of the first potential impact circle that contains either an identified site or 20 or more buildings intended for human occupancy to the outermost edge of the last contiguous potential impact circle that contains either an identified site or 20 or more buildings intended for human occupancy."

The extent of the HCA at the Southern Border of Brannon Island State Park appears to be flawed. Per Method 1 for identified sites, a picnic area northeast of the pipeline center line at the southern shoreline is within the PIR. Therefore, the HCA should be extended into the water "to the outer most edge of the last contiguous impact circle."

LGS is in violation of 192.903 for not extending the HCA to the proper Southern extent.

LGS Response:

LGS shall extend the southern border of the Brannon Island HCA in accordance with Method 1 for identified sites. Please note that the pipeline segment to be added to the

Brannan Island HCA is ~80' or more below ground level (three mile slough directional drill in 2001) and constructed using 0.500 wall thickness pipe.

SED's Conclusion:

LGS's response sufficiently addresses this violation.

A.06.a. Verify the operator's integrity management program includes documented processes for how new information that shows a pipeline segment impacts a high consequence area is identified and integrated with the integrity management program. The program is to identify and analyze changes for impacts on pipeline segments potentially affecting high consequence areas. Issues the program must consider include but are not limited to:[§192.905(c)]

- i. Changes in pipeline maximum allowable operating pressure (MAOP),
- ii. Pipeline modifications affecting piping diameter,
- iii. Changes in the commodity transported in the pipeline,
- iv. Identification of new construction in the vicinity of the pipeline that results in additional buildings intended for human occupancy or additional identified sites,
- v. Change in the use of existing buildings (e.g., hotel or house converted to nursing home),
- vi. Installation of new pipeline,
- vii. Change in pipeline class location (e.g., class 2 to 3) or class location boundary,
- viii. Pipeline reroutes
- ix. Corrections to erroneous pipeline center line data.

Issues Identified:

During the audit, LGS personnel identified a housing development that will extend the length of the HCA on the eastern side of the City of Isleton. LGS is having the extension of the HCA analyzed per the requirements in this protocol question.

While not a violation, SED staff would like an update on the results of the analysis undertaken by LGS, and whether this expansion of the HCA will impact the MAOP of the pipeline (i.e. if the class 3 area extends into thinner walled pipe).

LGS Response:

The engineering analysis in question is in progress; LGS shall provide SED with an update once the analysis has been finalized.

SED's Conclusion:

LGS's response sufficiently addresses this request.

II. Violations, Concerns and Recommendations Identified in Protocol Area B: Baseline Assessment Plan

B.01.b. If internal inspection tools are selected, verify that the operator followed ASME B31.8S-2004, Section 6.2 in selecting the appropriate internal inspection tool for the covered segment. [§192.921(a)(1)]

- i. Verify that the operator has evaluated the general reliability of any in-line assessment method selected by looking at factors including but not limited to: detection sensitivity; anomaly classification; sizing accuracy; location accuracy; requirements for direct examination; history of tool; ability to inspect full length and full circumference of the section; and ability to indicate the presence of multiple cause anomalies. Refer to ASME B31.8S-2004, Section 6.2.5. [§192.921(a)(1)]

In discussing validation of ILI results with LGS staff, SED staff noted that ASME B31.8S-2004, Section 6.2.6 requires validation digs. Consistent with this code requirement, LGS includes a requirement to do validation digs in the 2016 LGS IMP Plan, Element #3, page 10 of 25. The LGS requirement states:

The primary method LGS will use to validate and calibrate ILI tool data will be through excavations. The IMP Leader and/or IMP Team will make the determination on the appropriate number and location of validation digs. LGS will use a minimum of two excavation digs unless the IMP Leader and IMP Engineer can justify a lesser number. If data comparison from the two excavations conflicts with the ILI tool anomaly data, a least one other excavation dig shall be performed. LGS will select the two most severe locations for the two validation digs, unless the engineer can justify otherwise. The engineer shall document their excavation decision based on statistics or other sound engineering practices. [Underline Added]

To facilitate the comparison of ILI dig data with the ILI tool anomaly data, SED staff recommends that a detailed specification of the detection, sizing and location accuracy be included as an appendix to the ILI run report.

LGS Response:

LGS shall take SED's recommendation into consideration.

SED's Conclusion:

LGS's response sufficiently addresses this recommendation.

III. Violations, Concerns and Recommendations Identified in Protocol Area C: Identify Threats, Data Integration and Risk Assessment

C.01.a— If the operator is following the prescriptive or performance-related approaches, verify that the following categories of failure have been considered and evaluated: [§192.917(a) and ASME B31.8S-2004, Section 2.2]

- i. external corrosion,
- ii. internal corrosion,
- iii. stress corrosion cracking;
- iv. manufacturing-related defects, including the use of low frequency electric resistance welded (ERW) pipe, lap welded pipe, flash welded pipe, or other pipe potentially susceptible to manufacturing defects [§192.917(e)(4) and ASME B31.8S-2004, Appendix A4.3];
- v. welding- or fabrication-related defects,
- vi. equipment failures;
- vii. third party/mechanical damage [§192.917(e)(1)],
- viii. incorrect operations (including human error),
- ix. weather-related and outside force damage,
- x. cyclic fatigue or other loading condition [§192.917(e)(2)],
- xi. all other potential threats.

This item is covered in Element #2, page 4 of 32. The record demonstrating compliance with this item is the threat analysis spreadsheet for each year.

Issues Identified:

For item ii above (internal corrosion), SED staff recommends that LGS take samples of the liquid (if any) removed from the main 24" pipeline during the next ILI run scheduled for 2017. As noted from the 2012 ILI run report, there was a large amount of liquid that came out at the end of the

run on the 24 inch pipe. This will enable LGS to identify any indicators of internal corrosion, including corrosion byproducts, MIC, etc.

For item iii above (stress corrosion cracking), SED staff has two recommendations:

1. LGS should note in its TIMP plan that the screening criteria identified in ASME B31.8S-2004, Appendix A3, for the High pH Stress Corrosion Cracking (SCC) threat is not absolute. These criteria do not account for approximately 25-35% of historical SCC failures. As noted in the National Association of Corrosion Engineers (NACE) RP0204-2004 (Stress Corrosion Cracking Direct Assessment Methodology), Section 1.2.1, "...It is recognized that these screening factors will identify a substantial portion of the susceptible locations, but not all of them."

Therefore, while not a violation, SED staff recommends that LGS incorporate language in its TIMP plan that notes the screening criteria in ASME B31.8S, Appendix A3, Section A3.3, are not an absolute guarantee that there will not be High pH SCC in the future. This will alert LGS staff that integrity assessment for this threat may be necessary at some point in the future.

2. SED staff further recommends that WGS incorporate testing for SCC into all direct examinations (i.e. Magnetic Particle Inspection). Magnetic Particle Inspections will provide data for any potential SCC that might occur in the future. This data will also inform the threat analysis process, risk assessment and the need for addition integrity assessment techniques to assess for High pH SCC (i.e. an ILI tool with crack detection capability or hydro-testing are the two assessment techniques).

For item v above (welding or fabrication related defects¹), SED staff noted that the LGS "2016 Threat Analysis" spreadsheet has a column that identifies the "The Integrity Assessment Methods allowed for these Threats per ASME B31.8S, Section 6" for each threat. LGS incorrectly identifies the integrity assessment technique for the construction threats as "*Excavation protocols per ASME appendix A, Section A5.5*". Excavation/direct examination of individual construction features (i.e., girth welds) can be used to integrity assess individual construction defects, but integrity assessing an entire HCA would require direct examination of all construction features² in that HCA. ASME B31.8S, Section A5.5 discusses responses and mitigation.

Section A5.4 discusses integrity assessment. It states: "For construction threats, the inspection should be by data integration, examination, and evaluation for threats that are coincident with the potential for ground movement or outside forces that will impact the pipe." [Underline Added] While excavation and direct examination of construction defects can be part of the process, the full process is discussed in Section A5.4. Therefore, while not a violation, SED staff recommends that LGS update the Threat spreadsheet, and any other documents, to reflect the requirement in ASME B31.8S, Section A5.4 for integrity assessment.

For item x above (Cyclic Fatigue), SED staff identified an issue in the previous 2013 TIMP audit. As noted in the 2013 closure letter for the TIMP audit, LGS identified the threat of cyclic fatigue for pressure cycling and railroad traffic; this was identified in its "LGS_Gas_IMP_Threat Analysis_2013" spreadsheet. Then in the "LGS IMP_BAP & Mitigation, Rev #2013" spreadsheet, LGS identified a severity, likelihood and risk of zero; this effectively deactivated the threat for integrity assessment purposes.

¹ B31.8S, Section A5.1 defines construction as girth welds, fabrication welds, wrinkle bends or buckles, stripped threads, broken pipe and couplings.

For the 2016 threat analysis spreadsheet, LGS identified cyclic fatigue as a threat. Then in the “LGS Gas IMP Risk Rank and Schedule” for 2016, LGS identified the risk as 10 (the lowest risk score in LGSs risk ranking system).

If LGS intends to exclude this threat from an integrity assessment in 2017 (effectively calling the risk zero), LGS needs to justify the exclusion of this threat. This is supported by B31.8S-2004, Section 5.5 (Risk Assessment Approaches). In discussing the Subject Matter Expert approach, B31.8S-2004, page 12 states:

“1) Subject Matter Experts (SMEs). SMEs from the operating company or consultants, combined with information obtained from technical literature, can be used to provide a relative numeric value describing the likelihood of failure for each threat and the resulting consequences.” [Underline Added]

To not integrity assess for this threat in 2017³, LGS needs to justify this from SME opinion combined with the appropriate information from the technical literature. As noted during this audit, LGS had an analysis done of the railroad loading using API 1102, and referenced this analysis in the 2016 threat analysis spreadsheet and the 2016 risk assessment spreadsheet.

LGS needs to have a similar analysis done for the cyclic fatigue threat for pressure cycling. System-wide or generic studies may be used as long as the operator documents the reason(s) for why the study is applicable to the HCA segment specific conditions. For example, “*Evaluating the Stability of Manufacturing and Construction Defects in Natural Gas Pipelines*”, by John F. Kiefner (Publication date: April 26, 2007) is one possible report. Another example of a generic study is the “*Basics of Metal Fatigue in Natural Gas Pipeline Systems — A Primer for Gas Pipeline Operators*”, by Kiefner and Associates (Publication date: June 2006).

LGS needs to do the analysis and reference the technical literature in the 2016 threat analysis spreadsheet and the 2016 risk assessment spreadsheet to exclude the cyclic fatigue threat due to pressure cycling from integrity assessment.

LGS Response:

LGS shall take SED’s recommendations into consideration.

SED’s Conclusion:

With the exception of the last item regarding the threat of cyclic fatigue, LGS’s response sufficiently addresses these recommendations. SED staff will follow up on the cyclic fatigue issue during a future audit to properly exclude the threat as discussed above.

C.02.g. Verify that the operator’s program includes a procedure for ensuring the accuracy and completeness of information and data used in the identification of potential threats and the risk analysis.

Issues Identified:

This protocol question is included in the IMP Procedure, Section 2.7. It is also included in the Section 2.12 (List of Required Ongoing Documentation for Element #2), item #4 (Validation of Data Accuracy). But Protocol 2.02.g is not included as a line item in the LGS Element #2 Agenda. While not a violation, SED staff recommends this item be included in the agenda to ensure the item is reviewed yearly.

LGS Response:

LGS shall revise its Element #2 Agenda as recommended by SED during the next annual

³ Two integrity assessment techniques would be ILI with a crack detection tool, or hydro-testing.

IMP review.

SED's Conclusion:

LGS's response sufficiently addresses this recommendation.

C.02.h. Verify that the operator's program includes plans for additional inspection activities or field data collection efforts as needed to ensure data completeness and accuracy.

Issues Identified:

This Protocol is covered in the IMP Procedures, Section 2.7, page 20 of 32, in the last paragraph. The paragraph states in part: *"This may require additional inspections and field data collection efforts and will be noted on the agenda action item list and/or the summary of action item list."*

Although noted in the IMP text, this Protocol is not included in the Element #2 agenda. While not a violation, SED staff recommends this item be included in the agenda.

LGS Response:

LGS shall revise its Element #2 Agenda as recommended by SED during the next annual IMP review.

SED's Conclusion:

LGS's response sufficiently addresses this recommendation.

C.02.i. Verify that the records indicate that all existing data and information on the entire pipeline, that could be relevant to covered segments, has been gathered.

Adequate records that demonstrate all data and information has been gathered should:

- i. Show that comprehensive collection, review and analyzing of data was performed.
- ii. That data sets for threat identification and risk assessment were assembled in accordance with the requirements in ASME B31.8S-2004, Sections 4.2, 4.3 and 4.4.
- iii. Show that data sources listed in ASME B31.8S-2004, Table 2, were utilized for initiation of the integrity management program.
- iv. Show that new information was incorporated in a timely and effective manner.
- v. Show that controls to provide assurance of the completeness and accuracy of input information in accordance with the operator's procedure were properly applied.
- vi. Show additional inspection or field data collection activities to improve the accuracy and completeness of the data were conducted.

Issue Identified:

This item is not covered in the LGS IMP Element #2 Agenda. While not a violation, SED staff recommends that the Protocol and associated records for each item be referenced in the agenda.

With regard to item (v) above, SED staff is uncertain as to how this item is included in the Element #2 chapter. Please explain how this procedure is covered in the Element #2 chapter.

LGS Response:

LGS shall revise its Element #2 Agenda as recommended by SED during the next annual IMP review. Regarding item (v) above, the LGS procedures addressing quality and completeness of information may be found in the LGS IMP Procedures, Section 2.7, page 20 of 32.

SED's Conclusion:

LGS's response sufficiently addresses this recommendation and question.

C.03.c. Verify that the risk assessment explicitly accounts for factors that could affect the likelihood of a release and for factors that could affect the consequences of potential releases, and that these factors are combined in an appropriate manner to produce a risk value for each pipeline segment. [ASME B31.8S-2004, Section 3.1, ASME B31.8S-2004, Section 3.3, ASME B31.8S-2004, Section 5.2, ASME B31.8S-2004, Section 5.3 and ASME B31.8S-2004, Section 5.7(j)] Verify that the risk assessment approach includes the following characteristics:

...

- vi. The risk assessment process incorporates sufficient resolution of pipeline segment size to analyze data as it exists along the pipeline [ASME B31.8S-2004, Section 5.7(k)].

Issue Identified:

It appears that LGS's HCA segments include the entire extent of each HCA. This is allowable under ASME B31.8S-2004, Section 5.7(k). However, LGS may need to incorporate smaller resolution in the future. Therefore, SED staff recommends that LGS incorporate girth weld location data as a layer in the ArcGIS application to allow for smaller resolution of risk within each HCA segment.

LGS Response:

LGS shall take SED's recommendation into consideration.

SED's Conclusion:

LGS's response sufficiently addresses this recommendation.

C.04.b— Verify that the operator's process provides for revisions to the risk assessment if new information is obtained or conditions change on the pipeline segments. Verify that the provisions for change to the risk assessment address the following areas:

- i. the risk assessment plan calls for recalculating the risk for each segment to reflect the results from an integrity assessment or to account for completed prevention and mitigation actions. [ASME B31.8S-2004, Section 5.11, and ASME B31.8S-2004, Section 5.7(c)]
- ii. the operator integrates the risk assessment process into field reporting, engineering, facility mapping, and other processes as necessary to ensure regular updates. [ASME B31.8S-2004, Section 5.4]
- iii. the integrity management plan calls for revision to the risk assessment process if pipeline maintenance or other activities identify inaccuracies in the characterization of the risk for any segments. [§192.917(c) and ASME B31.8S-2004, Section 5.12]
- iv. the operator uses a feedback mechanism to ensure that the risk model is subject to continuous validation and improvement. [§192.917(c) and ASME B31.8S-2004, Section 5.7(f)]
- v. the use of a mechanism to ensure the risk model is subject to continuous validation and improvement.
- vi. leak, failure, and incident history is used to validate the risk model.

Issue Identified:

LGS covers this in the TIMP plan, Section 2.8. But the protocol question is not referenced in the 2016 "LGS Integrity Management Plan", Element #2 Agenda. While not a violation, LGS should include this in the agenda.

LGS Response:

LGS shall revise its Element #2 Agenda as recommended by SED during the next annual IMP review.

SED's Conclusion:

LGS's response sufficiently addresses this recommendation.

C.04.c— Verify that records demonstrate that the risk assessment was revised as necessary as new information was obtained or conditions changed on the pipeline segments. Verify that the records address the following:

- i. The risk for each segment was recalculated to reflect the results from an integrity assessment or to account for completed prevention and mitigation actions.
- ii. The risk assessment process was integrated into field reporting, engineering, facility mapping, and other processes as necessary to ensure regular updates.
- iii. The risk assessment process was revised if pipeline maintenance or other activities identify inaccuracies in the characterization of the risk for any segments.
- iv. The risk model is continually being validated and improved.
- v. The operator uses its leak, failure, and incident history to validate the risk model.
- vi. The operator captures actions such as installing new pipe, new coating, repairs, etc. into the pipeline system in and outside of HCA's.

Issue Identified:

LGS covers this in the TIMP plan, Section 2.8. But the protocol question is not referenced in the 2016 "LGS Integrity Management Plan", Element #2 Agenda. While not a violation, LGS should include this in the agenda.

LGS Response:

LGS shall revise its Element #2 Agenda as recommended by SED during the next annual IMP review.

SED's Conclusion:

LGS's response sufficiently addresses this recommendation.

IV. Violations, Concerns and Recommendations Identified in Protocol Area D: DA Plan

Per section 4.4 of the TIMP plan, LGS does not intend to use direct assessment as the primary assessment method. The TIMP plan states that LGS may use direct assessment processes to supplement other assessment methods, and in fact has done this with Close Interval Surveys (CIS) and a Direct Current Voltage Gradient (DCVG) Surveys.

V. Violations, Concerns and Recommendations Identified in Protocol Area E: Remediation

No issues identified.

VI. Violations, Concerns and Recommendations Identified in Protocol Area F: Continual Evaluation and Assessment

F.02.b. Review the methods selected for reassessments and verify that they are appropriate for the identified threats.

Issue Identified:

As noted by SED staff during the audit, LGS must do an integrity assessment for each threat identified in the threat analysis unless LGS evaluates the risk of that threat as zero (effectively deactivating the threat for integrity assessment purposes). This is supported by both 192.921(a) and 192.937(c). However, it should be noted that some threats have unique integrity assessment

techniques not covered by: (1) In-line-inspection, (2) hydro-testing, (3) Direct Assessment or (4) Other technology. These other integrity assessment techniques are specific for each threat and are identified in ASME B31.8S-2004, Appendix A. For example, for the construction threat, the assessment technique is covered in ASME B1.8S-2004, Appendix A5.4, and was discussed in Protocol question C.01 above.

Based on LGS's 2016 Threat Analysis and "2016 LGS Gas IMP Risk Rank and Schedule", it appears that LGS will not integrity assess for all threats identified in the 2016 Threat Analysis spreadsheet.⁴ The threats identified in the 2016 Threat Analysis are: External corrosion, internal corrosion, manufacturing, construction, third party damage, incorrect operations, weather related and outside force and cyclic fatigue and other loading conditions. The "2016 LGS Gas IMP Risk Rank and Schedule" identifies the integrity assessment technique as "MFL High Resolution and Geometry, Supplemented with CIS." Further, as noted in the "2016 LGS Gas IMP Risk Rank and Schedule," a column entitled "Basis for Assessment Method (Threats Identified)" identifies the threats as external corrosion and third party damage.

Therefore, while not a violation, LGS needs to ensure that all threats with non-zero risk are integrity assessed per the requirements of 192.921(a), 192.937(c) and ASME B31.8S-2004, Appendix A.

LGS Response:

LGS shall take SED's recommendation into consideration.

SED's Conclusion:

LGS's response sufficiently addresses this concern. SED staff will follow up during future audits to ensure LGS is integrity assessing the HCA segments with the proper assessment techniques for all threats with non-zero risk.

VII. Violations, Concerns and Recommendations Identified in Protocol Area G: Confirmatory DA

Not Applicable. LGS does their assessments on a five year period with ILI technology.

VIII. Violations, Concerns and Recommendations Identified in Protocol Area H: Preventative and Mitigative Measures

No issues identified.

IX. Violations, Concerns and Recommendations Identified in Protocol Area I: Performance Measures

No issues identified.

X. Violations, Concerns and Recommendations Identified in Protocol Area J: Record Keeping

No issues identified.

XI. Violations, Concerns and Recommendations Issues Identified in Protocol Area K: Management of Change (MOC)

No issues identified.

⁴ The next integrity reassessment is scheduled for 2017.

XII. Violations, Concerns and Recommendations Identified in Protocol Area L: Quality Assurance

No issues identified.

XIII. Violations, Concerns and Recommendations Identified in Protocol Area M: Communications Plan

No issues identified.

XIV. Violations, Concerns and Recommendations Identified in Protocol Area N: Submittal of Program Documentation

No issues identified.