



A  Sempra Energy utility®

Order Instituting Investigation into the November) Investigation 19-11-010
2019 Submission of Southern California Gas)
Company's Risk Assessment and Mitigation Phase.)

RISK ASSESSMENT MITGATION PHASE

WORKPAPERS TO

CHAPTER SCG-6

THIRD PARTY DIG-IN ON MEDIUM PRESSURE PIPELINE

November 27, 2019

Chapter	SCG-6		
Risk	Third Party Dig-in on a Medium Pressure Pipeline		

PHMSA Incident Rate

Number of Incidents_National

Type	Number of Incidents_3rd party dig-in		
	Transmission	Distribution_Main	Distribution_Service
MAOP <= 60 psig	-	127	46

SCG

Type	Miles			
	Transmission	Distribution_Main	Distribution_Service	Total
MAOP <= 60 psig	-	47396	50529	97925

National

Type	Miles		
	Transmission	Distribution_Main	Distribution_Service
MAOP <= 60 psig	-	1212344	924770

SCG_3rd party digin

Type	Incident Rate		
	Transmission	Distribution_Main	Distribution_Service
MAOP <= 60 psig	-	0.93	

Chapter	SCG-6
Risk	Third Party Dig-in on a Medium Pressure Pipeline

Single Point

ID	Activity	Project Life In Years	Cost Forecast (O&M, \$M) 2022	Cost Forecast (Capital, \$M)			Pre-Mitigation Single Point		% risk reduction (use if % risk addressed not available) (%)	% Risk Reduction			RSE Single Point	Post-Mitigation Single Point	
				2020	2021	2022	LORE	CORE		Safety	Reliability	Financial (\$M)		LORE	CORE
				SCG-6-M2	Establish a program to address the area of continual excavation	1	0.03	0.00		0.00	0.00	2966		0	0.2%
SCG-6-M3	Recording photographs for each locating mark ticket that is visited by the locator	1	1.96	0.00	0.00	0.00	2966	0	0.1%	0.1%	0.1%	0.35	2963.71	0.32	
SCG-6-M4	Utilize electronic positive response	1	0.22	0.00	0.00	0.00	2966	0	0.0%	0.0%	0.0%	0.62	2965.55	0.32	
SCG-6-M5	Enhance process to leverage excavation technology to help with difficult locates (vacuum excavation technology)	1	1.06	0.00	0.00	0.00	2966	0	1.3%	1.3%	1.3%	10.53	2928.37	0.32	
SCG-6-M8	Install warning mesh above buried company facilities (open trench new facilities only)	50	0.06	0.00	0.00	0.00	2966	0	0.0%	0.0%	0.0%	22.78	2965.84	0.32	
SCG-6-C7	Prevention and Improvements - Refreshed Laptops	5	0.74	0.94	0.94	0.94	2966	0	0.1%	0.1%	0.1%	0.54	2967.95	0.32	
SCG-6-C6	Damage Prevention Analysts Program	1	0.97	0.00	0.00	0.00	2966	0	6.6%	6.6%	6.6%	59.78	3160.81	0.32	
SCG-6-M1	Automate Third Party Excavation Reporting	5	0.00	2.61	2.61	2.61	2966	0	0.0%	0.0%	0.0%	0.03	2965.83	0.32	
SCG-6-M6	Promote process and system improvements in USA ticket routing and monitoring.	1	0.38	0.00	0.00	0.00	2966	0	0.2%	0.2%	0.2%	4.07	2960.86	0.32	
SCG-6-C5	Locate and Mark Quality Assurance Program	1	0.28	0.00	0.00	0.00	2966	0	0.4%	0.4%	0.4%	12.26	2977.49	0.32	
SCG-6-C8-T1	Public Awareness Compliance - Tranche 1: The Affected Public	1	0.71	0.00	0.00	0.00	2966	0	0.5%	0.5%	0.5%	5.69	2979.50	0.32	
SCG-6-C8-T2	Public Awareness Compliance - Tranche 2: Emergency Officials	1	0.07	0.00	0.00	0.00	2966	0	0.0%	0.0%	0.0%	1.77	2966.42	0.32	
SCG-6-C8-T3	Public Awareness Compliance - Tranche 3: Local Public Officials	1	0.21	0.00	0.00	0.00	2966	0	0.1%	0.1%	0.1%	3.77	2968.70	0.32	
SCG-6-C8-T4	Public Awareness Compliance - Tranche 4: Excavators	1	0.43	0.00	0.00	0.00	2966	0	0.8%	0.8%	0.8%	16.97	2990.29	0.32	
SCG-6-C9	Increase Reporting of Unsafe Excavation	1	0.11	0.00	0.00	0.00	2966	0	0.1%	0.1%	0.1%	11.27	2970.20	0.32	
SCG-6-C11	Public Awareness - Meet with Cities with Highest Damage Rates	1	0.26	0.00	0.00	0.00	2966	0	0.0%	0.0%	0.0%	0.90	2966.77	0.32	
SCG-6-C12	Public Awareness - Remain Active Members of the California Regional Common Ground Alliance	1	0.08	0.00	0.00	0.00	2966	0	0.0%	0.0%	0.0%	2.87	2966.74	0.32	
SCG-6-M7	Leverage data gathered by locating equipment	5	0.19	0.00	0.00	0.00	2966	0	0.0%	0.0%	0.0%	0.02	2966.00	0.32	
SCG-6-A1	Alternative: Virtual reality training / simulation to improve locator proficiency	1	0.03	0.00	0.00	0.00	2966	0	0.0%	0.0%	0.0%	0.20	2965.98	0.32	
SCG-6-A2	Alternative: GPS Tracking of Excavation Equipment	1	0.09	0.00	0.00	0.00	2966	0	0.0%	0.0%	0.0%	0.01	2966.00	0.32	

Low Alternative

ID	Activity	Project Life In Years	Cost Forecast (O&M, \$M) 2022	Cost Forecast (Capital, \$M)			Pre-Mitigation Low Alternative		% risk reduction (use if % risk addressed not available) (%)	% Risk Reduction			RSE Low Alternative	Post-Mitigation Low Alternative	
				2020	2021	2022	LORE	CORE		Safety	Reliability	Financial (\$M)		LORE	CORE
				SCG-6-M2	Establish a program to address the area of continual excavation	1	0.03	0.00		0.00	0.00	2966		0	0.2%
SCG-6-M3	Recording photographs for each locating mark ticket that is visited by the locator	1	1.96	0.00	0.00	0.00	2966	0	0.1%	0.1%	0.1%	0.26	2963.71	0.24	
SCG-6-M4	Utilize electronic positive response	1	0.22	0.00	0.00	0.00	2966	0	0.0%	0.0%	0.0%	0.46	2965.55	0.24	
SCG-6-M5	Enhance process to leverage excavation technology to help with difficult locates (vacuum excavation technology)	1	1.06	0.00	0.00	0.00	2966	0	1.3%	1.3%	1.3%	7.85	2928.37	0.24	
SCG-6-M8	Install warning mesh above buried company facilities (open trench new facilities only)	50	0.06	0.00	0.00	0.00	2966	0	0.0%	0.0%	0.0%	16.99	2965.84	0.24	
SCG-6-C7	Prevention and Improvements - Refreshed Laptops	5	0.74	0.94	0.94	0.94	2966	0	0.1%	0.1%	0.1%	0.41	2967.95	0.24	
SCG-6-C6	Damage Prevention Analysts Program	1	0.97	0.00	0.00	0.00	2966	0	6.6%	6.6%	6.6%	44.59	3160.81	0.24	
SCG-6-M1	Automate Third Party Excavation Reporting	5	0.00	2.61	2.61	2.61	2966	0	0.0%	0.0%	0.0%	0.02	2965.83	0.24	
SCG-6-M6	Promote process and system improvements in USA ticket routing and monitoring.	1	0.38	0.00	0.00	0.00	2966	0	0.2%	0.2%	0.2%	3.04	2960.86	0.24	
SCG-6-C5	Locate and Mark Quality Assurance Program	1	0.28	0.00	0.00	0.00	2966	0	0.4%	0.4%	0.4%	9.14	2977.49	0.24	
SCG-6-C8-T1	Public Awareness Compliance - Tranche 1: The Affected Public	1	0.71	0.00	0.00	0.00	2966	0	0.5%	0.5%	0.5%	4.24	2979.50	0.24	
SCG-6-C8-T2	Public Awareness Compliance - Tranche 2: Emergency Officials	1	0.07	0.00	0.00	0.00	2966	0	0.0%	0.0%	0.0%	1.32	2966.42	0.24	
SCG-6-C8-T3	Public Awareness Compliance - Tranche 3: Local Public Officials	1	0.21	0.00	0.00	0.00	2966	0	0.1%	0.1%	0.1%	2.81	2968.70	0.24	
SCG-6-C8-T4	Public Awareness Compliance - Tranche 4: Excavators	1	0.43	0.00	0.00	0.00	2966	0	0.8%	0.8%	0.8%	12.66	2990.29	0.24	
SCG-6-C9	Increase Reporting of Unsafe Excavation	1	0.11	0.00	0.00	0.00	2966	0	0.1%	0.1%	0.1%	8.41	2970.20	0.24	
SCG-6-C11	Public Awareness - Meet with Cities with Highest Damage Rates	1	0.26	0.00	0.00	0.00	2966	0	0.0%	0.0%	0.0%	0.67	2966.77	0.24	
SCG-6-C12	Public Awareness - Remain Active Members of the California Regional Common Ground Alliance	1	0.08	0.00	0.00	0.00	2966	0	0.0%	0.0%	0.0%	2.14	2966.74	0.24	
SCG-6-M7	Leverage data gathered by locating equipment	5	0.19	0.00	0.00	0.00	2966	0	0.0%	0.0%	0.0%	0.01	2966.00	0.24	
SCG-6-A1	Alternative: Virtual reality training / simulation to improve locator proficiency	1	0.03	0.00	0.00	0.00	2966	0	0.0%	0.0%	0.0%	0.15	2965.98	0.24	
SCG-6-A2	Alternative: GPS Tracking of Excavation Equipment	1	0.09	0.00	0.00	0.00	2966	0	0.0%	0.0%	0.0%	0.01	2966.00	0.24	

Chapter	SCG-6
Risk	Third Party Dig-in on a Medium Pressure Pipeline

High Alternative

ID	Activity	Project Life	Cost Forecast (O&M, \$M)	Cost Forecast (Capital, \$M)			Post-Mitigation High Alternative		% risk reduction (use if % risk addressed not available) (%)	% Risk Reduction			RSE	Post-Mitigation High Alternative	
		In Years	2022	2020	2021	2022	LORE	CORE		% scope	% of effectiveness	High Alternative	LORE	CORE	
		1	0.03	0.00	0.00	0.00	0.00	2966		0	0.2%	0.2%	0.2%	78.14	2961.20
SCG-6-M2	Establish a program to address the area of continual excavation	1	0.03	0.00	0.00	0.00	2966	0		0.2%	0.2%	0.2%	78.14	2961.20	0.45
SCG-6-M3	Recording photographs for each locating mark ticket that is visited by the locator	1	1.96	0.00	0.00	0.00	2966	0		0.1%	0.1%	0.1%	0.50	2963.71	0.45
SCG-6-M4	Utilize electronic positive response	1	0.22	0.00	0.00	0.00	2966	0		0.0%	0.0%	0.0%	0.89	2965.55	0.45
SCG-6-M5	Enhance process to leverage excavation technology to help with difficult locates (vacuum excavation technology)	1	1.06	0.00	0.00	0.00	2966	0		1.3%	1.3%	1.3%	14.99	2928.37	0.45
SCG-6-M8	Install warning mesh above buried company facilities (open trench new facilities only)	50	0.06	0.00	0.00	0.00	2966	0		0.0%	0.0%	0.0%	32.42	2965.84	0.45
SCG-6-C7	Prevention and Improvements - Refreshed Laptops	5	0.74	0.94	0.94	0.94	2966	0		0.1%	0.1%	0.1%	0.77	2967.95	0.45
SCG-6-C6	Damage Prevention Analysts Program	1	0.97	0.00	0.00	0.00	2966	0		6.6%	6.6%	6.6%	85.10	3160.81	0.45
SCG-6-M1	Automate Third Party Excavation Reporting	5	0.00	2.61	2.61	2.61	2966	0		0.0%	0.0%	0.0%	0.04	2965.83	0.45
SCG-6-M6	Promote process and system improvements in USA ticket routing and monitoring.	1	0.38	0.00	0.00	0.00	2966	0		0.2%	0.2%	0.2%	5.79	2960.86	0.45
SCG-6-C5	Locate and Mark Quality Assurance Program	1	0.28	0.00	0.00	0.00	2966	0		0.4%	0.4%	0.4%	17.45	2977.49	0.45
SCG-6-C8-T1	Public Awareness Compliance - Tranche 1: The Affected Public	1	0.71	0.00	0.00	0.00	2966	0		0.5%	0.5%	0.5%	8.10	2979.50	0.45
SCG-6-C8-T2	Public Awareness Compliance - Tranche 2: Emergency Officials	1	0.07	0.00	0.00	0.00	2966	0		0.0%	0.0%	0.0%	2.51	2966.42	0.45
SCG-6-C8-T3	Public Awareness Compliance - Tranche 3: Local Public Officials	1	0.21	0.00	0.00	0.00	2966	0		0.1%	0.1%	0.1%	5.37	2968.70	0.45
SCG-6-C8-T4	Public Awareness Compliance - Tranche 4: Excavators	1	0.43	0.00	0.00	0.00	2966	0		0.8%	0.8%	0.8%	24.16	2990.29	0.45
SCG-6-C9	Increase Reporting of Unsafe Excavation	1	0.11	0.00	0.00	0.00	2966	0		0.1%	0.1%	0.1%	16.05	2970.20	0.45
SCG-6-C11	Public Awareness - Meet with Cities with Highest Damage Rates	1	0.26	0.00	0.00	0.00	2966	0		0.0%	0.0%	0.0%	1.28	2966.77	0.45
SCG-6-C12	Public Awareness - Remain Active Members of the California Regional Common Ground Alliance	1	0.08	0.00	0.00	0.00	2966	0		0.0%	0.0%	0.0%	4.08	2966.74	0.45
SCG-6-M7	Leverage data gathered by locating equipment	5	0.19	0.00	0.00	0.00	2966	0		0.0%	0.0%	0.0%	0.02	2966.00	0.45
SCG-6-A1	Alternative: Virtual reality training / simulation to improve locator proficiency	1	0.03	0.00	0.00	0.00	2966	0		0.0%	0.0%	0.0%	0.29	2965.98	0.45
SCG-6-A2	Alternative: GPS Tracking of Excavation Equipment	1	0.09	0.00	0.00	0.00	2966	0		0.0%	0.0%	0.0%	0.01	2966.00	0.45

SCG-6-C5: Locate and Mark Quality Assurance Program

Attribute	Risk Reduction		Formula	Basis			Reference	Project Life	
		Total		Scope	Effectiveness	Risk Addressed			
Safety	% Scope	100.00%	0.40%	100% of activities will benefit	SME Estimate	SME Estimate	Based on a mapping of the 2018 DIRT database causes, this mitigation addresses 8% of the risk sources	1	
	% Effectiveness	5.00%							Above-marginal impact on reducing mismarks
	% Risk Addressed	8%							Mapping of the 2018 DIRT data causes
Reliability	% Scope	100.00%	0.40%	100% of activities will benefit	SME Estimate	SME Estimate	Based on a mapping of the 2018 DIRT database causes, this mitigation addresses 8% of the risk sources		
	% Effectiveness	5.00%							Above-marginal impact on reducing mismarks
	% Risk Addressed	8%							Mapping of the 2018 DIRT data causes
Financial	% Scope	100.00%	0.40%	100% of activities will benefit	SME Estimate	SME Estimate	Based on a mapping of the 2018 DIRT database causes, this mitigation addresses 8% of the risk sources		
	% Effectiveness	5.00%							Above-marginal impact on reducing mismarks
	% Risk Addressed	8%							Mapping of the 2018 DIRT data causes

SCG-6-C6: Damage Prevention Analyst Program

Attribute	Risk Reduction		Formula	Basis			Reference	Project Life	
		Total		Scope	Effectiveness	Risk Addressed			
Safety	% Scope	100.00%	6.50%	100% of the excavation tickets	SME Estimate	SME Estimate	Based on a mapping of the 2018 DIRT database causes, this mitigation addresses 26% of the risk sources	1	
	% Effectiveness	25.00%							Numerous impacted activities
	% Risk Addressed	26%							Mapping of the 2018 DIRT data causes
Reliability	% Scope	100.00%	6.50%	100% of the excavation tickets	SME Estimate	SME Estimate	Based on a mapping of the 2018 DIRT database causes, this mitigation addresses 26% of the risk sources		
	% Effectiveness	25.00%							Numerous impacted activities
	% Risk Addressed	26%							Mapping of the 2018 DIRT data causes
Financial	% Scope	100.00%	6.50%	100% of the excavation tickets	SME Estimate	SME Estimate	Based on a mapping of the 2018 DIRT database causes, this mitigation addresses 26% of the risk sources		
	% Effectiveness	25.00%						Numerous impacted activities	
	% Risk Addressed	26%						Mapping of the 2018 DIRT data causes	

SCG-6-C8 - T2: Public Awareness Compliance - Emergency Officials

Attribute	Risk Reduction		Formula	Basis			Reference	Project Life	
		Total		Scope	Effectiveness	Risk Addressed			
Safety	% Scope	5.00%	0.01%	<i>Impacted population</i>	SME Estimate	SME Estimate	Based on a mapping of the 2018 DIRT database causes, this mitigation addresses 28% of the risk sources	1	
	% Effectiveness	1.00%							<i>Some effectiveness as Affected Public Tranche</i>
	% Risk Addressed	28%							<i>Mapping of the 2018 DIRT data causes</i>
Reliability	% Scope	5.00%	0.01%	<i>Impacted population</i>	SME Estimate	SME Estimate	Based on a mapping of the 2018 DIRT database causes, this mitigation addresses 28% of the risk sources		
	% Effectiveness	1.00%							<i>Some effectiveness as Affected Public Tranche</i>
	% Risk Addressed	28%							<i>Mapping of the 2018 DIRT data causes</i>
Financial	% Scope	5.00%	0.01%	<i>Impacted population</i>	SME Estimate	SME Estimate	Based on a mapping of the 2018 DIRT database causes, this mitigation addresses 28% of the risk sources		
	% Effectiveness	1.00%							<i>Some effectiveness as Affected Public Tranche</i>
	% Risk Addressed	28%							<i>Mapping of the 2018 DIRT data causes</i>

SCG-6-C8 - T3: Public Awareness Compliance - Local Public Officials

Attribute	Risk Reduction		Formula	Basis			Reference	Project Life	
		Total		Scope	Effectiveness	Risk Addressed			
Safety	% Scope	15.00%	0.09%	<i>Impacted population</i>	SME Estimate	SME Estimate	Based on a mapping of the 2018 DIRT database causes, this mitigation addresses 61% of the risk sources	1	
	% Effectiveness	1.00%							<i>Minimal impact</i>
	% Risk Addressed	61%							<i>Mapping of the 2018 DIRT data causes</i>
Reliability	% Scope	15.00%	0.09%	<i>Impacted population</i>	SME Estimate	SME Estimate	Based on a mapping of the 2018 DIRT database causes, this mitigation addresses 61% of the risk sources		
	% Effectiveness	1.00%							<i>Minimal impact</i>
	% Risk Addressed	61%							<i>Mapping of the 2018 DIRT data causes</i>
Financial	% Scope	15.00%	0.09%	<i>Impacted population</i>	SME Estimate	SME Estimate	Based on a mapping of the 2018 DIRT database causes, this mitigation addresses 61% of the risk sources		
	% Effectiveness	1.00%							<i>Minimal impact</i>
	% Risk Addressed	61%							<i>Mapping of the 2018 DIRT data causes</i>

SCG-6-C8 - T4: Public Awareness Compliance - Excavators

Attribute	Risk Reduction		Formula	Basis			Reference	Project Life	
		Total		Scope	Effectiveness	Risk Addressed			
Safety	% Scope	30.00%	0.82%	<i>Impacted population</i>	SME Estimate	SME Estimate	Based on a mapping of the 2018 DIRT database causes, this mitigation addresses 91% of the risk sources	1	
	% Effectiveness	3.00%							<i>More effective than other diggers (expected)</i>
	% Risk Addressed	91%							<i>Mapping of the 2018 DIRT data causes</i>
Reliability	% Scope	30.00%	0.82%	<i>Impacted population</i>	SME Estimate	SME Estimate	Based on a mapping of the 2018 DIRT database causes, this mitigation addresses 91% of the risk sources		
	% Effectiveness	3.00%							<i>More effective than other diggers (expected)</i>
	% Risk Addressed	91%							<i>Mapping of the 2018 DIRT data causes</i>
Financial	% Scope	30.00%	0.82%	<i>Impacted population</i>	SME Estimate	SME Estimate	Based on a mapping of the 2018 DIRT database causes, this mitigation addresses 91% of the risk sources		
	% Effectiveness	3.00%							<i>More effective than other diggers (expected)</i>
	% Risk Addressed	91%							<i>Mapping of the 2018 DIRT data causes</i>

SCG-6-C9: Increase Reporting of Unsafe Excavation

Attribute	Risk Reduction		Formula	Basis			Reference	Project Life	
		Total		Scope	Effectiveness	Risk Addressed			
Safety	% Scope	1.00%	0.14%	<i>Reported problematic excavators</i>	Historical information	SME Estimate	Based on a mapping of the 2018 DIRT database causes, this mitigation addresses 47% of the risk sources	1	
	% Effectiveness	30.00%							<i>Observed increase in excavator notifications</i>
	% Risk Addressed	47%							<i>Mapping of the 2018 DIRT data causes</i>
Reliability	% Scope	1.00%	0.14%	<i>Reported problematic excavators</i>	Historical information	SME Estimate	Based on a mapping of the 2018 DIRT database causes, this mitigation addresses 47% of the risk sources		
	% Effectiveness	30.00%							<i>Observed increase in excavator notifications</i>
	% Risk Addressed	47%							<i>Mapping of the 2018 DIRT data causes</i>
Financial	% Scope	1.00%	0.14%	<i>Reported problematic excavators</i>	Historical information	SME Estimate	Based on a mapping of the 2018 DIRT database causes, this mitigation addresses 47% of the risk sources		
	% Effectiveness	30.00%							<i>Observed increase in excavator notifications</i>
	% Risk Addressed	47%							<i>Mapping of the 2018 DIRT data causes</i>

SCG-6-C11: Public Awareness - Meet with Cities with Highest Damage Rates

Attribute	Risk Reduction		Formula	Basis			Reference	Project Life			
		Total		Scope	Effectiveness	Risk Addressed					
Safety	% Scope	3.00%	0.03%	SME Estimate	SME Estimate	Based on a mapping of the 2018 DIRT database causes, this mitigation addresses 89% of the risk sources		1			
	% Effectiveness	1.00%							<i>Top 3% of cities (7 cities out of 240 total)</i>		
	% Risk Addressed	89%							<i>Some effectiveness as Affected Public Tranche</i>		
Reliability	% Scope	3.00%	0.03%	SME Estimate	SME Estimate	Based on a mapping of the 2018 DIRT database causes, this mitigation addresses 89% of the risk sources			1		
	% Effectiveness	1.00%								<i>Top 3% of cities (7 cities out of 240 total)</i>	
	% Risk Addressed	89%								<i>Some effectiveness as Affected Public Tranche</i>	
Financial	% Scope	3.00%	0.03%	SME Estimate	SME Estimate	Based on a mapping of the 2018 DIRT database causes, this mitigation addresses 89% of the risk sources	2018 DIRT database			1	
	% Effectiveness	1.00%									<i>Top 3% of cities (7 cities out of 240 total)</i>
	% Risk Addressed	89%									<i>Some effectiveness as Affected Public Tranche</i>

SCG-6-C12: Public Awareness - Remain Active Members of the California Regional Common Ground Alliance

Attribute	Risk Reduction		Formula	Basis			Reference	Project Life	
		Total		Scope	Effectiveness	Risk Addressed			
Safety	% Scope	50.00%	0.03%	SME Estimate	SME Estimate	Based on a mapping of the 2018 DIRT database causes, this mitigation addresses 100% of the risk sources		1	
	% Effectiveness	0.05%							<i>Affected policies</i>
	% Risk Addressed	100%							<i>Marginal Improvement</i>
Reliability	% Scope	50.00%	0.03%	SME Estimate	SME Estimate	Based on a mapping of the 2018 DIRT database causes, this mitigation addresses 100% of the risk sources		1	
	% Effectiveness	0.05%							<i>Affected policies</i>
	% Risk Addressed	100%							<i>Marginal Improvement</i>
Financial	% Scope	50.00%	0.03%	SME Estimate	SME Estimate	Based on a mapping of the 2018 DIRT database causes, this mitigation addresses 100% of the risk sources	2018 DIRT database	1	
	% Effectiveness	0.05%							<i>Affected policies</i>
	% Risk Addressed	100%							<i>Marginal Improvement</i>

SCG-6-M1: Automate Third Party Excavation Incident Reporting

Attribute	Risk Reduction		Formula	Basis			Reference	Project Life	
		Total		Scope	Effectiveness	Risk Addressed			
Safety	% Scope	100.00%	0.005%	100% as it applies to all stakeholder groups	SME Estimate	SME Estimate	Based on a mapping of the 2018 DIRT database causes, this mitigation addresses 1% of the risk sources	5	
	% Effectiveness	0.5%							Marginal Improvement
	% Risk Addressed	1%							Mapping of the 2018 DIRT data causes
Reliability	% Scope	100.00%	0.005%	100% as it applies to all stakeholder groups	SME Estimate	SME Estimate	Based on a mapping of the 2018 DIRT database causes, this mitigation addresses 1% of the risk sources		
	% Effectiveness	0.5%							Marginal Improvement
	% Risk Addressed	1%							Mapping of the 2018 DIRT data causes
Financial	% Scope	100.00%	0.005%	100% as it applies to all stakeholder groups	SME Estimate	SME Estimate	Based on a mapping of the 2018 DIRT database causes, this mitigation addresses 1% of the risk sources		
	% Effectiveness	0.5%						Marginal Improvement	
	% Risk Addressed	1%						Mapping of the 2018 DIRT data causes	

SCG-6-M2: Establish a Program to Address the Area of Continual Excavation

Attribute	Risk Reduction		Formula	Basis			Reference	Project Life			
		Total		Scope	Effectiveness	Risk Addressed					
Safety	% Scope	0.50%	0.162%	SME Estimate	SME Estimate	Based on a mapping of the 2018 DIRT database causes, this mitigation addresses 36% of the risk sources		1			
	% Effectiveness	90.0%							<i>Proportion of farmers to heavy machinery excavators</i>		
	% Risk Addressed	36%							<i>Percentage following procedure</i>		
Reliability	% Scope	0.50%	0.162%	SME Estimate	SME Estimate	Based on a mapping of the 2018 DIRT database causes, this mitigation addresses 36% of the risk sources			1		
	% Effectiveness	90.0%								<i>Proportion of farmers to heavy machinery excavators</i>	
	% Risk Addressed	36%								<i>Percentage following procedure</i>	
Financial	% Scope	0.50%	0.162%	SME Estimate	SME Estimate	Based on a mapping of the 2018 DIRT database causes, this mitigation addresses 36% of the risk sources	2018 DIRT database			1	
	% Effectiveness	90.0%									<i>Proportion of farmers to heavy machinery excavators</i>
	% Risk Addressed	36%									<i>Percentage following procedure</i>

SCG-6-M3: Recording Photographs for Each Locate and Mark Ticket Visited by Locator

Attribute	Risk Reduction		Formula	Basis			Reference	Project Life	
		Total		Scope	Effectiveness	Risk Addressed			
Safety	% Scope	100.00%	0.080%	100% of tickets have associated photographs	SME Estimate	SME Estimate	Based on a mapping of the 2018 DIRT database causes, this mitigation addresses 8% of the risk sources	1	
	% Effectiveness	1.0%							Marginal in nature
	% Risk Addressed	8%							Mapping of the 2018 DIRT data causes
Reliability	% Scope	100.00%	0.080%	100% of tickets have associated photographs	SME Estimate	SME Estimate	Based on a mapping of the 2018 DIRT database causes, this mitigation addresses 8% of the risk sources		
	% Effectiveness	1.0%							Marginal in nature
	% Risk Addressed	8%							Mapping of the 2018 DIRT data causes
Financial	% Scope	100.00%	0.080%	100% of tickets have associated photographs	SME Estimate	SME Estimate	Based on a mapping of the 2018 DIRT database causes, this mitigation addresses 8% of the risk sources		
	% Effectiveness	1.0%							Marginal in nature
	% Risk Addressed	8%							Mapping of the 2018 DIRT data causes

SCG-6-M4: Utilize Electronic Positive Response

Attribute	Risk Reduction		Formula	Basis			Reference	Project Life	
		Total		Scope	Effectiveness	Risk Addressed			
Safety	% Scope	100.00%	0.020%	100% of tickets will have EPR available	SME Estimate	SME Estimate	Based on a mapping of the 2018 DIRT database causes, this mitigation addresses 8% of the risk sources	1	
	% Effectiveness	1.0%							Marginal impact on excavator behavior
	% Risk Addressed	2%							Mapping of the 2018 DIRT data causes
Reliability	% Scope	100.00%	0.020%	100% of tickets will have EPR available	SME Estimate	SME Estimate	Based on a mapping of the 2018 DIRT database causes, this mitigation addresses 8% of the risk sources		
	% Effectiveness	1.0%							Marginal impact on excavator behavior
	% Risk Addressed	2%							Mapping of the 2018 DIRT data causes
Financial	% Scope	100.00%	0.020%	100% of tickets will have EPR available	SME Estimate	SME Estimate	Based on a mapping of the 2018 DIRT database causes, this mitigation addresses 8% of the risk sources		
	% Effectiveness	1.0%							Marginal impact on excavator behavior
	% Risk Addressed	2%							Mapping of the 2018 DIRT data causes

SCG-6-M5: Enhance Process to Leverage Excavation Technology to Help with Difficult Locates (Vacuum Excavation Technology)

Attribute	Risk Reduction		Formula	Basis			Reference	Project Life	
		Total		Scope	Effectiveness	Risk Addressed			
Safety	% Scope	15.00%	1.283%	SME Estimate	SME Estimate	Based on a mapping of the 2018 DIRT database causes, this mitigation addresses 9% of the risk sources		1	
	% Effectiveness	95.0%							<i>15% of targeted locations will be assisted</i>
	% Risk Addressed	9%							<i>High effectiveness</i>
Reliability	% Scope	15.00%	1.283%	SME Estimate	SME Estimate	Based on a mapping of the 2018 DIRT database causes, this mitigation addresses 9% of the risk sources		1	
	% Effectiveness	95.0%							<i>15% of targeted locations will be assisted</i>
	% Risk Addressed	9%							<i>High effectiveness</i>
Financial	% Scope	15.00%	1.283%	SME Estimate	SME Estimate	Based on a mapping of the 2018 DIRT database causes, this mitigation addresses 9% of the risk sources	2018 DIRT database	1	
	% Effectiveness	95.0%							<i>15% of targeted locations will be assisted</i>
	% Risk Addressed	9%							<i>High effectiveness</i>

SCG-6-M6: Promote Process and System Improvements in 811 USA Ticket Routing and Monitoring

Attribute	Risk Reduction		Formula	Basis			Reference	Project Life	
		Total		Scope	Effectiveness	Risk Addressed			
Safety	% Scope	100.00%	0.150%	100% of tickets, all stakeholder groups	SME Estimate	SME Estimate	Based on a mapping of the 2018 DIRT database causes, this mitigation addresses 1% of the risk sources	1	
	% Effectiveness	15.0%							Closely tied to the Damage Prevention Analysts program
	% Risk Addressed	1%							Mapping of the 2018 DIRT data causes
Reliability	% Scope	100.00%	0.150%	100% of tickets, all stakeholder groups	SME Estimate	SME Estimate	Based on a mapping of the 2018 DIRT database causes, this mitigation addresses 1% of the risk sources	1	
	% Effectiveness	15.0%							Closely tied to the Damage Prevention Analysts program
	% Risk Addressed	1%							Mapping of the 2018 DIRT data causes
Financial	% Scope	100.00%	0.150%	100% of tickets, all stakeholder groups	SME Estimate	SME Estimate	Based on a mapping of the 2018 DIRT database causes, this mitigation addresses 1% of the risk sources	1	
	% Effectiveness	15.0%							Closely tied to the Damage Prevention Analysts program
	% Risk Addressed	1%							Mapping of the 2018 DIRT data causes

SCG-6-M7: Leverage Data Gathered by Locating Equipment

Attribute	Risk Reduction		Formula	Basis			Reference	Project Life	
		Total		Scope	Effectiveness	Risk Addressed			
Safety	% Scope	25.00%	0.000%	<i>Midpoint of range</i>	SME Estimate	SME Estimate	Based on a mapping of the 2018 DIRT database causes, this mitigation addresses 3% of the risk sources	5	
	% Effectiveness	0.01%							<i>Marginal effectiveness</i>
	% Risk Addressed	3%							<i>Mapping of the 2018 DIRT data causes</i>
Reliability	% Scope	25.00%	0.000%	<i>Midpoint of range</i>	SME Estimate	SME Estimate	Based on a mapping of the 2018 DIRT database causes, this mitigation addresses 3% of the risk sources		
	% Effectiveness	0.01%							<i>Marginal effectiveness</i>
	% Risk Addressed	3%							<i>Mapping of the 2018 DIRT data causes</i>
Financial	% Scope	25.00%	0.000%	<i>Midpoint of range</i>	SME Estimate	SME Estimate	Based on a mapping of the 2018 DIRT database causes, this mitigation addresses 3% of the risk sources		
	% Effectiveness	0.01%							<i>Marginal effectiveness</i>
	% Risk Addressed	3%							<i>Mapping of the 2018 DIRT data causes</i>

SCG-6-M8: Install Warning Mesh Above Buried Company Facilities

Attribute	Risk Reduction		Formula	Basis			Reference	Project Life	
		Total		Scope	Effectiveness	Risk Addressed			
Safety	% Scope	0.04%	0.005%	<i>Procurement / System size</i>	Funding based	SME Estimate	Based on a mapping of the 2018 DIRT database causes, this mitigation addresses 3% of the risk sources	50	
	% Effectiveness	50.00%							<i>High effectiveness</i>
	% Risk Addressed	25%							<i>Mapping of the 2018 DIRT data causes</i>
Reliability	% Scope	0.04%	0.005%	<i>Procurement / System size</i>	Funding based	SME Estimate	Based on a mapping of the 2018 DIRT database causes, this mitigation addresses 3% of the risk sources		
	% Effectiveness	50.00%							<i>High effectiveness</i>
	% Risk Addressed	25%							<i>Mapping of the 2018 DIRT data causes</i>
Financial	% Scope	0.04%	0.005%	<i>Procurement / System size</i>	Funding based	SME Estimate	Based on a mapping of the 2018 DIRT database causes, this mitigation addresses 3% of the risk sources		
	% Effectiveness	50.00%							<i>High effectiveness</i>
	% Risk Addressed	25%							<i>Mapping of the 2018 DIRT data causes</i>

SCG-6-A1: Virtual Reality Training/Simulation to Improve Locator Proficiency

Attribute	Risk Reduction		Formula	Basis			Reference	Project Life	
		Total		Scope	Effectiveness	Risk Addressed			
Safety	% Scope	100.00%	0.001%	100% of locations would receive UTTO VR Tools	SME Estimate	SME Estimate	Based on a mapping of the 2018 DIRT database causes, this mitigation addresses 6% of the risk sources	1	
	% Effectiveness	0.01%							Minimal impact
	% Risk Addressed	6%							Mapping of the 2018 DIRT data causes
Reliability	% Scope	100.00%	0.001%	100% of locations would receive UTTO VR Tools	SME Estimate	SME Estimate	Based on a mapping of the 2018 DIRT database causes, this mitigation addresses 6% of the risk sources		
	% Effectiveness	0.01%							Minimal impact
	% Risk Addressed	6%							Mapping of the 2018 DIRT data causes
Financial	% Scope	100.00%	0.001%	100% of locations would receive UTTO VR Tools	SME Estimate	SME Estimate	Based on a mapping of the 2018 DIRT database causes, this mitigation addresses 6% of the risk sources		
	% Effectiveness	0.01%							Minimal impact
	% Risk Addressed	6%							Mapping of the 2018 DIRT data causes

SCG-6-A2: GPS Tracking of Excavation Equipment

Attribute	Risk Reduction		Formula	Basis			Reference	Project Life	
		Total		Scope	Effectiveness	Risk Addressed			
Safety	% Scope	25.00%	0.000%	Average of available opportunities	SME Estimate	SME Estimate	Based on a mapping of the 2018 DIRT database causes, this mitigation addresses 3% of the risk sources	1	
	% Effectiveness	0.01%							Minimal impact
	% Risk Addressed	3%							Mapping of the 2018 DIRT data causes
Reliability	% Scope	25.00%	0.000%	Average of available opportunities	SME Estimate	SME Estimate	Based on a mapping of the 2018 DIRT database causes, this mitigation addresses 3% of the risk sources		
	% Effectiveness	0.01%							Minimal impact
	% Risk Addressed	3%							Mapping of the 2018 DIRT data causes
Financial	% Scope	25.00%	0.000%	Average of available opportunities	SME Estimate	SME Estimate	Based on a mapping of the 2018 DIRT database causes, this mitigation addresses 3% of the risk sources		
	% Effectiveness	0.01%							Minimal impact
	% Risk Addressed	3%							Mapping of the 2018 DIRT data causes