Risk Assessment and Mitigation Phase

(Chapter SCG-Risk-2)

Excavation Damage (Dig-in) On The Gas System

May 17, 2021

TABLE OF CONTENTS

		Page
I.	INTRODUCTION	1
	A. Risk Overview	2
	B. Risk Definition	6
	C. Scope	6
II.	RISK ASSESSMENT	7
	A. Risk Bow Tie and Risk Event Associated with the Risk	7
	B. Cross-Functional Factors	9
	C. Potential Drivers/Triggers	9
	D. Potential Consequences of Risk Event	12
	E. Risk Score	12
III.	2020 CONTROLS	13
	A. Locate and Mark Training	14
	B. Locate and Mark Activities	15
	C. Locate and Mark Annual Refresher Training and Competency Program	15
	D. Locate and Mark Operator Qualification	16
	E. Locate and Mark Quality Assurance	16
	F. Damage Prevention Analysts	17
	G. Locating Equipment	18
	H. Public Awareness	19
	I. Public Awareness - Affected Public	21
	J. Public Awareness - Emergency Officials	21
	K. Public Awareness - Local Public Officials	22
	L. Public Awareness – Excavators	22
	M. Increase Reporting of Unsafe Excavation	23
	N. Damage Prevention Policy Activities	24
	O. Prevention & Improvements – Fiber Optics	25
	P. Gold Shovel Standard Program	26
	Q. Excess Flow Valve or Curb Valve Installation	26
	R. Pipeline Patrol and Pipeline Markers	27
	S. Company Excavator Training	27
	T. Warning Mesh	28

U. Ticket Risk Assessment and Evaluating City Permit Data 28
V. Enhance Ticket Management Software 29
W. Leverage Data Gathered by Locating Equipment 29
X. Pipeline Monitoring Technologies 30
IV. 2022-2024 CONTROL & MITIGATION PLAN 30
A. Changes to 2020 Controls 33
B. 2022 – 2024 Mitigations 33
1. Automate Third Party Excavation Incident Reporting 33
2. Locate and Mark Photographs 34
3. Electronic Positive Response 35
4. Leverage Technology for Difficult Locates 35
5. Outreach for Latent 3rd Party Damages 36
V. ALTERNATIVES 56
A. A1: Virtual Reality Training 56
B. A2: GPS Tracking of Excavation Equipment 56

APPENDIX A: SUMMARY OF ELEMENTS OF THE RISK BOW TIE A-1
APPENDIX B: QUANTITATIVE ANALYSIS SOURCE DATA REFERENCES B-1

RISK: EXCAVATION DAMAGE (DIG-IN) ON THE GAS SYSTEM

I. INTRODUCTION

The purpose of this chapter is to present Southern California Gas Company's (SoCalGas or Company) risk control and mitigation plan for the Excavation Damage (Dig-in) on the Gas System risk. Each chapter in this Risk Assessment Mitigation Phase (RAMP) Report contains the information and analysis that meets the requirements adopted in Decision (D.) 16-08-018 and D.18-12-014 and the Settlement Agreement included therein (the Settlement Decision).[1]

SoCalGas has identified and defined RAMP risks in accordance with the process described in further detail in Chapter SCG RAMP-B of this RAMP Report. On an annual basis, SoCalGas's Enterprise Risk Management (ERM) organization facilitates the Enterprise Risk Registry (ERR) process. The ERR process influenced how risks were selected for inclusion in this 2021 RAMP Report, consistent with the Settlement Decision's directives, as discussed in Chapter SCG/SDG&E RAMP-C.

The RAMP Report's purpose is to present a current assessment of key safety risks and the proposed activities for mitigating those risks. The RAMP Report does not request funding. Any funding requests will be made in SoCalGas's General Rate Case (GRC) application. The costs presented in this 2021 RAMP Report are those costs for which SoCalGas anticipates requesting recovery in its Test Year (TY) 2024 GRC. SoCalGas's TY 2024 GRC presentation will integrate developed and updated funding requests from the 2021 RAMP Report, supported by witness testimony.[2] This 2021 RAMP Report is presented consistent with SoCalGas's GRC presentation, in that the last year of recorded data (2020) provides baseline costs and cost estimates are provided for years 2022-2024, as further discussed in Chapter SCG/SDG&E RAMP-A. This 2021 RAMP Report presents capital costs as a sum of the years 2022, 2023, and 2024 as a three-year total; operations and maintenance (O&M) costs are only presented for TY 2024 (consistent with the GRC). Costs for each activity that directly address each risk are

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[1] D.16-08-018 also adopted the requirements previously set forth in D.14-12-025. D.18-12-014 adopted the Safety Model Assessment Proceeding (S-MAP) Settlement Agreement with modifications and contains the minimum required elements to be used by the utilities for risk and mitigation analysis in the RAMP and GRC.

[2] *See* D.18-12-014 at Attachment A, A-14 ("Mitigation Strategy Presentation in the RAMP and GRC").

provided where those costs are available and within the scope of the analysis required in this RAMP Report.

Throughout this 2021 RAMP Report, activities are delineated between controls and mitigations, consistent with the definitions adopted in the Settlement Decision's Revised Lexicon. A "control" is defined as a "[c]urrently established measure that is modifying risk."[3] A "mitigation" is defined as a "[m]easure or activity proposed or in process designed to reduce the impact/consequences and/or likelihood/probability of an event."[4] Activities presented in this chapter are representative of those that are primarily scoped to address SoCalGas's High Pressure Incident risk; however, many of the activities presented herein also help mitigate other areas.

As discussed in Chapters RAMP-A and RAMP-C, SoCalGas has endeavored to calculate a Risk Spend Efficiency (RSE) for all controls and mitigations presented in this risk chapter. However, for controls and mitigations where no meaningful data or SME opinion exists to calculate the RSE, SoCalGas has included an explanation why no RSE can be provided, in accordance with California Public Utilities Commission (CPUC or Commission) Safety Policy Division (SPD) staff guidance.[5] Activities with no RSE value presented in this 2021 RAMP Report are identified in Section V below.

SoCalGas has also included a qualitative narrative discussion of certain risk mitigation activities that would otherwise fall outside of the RAMP Report's requirements, to aid the California Public Utilities Commission (CPUC or Commission) and stakeholders in developing a more complete understanding of the breadth and quality of the Company's mitigation activities. These distinctions are discussed in the applicable control and mitigation narratives in Section(s) III and/or IV.

A. Risk Overview

SoCalGas operates and manages a natural gas system of over 101,000 miles of Distribution pipe and 3,385 miles of Transmission pipe within its 24,000 square mile service

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3 *Id*. at 16.

4 *Id.* at 17.

5 *See* Safety Policy Division Staff Evaluation Report on PG&E's 2020 Risk Assessment and Mitigation Phase (RAMP) Application (A.) 20-06-012 (November 25, 2020) at 5 ("SPD recommends PG&E and all IOUs provide RSE calculations for controls and mitigations or provide an explanation for why it is not able to provide such calculations.")

territory. Pipe mileage can be further segregated into general operating pressure categories of Medium Pressure (MP) which operates at or less than 60 psig, and High Pressure (HP) which operates above 60 psig. The expansive SoCalGas piping network and service territories have a potential for dig-in related incidents. This risk highlights the consequence and likelihood of dig-in damage that causes a release of natural gas, damages property, or causes personal injury due to excavation activity.

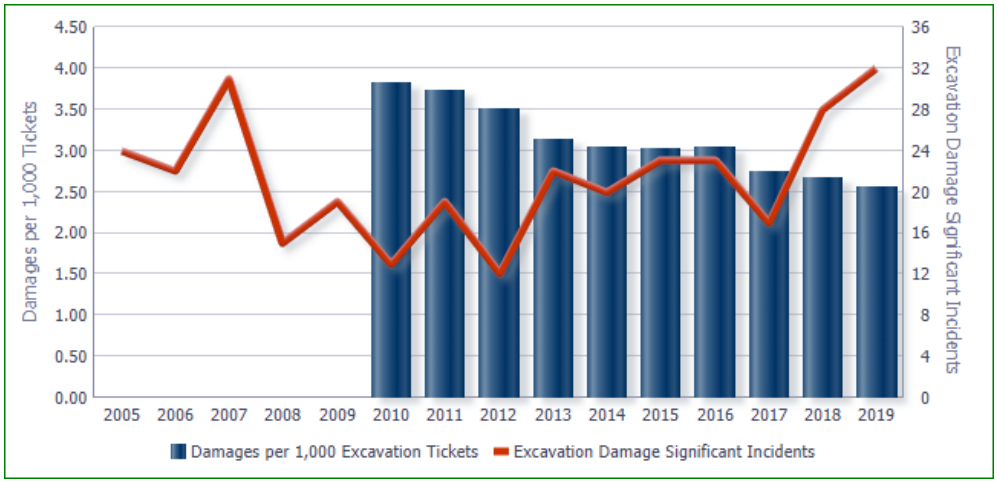
SoCalGas has been mitigating dig-in risk to its underground gas infrastructure for decades. Dig-ins are a common national problem for all utilities and industries with buried infrastructure and are not unique to SoCalGas. Excavation activities can vary widely based on project scope and size. Examples include a homeowner doing landscaping work, a plumber repairing a sewer line, or a city upgrading its aging municipal water or sewer systems. Excavation damage consequences can range from minor scratches or dents potentially leading to external corrosion, to ruptures with an uncontrolled release of natural gas. A leak or rupture may not happen immediately and can also occur after the infrastructure has sustained minor damage that has accumulated over time. Additionally, minor damages that do not result in a release of gas are often not reported by the responsible party, as required by California law. This impedes SoCalGas's ability to assess the pipe for damage and make the appropriate repairs to preserve the integrity of the pipe.

Federal and state agencies acknowledge the serious consequences of dig-in risk and have responded by adopting several regulations and industry standards and by supporting awareness efforts to help prevent dig-ins. For example, the Department of Transportation (DOT) sponsored the "Common Ground Study," completed in 1999. Subsequently, the "Common Ground Study" led to the creation of the Common Ground Alliance (CGA), a member-driven association of 1,700 individuals, organizations, and sponsors in every facet of the underground utility industry. With industry-wide support, CGA created a comprehensive consensus document that details the best practices addressing every stakeholder groups' activity in promoting safe excavation and dig-in prevention.

While these efforts are important and commendable, and the number of dig-ins per 1,000 excavation tickets has been trending down (Figure 1), the incidents continue. Excavation tickets are a common metric used throughout the industry to gauge the status of a damage prevention program. Figure 1 represents trends for dig-ins on distribution lines. Excavation data for

transmission incidents are less frequent and harder to trend. Thus, the Pipeline and Hazardous Materials Safety Administration (PHMSA) collects ticket totals in annual reports for distribution facilities, but does not collect ticket information for transmission facilities.

Figure 1: Excavation Tickets & Incidents



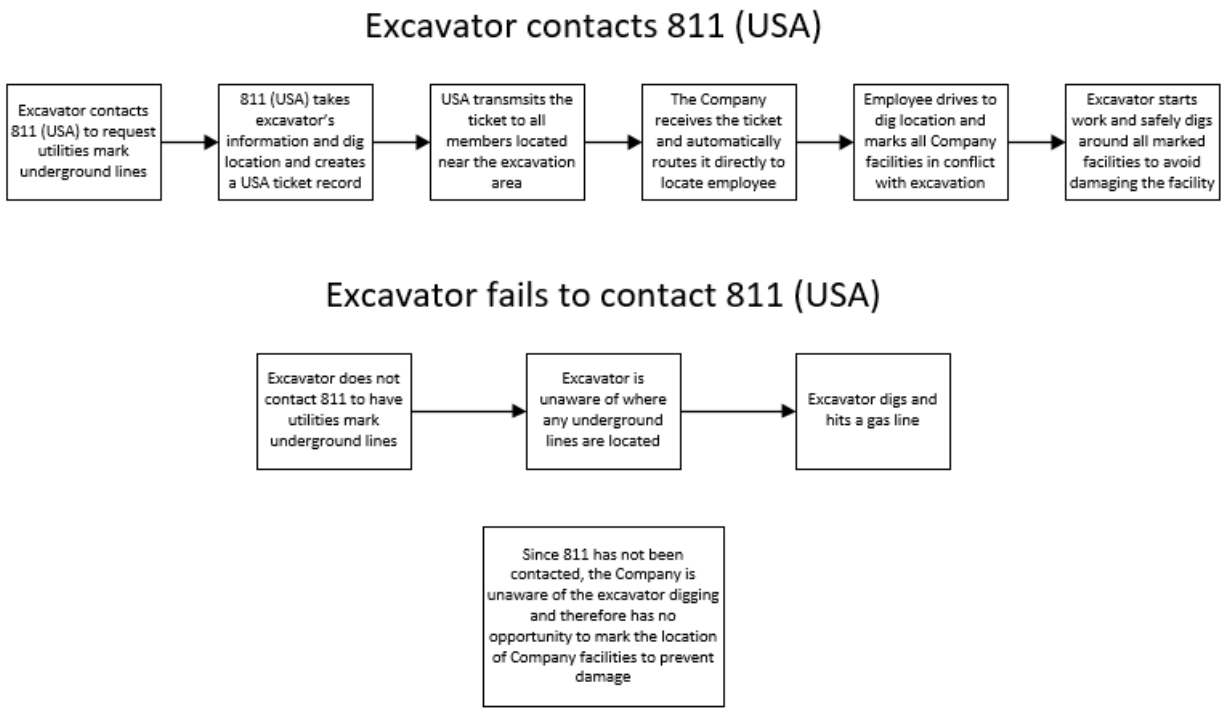
Under California State Law, an excavator planning excavation work is required to contact the Regional Notification Center for their area, also known as Eight-One-One (811) or Underground Service Alert (USA), at least two full working days prior to commencing construction excavation activities, not including the day of the notification.[6] 811 is the national phone number designated by the Federal Communications Commission (FCC) that connects homeowners or contractors who plan to dig with professionals through a local call center. California has two Regional Notification Centers, DigAlert and USA North, that split California at the Los Angeles/Kern County and Santa Barbara/San Luis Obispo County lines; USA North serves all counties north of the county lines and DigAlert serves all counties south of the county lines. DigAlert and USA North will be referenced as 811 USA for the remainder of this chapter. Once an excavator makes contact, the Regional Notification Center will issue a USA Ticket notifying local utilities and other operators of the location and areas to be inspected for potential conflicts of underground infrastructure with the pending planned excavation work. Operators are then required to provide a positive response to indicate that there are no facilities in conflict or to mark their underground facilities via aboveground identifiers (*e.g.* paint, chalk, flags, whiskers) to designate where underground utilities are positioned, thus enabling excavators, like

[6] Cal. Gov. Code § 4216.2(b).

contractors and homeowners, to know where substructures are located. The law also requires excavators to use careful, manual (hand digging) methods to expose substructures prior to using mechanical excavation tools.[7]

Figure 2 below illustrates the sequence of events that may occur when an excavator contacts 811 USA prior to conducting excavation work and, in contrast, the sequence that may occur when they do not.

Figure 2: Excavation Contact Process Flow



As can be seen in the figure above, while there may be more steps when an excavator calls 811 USA prior to commencing excavation work, it is more likely to result in a positive outcome compared to when a call is not made. When excavators call 811 USA before excavating, the risk of a dig-in is significantly reduced.

SoCalGas managed over 938,000 811 USA tickets and reported over 2,800 dig-in excavation damage incidents in 2020. Analysis of the data collected during routine damage investigations indicate that about 58% were due to a lack of notification to 811 USA for a locate

[7] Cal. Gov. Code § 4216.4(a)(1).

and mark ticket and another 26% were due to inadequate excavation practices even after the excavator called 811 USA and underground facilities were marked.

In addition to direct involvement with excavators and 811 USA, SoCalGas engages in promoting safe digging practices through its Public Awareness Program and corporate safety messaging through stakeholder outreach. The message is presented by way of multi-formatted educational materials through mail, email, social media, television, radio, events, and association sponsorships.

B. Risk Definition

For purposes of this RAMP Application, SoCalGas's Dig-in risk is defined as excavation damage on the gas system regardless of the party (1st, 2nd, 3rd) which results in significant consequences including serious injuries and/or fatalities.

Excavation Damage (Dig-In) on the Gas System has evolved from Dig-in on the Distribution System & Dig-in on the Transmission System in the 2020 ERR. In the 2019 RAMP the risk was referred to as "Third Party Dig-in Medium Pressure" and "Third Party Dig-in High Pressure." For this RAMP Application the definition of Excavation Damage (Dig-In) On the Gas System has been expanded to include all aspects and parties involved with excavation damage. The gas system is considered gas pipelines upstream of the gas meter for both medium and high-pressure systems.

C. Scope

Table 1 below provides what is considered in and out of scope for the Dig-in risk in this RAMP Application.

Table 1: Risk Scope

In-Scope:	Excavation damage on the gas system, which includes both medium and high-pressure pipelines upstream of the gas meter, regardless of the party (1st, 2nd, 3rd) that results in significant consequences including serious injuries and/or fatalities.
Data Quantification Sources:	SoCalGas engaged internal data sources for the calculation surrounding risk reduction; however, if data was insufficient, industry or national data was supplemented and adjusted to fit the risk profile associated with the operating locations and perimeter of the utilities. For example, certain types of incident events have not occurred within the SoCalGas and SDG&E territory; therefore, expanding the quantitative needs to encompass industry data where said incident(s) have been recorded can provide a proximate incident and is appropriate for establishing a baseline of risk and risk addressed by activities.

	See Appendix B for additional information.

II. RISK ASSESSMENT

In accordance with the Settlement Decision,[8] this section describes the risk bow tie, possible drivers, potential consequences, and the risk score for the Dig-in risk.

D. Risk Bow Tie and Risk Event Associated with the Risk

The risk bow tie is a commonly used tool for risk analysis, and the Settlement Decision[9] instructs the utility to include a Risk Bow Tie illustration for each risk included in RAMP. As illustrated below in Figure 3, the risk event (center of the Risk Bow Tie) is Excavation Damage (Dig-In) On The Gas System, the left side of the Risk Bow Tie illustrates drivers/triggers that lead to the Excavation Damage, and the right side shows the potential consequences of the Excavation Damage. SoCalGas applied this framework to identify and summarize the information provided in Figure 3. A mapping of each mitigation to the element(s) of the risk bow tie addressed is provided in Appendix A.

[8] D.18-12-014 at 33 and Attachment A, A-11 ("Bow Tie").

[9] *Id.* at Attachment A, A-11 ("Bow Tie").

Figure 3: Risk Bow Tie -
Excavation Damage (Dig-In) Medium Pressure

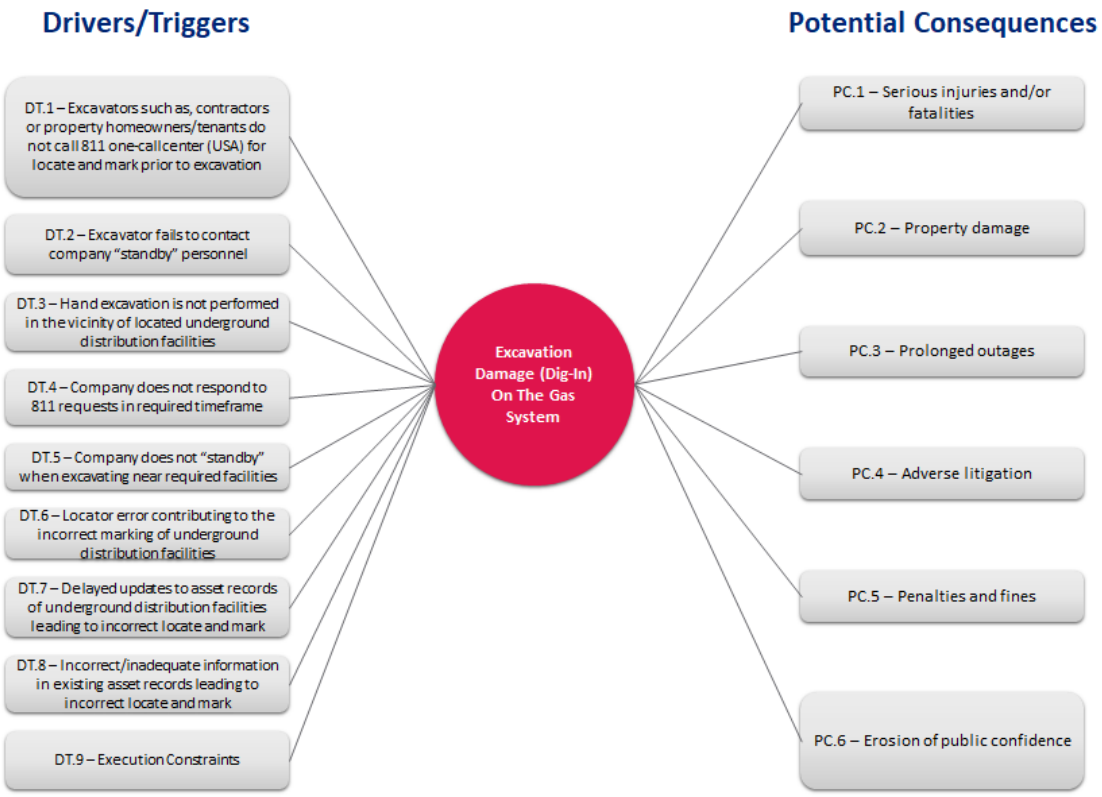
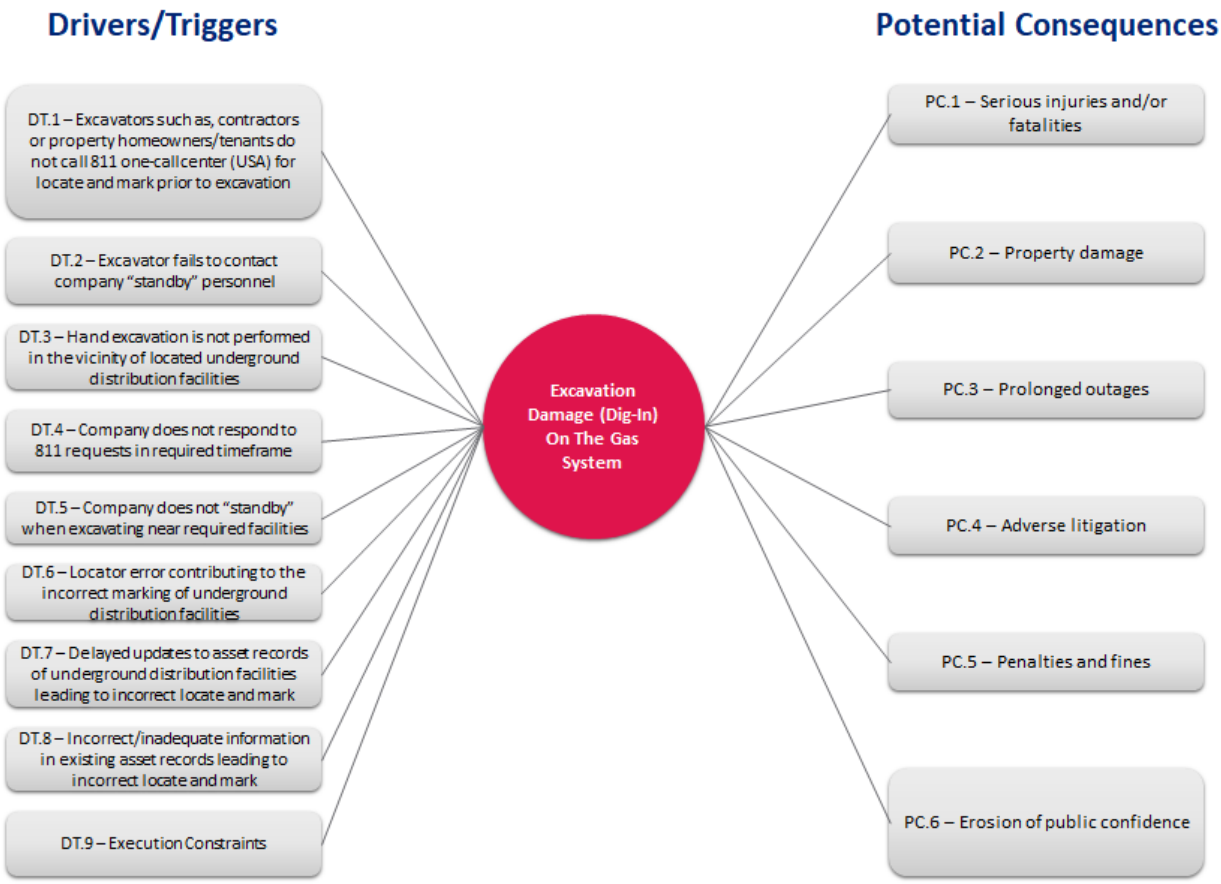


Figure 4: Risk Bow Tie -
Excavation Damage (Dig-In) High Pressure



E. Cross-Functional Factors

The following CFFs have programs and/or projects that affect this risk chapter: Workforce Planning / Quality Workforce, Emergency Preparedness and Response and Pandemic, Foundational Technology Systems, and Safety Management Systems. As an example, the training of SoCalGas emergency response personnel and activation of SoCalGas's emergency operations control center, as discussed in the Emergency Preparedness and Response and Pandemic CFF, address some of the potential consequences of this risk. The narratives for the referenced CFFs provide additional information.

F. Potential Drivers/Triggers[10]

The Settlement Decision[11] instructs the utility to identify which element(s) of the associated risk bow tie each mitigation addresses. When performing the risk assessment for dig-in on the system, SoCalGas identified potential leading indicators, referred to as drivers or triggers. These include, but are not limited to:

- **DT.1 –** Excavators such as contractors or property homeowners/tenants do not follow 811 One-Call Dig-Safe law requirements (USA) for locate and mark prior to excavation: Despite the creation of Regional Notification Centers to inform and allow excavators to have underground infrastructure located and marked, and advertising campaigns alerting the excavator of the need to do so, incidents still occur where excavations are conducted without notifying 811 USA. In fact, third party failure to contact the Regional Notification Center prior to excavating is the leading contributor of damages to Company pipelines. Third parties can damage or rupture underground pipelines and potentially cause property damage, injuries, or even death if gas lines are not properly marked before excavation activities begin. Without receiving an 811 USA ticket, the Company has no opportunity to mark its facility within the area of excavation.
- Furthermore, even when an 811 USA ticket is requested, excavators who are not knowledgeable about the details of the Dig-Safe law may still damage underground facilities by performing some of the following practices:

[10] An indication that a risk could occur. It does not reflect actual or threatened conditions.

[11] D.18-12-014 at Attachment A, A-11 ("Bow Tie").

- Excavating prior to the valid start date/time;
- Excavating after a valid ticket has expired;
- Excavating under another excavator's USA ticket;
- Improper job delineation and/or excavating beyond delineation marks.

- **DT.2 –** Excavator fails to contact company "standby" personnel: An excavator may fail to contact the utility's "standby" personnel for the prevention of damage to high pressure gas pipelines and other facilities when required, prior to excavating within 24 inches of a high-pressure gas pipeline. This would increase the risk and likelihood that the excavator damages a high-pressure pipeline or other facility.
- **DT.3 –** Hand excavation and other required excavation practices are not performed in the vicinity of located underground facilities: Before using any power-operated excavation equipment or boring equipment, the excavator is required to hand expose, using "Hand Tools,"[12] to verify the exact location and that no conflicts exist within 24 inches of either side of the gas pipeline. Excavators put themselves and others at risk for injury when they do not exercise caution when digging near natural gas pipelines. However, even when proper hand excavation is performed damages can still occur if an excavator fails to continue with unsafe excavation practices such as:
  - Maintaining proper clearance from the underground facilities;
  - Allowing the above ground locating marks to become faded or lost, rendering them ineffective;
  - Failure to provide adequate shoring, protection or support facilities;
  - Utilizing improper backfill procedures.
- **DT. 4 –** Company does not respond to 811 requests in required timeframe: The Company may fail to respond to 811 USA requests within the "legal excavation start date and time" [13] (within two working days of notification, excluding

[12] Cal. Govt. Code § 4216(i).

[13] *Id.* at § 4216(u)(l).

weekends and state holidays, not including the date of notification, or before the start of the excavation work, whichever is later, or at a time mutually agreeable to the operator and the excavator). This may happen because of human error, poor communication, or ticket reporting system failures. In these cases, the excavator may not know that the locate and mark activity was not performed and may wrongly assume that not seeing any marking at the excavation site indicates there is no gas infrastructure nearby. Without marking underground gas infrastructure, excavators may cause unintended damage.

- **DT.5 –** Company does not "standby" when requested near required facilities: High Pressure pipelines (those that operate over 60 psig) and pipelines near required facilities pose a higher risk of hazard to life and property when damaged and additional precautions are not taken by the Company to observe excavation activities in the vicinity of these facilities. Qualified Company personnel are required to be present during excavation activities within 10 feet of any high-pressure gas line (commonly referred to as "stand-by"). The stand-by employee is onsite to monitor and communicate with the excavator so safe excavation activities are followed (*e.g.*, hand-excavating near the pipeline).
- **DT.6 –** Locator error contributing to the incorrect marking of underground facilities: The Company, in some cases, inaccurately marks facilities due to incorrect operations, such as mapping/data inaccuracies, equipment signal interference, and human error. When this happens, third parties are not provided with accurate knowledge of underground pipelines in the vicinity of excavations and the risk of damaging or rupturing gas pipelines increases.
- **DT. 7** – Delayed updates to asset records of underground facilities leading to incorrect locate and mark: The Company could be delayed in updating permanent mapping records. This could result in underground infrastructure being incorrectly marked, which could lead to excavation damage. In addition, inaccurate mapping data could delay repairs if a pipeline is damaged.
- **DT. 8** – Incorrect/inadequate information in existing asset records leading to incorrect locate and mark: The use of inaccurate or incomplete information in

asset records could result in underground infrastructure being incorrectly marked, which could lead to excavation damage.

- **DT.9** - Execution Constraints: Events (excluding those from outside force damages) that impact the Company's ability to perform as anticipated. Examples include, but are not limited to: Materials and operational oversight, delays in response and awareness, resource constraints, and/or inefficiencies and reallocation of (human and material) resources, unexpected maintenance, or regulatory requirements.

G. Potential Consequences of Risk Event

Potential Consequences[14] are listed to the right side of the risk bow tie illustration provided above. If one or more of the drivers/triggers listed above were to result in an incident, the potential consequences, in a reasonable worst-case scenario, could include:

- PC. 1 - Serious injuries[15] and/or fatalities;
- PC. 2 - Property damage;
- PC. 3 - Prolonged outages;
- PC. 4 - Adverse litigation;
- PC. 5 - Penalties and fines; and
- PC. 6 - Erosion of public confidence.

These potential consequences were used in the scoring of Dig-In on the System that occurred during the development of SoCalGas's 2020 Enterprise Risk Registry.

H. Risk Score

The Settlement Decision requires a pre- and post-mitigation risk calculation.[16] Chapter SCG/SDG&E RAMP-C of this RAMP Application explains the Risk Quantitative Framework

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[14] D.18-12-014 at 16 and Attachment A, A-8 ("Identification of Potential Consequences of Risk Event").

[15] As defined by Cal/OSHA as "any injury or illness occurring in a place of employment or in connection with any employment which requires inpatient hospitalization for a period in excess of 24 hours for other than medical observation or in which an employee suffers a loss of any member of the body or suffers any serious degree of permanent disfigurement, but does not include any injury or illness or death caused by the commission of a Penal Code violation, except the violation of Section 385 of the Penal Code, or an accident on a public street or highway." *See* 8 CCR § 330(h).

[16] D.18-12-014 at Attachment A, A-11 ("Calculation of Risk").

which underlies this chapter, including how the Pre-Mitigation Risk Score, Likelihood of Risk Event (LoRE), and Consequence of Risk Event (CoRE) are calculated.

Table 2: Pre-Mitigation Analysis Risk Quantification Scores[17]

	LoRE	CoRE	Risk Score
Dig-In on the High-Pressure System	0.70	3,114	2,180

	LoRE	CoRE	Risk Score
Dig-In on the Medium Pressure System	2,914.10	0.5	1,523

Pursuant to Step 2A of the Settlement Decision, the utility is instructed to use actual results, and available and appropriate data (*e.g.,* Pipeline and Hazardous Materials Safety Administration data).[18] Historical PHMSA data, internal damage database and emergency incident reporting were used to estimate the frequency of incidents.

III. 2020 CONTROLS

This section "[d]escribe[s] the controls or mitigations currently in place" as required by the Settlement Decision.[19] The activities in this section were in place as of December 31, 2020. Controls that will continue are addressed in Section IV.

As stated above, the excavation damage on the gas system is the risk of damage caused by an excavation event, which could result in serious injuries and/or fatalities. The risk control and mitigation plan includes both controls that are expected to continue and projected mitigations for the period of SoCalGas's TY 2024 GRC cycle. The controls are those activities that were in place as of 2021, most of which are compliance driven and have been implemented over decades. These activities focus mainly on the essentials of damage prevention, including excavator's knowledge and use of the 811 one-call services and safe excavation practices, and the

[17] The term "pre-mitigation analysis," in the language of the S-MAP Settlement Agreement Decision (Attachment A, A-12 ("Determination of Pre-Mitigation LoRE by Tranche," "Determination of Pre-Mitigation CoRE," "Measurement of Pre-Mitigation Risk Score")), refers to required pre-activity analysis conducted prior to implementing control or mitigation activity.

[18] *Id.* at Attachment A, A-8 ("Identification of Potential Consequences of Risk Event").

[19] S-MAP Settlement Agreement Decision at 33.

operator's responsibility to communicate the location of underground facilities through activities such as 811 one-call ticket responses and locate and mark activities.

A. Locate and Mark Training

- **C1: MP; C2: HP**

Locate and mark training provides employees who perform locating tasks with the necessary knowledge and operator qualification to locate and mark underground gas facilities. At SoCalGas, in response to an 811-excavation request, the Energy Technician Distribution (ETD) and Lead Construction Technician (LCT) functions have the responsibility to locate and mark Distribution Operations gas facilities and the Pipeline Technician, Pipeline Specialist and Welding Specialist have the responsibility to perform the Locate and Mark duties for Transmission Operations facilities. Gas Operations Training and Development provides each trainee with the initial locate and mark training upon being newly assigned to a position. Overall, training is approximately an eight-week course with hands-on locate and mark training comprising approximately one week. The employees are not certified to locate or mark gas facilities until they have successfully completed initial training and passed locate and mark operator qualification tasks. In 2020, SoCalGas's Gas Operations Training and Development provided locate and mark training to approximately 125 employees. It is necessary to have a trained workforce to accurately locate and mark gas infrastructure and provide the necessary information to third-party excavators for safe excavation. Marked facilities provide the excavator with approximate pipeline locations within the delineated work area. Awareness of underground gas facilities allows the excavator to either avoid the areas or carefully dig with hand tools to prevent damage while excavating. Since a vast majority of SoCalGas's assets are buried below ground, it is imperative that proper action is taken to reduce the risk of accidental damage to these facilities by accurately communicating the locations to the excavators. Without a highly skilled and trained locate and mark workforce, excavators would have little knowledge and confidence of pipeline locations which could lead to third party excavation damage. By improving knowledge and competency through training, locate and mark accuracy will increase, and the number of mismarks and third-party damages should reduce. Additionally, this training reinforces the requirements to accurately locate our pipelines, the importance of two-way communication with an excavator, the completeness and thoroughness of documentation, and the timeliness of locate and mark ticket completion.

B. Locate and Mark Activities

- **C3: MP; C4: HP**

The purpose of the Locate and Mark Activities is to prevent damage to gas infrastructure caused by excavators. Three primary locate and mark activities are listed below:

(1) locating and marking underground gas facilities before excavation occurs;

(2) observing (stand-by) pipeline excavation activities; and

(3) providing staff support for compliance and improvement.

The first of these activities, locating and marking, refers to the physical act of locating and marking of underground facilities. In 2020, SoCalGas responded to over 930,000 locate and mark ticket requests. By providing a visual indication of the location of underground facilities, the excavator has the necessary information to excavate safely.

The second locate and mark activity is pipeline observation, or "stand-by", which is a critical activity that requires a qualified Company representative to be present anytime excavation activities take place near high priority pipelines. The purpose for this activity is to decrease the likelihood of a damage occurring by having a dedicated employee present to maintain the integrity of the pipeline.

The third activity is providing daily damage prevention staff support to operations by interpreting policies, tracking compliance, evaluating tools, equipment and new technologies, providing refresher training, and tracking and trending locate and mark data to proactively identify areas for improvement. This is a critical risk reduction activity that directly supports the field locator personnel in their daily activities and leads to more accurate and timely responses to locate and mark tickets and reduction in damages. This collection of Locate and Mark Activities ultimately provides the excavator with the necessary information to avoid hitting or damaging gas facilities.

C. Locate and Mark Annual Refresher Training and Competency Program

- **C5: MP; C6: HP**

All company personnel performing Locate and Mark Activities must complete an annual re-training and refresh program. This program consists of local supervisors reviewing SoCalGas Gas Standards with the locate and mark workforce. Employees are required to pass the refresher training in order to continue Locate and Mark Activities. This refresher training involves all aspects of the Locate and Mark procedures to allow personnel to be able to successfully receive

an 811 USA ticket and provide a proper positive response. Similar to the Locate and Mark training mentioned above, interactive electronic learning course modules are being developed for this refresher training with the addition of other training methods such as on-the-job training and mentoring. This is a mandated activity in order to comply with regulations and code requirements and to provide employees with the basic knowledge to satisfactorily perform this critical task.

D. Locate and Mark Operator Qualification

- **C7: MP; C8: HP**

Locate and Mark Operator Qualification (OQ) training requires employees to field-demonstrate their knowledge and competency to perform locate and mark tasks. This includes activities such as obtaining proper locating signals, interpreting the signals by placing accurate and proper markings on the ground to indicate the location of the pipe. This OQ training is in addition to Locate and Mark Training (C1), is required for employees every three years, and is administered by the Gas System Integrity - Operator Qualification department at SoCalGas. In 2020, there were approximately 215 employees at SoCalGas who participated in OQ training. OQ training is mandated by PHMSA.[20]

Maintaining resources that are trained and Operator Qualified to perform Locate and Mark functions promotes procedural knowledge and competency to perform the tasks. A prepared and qualified workforce allows SoCalGas to meet its regulatory requirements, the demands of the excavator community, and helps provide for a safe excavation environment.

E. Locate and Mark Quality Assurance

- **C9: MP; C10: HP**

The purpose of the Locate and Mark Quality Assurance (QA) Program is to validate that locators are following processes and procedures when performing locating tasks. The QA evaluators document each ticket assessment and identify opportunities for improvement. SoCalGas's Safety Assurance, Quality, and Risk department administers the QA program and visits every operating district at least once per year. During these visits, they select a prescribed number of 811 USA tickets for each Locator, check the employees' Operator Qualification status and evaluate the documentation on the ticket. Additionally, they will perform field visits, when

[20] 49 CFR §§ 192.801 - 192.809.

possible, to evaluate in-field activities such as equipment setup and use, Company Gas Standard compliance, accuracy of locate and markings, proper documentation, and proper use of the Korterra ticket management system, among other activities. Feedback on a quality assurance audit is provided to each local supervisor who is responsible for following-up with employees and providing coaching or refresher training.

The Locate and Mark QA Program provides a variety of benefits to reduce the number of and potential for damage to gas infrastructure by a third party. By evaluating Locate and Mark Activities that have been completed or are being performed, SoCalGas can address gaps in performance with additional training, or updating Company documentation or recording Company assets. Locator errors can result in a mismark, or a ticket not completed within the required timeframe. Additionally, the QA review can highlight errors in the timely and/or accurate documentation of utility assets. Adherence to proper Company policy and procedures reduces the percentage of Locate and Mark mismarks, increases the overall awareness of unsafe activity, and expedites response times.

F. Damage Prevention Analysts

- **C11: MP; C12: HP**

The Damage Prevention Analyst Program works to reduce the number of third-party damages to gas facilities by identifying at risk excavating contractors and educating them on proper one-call and safe digging techniques. The Damage Prevention Analyst Program strives to reduce the number of third-party damages to gas facilities by identifying at-risk excavating contractors through data analysis. The benefit of the damage prevention analyst is threefold. First, it enables SoCalGas to stop a job before an incident occurs if no underground markings are present or the excavator is not practicing safe digging techniques. Second, it provides an opportunity to educate contractors on the requirements before digging or when digging around gas facilities before damage is done. This education has far-reaching benefits as the contractor will perform future projects in other districts not currently part of the program, and the education can be applied to those future projects. Third, it creates a list of contractors who might be repeat offenders and/or prevalent site characteristics to improve prioritization of future construction site inspections.

The damage prevention analysts focus on six districts (out of a total 48 districts) with the greatest number of reported incidents, by driving to and physically inspecting excavation

projects with 811 USA ticket requests. The analysts stop at other construction projects to investigate if the excavator notified USA 811 and if safe excavating techniques are followed. At times, the analysts will stop the job and provide education to the contractor about safe excavating practices and procedures. SoCalGas expects to expand this program with additional analysts and broader system-wide coverage. SoCalGas's damage prevention analysts have stopped over 470 jobs since the program's inception in 2018 and have conducted over 4,500 contractor outreach and educational opportunities.

G. Locating Equipment

- **C13: MP; C14: HP**

This control involves providing hardware that is appropriate for the rugged outdoor environment that is updated with the latest software to run efficiently and provide correct information to accurately locate underground pipelines. Laptops with the applicable software are deployed across SoCalGas's territory. SoCalGas has a vast service territory that covers 24,000 square miles in diverse terrain throughout Central and Southern California, from Visalia to the Mexican border. The service territory covers 12 counties, and 220 incorporated cities in more than 500 communities. SoCalGas provides the locate and mark workforce with the tools and information needed to accurately locate and mark underground gas infrastructure, as mandated by Title 49 Code of Federal Regulation, section 192.614, and California Government Code, section 4216.

Employees who perform Locate and Mark Activities rely on laptops, 811 USA tickets, asset mapping, records data, software, and locating equipment. Using laptops in an outdoor setting, and often in construction areas, can reduce life expectancy due to the harsh environment. Therefore, employees have laptops that are designed to withstand a harsh environment. Additionally, as software and data are updated and become more sophisticated with new and more powerful features, new laptops with advanced capabilities are required to process the information. Approximately 350 laptops are replaced every five years.

Updated and ruggedized laptops provide a longer battery life and can process software faster and more efficiently. Updated hardware and software increase the effectiveness of performing Locate and Mark Activities. The ruggedized laptops can also take pictures of the area near the excavation site to update and improve asset mapping information. New laptops provide enhanced features to reduce locator errors and reduce pipeline damage.

The purpose of the Locating Equipment Program is to utilize technology to standardize locating tools to accurately locate and mark underground gas infrastructure. The Locating Equipment program will provide employees with standardized locating devices. Employee locating equipment will be replaced as new technology becomes available. Reducing the potential for damage to underground facilities that is caused by excavation activities requires correct facility markings. Excavators use these markings to know when hand-digging and other safe digging practices should be followed. Finally, providing employees standardized equipment allows for consistent training and use of the equipment to improve locate accuracy.

H. Public Awareness

- **C15: MP; C16: HP**

For the purposes of an RSE analysis, SoCalGas separated Public Awareness into four tranches. Each of the four tranches reduces the likelihood of third-party damage differently according to the RSEs.

It is important for contractors and excavators to be informed of the potential safety issues that might arise when working around natural gas pipelines. Underground pipelines can be located anywhere, including under streets, sidewalks and private property – sometimes just inches below the surface. Hitting one of these pipelines while digging, planting or doing demolition work can cause serious injury, property damage, and loss of utility service.

Title 49 Code of Federal Regulation, section 192.616 requires utilities/natural gas providers to include efforts to educate the public, appropriate government organizations, and persons engaged in excavation related activities. The four types of groups identified in section 192.616[21] are the affected public, emergency officials, local public officials, and excavators. The SCG-2-C8 – Public Awareness mitigation has been tranched to match the four groups identified in section 192.616.

[21] 49 CFR § 192.616 (emphasis added):
(d) The operator's program must specifically include provisions to educate the public, appropriate government organizations, and persons engaged in excavation related activities on:

(1) Use of a one-call notification system prior to excavation and other damage prevention activities;
(2) Possible hazards associated with unintended releases from a gas pipeline facility;
(3) Physical indications that such a release may have occurred;
(4) Steps that should be taken for public safety in the event of a gas pipeline release; and
(5) Procedures for reporting such an event.

Periodically SoCalGas participates in Distribution Public Awareness Council benchmark studies to collect and compare membership data related to the effectiveness of public awareness and community safety outreach programs managed by gas utilities. There is a clear distinction between the general level of awareness between the affected public, emergency officials, local public officials, and excavators. In order to address this gap and reduce third party damage, targeted messaging campaigns are performed for each subgroup to increase overall awareness and education. Emergency officials and local public officials are often met with in person to discuss municipal third-party damage trends. The public and excavators are informed of 811 USA notification and safe digging practices using bill inserts, media campaigns, SoCalGas damage prevention analysts, radio advertising, internet advertising, billboard advertising, and safety meetings. A summary of SoCalGas's 2019 public awareness activities is shown in the table below.

Table 5: Summary of SoCalGas's 2019 Public Awareness Activities

	Mailers	**Email messages**	**Campaigns/ Presentations**	**811 Unique Page views**
Affected Public	3.1M customers and 750K live/work near high-pressure	2.9M	26	10,946
Local Public Officials	2.2K	618	0	
Excavators	170K	6K	209	
Emergency Officials	2K	33	251	

A comprehensive public awareness program works to reduce the number of gas incidents by educating the general public how to the identify and recognize a gas leak and who to notify if a leak is suspected. This allows first responders and SoCalGas to respond in a timely manner to avoid a gas incident or minimize the impact. More specifically, the Public Awareness Program works to reduce the number of potential gas incidents due to third party excavation activities. "Third parties" refers to a broader group than just excavators, it can also include "do it yourself" home and business owners. By providing information about the 811 USA process and safe digging practices to these audiences, SoCalGas can increase the number of locates performed by the gas utility and potentially reduce the number of incidents and damage to gas infrastructure.

I. Public Awareness - Affected Public

- **C15-T1: MP; C16-T1: HP**

SoCalGas continues to promote awareness of the Underground Service Alert (811, "call-before-you dig") system to the affected public by reaching out to contractors and the general public through meetings, mailers, bill inserts, hosting events, the Company website, marketing and banners at locally broadcasted events and other methods, so pipelines are properly marked and located before excavation activities. Excavation activity includes excavating, blasting, boring, tunneling, backfilling, and removing aboveground structures by both explosive or mechanical means, and other earth-moving operations.

Additionally, to promote National Safe Digging Month, SoCalGas brings a 30-foot-tall shovel to public gatherings to raise awareness about the importance of contacting 811 USA at least 72 hours prior to the start of any excavation project. For example, SoCalGas brings the giant shovel—popular for photos—to inform area residents about pipeline safety and customer assistance programs. When residents or contractors dial 811 USA before any project that involves digging, SoCalGas marks the locations of underground lines to prevent damage, which could cause injury or service outages. This outreach is performed in compliance with Title 49 Code of Federal Regulations, section 192.616(d) subsections 1-5.

J. Public Awareness - Emergency Officials

- **C15-T2: MP; C16-T2: HP**

SoCalGas has the responsibility to train its employees on emergency procedures as well as establishing a liaison with first responders in accordance with Title 49 Code of Federal Regulations, section 192.615.[22] According to GO 112-F, SoCalGas, is an "Operator," which must comply with the requirements of sections 192, 192.615, and 192.616(e). There are significant benefits to creating strategic partnerships and promoting awareness with emergency officials. Communication and coordination are improved when it matters most. SoCalGas works to implement this requirement by establishing lines of communication between SoCalGas and first responders, by learning about the responsibility and resources available to each party in the event of a gas pipeline emergency, and by educating each other on how to best respond to a gas system emergency.

[22] 49 CFR § 192.615.

Additionally, section 192.616, implemented through GO 112-F, states that SoCalGas is required to coordinate emergency exercises or drills with first responders. To commemorate "811," August 11 (or 8/11 Day) SoCalGas, The California Regional Common Ground Alliance (CARCGA), and Orange County Fire Authority (OCFA) hold a mock utility line strike to raise awareness about the importance of contacting 811 USA at least two working days (not counting the day of notification) prior to the start of any project that involves digging. The event program includes exhibiting the 811 USA process, emergency response demonstration, investigation by the Dig Safe Board, speakers from Dig Safe Board, OCFA, plus exhibitor booths. Building relationships with emergency officials is imperative in creating awareness of safe digging practices and potential consequences if excavators are not safe.

K. Public Awareness - Local Public Officials

- **C15-T3: MP; C16-T3: HP**

Working directly with city officials involved in construction activities within their jurisdictions helps to educate external personnel to not support unsafe excavation practices that could result in damage to underground facilities. This interaction can involve several efforts. First, educating city personnel on the specific requirements of the California safe excavation laws. Second, helping officials understand their role in enforcing the laws by promoting the use of 811 USA for excavation tickets through their project review and permitting activities and through field inspections their employees perform. Third, to explain the city's potential cost savings from avoiding their emergency personnel from having to respond to a blowing gas emergency due to non-compliant excavation damage. City officials can avoid unnecessary emergency response if they promote safe excavation practices during their routine daily planning and permitting work. This outreach is performed to be compliant with Title 49 Code of Federal Regulations, section 192.616(d) subsections 1-5.

L. Public Awareness – Excavators

- **C15-T4: MP; C16-T4: HP**

Excavator awareness of 811 USA is very important. Nationwide statistics from the Common Ground Alliance indicate that when a locate request is made prior to an underground

excavation, no damage will occur 99% of the time.[23] It is important for contractors and excavators to be informed of the potential safety issues that might arise when working around natural gas pipelines. Underground pipelines are in various locations, including under streets, sidewalks and private property – sometimes just inches below the surface. Hitting one of these pipelines while conducting routine work such as digging, planting, or demolition work can cause serious injury, property damage, and loss of utility service. The benefits of calling 811 USA are communicated through awareness campaigns, such as, in-person excavator outreach events, targeted mailings, and the Big Shovel display. Excavator outreach is performed to be compliant with Title 49 Code of Federal Regulations, section 192.616(d) subsections 1-5.

M. Increase Reporting of Unsafe Excavation

- **C17: MP; C18: HP**

The purpose of Increased Reporting of Unsafe Excavation is to identify and report excavators who frequently utilize unsafe excavation practices and to report those contractors to the California Underground Safe Excavation Board (Dig-Safe Board) and/or State Licensing Board (CSLB). Reporting of unsafe excavation is applicable to the entire SoCalGas territory.

SoCalGas has increased reporting of unsafe excavation by consolidating and formalizing internal procedures for identifying and reporting excavators who frequently utilize unsafe excavation practices and to report those contractors to the Dig-Safe Board and/or (CSLB). This includes consolidating the efforts of the Damage Prevention Strategies Team with the Claims Recovery Team. Both internal groups engage in various degrees of excavator education and outreach efforts on safe digging practices. The consolidation of efforts includes a consistent methodology for identifying targeted excavators. Education and outreach efforts provide the excavators understanding of the implications of unsafe excavation practices. SoCalGas has stopped over 470 jobs and conducted over 4,500 outreach and educational opportunities.

By combining the outreach information, this program provides a more comprehensive and holistic effort to achieve the benefits of reducing third-party damage. First, it provides the names of unsafe excavators to the appropriate state boards to support the state's objectives. Second, it provides an opportunity for excavators to be educated and informed on their

[23] Common Ground Alliance, *Common Ground Alliance's 2014 DIRT Report Confirms Importance of Calling 811 Before Digging for Fifth Consecutive Year* (August 11, 2015), *available at* *https://commongroundalliance.com/sites/default/files/press_release_pdfs/2014%20DIRT%20Report%20Press%20Release%20FINAL.pdf* .

obligations, such as the contractor's requirement to call prior to any excavation activity and to perform hand excavation in the vicinity of gas pipelines. The outreach to the excavator and contractor community should reduce the number of excavation activities without location marks and reduce the number incidents on our pipelines.

The costs for these activities are not planned to be incorporated into the next GRC; therefore, these activities are not part of the risk mitigation plan.

N. Damage Prevention Policy Activities

- **C19: MP; C20: HP**

SoCalGas aims to secure greater education, compliance, and enforcement of safe excavation practices through legislation and work with other organizations. SoCalGas actively participates in the Dig-Safe Board to provide input and education from the natural gas utility perspective. Similarly, the purpose of remaining active members of the California Regional Common Ground Alliance (CARGA) is to work with all members of the excavation community in achieving the Dig-Safe Board's objectives of providing education and outreach, developing safe excavation practices, investigating violations, and supporting the Dig-Safe Board's authority. Securing greater enforcement through legislation and working with the California State Digging Board is applicable to all third-party excavations.

The purpose of this participation is to work with all members of the excavation community in achieving the Dig-Safe Board's objectives of providing education and outreach, developing safe excavation practices, investigating violations, and supporting the Dig-Safe Board's authority.

Through involvement in board meetings and workshops and collaborating to achieve common objectives related to damage prevention, SoCalGas fosters a positive and stronger working relationship with all stakeholders. By playing an active role in developing, educating and enforcing utility and contractor requirements, a collaborative and holistic environment can be achieved among all stakeholders. The Dig-Safe Board provides a forum so that effective safe excavation requirements can be cooperatively developed and disseminated to reduce third party damage.

SoCalGas is an active member of both Dig Alert and USA North. Dig Alert's territory includes nine Southern California Counties: Imperial, Inyo, Los Angeles, Orange, San Bernardino, San Diego, Santa Barbara, Riverside, and Ventura. USA North covers fifty

Northern California Counties. SoCalGas is mandated by Title 49 Code of Federal Regulation, section 192.614, and California Government Code, section 4216, to remain an active member of the California One-Call Centers.

The California 811 USA One-Call Centers serve as the communication conduit between SoCalGas and excavators to support safe digging practices. Excavators contact the 811 USA one-call centers with their intent to excavate in a specific location. This information is made available to the owners and operators of underground infrastructure to provide pipeline location information before excavation occurs. SoCalGas is an active member of local one-call centers. In calendar year 2019, SoCalGas responded to over 960,000 locate and mark requests on the system through the local one-call centers.

As a member of the 811 USA one-call centers, SoCalGas actively works with other industry stakeholders toward simplifying the process, improving its accessibility, and educating safe digging practices. The California one-call centers play a critical role in safe excavation practices and reducing the number of third-party damages. The call centers provide a single source for all excavators to contact as well as a source for utilities, simplifying the communication process between contractors and the various utilities, many of which are not known by the contractors. The one-call process also allows this communication process to take place before digging occurs, so that utilities can correctly locate and mark their facilities in the required timeframe. Excavating after pipeline marks are provided, allows the contractors to practice safe digging techniques, minimizing the potential of hitting or damaging gas pipelines.

O. Prevention & Improvements – Fiber Optics

- **C21: HP**

The fiber optic technology installed on high pressure pipelines serves as an early warning system to detect unauthorized construction work or other hazardous encroachments or external forces that could damage the pipeline. It also serves to monitor changes in pipeline trench that could indicate a leak, rupture, or pipeline movement. This program is applicable to high pressure Company facilities, and currently limited to new transmission pipeline projects with an outer diameter of 12” or greater, over one-mile in continuous length, and operating at over 20% of its specified minimum yield strength.

In 2017, SoCalGas initiated a program to install fiber optic monitoring systems designed to allow real-time monitoring of the condition of high-pressure pipelines included in the

program. The technology uses fiber optic cables, that are installed and run above and parallel to the pipeline, to detect stresses imposed on the pipeline that could have the potential to cause damage. The fiber optic cable detects changes in the pipeline trench which are analyzed by a remote monitoring station, in real time, and SoCalGas operators can interpret the data to determine potential stresses. The initial installation was along a seven-mile section of high-pressure pipeline in Bakersfield, California.

The information received from the fiber optic technology gives SoCalGas the opportunity to respond quickly to potential issues with its high-pressure transmission pipelines. It can identify a potential problem within twenty feet, and with real-time information, can be critical to early detection. Examples of some of the stresses that it can detect is construction and excavation activity near and around the pipeline. Receiving this information quickly, can alert SoCalGas to inspect the area and put a stop to any excavator that does not have an 811 USA ticket or is not practicing safe-digging techniques.

P. Gold Shovel Standard Program

- **C22: MP; C23: HP**

The Gold Shovel Standard (GSS) Program utilizes an external organization that certifies contractors' policies and procedures to protect underground facilities against an established GSS. SoCalGas requires all pipeline contractors to participate in the Gold Shovel Program. All third-party damage caused by contractors working for SoCalGas poses the same safety risk.

The GSS provides positive guidance to underground contractors, aligning their excavation practices against established safe digging practices and procedures. It helps to educate contractors about industry excavation standards and identify and address gaps in their processes. SoCalGas requires contractors who perform excavation on behalf of SoCalGas to be GSS certified. GSS serves as an additional quality check for its contractors. Actively supporting the GSS Program helps to improve use of 811 USA one-call requirement and to improve safe digging techniques, such as hand-digging when near gas pipelines.

Q. Excess Flow Valve or Curb Valve Installation

- **C24: MP**

Excess Flow Valves (EFV) are designed to prevent gas escape by automatically stopping the gas flow when a medium pressure service is damaged. Curb valves are used to quickly shut down damaged medium pressure service line.

A medium pressure service line can be damaged by several driver/triggers, such as the failure to follow the 811-notification process, a mismark by the locator, or the lack of caution during excavation. When a gas service line is severely damaged, the EFV immediately stops the flow of gas eliminating the risk of prolonged gas release and migration. EFV and curb valves mitigate the consequences associated with a damaged medium pressure gas service line.

R. Pipeline Patrol and Pipeline Markers

- **C25: MP; C26: HP**

Qualified employees patrol high-pressure pipelines, assessing the area over and around the pipeline for signs of excavation or potential excavation. Part of this patrol includes establishing and maintaining pipeline markers where required. Pipeline markers provide a visual warning to outside parties that a high-pressure gas pipeline is in the vicinity and contact must be made to 811 or SoCalGas before any excavation occurs. Pipeline patrol and pipeline markers are important for preventing damage to the pipeline. During patrol, potential excavators without a USA ticket could be identified. The patrols help prevent excavators from digging without a USA ticket or without a SoCalGas standby employee onsite when required. This mitigation is a proactive measure to alert excavators who are unaware of 811 laws and rules or standby requirements.

S. Company Excavator Training

- **C27: MP; C28: HP**

A formal training program provides excavation training to employees who are required to excavate as part of their job duties. The training reinforces safe excavating procedures, so employees know how to avoid damaging company pipelines as well as other utilities' buried facilities. The training includes the use of a pneumatic clay spade around buried facilities and backhoe training. The training is comprehensive in content, covering all operational aspects for the safe use of a particular piece of equipment including the required personal protective equipment, manufacturers recommendations and instructions, as well as additional procedures, guidelines and limitations developed internally by SoCalGas. Excavation equipment training is typically performed when an employee begins a new job position, as part of the job requirements. Once trained and qualified, employees continue to develop their safe operating skills in the field under direction of senior employees and supervision. Refresher training is available to employees on an as-needed basis. Training employees to understand the applicable

excavation regulations and safe excavating techniques around pipelines will mitigate the risk of employees damaging pipelines.

T. Warning Mesh

- **C29: MP; C30: HP**

Warning mesh is a practice to help prevent excavators from the consequences of not adhering to the 811 USA excavation safety notification requirement. Approximately 60% of Company damages are caused by excavators not contacting 811 USA before excavating. Warning mesh is installed over pipelines in open trench before backfilling. This program is applicable to all SoCalGas open trench new pipeline installations or replacements.

The purpose of installing warning mesh over pipelines is to provide a visual warning to excavators to prevent damage. Warning mesh is installed over pipelines when an open-trench installation opportunity is available for new construction, repair, and replacements projects before backfilling. The warning mesh is a visual indicator that can be exposed before the excavator damages pipelines and can mitigate locate errors or unsafe excavation techniques. It reminds the excavator to exercise safe excavation techniques, it corrects inaccurate surface locate markings, and it warns the excavator that a pipeline is nearby.

U. Ticket Risk Assessment and Evaluating City Permit Data

- **C31: MP; C32**

Ticket Risk Assessment (TRA) technology uses complex modeling software to assign risk scores to every USA ticket received by the Company. The technology also provides additional identifiers on each USA ticket for fast identification of other facility properties such as flags for high pressure pipes or regulator stations intersecting the ticket's work scope. The tool also provides integration with public information such as city and county permit data, where available. This permit data is used to help determine areas with construction or building permits that may not have a USA ticket.

The TRA provides a new way to mitigate notification issues, location issues, and excavation issues that could lead to significant consequences. The higher risk tickets are visited by field employees who communicate with the excavator to assess if excavation rules are understood to prevent damage to pipelines. Field employees review and assess the USA ticket to verify it has been adequately addressed by locators and take appropriate follow up action, if required.

V. Enhance Ticket Management Software

- **C33: MP; C34: HP**

The primary focus of system improvements to the 811 USA ticket routing and monitoring is to upgrade the ticket management system to automatically provide periodic reports on the status of ticket requests, send notifications as a ticket is approaching its deadline, and capture and report data that will be used to monitor and evaluate performance per Title 49 Code of Federal Regulation section 192.614.

As part of continuous improvement, an assessment of the current state of the 811 USA one-call ticket routing and monitoring is underway. The primary focus of system improvements to the USA ticket routing and monitoring is to upgrade the ticket management system to provide increased abilities to monitor and manage locate and mark ticket requests and to evaluate and measure performance for meeting time commitments.

SoCalGas has a time requirement to fulfill locate and mark ticket requests. If time requirements are not met, contractors might excavate and could assume no visible marks means no underground facilities conflict with their project. If this occurs, contractors could hit and damage underground gas infrastructure due to the lack of surface markings. By providing enhanced capabilities to monitor and manage ticket request workload, SoCalGas will have the ability to prioritize ticket requests, assign crews, and balance workload among the locate and mark crews. Additionally, the data capture and reporting enhancements can improve SoCalGas's ability to monitor its own processes and identify process improvements. These enhancements work toward improving SoCalGas's performance in meeting the locate and mark timeframe, thereby reducing the potential of contractors digging without knowledge of underground gas infrastructure.

W. Leverage Data Gathered by Locating Equipment

- **C35: MP; C36: HP**

The purpose of leveraging data gathered by locating equipment is to utilize technology to improve how SoCalGas mapping and asset records are updated and improve the accuracy of Locate and Mark Activities. The current locating equipment has the capability of recording information from a locate site. This information could be used to assess the quality of each locate and the relative accuracy of pipe location in the Geographic Information System (GIS). This technology allows locate and mark employees to update Company records by capturing

location coordinates found in the field, which is used to validate existing company records and identify GIS or locating errors.

Correct and accurate pipeline locations reduce the potential for damage to underground facilities caused by excavation. Excavators use markings to inform when to hand expose a pipeline or utilize other safe excavation techniques. Equipment with the latest technology provides an opportunity for more accurate pipeline location and the ability to provide latitude and longitude coordinates to update GIS records. Maintaining an accurate GIS database and records are essential to improve locate and mark quality and mitigate pipeline damage.

X. Pipeline Monitoring Technologies

- **C37: HP**

The Control Center Modernization (CCM) organization will deploy new field pipeline monitoring technologies along existing high consequence area and evacuation challenged areas as well as along new and replaced transmission pipelines. These field monitoring assets (*i.e.*, fiber, methane) will allow Gas Control to better monitor pipelines to more quickly identify and respond to abnormal operating or emergency conditions resulting from a dig-in incident.

These new field pipeline technologies will provide multiple safety and reliability benefits, including, but not limited to:

- Faster response times to incidents and the reduction of severity of incidents due to the ability to monitor and respond to unfolding incidents in real time.
- A centralized and modernized technology will increase operational efficiency and improve the speed and ability to manage incidents which will directly translate to improvement in public and employee safety.

IV. 2022-2024 CONTROL & MITIGATION PLAN

This section contains a table identifying the controls and mitigations comprising the portfolio of mitigations for this risk.[24]

As reflected in Table 6 below, all of the activities discussed in Section III above are expected to continue during the TY 2024 GRC. For clarity, a current activity that is included in the Plan may be referred to as either a control and/or a mitigation. For purposes of this RAMP, a control that will continue as a mitigation will retain its control ID unless the size and/or scope of

[24] *See* D.18-12-014, Attachment A at A-14 ("Mitigation Strategy Presentation in the RAMP and GRC").

that activity will be modified, in which case that activity's control ID will be replaced with a mitigation ID. The table below shows which activities are expected to continue.

Table 6: Control and Mitigation Plan Summary

Line No.	Control/ Mitigation ID	Control/Mitigation Description	2020 Controls	2022-2024 Plan
1	C1	Locate & Mark Training (MP)	X	X
2	C2	Locate & Mark Training (HP)	X	X
3	C3	Locate & Mark Activities (MP)	X	X
4	C4	Locate & Mark Activities (HP)	X	X
5	C5	Locate and Mark Annual Refresher Training and Competency Program (MP)	X	X
6	C6	Locate and Mark Annual Refresher Training and Competency Program (HP)	X	X
7	C7	Locate and Mark Operator Qualification (MP)	X	X
8	C8	Locate and Mark Operator Qualification (HP)	X	X
9	C9	Locate and Mark Quality Assurance Program (MP)	X	X
10	C10	Locate and Mark Quality Assurance Program (HP)	X	X
11	C11	Damage Prevention Analyst Program (MP)	X	X
12	C12	Damage Prevention Analyst Program (HP)	X	X
13	C13	Locating Equipment (MP)	X	X
14	C14	Locating Equipment (HP)	X	X
15	C15 – T1	Public Awareness Compliance - The Affected Public (MP)	X	X
16	C16 – T1	Public Awareness Compliance - The Affected Public (HP)	X	X
17	C15 – T2	Public Awareness Compliance - Emergency Officials (MP)	X	X
18	C16 – T2	Public Awareness Compliance - Emergency Officials (HP)	X	X
19	C15 – T3	Public Awareness Compliance - Local Public Officials (MP)	X	X

Line No.	Control/ Mitigation ID	Control/Mitigation Description	2020 Controls	2022-2024 Plan
20	C16 – T3	Public Awareness Compliance - Local Public Officials (HP)	X	X
21	C15 – T4	Public Awareness Compliance – Excavators (MP)	X	X
22	C16 – T4	Public Awareness Compliance – Excavators (HP)	X	X
23	C17	Increase Reporting of Unsafe Excavation (MP)	X	No
24	C18	Increase Reporting of Unsafe Excavation (HP)	X	No
25	C19	Damage Prevention Policy Activities (MP)	X	X
26	C20	Damage Prevention Policy Activities (HP)	X	X
27	C21	Prevention & Improvements - Fiber Optics (HP)	X	X
28	C22	Gold Shovel Standard Program (MP)	X	X
29	C23	Gold Shovel Standard Program (HP)	X	X
30	C24	Excess Flow Valve or Curb Valve Installation (MP)	X	X
31	C25	Pipeline Patrol and Pipeline Markers (MP)	X	X
32	C26	Pipeline Patrol and Pipeline Markers (HP)	X	X
33	C27	Company Excavator Training (MP)	X	X
34	C28	Company Excavator Training (HP)	X	X
35	C29	Warning Mesh (MP)	X	X
36	C30	Warning Mesh (HP)	X	X
37	C31	Ticket Risk Assessment and Evaluating City Permit Data (MP)	X	X
38	C32	Ticket Risk Assessment and Evaluating City Permit Data (HP)	X	X
39	C33	Enhance Ticket Management Software (MP)	X	X
40	C34	Enhance Ticket Management Software (HP)	X	X

Line No.	Control/ Mitigation ID	Control/Mitigation Description	2020 Controls	2022-2024 Plan
41	C35	Leverage Data Gathered by Locating Equipment (MP)	X	X
42	C36	Leverage Data Gathered by Locating Equipment (HP)	X	X
43	C37	Pipeline Monitoring Technologies (HP)	X	X
44	M1	Automate Third Party Excavation Incident Reporting (MP)	-	X
45	M2	Automate Third Party Excavation Incident Reporting (HP)	-	X
46	M3	Locate and Mark Photographs (MP)	-	X
47	M4	Locate and Mark Photographs (HP)	-	X
48	M5	Electronic Positive Response (MP)	-	X
49	M6	Electronic Positive Response (HP)	-	X
50	M7	Leverage Technology for Difficult Locates (MP)	-	X
51	M8	Leverage Technology for Difficult Locates (HP)	-	X
52	M9	Outreach for Latent 3rd Party Damages (MP)	-	X
53	M10	Outreach for Latent 3rd Party Damages (HP)	-	X

For activities SoCalGas plans to perform that remain unchanged, please refer to the description in Section III. If changes to the various activities are anticipated, such modifications are further described in this section below.

A. Changes to 2020 Controls

SoCalGas plans to continue each of the existing mitigations discussed above in Section III through the 2022 – 2024 period without any significant changes.

B. 2022 – 2024 Mitigations

1. Automate Third Party Excavation Incident Reporting

- **M1: MP; M2: HP**

Automating Third Party Excavation incident reporting into one system will centralize the reporting and data analysis. This will assist with meeting compliance reporting obligations, develop a better understanding of the data collected in an investigation, simplify reporting, and

enhance data analysis processes. SoCalGas is mandated by Title 49 Code of Federal Regulation section 192.614, and California Government Code, section 4216, to collect data on third Party Excavation Incidents.

Automating Third Party Excavation incident reporting is an effort to consolidate and simplify the data collection process involved in investigating a gas incident. Field supervisors complete the investigations of gas incidents. Currently, there are multiple systems and processes used to capture and report data, internally and externally, for a gas incident. All systems and processes might not be updated simultaneously, thereby creating additional manual steps when using the data for internal analysis for process improvements, or to generate reports for internal or external stakeholders. SoCalGas is undertaking an initiative to centralize these processes and systems into one system of record to minimize data quality issues, simplify reporting, and standardize data collection with field supervisors.

Standardizing data collection into one system will centralize reporting and data analysis, assist with meeting compliance reporting obligations, develop a better understanding of data collected in an investigation, simplify reporting, and enhance data analysis processes. This will facilitate improvements in SoCalGas's accuracy and timeliness in locating and marking its infrastructure.

2. Locate and Mark Photographs

- **M3: MP; M4: HP**

Recording photographs for each locate and mark ticket visited by locators is planned for all SoCalGas's above- and belowground facilities in the service territory. These pictures will help audit the quality of locates and provide an opportunity to improve future locate and mark ticket requests for previous locations.

The purpose of recording photographs of each locate and mark ticket is to improve the accuracy of the locating activity and to inform process improvements based on investigations of gas incidents and quality assurance audits. By having a record of the locate marks, SoCalGas can assess QA activities and improve investigations of gas incidents. Photographs could show incorrect markings or GIS mapping which could be used to improve employee training and update GIS data. The benefits of this mitigation are to improve locate and mark accuracy and mitigate gas infrastructure damage.

3. Electronic Positive Response

- **M5: MP; M6: HP**

Electronic positive response is an electronic response provided to the regional notification center (DigAlert and USA North) that informs the excavator, prior to the excavation date, that the facility has been marked or there is no conflict with the proposed excavation area. Electronic positive response is utilized throughout SoCalGas's territory. All excavations utilizing electronic positive response poses the same safety risk and a single tranche is appropriate.

SoCalGas is required to locate and mark its underground infrastructure within two business days after receiving an 811 USA locate and mark ticket request. Implementing a positive response feature with the regional notification centers, such as USA North and DigAlert, improves communication between SoCalGas and excavating contractors. The system will inform the contractor that the utility has completed its task or, alternatively, will inform the excavator there is no conflict with gas infrastructure in the excavation area. The system also provides a way to communicate stand-by requirements and notification if the locate task was incomplete due to weather or accessibility issues.

This program requires participation from contractors and SoCalGas. It will mitigate potential damage to gas infrastructure due to miscommunication between the contractors and SoCalGas. This is especially important in situations where the utility could not provide markings within the required timeframe and the contractor assumes no conflict with gas infrastructure because no marks are present. Without pipeline markings, the contractor may not exercise safe excavation techniques and damage gas infrastructure.

4. Leverage Technology for Difficult Locates

- **M7: MP; M8: HP**

Vacuum excavation technology is an example of a hydro excavation tool that can be deployed to find the location of pipelines when they are difficult to locate because of interference or other reasons. The technology is a safe alternative to hand tools to locate and prevent damage to unknown pipeline locations. Vacuum excavation is utilized on an as-needed, case-by-case basis during Locate and Mark Activities or in a proactive way in areas that are historically known to have pipelines that are hard to locate. Vacuum excavation is applicable to areas in

SoCalGas's territory. All excavations utilizing vacuum excavation technology address the same risk profile therefore a single tranche is appropriate.

At times, employees cannot accurately locate pipelines using standard tools available. In these instances, SoCalGas will work with the requesting contractor to help fulfill the request without creating an unsafe situation. SoCalGas will establish a process to work with the excavator to utilize various alternatives to locate gas facilities or enhance safe-digging technologies. These alternatives include standing-by and observing contractors as they perform their excavations or using other tools such as a Jameson locator or utilizing vacuum technology that can expose the pipe for visual verification.

Using locating tools that can provide the actual location of gas infrastructure by safely exposing the pipe will provide the most accurate location of the gas infrastructure. With this knowledge, the contractor is aware of when to exercise safe excavation techniques and Company records can be updated with the exact location of the pipeline. Both benefits will work toward reducing the potential for damage to underground pipelines for current and future projects.

5. Outreach for Latent 3rd Party Damages

- **M9: MP; M10: HP**

This mitigation encompasses the efforts to identify and communicate with excavators who may have damaged a SoCalGas underground facility without complying with safe excavation laws and best practices.

Occasionally, during routine activities, SoCalGas will expose a section of underground piping and upon visual inspection determine that previously unknown damage has occurred. SoCalGas was likely unaware of the excavation activity and thus was not onsite to perform the required stand-by activities. To identify excavators who may have conducted the excavation, further investigations would be required to determine if any USA tickets or excavation/construction permits had been valid in the area over a given time period. This would include communication and information requests with the Regional Notification Center and any local jurisdiction who may have issued a permit. Follow-up communications would then be made to these excavators to remind them of the safe excavation law requirements and best practices along with an offer to conduct a safe excavation training event at their facilities for their employees and management to attend. Additionally, information would be provided

regarding the potential enforcement actions that can be taken by the Dig-Safe Board Investigation department and the Contractor State Licensing Board.

The benefits for this activity would be to continue to educate the excavator community on the importance in following the laws and best practices in order to prevent unintended consequences that can be attributed to unsafe excavations.

V. COST, UNITS, AND QUANTITATIVE SUMMARY TABLES

The tables in this section provide a summary of the risk control and mitigation plan, including the associated costs, units, and the RSEs, by tranche. When an RSE could not be performed, an explanation is provided. SoCalGas does not account for and track costs by activity or tranche; rather, SoCalGas accounts for and tracks costs by cost center and capital budget code. The costs shown were estimated using assumptions provided by SMEs and available accounting data.

Table 7: Risk Control and Mitigation Plan - Recorded and Forecast Dollars Summary[25] (Direct After Allocations, In 2020 $000)

ID	Control/ Mitigation Name	Recorded Dollars		Forecast Dollars			
		2020 Capital[26]	2020 O&M	2022-2024 Capital (Low)	2022-2024 Capital (High)	TY 2024 O&M (Low)	TY 2024 O&M (High)
C1	Locate & Mark Training (MP)	-	416	-	-	426	515
C2	Locate & Mark Training (HP)	-	37	-	-	36	43
C3	Locate & Mark Activities (MP)	-	18,395	-	-	19,062	23,076
C4	Locate & Mark Activities (HP)	-	4,113	-	-	4,346	5,261

[25] Recorded costs and forecast ranges are rounded. Additional cost-related information is provided in workpapers. Costs presented in the workpapers may differ from this table due to rounding. The figures provided are direct charges and do not include company loaders, with the exception of vacation and sick. The costs are also in 2020 dollar and have not been escalated to 2021 amounts. The capital presented is the sum of the years 2022, 2023, and 2024, or a three-year total. Years 2022, 2023 and 2024 are the forecast years for SoCalGas's Test Year 2024 GRC Application.

[26] Pursuant to D.14-12-025 and D.16-08-018, the Company provides the 2020 "baseline" capital costs associated with Controls. The 2020 capital amounts are for illustrative purposes only. Because capital programs generally span several years, considering only one year of capital may not represent the entire activity.

ID	Control/ Mitigation Name	Recorded Dollars		Forecast Dollars			
		2020 Capital[26]	2020 O&M	2022-2024 Capital (Low)	2022-2024 Capital (High)	TY 2024 O&M (Low)	TY 2024 O&M (High)
C5	Locate and Mark Annual Refresher Training and Competency Program (MP)	-	47	-	-	49	59
C6	Locate and Mark Annual Refresher Training and Competency Program (HP)	-	13	-	-	14	16
C7	Locate and Mark Operator Qualification (MP)	-	118	-	-	120	145
C8	Locate and Mark Operator Qualification (HP)	-	28	-	-	29	35
C9	Locate and Mark Quality Assurance Program (MP)	-	2,004	-	-	1,902	2,302
C10	Locate and Mark Quality Assurance Program (HP)	-	387	-	-	367	444
C11	Damage Prevention Analyst Program (MP)	-	470	-	-	1,745	2,230
C12	Damage Prevention Analyst Program (HP)	-	112	-	-	345	440
C13	Locating Equipment (MP)	2,874	-	16,236	19,654	-	-
C14	Locating Equipment (HP)	686	-	3,877	4,693	-	-
C15-T1	Public Awareness Compliance - The Affected Public (MP)	-	327	-	-	785	951
C16-T1	Public Awareness Compliance - The Affected Public (HP)	-	78	-	-	188	227

ID	Control/ Mitigation Name	Recorded Dollars		Forecast Dollars			
		2020 Capital[26]	2020 O&M	2022-2024 Capital (Low)	2022-2024 Capital (High)	TY 2024 O&M (Low)	TY 2024 O&M (High)
C15-T2	Public Awareness Compliance - Emergency Officials (MP)	-	2	-	-	13	16
C16-T2	Public Awareness Compliance - Emergency Officials (HP)	-	0	-	-	3	4
C15-T3	Public Awareness Compliance - Local Public Officials (MP)	-	1	-	-	20	25
C16-T3	Public Awareness Compliance - Local Public Officials (HP)	-	0	-	-	5	6
C15-T4	Public Awareness Compliance – Excavators (MP)	-	303	-	-	228	276
C16-T4	Public Awareness Compliance – Excavators (HP)	-	72	-	-	54	66
C19	Damage Prevention Policy Activities (MP)	-	1	-	-	1	1
C20	Damage Prevention Policy Activities (HP)	-	0	-	-	0	0
C21	Prevention & Improvements-Fiber Optics (HP)	-	-	7,577	9,172	-	-
C22	Gold Shovel Standard Program (MP)	-	2	-	-	2	3
C23	Gold Shovel Standard Program (HP)	-	0	-	-	0	1
C24	Excess Flow Valve or Curb Valve Installation	915	-	2,383	3,045	-	-

ID	Control/ Mitigation Name	Recorded Dollars		Forecast Dollars			
		2020 Capital[26]	2020 O&M	2022-2024 Capital (Low)	2022-2024 Capital (High)	TY 2024 O&M (Low)	TY 2024 O&M (High)
C25	Pipeline Patrol and Pipeline Markers (MP)	-	83	-	-	79	101
C26	Pipeline Patrol and Pipeline Markers (HP)	-	459	-	-	451	576
C27	Company Excavator Training (MP)	-	217	-	-	321	411
C28	Company Excavator Training (HP)	-	34	-	-	36	47
C29	Warning Mesh (MP)	273	-	753	911	-	-
C30	Warning Mesh (HP)	65	-	180	218	-	-
C31	Ticket Risk Assessment and Evaluating City Permit Data (MP)	-	310	-	-	181	232
C32	Ticket Risk Assessment and Evaluating City Permit Data (HP)		74	-	-	43	55
C33	Enhance Ticket Management Software (MP)	179	6	465	594	7	8
C34	Enhance Ticket Management Software (HP)	43	2	111	142	2	2
C35	Leverage Data Gathered by Locating Equipment (MP)	124	-	355	454	-	-
C36	Leverage Data Gathered by Locating Equipment (HP)	30	-	85	108	-	-
C37	Pipeline Monitoring Technologies (HP)	43	-	5,378	7,768	169	244
M1	Automate Third Party Excavation Incident Reporting (MP)	-	-	-	-	63	80

ID	Control/ Mitigation Name	Recorded Dollars		Forecast Dollars			
		2020 Capital[26]	2020 O&M	2022-2024 Capital (Low)	2022-2024 Capital (High)	TY 2024 O&M (Low)	TY 2024 O&M (High)
M2	Automate Third Party Excavation Incident Reporting (HP)	-	-	-	-	15	19
M3	Locate and Mark Photographs (MP)	-	-	-	-	392	501
M4	Locate and Mark Photographs (HP)	-	-	-	-	87	112
M5	Electronic Positive Response (MP)	-	-	Included with C33		-	-
M6	Electronic Positive Response (HP)	-	-	Included with C34		-	-
M7	Leverage Technology for Difficult Locates (MP)	-	-	Included with C35		-	-
M8	Leverage Technology for Difficult Locates (HP)	-	-	Included with C36		-	-
M9	Outreach for Latent 3rd Party Damages (MP)	-	-	-	-	16	21
M10	Outreach for Latent 3rd Party Damages (HP)	-	-	-	-	4	5

Table 8: Risk Control & Mitigation Plan - Units Summary

ID	Control/Mitigation Name	Units Description		2022-2024 Capital (Low)	2022-2024 Capital (High)	Forecast Units	
		Capital[27]	O&M			TY 2024 (Low) O&M	TY 2024 O&M (High)
C1	Locate & Mark Training (MP)	Training Hours		-	-	6,363	7,702
C2	Locate & Mark Training (HP)	Training Hours		-	-	543	657
C3	Locate & Mark Activities (MP)	Ticket Count		-	-	805,392	974,949
C4	Locate & Mark Activities (HP)	Ticket Count		-	-	192,324	232,813
C5	Locate and Mark Annual Refresher Training and Competency Program (MP)	Training Hours		-	-	863	1,044
C6	Locate and Mark Annual Refresher Training and Competency Program (HP)	Training Hours		-	-	244	295
C7	Locate and Mark Operator Qualification (MP)	FTE Headcount		-	-	1	1
C8	Locate and Mark Operator Qualification (HP)	The units for this control are included in C7.					
C9	Locate and Mark Quality Assurance Program (MP)	Program		1	1	1	1
C10	Locate and Mark Quality Assurance Program (HP)	The units for this control are included in C9.					
C11	Damage Prevention Analyst Program (MP)	FTE Headcount		-	-	10	13

[27] Pursuant to D.14-12-025 and D.16-08-018, the Company provides the 2020 "baseline" capital costs associated with Controls. The 2020 capital amounts are for illustrative purposes only. Because capital programs generally span several years, considering only one year of capital may not represent the entire activity.

ID	Control/Mitigation Name	Units Description				Forecast Units	
		Capital[27]	O&M	2022-2024 Capital (Low)	2022-2024 Capital (High)	TY 2024 (Low) O&M	TY 2024 O&M (High)
C12	Damage Prevention Analyst Program (HP)	The units for this control are included in C11.					
C13	Locating Equipment (MP)	This control comprises costs from pieces of equipment of varying prices. As a result, units cannot be calculated.					
C14	Locating Equipment (HP)	This control comprises costs from pieces of equipment of varying prices. As a result, units cannot be calculated.					
C15-T1	Public Awareness Compliance - The Affected Public (MP)	Number of Communications Sent		-	-	5,656,392	6,847,211
C16-T1	Public Awareness Compliance - The Affected Public (HP)	Number of Communications Sent				1,350,720	1,635,082
C15-T2	Public Awareness Compliance - Emergency Officials (MP)	Number of Communications Sent		-	-	1,845	2,234
C16-T2	Public Awareness Compliance - Emergency Officials (HP)	Number of Communications Sent				417	533
C15-T3	Public Awareness Compliance - Local Public Officials (MP)	Number of Communications Sent		-	-	2,223	2,840
C16-T3	Public Awareness Compliance - Local Public Officials (HP)	Number of Communications Sent				531	678
C15-T4	Public Awareness Compliance – Excavators (MP)	Number of Communications Sent		-	-	258,518	312,943
C16-T4	Public Awareness Compliance – Excavators (HP)	Number of Communications Sent				61,733	74,729
C19	Damage Prevention Policy Activities (MP)	This control contains numerous cost types. As a result, units cannot be calculated.					

ID	Control/Mitigation Name	Units Description				Forecast Units	
		Capital[27]	O&M	2022-2024 Capital (Low)	2022-2024 Capital (High)	TY 2024 (Low) O&M	TY 2024 O&M (High)
C20	Damage Prevention Policy Activities (HP)	This control contains numerous cost types. As a result, units cannot be calculated.					
C21	Prevention & Improvements-Fiber Optics (HP)	This control contains numerous cost types. As a result, units cannot be calculated.					
C22	Gold Shovel Standard Program (MP)	Memberships		-	-	1	1
C23	Gold Shovel Standard Program (HP)	The units are included in C22					
C24	Excess Flow Valve or Curb Valve Installation (MP)	Number of Installations		94,659	120,953	-	-
C25	Pipeline Patrol and Pipeline Markers (MP)	The units are included in C26					
C26	Pipeline Patrol and Pipeline Markers (HP)	Number of Items		-	-	2,181	2,640
C27	Company Excavator Training (MP)	Training Hours		-	-	5,376	6,508
C28	Company Excavator Training (HP)	Training Hours		-	-	620	750
C29	Warning Mesh (MP)	Number of Warning Mesh Rolls		14,243	17,242	-	-
C30	Warning Mesh (HP)	Number of Warning Mesh Rolls		3,400	4,117		
C31	Ticket Risk Assessment and Evaluating City Permit Data (MP)	FTE Headcount				5	7
C32	Ticket Risk Assessment and Evaluating City Permit Data (HP)	FTE Headcount		-	-	1	2
C33	Enhance Ticket Management Software (MP)	This control contains numerous cost types. As a result, units cannot be calculated.					

ID	Control/Mitigation Name	Units Description				Forecast Units	
		Capital[27]	O&M	2022-2024 Capital (Low)	2022-2024 Capital (High)	TY 2024 (Low) O&M	TY 2024 O&M (High)
C34	Enhance Ticket Management Software (HP)	This control contains numerous cost types. As a result, units cannot be calculated.					
C35	Leverage Data Gathered by Locating Equipment (MP)	This control contains numerous cost types. As a result, units cannot be calculated.					
C36	Leverage Data Gathered by Locating Equipment (HP)	This control contains numerous cost types. As a result, units cannot be calculated.					
C37	Pipeline Monitoring Technologies (HP)	Fiber		3	3	3	4
M1	Automate Third Party Excavation Incident Reporting (MP)	This mitigation contains numerous cost types. As a result, units cannot be calculated.					
M2	Automate Third Party Excavation Incident Reporting (HP)	This mitigation contains numerous cost types. As a result, units cannot be calculated.					
M3	Locate and Mark Photographs (MP)	FTE Headcount		-	-	5	6
M4	Locate and Mark Photographs (HP)	FTE Headcount		-	-	1	1
M5	Electronic Positive Response (MP)	The units are included with C33.					
M6	Electronic Positive Response (HP)	The units are included with C34.					
M7	Leverage Technology for Difficult Locates (MP)	The units are included with C35.					
M8	Leverage Technology for Difficult Locates (HP)	The units are included with C36.					
M9	Outreach for Latent 3rd Party Damages (MP)	This mitigation contains numerous cost types. As a result, units cannot be calculated.					

ID	Control/Mitigation Name	Units Description				Forecast Units	
		Capital[27]	O&M	2022-2024 Capital (Low)	2022-2024 Capital (High)	TY 2024 (Low) O&M	TY 2024 O&M (High)
M10	Outreach for Latent 3rd Party Damages (HP)	This mitigation contains numerous cost types. As a result, units cannot be calculated.					

Table 9: Risk Control & Mitigation Plan - Quantitative Analysis Summary (Direct After Allocations, In 2020 $000)

ID	Control/Mitigation Name	LoRE	CoRE	Risk Score	RSE
C1	Locate & Mark Training (MP)	See Table 10			
C2	Locate & Mark Training (HP)	See Table 10			
C3	Locate & Mark Activities (MP)	32351	0.52	16911	767
C4	Locate & Mark Activities (HP)	0.62	3114	1930	55
C5	Locate and Mark Annual Refresher Training and Competency Program (MP)	2912	0.52	1522	23.1
C6	Locate and Mark Annual Refresher Training and Competency Program (HP)	0.7	3114	2178	121
C7	Locate and Mark Operator Qualification (MP)	See Table 10			
C8	Locate and Mark Operator Qualification (HP)	See Table 10			
C9	Locate and Mark Quality Assurance Program (MP)	0.7	3114	2172	21
C10	Locate and Mark Quality Assurance Program (HP)	2903	0.52	1518	3
C11	Damage Prevention Analyst Program (MP)	2777	0.52	1451	48
C12	Damage Prevention Analyst Program (HP)	0.7	6114	2169	36

ID	Control/Mitigation Name	LoRE	CoRE	Risk Score	RSE
C13	Locating Equipment (MP)	2747	0.52	1436	24
C14	Locating Equipment (HP)	0.69	3114	2153	31
C15-T1	Public Awareness Compliance - The Affected Public (MP)	2874	0.52	1503	25
C16-T1	Public Awareness Compliance - The Affected Public (HP)	0.7	3114	2173	34
C15-T2	Public Awareness Compliance - Emergency Officials (MP)	2914	0.52	1523	14
C16-T2	Public Awareness Compliance - Emergency Officials (HP)	0.7	3114	2180	22
C15-T3	Public Awareness Compliance - Local Public Officials (MP)	2911	0.52	1522	63
C16-T3	Public Awareness Compliance - Local Public Officials (HP)	0.7	3114	2180	97
C15-T4	Public Awareness Compliance – Excavators (MP)	2890	0.52	1511	52
C16-T4	Public Awareness Compliance – Excavators (HP)	0.7	3114	2176	78
C19	Damage Prevention Policy Activities (MP)	See Table 10			
C20	Damage Prevention Policy Activities (HP)	See Table 10			
C21	Prevention & Improvements-Fiber Optics (HP)	0.7	3114	2175	10
C22	Gold Shovel Standard Program (MP)	See Table 10			
C23	Gold Shovel Standard Program (HP)	See Table 10			
C24	Excess Flow Valve or Curb Valve Installation (MP)	2895	0.52	1514	105
C25	Pipeline Patrol and Pipeline Markers (MP)	2904	0.52	1518	62

ID	Control/Mitigation Name	LoRE	CoRE	Risk Score	RSE
C26	Pipeline Patrol and Pipeline Markers (HP)	0.69	3114	2161	39
C27	Company Excavator Training (MP)	See Table 10			
C28	Company Excavator Training (HP)	See Table 10			
C29	Warning Mesh (MP)	2913	0.52	1523	19
C30	Warning Mesh (HP)	0.707	3114	2177	484
C31	Ticket Risk Assessment and Evaluating City Permit Data (MP)	2914	0.52	1523	1
C32	Ticket Risk Assessment and Evaluating City Permit Data (HP)	0.7	3114.36	2180	10
C33	Enhance Ticket Management Software (MP)	2895	0.52	1513	86
C34	Enhance Ticket Management Software (HP)	0.7	3114	2177	115
C35	Leverage Data Gathered by Locating Equipment (MP)	2914	0.52	1523	4
C36	Leverage Data Gathered by Locating Equipment (HP)	0.7	3114	218	2
C37	Pipeline Monitoring Technologies (HP)	See Table 10			
M1	Automate Third Party Excavation Incident Reporting (MP)	2911	0.52	1522	58
M2	Automate Third Party Excavation Incident Reporting (HP)	0.7	3114	2180	70
M3	Locate and Mark Photographs (MP)	2914	0.52	1523	13
M4	Locate and Mark Photographs (HP)	0.7	3114	2180	20
M5	Electronic Positive Response (MP)	Included in C33			
M6	Electronic Positive Response (HP)	Included in C34			
M7	Leverage Technology for Difficult Locates (MP)	Included in C35			

ID	Control/Mitigation Name	LoRE	CoRE	Risk Score	RSE
M8	Leverage Technology for Difficult Locates (HP)	Included in C36			
M9	Outreach for Latent 3rd Party Damages (MP)	See Table 10			
M10	Outreach for Latent 3rd Party Damages (HP)	See Table 10			

Table 10: Risk Control & Mitigation Plan - Quantitative Analysis Summary for RSE Unavailability

ID	Control/Mitigation Name	RSE Unavailability
C1	Locate & Mark Training (MP)	Providing Locator training is standard practice across the industry. The need for in-depth knowledge of the use of proper tools and resources is paramount for the efficient and accurate application of L&M procedures. There are no known sources to find data associated with operators who do not have a training program and SMEs are unable to reliably speculate on the quantitative benefits of training.
C2	Locate & Mark Training (HP)	Providing Locator training is standard practice across the industry. The need for in-depth knowledge for the use of proper tools and resources is paramount for the efficient and accurate application of L&M procedures. There are no known sources to find data associated with operators who do not have a training program and SMEs are unable to reliably speculate on the quantitative benefits of training.
C7	Locate and Mark Operator Qualification (MP)	Locate & Mark Activities are "covered tasks" as defined in 49 CFR 192.801. As such the Op Qual program is required for all individuals performing the tasks. The program was mandated in 2004. Data representing the status of the L&M program before that time is not available to provide comparison to

ID	Control/Mitigation Name	RSE Unavailability
		the pre-Op Qual environment, and SMEs are unable to reliably speculate on the quantitative benefits of this longstanding program.
C8	Locate and Mark Operator Qualification (HP)	Locate & Mark Activities are "covered tasks" as defined in 49 CFR 192.801. As such the Op Qual program is required for all individuals performing the tasks. The program was mandated in 2004. Data representing the status of the L&M program before that time is not available to provide comparison to the pre-Op Qual environment, and SMEs are not able to speculate on the quantitative benefits of this longstanding program.
C19	Damage Prevention Policy Activities (MP)	This activity involves the proactive participation at meetings and workshops with the Dig-Safe Board, CARGA, both California One-Call centers, and meetings with State Assembly and Senator staff to advocate from the Operator/Excavator perspective, for sensible and comprehensive enhancements to state laws and regulations. Participation provides the opportunity to make positive and beneficial changes. Choosing not to participate could lead to poor, costly, and ineffective regulations. The Damage Prevention Strategies group began this activity in 2018 and are not aware of meaningful data that would provide for an RSE calculation at this time. SMEs are unable to quantify the benefits of this activity.
C20	Damage Prevention Policy Activities (HP)	This activity involves the proactive participation at meetings and workshops with the Dig-Safe Board, CARCGA, both California One-Call centers, and meetings with State Assembly and Senator staff to advocate, from the Operator/Excavator perspective, for sensible and comprehensive enhancements to state laws and regulations. Participation provides the opportunity to make positive and beneficial changes. Choosing not to participate could lead to poor, costly, and ineffective regulations. The

ID	Control/Mitigation Name	RSE Unavailability
		Damage Prevention Strategies group began this activity in 2018 and are not aware of meaningful data that would provide for an RSE calculation at this time. SMEs are unable to quantify the benefits of this activity.
C22	Gold Shovel Standard Program (MP)	Participation in this program is one component of SoCalGas's contractor performance management program and applies to a small subset of the excavator community – those contractors who perform construction work on SoCalGas's behalf. SoCalGas has been working with the GSS organization to develop useful metrics, but is currently unaware of their availability. SMEs are unable to quantify the benefits of this program.
C23	Gold Shovel Standard Program (HP)	Participation in this program is one component of SoCalGas's contractor performance management program and applies to a small subset of the excavator community, those contractors who perform construction work on SoCalGas's behalf. SoCalGas has been working with the GSS organization to develop useful metrics but is currently unaware of their availability currently. SMEs are unable to quantify the benefits of this program.
C25	Pipeline Patrol and Pipeline Markers (MP)	Pipeline Patrol and Pipeline Markers for medium pressure lines are both activities with specific federal requirements (49 CFR 192.707, 192,721). For Dig-Ins, frequent patrolling seeks to identify and mitigate undesirable encroachments to the pipeline. Patrolling also validates and/or mitigates for proper placement of pipeline markers to help communicate the presence of underground gas pipelines to avoid rogue excavation and prevent damages. These are both industry requirements and standard operating practices. No known data is available to provide damage prevention information without having these programs in place, and SMEs are unable to reliably speculating on the quantitative benefits of these activities.

ID	Control/Mitigation Name	RSE Unavailability
C26	Pipeline Patrol and Pipeline Markers (HP)	Pipeline Patrol and Pipeline Markers for high pressure lines are both activities with specific federal requirements (49CFR192.705, 192,707). For Dig-Ins, frequent patrolling seeks to identify and mitigate undesirable encroachments to the pipeline. Patrolling also validates and/or mitigates for proper placement of pipeline markers to help communicate the presence of underground gas pipelines to avoid rogue excavation and prevent damages. These are both industry requirements and standard operating practices. No known data is available to provide damage prevention information without having these programs in place. No known data is available to provide damage prevention information without having these programs in place, and SMEs are unable to reliably speculate as to the quantitative benefits of these activities.
C27	Company Excavator Training (MP)	Providing training is a common, necessary, and expected practice regardless of the industry. It is important to properly train employees on the safe use of excavation implements or machines. When working around a hazardous material, such as natural gas, many safety practices and protocols have been developed internally and by institutions such as OSHA to promote safety and personal wellbeing. It is unknown where data can be found to represent an entity that does not provide adequate training, and SMEs cannot determine the quantitative effects of these activities.
C28	Company Excavator Training (HP)	Providing training is a common, necessary, and expected practice regardless of the industry. It is important to properly train employees on the safe use of excavation implements or machines . When working around a hazardous material such as natural gas, many safety practices and protocols have been developed internally and by institutions such as OSHA to promote safety and personal wellbeing. It is unknown where data can be found to represent an

ID	Control/Mitigation Name	RSE Unavailability
		entity that does not provide adequate training, and SMEs cannot determine the quantitative effects of these activities.
M5	Electronic Positive Response (MP)	The data associated with Electronic Positive Response is closely integrated with and therefore included within the RSE for C-33 Enhance Ticket Management Software (MP)
M6	Electronic Positive Response (HP)	The data associated with Electronic Positive Response is closely integrated with and therefore included within the RSE for C-33 Enhance Ticket Management Software (HP)
M7	Leverage Technology for Difficult Locates (MP)	RSE is included in C-35 Leverage Data Gathered by Locating Equipment (MP)
M8	Leverage Technology for Difficult Locates (HP)	RSE is included in C-36 Leverage Data Gathered by Locating Equipment (HP)
M9	Outreach for Latent 3rd Party Damages (MP)	This is a new mitigation with no historical data. SoCalGas's intent is to attempt to identify an excavator who damaged a pipeline in the past (via historic permit or USA ticket information) to provide the opportunity for outreach and education to minimize or prevent a similar occurrence in the future. With no historical data to provide any indication for a potential success rate, calculation of an RSE is infeasible, as it would require SME speculation about this activity.
M10	Outreach for Latent 3rd Party Damages (HP)	This is a new mitigation with no historical data. The intent is to attempt to identify an excavator who damaged a pipeline in the past (via historic permit or USA ticket information) to provide the opportunity for outreach and education to minimize or prevent a similar occurrence in the future. With no

ID	Control/Mitigation Name	RSE Unavailability
		historical data to provide any indication for a potential success rate, calculation of an RSE is infeasible, as it would require SME speculation about this activity.
C37	Pipeline Monitoring Technologies (HP)	Increasing the ability to monitor and control the natural gas system is a prudent safety and reliability measure for California's energy grid. The CCM will allow for the system to be controlled or isolated faster in the event of a system incident. Likewise, the CCM will allow for potential issues in the system to be identified sooner, as opposed to patrols or a system with fewer monitor points, and potentially resolved before becoming an incident. This can include dig-in detection and response, over/under pressure awareness and response as well as increased flexibility to respond to the varying demands on the system throughout the year. Increased remote control can also alleviate employee exposure while operating equipment prior to, during or after an incident. Overall, the CCM will decrease the consequences of system incidents through the opportunity for quicker identification, more timely response, and fewer human asset involvement in potentially hazardous conditions. Since the CCM is still in the design phase and not operational yet, there is no historical data available to develop an RSE for the risk mitigations of Dig-Ins, and SME input cannot fill the information gap.

VI. ALTERNATIVES

Pursuant to D.14-12-025 and D.16-08-018, SoCalGas considered alternatives to the risk control and mitigation plan for the Dig-in on the System risk. Typically, analysis of alternatives occurs when implementing activities to obtain the best result or product for the cost. The alternatives analysis for this risk control and mitigation plan also took into account modifications to the plan and constraints, such as budget and resources.

A. A1: Virtual Reality Training

The virtual reality Locate and Mark training simulator provides a portable and scenario-based training system. It allows for instructors to simulate a variety of real-world locate and mark scenarios. Virtual reality provides more flexibility in training curriculum and allows for more focused educational opportunities. More research is needed to identify system requirements and standardization scores, and identify impacts to existing locate equipment and performance management software.

B. A2: GPS Tracking of Excavation Equipment

SoCalGas has supported the Gas Technology Institute (GTI) and other research organizations in their efforts to help the industry improve damage prevention practices. Past and ongoing efforts included real-time GPS tracking of excavation equipment operating in pipeline rights-of-way and quick-shut breakaway meter set valves.

Real-time tracking of excavation is done using a “black box” attached to the excavation equipment such as a backhoe, grader, etc. The black box monitors the location of the equipment and can sense when the equipment is getting ready to dig. There is sophisticated software that monitors the GPS data in relation to its proximity to spatial pipe locations. If the box is detected near a Company asset, then an alarm is triggered on the equipment alerting the equipment operator that there is a pipeline in the area. There is also an alert that is sent to the Company, so action may be taken to investigate the location.

The technology is not being pursued currently as the initial experience demonstrated false positives. Follow-up is needed to validate technology maturity.

Table 11: Alternate Mitigation Plan - Forecast Dollars Summary[28]
(Direct After Allocations, In 2020 $000)

ID	Alternate Mitigation Name	Forecast Dollars			
		2022-2024 Capital (Low)	2022-2024 Capital (High)	TY 2024 O&M (Low)	TY 2024 O&M (High)
A1	Virtual Reality Training	-	-	94	120
A2	GPS Tracking of Excavation Equipment	-	-	306	391

Table 12: Risk Control & Mitigation Plan - Units Summary

IID	Control/Mitigation Name	Units Description		Forecast Units			
		Capital	O&M	2022-2024 Capital (Low)	2022-2024 Capital (High)	TY 2024 O&M (Low)	TY 2024 O&M (High)
A1	Virtual Reality Training (MP)	This mitigation contains numerous cost types. As a result, units cannot be calculated.					
A2	GPS Tracking of Excavation Equipment	This mitigation contains numerous cost types. As a result, units cannot be calculated.					

Table 13: Alternate Mitigation Plan - Quantitative Analysis Summary
(Direct After Allocations, In 2020 $000)

ID	Control/Mitigation Name	Forecast			
		LoRE	CoRE	Risk S	RSE
AA1	Virtual Reality Training (MP)	2914	0.52	1523	0.1
AA2	Virtual Reality Training (HP)	0.7	3114	2180	0.009
AA3	GPS Tracking of Excavation Equipment (MP)	2914	0.52	1523	0.1
A4	GPS Tracking of Excavation Equipment (HP)	0.7	3114	2180	0.003

[28] Recorded costs and forecast ranges are rounded. Additional cost-related information is provided in workpapers. Costs presented in the workpapers may differ from this table due to rounding. The figures provided are direct charges and do not include company loaders, with the exception of vacation and sick. The costs are also in 2020 dollar amounts and have not been escalated to 2021 amounts. The capital presented is the sum of the years 2022, 2023, and 2024, or a three-year total. Years 2022, 2023 and 2024 are the forecast years for SoCalGas's Test Year 2024 GRC Application.

APPENDIX A: SUMMARY OF ELEMENTS OF THE RISK BOW TIE

APPENDIX A: SUMMARY OF ELEMENTS OF THE RISK BOW TIE

Table 14: Dig-in on the System: Summary of Elements of the Risk Bow Tie

ID	Control/Mitigation Name	Elements of the Risk Bow Tie Addressed
C1	Locate & Mark Training (MP)	DT.4, DT.5, DT.6, PC.1, PC.2, PC.3, PC.4, PC.5, PC.6
C2	Locate & Mark Training (HP)	DT.4, DT.5, DT.6, PC.1, PC.2, PC.3, PC.4, PC.5, PC.6
C3	Locate & Mark Activities (MP)	DT.4, DT.6, PC.1, PC.2, PC.3, PC.4, PC.5, PC.6
C4	Locate & Mark Activities (HP)	DT.4, DT.6, PC.1, PC.2, PC.3, PC.4, PC.5, PC.6
C5	Locate and Mark Annual Refresher Training and Competency Program (MP)	DT.4, DT.5, DT.6, PC.1, PC.2, PC.3, PC.4, PC.5, PC.6
C6	Locate and Mark Annual Refresher Training and Competency Program (HP)	DT.4, DT.5, DT.6, PC.1, PC.2, PC.3, PC.4, PC.5, PC.6
C7	Locate and Mark Operator Qualification (MP)	DT.4, DT.5, DT.6, PC.1, PC.2, PC.3, PC.4, PC.5, PC.6
C8	Locate and Mark Operator Qualification (HP)	DT.4, DT.5, DT.6, PC.1, PC.2, PC.3, PC.4, PC.5, PC.6
C9	Locate and Mark Quality Assurance (MP)	DT.4, DT.5, DT.6, DT. 8, PC.1, PC.2, PC.3, PC.4, PC.5, PC.6
C10	Locate and Mark Quality Assurance Program (HP)	DT.4, DT.5, DT.6, DT. 8, PC.1, PC.2, PC.3, PC.4, PC.5, PC.6
C11	Damage Prevention Analyst Program (MP)	DT.1, DT.2, DT.6, DT.3, DT.4, DT.5, PC.1, PC.2, PC.3, PC.4, PC.5, PC.6
C12	Damage Prevention Analyst Program (HP)	DT.1, DT.2, DT.3, DT.4, DT.5, DT.6, PC.1, PC.2, PC.3, PC.4, PC.5, PC.6
C13	Locating Equipment (MP)	DT.4, DT.6, DT.7, DT.8, DT.9, PC.1, PC.2, PC.3, PC.4, PC.5, PC.6
C14	Locating Equipment (HP)	DT.4, DT.6, DT.7, DT.8, DT.9, PC.1, PC.2, PC.3, PC.4, PC.5, PC.6

ID	Control/Mitigation Name	Elements of the Risk Bow Tie Addressed
C15-T1	Public Awareness – Affected Public (MP)	DT.1, DT.3, DT.6, PC.1, PC.2, PC.3, PC.4, PC.5, PC.6
C16-T1	Public Awareness – Affected Public (HP)	DT.1, DT.3, DT.2, PC.1, PC.2, PC.3, PC.4, PC.5, PC.6
C15-T2	Public Awareness – Emergency Officials (MP)	DT.1, PC.1, PC.2, PC.3, PC.4, PC.5, PC.6
C16-T2	Public Awareness – Emergency Officials (HP)	DT.1, PC.1, PC.2, PC.3, PC.4, PC.5, PC.6
C15-T3	Public Awareness – Local Public Officials (MP)	DT.1, DT.3, PC.1, PC.2, PC.3, PC.4, PC.5, PC.6
C16-T3	Public Awareness – Local Public Officials (HP)	DT.1, DT.3, PC.1, PC.2, PC.3, PC.4, PC.5, PC.6
C15-T4	Public Awareness – Excavators (MP)	DT.1, DT.3, DT.6, PC.1, PC.2, PC.3, PC.4, PC.5, PC.6
C16-T4	Public Awareness – Excavators (HP)	DT.1, DT.2, DT.3, PC.1, PC.2, PC.3, PC.4, PC.5, PC.6
C17	Increase Reporting of Unsafe Excavation (MP)	DT.1, DT.2, DT.3, PC.1, PC.2, PC.3, PC.4, PC.5, PC.6
C18	Increase Reporting of Unsafe Excavation (HP)	DT.1, DT.2, DT.3, PC.1, PC.2, PC.3, PC.4, PC.5, PC.6
C19	Damage Prevention Policy (MP)	DT.1, DT.2, DT.3, PC.1, PC.2, PC.3, PC.4, PC.5, PC.6
C20	Damage Prevention Policy (HP)	DT.1, DT.2, DT.3, PC.1, PC.2, PC.3, PC.4, PC.5, PC.6
C21	Prevention & Improvements-Fiber Optics (HP)	DT. 1, DT. 2, DT. 3, PC.1, PC.2, PC.3, PC.4, PC.5, PC.6
C22	Gold Shovel Standard Program (MP)	DT.1, DT.2, DT.3, PC.1, PC.2, PC.3, PC.4, PC.5, PC.6
C23	Gold Shovel Standard Program (HP)	DT.1, DT.2, DT.3, PC.1, PC.2, PC.3, PC.4, PC.5, PC.6
C24	Excess Flow Valve or Curb Valve Installation (MP)	DT.1, DT.3, DT.4, DT.6, DT.7, DT.8, PC.1, PC.2, PC.3, PC.4, PC.5, PC.6
C25	Pipeline Patrol and Pipeline Markers (MP)	DT.1, DT.2, PC.1, PC.2, PC.3, PC.4, PC.5, PC.6

ID	Control/Mitigation Name	Elements of the Risk Bow Tie Addressed
C26	Pipeline Patrol and Pipeline Markers (HP)	DT.1, DT.2, PC.1, PC.2, PC.3, PC.4, PC.5, PC.6
C27	Company Excavator Training (MP)	DT.3, PC.1, PC.2, PC.3, PC.4, PC.5, PC.6
C28	Company Excavator Training (HP)	DT.3, PC.1, PC.2, PC.3, PC.4, PC.5, PC.6
C29	Warning Mesh (MP)	DT.1, DT.3, DT.4, DT.2, DT.7, DT.8, DT.9, PC.1, PC.2, PC.3, PC.4, PC.5, PC.6
C30	Warning Mesh (HP)	DT.1, DT.2 DT.3, DT.4, , DT.7, DT.8, DT.9, PC.1, PC.2, PC.3, PC.4, PC.5, PC.6
C31	Ticket Risk Assessment and Evaluating City Permit Data (MP)	DT.1, DT.2, DT.3, DT.4, DT.5, DT.6, PC.1, PC.2, PC.3, PC.4, PC.5, PC.6
C32	Ticket Risk Assessment and Evaluating City Permit Data (HP)	DT.1, DT.6, DT.3, DT.4, DT.5, PC.1, PC.2, PC.3, PC.4, PC.5, PC.6
C33	Enhance Ticket Management Software (MP)	DT.2, DT.4, DT.5, DT.9, PC.1, PC.2, PC.3, PC.4, PC.5, PC.6
C34	Enhance Ticket Management Software (HP)	DT.4, DT.5, DT.2, DT.9, PC.1, PC.2, PC.3, PC.4, PC.5, PC.6
C35	Leverage Data Gathered by Locating Equipment (MP)	DT.4, DT.8, DT.6, PC.1, PC.2, PC.3, PC.4, PC.5, PC.6
C36	Leverage Data Gathered by Locating Equipment (HP)	DT.4, DT.6, DT.8, PC.1, PC.2, PC.3, PC.4, PC.5, PC.6
C37	Pipeline Monitoring Technologies (HP)	DT. 1, DT. 2, DT. 3, DT. 4, DT. 5, DT.6, DT. 7, PC.1, PC.2, PC.3, PC.4, PC.5, PC.6
M1	Automate Third Party Excavation Incident Reporting (MP)	DT.2, DT.4, DT.6, PC.1, PC.2, PC.3, PC.4, PC.5, PC.6
M2	Automate Third Party Excavation Incident Reporting (HP)	DT.2, DT.4, DT.6, PC.1, PC.2, PC.3, PC.4, PC.5, PC.6
M3	Locate and Mark Photographs (MP)	DT.4, DT.6, DT.8, PC.1, PC.2, PC.3, PC.4, PC.5, PC.6
M4	Locate and Mark Photographs (HP)	DT.4, DT.6, DT.8, PC.1, PC.2, PC.3, PC.4, PC.5, PC.6

ID	Control/Mitigation Name	Elements of the Risk Bow Tie Addressed
M5	Electronic Positive Response (MP)	DT.2, DT.4, DT.5, PC.1, PC.2, PC.3, PC.4, PC.5, PC.6
M6	Electronic Positive Response (HP)	DT.2, DT.4, DT.5, PC.1, PC.2, PC.3, PC.4, PC.5, PC.6
M7	Leverage Technology for Difficult Locates (MP)	DT.5, DT.6, DT.8, PC.1, PC.2, PC.3, PC.4, PC.5, PC.6
M8	Leverage Technology for Difficult Locates (HP)	DT.5, DT.6, DT.8, PC.1, PC.2, PC.3, PC.4, PC.5, PC.6
M9	Outreach for Latent 3rd Party Damages (MP)	DT.1, DT.2, DT. 3, PC.1, PC.2, PC.3, PC.4, PC.5, PC.6
M10	Outreach for Latent 3rd Party Damages (HP)	DT.1, DT. 3, PC.1, PC.2, PC.3, PC.4, PC.5, PC.6

APPENDIX B: QUANTITATIVE ANALYSIS SOURCE DATA REFERENCES

Appendix B: Quantitative Analysis Source Data References

The Settlement Decision directs the utility to identify potential consequences of a risk event using available and appropriate data. The below provides a listing of the inputs utilized as part of this assessment.

Annual Report Mileage for Natural Gas Transmission & Gathering Systems
Agency: Pipeline and Hazardous Materials Safety Administration (PHMSA)
Link: *https://cms.phmsa.dot.gov/data-and-statistics/pipeline/annual-report-mileage-natural-gas-transmission-gathering-systems*

Annual Report Mileage for Gas Distribution Systems
Agency: Pipeline and Hazardous Materials Safety Administration (PHMSA)
Link: *https://cms.phmsa.dot.gov/data-and-statistics/pipeline/annual-report-mileage-gas-distribution-systems*

Distribution, Transmission & Gathering, LNG, and Liquid Accident and Incident Data
Agency: Pipeline and Hazardous Materials Safety Administration (PHMSA)
Link: *https://www.phmsa.dot.gov/data-and-statistics/pipeline/distribution-transmission-gathering-lng-and-liquid-accident-and-incident-data*

United States Census Bureau Quick Facts
Agency: United States Census Bureau
Link: *https://www.census.gov/quickfacts/fact/table/US/PST045219*

Real Estate Property Costs
Agency: National Association of Realtors
Link: *https://www.nar.realtor/research-and-statistics/housing-statistics/county-median-home-prices-and-monthly-mortgage-payment*

SoCalGas high-pressure pipeline miles
Source: 2020 internal SME data

DIRT - Damage Information Reporting Tool
Source: Internal Incident Data

Warning Mesh Usage Information
Source: Internal Cost (Labor and Material) and Mileage Data

Excess Flow Valve (EFV) Installation Data
Source: Internal Cost (Labor and Material) and Scope Data