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VOLUME II

WP-474 – 967

SCG Reasonableness Review
Valve Enhancement Project Workpapers

SCG Reasonableness Review Valve Enhancement Project Workpapers

REASONABLENESS REVIEW VALVE ENHANCEMENT PROJECTS

Table 3 – Valve Project Bundles submitted in the 2024 Reasonableness Review

Valve Workpaper Title	Project Scope (valves, sites)	Workpaper Volume	Workpaper Page
29 Palms Valve Enhancement Project - Indian Canyon	1 valve, 1 site	II.	WP-474
29 Palms Valve Enhancement Project - Mohawk Trail	1 valve, 1 site	II.	WP-491
29 Palms Valve Enhancement Project - Sunburst Street	1 valve, 1 site	II.	WP-506
29 Palms Valve Enhancement Project - Utah Trail	1 valve, 1 site	II.	WP-523
45-120 Valve Enhancement Project	1 valve, 1 site	II.	WP-540
225 Valve Enhancement Project - Beartrap	1 valve, 1 site	II.	WP-558
225 Valve Enhancement Project - Quail Canal	1 valve, 1 site	II.	WP-575
404-406 Valley Bundle Valve Enhancement Project	8 valves, 4 sites	II.	WP-592
404-406 Ventura Valve Enhancement Project - Somis Yard	1 valve, 1 site	II.	WP-624
1014 Olympic Valve Enhancement Project	6 valves, 2 sites	II.	WP-641
1018 Valve Enhancement Project - Alipaz Street	1 valve, 1 site	II.	WP-667
1018 Valve Enhancement Project - Avery Parkway	1 valve, 1 site	II.	WP-684
1018 Valve Enhancement Project - Burt Road	2 valves, 1 site	II.	WP-702
1018 Valve Enhancement Project - Camino Capistrano	1 valve, 1 site	II.	WP-720
1018 Valve Enhancement Project - El Toro Road	1 valve, 1 site	II.	WP-740
1018 Valve Enhancement Project - Harvard & Alton	3 valves, 1 site	II.	WP-759
2000 Beaumont Riverside 2016 Valve Enhancement Project Bundle	4 valves, 4 sites	II.	WP-778
4000 Valve Enhancement Project - Camp Rock Road	1 valve, 1 site	II.	WP-807
4000 Valve Enhancement Project - Desert View Road	1 valve, 1 site	II.	WP-824
4000 Valve Enhancement Project - Devore Station	2 valves, 1 site	II.	WP-841
4000 Valve Enhancement Project - Powerline Road	1 valve, 1 site	II.	WP-858
4002 Fontana Valve Enhancement Project - Etiwanda & 4th	1 valve, 1 site	II.	WP-875
7000 Valve Enhancement Project - Beech & Highway 46	1 valve, 1 site	II.	WP-894
7000 Valve Enhancement Project - Melcher & Elmo	3 valves, 1 site	II.	WP-912
7000 Valve Enhancement Project - Road 68 & Avenue 232	1 valve, 1 site	II.	WP-931
7000 Valve Enhancement Project - Road 96 & Avenue 198	1 valve, 1 site	II.	WP-949
7000 Valve Enhancement Project - Visalia Station	2 valves, 1 site	III.	WP-968
Adelanto Valve Enhancement Project - MLV 4	1 valve, 1 site	III.	WP-987
Apple Valley Valve Enhancement Project - MLV 2	1 valve, 1 site	III.	WP-1003
Apple Valley Valve Enhancement Project - MLV 13	1 valve, 1 site	III.	WP-1020
Aviation & 104th Valve Enhancement Project	5 valves, 1 site	III.	WP-1038
Banning 2001 Valve Enhancement Project - MLV 14.3A	3 valves, 1 site	III.	WP-1063
Banning 2001 Valve Enhancement Project - MLV 14A	1 valve, 1 site	III.	WP-1081
Banning 2001 Valve Enhancement Project - MLV 16A	1 valve, 1 site	III.	WP-1098

REASONABLENESS REVIEW VALVE ENHANCEMENT PROJECTS

Valve Workpaper Title	Project Scope (valves, sites)	Workpaper Volume	Workpaper Page
Banning 2001 Valve Enhancement Project - MLV 17A	1 valve, 1 site	III.	WP-1116
Banning Airport Valve Enhancement Project	2 valves, 1 site	III.	WP-1133
Blythe Valve Enhancement Project - Cactus City	1 valve, 1 site	III.	WP-1151
Brea Valve Enhancement Project - Atwood Station	3 valves, 1 site	III.	WP-1169
Brea Valve Enhancement Project - Carbon Canyon	1 valve, 1 site	III.	WP-1186
Brea Valve Enhancement Project - Gale & Azusa	1 valve, 1 site	III.	WP-1203
Brea Valve Enhancement Project - Brea Canyon	3 valves, 1 site	III.	WP-1220
Burbank Valve Enhancement Project - Riverside & Agnes	1 valve, 1 site	III.	WP-1238
Carpinteria Valve Enhancement Project - Oxy & Rincon	1 valve, 1 site	III.	WP-1254
Del Amo Station Valve Enhancement Project	3 valves, 1 site	III.	WP-1271
Fontana 4000-4002 Valve Enhancement Project - Benson & Chino	1 valve, 1 site	III.	WP-1288
Glendale Valve Enhancement Project - Geneva & Monterey	1 valve, 1 site	III.	WP-1309
Indio Valve Enhancement Project - MLVs 8, 8A, & 8B	3 valves, 2 sites	III.	WP-1326
Indio Valve Enhancement Project - MLV 9A & 9B	2 valves, 1 site	III.	WP-1347
Indio Valve Enhancement Project - MLVs 10, 10A, & 10B	3 valves, 1 site	III.	WP-1366
Palowalla Valve Enhancement Project	3 valves, 1 site	III.	WP-1385
Rainbow 2017 Valve Enhancement Project - Martin & Ramona	2 valves, 1 site	III.	WP-1402
Rainbow Check Valve Enhancement Project - Newport & Briggs	1 valve, 1 site	III.	WP-1418
Rainbow Check Valve Enhancement Project - Scott & El Centro	2 valves, 1 site	III.	WP-1434
Rainbow Check Valve Enhancement Project - Rainbow Valley & Pechanga	2 valves, 1 site	III.	WP-1450
Rainbow CV Valve Enhancement Project - Ramona & Lakeview	2 valves, 1 site	III.	WP-1467
Rainbow Valve Enhancement Project - MLV 5	3 valves, 1 site	IV.	WP-1483
Santa Barbara County Valve Enhancement Project - Lions	1 valve, 1 site	IV.	WP-1500
Spence Station Valve Enhancement Project	1 valve, 1 site	IV.	WP-1520
Taft Valve Enhancement Project - 7th Standard	1 valve, 1 site	IV.	WP-1536
Taft Valve Enhancement Project - Buttonwillow	1 valve, 1 site	IV.	WP-1553
Taft Valve Enhancement Project - Hageman & Renfro	2 valves, 1 site	IV.	WP-1571
Taft Valve Enhancement Project – Sycamore Road	1 valve, 1 site	IV.	WP-1592
Victorville COMMS Valve Enhancement Project - MLV 11	1 valve, 1 site	IV.	WP-1609
Victorville COMMS Valve Enhancement Project - MLV 12	1 valve, 1 site	IV.	WP-1626
Western Del Rey Valve Enhancement Project - Mississippi & Armacost	1 valve, 1 site	IV.	WP-1643
Wilmington Valve Enhancement Project - Eubank Station	2 valves, 1 site	IV.	WP-1660

I. 29 PALMS VALVE ENHANCEMENT PROJECT - INDIAN CANYON

A. Background and Summary

The 29 Palms Valve Enhancement Project – Indian Canyon consists of valve enhancements made to an existing mainline valve (MLV) located in an unincorporated area within Riverside County. Through this project, SoCalGas enhanced the safety of its natural gas transmission system by enabling the rapid detection of a significant change in pipeline pressure and remote isolation and depressurization of a portion of Line 6916 in the event of a pipeline rupture. SoCalGas installed a new block wall, new power equipment, new communications equipment, and the necessary automation equipment at the site. The total loaded project cost is $1,496,887.

The 29 Palms Valve Enhancement Project – Indian Canyon construction site is within an existing SoCalGas facility located in a remote desert region near Indian Canyon Drive in Riverside County. SoCalGas bundled this valve project with three additional valve projects, the 29 Palms Valve Enhancement Projects – Mohawk Trail, Sunburst Street, and Utah Trail, to gain efficiencies in engineering, planning, and construction activities. This workpaper describes the construction activities and costs of the 29 Palms Valve Enhancement Project – Indian Canyon. This project was designed and executed as one cohesive project. However, the project costs were shared by PSEP and the Operating District with the Operating District funding half of the cost of the new block wall.

Final Report for 29 Palms Valve Enhancement Project – Indian Canyon

Table 1: General Project Information

29 Palms Valve Enhancement Project - Indian Canyon			
Location	Riverside County		
Days on Site	32 days		
Construction Start	10/16/2017		
Construction Finish	01/18/2018		
Commissioning Date	06/05/2019		
Valve Upgrades			
Valve Number	6916-105.00-0		
Valve Type	Existing – Ball		
Actuator	Existing		
Actuator Above-/Below-Grade	Above-Grade		
ASV	Yes		
RCV	Yes		
Site Upgrades			
Vault	Existing		
Power	New – Solar		
Communication	New – Radio		
SCADA Panel	New		
Equipment Shelter	None		
Wall	New		
Project Costs ($)	**Capital**	**O&M**	**Total**
Loaded Project Costs	1,496,887	-	1,496,887
Disallowed Costs	-	-	-

B. Maps and Images

Figure 1: 29 Palms Bundle Overview

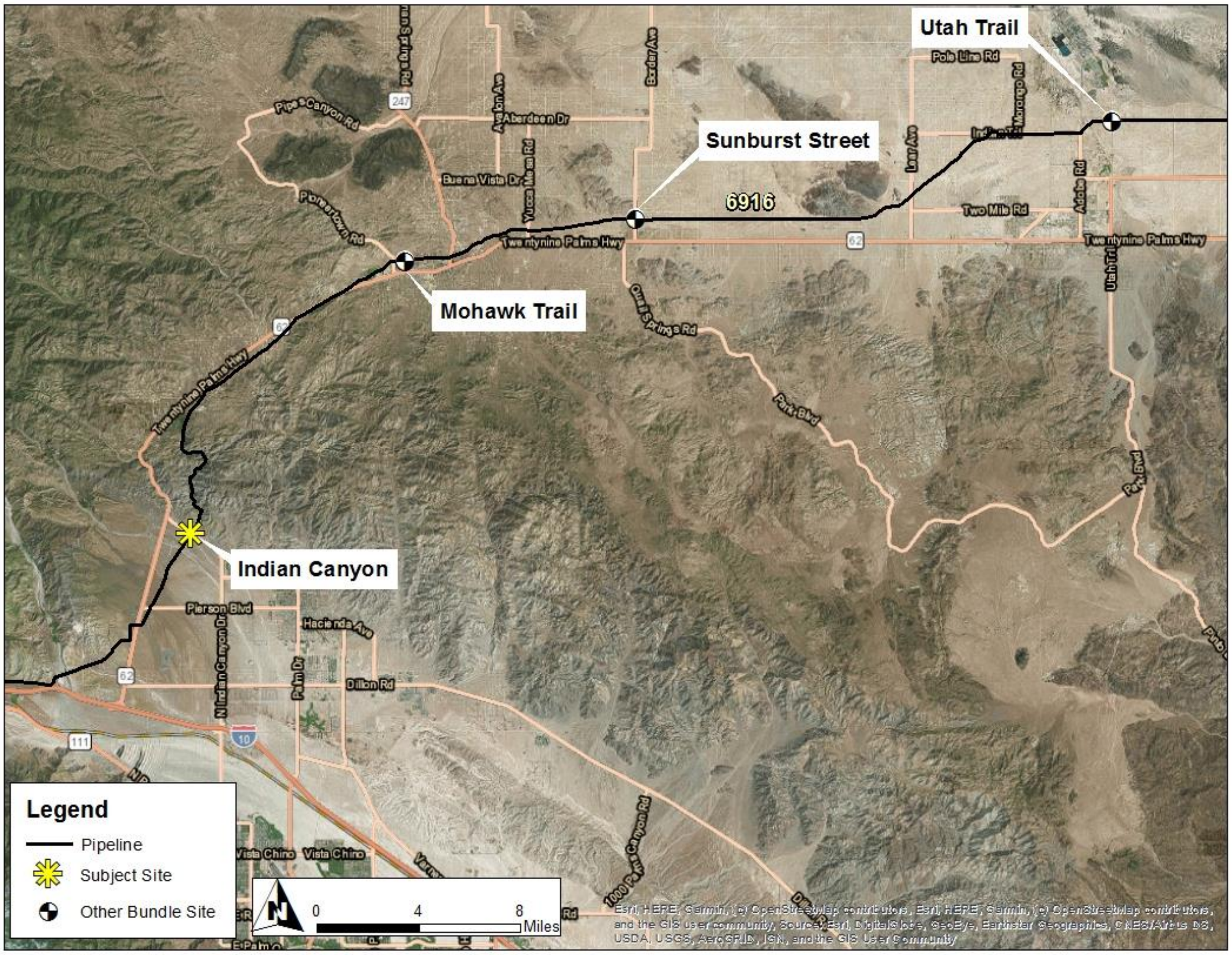
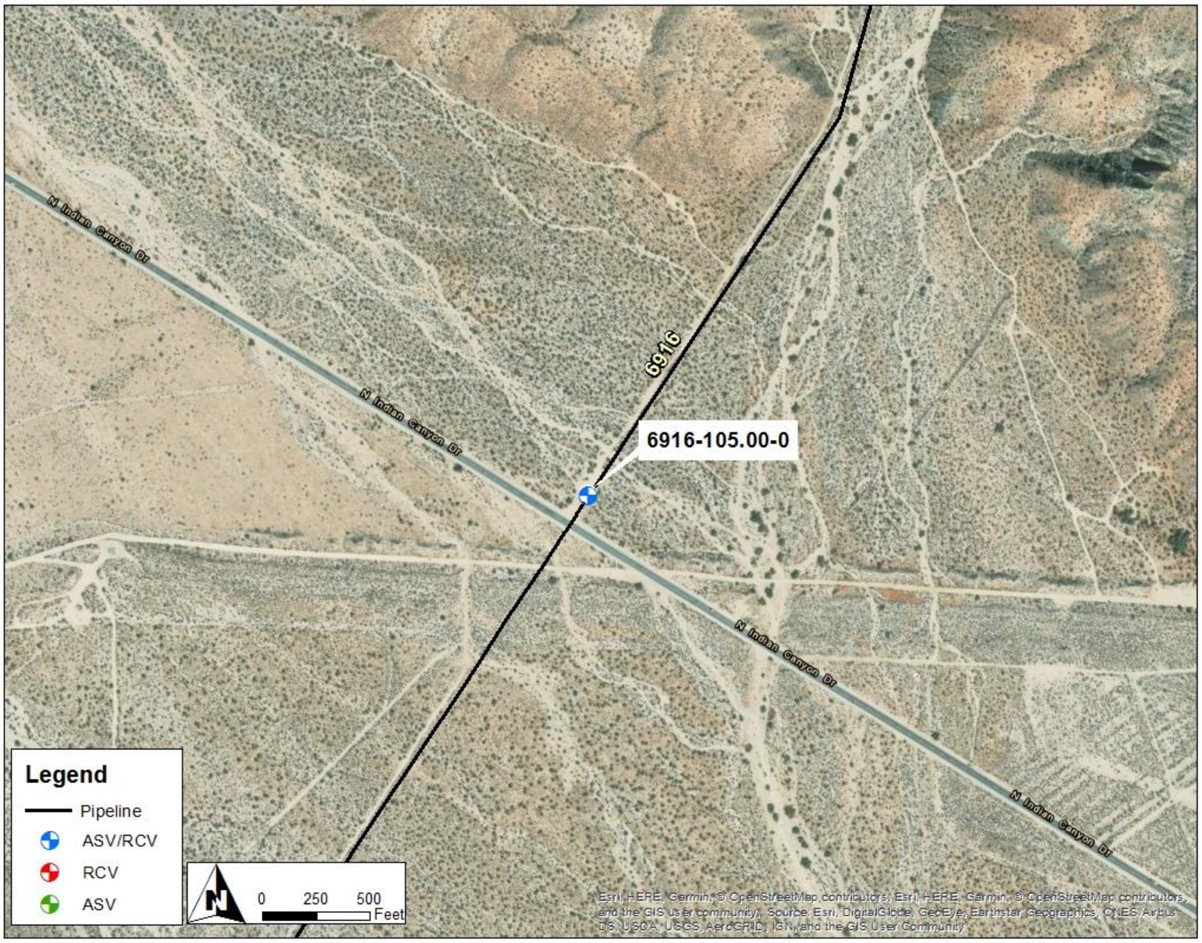


Figure 2: Satellite Image of 29 Palms Valve Enhancement Project - Indian Canyon



II. ENGINEERING, DESIGN, AND PLANNING

A. Project Scope

SoCalGas presented a conceptual project scope in workpapers supporting the Valve Enhancement Plan in the 2011 PSEP filing.[1] This conceptual scope did not identify this project. SoCalGas reviewed available information, performed a detailed system flow analysis, and identified this mainline valve as a candidate for enhancement to provide the planned isolation. The final project scope is summarized in Table 2 below.

1. 2011 PSEP Filing: SoCalGas did not identify this MLV for automation to achieve the objective of rapid system isolation.
2. Updated Scope: SoCalGas determined that the automation of MLV 6916-105.00-0 would enable rapid isolation, thereby achieving Valve Enhancement Plan objectives.
3. Engineering, Design, and Constructability: No notable engineering adjustments were required to the standard design.
4. Final Project Scope: The final project scope consists of the automation of one MLV that included the installation of a new block wall, the installation of new power equipment, the installation of new communications equipment, and the installation of the necessary automation equipment at the site.

Table 2: Final Project Scope

Final Project Scope					
Line	Mile	Valve #	Valve Size (*confidential*)	Installation Type	Function
6916	105.00	0	[redacted]	C/P	ASV/RCV

[1] *See* Workpapers supporting Amended Pipeline Safety Enhancement Plan (PSEP) of SoCalGas and SDG&E, submitted on December 2, 2011, at WP-IX-2-14 through WP-IX-2-25 (A.11-11-002 Exh. SCG-32).

B. Site Evaluation and Planning

SoCalGas initiated the planning process for the 29 Palms Valve Enhancement Project – Indian Canyon by performing a pre-design site walk to determine the existing conditions and assess any potential impact on the design. Key factors that influenced the engineering and design of this project are as follows:

1. Site Description: This site is an existing SoCalGas facility in a desert environment. There is an existing chain link fence enclosing the site.
2. Land Issues: During the site evaluation, the Project Team noted that the existing station would need to be expanded to accommodate the additional equipment.
3. DOT Class: This project site is in a Class 1 location. SoCalGas selected this MLV for automation to isolate an HCA location downstream of this valve.
4. Power Source: There was no preexisting power source. The Project Team installed new power equipment at the site.
5. Communication Technology: There was no preexisting communications equipment. The Project Team installed new communications equipment at the site.

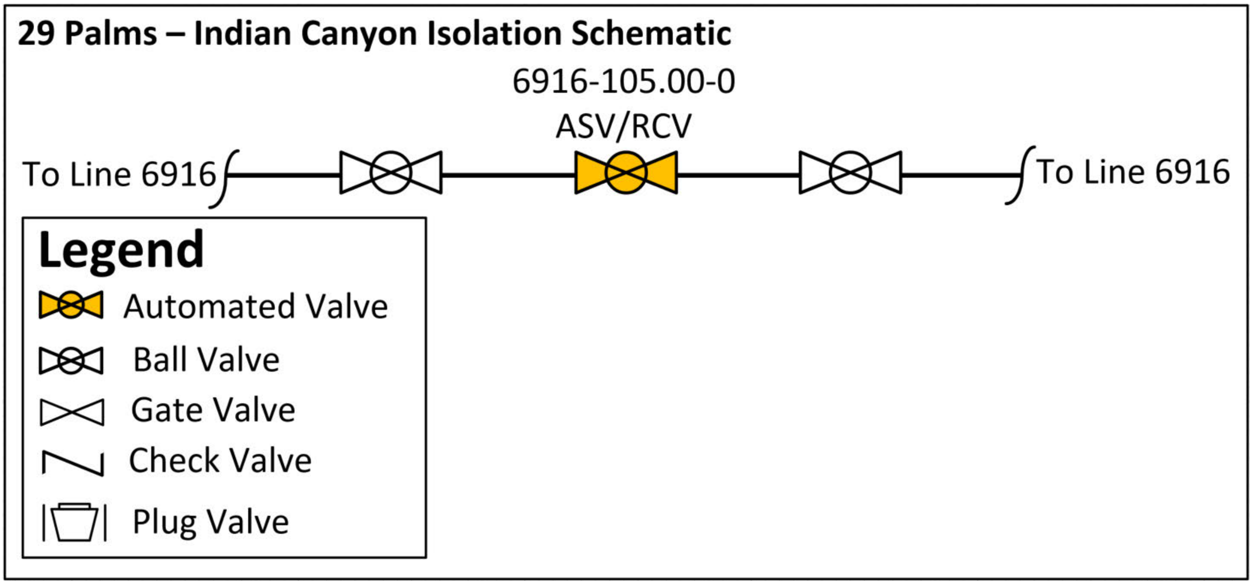
C. Engineering, Design, and Planning Factors

SoCalGas reviewed drawings and records, contacted internal planning groups, communicated with external stakeholders, and conducted survey activity. Key factors that influenced the engineering and design of the Project are as follows:

1. Engineering Assessment: During the site evaluation, the Project Team confirmed the existing technology and verified the need to expand the existing station to accommodate the new equipment.
2. Valve Details: The existing valve was a manually actuated Class 600 ball valve, which was reused by the Project Team.
3. Actuator Details: The existing actuator was a rotary piston double-acting actuator, which was reused by the Project Team.

4. Customer Impact: The Project Team did not identify any anticipated service disruptions to customers.
5. Community Impact: The Project Team did not anticipate any notable impacts to the community from this project.
6. Substructures: The Project Team did not identify any existing substructures that affected the design and engineering at this site.
7. Environmental: The Project Team identified the potential for desert tortoises in the surrounding area. No environmental permits were required. An environmental monitor performed routine site visits during construction.
8. Permit Restrictions: There were no special permits or permit restrictions for this project.
9. Land Use: The Project Team obtained an easement from the Coachella Valley Conservation Commission.
10. Traffic Control: The Project Team did not anticipate any traffic control for this project.

Figure 3: 29 Palms Valve Enhancement Project - Indian Canyon Schematic



D. Scope Changes

Through engineering, design, and planning activities, SoCalGas determined that changes in scope were appropriate to enhance the design of the Project and address engineering factors. As a result, the preliminary cost estimate does not fully reflect the final scope. Prior to construction, SoCalGas determined that the cost of the installation of the block wall would be shared between PSEP and the Operating District.

III. CONSTRUCTION

A. Construction Contractor Selection

The Project Team prepared an initial cost estimate based on the preliminary design. Following completion of the engineering, design, and planning activities described above, the Project Team directed the Performance Partner (Mechanical Construction Contractor) and Alliance Partner (Electrical Contractor) to prepare cost estimates based on a more detailed engineering design package, which included the updated design described in the discussion of notable changes in scope above.

1. <u>SoCalGas' Preliminary Mechanical Construction Contractor Estimate *(confidential)*:</u> SoCalGas' preliminary cost estimate for construction was [redacted].

2. <u>Mechanical Construction Contractor's Target Price Estimate *(confidential)*:</u> The Mechanical Construction Contractor's cost estimate was [redacted], which was [redacted] than SoCalGas' preliminary cost estimate for construction.

3. <u>SoCalGas' Preliminary Electrical Contractor Estimate *(confidential)*:</u> SoCalGas' preliminary cost estimate for the electrical contractor was [redacted].

4. <u>Electrical Contractor's Estimate (*confidential*):</u> The Electrical Contractor's estimate was [redacted], which was [redacted] than SoCalGas' preliminary cost estimate.

B. Construction Schedule

Table 3: Construction Timeline

Construction Start Date	10/16/2017
Construction Completion Date	01/18/2018
Days on Site	32 days
Commissioning Date	06/05/2019

The Project Team completed all construction activities as soon as practicable prior to commissioning. Finalization of commissioning activities is dependent on electrical utility connections, and system and/or resource availability.

C. Changes During Construction

SoCalGas successfully mitigated field conditions during construction in a manner that minimized potential impacts on project scope, cost, and schedule. As a result, these conditions did not result in any notable change orders.

Final Report for 29 Palms Valve Enhancement Project – Indian Canyon

Figure 4: New Block Wall in the Foreground, New Canopies in the Background

D. Commissioning and Site Restoration

Commissioning activities included site restoration, final inspections, and placement of the valve into service. During this stage, SoCalGas successfully performed site acceptance testing and conducted point-to-point verification with Gas Control personnel for the newly automated valve and transferred ownership of the new equipment to Field Operations. Closeout activities included development of final drawings, the reconciliation package, and updates to company recordkeeping systems to reflect the completed scope of work. The site was commissioned on June 5, 2019, as summarized in Table 3.

IV. PROJECT COSTS

A. Cost Avoidance Actions

SoCalGas exercised due diligence in the design, planning, and construction activities for this project to minimize or avoid costs when prudent to do so. As discussed above, the Project Team reviewed existing records, communicated with external stakeholders, and conducted a site walk to incorporate known site conditions in the project plan and design. SoCalGas bundled this project with the 29 Palms Valve Enhancement Projects – Mohawk Trail, Sunburst Street, and Utah Trail, coordinating engineering and construction activities between the project sites to minimize costs for the benefit of customers.

B. Cost Estimates

Based on the preliminary design, once the preliminary project scope was confirmed and engineering, design, and planning activities were underway, SoCalGas prepared an estimate of the Direct Costs of the Project in the amount of $1,712,812. The Project Team considered the conditions known at the time to prepare the preliminary Direct Cost estimate. This estimate reflects the projected Labor, Material, and Services costs anticipated to be incurred to execute the Project, based on initial design plans.

SoCalGas estimated Indirect Costs of the Project based on the estimated Direct Costs and other project-related variables.

C. Actual Direct and Indirect Costs

Actual Direct Costs reflect the Labor, Material, and Services costs incurred to execute the Project. Actual Indirect Costs reflect costs for incremental overhead loaders in accordance with Company overhead allocation policies. The total loaded cost of the Project is $1,496,887.

Table 4: Estimated and Actual Direct Costs and Variances[2]

Direct Costs ($)	Estimate	Actuals	Delta Over/(Under)
Company Labor	298,154	100,624	(197,530)
Materials	59,066	90,136	31,070
Mechanical Construction Contractor	591,927	453,179	(138,748)
Electrical Contractor	125,045	100,509	(24,536)
Construction Management & Support	66,443	68,357	1,914
Environmental	44,522	21,941	(22,580)
Engineering & Design	203,030	208,062	5,032
Project Management & Services	95,099	18,047	(77,052)
ROW & Permits	39,672	6,326	(33,346)
GMA	189,854	134,215	(55,639)
Total Direct Costs	**1,712,812**	**1,201,396**	**(511,415)**

Table 5: Estimated and Actual Indirect Costs, Total Costs, and Variances[3]

Indirect Costs/Total Costs ($)	Estimate	Actuals	Delta Over/(Under)
Overheads	347,982	164,049	(183,933)
AFUDC	92,036	114,584	22,548
Property Taxes	21,561	16,857	(4,704)
Total Indirect Costs	**461,579**	**295,490**	**166,089**
Total Direct Costs	**1,712,812**	**1,201,396**	**(511,415)**
Total Loaded Costs	**2,174,391**	**1,496,887**	**(677,503)**

The Actual Full-Time Equivalent[4] (FTE) for this Project is 0.45.

[2] Values may not add to total due to rounding.

[3] Ibid

[4] Full-time equivalents (FTEs) are included in GRC forecasts to provide context to requested amounts for company labor. FTEs are calculated by measuring the number of hours charged over a given time period. For example, one FTE is equal to 40 hours per week, or typically 2,080 hours per year. The calculation of FTEs includes overtime hours. Therefore, if one employee works 60 hours per week, he or she would be recorded as 1.5 FTEs.

D. Cost Impacts

Consistent with one of the overarching objectives of PSEP to maximize the cost effectiveness of safety enhancement investments, SoCalGas effectively planned, designed, and completed construction activities for this project. Each pipeline project is unique in scope and inherently complex due to a variety of factors including terrain, environmental and permitting constraints, scope changes during detailed design, material cost fluctuations, regulatory changes, and more. These complexities can lead to variances between initial estimates and actual costs. Consistent with prudent management at the time, the Project Team successfully mitigated these variances whenever feasible through the implementation of effective project management practices, thorough planning, and continuous monitoring.

At the completion of the 29 Palms Valve Enhancement Project - Indian Canyon, Actual Direct Costs were less than the preliminary estimate by $511,415. This variance is attributable to a variety of factors including: SoCalGas bundled this valve project with three additional valve projects to gain efficiencies in engineering, planning, and construction activities; increased construction contractor productivity allowed for construction to be completed in approximately 32 days instead of the originally estimated 45 days, resulting in lower construction costs; the project was scheduled to be executed concurrently with a SoCalGas Operating District project, allowing for shared costs for construction of a block wall.

V. CONCLUSION

SoCalGas enhanced the safety of its natural gas system by prudently executing the 29 Palms Valve Enhancement Project - Indian Canyon. Through this Valve Enhancement Project, SoCalGas successfully automated one mainline valve to achieve the objective of enabling rapid system isolation of a portion of Line 6916 located in an unincorporated area within Riverside County. The total loaded cost of the Project is $1,496,887.

SoCalGas executed this project prudently through designing and executing the project to support achievement of Valve Enhancement Plan isolation objectives, bundling four projects together to capture efficiencies through coordinated engineering, expanding the existing site to accommodate the new equipment, erecting a block wall to protect the equipment from theft and vandalism, installing the necessary automation equipment, and installing equipment necessary to bring power and communication capabilities to the site to enable rapid system isolation of a portion of Line 6916 located in an unincorporated area of Riverside County.

SoCalGas engaged in prudent cost avoidance efforts to complete this safety enhancement at a reasonable cost by carefully planning and coordinating engineering and construction activities to maximize efficiencies and reduce customer and community impacts, engaging in reasonable efforts to promote competitive and market-based rates for contractor services and materials, and using a reasonable amount of company and contractor resources to complete this safety enhancement as soon as practicable.

End of 29 Palms Valve Enhancement Project - Indian Canyon Final Report

I. 29 PALMS VALVE ENHANCEMENT PROJECT – MOHAWK TRAIL

A. Background and Summary

The 29 Palms Valve Enhancement Project – Mohawk Trail consists of valve enhancements made to an existing mainline valve (MLV) located within the Community of Yucca Valley in San Bernardino County. Through this project, SoCalGas enhanced the safety of its natural gas transmission system by enabling the rapid detection of a significant change in pipeline pressure and remote isolation and depressurization of a portion of Line 6916 in the event of a pipeline rupture. SoCalGas installed new fencing, new communications equipment and the necessary automation equipment at the site. The total loaded project cost is $979,689.

The 29 Palms Valve Enhancement Project – Mohawk Trail construction site is within an existing SoCalGas facility located in a rural desert region near the intersection of Buena Vista Drive and Mohawk Trail in the Community of Yucca Valley in San Bernardino County. SoCalGas grouped this site with three additional sites, Indian Canyon, Sunburst Street, and Utah Trail to gain efficiencies in engineering, planning, and construction activities. This workpaper describes the construction activities and costs of the 29 Palms Valve Enhancement Project – Mohawk Trail.

Final Report for 29 Palms Valve Enhancement Project – Mohawk Trail

Table 1: General Project Information

29 Palms Valve Enhancement Project – Mohawk Trail			
Location	San Bernardino County		
Days on Site	24 days		
Construction Start	02/07/2018		
Construction Finish	08/14/2018		
Commissioning Date	07/31/2019		
Valve Upgrades			
Valve Number	6916-90.94-0		
Valve Type	Existing – Ball		
Actuator	Existing		
Actuator Above-/Below-Grade	Above-Grade		
ASV	Yes		
RCV	Yes		
Site Upgrades			
Vault	None		
Power	New – Utility		
Communication	New – Radio		
SCADA Panel	New		
Equipment Shelter	New		
Fencing	Yes		
Project Costs ($)	**Capital**	**O&M**	**Total**
Loaded Project Costs	979,689	-	979,689
Disallowed Costs	-	-	-

B. Maps and Images

Figure 1: 29 Palms Bundle Overview

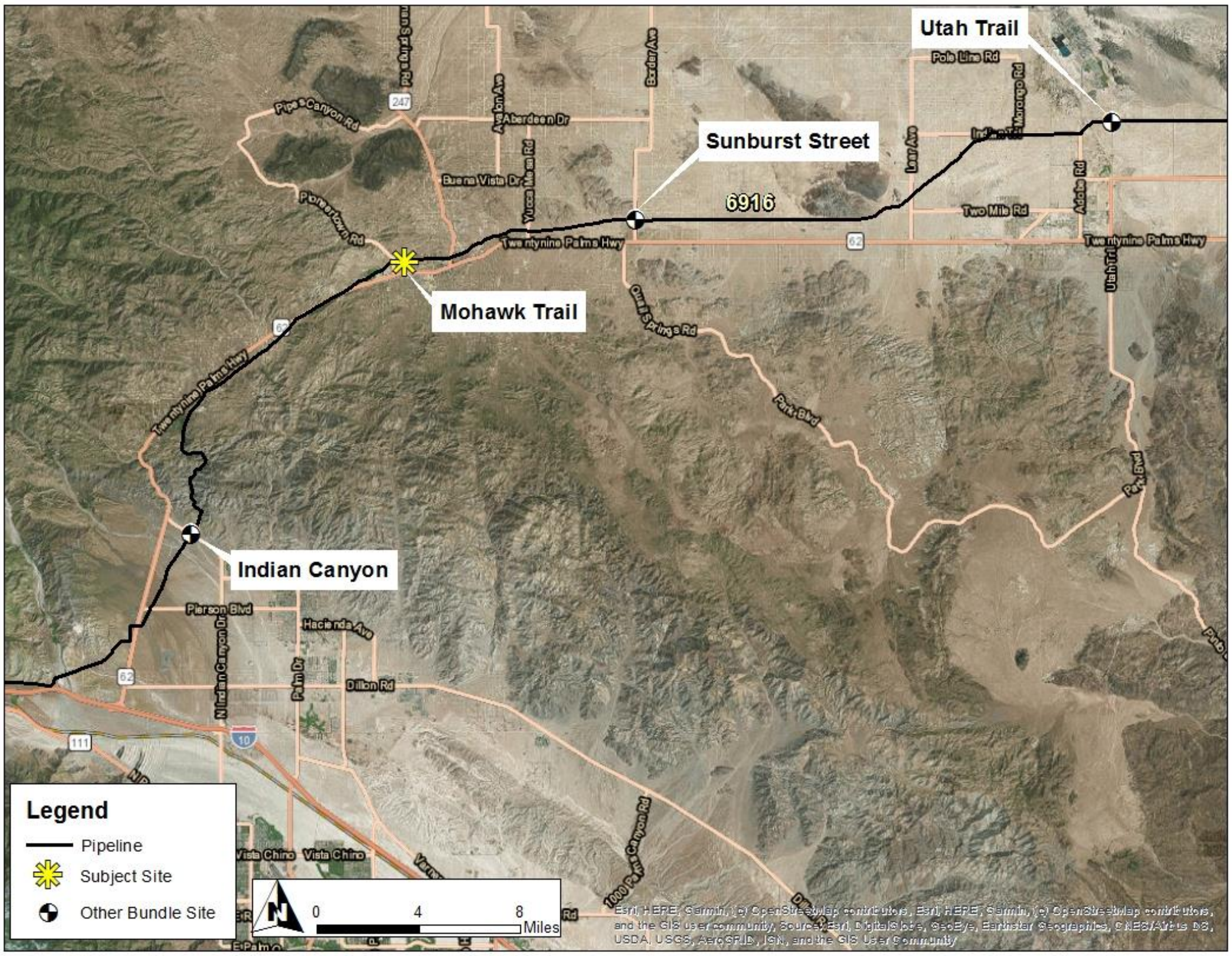


Figure 2: Satellite Image of 29 Palms Valve Enhancement Project – Mohawk Trail

II. ENGINEERING, DESIGN, AND PLANNING

A. Project Scope

SoCalGas presented a conceptual project scope in workpapers supporting the Valve Enhancement Plan in the 2011 PSEP filing.[1] The conceptual scope did not include this project. SoCalGas reviewed available information, performed a detailed system flow analysis, and identified this valve as a candidate for enhancement to provide the planned isolation. The final project scope is summarized in Table 2 below.

1. 2011 PSEP Filing: SoCalGas did not identify this valve for automation to achieve the objective of rapid system isolation.
2. Updated Scope: SoCalGas determined that the automation of MLV 6916-90.94-0 would enable rapid isolation, thereby achieving Valve Enhancement Plan objectives.
3. Engineering, Design, and Constructability: No notable engineering adjustments were required to the standard design.
4. Final Project Scope: The final project scope consists of the automation of one MLV, the installation of communications equipment, the installation of new fencing, and the installation of the necessary automation equipment at the site.

Table 2: Final Project Scope

Final Project Scope					
Line	Mile	Valve #	Valve Size (*confidential*)	Installation Type	Function
6916	90.94	0	[redacted]	C/P	ASV/RCV

[1] *See* Workpapers supporting Amended Pipeline Safety Enhancement Plan (PSEP) of SoCalGas and SDG&E, submitted on December 2, 2011, at WP-IX-2-14 through WP-IX-2-25 (A.11-11-002 Exh. SCG-32).

B. Site Evaluation and Planning

SoCalGas initiated the planning process for the 29 Palms Valve Enhancement Project – Mohawk Trail by performing a pre-design site walk to determine the existing conditions and assess any potential impact on the design. Key factors that influenced the engineering and design of this project are as follows:

1. Site Description: This site is an existing SoCalGas facility in a rural desert environment in the community of Yucca Valley.
2. Land Issues: During the pre-design site walk, the Project Team noted that the existing fencing would need to be replaced..
3. DOT Class: This project site is in a Class 2 location. SoCalGas selected this MLV for automation to isolate an HCA location downstream of this valve.
4. Power Source: There was no existing power source. The Project Team installed new power equipment at the site.
5. Communication Technology: There was no preexisting communications equipment. The Project Team installed new communications equipment at the site.

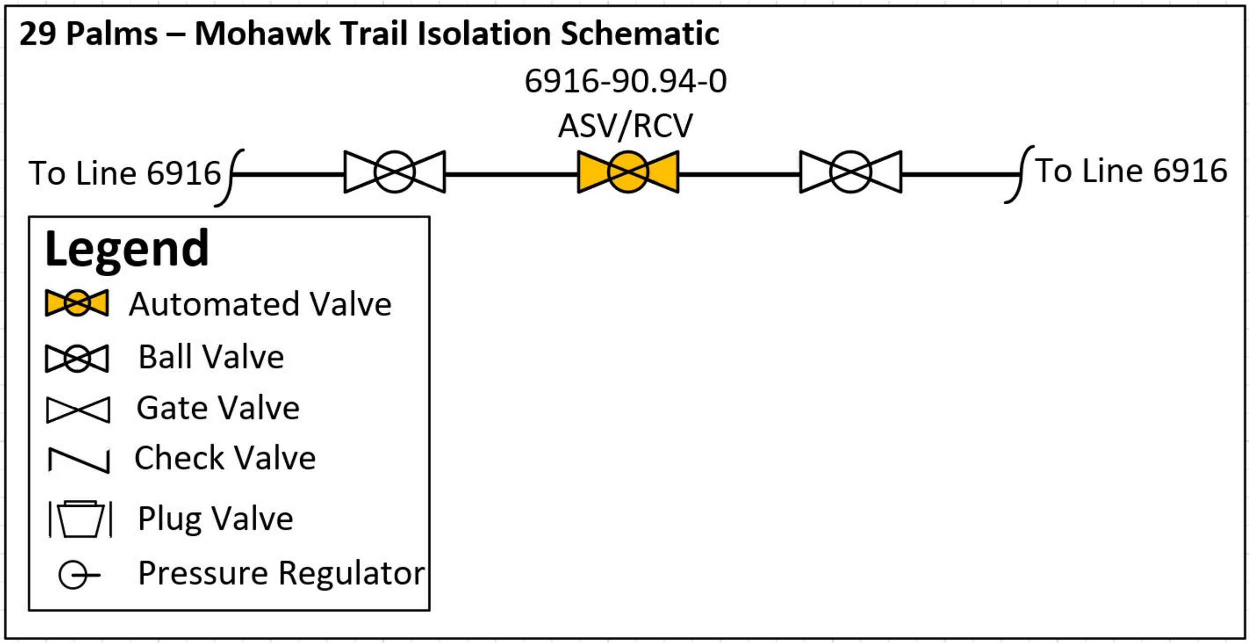
C. Engineering, Design, and Planning Factors

SoCalGas reviewed drawings and records, contacted internal planning groups, communicated with external stakeholders, and completed a site walk. Key factors that influenced the engineering and design of the Project are as follows:

1. Engineering Assessment: During the site evaluation, the Project Team confirmed the preexisting technology and verified the need to install new fencing to accommodate the new equipment.
2. Valve Details: The existing valve was a manually actuated Class 600 ball valve, which was reused by the Project Team.
3. Actuator Details: The existing actuator was a rotary piston double-acting actuator, which was reused by the Project Team.

4. Customer Impact: The Project Team did not identify any anticipated service disruptions to customers.
5. Community Impact: The Project Team did not anticipate any notable impacts to the community from this project.
6. Substructures: The Project Team did not identify any existing substructures that affected the design and engineering at this site.
7. Environmental: The Project Team did not identify any notable environmental concerns at the site. An environmental monitor performed routine site visits during construction.
8. Permit Restrictions: The Project Team obtained an Encroachment permit from San Bernardino County.
9. Land Use: The Project Team performed all work within the existing SoCalGas easement.
10. Traffic Control: The Project Team did not identify any traffic control needs at the site.

Figure 3: 29 Palms Valve Enhancement Project – Mohawk Trail Schematic



D. Scope Changes

SoCalGas did not make any notable scope changes during detailed design.

III. CONSTRUCTION

A. Construction Contractor Selection

The Project Team prepared an initial cost estimate based on the preliminary design. Following completion of the engineering, design, and planning activities described above, SoCalGas entered into a competitive bidding process to select a construction contractor that included the updated design described in the discussion of notable Scope Changes above. SoCalGas awarded the construction contract to the bidder that best met the selection criteria for this project.

1. <u>SoCalGas' Preliminary Mechanical Construction Contractor Estimate *(confidential)*:</u> SoCalGas' preliminary cost estimate for construction was [redacted].

2. <u>Mechanical Construction Contractor's Bid *(confidential)*:</u> The Mechanical Construction Contractor's cost estimate was [redacted], which was [redacted] than SoCalGas' preliminary cost estimate for construction.

3. <u>SoCalGas' Preliminary Electrical Contractor Estimate *(confidential)*:</u> SoCalGas' preliminary cost estimate for the electrical contractor was [redacted].

4. <u>Electrical Contractor's Estimate (*confidential*):</u> The Electrical Contractor's estimate was [redacted], which was [redacted] than SoCalGas' preliminary cost estimate.

B. Construction Schedule

Table 3: Construction Timeline

Construction Start Date	02/07/2018
Construction Completion Date	08/14/2018
Days on Site	24 days
Commissioning Date	07/31/2019

The Project Team completed all construction activities as soon as practicable prior to commissioning. Finalization of commissioning activities is dependent on electrical utility connections, and system and/or resource availability.

C. Changes During Construction

SoCalGas successfully mitigated field conditions during construction in a manner that minimized potential impacts on project scope, cost, and schedule. As a result, these conditions did not result in any notable change orders.

D. Commissioning and Site Restoration

Commissioning activities included site restoration, final inspections, and placement of the valve into service. During this stage, SoCalGas successfully performed site acceptance testing and conducted point-to-point verification with Gas Control personnel for the newly-automated valve, and transferred ownership of the new equipment to Field Operations. Closeout activities included development of final drawings, the reconciliation package, and updates to company recordkeeping systems to reflect the completed scope of work. The site was commissioned on July 31, 2019, as summarized in Table 3.

IV. PROJECT COSTS

A. Cost Avoidance Actions

SoCalGas exercised due diligence in the design, planning, and construction activities for this project to minimize or avoid costs when prudent to do so. As discussed above, the Project Team reviewed existing records, communicated with external stakeholders, and conducted a site walk to incorporate known site conditions in the project plan and design. SoCalGas bundled this project with the 29 Palms Valve Enhancement Projects – Indian Canyon, Sunburst Street, and Utah Trail, coordinating engineering and construction activities between the project sites to minimize costs for the benefit of customers.

B. Cost Estimates

Based on the preliminary design, once the preliminary project scope was confirmed and engineering, design, and planning activities were underway, SoCalGas prepared an estimate of the Direct Costs of the Project in the amount of $1,646,499. The Project Team considered the conditions known at the time to prepare the preliminary Direct Cost estimate. This estimate reflects the projected Labor, Material, and Services costs anticipated to be incurred to execute the Project, based on initial design plans.

SoCalGas estimated Indirect Costs of the Project based on the estimated Direct Costs and other project-related variables.

C. Actual Direct and Indirect Costs

Actual Direct Costs reflect the Labor, Material, and Services costs incurred to execute the Project. Actual Indirect Costs reflect costs for incremental overhead loaders in accordance with Company overhead allocation policies. The total loaded cost of the Project is $ 979,689.

Table 4: Estimated and Actual Direct Costs and Variances[2]

Direct Costs ($)	Estimate	Actuals	Delta Over/(Under)
Company Labor	313,658	50,514	(263,144)
Materials	57,122	65,380	8,258
Mechanical Construction Contractor	545,655	232,674	(312,981)
Electrical Contractor	164,665	100,277	(64,388)
Construction Management & Support	67,808	44,370	(23,438)
Environmental	49,366	23,604	(25,762)
Engineering & Design	160,851	187,136	26,285
Project Management & Services	42,486	19,347	(23,139)
ROW & Permits	57,877	14,830	(43,048)
GMA	187,011	94,068	(92,943)
Total Direct Costs	**1,646,499**	**832,200**	**(814,300)**

Table 5: Estimated and Actual Indirect Costs, Total Costs, and Variances[3]

Indirect Costs/Total Costs ($)	Estimate	Actuals	Delta Over/(Under)
Overheads	372,091	104,251	(267,840)
AFUDC	285,414	37,626	(247,788)
Property Taxes	64,982	5,612	(59,370)
Total Indirect Costs	**722,487**	**147,489**	**(574,998)**
Total Direct Costs	**1,646,499**	**832,200**	**(814,300)**
Total Loaded Costs	**2,368,987**	**979,689**	**(1,389,298)**

The Actual Full-Time Equivalent[4] (FTE) for this Project is 0.25.

[2] Values may not add to total due to rounding.
[3] Values may not add to total due to rounding.
[4] Full-time equivalents (FTEs) are included in GRC forecasts to provide context to requested amounts for company labor. FTEs are calculated by measuring the number of hours charged over a given time period. For example, one FTE is equal to 40 hours per week, or typically 2,080 hours per year. The calculation of FTEs includes overtime hours. Therefore, if one employee works 60 hours per week, he or she would be recorded as 1.5 FTEs.

D. Cost Impacts

Consistent with one of the overarching objectives of PSEP to maximize the cost effectiveness of safety enhancement investments, SoCalGas effectively planned, designed, and completed construction activities for this project. Each pipeline project is unique in scope and inherently complex due to a variety of factors including terrain, environmental and permitting constraints, scope changes during detailed design, material cost fluctuations, regulatory changes, and more. These complexities can lead to variances between initial estimates and actual costs. Consistent with prudent management at the time, the Project Team successfully mitigated these variances whenever feasible through the implementation of effective project management practices, thorough planning, and continuous monitoring.

At the completion of the 29 Palms Valve Enhancement Project – Mohawk Trail, Actual Direct Costs were less than the preliminary estimate by $814,300. This variance is attributable to a variety of factors including: SoCalGas grouped this site with three additional sites to gain efficiencies in engineering, planning, and construction activities; Detailed engineering, design, and planning activities led to enhancements in the Project design and addressed key engineering factors. As a result, The Target Price Estimate (TPE) developed by SoCalGas and the Construction Contractor before construction [redacted] the construction estimate to [redacted]; construction was anticipated to required 32 days but was completed in 24 days through bundling efficiencies, reducing costs for the construction contractors and construction management; abatement and x-ray requirements were not required due to the utilization of existing instrument taps during construction; survey requirements for construction were lower than originally expected.

V. CONCLUSION

SoCalGas enhanced the safety of its natural gas system by prudently executing the 29 Palms Valve Enhancement Project – Mohawk Trail site. Through this Valve Enhancement Project, SoCalGas successfully automated one mainline valve to achieve the objective of enabling rapid system isolation of a portion of Line 6916 located in the Community of Yucca Valley. The total loaded cost of the Project is $979,689 .

SoCalGas executed this project prudently through designing and executing the project to support achievement of Valve Enhancement Plan isolation objectives, bundling four geographically proximate projects together to capture efficiencies through coordinated engineering, and installing equipment necessary to bring power and communication capabilities to the site to enable rapid system isolation to a portion of Line 6916 in the Community of Yucca Valley.

SoCalGas engaged in prudent cost avoidance efforts to complete this safety enhancement at a reasonable cost by carefully planning and coordinating engineering and construction activities to maximize efficiencies and reduce customer and community impacts, engaging in reasonable efforts to promote competitive and market based rates for contractor services and materials, and using a reasonable amount of company and contractor resources to complete this safety enhancement as soon as practicable.

End of 29 Palms Valve Enhancement Project – Mohawk Trail Final Report

I. 29 PALMS VALVE ENHANCEMENT PROJECT – SUNBURST STREET

A. Background and Summary

The 29 Palms Valve Enhancement Project – Sunburst Street consists of valve enhancements made to an existing mainline valve (MLV) located in an unincorporated area within San Bernardino County. Through this project, SoCalGas enhanced the safety of its natural gas transmission system by enabling the rapid detection of a significant change in pipeline pressure and remote isolation and depressurization of a portion of Line 6916 in the event of a pipeline rupture. SoCalGas installed a new block wall, a new shelter, new power equipment, new communications equipment, and the necessary automation equipment at the site. The total loaded project cost is $1,437,551.

The 29 Palms Valve Enhancement Project – Sunburst Street construction site is located in a remote desert region near Sunburst Street in San Bernardino County. SoCalGas bundled this valve project with three additional valve projects, 29 Palms Valve Enhancement Projects – Indian Canyon, Mohawk Trail, and Utah Trail, to gain efficiencies in engineering, planning, and construction activities. This workpaper describes the construction activities and costs of the 29 Palms Valve Enhancement Project – Sunburst Street. This project was designed and executed as one cohesive project. However, the project costs were shared by PSEP and the Operating District with the Operating District funding half of the cost of the new block wall.

Final Report for 29 Palms Valve Enhancement Project – Sunburst Street

Table 1: General Project Information

29 Palms Valve Enhancement Project – Sunburst Street			
Location	San Bernardino County		
Days on Site	40 days		
Construction Start	04/23/2018		
Construction Finish	06/29/2018		
Commissioning Date	7/30/2019		
Valve Upgrades			
Valve Number	6916-83.11-0		
Valve Type	Existing – Ball		
Actuator	Existing		
Actuator Above-/Below-Grade	Above-Grade		
ASV	Yes		
RCV	Yes		
Site Upgrades			
Vault	Existing		
Power	New – Utility		
Communication	New – Radio		
SCADA Panel	New		
Equipment Shelter	New		
Wall	New		
Project Costs ($)	**Capital**	**O&M**	**Total**
Loaded Project Costs	1,437,551	-	1,437,551
Disallowed Costs	-	-	-

B. Maps and Images

Figure 1: 29 Palms Bundle Overview

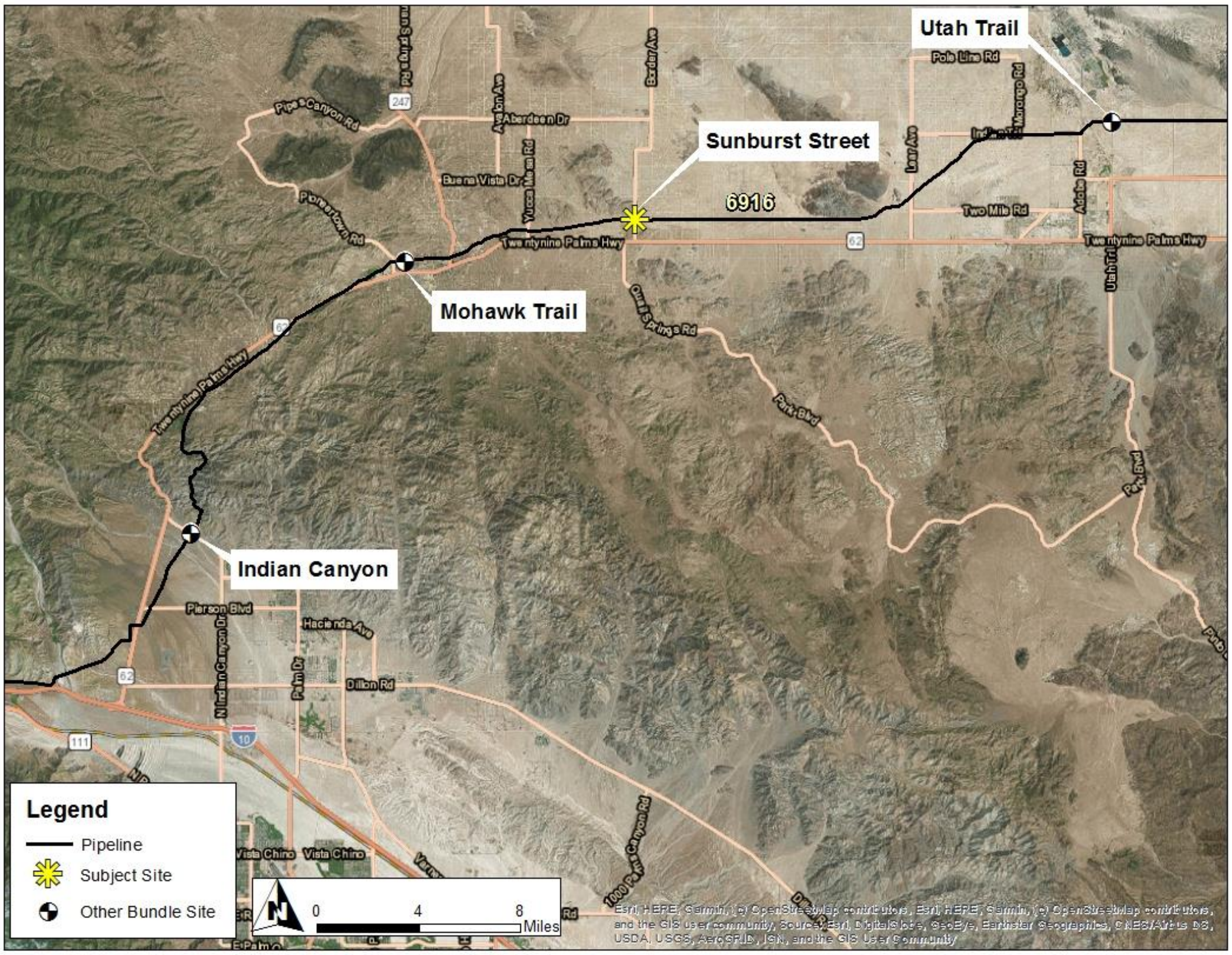
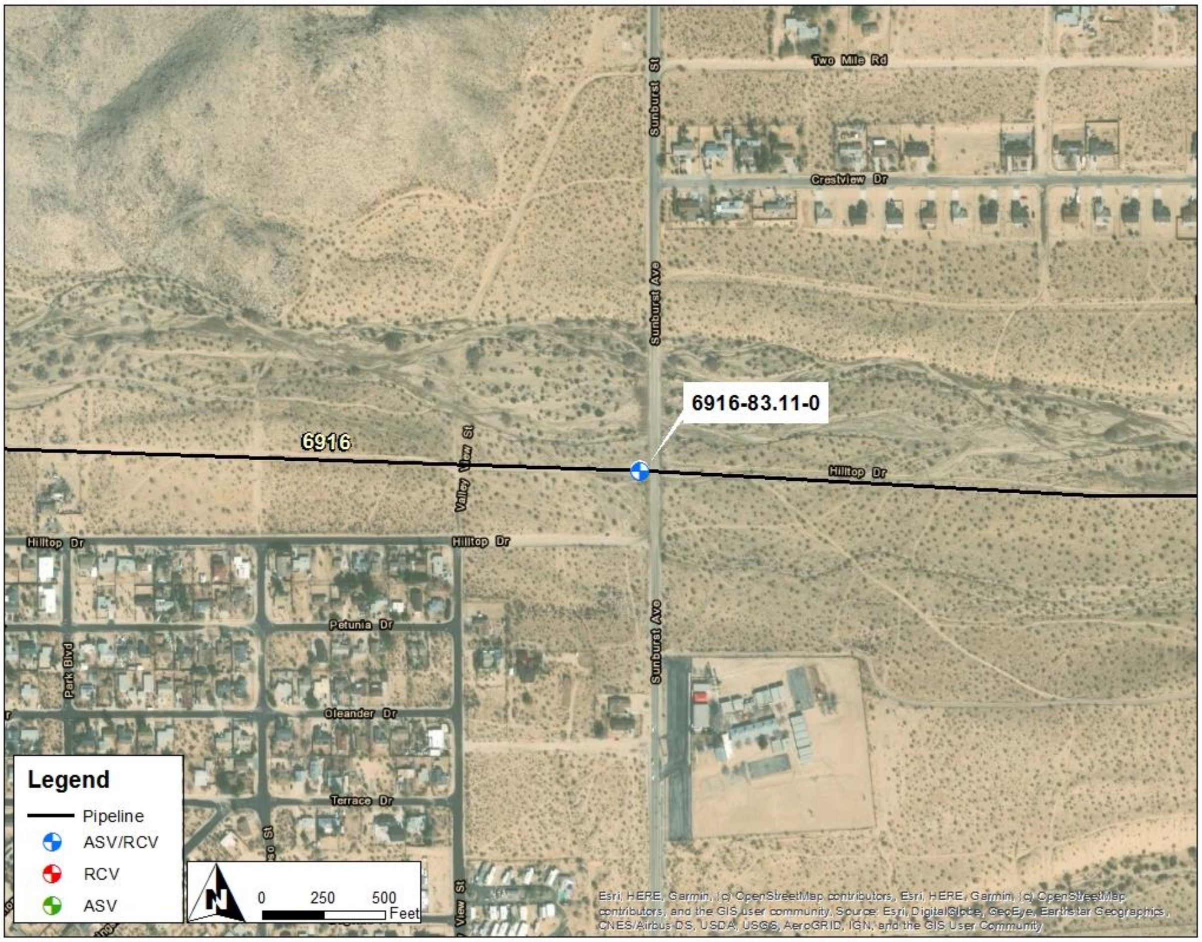


Figure 2: Satellite Image of 29 Palms Valve Enhancement Project – Sunburst Street



II. ENGINEERING, DESIGN, AND PLANNING

A. Project Scope

SoCalGas presented a conceptual project scope in workpapers supporting the Valve Enhancement Plan in the 2011 PSEP filing.[1] This conceptual scope did not identify this project. SoCalGas reviewed available information and performed a detailed system flow analysis that identified one mainline valve as a candidate for enhancement to provide the planned isolation. The final project scope is summarized in Table 2 below.

1. 2011 PSEP Filing: SoCalGas did not identify this MLV for automation to achieve the objective of rapid system isolation.
2. Updated Scope: SoCalGas determined that the automation of MLV 6916-83.11-0 would enable rapid isolation, thereby achieving Valve Enhancement Plan objectives.
3. Engineering, Design, and Constructability: The Project Team did not make any notable changes in scope to the engineering and design of this project.
4. Final Project Scope: The final project scope consists of the automation of one MLV, the installation of a new block wall, the installation of a new shelter, the expansion of the existing facility, the installation of new power equipment, the installation of new communications equipment, and the installation of the necessary automation equipment at the site.

Table 2: Final Project Scope

Final Project Scope					
Line	Mile	Valve #	Valve Size (*confidential*)	Installation Type	Function
6916	83.11	0	[redacted]	C/P	ASV/RCV

[1] *See* Workpapers supporting Amended Pipeline Safety Enhancement Plan (PSEP) of SoCalGas and SDG&E, submitted on December 2, 2011, at WP-IX-2-14 through WP-IX-2-25 (A.11-11-002 Exh. SCG-32).

B. Site Evaluation and Planning

SoCalGas initiated the planning process for the 29 Palms Valve Enhancement Project Valve Enhancement Project by performing a pre-design site walk to determine the existing conditions and assess any potential impact on the design. Key factors that influenced the engineering and design of this project are as follows:

1. Site Description: This site is an existing SoCalGas facility in a desert environment in an unincorporated area in San Bernardino County.
2. Land Issues: During the pre-design site walk, the Project Team noted that the existing station would need to be expanded to accommodate the additional equipment.
3. DOT Class: This project site is in a Class 3 location.
4. Power Source: There was no preexisting power source. The Project Team installed new power equipment at the site.
5. Communication Technology: There was no preexisting communications equipment. The Project Team installed new communications equipment at the site.

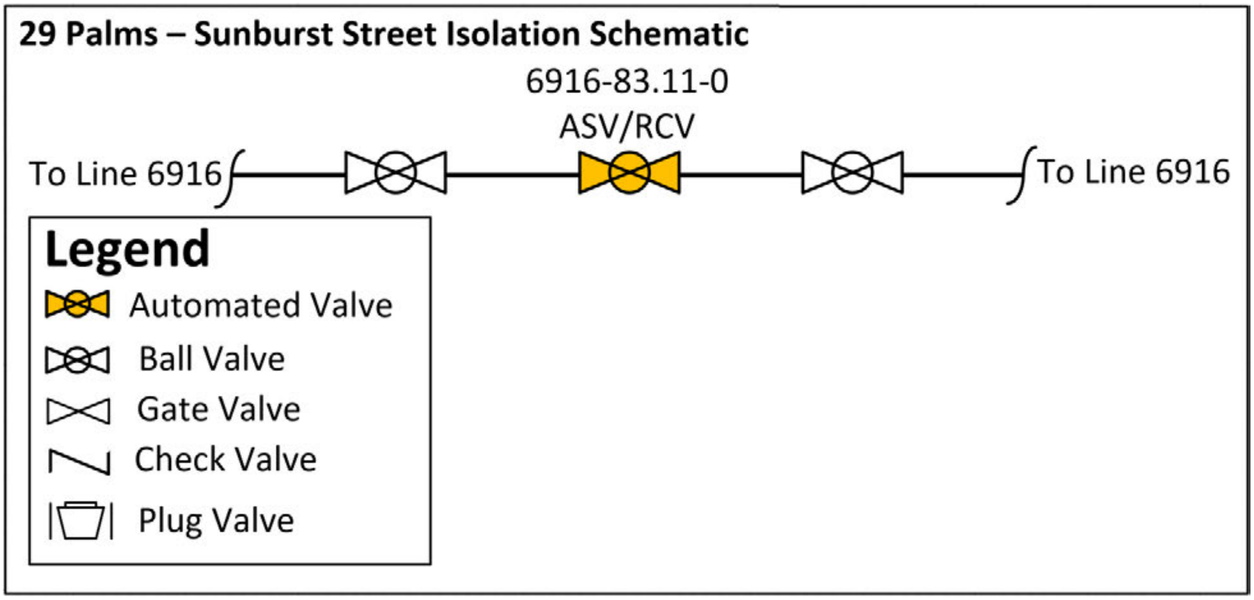
C. Engineering, Design, and Planning Factors

SoCalGas reviewed drawings and records, contacted internal planning groups, communicated with external stakeholders, conducted survey activity, and completed a site walk. Key factors that influenced the engineering and design of the Project are as follows:

1. Engineering Assessment: During the site evaluation, the Project Team confirmed the existing technology and verified the need to expand the existing station to accommodate the new equipment.
2. Valve Details: The existing valve was a manually actuated Class 600 ball valve, which was reused by the Project Team.
3. Actuator Details: The existing actuator was a rotary piston double-acting actuator, which was reused by the Project Team.

4. Customer Impact: The Project Team did not identify any anticipated service disruptions to customers.
5. Community Impact: The Project Team did not anticipate any notable impacts to the community from this project.
6. Substructures: The Project Team did not identify any existing substructures that affected the design and engineering at this site.
7. Environmental: The Project Team identified the potential for desert tortoises in the surrounding area. No environmental permits were required. An environmental monitor performed routine site visits construction.
8. Permit Restrictions: The Project Team acquired an Incidental Take Permit from the California Department of Fish and Wildlife and an encroachment permit from San Bernardino County.
9. Land Use: The Project Team acquired a new easement for the expansion of the new station.
10. Traffic Control: The Project Team closed one lane on Sunburst Street and utilized flagmen and signage in order to direct traffic.

Figure 3: 29 Palms Valve Enhancement Project Schematic



D. Scope Changes

Through engineering, design, and planning activities, SoCalGas determined that changes in scope were appropriate to enhance the design of the Project and address engineering factors. As a result, the preliminary cost estimate does not fully reflect the final scope. Prior to construction, SoCalGas determined that the cost of the installation of the block wall would be shared between PSEP and the Operating District.

III. CONSTRUCTION

A. Construction Contractor Selection

The Project Team prepared an initial cost estimate based on the preliminary design. Following completion of the engineering, design, and planning activities described above, the Project Team directed the Performance Partner (Mechanical Construction Contractor) and Alliance Partner (Electrical Contractor) to prepare cost estimates based on a more detailed engineering design package, which included the updated design described in the discussion of notable changes in scope above.

1. <u>SoCalGas' Preliminary Mechanical Construction Contractor Estimate *(confidential)*:</u> SoCalGas' preliminary cost estimate for construction was [redacted].

2. <u>Mechanical Construction Contractor's Target Price Estimate *(confidential)*:</u> The Mechanical Construction Contractor's cost estimate was [redacted], which was [redacted] than SoCalGas' preliminary cost estimate for construction.

3. <u>SoCalGas' Preliminary Electrical Contractor Estimate *(confidential)*:</u> SoCalGas' preliminary cost estimate for the electrical contractor was [redacted].

4. <u>Electrical Contractor's Estimate *(confidential)*:</u> The Electrical Contractor's estimate was [redacted], which was [redacted] than SoCalGas' preliminary cost estimate.

B. Construction Schedule

Table 3: Construction Timeline

Construction Start Date	04/23/2018
Construction Completion Date	06/29/2018
Days on Site	40 days
Commissioning Date	7/30/2019

The Project Team completed all construction activities as soon as practicable prior to commissioning. Finalization of commissioning activities is dependent on electrical utility connections, and system and/or resource availability.

C. Changes During Construction

SoCalGas successfully mitigated field conditions during construction in a manner that minimized potential impacts on project scope, cost, and schedule. As a result, these conditions did not result in any notable change orders.

Figure 4: New Block Wall in Background, New Automation Equipment in Foreground

D. Commissioning and Site Restoration

Commissioning activities included site restoration, final inspections, and placement of the valve into service. During this stage, SoCalGas successfully performed site acceptance testing, and conducted point-to-point verification with Gas Control personnel for the newly-automated valve, and transferred ownership of the new equipment to Field Operations. Closeout activities included development of final drawings, the reconciliation package, and updates to company recordkeeping systems to reflect the completed scope of work. The site was commissioned on July 30, 2019, as summarized in Table 3.

IV. PROJECT COSTS

A. Cost Avoidance Actions

SoCalGas exercised due diligence in the design, planning, and construction activities for this project to minimize or avoid costs when prudent to do so. As discussed above, the Project Team reviewed existing records, communicated with external stakeholders, and conducted a site walk to incorporate known site conditions in the project plan and design. The Project Team grouped this site with three additional sites into a single valve bundle to reduce engineering and construction costs. The Project Team tracked the projects separately to more effectively track cost and streamline project closeout for individual sites to minimize costs for the benefit of customers.

B. Cost Estimates

Based on the preliminary design, once the preliminary project scope was confirmed and engineering, design, and planning activities were underway, SoCalGas prepared an estimate of the Direct Costs of the Project in the amount of $976,029. The Project Team considered the conditions known at the time to prepare the preliminary Direct Cost estimate. This estimate reflects the projected Labor, Material, and Services costs anticipated to be incurred to execute the Project, based on initial design plans.

SoCalGas estimated Indirect Costs of the Project based on the estimated Direct Costs and other project-related variables.

C. Actual Direct and Indirect Costs

Actual Direct Costs reflect the Labor, Material, and Services costs incurred to execute the Project. Actual Indirect Costs reflect costs for incremental overhead loaders in accordance with Company overhead allocation policies. The total loaded cost of the Project is $1,437,551.

Table 4: Estimated and Actual Direct Costs and Variances[2]

Direct Costs ($)	Estimate	Actuals	Delta Over/(Under)
Company Labor	185,555	87,467	(98,088)
Materials	57,894	63,960	6,066
Mechanical Construction Contractor	310,940	430,601	119,661
Electrical Contractor	72,974	111,325	38,351
Construction Management & Support	55,799	54,484	(1,315)
Environmental	12,027	30,931	18,904
Engineering & Design	117,810	272,718	154,908
Project Management & Services	28,775	9,065	(19,710)
ROW & Permits	22,788	18,501	(4,287)
GMA	111,468	134,065	22,597
Total Direct Costs	**976,030**	**1,213,116**	**237,086**

Table 5: Estimated and Actual Indirect Costs, Total Costs, and Variances[3]

Indirect Costs/Total Costs ($)	Estimate	Actuals	Delta Over/(Under)
Overheads	483,821	175,455	(308,366)
AFUDC	396,891	42,593	(354,298)
Property Taxes	89,730	6,387	(83,343)
Total Indirect Costs	**970,442**	**224,435**	**(746,007)**
Total Direct Costs	**976,030**	**1,213,116**	**237,086**
Total Loaded Costs	**1,946,472**	**1,437,551**	**(508,921)**

The Actual Full-Time Equivalents[4] (FTEs) for this Project are 0.48.

2 Values may not add to total due to rounding.

3 Ibid

4 Full-time equivalents (FTEs) are included in GRC forecasts to provide context to requested amounts for company labor. FTEs are calculated by measuring the number of hours charged over a given time period. For example, one FTE is equal to 40 hours per week, or typically 2,080 hours per year. The calculation of FTEs includes overtime hours. Therefore, if one employee works 60 hours per week, he or she would be recorded as 1.5 FTEs.

D. Cost Impacts

Consistent with one of the overarching objectives of PSEP to maximize the cost effectiveness of safety enhancement investments, SoCalGas effectively planned, designed, and completed construction activities for this project. Each pipeline project is unique in scope and inherently complex due to a variety of factors including terrain, environmental and permitting constraints, scope changes during detailed design, material cost fluctuations, regulatory changes, and more. These complexities can lead to variances between initial estimates and actual costs. Consistent with prudent management at the time, the Project Team successfully mitigated these variances whenever feasible through the implementation of effective project management practices, thorough planning, and continuous monitoring.

At the completion of the 29 Palms Valve Enhancement Project – Sunburst Street, Actual Direct Costs came within the AACE Class 3 Total Installed Cost (TIC) accuracy range, adhering to the standard industry practices defined by the Association for the Advancement of Cost Engineering (AACE) International. The Actual Direct Costs exceeded the preliminary estimate by $237,086. This variance can be attributed to several factors including: Detailed engineering, design, and planning activities led to enhancements in the Project design and addressed key engineering factors. As a result, The Target Price Estimate (TPE) developed by SoCalGas and the Construction Contractor before construction decreased the construction estimate to [redacted]; the Project Team identified during detailed design that an environmental monitor would be required for the desert tortoise as there was potential habitat in the area; and the engineering firm provided Project Manager and Project Engineer support during development, construction, and closeout, these costs were recognized under Engineering and Design.

V. CONCLUSION

SoCalGas enhanced the safety of its natural gas system by prudently executing the 29 Palms Valve Enhancement Project – Sunburst Street. Through this Valve Enhancement Project, SoCalGas successfully automated one mainline valve to achieve the objective of enabling rapid system isolation of a portion of Line 6916 located in San Bernardino County. The total loaded cost of the Project is $1,437,551.

SoCalGas executed this project prudently through designing and executing the project to support achievement of Valve Enhancement Plan isolation objectives, bundling four projects together to capture efficiencies through coordinated engineering, expanding the existing site to accommodate the new equipment, erecting a block wall to protect the equipment from theft and vandalism, installing the necessary automation equipment, and installing equipment necessary to bring power and communication capabilities to the site to enable rapid system isolation of a portion of Line 6916 located in an unincorporated area of San Bernardino County.

SoCalGas engaged in prudent cost avoidance efforts to complete this safety enhancement at a reasonable cost by carefully planning and coordinating engineering and construction activities to maximize efficiencies and reduce customer and community impacts, engaging in reasonable efforts to promote competitive and market- based rates for contractor services and materials, and using a reasonable amount of company and contractor resources to complete this safety enhancement as soon as practicable.

End of 29 Palms Valve Enhancement Project – Sunburst Street Final Report

I. 29 PALMS VALVE ENHANCEMENT PROJECT – UTAH TRAIL

A. Background and Summary

The 29 Palms Valve Enhancement Project – Utah Trail consists of valve enhancements made to an existing mainline valve (MLV) located in the City of Twentynine Palms in San Bernardino County. Through this project, SoCalGas enhanced the safety of its natural gas transmission system by enabling the rapid detection of a significant change in pipeline pressure and remote isolation and depressurization of a portion of Line 6916 in the event of a pipeline rupture. SoCalGas installed new power equipment, new communications equipment, and the necessary automation equipment at the site. The total loaded project cost is $1,287,490.

The 29 Palms Valve Enhancement Project – Utah Trail construction site is located within an existing SoCalGas facility located in a desert environment at the intersection of Utah Trail and Valle Vista Road in the City of Twentynine Palms in San Bernardino County. SoCalGas bundled this valve project with three additional valve projects, the 29 Palms Valve Enhancement Projects – Indian Canyon, Mohawk Trail, and Sunburst Street, into a single valve bundle to gain efficiencies in engineering, planning, and construction activities. The Project Team tracked the projects separately to more effectively track costs and streamline project closeout for individual sites. This workpaper describes the construction activities and costs of the 29 Palms Valve Enhancement Project – Utah Trail.

Final Report for 29 Palms Valve Enhancement Project – Utah Trail

Table 1: General Project Information

29 Palms Valve Enhancement Project - Utah Trail			
Location	City of Twentynine Palms		
Days on Site	26 days		
Construction Start	01/8/2018		
Construction Finish	03/20/2018		
Commissioning Date	10/31/2019		
Valve Upgrades			
Valve Number	6916-66.30-0		
Valve Type	Existing – Ball		
Actuator	Existing		
Actuator Above-/Below-Grade	Above-Grade		
ASV	Yes		
RCV	Yes		
Site Upgrades			
Vault	Existing		
Power	New – Solar		
Communication	New – Radio		
SCADA Panel	New		
Equipment Shelter	New		
Fencing	New – Expanded		
Project Costs ($)	**Capital**	**O&M**	**Total**
Loaded Project Costs	1,287,490	-	1,287,490
Disallowed Costs	-	-	-

B. Maps and Images

Figure 1: 29 Palms Bundle Overview

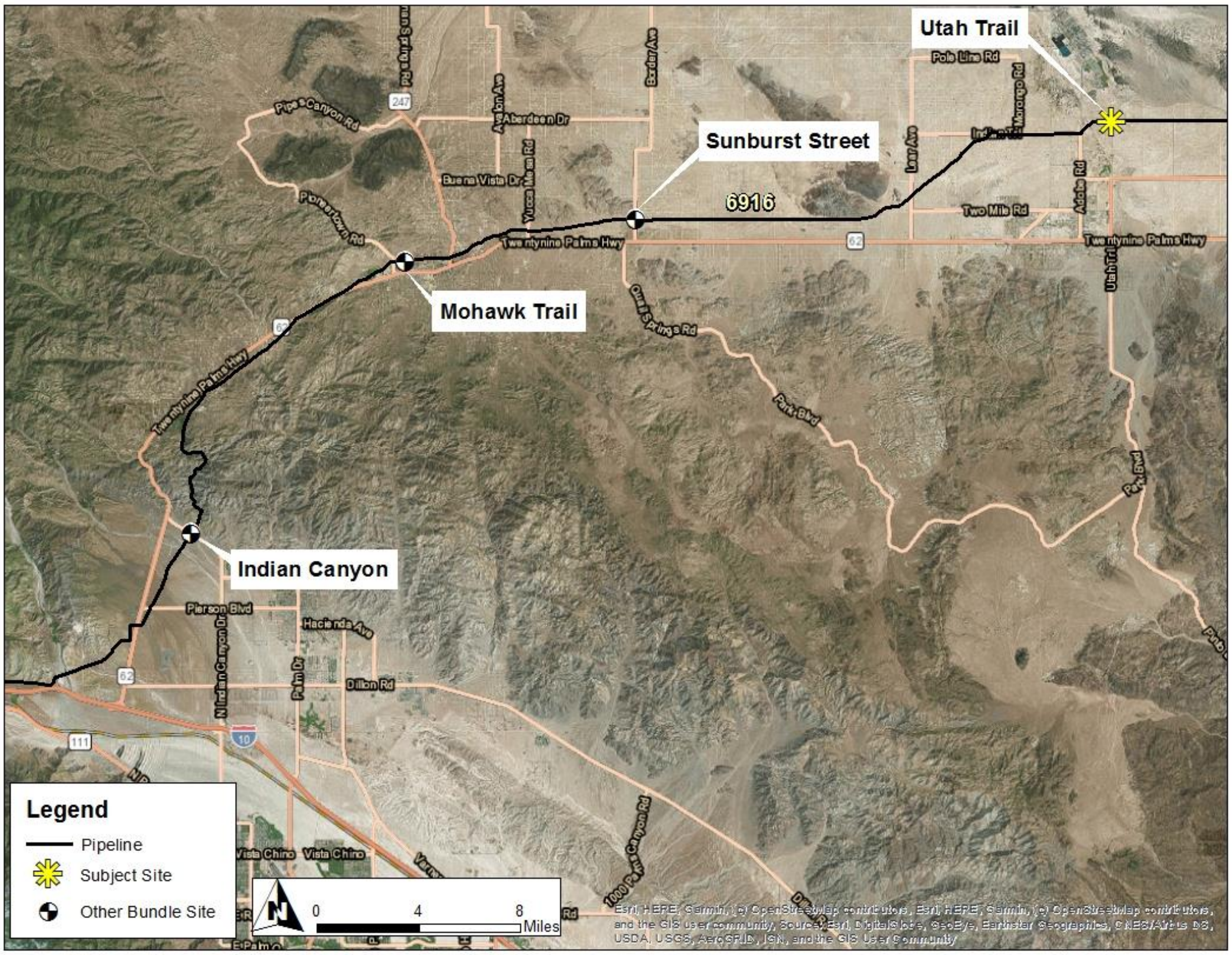
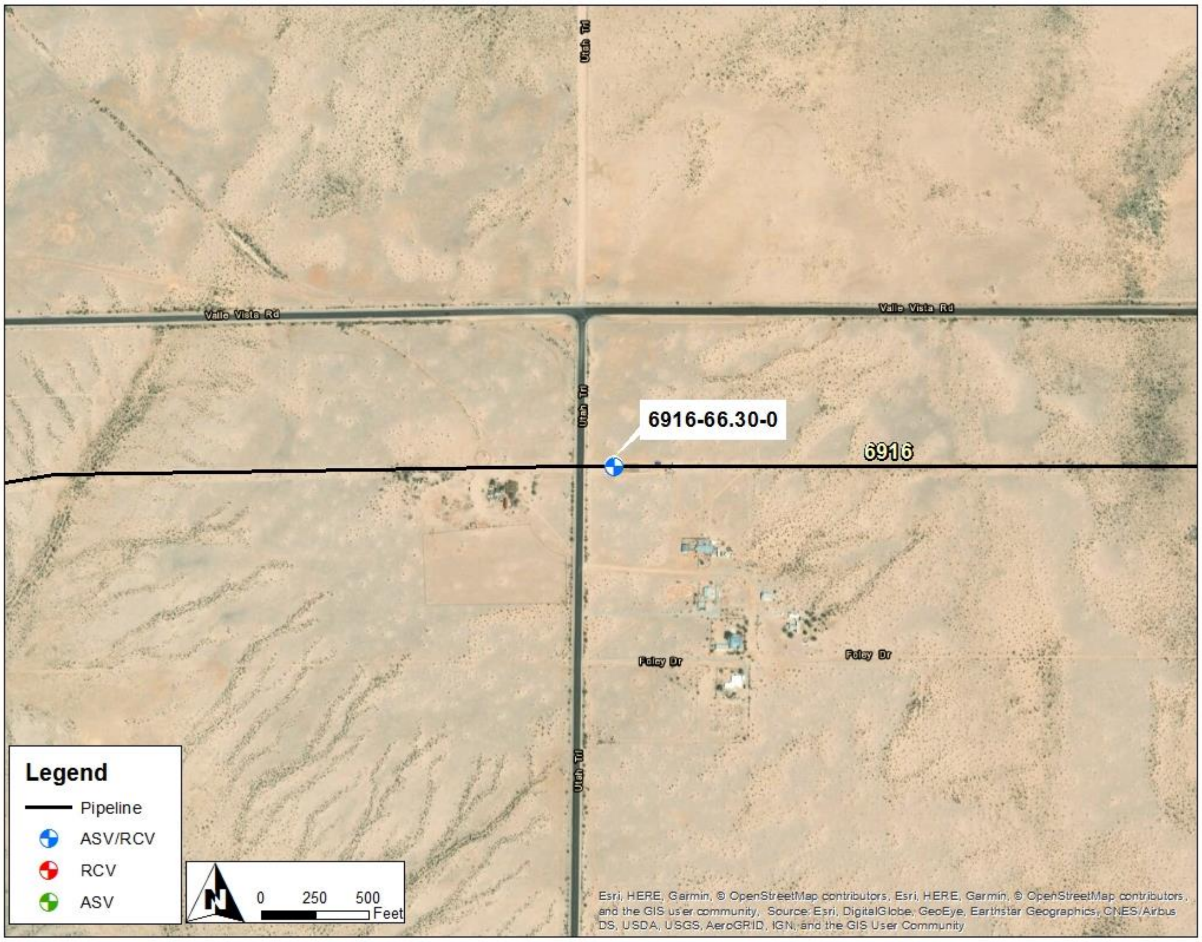


Figure 2: Satellite Image of 29 Palms Valve Enhancement Project – Utah Trail



II. ENGINEERING, DESIGN, AND PLANNING

A. Project Scope

SoCalGas presented a conceptual project scope in workpapers supporting the Valve Enhancement Plan in the 2011 PSEP filing.[1] This conceptual scope did not include this project. SoCalGas reviewed available information, performed a detailed system flow analysis, and identified this mainline valve as a candidate for enhancement to provide the planned isolation. The final project scope is summarized in Table 2 below.

1. 2011 PSEP Filing: SoCalGas did not identify this valve for automation to achieve the objective of rapid system isolation.
2. Updated Scope: SoCalGas determined that the automation of MLV 6916-66.30-0 would enable rapid isolation, thereby achieving Valve Enhancement Plan objectives.
3. Engineering, Design, and Constructability: No notable engineering adjustments were required to the standard design.
4. Final Project Scope: The final project scope consists of the automation of one MLV, the expansion of the existing facility, the installation of new power equipment, the installation of new communications equipment, the installation of new fencing, and the installation of the necessary automation equipment at the site.

Table 2: Final Project Scope

Final Project Scope					
Line	Mile	Valve #	Valve Size (*confidential*)	Installation Type	Function
6916	66.30	0	[redacted]	C/P	ASV/RCV

[1] *See* Workpapers supporting Amended Pipeline Safety Enhancement Plan (PSEP) of SoCalGas and SDG&E, submitted on December 2, 2011, at WP-IX-2-14 through WP-IX-2-25 (A.11-11-002 Exh. SCG-32).

B. Site Evaluation and Planning

SoCalGas initiated the planning process for the 29 Palms Valve Enhancement Project – Utah Trail by performing a pre-design site walk to determine the existing conditions and assess any potential impact on the design. Key factors that influenced the engineering and design of this project are as follows:

1. Site Description: This project site is an existing SoCalGas facility in a remote desert area near the intersection of Utah Trail and Valle Vista Road in the City of Twentynine Palms.
2. Land Issues: During the pre-design site walk, the Project Team noted that the existing station would need to be expanded to accommodate the additional equipment.
3. DOT Class: This project site is in a Class 2 location. SoCalGas selected this MLV for automation to isolate an HCA location downstream of this valve.
4. Power Source: There was no preexisting power source. The Project Team installed new power equipment at the site.
5. Communication Technology: There was no preexisting communications equipment. The Project Team installed new communications equipment at the site.

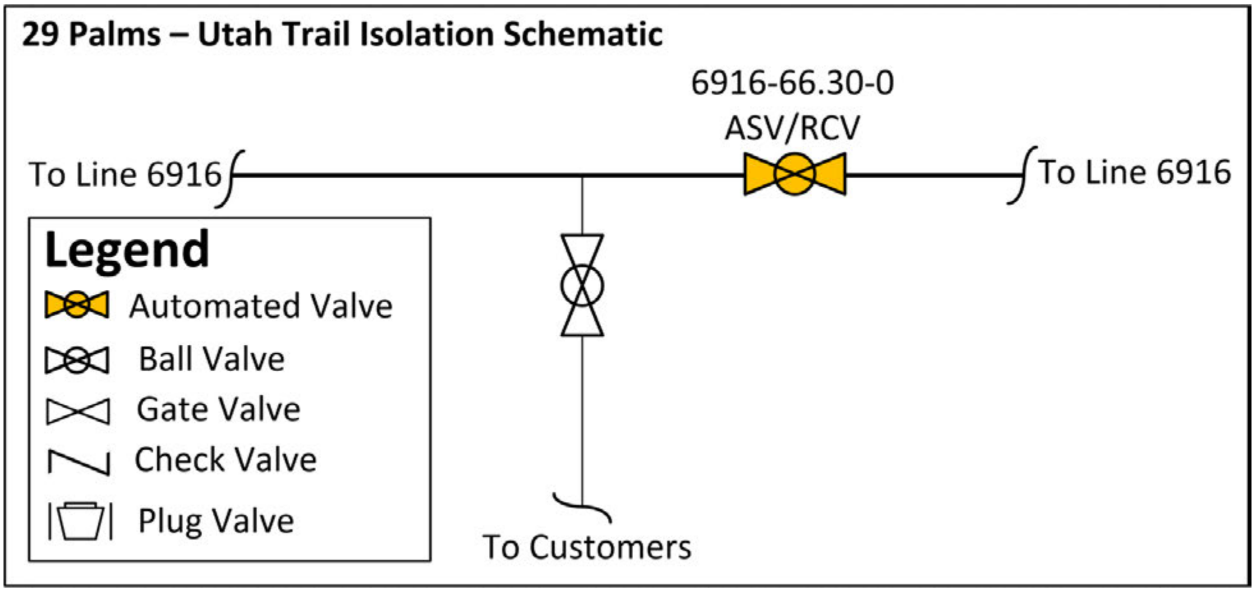
C. Engineering, Design, and Planning Factors

SoCalGas reviewed drawings and records, contacted internal planning groups, communicated with external stakeholders, conducted survey activity, and completed a site walk. Key factors that influenced the engineering and design of the Project are as follows:

1. Engineering Assessment: During the site evaluation, the Project Team confirmed the preexisting technology and verified the need to expand the existing station to accommodate the new equipment.
2. Valve Details: The existing valve was a manually actuated Class 600 ball valve, which was reused by the Project Team.

3. Actuator Details: The existing actuator was a double-acting pneumatic actuator, which was reused by the Project Team.
4. Customer Impact: The Project Team did not identify any anticipated service disruptions to customers.
5. Community Impact: The Project Team did not anticipate any notable impacts to the community from this project.
6. Substructures: The Project Team did not identify any existing substructures that affected the design and engineering at this site.
7. Environmental: The Project Team did not identify any notable environmental concerns at the site. An environmental monitor performed routine site visits during construction.
8. Permit Restrictions: The Project Team obtained an electrical permit and an encroachment permit from San Bernardino County.
9. Land Use: The Project Team performed all work within the existing SoCalGas easement.
10. Traffic Control: The Project Team did not identify any traffic control for this project.

Figure 3: 29 Palms Valve Enhancement Project – Utah Trail Schematic



D. Scope Changes

SoCalGas did not make any notable scope changes during detailed design.

III. CONSTRUCTION

A. Construction Contractor Selection

The Project Team prepared an initial cost estimate based on the preliminary design. Following completion of the engineering, design, and planning activities described above, the Project Team directed the Performance Partner (Mechanical Construction Contractor) and Alliance Partner (Electrical Contractor) to prepare cost estimates based on a more detailed engineering design package. As indicated above, there were no notable changes in scope between the time when the Project Team prepared the preliminary cost estimate and when the Performance Partner and Alliance Partner prepared and submitted their estimates.

1. <u>SoCalGas' Preliminary Mechanical Construction Contractor Estimate *(confidential)*:</u> SoCalGas' preliminary cost estimate for construction was [redacted].

2. <u>Mechanical Construction Contractor's Target Price Estimate *(confidential)*:</u> The Mechanical Construction Contractor's cost estimate was [redacted], which was [redacted] than SoCalGas' preliminary cost estimate for construction.

3. <u>SoCalGas' Preliminary Electrical Contractor Estimate *(confidential)*:</u> SoCalGas' preliminary cost estimate for the electrical construction was [redacted].

4. <u>Electrical Contractor's Estimate *(confidential)*:</u> The Electrical Contractor's estimate was [redacted], which was [redacted] than SoCalGas' preliminary cost estimate.

B. Construction Schedule

Table 3: Construction Timeline

Construction Start Date	01/08/2018
Construction Completion Date	03/20/2018
Days on Site	26 days
Commissioning Date	10/31/2019

The Project Team completed all construction activities as soon as practicable prior to commissioning. Finalization of commissioning activities is dependent on electrical utility connections, and system and/or resource availability.

C. Changes During Construction

SoCalGas successfully mitigated field conditions during construction in a manner that minimized potential impacts on project scope, cost, and schedule. As a result, these conditions did not result in any notable change orders.

Figure 4: New Linebreak Cabinet in the Foreground, New Shelter in the Background

D. Commissioning and Site Restoration

Commissioning activities included site restoration, final inspections, and placement of the valve into service. During this stage, SoCalGas successfully performed site acceptance testing and conducted point-to-point verification with Gas Control personnel for the newly-automated valve, and transferred ownership of the new equipment to Field Operations. Closeout activities included development of final drawings, the reconciliation package, and updates to company recordkeeping systems to reflect the completed scope of work. The site was commissioned on October 31, 2019, as summarized in Table 3.

IV. PROJECT COSTS

A. Cost Avoidance Actions

SoCalGas exercised due diligence in the design, planning, and construction activities for this project to minimize or avoid costs when prudent to do so. As discussed above, the Project Team reviewed existing records, communicated with external stakeholders, and conducted a site walk to incorporate known site conditions in the project plan and design. SoCalGas bundled this valve project with three additional valve projects, the 29 Palms Valve Enhancement Projects – Indian Canyon, Mohawk Trail, and Sunburst Street, into a single valve bundle to gain efficiencies in engineering, planning, and construction activities to minimize costs for the benefit of customers.

B. Cost Estimates

Based on the preliminary design, once the preliminary project scope was confirmed and engineering, design, and planning activities were underway, SoCalGas prepared an estimate of the Direct Costs of the Project in the amount of $1,681,785. The Project Team considered the conditions known at the time to prepare the preliminary Direct Cost estimate. This estimate reflects the projected Labor, Material, and Services costs anticipated to be incurred to execute the Project, based on initial design plans.

SoCalGas estimated Indirect Costs of the Project based on the estimated Direct Costs and other project-related variables.

C. Actual Direct and Indirect Costs

Actual Direct Costs reflect the Labor, Material, and Services costs incurred to execute the Project. Actual Indirect Costs reflect costs for incremental overhead loaders in accordance with Company overhead allocation policies. The total loaded cost of the Project is $1,287,490.

Table 4: Estimated and Actual Direct Costs and Variances[2]

Direct Costs ($)	Estimate	Actuals	Delta Over/(Under)
Company Labor	296,263	67,898	(228,365)
Materials	56,901	69,620	12,719
Mechanical Construction Contractor	576,417	382,028	(194,389)
Electrical Contractor	166,210	120,347	(45,863)
Construction Management & Support	58,536	65,474	6,938
Environmental	105,291	21,077	(84,214)
Engineering & Design	147,338	201,131	53,793
Project Management & Services	39,630	12,255	(27,375)
ROW & Permits	42,810	14,380	(28,430)
GMA	192,389	131,007	(61,382)
Total Direct Costs	**1,681,785**	**1,085,217**	**(596,568)**

Table 5: Estimated and Actual Indirect Costs, Total Costs, and Variances[3]

Indirect Costs/Total Costs ($)	Estimate	Actuals	Delta Over/(Under)
Overheads	354,839	133,067	(221,772)
AFUDC	287,963	59,007	(228,956)
Property Taxes	65,563	10,200	(55,363)
Total Indirect Costs	**708,365**	**202,273**	**(506,092)**
Total Direct Costs	**1,681,785**	**1,085,217**	**(596,568)**
Total Loaded Costs	**2,390,150**	**1,287,490**	**(1,102,660)**

The Actual Full-Time Equivalent[4] (FTE) for this Project is 0.32.

[2] Values may not add to total due to rounding.
[3] Ibid.
[4] Full-time equivalents (FTEs) are included in GRC forecasts to provide context to requested amounts for company labor. FTEs are calculated by measuring the number of hours charged over a given time period. For example, one FTE is equal to 40 hours per week, or typically 2,080 hours per year. The calculation of FTEs includes overtime hours. Therefore, if one employee works 60 hours per week, he or she would be recorded as 1.5 FTEs.

D. Cost Impacts

Consistent with one of the overarching objectives of PSEP to maximize the cost effectiveness of safety enhancement investments, SoCalGas effectively planned, designed, and completed construction activities for this project. Each pipeline project is unique in scope and inherently complex due to a variety of factors including terrain, environmental and permitting constraints, scope changes during detailed design, material cost fluctuations, regulatory changes, and more. These complexities can lead to variances between initial estimates and actual costs. Consistent with prudent management at the time, the Project Team successfully mitigated these variances whenever feasible through the implementation of effective project management practices, thorough planning, and continuous monitoring.

At the completion of the 29 Palms Valve Enhancement Project – Utah Trail, Actual Direct Costs were less than the preliminary estimate by $596,568. This variance is attributable to a variety of factors including: coordination with other projects in the 29 Palms Valve Enhancement Bundle allowed for shared efforts and reduced project planning costs; after the completion of detailed design, Detailed engineering, design, and planning activities led to enhancements in the Project design and addressed key engineering factors. As a result, The Target Price Estimate (TPE) developed by SoCalGas and the Construction Contractor before construction [redacted] the construction estimate to [redacted]; the project team did not encounter hazardous materials during construction as anticipated, removing costs for abatement and removal; environmental costs were lowered due to the project site being primarily in an existing SoCalGas station; and survey requirements were lower than originally anticipated.

V. CONCLUSION

SoCalGas enhanced the safety of its natural gas system by prudently executing the 29 Palms Valve Enhancement Project – Utah Trail. Through this Valve Enhancement Project, SoCalGas successfully automated one mainline valve to achieve the objective of enabling rapid system isolation of a portion of Line 6916 located in the City of Twentynine Palms in San Bernardino County. The total loaded cost of the Project is $1,287,490.

SoCalGas executed this project prudently through designing and executing the project to support achievement of Valve Enhancement Plan isolation objectives, bundling four geographically proximate projects together to capture efficiencies through coordinated engineering, and installing equipment necessary to bring power and communication capabilities to the site to enable rapid system isolation to a portion of Line 6916 located in the City of Twentynine Palms.

SoCalGas engaged in prudent cost avoidance efforts to complete this safety enhancement at a reasonable cost by carefully planning and coordinating engineering and construction activities to maximize efficiencies and reduce customer and community impacts, engaging in reasonable efforts to promote competitive and market- based rates for contractor services and materials, and using a reasonable amount of company and contractor resources to complete this safety enhancement as soon as practicable.

End of 29 Palms Valve Enhancement Project - Utah Trail Final Report

I. SUPPLY LINE 45-120 VALVE ENHANCEMENT PROJECT

A. Background and Summary

The Supply Line 45-120 Valve Enhancement Project consists of valve enhancements made to one new mainline valve (MLV) located in Valencia. Through this project, SoCalGas enhanced the safety of its natural gas transmission system by enabling the rapid detection of a significant change in pipeline pressure and remote isolation and depressurization of a portion of Supply Lines 45-120 and 33-120 in the event of a pipeline rupture. SoCalGas installed one new MLV, one new actuator, one shelter, new communication equipment, and the necessary automation equipment. The total loaded project cost is $1,090,922.

Supply Line 45-120 Valve Enhancement Project site is an existing SoCalGas facility within a Metropolitan Water District (MWD) property west of San Fernando Road.

Final Report for Supply Line 45-120 Valve Enhancement Project

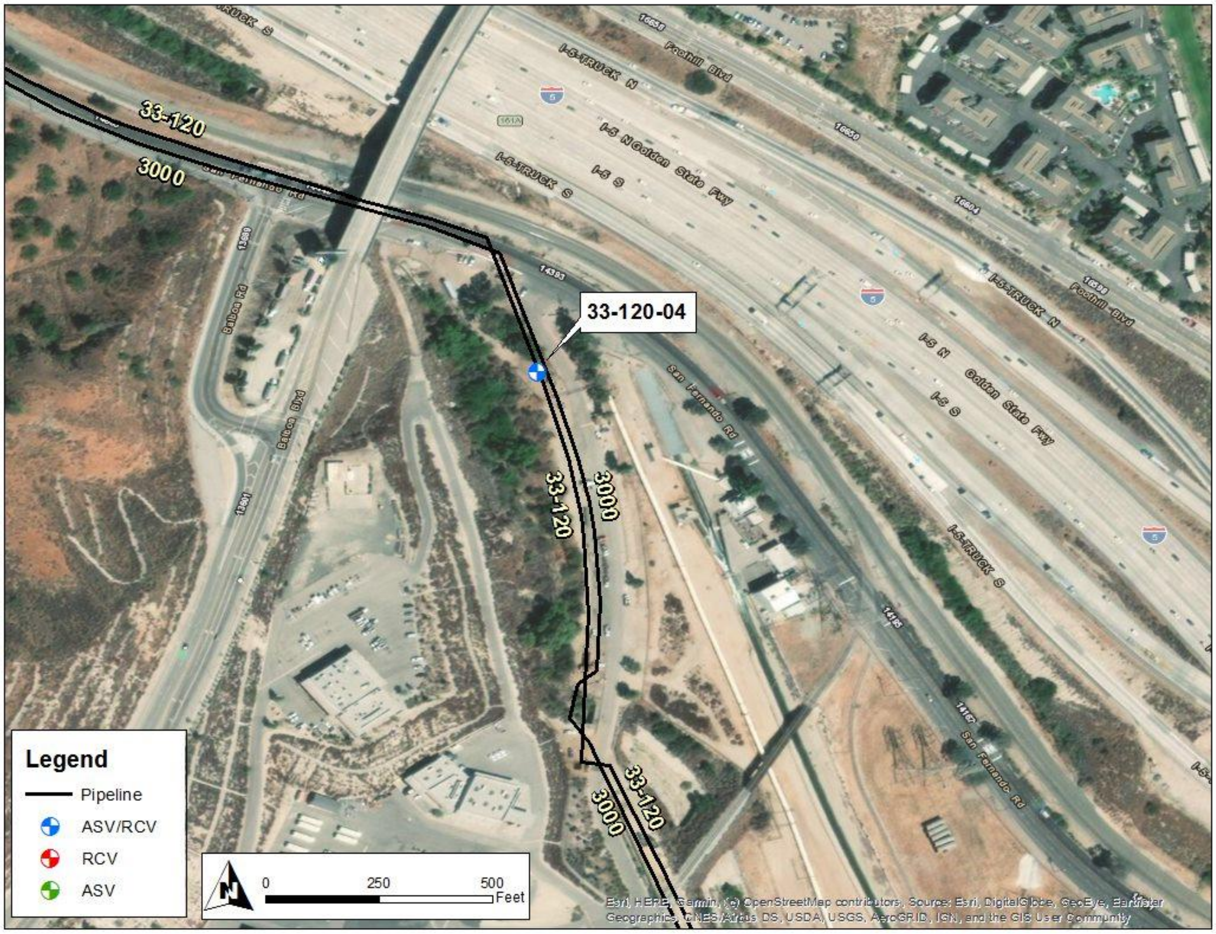
Table 1: General Project Information

Supply Line 45-120 Valve Enhancement Project			
Location	Valencia		
Days on Site	94 days		
Construction Start	04/02/2018		
Construction Finish	07/05/2018		
Commissioning Date	03/25/2019		
Valve Upgrades			
Valve Number	33-120-04		
Valve Type	New – Ball [1]		
Actuator	New		
Actuator Above-/Below-Grade	Above-Grade		
ASV	Yes		
RCV	Yes		
Site Upgrades			
Vault	None		
Power	Upgraded – Utility		
Communication	Replaced – Radio		
SCADA Panel	New		
Equipment Shelter	New		
Fencing/Wall	Existing		
Project Costs ($)	**Capital**	**O&M**	**Total**
Loaded Project Costs	1,090,922	-	1,090,922
Disallowed Costs	-	-	-

[1] The PSEP Supply Line 33-120 Section 1 Replacement Project funded the installation of the new mainline valve.

B. Maps and Images

Figure 1: Satellite Image of Supply Line 45-120 Valve Enhancement Project



II. ENGINEERING, DESIGN, AND PLANNING

A. Project Scope

SoCalGas presented a conceptual project scope in workpapers supporting the Valve Enhancement Plan in the 2011 PSEP filing.[2] This conceptual scope did not identify this project. SoCalGas reviewed available information and performed a detailed system flow analysis that identified this MLV as a candidate for installation to provide the planned isolation. The final project scope is summarized in Table 2 below.

1. <u>2011 PSEP Filing:</u> SoCalGas did not originally identify this MLV for installation to achieve the objective of rapid system isolation.
2. <u>Updated Scope:</u> SoCalGas determined that the automation of MLV 33-120-04 would enable rapid isolation, thereby achieving Valve Enhancement Plan objectives.
3. <u>Engineering, Design, and Constructability:</u>
   a. The Project Team coordinated the enhancement of the valve at this site with the Supply Line 33-120 Replacement Project – Section 1. The Installation of the new valve was included in the scope of the replacement project. The scope of the automation work for this value included the upgrading of the power equipment, the installation of new communication equipment, and the necessary automation equipment.
   b. The Project Team identified this valve as the demarcation feature for Supply Line 45-120 and Supply Line 33-120.
4. <u>Final Project Scope:</u> The final project scope consists of the installation of one new MLV, installation of one new actuator, the installation of a new shelter, the installation of the new communication equipment, and the installation of the necessary automation equipment.

[2] *See* Workpapers supporting Amended Pipeline Safety Enhancement Plan (PSEP) of SoCalGas and SDG&E, submitted on December 2, 2011, at WP-IX-2-14 through WP-IX-2-25 (A.11-11-002 Exh. # SCG-32).

Table 2: Final Project Scope

Final Project Scope					
Line	Mile	Valve #	Valve Size (*confidential*)	Installation Type	Function
33-120	0.00	04	[redacted]	A/AG	ASV/RCV

B. Site Evaluation and Planning

SoCalGas initiated the planning process for the Supply Line 45-120 Valve Enhancement Project by performing a pre-design site walk to determine the existing conditions and assess any potential impact on the design. Key factors that influenced the engineering and design of this project are as follows:

1. Site Description: This site is an existing SoCalGas facility located in a high-density area within MWD property west of San Fernando Road.
2. Land Issues: The Project Team noted that the existing facility can accommodate the new equipment.
3. DOT Class: This project site is in a Class 3 location.
4. Power Source: The site had preexisting utility power. The Project Team installed new utility power equipment to accommodate the increased loads from the new automation equipment.
5. Communication Technology: There was preexisting communications equipment. The Project Team upgraded the communications equipment at the site.

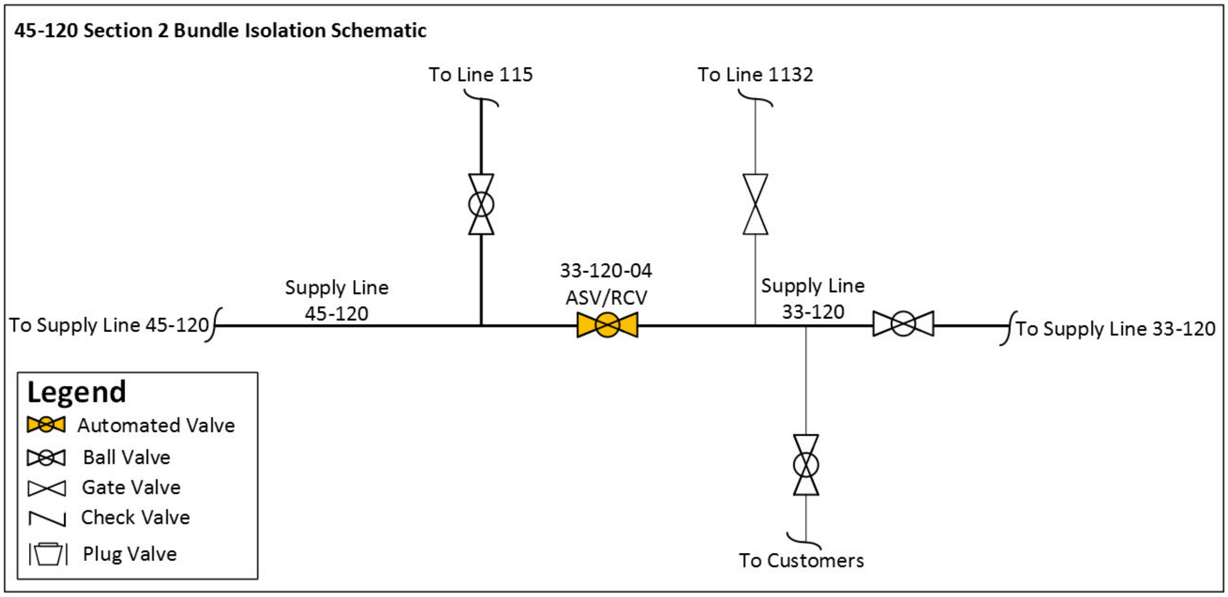
C. Engineering, Design, and Planning Factors

SoCalGas reviewed drawings and records, contacted internal planning groups, communicated with external stakeholders, conducted survey activity, and completed a site walk. Key factors that influenced the engineering and design of the Project are as follows:

Final Report for Supply Line 45-120 Valve Enhancement Project

1. Engineering Assessment: During the site evaluation, the Project Team confirmed the existing technology and verified that the station could accommodate the new equipment.
2. Valve Details: There was no existing valve. The Project Team installed a new Class 600 ball valve.
3. Actuator Details: There was no preexisting actuator. The Project Team installed a new actuator.
4. Customer Impact: The Project Team did not identify any anticipated service disruptions to customers.
5. Community Impact: The Project Team did not anticipate any notable impacts to the Community from this project.
6. Substructures: The Project Team did not identify any existing substructures that affected the design and engineering at this site.
7. Environmental: The Project Team did not anticipate environmental impact from this project. An environmental monitor performed routine site visits during construction.
8. Permit Restrictions: The Project Team acquired an encroachment permit MWD.
9. Land Use: The Project Team performed all construction activity within the existing easement.
10. Traffic Control: The Project Team did not identify any traffic control needs at the site.

Figure 2: Supply Line 45-120 Valve Enhancement Project Schematic



D. Scope Changes

Through engineering, design, and planning activities, SoCalGas determined that changes in scope were appropriate to enhance the design of the Project and address engineering factors. As a result, the preliminary cost estimate does not fully reflect the final scope. The Project Team determined that the preexisting shelter had to be removed and a new one installed at a different location to meet electrical area classification requirements. The Operating District funded the removal of the preexisting shelter and the installation of the new shelter.

III. CONSTRUCTION

A. Construction Contractor Selection

The Project Team prepared an initial cost estimate based on the preliminary design. Following completion of the engineering, design, and planning activities described above, the Project Team directed the Alliance Partner (Electrical Contractor) to prepare a cost estimate based on a more detailed engineering design package. As indicated above, there were no notable changes in scope between the time when the Project Team prepared the preliminary cost estimate and when the Alliance Partner prepared and submitted their estimate.

1. <u>SoCalGas' Preliminary Electrical Contractor Estimate *(confidential)*:</u> SoCalGas' preliminary cost estimate for construction was [redacted].
2. <u>Electrical Contractor's Estimate (*confidential*):</u> The Electrical Contractor's estimate was [redacted], which was [redacted] than SoCalGas' preliminary cost estimate.

B. Construction Schedule

Table 3: Construction Timeline

Construction Start Date	04/02/2018
Construction Completion Date	07/05/2018
Days on Site	94 days
Commissioning Date	03/25/2019

The Project Team completed all construction activities as soon as practicable prior to commissioning. Finalization of commissioning activities is dependent on electrical utility connections, and system and/or resource availability.

C. Changes During Construction

SoCalGas successfully mitigated field conditions during construction in a manner that minimized potential impacts on project scope, cost, and schedule. As a result, these conditions did not result in any notable change orders.

Figure 3: Marking of Trench Line for Conduit Run

Figure 4: Trench for Conduit Run

Figure 5: New Actuator and Equipment

D. Commissioning and Site Restoration

Commissioning activities included site restoration, final inspections, and placement of the valve into service. During this stage, SoCalGas successfully performed site acceptance testing and conducted point-to-point verification with SoCalGas Gas Control personnel for the newly-automated valve, and transferred ownership of the new equipment to Field Operations. Closeout activities included development of final drawings, the reconciliation package, and updates to company recordkeeping systems to reflect the completed scope of work. The site was commissioned on March 25, 2019, as summarized in Table 3.

IV. PROJECT COSTS

A. Cost Avoidance Actions

SoCalGas exercised due diligence in the design, planning, and construction activities for this project to minimize or avoid costs when prudent to do so. As discussed above, the Project Team reviewed existing records, communicated with external stakeholders, and conducted a site walk to incorporate the site conditions in the project plan and design. Specific examples of cost avoidance actions taken on this project were:

1. Land Use: The Project Team shared a TRE for the laydown yard and parking with the PSEP Supply Line 33-120 Section 1 Replacement Project.
2. Permit Conditions: The Project Team shared permit costs with the PSEP Supply Line 33-120 Section 1 Replacement Project.
3. Construction Execution: The Project Team coordinated the installation of the new valve with the PSEP Supply Line 33-120 Section 1 Replacement Project with the Replacement Project funding the activities related to the installation of the new and the Valve Enhancement Project funding the activities related to the automation of the new valve.

B. Cost Estimates

Based on the preliminary design, once the preliminary project scope was confirmed and engineering, design, and planning activities were underway, SoCalGas prepared an estimate of the Direct Costs of the Project in the amount of $997,333. The Project Team considered the conditions known at the time to prepare the preliminary Direct Cost estimate. This estimate reflects the projected Labor, Material, and Services costs anticipated to be incurred to execute the Project, based on initial design plans.

SoCalGas estimated Indirect Costs of the Project based on the estimated Direct Costs and other project-related variables.

C. Actual Direct and Indirect Costs

Actual Direct Costs reflect the Labor, Material, and Services costs incurred to execute the Project. Actual Indirect Costs reflect costs for incremental overhead loaders in accordance with Company overhead allocation policies. The total loaded cost of the Project is $1,090,922.

Table 4: Estimated and Actual Direct Costs and Variances[3]

Direct Costs ($)	Estimate	Actuals	Delta Over/(Under)
Company Labor	209,474	107,032	(102,442)
Materials	119,480	112,109	(7,371)
Mechanical Construction Contractor	-	-	-
Electrical Contractor	168,137	161,923	(6,214)
Construction Management & Support	55,512	78,441	22,929
Environmental	27,562	-	(27,562)
Engineering & Design	187,187	241,507	54,320
Project Management & Services	128,021	42,755	(85,266)
ROW & Permits	-	-	-
GMA	101,960	123,266	21,306
Total Direct Costs	**997,333**	**867,034**	**(130,299)**

Table 5: Estimated and Actual Indirect Costs, Total Costs, and Variances[4]

Indirect Costs/Total Costs ($)	Estimate	Actuals	Delta Over/(Under)
Overheads	321,717	153,914	(167,803)
AFUDC	28,876	60,868	31,992
Property Taxes	6,369	9,106	2,737
Total Indirect Costs	**356,962**	**223,888**	**(133,074)**
Total Direct Costs	**997,333**	**867,034**	**(130,299)**
Total Loaded Costs	**1,354,295**	**1,090,922**	**(263,373)**

[3] Values may not add to total due to rounding.
[4] Ibid.

The Actual Full-Time Equivalent[5] (FTE) for this Project is 0.28.

D. Cost Impacts

Consistent with one of the overarching objectives of PSEP to maximize the cost effectiveness of safety enhancement investments, SoCalGas effectively planned, designed, and completed construction activities for this project. Each pipeline project is unique in scope and inherently complex due to a variety of factors including terrain, environmental and permitting constraints, scope changes during detailed design, material cost fluctuations, regulatory changes, and more. These complexities can lead to variances between initial estimates and actual costs. Consistent with prudent management at the time, the Project Team successfully mitigated these variances whenever feasible through the implementation of effective project management practices, thorough planning, and continuous monitoring.

At the completion of the Supply Line 45-120 Valve Enhancement Project, Actual Direct Costs came within the AACE Class 3 Total Installed Cost (TIC) accuracy range, adhering to the standard industry practices defined by the Association for the Advancement of Cost Engineering (AACE) International. The Actual Direct Costs were less than the preliminary estimate by $130,299. This variance can be attributed to several factors including: the initial project estimate was developed as a standalone project, but after further review, the Project Team identified an opportunity for project efficiencies with another SoCalGas project and Company Labor and Project Management & Services shared costs; the project estimate included Environmental abatement and hazardous disposal costs for 5 days, which during construction was determine not required.

[5] Full-time equivalents (FTEs) are included in GRC forecasts to provide context to requested amounts for company labor. FTEs are calculated by measuring the number of hours charged over a given time period. For example, one FTE is equal to 40 hours per week, or typically 2,080 hours per year. The calculation of FTEs includes overtime hours. Therefore, if one employee works 60 hours per week, he or she would be recorded as 1.5 FTEs.

V. CONCLUSION

SoCalGas enhanced the safety of its natural gas system by prudently executing the Supply Line 45-120 Valve Enhancement Project. Through this Valve Enhancement Project, SoCalGas successfully automated one valve, installed one new actuator, one shelter, new communication equipment, and the necessary automation equipment to achieve the objective of enabling rapid system isolation of portions of Supply Lines 45-120 and 33-120 in Valencia. The total loaded cost of the Project is $1,090,922.

SoCalGas executed this project prudently through designing and executing the project to support achievement of Valve Enhancement Plan isolation objectives by installing equipment necessary to bring power and communication capabilities to enable rapid system isolation to a portion of Supply Lines 45-120 and 33-120 located in Los Angeles County.

SoCalGas engaged in prudent cost avoidance efforts to complete this safety enhancement at a reasonable cost by carefully planning and coordinating construction activities to maximize efficiencies and reduce customer and community impacts.

End of Supply Line 45-120 Valve Enhancement Project Final Report

I. LINE 225 VALVE ENHANCEMENT PROJECT – BEARTRAP

A. Background and Summary

The Line 225 Valve Enhancement Project – Beartrap consists of valve enhancements made to an existing mainline valve (MLV) located near the community of Lebec within Kern County. Through this project, SoCalGas enhanced the safety of its natural gas transmission system by enabling the rapid detection of a significant change in pipeline pressure and remote isolation and depressurization of a portion of Line 225 in the event of a pipeline rupture. SoCalGas installed one new actuator, new communications equipment, the necessary automation equipment, and new fencing at the site. The total loaded project cost is $1,262,291.

The Line 225 Valve Enhancement Project – Beartrap construction site is within an existing SoCalGas facility in a rural area on private property near the community of Lebec. SoCalGas bundled this valve project with an additional valve project, Line 225 Valve Enhancement Project – Quail Canal to gain efficiencies in engineering, planning, and construction activities. This workpaper describes the construction activities and costs of the Line 225 Valve Enhancement Project – Beartrap site.

Final Report for Line 225 Valve Enhancement Project – Beartrap

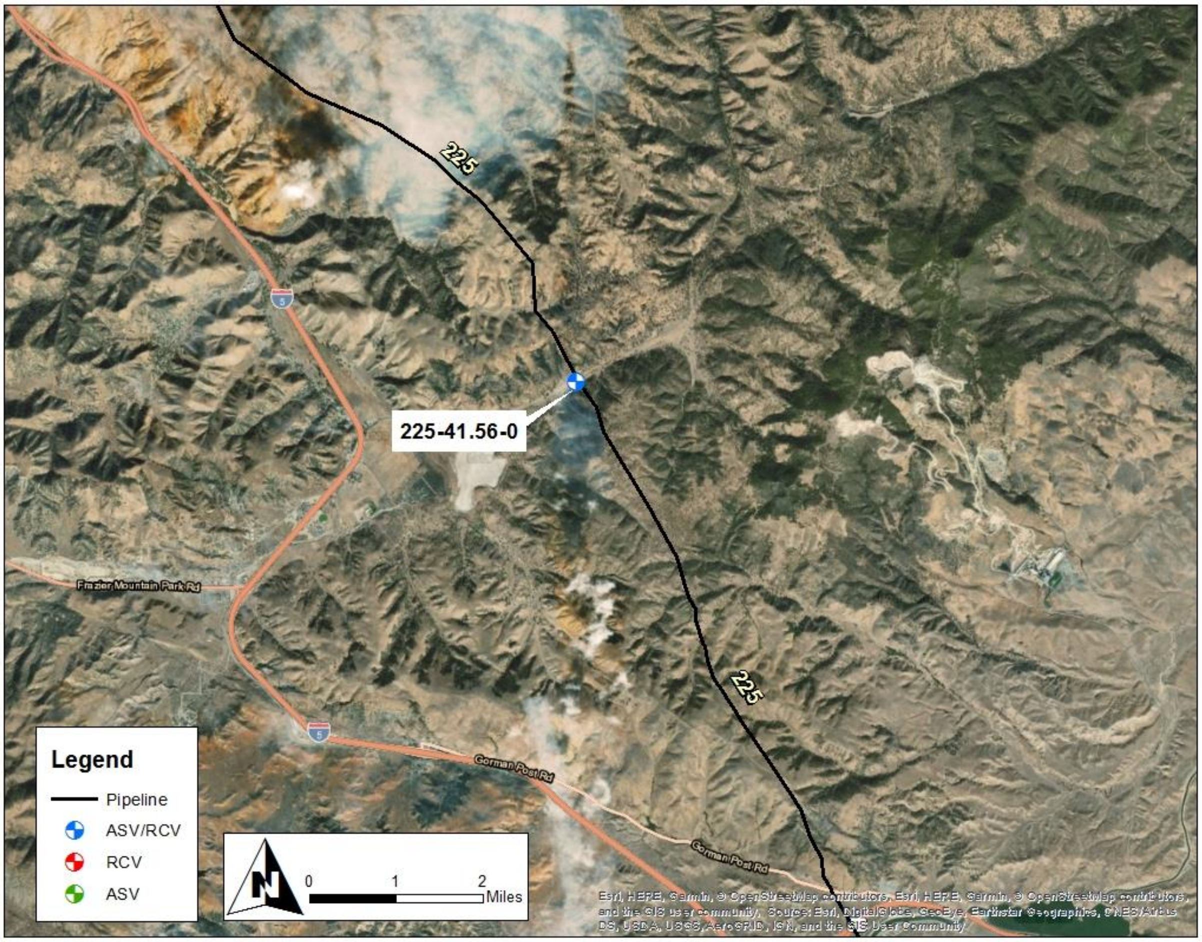
Table 1: General Project Information

Line 225 Valve Enhancement Project – Beartrap			
Location	Kern County		
Days on Site	39 days		
Construction Start	05/15/2017		
Construction Finish	08/03/2018		
Commissioning Date	01/23/2018		
Valve Upgrades			
Valve Number	225-41.56-0		
Valve Type	Existing – Ball		
Actuator	Replaced		
Actuator Above-/Below-Grade	Above-Grade		
ASV	Yes		
RCV	Yes		
Site Upgrades			
Vault	None		
Power	Existing – Solar		
Communication	New – VSAT		
SCADA Panel	New		
Equipment Shelter	None		
Fencing	New		
Project Costs ($)	**Capital**	**O&M**	**Total**
Loaded Project Costs	1,262,291	-	1,262,291
Disallowed Costs	-	-	-

B. Maps and Images

Figure 1: Satellite Image of Line 225 Valve Enhancement Project Overview

Figure 2: Satellite Image of Line 225 Valve Enhancement Project – Beartrap



II. ENGINEERING, DESIGN, AND PLANNING

A. Project Scope

SoCalGas presented a conceptual project scope for the Line 225 Valve Enhancement Project – Beartrap in workpapers supporting the Valve Enhancement Plan in the 2011 PSEP filing.[1] This conceptual scope identified MLV 225-41.56-0 for automation to enable remote isolation to a portion of Line 225. Prior to initiating execution of the Project, SoCalGas reviewed available information, performed a detailed system flow analysis to validate the scope of the Project, and confirmed that this valve enhancement will provide the planned isolation. The final project scope is summarized in Table 2 below.

1. <u>2011 PSEP Filing:</u> SoCalGas identified MLV 225-41.56-0 for automation to achieve the objective of rapid system isolation.
2. <u>Updated Scope:</u> Upon project initiation, SoCalGas reviewed the conceptual project scope and determined that this isolation point would enable rapid isolation, thereby achieving Valve Enhancement Plan objectives.
3. <u>Engineering, Design, and Constructability:</u> No notable engineering adjustments were required to the standard design.
4. <u>Final Project Scope:</u> The final project scope consists of the automation of one MLV, that included the installation of one new actuator, the installation of communications equipment, the installation of the necessary automation equipment, and the installation of new fencing at the project site.

[1] See Workpapers supporting Amended Pipeline Safety Enhancement Plan (PSEP) of SoCalGas and SDG&E, submitted on December 2, 2011, at WP-IX-2-14 through WP-IX-2-25 (A.11-11-002 Exh. # SCG-32).

Table 2: Final Project Scope

Final Project Scope					
Line	Mile	Valve #	Valve Size (*confidential*)	Installation Type	Function
225	41.56	0	[redacted]	A/AG	ASV/RCV

B. Site Evaluation and Planning

SoCalGas initiated the planning process for the Line 225 Beartrap Valve Enhancement Project by performing a pre-design site walk to determine the existing conditions and assess any potential impact on the design. Key factors that influenced the engineering and design of this project are as follows:

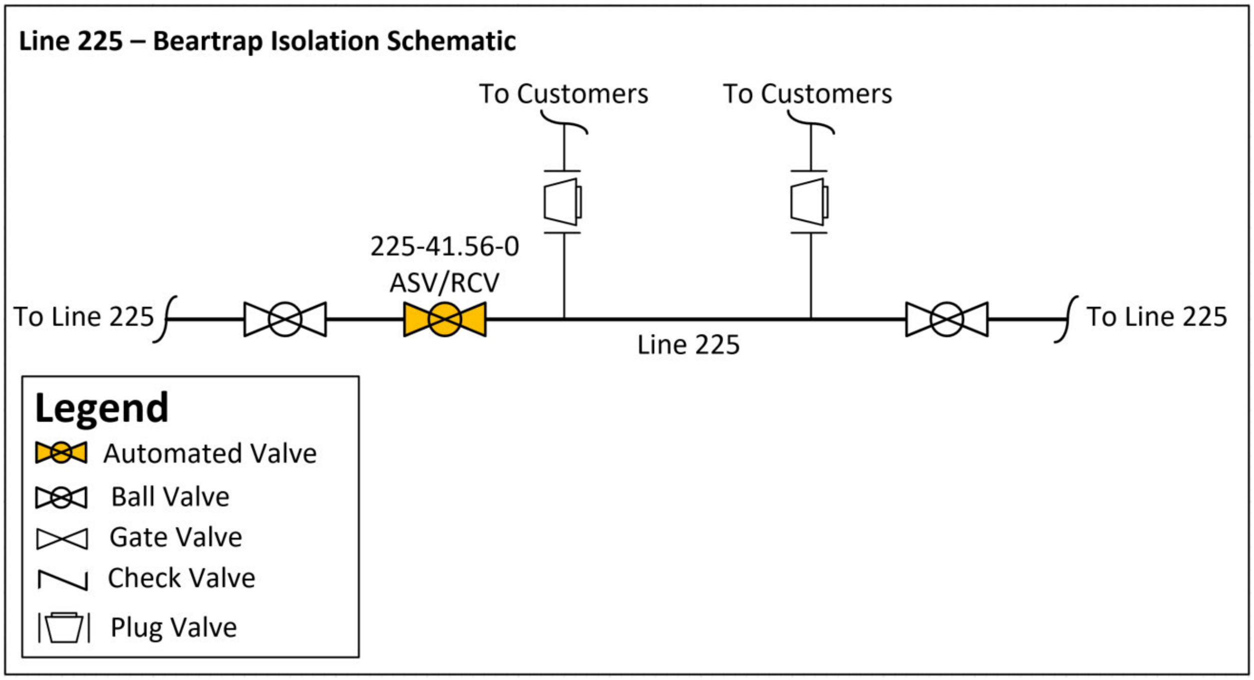
1. Site Description: This site is an existing SoCalGas facility in a rural area near the community of Lebec.
2. Land Issues: During the pre-design site walk, the Project Team noted that the existing station would need to be expanded to accommodate the additional equipment.
3. DOT Class: This project site is in a Class 1 location. SoCalGas selected this MLV for automation to isolate known geological threats upstream and downstream of this valve.
4. Power Source: The site had existing solar power.
5. Communication Technology: There was no preexisting communications equipment at this site. The Project Team installed new communications equipment.

C. Engineering, Design, and Planning Factors

SoCalGas reviewed drawings and records, contacted internal planning groups, communicated with external stakeholders, conducted survey activity, performed potholing of the area to identify the presence of underground utilities and substructures, and completed a site walk. Key factors that influenced the engineering and design of the Project are as follows:

1. Engineering Assessment: The Project Team determined that the station would need to be expanded in order to accommodate the new automation equipment.
2. Valve Details: The existing valve was a manually actuated Class 400 ball valve, which was reused by the Project Team.
3. Actuator Details: The preexisting actuator was incompatible with PSEP linebreak technology, so the Project Team installed a new actuator.
4. Customer Impact: The Project Team did not identify any anticipated service disruptions to customers.
5. Community Impact: The Project Team did not anticipate any notable impacts to the community from this project.
6. Substructures: The Project Team did not identify any existing substructures that affected the design and engineering at this site.
7. Environmental: The Project Team did not identify any notable environmental concerns at the site. An environmental monitor performed routine site visits during construction.
8. Permit Restrictions: There were no special permits or permit restrictions for this project.
9. Land Use: The Project Team expanded the existing facility to accommodate the new automation equipment however no new easements were required. A Temporary Right of Entry agreement from The Tejon Ranch Corporation was in place during construction.
10. Traffic Control: The Project Team did not identify any traffic control needs at the site.

Figure 3: Line 225 Valve Enhancement Project – Beartrap Schematic



D. Scope Changes

SoCalGas did not make any notable scope changes during detailed design.

III. CONSTRUCTION

A. Construction Contractor Selection

The Project Team prepared an initial cost estimate based on the preliminary design. Following completion of the engineering, design, and planning activities described above, the Project Team directed the Performance Partner (Mechanical Construction Contractor) and Alliance Partner (Electrical Contractor) to prepare cost estimates based on a more detailed engineering design package. As indicated above, there were no notable changes in scope between the time when the Project Team prepared the preliminary cost estimate and when the Performance Partner and Alliance Partner prepared and submitted their estimates.

1. <u>SoCalGas' Preliminary Mechanical Construction Contractor Estimate *(confidential)*:</u> SoCalGas' preliminary cost estimate for construction was [redacted]

2. <u>Mechanical Construction Contractor's Target Price Estimate *(confidential)*:</u> The Mechanical Construction Contractor's cost estimate was [redacted], which was [redacted] than SoCalGas' preliminary cost estimate for construction.

3. <u>SoCalGas' Preliminary Electrical Contractor Estimate *(confidential)*:</u> SoCalGas' preliminary cost estimate for the electrical contractor was [redacted]

4. <u>Electrical Contractor's Estimate *(confidential)*:</u> The Electrical Contractor's estimate was [redacted], which was [redacted] than SoCalGas' preliminary cost estimate.

B. Construction Schedule

Table 3: Construction Timeline

Construction Start Date	05/15/2017
Construction Completion Date	08/03/2018
Days on Site	39 days
Commissioning Date	01/23/2018

The Project Team completed all construction activities as soon as practicable prior to commissioning. Finalization of commissioning activities is dependent on electrical utility connections, and system and/or resource availability.

C. Changes During Construction

SoCalGas successfully mitigated field conditions during construction in a manner that minimized potential impacts on project scope, cost, and schedule. As a result, these conditions did not result in any notable change orders.

Figure 4: New Actuator and Excavation for Instrument Taps

D. Commissioning and Site Restoration

Commissioning activities included site restoration, final inspections, and placement of the valve into service. During this stage, SoCalGas successfully performed site acceptance testing and conducted point-to-point verification with Gas Control personnel for the newly-automated valve, and transferred ownership of the new equipment to Field Operations. Closeout activities included development of final drawings, the reconciliation package, and updates to company recordkeeping systems to reflect the completed scope of work. The site was commissioned on January 23, 2018, as summarized in Table 3.

IV. PROJECT COSTS

A. Cost Avoidance Actions

SoCalGas exercised due diligence in the design, planning, and construction activities for this project to minimize or avoid costs when prudent to do so. As discussed above, the Project Team reviewed existing records, communicated with external stakeholders, and conducted a site walk to incorporate known site conditions in the project plan and design. The Project Team bundled this project with the Line 225 Valve Enhancement Project – Quail Canal, coordinating engineering and construction activities between the project sites to minimize costs for the benefit of customers.

B. Cost Estimates

Based on the preliminary design, once the preliminary project scope was confirmed and engineering, design, and planning activities were underway, SoCalGas prepared an estimate of the Direct Costs of the Project in the amount of $1,049,625. The Project Team considered the conditions known at the time to prepare the preliminary Direct Cost estimate. This estimate reflects the projected Labor, Material, and Services costs anticipated to be incurred to execute the Project, based on initial design plans.

SoCalGas estimated Indirect Costs of the Project based on the estimated Direct Costs and other project-related variables.

C. Actual Direct and Indirect Costs

Actual Direct Costs reflect the Labor, Material, and Services costs incurred to execute the Project. Actual Indirect Costs reflect costs for incremental overhead loaders in accordance with Company overhead allocation policies. The total loaded cost of the Project is $1,262,291.

Table 4: Estimated and Actual Direct Costs and Variances[2]

Direct Costs ($)	Estimate	Actuals	Delta Over/(Under)
Company Labor	94,275	54,902	(39,373)
Materials	116,377	107,943	(8,434)
Mechanical Construction Contractor	281,519	279,349	(2,170)
Electrical Contractor	103,185	110,517	7,332
Construction Management & Support	92,423	107,940	15,517
Environmental	25,740	64,861	39,121
Engineering & Design	156,269	198,805	42,536
Project Management & Services	56,749	29,277	(27,472)
ROW & Permits	27,668	22,476	(5,192)
GMA	95,420	136,497	41,077
Total Direct Costs	**1,049,625**	**1,112,566**	**62,941**

Table 5: Estimated and Actual Indirect Costs, Total Costs, and Variances[3]

Indirect Costs/Total Costs ($)	Estimate	Actuals	Delta Over/(Under)
Overheads	117,937	112,425	(5,512)
AFUDC	131,607	36,393	(95,214)
Property Taxes	30,824	907	(29,917)
Total Indirect Costs	**280,368**	**149,725**	**(130,643)**
Total Direct Costs	**1,049,625**	**1,112,566**	**62,941**
Total Loaded Costs	**1,329,993**	**1,262,291**	**(67,702)**

The Actual Full-Time Equivalents[4] (FTEs) for this Project are 0.69.

[2] Values may not add to total due to rounding.
[3] Ibid.
[4] Full-time equivalents (FTEs) are included in GRC forecasts to provide context to requested amounts for company labor. FTEs are calculated by measuring the number of hours charged over a given time period. For example, one FTE is equal to 40 hours per week, or typically 2,080 hours per year. The calculation of FTEs includes overtime hours. Therefore, if one employee works 60 hours per week, he or she would be recorded as 1.5 FTEs.

D. Cost Impacts

Consistent with one of the overarching objectives of PSEP to maximize the cost effectiveness of safety enhancement investments, SoCalGas effectively planned, designed, and completed construction activities for this project. Each pipeline project is unique in scope and inherently complex due to a variety of factors including terrain, environmental and permitting constraints, scope changes during detailed design, material cost fluctuations, regulatory changes, and more. These complexities can lead to variances between initial estimates and actual costs. Consistent with prudent management at the time, the Project Team successfully mitigated these variances whenever feasible through the implementation of effective project management practices, thorough planning, and continuous monitoring.

At the completion of the Line 225 Valve Enhancement Project – Beartrap, Actual Direct Costs came within the AACE Class 3 Total Installed Cost (TIC) accuracy range, adhering to the standard industry practices defined by the Association for the Advancement of Cost Engineering (AACE) International. The Actual Direct Costs were more than the preliminary estimate by $62,941. This variance can be attributed to several factors including: the project required an Environmental Monitor to complete routine site visits, which was not originally anticipated in the preliminary design; and the Engineering and Design firms completed activities originally identified as Project Management & Services in the initial estimate while the actual costs were recognized under Engineering and Design.

V. CONCLUSION

SoCalGas enhanced the safety of its natural gas system by prudently executing the L225 Beartrap Valve Enhancement Project. Through this Valve Enhancement Project, SoCalGas successfully automated one existing MLV to achieve the objective of enabling rapid system isolation of a portion of Line 225 located near the community of Lebec within Kern County. The total loaded cost of the Project is $1,262,291.

SoCalGas executed this project prudently through designing and executing the project to support achievement of Valve Enhancement Plan isolation objectives, bundling two similar valve projects to capture efficiencies and, installing equipment necessary to bring communication capabilities to the site to enable rapid system isolation of a portion of Line 225 located near the community of Lebec in Kern County.

SoCalGas engaged in prudent cost avoidance efforts to complete this safety enhancement at a reasonable cost by carefully planning and coordinating construction activities to maximize efficiencies and reduce customer and community impacts.

End of Line 225 Valve Enhancement Project – Beartrap Final Report

I. LINE 225 VALVE ENHANCEMENT PROJECT – QUAIL CANAL

A. Background and Summary

The Line 225 Valve Enhancement Project - Quail Canal consists of valve enhancements made to an existing mainline valve (MLV) located in an unincorporated area within Los Angeles County. Through this project, SoCalGas enhanced the safety of its natural gas transmission system by enabling the rapid detection of a significant change in pipeline pressure and remote isolation and depressurization of a portion of Line 225 in the event of a pipeline rupture. SoCalGas installed one new actuator, new power equipment, new communications equipment, new fencing, and the necessary automation equipment at the site. The total loaded project cost is $1,259,628.

The Line 225 Valve Enhancement Project – Quail Canal construction site is within an existing SoCalGas facility located in a rural area on private property near the community of Gorman. SoCalGas bundled this valve project with an additional valve project, Line 225 Valve Enhancement Project – Beartrap, to gain efficiencies in engineering, planning, and construction activities. This workpaper describes the construction activities and costs of the Line 225 Valve Enhancement Project -- Quail Canal.

Final Report for Line 225 Valve Enhancement Project – Quail Canal

Table 1: General Project Information

L225 Quail Canal Valve Enhancement Project			
Location	Los Angeles County		
Days on Site	36 days		
Construction Start	06/26/2017		
Construction Finish	08/29/2017		
Commissioning Date	05/08/2018		
Valve Upgrades			
Valve Number	225-48.16-0		
Valve Type	Existing – Plug		
Actuator	New		
Actuator Above-/Below-Grade	Above-Grade		
ASV	Yes		
RCV	Yes		
Site Upgrades			
Vault	None		
Power	New – Solar		
Communication	New – Radio		
SCADA Panel	New		
Equipment Shelter	None		
Fencing	Yes – New		
Project Costs ($)	**Capital**	**O&M**	**Total**
Loaded Project Costs	1,259,628	-	1,259,628
Disallowed Costs	-	-	-

B. Maps and Images

Figure 1: Line 225 Bundle Overview

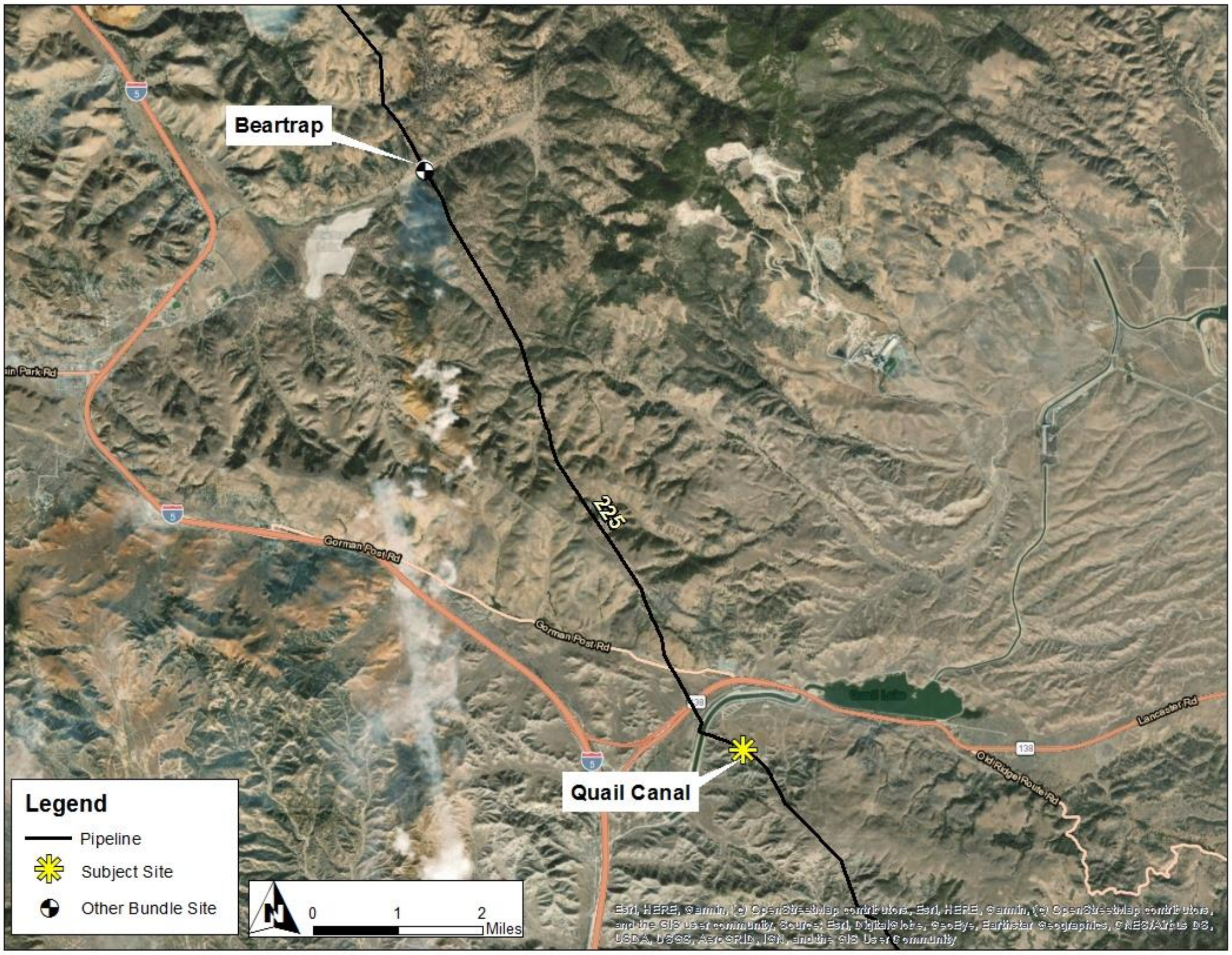
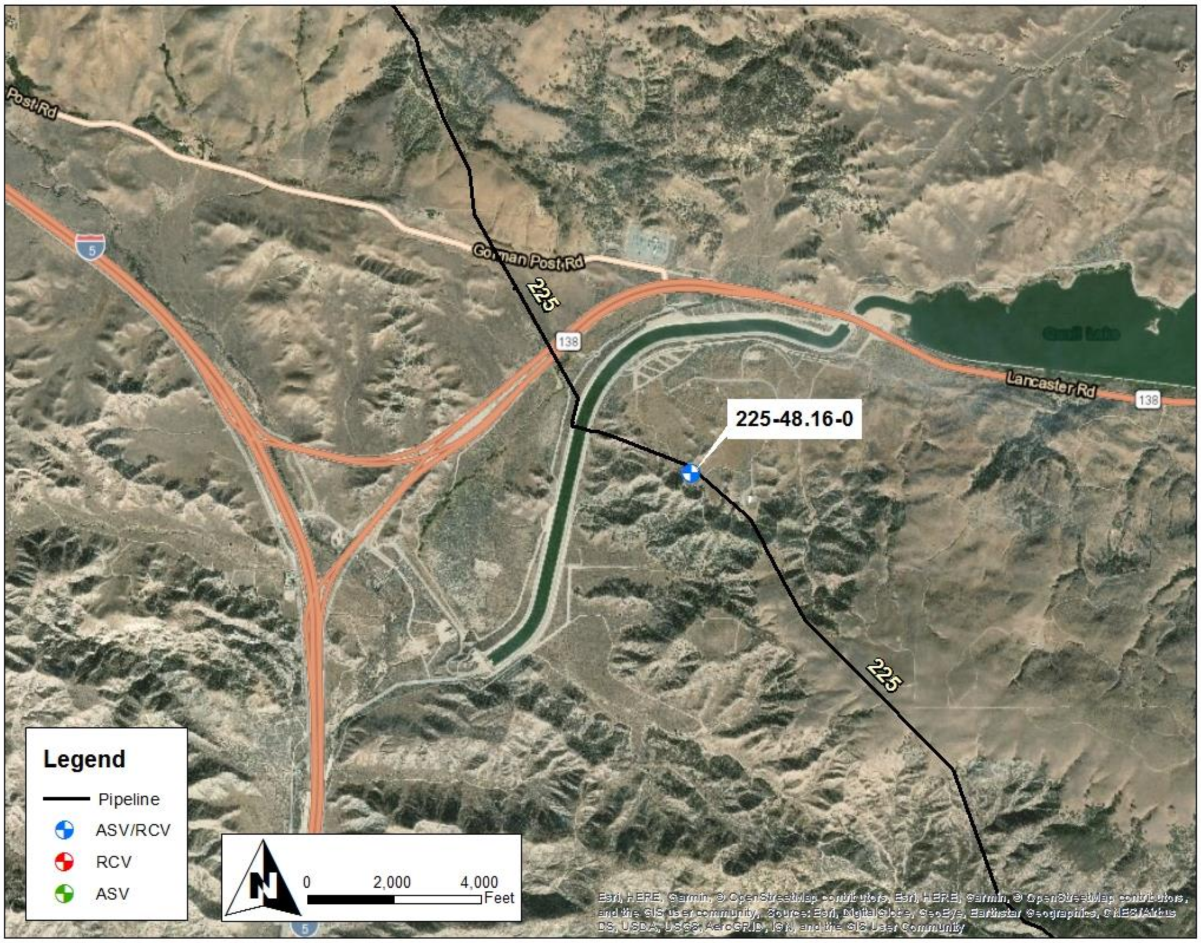


Figure 2: Satellite Image of Line 225 Valve Enhancement Project – Quail Canal



II. ENGINEERING, DESIGN, AND PLANNING

A. Project Scope

SoCalGas presented a conceptual project scope for the Line 225 Valve Enhancement Project – Quail Canal in workpapers supporting the Valve Enhancement Plan in the 2011 PSEP filing.[1] This conceptual scope identified MLV 225-48.16-0 for automation to enable remote isolation to a portion of Line 225. Prior to initiating execution of the Project, SoCalGas reviewed available information, performed a detailed system flow analysis to validate the scope of the Project, and confirmed that this valve enhancement will provide the planned isolation. The final project scope is summarized in Table 2 below.

1. <u>2011 PSEP Filing:</u> SoCalGas identified MLV 225-48.16-0 for automation to achieve the objective of rapid system isolation.
2. <u>Updated Scope:</u> Upon project initiation, SoCalGas reviewed the conceptual project scope and determined that this isolation point would enable rapid isolation, thereby achieving Valve Enhancement Plan objectives.
3. <u>Engineering, Design, and Constructability:</u> No notable engineering adjustments were required to the standard design.
4. <u>Final Project Scope:</u> The final project scope consists of the automation of one MLV, that included the installation of one new actuator, the installation of power equipment, the installation of communications equipment, new fencing, and the installation of the necessary automation equipment at the site.

[1] *See* Workpapers supporting Amended Pipeline Safety Enhancement Plan (PSEP) of SoCalGas and SDG&E, submitted on December 2, 2011, at WP-IX-2-14 through WP-IX-2-25 (A.11-11-002 Exh. SCG-32).

Table 2: Final Project Scope

Final Project Scope					
Line	Mile	Valve #	Valve Size (*confidential*)	Installation Type	Function
225	48.16	0	[redacted]	A/AG	ASV/RCV

B. Site Evaluation and Planning

SoCalGas initiated the planning process for the Line 225 Valve Enhancement Project – Quail Canal by performing a pre-design site walk to determine the existing conditions and assess any potential impact on the design. Key factors that influenced the engineering and design of this project are as follows:

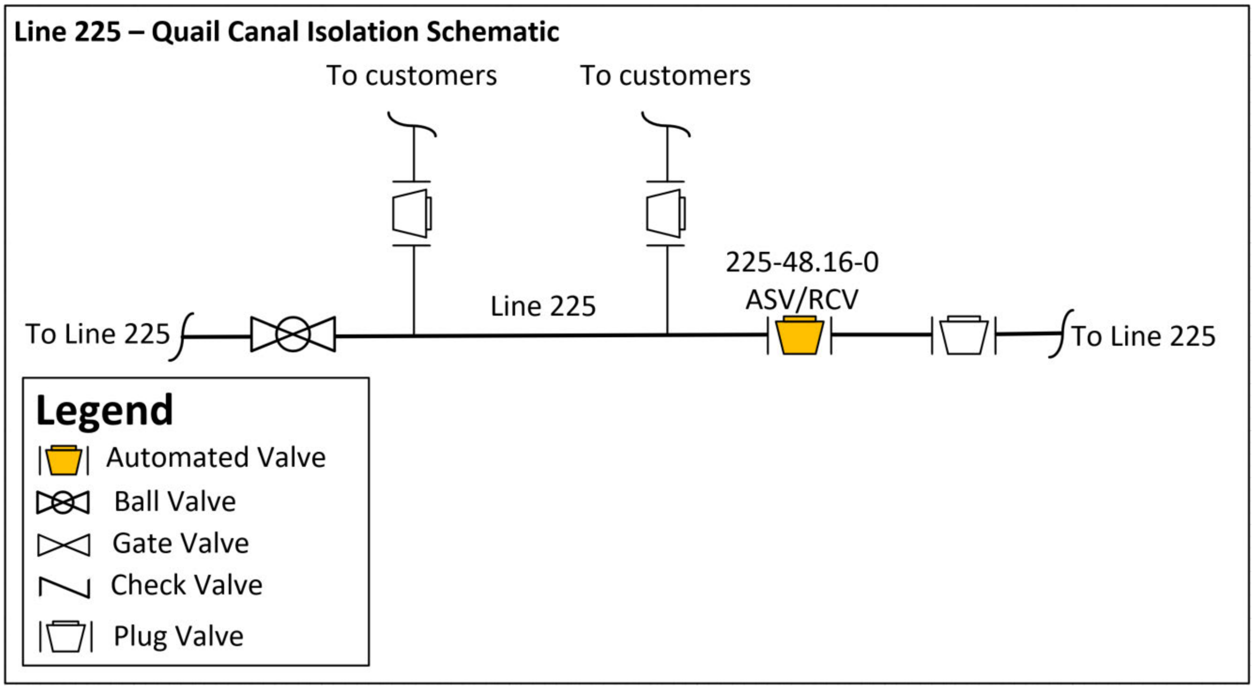
1. <u>Site Description:</u> This site is an existing SoCalGas facility in a rural area near the community of Gorman.
2. <u>Land Issues:</u> During the site evaluation, the Project Team noted that the existing station would need to be expanded to accommodate the additional equipment.
3. <u>DOT Class:</u> This project site is in a Class 1 location. SoCalGas selected this MLV for automation to isolate known geological threats upstream and downstream of this valve, and to satisfy the objectives of the PSEP Valve Enhancement Plan spacing criteria.
4. <u>Power Source:</u> There was no preexisting power source. The Project Team installed new power equipment at the site.
5. <u>Communication Technology</u>: There was no preexisting communications equipment. The Project Team installed new communications equipment at the site.

C. Engineering, Design, and Planning Factors

SoCalGas reviewed drawings and records, contacted internal planning groups, communicated with external stakeholders, conducted survey activity, and completed a site walk. Key factors that influenced the engineering and design of the Project are as follows:

1. Engineering Assessment: During the site evaluation, the Project Team confirmed the existing technology and verified the need to expand the existing station to accommodate the new equipment.
2. Valve Details: The existing valve was a manually actuated Class 400 plug valve, which was reused by the Project Team.
3. Actuator Details: The preexisting actuator was incompatible with PSEP linebreak technology, so the Project Team installed a new actuator.
4. Customer Impact: The Project Team did not identify any anticipated service disruptions to customers.
5. Community Impact: The Project Team did not anticipate any notable impacts to the community from this project.
6. Substructures: The Project Team did not identify any existing substructures that affected the design and engineering at this site.
7. Environmental: The Project Team did not identify any notable environmental concerns at the site. An environmental monitor performed routine site visits during construction.
8. Permit Restrictions: There were no special permits or permit restrictions for this project.
9. Land Use: The Project Team expanded the existing facility to accommodate the new automation equipment.
10. Traffic Control: The Project Team did not identify any traffic control needs at the site.

Figure 3: Line 225 Valve Enhancement Project – Quail Canal Schematic



D. Scope Changes

SoCalGas did not make any notable scope changes during detailed design.

III. CONSTRUCTION

A. Construction Contractor Selection

The Project Team prepared an initial cost estimate based on the preliminary design. Following completion of the engineering, design, and planning activities described above, the Project Team directed the Performance Partner (Mechanical Construction Contractor) and Alliance Partner (Electrical Contractor) to prepare cost estimates based on a more detailed engineering design package. As indicated above, there were no notable changes in scope between the time when the Project Team prepared the preliminary cost estimate and when the Performance Partner and Alliance Partner prepared and submitted their estimates.

1. <u>SoCalGas' Preliminary Mechanical Construction Contractor Estimate *(confidential)*:</u> SoCalGas' preliminary cost estimate for construction was [redacted].

2. <u>Mechanical Construction Contractor's Target Price Estimate *(confidential)*:</u> The Mechanical Construction Contractor's cost estimate was [redacted], which was [redacted] than SoCalGas' preliminary cost estimate for construction.

3. <u>SoCalGas' Preliminary Electrical Contractor Estimate *(confidential)*:</u> SoCalGas' preliminary cost estimate for electrical services was [redacted].

4. <u>Electrical Contractor's Estimate (*confidential*):</u> The Electrical Contractor's estimate was [redacted] which was [redacted] than SoCalGas' preliminary cost estimate.

B. Construction Schedule

Table 3: Construction Timeline

Construction Start Date	06/26/2017
Construction Completion Date	08/29/2017
Days on Site	36 days
Commissioning Date	05/08/2018

The Project Team completed all construction activities as soon as practicable prior to commissioning. Finalization of commissioning activities is dependent on electrical utility connections, and system and/or resource availability.

C. Changes During Construction

SoCalGas successfully mitigated field conditions during construction in a manner that minimized potential impacts on project scope, cost, and schedule. As a result, these conditions did not result in any notable change orders.

Figure 4: Project Site During Construction
Foundation for the Linebreak Cabinet in the Foreground; Foundations for Solar Panel and Pole, New Battery Enclosure and New SCADA Enclosure in the Background

D. Commissioning and Site Restoration

Commissioning activities included site restoration, final inspections, and placement of the valve into service. During this stage, SoCalGas successfully performed site acceptance testing and conducted point-to-point verification with Gas Control personnel for the newly-automated valve, and transferred ownership of the new equipment to Field Operations. Closeout activities included development of final drawings, the reconciliation package, and updates to company recordkeeping systems to reflect the completed scope of work. The site was commissioned on May 8, 2018, as summarized in Table 3.

IV. PROJECT COSTS

A. Cost Avoidance Actions

SoCalGas exercised due diligence in the design, planning, and construction activities for this project to minimize or avoid costs when prudent to do so. As discussed above, the Project Team reviewed existing records, communicated with external stakeholders, and conducted a site walk to incorporate known site conditions in the project plan and design. The Project Team bundled this project with the Line 225 Valve Enhancement Project – Beartrap, coordinating engineering and construction activities between the project sites to minimize costs for the benefit of customers.

B. Cost Estimates

Based on the preliminary design, once the preliminary project scope was confirmed and engineering, design, and planning activities were underway, SoCalGas prepared an estimate of the Direct Costs of the Project in the amount of $1,026,898. The Project Team considered the conditions known at the time to prepare the preliminary Direct Cost estimate. This estimate reflects the projected Labor, Material, and Services costs anticipated to be incurred to execute the Project, based on initial design plans.

SoCalGas estimated Indirect Costs of the Project based on the estimated Direct Costs and other project-related variables.

C. Actual Direct and Indirect Costs

Actual Direct Costs reflect the Labor, Material, and Services costs incurred to execute the Project. Actual Indirect Costs reflect costs for incremental overhead loaders in accordance with Company overhead allocation policies. The total loaded cost of the Project is $1,259,628.

Table 4: Estimated and Actual Direct Costs and Variances[2]

Direct Costs ($)	Estimate	Actuals	Delta Over/(Under)
Company Labor	92,692	58,899	(33,793)
Materials	116,600	104,504	(12,096)
Mechanical Construction Contractor	265,463	274,138	8,675
Electrical Contractor	103,185	95,874	(7,311)
Construction Management & Support	92,423	125,636	33,213
Environmental	25,740	62,432	36,692
Engineering & Design	155,477	223,789	68,312
Project Management & Services	55,087	23,309	(31,778)
ROW & Permits	26,876	21,625	(5,251)
GMA	93,354	118,505	25,151
Total Direct Costs	**1,026,897**	**1,108,712**	**81,815**

Table 5: Estimated and Actual Indirect Costs, Total Costs, and Variances[3]

Indirect Costs/Total Costs ($)	Estimate	Actuals	Delta Over/(Under)
Overheads	115,832	113,857	(1,975)
AFUDC	274,808	35,382	(239,426)
Property Taxes	30,168	1,678	(28,490)
Total Indirect Costs	**420,808**	**150,917**	**(269,891)**
Total Direct Costs	**1,026,897**	**1,108,712**	**81,815**
Total Loaded Costs	**1,447,705**	**1,259,628**	**(188,077)**

The Actual Full-Time Equivalent[4] (FTE) for this Project is 0.58.

[2] Values may not add to total due to rounding.
[3] Values may not add to total due to rounding.
[4] Full-time equivalents (FTEs) are included in GRC forecasts to provide context to requested amounts for company labor. FTEs are calculated by measuring the number of hours charged over a given time period. For example, one FTE is equal to 40 hours per week, or typically 2,080 hours per year. The calculation of FTEs includes overtime hours. Therefore, if one employee works 60 hours per week, he or she would be recorded as 1.5 FTEs.

D. Cost Impacts

Consistent with one of the overarching objectives of PSEP to maximize the cost effectiveness of safety enhancement investments, SoCalGas effectively planned, designed, and completed construction activities for this project. Each pipeline project is unique in scope and inherently complex due to a variety of factors including terrain, environmental and permitting constraints, scope changes during detailed design, material cost fluctuations, regulatory changes, and more. These complexities can lead to variances between initial estimates and actual costs. Consistent with prudent management at the time, the Project Team successfully mitigated these variances whenever feasible through the implementation of effective project management practices, thorough planning, and continuous monitoring.

At the completion of the Line 225 Valve Enhancement Project – Quail Canal, Actual Direct Costs came within the AACE Class 3 Total Installed Cost (TIC) accuracy range, adhering to the standard industry practices defined by the Association for the Advancement of Cost Engineering (AACE) International. The Actual Direct Costs were more than the preliminary estimate by $81,815. This variance can be attributed to factors including: labor costs for actuator installation, construction inspection, and NDE were higher than anticipated; and the amount of hazardous materials encountered during construction which required abatement was higher than anticipated.

V. CONCLUSION

SoCalGas enhanced the safety of its natural gas system by prudently executing the Line 225 Valve Enhancement Project – Quail Canal. Through this Valve Enhancement Project, SoCalGas successfully automated one mainline valve to achieve the objective of enabling rapid system isolation of a portion of Line 225 located in an unincorporated area within Los Angeles County. The total loaded cost of the project is $1,259,628.

SoCalGas executed this project prudently through designing and executing the project to support achievement of Valve Enhancement Plan isolation objectives, bundling two similar valve projects to capture efficiencies and installing equipment necessary to bring communication capabilities to the site to enable rapid system isolation of a portion of Line 225 located in an unincorporated area of Los Angeles County.

SoCalGas engaged in prudent cost avoidance efforts to complete this safety enhancement at a reasonable cost by carefully planning and coordinating construction activities to maximize efficiencies and reduce customer and community impacts.

End of Line 225 Valve Enhancement Project – Quail Canal Final Report

I. LINE 404-406 VALLEY BUNDLE VALVE ENHANCEMENT PROJECT

A. Background and Summary

Line 404 is an [redacted] diameter transmission line and Line 406 is a [redacted] diameter transmission line that run in parallel for approximately 55 miles through Ventura County and Los Angeles County, including the Cities of Ventura, Camarillo, Moorpark, Thousand Oaks, and Los Angeles, terminating in the Encino neighborhood in the City of Los Angeles. The pipelines are primarily routed across Class 3 locations. This report describes the activities associated with Line 404-406 Valley Bundle Valve Enhancement Project Station Replacement Project. The Line 404-406 Valley Bundle Valve Enhancement Project consists of valve enhancements made to one new and three existing mainline valves (MLVs) located in the Cities of Ventura and Los Angeles. Through this project, SoCalGas enhanced the safety of its natural gas transmission system by replacing 74 feet of Criteria Pipe, and by enabling the rapid detection of a significant change in pipeline pressure and remote isolation and depressurization of Lines 404, 406, and 1011 in the event of a pipeline rupture. SoCalGas replaced 74 feet of Category 4 Criteria pipe, installed one new MLV, three new actuators, three new vaults to house the actuators, four new check valves, one new blowdown assembly, new power equipment, new communications equipment, and the necessary automation equipment at the sites. The total loaded cost of the Project is $11,354,719.

The Line 404-406 Valley Bundle Valve Enhancement Project is separated into four construction sites that are in urban areas. The Mills Station construction site is located in an area that is a mix of commercial and residential developments on Mills Road in the City of Ventura. The Kimball Road construction site is located in a residential area south of the intersection of Kimball Road and Telegraph Road in the City of Ventura. The Canoga Avenue construction site is located in an area that is a mix of commercial and residential developments on the east side of Canoga Avenue in the City of Los Angeles.

The Lindley Avenue construction site is located in a residential area on the northwest corner of Lindley Avenue and Burbank Boulevard in the City of Los Angeles. SoCalGas bundled the project sites to gain efficiencies in engineering, planning, and construction activities.

Table 1: General Project Information

Kimball Road Replacement	
Location	Ventura County
Project Type	Replacement
Length	13 feet
Location	City of Ventura
Class	3
MAOP *(confidential)*	[redacted]
Pipe Vintage	1944
Construction Start	09/15/2015
Construction Finish	08/15/2018
NOP Date	10/31/2017
Original Pipe Diameter *(confidential)*	[redacted]
New Diameter *(confidential)*	[redacted]
Original SMYS[1] *(confidential)*	[redacted]
New SMYS *(confidential)*	[redacted]

Canoga Avenue	
Location	Los Angeles County
Project Type	Replacement
Length	45 feet
Location	Los Angeles
Class	3
MAOP *(confidential)*	[redacted]
Pipe Vintage	1944
Construction Start	06/20/2016
Construction Finish	08/05/2016
NOP Date	07/27/2016
Original Pipe Diameter *(confidential)*	[redacted]
New Diameter *(confidential)*	[redacted]
Original SMYS[2] *(confidential)*	[redacted]
New SMYS *(confidential)*	[redacted]

[1] Highest percentage of Specified Minimum Yield Strength (SMYS) of Category 4 Criteria pipe.
[2] Ibid.

Table 1: General Project Information (continued)

Lindley Avenue	
Location	Los Angeles County
Project Type	Replacement
Length	59 feet
Location	Los Angeles
Class	3
MAOP *(confidential)*	[redacted]
Pipe Vintage	1944
Construction Start	10/16/2017
Construction Finish	10/12/2018
NOP Date	05/15/2018
Original Pipe Diameter *(confidential)*	[redacted]
New Diameter *(confidential)*	[redacted]
Original SMYS[3] *(confidential)*	[redacted]
New SMYS *(confidential)*	[redacted]

[3] Highest percentage of Specified Minimum Yield Strength (SMYS) of Category 4 Criteria pipe.

Table 1: General Project Information (continued)

Line 404-406 Valley Bundle Valve Enhancement Project Valve Upgrades				
Site	Mills Station	Kimball Road	Canoga Avenue	Lindley Avenue
Location	City of Ventura	City of Ventura	Los Angeles	Los Angeles
Days on Site	127 days	127 days	29 days	76 days
Construction Start	09/15/2015	09/15/2015	06/20/2016	10/16/2017
Construction Finish	08/15/2018	08/15/2018	08/05/2016	10/12/2018
Commissioning Date	08/15/2018	08/15/2018[4]	06/25/2019	05/15/2018[5]
Valve Upgrades				
Valve Number	404-4.84-0	404-8.11-0	404-47.14-0	404-51.46-0
Valve Type	New – Ball	-	Existing – Ball	-
Actuator	New	-	New	-
Actuator Above-/Below-Grade	Below-Grade	-	Below-Grade	-
ASV	Yes	-	Yes	-
RCV	Yes	-	Yes	-
Valve Number	1011-5.13-2	-	406-47.14-0	-
Valve Type	New – Ball	-	Existing – Ball	-
Actuator	New	-	New	-
Actuator Above-/Below-Grade	Below-Grade	-	Below-Grade	-
ASV	No	-	Yes	-
RCV	Yes	-	Yes	-
Valve Number	-	-	N/A[6]	-
Valve Type	-	-	New – Check	-
Actuator	-	-	N/A	-
Actuator Above-/Below-Grade	-	-	Below-Grade	-
ASV	-	-	N/A	-
RCV	-	-	N/A	-

[4] Represents NOP date
[5] Ibid
[6] Check valves are not numbered.

Table 1: General Project Information (continued)

Line 404-406 Valley Bundle Valve Enhancement Project				
Site	Mills Station	Kimball Road	Canoga Avenue	Lindley Avenue
Valve Number	-	-	N/A	-
Valve Type	-	-	New – Check	-
Actuator	-	-	N/A	-
Actuator Above-/Below-Grade	-	-	Below-Grade	-
ASV	-	-	N/A	-
RCV	-	-	N/A	-
Valve Number	-	-	N/A	-
Valve Type	-	-	New – Check	-
Actuator	-	-	N/A	-
Actuator Above-/Below-Grade	-	-	Below-Grade	-
ASV	-	-	N/A	-
RCV	-	-	N/A	-
Valve Number	-	-	N/A	-
Valve Type	-	-	New – Check	-
Actuator	-	-	N/A	-
Actuator Above-/Below-Grade	-	-	Below-Grade	-
ASV	-	-	N/A	-
RCV	-	-	N/A	-
Site Upgrades				
Vault	New	N/A	New – Two	N/A
Power	Existing – Utility	N/A	New – Utility	N/A
Communication	New – Radio	N/A	New – Radio	N/A
SCADA Panel	New	N/A	New	N/A
Equipment Shelter	Existing	None	None	None
Fencing/Wall	Existing	None	None	None

Project Costs ($)	Capital	O&M	Total
Loaded Project Costs	11,354,719	-	11,354,719
Disallowed Costs	-	-	-

B. Maps and Images

Figure 1: Line 404-406 Valley Bundle Valve Enhancement Project Overview

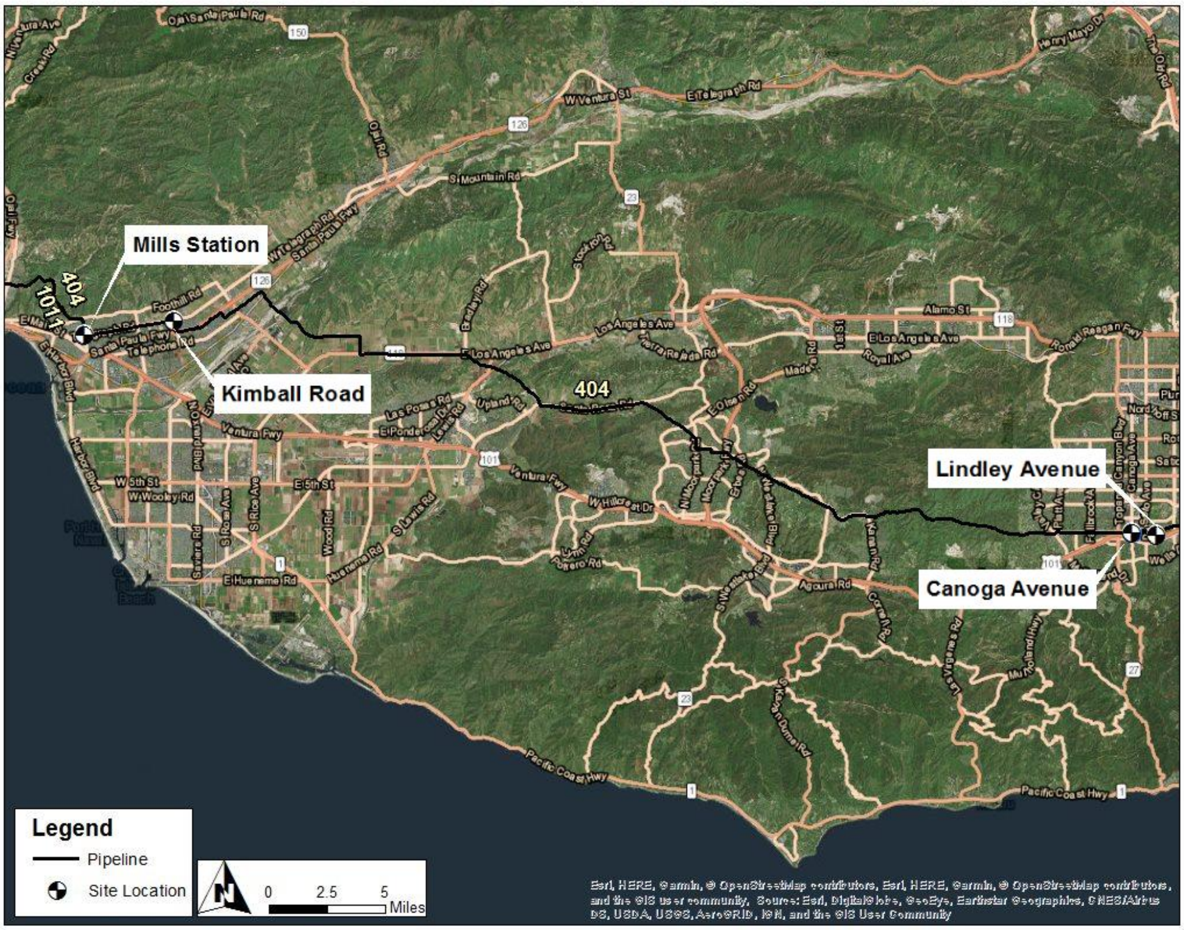
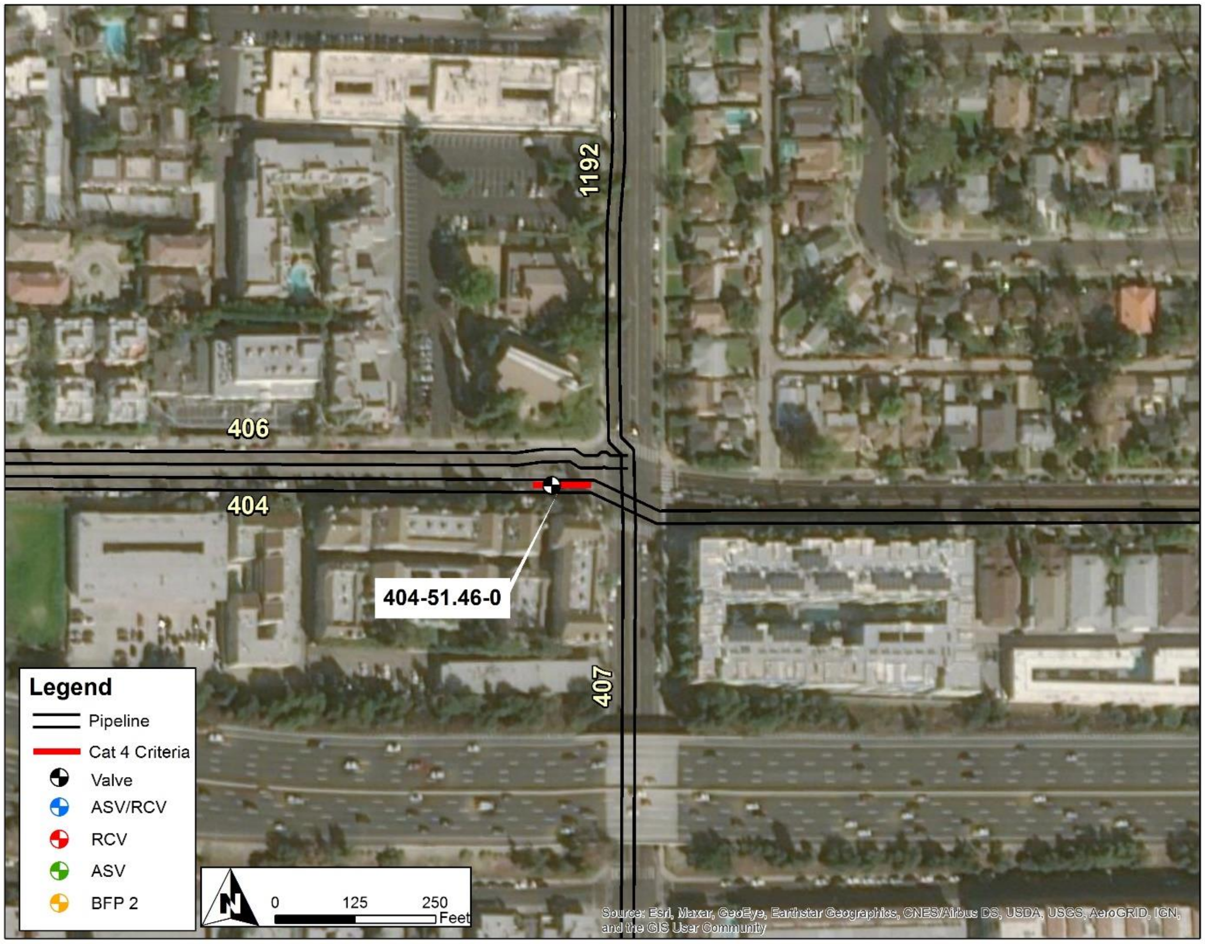


Figure 2: Satellite Image of Line 404-406 Valley Bundle Valve Enhancement Project – Mills Station

Figure 3: Satellite Image of Line 404-406 Valley Bundle Valve Enhancement Project – Kimball Road

Figure 4: Satellite Image of Line 404-406 Valley Bundle Valve Enhancement Project – Canoga Avenue

Figure 5: Satellite Image of Line 404-406 Valley Bundle Valve Enhancement Project – Lindley Avenue



II. ENGINEERING, DESIGN, AND PLANNING

A. Project Scope

SoCalGas presented a conceptual project scope for the Line 404-406 Valley Bundle Valve Enhancement Project in workpapers supporting the Valve Enhancement Plan in the 2011 PSEP filing.[7] This conceptual scope identified four MLVs for automation to enable remote isolation to a portion of Line 404, Line 406, and Line 1011. Prior to initiating execution of the Project, SoCalGas reviewed available information, performed a detailed system flow analysis to validate the scope of the Project, and identified an additional valve for enhancement to provide the planned isolation. The final project scope is summarized in Table 2 below.

1. 2011 PSEP Filing: SoCalGas identified MLVs 404-4.84-0, 404-47.14-0, 404-51.46-0, 406-47.14-0, and 1011-5.13-0 for automation to achieve the objective of rapid system isolation.
2. Updated Scope:
   a. Upon project initiation, SoCalGas reviewed the conceptual project scope and determined that that the automation of MLV 404-51.46-0 was not necessary to achieve the transmission isolation objectives set forth in the Valve Enhancement Plan.
   b. SoCalGas determined that it was also necessary to install four check valves on the taps from Lines 404 and 406 to Supply Line 33-6261 to prevent backflow from Supply Line 33-6261 to Lines 404 and 406.
3. Engineering, Design, and Constructability: The Project Team included in their design the replacement of 74 feet of CAT 4 pipeline adjacent to existing MLVs in order to

[7] *See* Workpapers supporting Amended Pipeline Safety Enhancement Plan (PSEP) of SoCalGas and SDG&E, submitted on December 2, 2011, at WP-IX-2-14 through WP-IX-2-25 (A.11-11-002 Exh. SCG-32).

capture the efficiencies of utilizing construction crews within the region and to avoid additional blowdowns of the pipelines.

4. Final Project Scope: The final project scope consists of 116 feet of replaced pipe that included of the removal and replacement of 74 feet of Criteria pipe on Line 404, the automation of four MLVs, the installation of new fencing, the installation of a new a new blowdown assembly, the installation of three new actuators, the installation of three new vaults to house the actuators, the installation of new power equipment, the installation of new communications equipment, and the installation of the necessary automation equipment at the sites.

Table 2: Final Project Scope

Final Project Scope					
Line	Mile	Valve #	Valve Size (*confidential*)	Installation Type	Function
404	4.84	0	[redacted]	NV/NP	ASV/RCV
1011	5.13	2	[redacted]	C/P	RCV
404	8.11	0	N/A	N/A	N/A
404	47.14	0	[redacted]	A/VT	ASV/RCV
404	47.14	N/A	N/A	NV	BFP2
404	47.14	N/A	N/A	NV	BFP2
404	47.14	N/A	N/A	NV	BFP2
404	47.14	N/A	N/A	NV	BFP2
406	47.14	0	[redacted]	A/VT	ASV/RCV
404	51.46	0	N/A	N/A	N/A

Table 2A: Mileage Information

	Criteria	Accelerated[8]	Incidental	New	Total[9]
Final Mileage	0.014 mi.	0.003 mi.	0.005 mi.	0 mi.	0.022 mi.
	74 ft.	18 ft.	25 ft.	0 ft.	116 ft.

[8] Accelerated mileage include Phase 2 pipe. The Accelerated mileage was included to realize efficiencies and to enhance project constructability.

[9] Values may not add to total due to rounding.

B. Site Evaluation and Planning

SoCalGas initiated the planning process for the Line 404-406 Valley Bundle Valve Enhancement Project by performing a pre-design site walk to determine the existing conditions and assess any potential impact on the design. Key factors that influenced the engineering and design of this project are as follows:

Mills Station

1. Site Description: This site is at an existing SoCalGas facility located near the intersection of Mills Road and Telegraph Road in the City of Ventura in a high-density area that is a mix of commercial businesses and residential buildings.
2. Land Issues: During the pre-design site walk, the Project Team noted that excavations will impact the street as well as the adjacent sidewalk.
3. DOT Class: This project site is in a Class 3 location.
4. Power Source: The site had existing utility power.
5. Communication Technology: There was preexisting communications equipment. The Project Team upgraded the communications equipment at the site.

Kimball Road

1. Site Description: This site is located south of the Kimball Road and Telegraph Road intersection within the roadway of Kimball Road in the City of Ventura in a residential area.
2. Land Issues: During the pre-design site walk, the Project Team noted that excavations will impact the street.
3. DOT Class: This project site is in a Class 3 location.
4. Power Source: The scope of work for this project site did not require any power equipment.
5. Communication Technology: The scope of work for this project site did not require any communications equipment.

Canoga Avenue

1. Site Description: This site is located on the east side of Canoga Avenue in the City of Los Angeles in an area that is a mix of commercial and residential buildings.
2. Land Issues: During the site evaluation, the Project Team noted that the existing facility would need to be expanded to accommodate the additional equipment.
3. DOT Class: This project site is in a Class 3 location.
4. Power Source: There was no preexisting power equipment at this site. The Project Team installed new power equipment at the site.
5. Communication Technology: There was no preexisting communications equipment. The Project Team installed new communications equipment at the site.

Lindley Avenue

1. Site Description: The site is located on the northwest corner of Lindley Avenue and Burbank Boulevard in the City of Los Angeles. There are multiple residential developments nearby.
2. Land Issues: During the site evaluation, the Project Team noted that the existing facility would need to be expanded to accommodate the additional equipment.
3. DOT Class: This project site is in a Class 3 location.
4. Power Source: The scope of work for this project site did not require any power equipment.
5. Communication Technology: The scope of work for this project site did not require any communications equipment.

C. Engineering, Design, and Planning Factors

SoCalGas reviewed drawings and records, contacted internal planning groups, communicated with external stakeholders, conducted survey activity, and completed a site walk. Key factors that influenced the engineering and design of the Project are as follows:

Mills Station

1. Engineering Assessment: During the site evaluation, the Project Team confirmed the existing technology and verified the existing equipment.
2. Valve Details: The preexisting valve was a manually actuated Class 600 ball valve, which was replaced by the Project Team.
3. Actuator Details: There was no existing actuator. The Project Team installed a new actuator.
4. Customer Impact: The Project Team planned a shut-in of Line 404 during the tie-in. The Project Team utilized CNG to provide uninterrupted service to one customer and coordinated the shut-in during a scheduled maintenance for a power plant to prevent any impact to their facility.
5. Community Impact: The Project Team restricted access to the sidewalk during construction.
6. Substructures: The Project Team identified multiple below-grade utilities. The Project Team incorporated these below-grade items into the design by relocating a portion of Line 404 and by closing two lanes of Mills Road during a portion of construction.
7. Environmental: The Project Team did not identify any notable environmental concerns at the site. An environmental monitor performed routine site visits during construction.
8. Permit Restrictions: The Project Team obtained an encroachment permit from the City of Ventura.
9. Land Use: The Construction Contractor utilized one of their laydown yards during construction.
10. Traffic Control: The Project Team closed two southbound lanes on Mills Road for a portion of construction.

Kimball Road

1. Engineering Assessment: The Project Team confirmed the scope of work at this consisted only of pipe replacement.
2. Customer Impact: The Project Team planned a shut-in of Line 404 during the tie-in. The Project Team utilized CNG to provide uninterrupted service to one customer and coordinated the shut-in during a scheduled maintenance for a power plant to prevent any impact to their facility.
3. Community Impact: The Project Team closed portions of Kimball Road during a portion of construction.
4. Substructures: The Project Team did not identify any existing substructures that affected the design and engineering at this site.
5. Environmental: The Project Team did not anticipate environmental impact from this project. An environmental monitor performed routine site visits during construction.
6. Permit Restrictions: The Project Team obtained an encroachment permit from the City of Ventura.
7. Land Use: The Construction Contractor utilized one of their laydown yards during construction.
8. Traffic Control: The Project Team closed three northbound lanes on Kimball Road during construction.

Canoga Avenue

1. Engineering Assessment: During the site evaluation, the Project Team confirmed the existing technology. The Project Team determined that the existing blowdown and associated piping required a redesign in order to accommodate the necessary automation equipment.
2. Valve Details:
   a. 404-47.14-0: The existing valve is a manually actuated Class 600 ball valve, which was reused by the Project Team.

   b. 406-47.14-0: The existing valve is a manually actuated Class 600 ball valve, which was reused by the Project Team.
   c. There were no preexisting check valves.
3. Actuator Details:
   a. 404-47.14-0: There was no preexisting actuator. The Project Team installed a new actuator.
   b. 406-47.14-0: There was no preexisting actuator. The Project Team installed a new actuator.
4. Customer Impact: The Project Team planned a shut-in of Line 404 during the tie-in. The Project Team utilized CNG to provide uninterrupted service to one customer.
5. Community Impact: The Project Team identified the potential for occasional noise, lane closures on Canoga Avenue, and restricted access to the sidewalk during construction.
6. Substructures: The Project Team identified multiple below-grade utilities. The Project Team incorporated these below-grade items into the design.
7. Environmental: The Project Team did not identify any notable environmental concerns at the site. An environmental monitor performed routine site visits during construction.
8. Permit Restrictions: The Project Team obtained an encroachment permit from the City of Los Angeles.
9. Land Use:
   a. The Project Team obtained a new exclusive easement to expand the existing facility.
   b. The Project Team obtained Temporary Right of Entry (TRE) from the neighboring business. The TRE was utilized for a laydown yard and workspace for both the Canoga Avenue site and Lindley Avenue site.
10. Traffic Control: The Project Team closed two lanes on Canoga Avenue for a portion of construction.

Lindley Avenue

1. Engineering Assessment: The Project Team confirmed the scope of work at this consisted only of pipe replacement.
2. Customer Impact: The Project Team planned a shut-in of Line 404 during the tie-in. The Project Team utilized CNG to provide uninterrupted service to one customer.
3. Community Impact: The Project Team identified the potential for occasional noise and lane closures on Burbank Boulevard and Lindley Avenue.
4. Substructures: The Project Team did not identify any existing substructures that affected the design and engineering at the site.
5. Environmental: The Project Team did not anticipate environmental impact from this project. An environmental monitor performed routine site visits during construction.
6. Permit Restrictions: The Project Team obtained an encroachment permit from the from the City of Los Angeles. Construction was only allowed on Saturday's due to heavy traffic.
7. Land Use: The Project Team utilized the TRE on Canoga Avenue as a laydown yard for both the Canoga Avenue site and the Lindley Avenue site.
8. Traffic Control: The Project Team closed a portion of Lindley Avenue during construction.

Figure 6: Line 404-406 Valley Bundle Valve Enhancement Project – Canoga Avenue Schematic

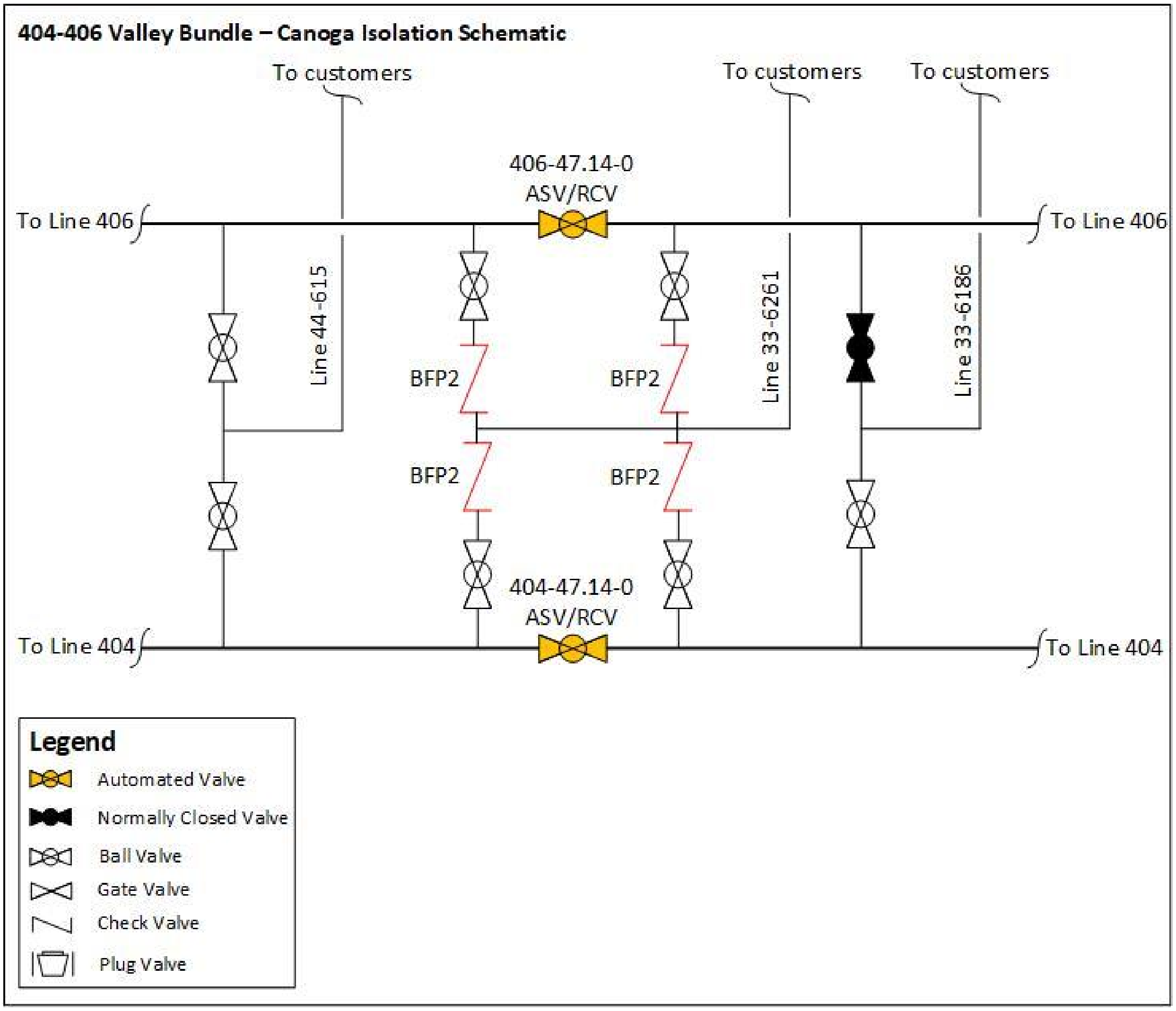
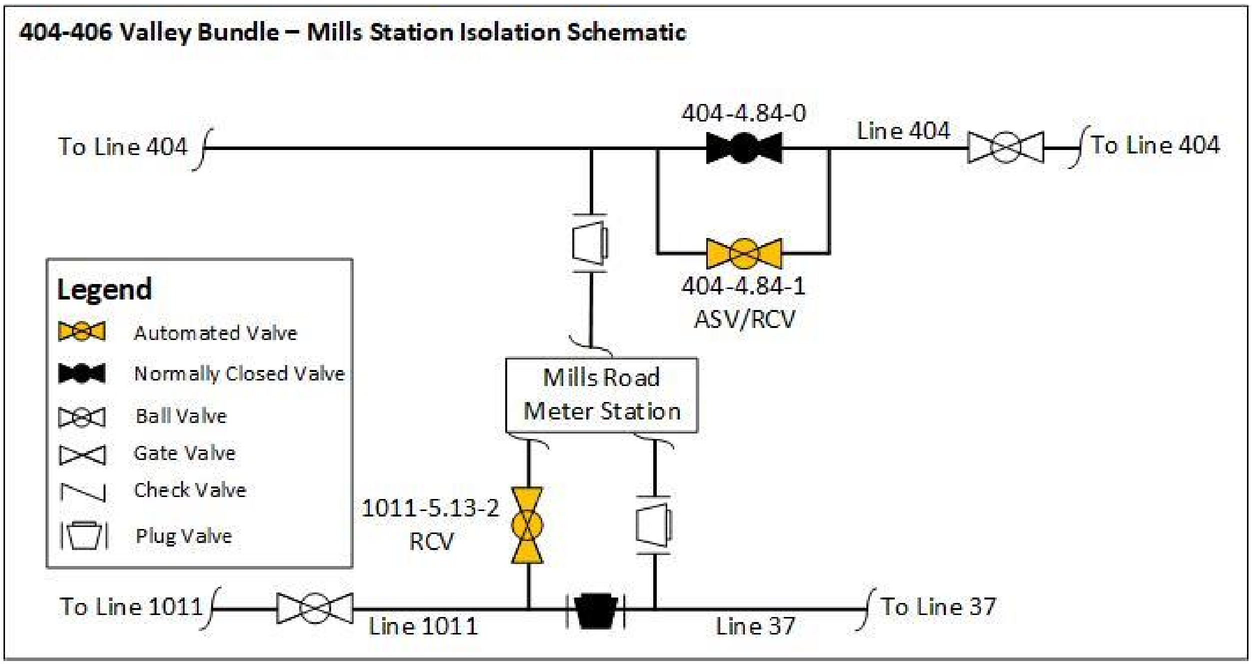


Figure 7: Line 404-406 Valley Bundle Valve Enhancement Project – Mills Station Schematic



D. Scope Changes

Through engineering, design, and planning activities, SoCalGas determined that changes in scope were appropriate to enhance the design of the Project and address engineering factors. As a result, the preliminary cost estimate does not fully reflect the final scope. During construction the Project Team determined that the automation of valve 1011-5.13-2 was necessary to achieve the transmission isolation objectives set forth in the Valve Enhancement Plan.

III. CONSTRUCTION

A. Construction Contractor Selection

The Project Team prepared an initial cost estimate based on the preliminary design. Following completion of the engineering, design, and planning activities described above, the Project Team directed the Performance Partner (Mechanical Construction Contractor) and Alliance Partner (Electrical Contractor) to prepare cost estimates based on a more detailed engineering design package. The scope change indicated above occurred during construction. The related costs were not included when the Performance Partner and Alliance Partner prepared and submitted their estimates.

1. <u>SoCalGas' Preliminary Mechanical Construction Contractor Estimate *(confidential)*:</u> SoCalGas' preliminary cost estimate for construction was [redacted].

2. <u>Mechanical Construction Contractor's Target Price Estimate *(confidential)*:</u> The Mechanical Construction Contractor's cost estimate was [redacted], which was [redacted] than SoCalGas' preliminary cost estimate for construction.

3. <u>SoCalGas' Preliminary Electrical Contractor Estimate *(confidential)*:</u> SoCalGas' preliminary cost estimate for the electrical contractor was [redacted].

4. <u>Electrical Contractor's Estimate (*confidential*):</u> The Electrical Contractor's estimate was [redacted], which was [redacted] than SoCalGas' preliminary cost estimate.

B. Construction Schedule

Table 4: Construction Timeline

Mills Station	
Construction Start Date	09/15/2015
Construction Completion Date	08/15/2018
Days on Site	127 days
Commissioning Date	08/15/2018
Kimball Road	
Construction Start Date	09/15/2015
Construction Completion Date	08/15/2018
Days on Site	127 days
NOP Date	08/15/2018
Canoga Avenue	
Construction Start Date	06/20/2016
Construction Completion Date	08/05/2016
Days on Site	29 days
Commissioning Date	06/25/2019
Lindley Avenue	
Construction Start Date	10/16/2017
Construction Completion Date	10/12/2018
Days on Site	76 days
NOP Date	05/15/2018

The Project Team completed all construction activities as soon as practicable prior to commissioning. Finalization of commissioning activities is dependent on electrical utility connections, and system and/or resource availability.

C. Changes During Construction

SoCalGas successfully mitigated field conditions during construction in a manner that minimized potential impacts on project scope, cost, and schedule. As a result, these conditions did not result in any notable change orders.

Figure 7: Abatement Activities at the Mills Station

Figure 8: Mainline Valve Excavation and Instrument Piping

D. Commissioning and Site Restoration

Commissioning activities included site restoration, final inspections, and placement of the valve back into service. During this stage, SoCalGas successfully performed site acceptance testing and conducted point-to-point verification with Gas Control personnel for the newly automated valves and transferred ownership of the new equipment to Field Operations. Closeout activities included development of final drawings, the reconciliation package, and updates to company recordkeeping systems to reflect the completed scope of work. The sites were commissioned on August 15, 2018, and June 25, 2019, as summarized in Table 3.

IV. PROJECT COSTS

A. Cost Avoidance Actions

SoCalGas exercised due diligence in the design, planning, and construction activities for this project to minimize or avoid costs when prudent to do so. As discussed above, the Project Team reviewed existing records, communicated with external stakeholders, and conducted a site walk to incorporate known site conditions in the project plan and design. Specific examples of cost avoidance actions taken on this project were:

1. Bundling of Projects: SoCalGas combined four sites into a single valve bundle to gain efficiencies in engineering, planning, and construction activities.
2. Schedule Coordination:
   a. The Mills Station and Kimball sites coordinated with the shut-in with the PSEP Line 404 Section 2A Hydrotest Project to avoid the costs of blowing down the pipeline multiple times.
   b. The Canoga and Lindley sites coordinated with the shut-in with the PSEP Line 404 Section 9 and Line 406 Section 3 Hydrotest Projects to avoid the costs of blowing down the pipelines multiple times.

B. Cost Estimates

Based on the preliminary design, once the preliminary project scope was confirmed and engineering, design, and planning activities were underway, SoCalGas prepared an estimate of the Direct Costs of the Project in the amount of $7,374,213. The Project Team considered the conditions known at the time to prepare the preliminary Direct Cost estimate. This estimate reflects the projected Labor, Material, and Services costs anticipated to be incurred to execute the Project, based on initial design plans.

SoCalGas estimated Indirect Costs of the Project based on the estimated Direct Costs and other project-related variables.

C. Actual Direct and Indirect Costs

Actual Direct Costs reflect the Labor, Material, and Services costs incurred to execute the Project. Actual Indirect Costs reflect costs for incremental overhead loaders in accordance with Company overhead allocation policies. The total loaded cost of the Project is $11,354,719.

Table 5: Estimated and Actual Direct Costs and Variances[10]

Direct Costs ($)	Estimate	Actuals	Delta Over/(Under)
Company Labor	430,527	703,765	273,238
Materials	808,277	784,031	(24,246)
Mechanical Construction Contractor	3,095,259	3,496,906	401,647
Electrical Contractor	245,603	347,483	101,880
Construction Management & Support	352,836	886,126	533,290
Environmental	117,682	244,630	126,948
Engineering & Design	919,458	1,371,652	452,194
Project Management & Services	542,683	257,939	(284,744)
ROW & Permits	82,500	172,312	89,812
GMA	779,388	1,092,953	313,565
Total Direct Costs	**7,374,213**	**9,357,797**	**1,983,584**

Table 6: Estimated and Actual Indirect Costs, Total Costs, and Variances[11]

Indirect Costs/Total Costs ($)	Estimate	Actuals	Delta Over/(Under)
Overheads	742,936	1,104,193	361,257
AFUDC	566,706	781,041	214,335
Property Taxes	120,604	111,688	(8,916)
Total Indirect Costs	**1,430,246**	**1,996,922**	**566,676**
Total Direct Costs	**7,374,213**	**9,357,797**	**1,983,584**
Total Loaded Costs	**8,804,459**	**11,354,719**	**2,550,260**

[10] Values may not add to total due to rounding.
[11] Ibid.

The Actual Full-Time Equivalents[12] (FTEs) for this Project are 1.40.

D. Cost Impacts

Consistent with one of the overarching objectives of PSEP to maximize the cost effectiveness of safety enhancement investments, SoCalGas effectively planned, designed, and completed construction activities for this project. Each pipeline project is unique in scope and inherently complex due to a variety of factors including terrain, environmental and permitting constraints, scope changes during detailed design, material cost fluctuations, regulatory changes, and more. These complexities can lead to variances between initial estimates and actual costs. Consistent with prudent management at the time, the Project Team successfully mitigated these variances whenever feasible through the implementation of effective project management practices, thorough planning, and continuous monitoring.

At the completion of the Line 404-406 Valley Bundle Valve Enhancement Project, Actual Direct Costs came within the AACE Class 3 Total Installed Cost (TIC) accuracy range, adhering to the standard industry practices defined by the Association for the Advancement of Cost Engineering (AACE) International. The Actual Direct Costs exceeded the preliminary estimate by $1,983,584. This variance can be attributed to several factors including: the Project Team determined in detailed design that a scope increase to automate an additional valve at Mills Station was necessary to achieve all transmission isolation objectives; system constraints encountered during construction led to temporary demobilization at Mills Station, which delayed completion and increased

[12] Full-time equivalents (FTEs) are included in GRC forecasts to provide context to requested amounts for company labor. FTEs are calculated by measuring the number of hours charged over a given time period. For example, one FTE is equal to 40 hours per week, or typically 2,080 hours per year. The calculation of FTEs includes overtime hours. Therefore, if one employee works 60 hours per week, he or she would be recorded as 1.5 FTEs.

total costs; a temporary demobilization was required at Canoga Avenue in order to coordinate with a hydrotest being performed on Line 404.

E. Disallowance

The scope of the Line 404-406 Valley Bundle Valve Enhancement Project did not include any pipe subject to disallowance under D.14-06-007 or D.15-12-020.

V. CONCLUSION

SoCalGas enhanced the safety of its natural gas system by prudently executing the Line 404-406 Valley Bundle Valve Enhancement Project. Through this Valve Enhancement Project, SoCalGas replaced one mainline valve (MLV), replaced 41 feet of Category 4 Criteria pipe, new power equipment, new communications equipment, and the necessary automation equipment at the sites to achieve the objective of enabling rapid system isolation of a portion of Line 404 in the Cities of Ventura and Los Angeles. The total loaded cost of the Project is $11,354,719.

SoCalGas executed this project prudently through designing and executing the project to support achievement of Valve Enhancement Plan isolation objectives, bundling four projects together to capture efficiencies through coordinated engineering, and installing equipment necessary to bring power and communication capabilities to the sites to enable rapid system isolation of a portion of Line 404 in the Cities of Ventura and Los Angeles.

SoCalGas engaged in prudent cost avoidance efforts to complete this safety enhancement at a reasonable cost by carefully planning and coordinating engineering and construction activities to maximize efficiencies and reduce customer and community impacts, engaging in reasonable efforts to promote competitive and market based rates for contractor services and materials, and using a reasonable amount of company and contractor resources to complete this safety enhancement as soon as practicable.

End of Line 404-406 Valley Bundle Valve Enhancement Project Final Report

I. LINE 404-406 VENTURA VALVE ENHANCEMENT PROJECT – SOMIS YARD

A. Background and Summary

The Line 404-406 Ventura Valve Enhancement Project – Somis Yard consists of valve enhancements made to an existing mainline valve (MLV) located in Ventura County. Through this project, SoCalGas enhanced the safety of its natural gas transmission system by enabling the rapid detection of a significant change in pipeline pressure and remote isolation and depressurization of a portion of Line 404 in the event of a pipeline rupture. SoCalGas installed new fencing, new power equipment, new communications equipment, and the necessary automation equipment at the site. The total loaded project cost is $1,278,753.

The Line 404-406 Ventura Valve Enhancement Project – Somis Yard is located in a privately-owned agricultural field. SoCalGas bundled this valve project with two additional valve projects, Line 404-406 Ventura Valve Enhancement Projects – Hall Canyon, and Santa Clara West, to gain efficiencies in engineering, planning, and construction activities. This workpaper describes the construction activities and costs of the Line 404-406 Ventura Valve Enhancement Project – Somis Yard.

Table 1: General Project Information

Line 404-406 Ventura Valve Enhancement Project – Somis Yard			
Location	Ventura County		
Days on Site	30 days		
Construction Start	05/15/2018		
Construction Finish	10/09/2018		
Commissioning Date	07/17/2018		
Valve Upgrades			
Valve Number	404-22.36-0		
Valve Type	Existing – Ball		
Actuator	Existing		
Actuator Above-/Below-Grade	Below-Grade		
ASV	Yes		
RCV	Yes		
Site Upgrades			
Vault	Existing		
Power	New – Solar		
Communication	New – Radio		
SCADA Panel	New		
Equipment Shelter	None		
Fencing	New		
Project Costs ($)	**Capital**	**O&M**	**Total**
Loaded Project Costs	1,278,753	0	1,278,753

B. Maps and Images

Figure 1: Line 404-406 Ventura Bundle Overview

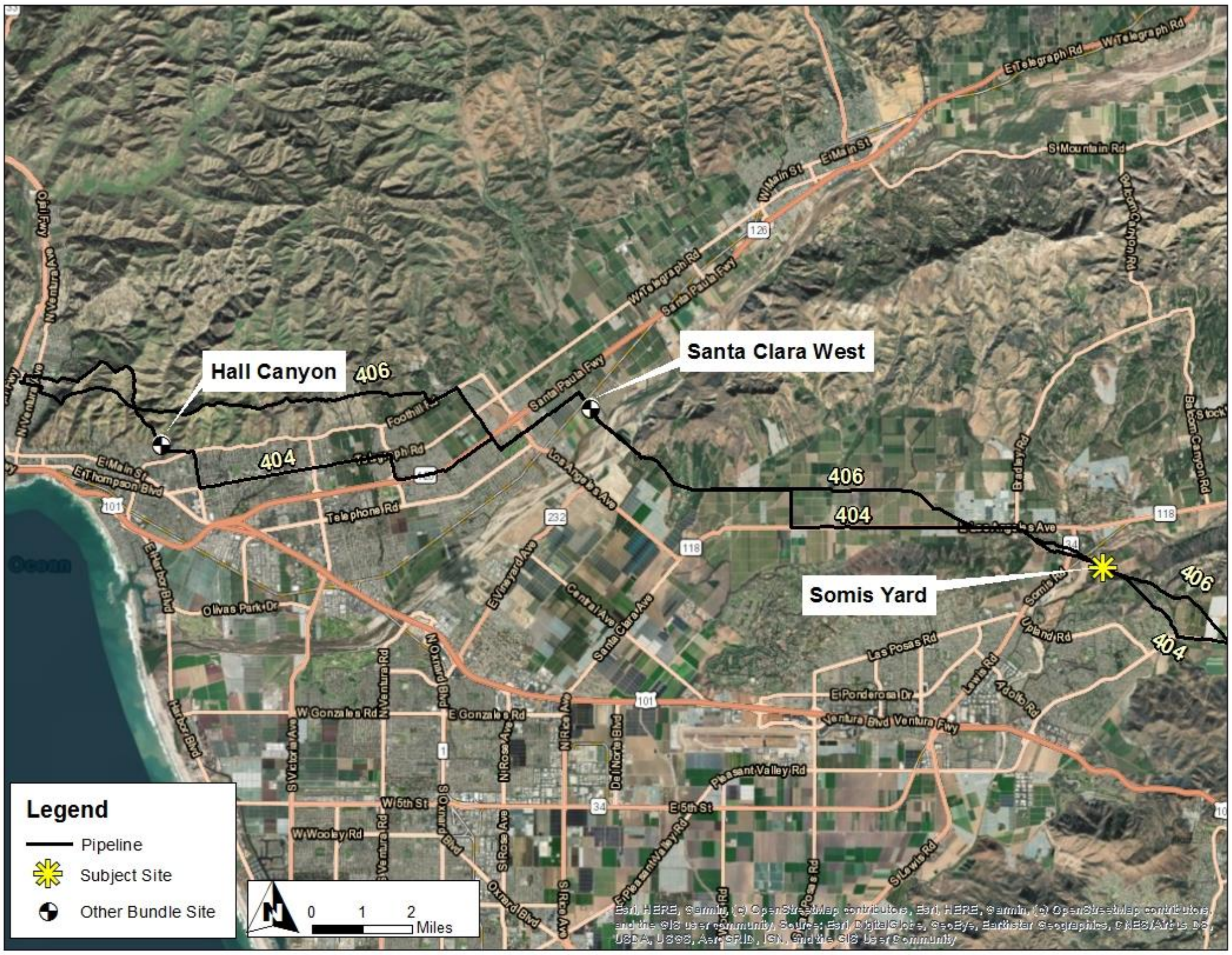


Figure 2: Satellite Image of Line 404-406 Ventura Valve Enhancement Project – Somis Yard

II. ENGINEERING, DESIGN, AND PLANNING

A. Project Scope

SoCalGas and SDG&E presented a conceptual project scope in workpapers supporting the Valve Enhancement Plan in the 2011 PSEP filing.[1] This conceptual scope did not include this project. SoCalGas and SDG&E reviewed available information and performed a detailed system flow analysis that identified this valve as a candidate for enhancement to provide the planned isolation. The final project scope is summarized in Table 2 below.

1. 2011 PSEP Filing: SoCalGas did not identify this valve for automation to achieve the objective of rapid system isolation.
2. Updated Scope: SoCalGas determined that the automation of MLV 404-22.36-0 would enable rapid isolation, thereby achieving Valve Enhancement Plan objectives.
3. Engineering, Design, and Constructability: No notable engineering adjustments were required to the standard design.
4. Final Project Scope: The final project scope consists of the automation of one MLV, that included the installation of power equipment, the installation of communications equipment, the installation of new fencing, and the installation of the necessary automation equipment at the site.

Table 2: Final Project Scope

Final Project Scope					
Line	Mile	Valve #	Valve Size (*confidential*)	Installation Type	Function
404	22.36	0	[redacted]	C/P	ASV/RCV

[1] *See* Workpapers supporting Amended Pipeline Safety Enhancement Plan (PSEP) of SoCalGas and SDG&E, submitted on December 2, 2011, at WP-IX-2-14 through WP-IX-2-25 (A.11-11-002 Exh. SCG-32).

B. Site Evaluation and Planning

SoCalGas initiated the planning process for the Line 404-406 Ventura Valve Enhancement Project – Somis Yard by performing a pre-design site walk to determine the existing conditions and assess any potential impact on the design. Key factors that influenced the engineering and design of this project are as follows:

1. Site Description: The site is located in a privately-owned agricultural field.
2. Land Issues: During the pre-design site walk, the Project Team noted that the existing easement would need to be expanded to accommodate the additional equipment.
3. DOT Class: This project site is in a Class 1 location. SoCalGas selected this MLV for automation in order to isolate a known geological threat downstream of this valve.
4. Power Source: There was no preexisting power source. The Project Team installed new power equipment at the site.
5. Communication Technology: There was no preexisting communications equipment. The Project Team installed new communications equipment at the site.

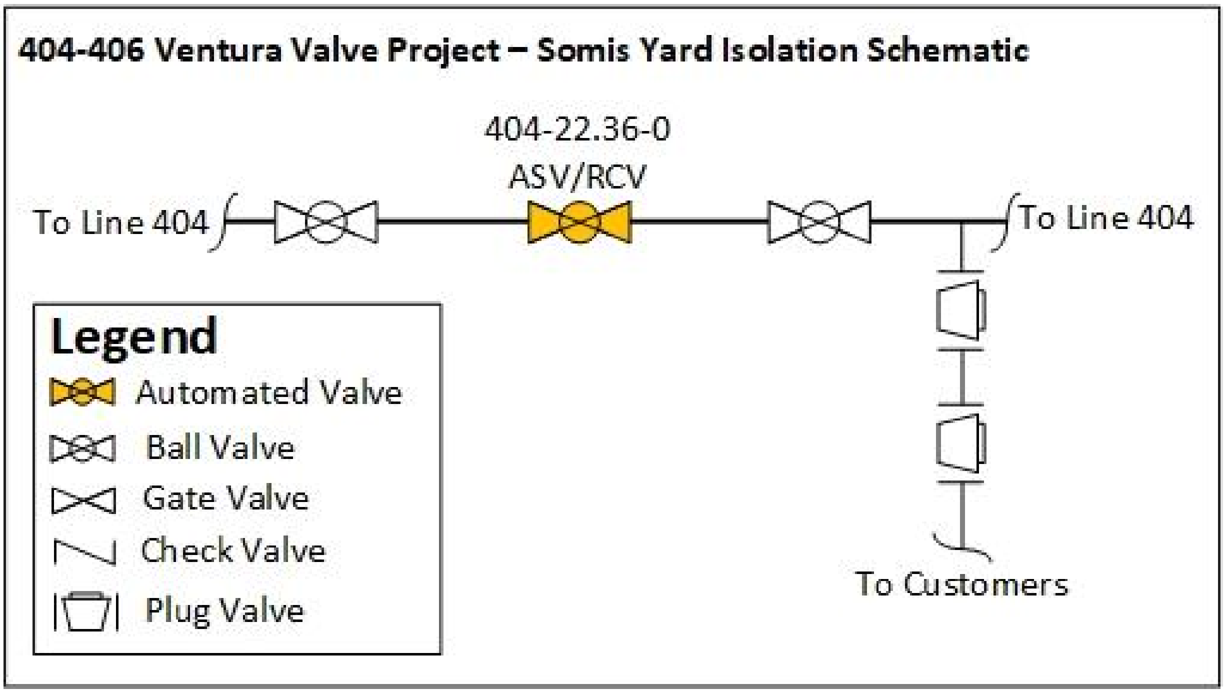
C. Engineering, Design, and Planning Factors

SoCalGas reviewed drawings and records, contacted internal planning groups, communicated with external stakeholders, conducted survey activity, and completed a site walk. Key factors that influenced the engineering and design of the Project are as follows:

1. Engineering Assessment: During the site evaluation, the Project Team confirmed the existing technology and verified the need to expand the existing easement to accommodate the new equipment.
2. Valve Details: The existing valve was a manually actuated Class 600 ball valve, which was reused by the Project Team.
3. Actuator Details: The existing actuator was a double-acting pneumatic actuator, which was reused by the Project Team.

4. Customer Impact: The Project Team did not identify any anticipated service disruptions to customers.
5. Community Impact: The Project Team did not anticipate any notable impacts to the community from this project.
6. Substructures: The Project Team did not identify any existing substructures that affected the design and engineering at this site.
7. Environmental: The Project Team did not identify any notable environmental concerns at the site. An environmental monitor performed routine site visits during construction.
8. Permit Restrictions: There were no special permits or permit restrictions for this project site.
9. Land Use: The Project Team expanded the existing facility to accommodate the new automation equipment.
10. Traffic Control: The Project Team did not identify any traffic control needs at the site.

Figure 3: Line 404-406 Ventura Valve Enhancement Project – Somis Yard Schematic



D. Scope Changes

SoCalGas did not make any notable scope changes during detailed design.

III. CONSTRUCTION

A. Construction Contractor Selection

The Project Team prepared an initial cost estimate based on the preliminary design. Following completion of the engineering, design, and planning activities described above, the Project Team directed the Performance Partner (Mechanical Construction Contractor) and Alliance Partner (Electrical Contractor) to prepare cost estimates based on a more detailed engineering design package. As indicated above, there were no notable changes in scope between the time when the Project Team prepared the preliminary cost estimate and when the Performance Partner and Alliance Partner prepared and submitted their estimates.

1. <u>SoCalGas' Preliminary Mechanical Construction Contractor Estimate *(confidential)*:</u> SoCalGas' preliminary cost estimate for construction was [redacted].

2. <u>Mechanical Construction Contractor's Target Price Estimate *(confidential)*:</u> The Mechanical Construction Contractor's cost estimate was [redacted], which was [redacted] than SoCalGas' preliminary cost estimate for construction.

3. <u>SoCalGas' Preliminary Electrical Contractor Estimate *(confidential)*:</u> SoCalGas' preliminary cost estimate for the electrical contractor was [redacted].

4. <u>Electrical Contractor's Estimate (*confidential*):</u> The Electrical Contractor's estimate was [redacted], which was [redacted] SoCalGas' preliminary cost estimate.

B. Construction Schedule

Table 3: Construction Timeline

Construction Start Date	05/15/2018
Construction Completion Date	10/09/2018
Days on Site	30 days
Commissioning Date	07/17/2018

The Project Team completed all construction activities as soon as practicable prior to commissioning. Finalization of commissioning activities is dependent on electrical utility connections, and system and/or resource availability.

C. Changes During Construction

SoCalGas successfully mitigated field conditions during construction in a manner that minimized potential impacts on project scope, cost, and schedule. As a result, these conditions did not result in any notable change orders.

Figure 4: Project Site With New Fencing

D. Commissioning and Site Restoration

Commissioning activities included site restoration, final inspections, and placement of the valve into service. During this stage, SoCalGas successfully performed site acceptance testing, and conducted point-to-point verification with Gas Control personnel for the newly-automated valve and transferred ownership of the new equipment to Field Operations. Closeout activities included development of final drawings, the reconciliation package, and updates to company recordkeeping systems to reflect the completed scope of work. The site was commissioned on July 17, 2018, as summarized in Table 3.

IV. PROJECT COSTS

A. Cost Avoidance Actions

SoCalGas exercised due diligence in the design, planning, and construction activities for this project to minimize or avoid costs when prudent to do so. As discussed above, the Project Team reviewed existing records, communicated with external stakeholders, and conducted a site walk to incorporate known site conditions in the project plan and design. The Project Team bundled this valve project with two additional valve projects, the Line 404-406 Ventura Valve Enhancement Projects – Hall Canyon, and Santa Clara West, coordinating engineering and construction activities between the projects sites to minimize costs for the benefit of customers.

B. Cost Estimates

Based on the preliminary design, once the preliminary project scope was confirmed and engineering, design, and planning activities were underway, SoCalGas prepared an estimate of the Direct Costs of the Project in the amount of $2,532,022. The Project Team considered the conditions known at the time to prepare the preliminary Direct Cost estimate. This estimate reflects the projected Labor, Material, and Services costs anticipated to be incurred to execute the Project, based on initial design plans.

SoCalGas estimated Indirect Costs of the Project based on the estimated Direct Costs and other project-related variables.

C. Actual Direct and Indirect Costs

Actual Direct Costs reflect the Labor, Material, and Services costs incurred to execute the Project. Actual Indirect Costs reflect costs for incremental overhead loaders in accordance with Company overhead allocation policies. The total loaded cost of the Project is $1,278,753.

Table 4: Estimated and Actual Direct Costs and Variances[2]

Direct Costs ($)	Estimate	Actuals	Delta Over/(Under)
Company Labor	316,959	72,555	(244,404)
Materials	95,469	77,462	(18,007)
Mechanical Construction Contractor	638,767	240,699	(398,068)
Electrical Contractor	112,000	111,845	(155)
Construction Management & Support	55,277	46,399	(8,878)
Environmental	117,372	33,051	(84,321)
Engineering & Design	142,282	254,883	112,601
Project Management & Services	326,159	25,271	(300,888)
ROW & Permits	436,734	63,122	(373,612)
GMA	291,003	146,161	(144,842)
Total Direct Costs	**2,532,022**	**1,071,449**	**(1,460,573)**

Table 5: Estimated and Actual Indirect Costs, Total Costs, and Variances[3]

Indirect Costs/Total Costs ($)	Estimate	Actuals	Delta Over/(Under)
Overheads	420,040	164,342	(255,698)
AFUDC	55,555	38,857	(16,698)
Property Taxes	8,300	4,105	(4,195)
Total Indirect Costs	**483,895**	**207,304**	**(276,591)**
Total Direct Costs	**2,532,022**	**1,071,449**	**(1,460,573)**
Total Loaded Costs	**3,015,917**	**1,278,753**	**(1,737,164)**

The Actual Full-Time Equivalent[4] (FTE) for this Project is 0.39.

[2] Values may not add to total due to rounding.
[3] Ibid.
[4] Full-time equivalents (FTEs) are included in GRC forecasts to provide context to requested amounts for company labor. FTEs are calculated by measuring the number of hours charged over a given time period. For example, one FTE is equal to 40 hours per week, or typically 2,080 hours per year. The calculation of FTEs includes overtime hours. Therefore, if one employee works 60 hours per week, he or she would be recorded as 1.5 FTEs.

D. Cost Impacts

Consistent with one of the overarching objectives of PSEP to maximize the cost effectiveness of safety enhancement investments, SoCalGas effectively planned, designed, and completed construction activities for this project. Each pipeline project is unique in scope and inherently complex due to a variety of factors including terrain, environmental and permitting constraints, scope changes during detailed design, material cost fluctuations, regulatory changes, and more. These complexities can lead to variances between initial estimates and actual costs. Consistent with prudent management at the time, the Project Team successfully mitigated these variances whenever feasible through the implementation of effective project management practices, thorough planning, and continuous monitoring.

At the completion of the 404-406 Ventura Valve Enhancement Project – Somis Yard, Actual Direct Costs were less than the preliminary estimate by $1,460,573. This variance can be attributed to a variety of factors including: Detailed engineering, design, and planning activities led to enhancements in the Project design and addressed key engineering factors. As a result, The Target Price Estimate (TPE) developed by SoCalGas and the Construction Contractor before construction [redacted] the construction estimate to [redacted]; the Project Team originally anticipated engineering would be partially completed with company labor, however as the project progressed through more detailed design, it was determined that this work would be completed by an engineering firm; and the Engineering and Design firms completed activities originally identified as Project Management & Services in the initial estimate while the actual costs were recognized under Engineering and Design.

V. CONCLUSION

SoCalGas enhanced the safety of their integrated natural gas system by prudently executing the 404-406 Ventura Valve Enhancement Project – Somis Yard. Through this Valve Enhancement Project, SoCalGas successfully automated one mainline valve to achieve the objective of enabling rapid system isolation of a portion of Lines 404 and 406 in Ventura County. The total loaded cost of the Project is $1,278,753.

SoCalGas executed this project prudently through designing and executing the project to support achievement of Valve Enhancement Plan isolation objectives, and installing equipment necessary to bring power and communication capabilities to the site.

SoCalGas engaged in prudent cost avoidance efforts to complete this safety enhancement at a reasonable cost by carefully planning and coordinating engineering and construction activities to maximize efficiencies and reduce customer and community impacts, engaging in reasonable efforts to promote competitive and market based rates for contractor services and materials, and using a reasonable amount of company and contractor resources to complete this safety enhancement as soon as practicable.

End of Line 404-406 Ventura Valve Enhancement Project – Somis Yard Final Report

I. LINE 1014 OLYMPIC VALVE ENHANCEMENT PROJECT

A. Background and Summary

The Line 1014 Olympic Valve Enhancement Project consists of valve enhancements made to two new mainline valves (MLVs), two new bridle valves, and the installation of two new check valves located in the Cities of Lakewood and Long Beach in Los Angeles County. Through this project, SoCalGas enhanced the safety of its natural gas transmission system by enabling the rapid detection of a significant change in pipeline pressure and remote isolation and depressurization of Lines 1014 and 512, and Supply Line 42-72 in the event of a pipeline rupture. SoCalGas installed four new automated valves, four new actuators, four new vaults to house the actuators, two new check valves, new power equipment, new communication equipment, and the necessary automation equipment at the sites. The total loaded project cost is $8,374,835.

The Line 1014 Olympic Valve Enhancement Project was separated into two different project sites that are in high density commercial and residential neighborhoods. The Cherry site is on the border of the City of Lakewood and the City of Long Beach on the southeast corner of Del Amo Boulevard and Cherry Avenue. The Faust site is located on the south side of Del Amo Boulevard in a parkway between Del Amo Boulevard and a local residential access road in the City of Lakewood. SoCalGas bundled the two project sites to gain efficiency in engineering, planning, and construction activities. This workpaper describes the construction activities and costs of Line 1014 Olympic Valve Enhancement Project.

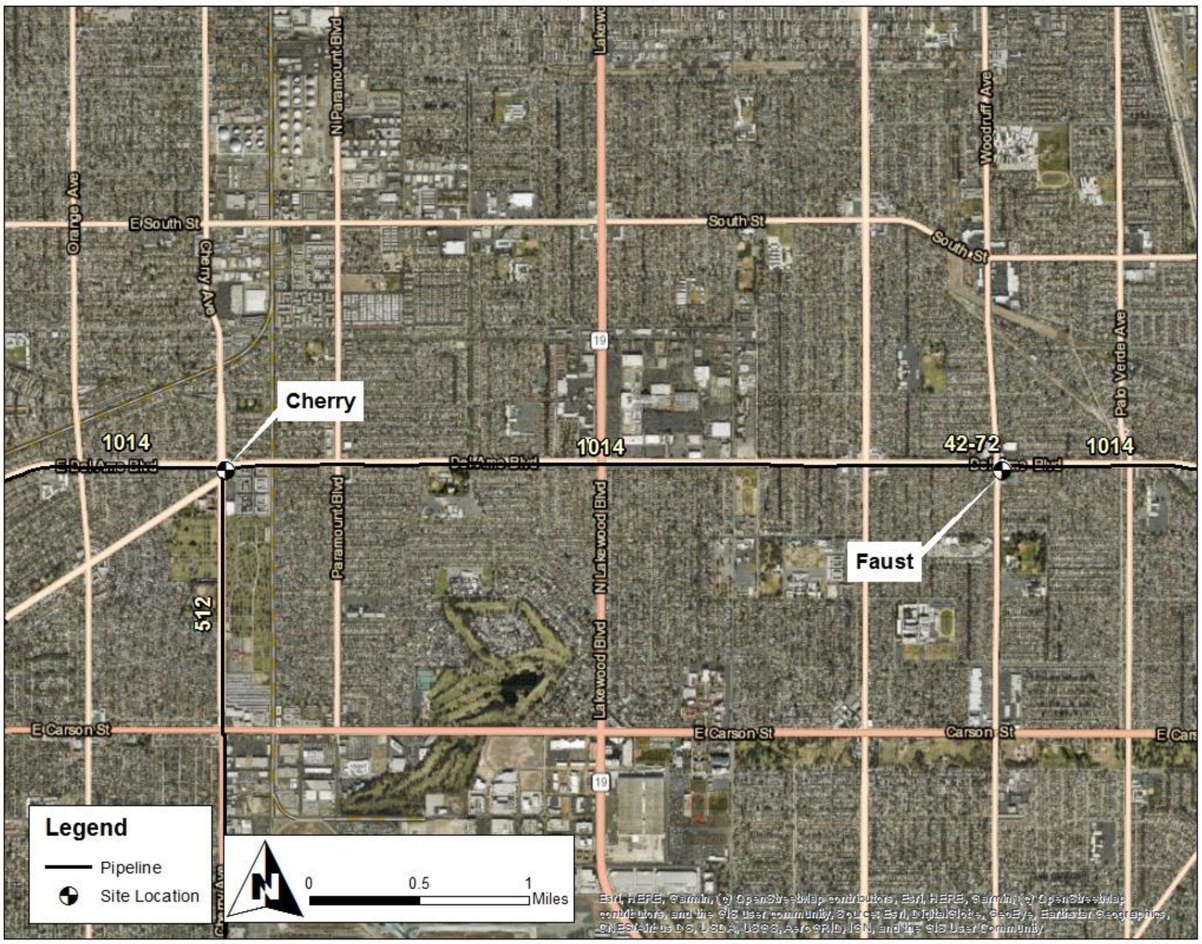
Final Report for Line 1014 Olympic Valve Enhancement Project

Table 1: General Project Information

Line 1014 Olympic Valve Enhancement Project			
Site	Cherry	Faust	
Location	Cities of Lakewood and Long Beach	City of Lakewood	
Days on Site	117 days	60 days	
Construction Start	06/01/2016	2/22/2016	
Construction Finish	11/17/2016	5/11/2016	
Commissioning Date	5/29/2019	8/23/2016	
Valve Upgrades			
Valve Number	1014-21.44-0	1014-18.42-0	
Valve Type	New – Ball	New – Ball	
Actuator	New	New	
Actuator Above-/Below-Grade	Below-Grade	Below-Grade	
ASV	Yes	Yes	
RCV	Yes	Yes	
Valve Number	1014-21.44-1	N/A[1]	
Valve Type	New – Ball	New – Check	
Actuator	New	N/A	
Actuator Above-/Below-Grade	Below-Grade	Below-Grade	
ASV	No	N/A	
RCV	Yes	N/A	
Valve Number	1014-21.44-2	N/A	
Valve Type	New – Ball	New – Check	
Actuator	New	N/A	
Actuator Above-/Below-Grade	Below-Grade	Below-Grade	
ASV	No	N/A	
RCV	Yes	N/A	
Site Upgrades			
Vault	New – Three	New	
Power	New – Utility	New – Utility	
Communication	New – Radio	New – Radio	
SCADA Panel	New	New	
Equipment Shelter	None	None	
Fencing/Wall	None	None	
Project Costs ($)	**Capital**	**O&M**	**Total**
Loaded Project Costs	8,374,835	-	8,374,835
Disallowed Costs	-	-	-

B. Maps and Images

Figure 1: Satellite Image of Line 1014 Olympic Valve Enhancement Project: Overview



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1 Check valves are not numbered.

Figure 2: Satellite Image of Cherry Site

Figure 3: Satellite Image of Faust Site

II. ENGINEERING, DESIGN, AND PLANNING

A. Project Scope

SoCalGas presented a conceptual project scope for the Valve Enhancement Plan[2] in the 2011 filing. This conceptual scope identified two mainline valves for automation to enable remote isolation to a portion of Line 1014. Prior to initiating execution of the Project, SoCalGas reviewed available information, performed a detailed system flow analysis to validate the scope of the Project, and identified two additional valves for enhancement and two check valve installations to provide the planned isolation. The final project scope is summarized in Table 2 below.

1. <u>2011 PSEP Filing:</u> SoCalGas identified MLVs 1014-18.42-0 and 1014-21.44-0 for automation to achieve the objective of rapid system isolation.
2. <u>Updated Scope:</u> Upon project initiation, SoCalGas reviewed the conceptual project scope and determined that these isolation points alone would not achieve the transmission isolation objectives set forth in the Valve Enhancement Plan. SoCalGas reevaluated the isolation points and determined that the installation and automation of valves 1014-21.44-1 and 1014-21.44-2 and the installation of two check valves would better achieve the objectives set forth in the Valve Enhancement Plan.
3. <u>Engineering, Design, and Constructability:</u>
   a. The Project Team initially planned to automate the preexisting valves at the Cherry Site in place. During subsequent site evaluations, the Project Team determined that due to the existing piping configuration, the valves could not be automated in place. The Project Team updated the scope to include new valves and a new piping configuration.

[2] *See* Workpapers supporting Amended Pipeline Safety Enhancement Plan (PSEP) of SoCalGas and SDG&E, submitted on December 2, 2011, at WP-IX-2-14 through WP-IX-2-25 (A.11-11-002 Exh. SCG-32).

b. The Project Team initially planned to automate the preexisting mainline valve at the Faust Site in place. During subsequent site evaluations, the Project Team determined that due to the existing valve configuration, the valve could not be automated in place. The Project Team updated the scope to include a new valve.

4. Final Project Scope: The final project scope consists of the automation of four valves, the installation of four new actuators, the installation of four new vaults to house the actuators, the installation of new power equipment, the installation of new communications equipment, the installation of the necessary automation equipment, and the installation of two new check valves at the project site.

Table 2: Final Project Scope

Final Project Scope					
Line	Mile	Valve #	Valve Size (*confidential*)	Installation Type	Function
1014	18.42	0	[redacted]	NV/VT	ASV/RCV
1014	18.42	N/A	[redacted]	NV	BFP2
1014	18.42	N/A	[redacted]	NV	BFP2
1014	21.44	0	[redacted]	NV/VT	ASV/RCV
1014	21.44	1	[redacted]	NV/VT	RCV
1014	21.44	2	[redacted]	NV/VT	RCV

B. Site Evaluation and Planning

SoCalGas initiated the planning process for the Line 1014 Olympic Valve Enhancement Project by performing a pre-design site walk to determine the existing conditions and assess any potential impact on the design. Key factors that influenced the engineering and design of this project are as follows:

Cherry

1. Site Description: This site is located in a high-density area that is a mix of commercial and residential buildings. The valve is on the southeast corner of the intersection of Del Amo Boulevard and Cherry Avenue.

2. Land Issues: During the pre-design site walk, the Project Team noted that easements from two nearby property owners would be required for the new utility power. The Project Team also noted that there was insufficient room for a laydown yard at the site and that an additional laydown yard was necessary.
3. DOT Class: This project site is in a Class 3 location.
4. Power Source: There was no preexisting power source. The Project Team installed new power equipment at the site.
5. Communication Technology: There was no preexisting communications equipment. The Project Team installed new communications equipment at the site.

Faust

1. Site Description: This site is located in a high-density area that is a mix of commercial and residential buildings. The valve is on the south side of Del Amo Boulevard in a parkway between Del Amo Boulevard and a local residential access road.
2. Land Issues: During the pre-design site walk, the Project Team noted that two nearby trees would need to be removed in order to accommodate the necessary automation equipment.
3. DOT Class: This project site is in a Class 3 location.
4. Power Source: There was no preexisting power source. The Project Team installed new power equipment at the site.
5. Communication Technology: There was no preexisting communications equipment. The Project Team installed new communications equipment at the site.

C. Engineering, Design, and Planning Factors

SoCalGas reviewed drawings and records, contacted internal planning groups, communicated with external stakeholders, conducted survey activity, and completed a site walk. Key factors that influenced the engineering and design of the Project are as follows:

Cherry

1. Engineering Assessment: During the site evaluation, the Project Team confirmed the location of the preexisting valves and verified that the automation of the preexisting valves would require a redesign of the preexisting piping configuration.
2. Valve Details:
   a. 1014-21.44-0: The preexisting valve was a manually operated Class 600 ball valve, which was replaced by the Project Team.
   b. 1014-21.44-1: The preexisting valve was a manually operated Class 600 ball valve, which was replaced by the Project Team.
   c. 1014-21.44-2: The preexisting valve was a manually operated Class 600 ball valve, which was replaced by the Project Team.
3. Actuator Details:
   a. 1014-21.44-0: There was no preexisting actuator. The Project Team installed a new actuator.
   b. 1014-21.44-1: There was no preexisting actuator. The Project Team installed a new actuator.
   c. 1014-21.44-2: There was no preexisting actuator. The Project Team installed a new actuator.
4. Customer Impact: The Project Team planned a shut-in of Lines 1014 and 512 during the tie-in. Line 512 services a large natural gas vehicle fueling station and two other non-core customers. The Project Team utilized CNG to provide uninterrupted service to the fueling station and coordinated the shut-in with the non-core customers to prevent any impact to their facilities.
5. Community Impact:
   a. The construction work area blocked a driveway of an adjacent gas station.
   b. Construction activity restricted public access to the sidewalk during construction.
6. Substructures: The Project Team did not identify any existing substructures that affected the design and engineering at this site.

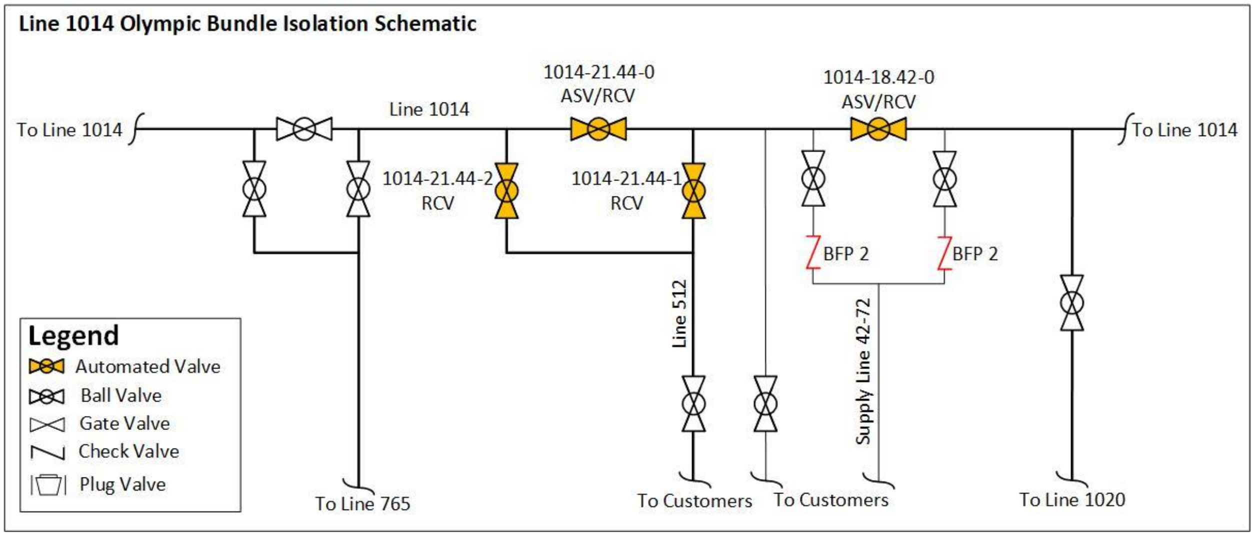
7. Environmental: The Project Team did not identify any notable environmental concerns at the site. An environmental monitor performed routine site visits during construction.
8. Permit Restrictions: The Project Team obtained encroachment permits from City of Lakewood, City of Long Beach, and Los Angeles County.
9. Land Use:
   a. The Project Team obtained easements from City of Lakewood, City of Long Beach, and Los Angeles County for the installation of the utility power.
   b. The Project Team obtained Temporary Right of Entry (TRE) from a gas station next to the project site.
   c. The Project Team utilized a nearby laydown area.
10. Traffic Control: The Project Team closed two eastbound lanes on Del Amo Boulevard for the duration of construction.

Faust

1. Engineering Assessment: During the site evaluation, the Project Team confirmed the location of the preexisting valves and verified that the automation of the preexisting valves would require a redesign of the preexisting piping configuration.
2. Valve Details: The preexisting valve was a manually operated Class 600 ball valve which was replaced by the Project Team.
3. Actuator Details: There was no preexisting actuator. The Project Team installed a new actuator.
4. Customer Impact: The Project Team scheduled the shut-in during warm weather conditions to avoid any service disruptions to customers.
5. Community Impact: The Project Team notified the residents prior to construction. The Project Team made efforts to minimize the impact to the community from this project.
6. Substructures: The Project Team did not identify any existing substructures that affected the design and engineering at this site.

7. Environmental: The Project Team identified two trees that interfered with the installation of the new equipment. The City of Lakewood removed the two trees prior to construction. An environmental monitor performed routine site visits during construction.
8. Permit Restrictions: The Project Team obtained a utility excavation permit from Los Angeles County.
9. Land Use: There was sufficient space at the construction site for a laydown yard within the public right of way.
10. Traffic Control: The Project Team partially closed the local residential access road at the intersection with Faust Avenue and closed one eastbound lane of Del Amo Boulevard during construction for excavation. The Project Team plated the excavation during non-working hours to allow traffic to pass through unimpeded during non-construction hours.

Figure 4: Line 1014 Olympic Valve Enhancement Project Schematic



D. Scope Changes

SoCalGas did not make any notable scope changes during detailed design.

III. CONSTRUCTION

A. Construction Contractor Selection

The Project Team prepared an initial cost estimate based on the preliminary design. Following completion of the engineering, design, and planning activities described above, the Project Team directed the Performance Partner (Mechanical Construction Contractor) and Alliance Partner (Electrical Contractor) to prepare cost estimates based on a more detailed engineering design package. As indicated above, there were no notable changes in scope between the time when the Project Team prepared the preliminary cost estimate and when the Performance Partner and Alliance Partner prepared and submitted their estimates.

1. <u>SoCalGas' Preliminary Mechanical Construction Contractor Estimate *(confidential)*:</u> SoCalGas' preliminary cost estimate for construction was [redacted].

2. <u>Mechanical Construction Contractor's Target Price Estimate *(confidential)*:</u> The Mechanical Construction Contractor's cost estimate was [redacted], which was [redacted] than SoCalGas' preliminary cost estimate for construction.

3. <u>SoCalGas' Preliminary Electrical Contractor Estimate *(confidential)*:</u> SoCalGas' preliminary cost estimate for construction was [redacted].

4. <u>Electrical Contractor's Estimate (*confidential*):</u> The Electrical Contractor's estimate was [redacted], which was [redacted] than SoCalGas' preliminary cost estimate.

B. Construction Schedule

Table 3: Construction Timeline

Cherry	
Construction Start Date	06/01/2016
Construction Completion Date	11/17/2016
Days on Site	117 days
Commissioning Date	05/29/2019
Faust	
Construction Start Date	02/22/2016
Construction Completion Date	05/11/2016
Days on Site	60 days
Commissioning Date	8/23/2016

The Project Team completed all construction activities as soon as practicable prior to commissioning. Finalization of commissioning activities is dependent on electrical utility connections, and system and/or resource availability.

C. Changes During Construction

The field conditions summarized below were encountered during construction. Activities to address or mitigate these conditions resulted in approximately $307,000 in change orders.

Cherry

1. Field Design Change: During construction, the specifications for the vault lids were altered by the City of Long Beach to include slip resistant steel surfaces. The Mechanical Construction Contractor procured the new vault lids.
   a. During the excavation, the Mechanical Construction Contractor determined that the selected tie-in location was on a pipe bend. The Mechanical Construction Contractor extended the excavation in order to find an acceptable tie-in location.

b. The scope of work called for the Electrical Construction Contractor to install the concrete pads and foundations for the necessary automation equipment. The Mechanical Construction Contractor performed this work.

2. Schedule Delay: Due to the complexity of the construction methods, the removal of the beam and plate shoring took longer than anticipated.

Faust

1. Construction Method:
   a. The scope of work called for the Electrical Construction Contractor to excavate and backfill the trenches for the electrical conduit. The Mechanical Construction Contractor performed this work.
   b. The abatement and removal of the existing vault and actuator was not included in the scope of work for the Mechanical Construction Contractor.
2. Schedule Delay: Construction was extended beyond what the Mechanical Construction Contractor assumed in the bid due to conditions encountered during construction. These conditions include excavation and backfill work, and the previously mentioned vault and actuator abatement and removal discussed above, and extended tie-in activities mentioned below.
3. Tie-in: Due to complex gas handling and isolation activities, the tie-in for Line 1014 was extended by one day.
4. Permits Conditions: SoCalGas requested the Mechanical Contractor provide payment to the City of Lakewood for the removal of two trees at the project site.

Figure 5: Cherry Site: New Bridle Assembly in Excavation Area

Figure 6: Faust Site: New Valves and Piping Assembly

D. Commissioning and Site Restoration

Commissioning activities included site restoration, final inspections, and placement of the valves into service. During this stage, SoCalGas successfully performed site acceptance testing, and conducted point-to-point verification with Gas Control personnel for the newly-automated valves, and transferred ownership of the new equipment to Field Operations. Closeout activities included development of final drawings, the reconciliation package, and updates to company recordkeeping systems to reflect the completed scope of work. The sites were commissioned on August 23, 2016 and May 29, 2019, as summarized in Table 3.

IV. PROJECT COSTS

A. Cost Avoidance Actions

SoCalGas exercised due diligence in the design, planning, and construction activities for this project to minimize or avoid costs when prudent to do so. As discussed above, the Project Team reviewed existing records, communicated with external stakeholders, and conducted a site walk to incorporate known site conditions in the project plan and design. Specific examples of cost avoidance actions taken on this project were:

1. Bundling of Projects: The Project Team bundled these projects to coordinate engineering and construction activities between the project sites to minimize costs for the benefit of customers.
2. Land Use: The laydown yard utilized by the Mechanical Contractor was used by other concurrent PSEP projects.
3. Tie-in: During the shut-in of Line 512, the Operating District took advantage of the shut-in and removed a nearby valve.

B. Cost Estimates

Based on the preliminary design, once the preliminary project scope was confirmed and engineering, design, and planning activities were underway, SoCalGas prepared an estimate of the Direct Costs of the Project in the amount of $3,902,226. The Project Team considered the conditions known at the time to prepare the preliminary Direct Cost estimate. This estimate reflects the projected Labor, Material, and Services costs anticipated to be incurred to execute the Project, based on initial design plans.

SoCalGas estimated Indirect Costs of the Project based on the estimated Direct Costs and other project-related variables.

C. Actual Direct and Indirect Costs

Actual Direct Costs reflect the Labor, Material, and Services costs incurred to execute the Project. Actual Indirect Costs reflect costs for incremental overhead loaders in accordance with Company overhead allocation policies. The total loaded cost of the Project is $ 8,374,835.

Table 4: Estimated and Actual Direct Costs and Variances[3]

Direct Costs ($)	Estimate	Actuals	Delta Over/(Under)
Company Labor	212,551	525,219	312,668
Materials	798,608	639,046	(159,562)
Mechanical Construction Contractor	1,188,986	2,672,004	1,483,018
Electrical Contractor	199,304	222,926	23,622
Construction Management & Support	181,037	668,321	487,284
Environmental	105,459	120,990	15,531
Engineering & Design	446,822	1,076,750	629,928
Project Management & Services	296,856	235,572	(61,284)
ROW & Permits	60,173	138,610	78,437
GMA	412,430	820,351	407,921
Total Direct Costs	**3,902,226**	**7,119,788**	**3,217,562**

Table 5: Estimated and Actual Indirect Costs, Total Costs, and Variances[4]

Indirect Costs/Total Costs ($)	Estimate	Actuals	Delta Over/(Under)
Overheads	401,122	789,941	388,819
AFUDC	190,338	401,777	211,439
Property Taxes	39,682	63,329	23,647
Total Indirect Costs	**631,142**	**1,255,047**	**623,905**
Total Direct Costs	**3,902,226**	**7,119,788**	**3,217,562**
Total Loaded Costs	**4,533,368**	**8,374,835**	**3,841,467**

3 Values may not add to total due to rounding.

4 Ibid.

The Actual Full-Time Equivalents[5] (FTEs) for this Project are 0.95.

D. Cost Impacts

Consistent with one of the overarching objectives of PSEP to maximize the cost effectiveness of safety enhancement investments, SoCalGas effectively planned, designed, and completed construction activities for this project. Each pipeline project is unique in scope and inherently complex due to a variety of factors including terrain, environmental and permitting constraints, scope changes during detailed design, material cost fluctuations, regulatory changes, and more. These complexities can lead to variances between initial estimates and actual costs. Consistent with prudent management at the time, the Project Team successfully mitigated these variances whenever feasible through the implementation of effective project management practices, thorough planning, and continuous monitoring.

At the completion of the Line 1014 Olympic Valve Enhancement Project, Actual Direct Costs exceeded than the preliminary estimate by $3,217,562. This variance is attributable to a variety of factors including:

1. Company Labor: Company Labor cost were approximately $60,000 higher than anticipated due to an extended project duration and a redesign caused by delays due to protracted negotiations during electrical easement acquisition.

[5] Full-time equivalents (FTEs) are included in GRC forecasts to provide context to requested amounts for company labor. FTEs are calculated by measuring the number of hours charged over a given time period. For example, one FTE is equal to 40 hours per week, or typically 2,080 hours per year. The calculation of FTEs includes overtime hours. Therefore, if one employee works 60 hours per week, he or she would be recorded as 1.5 FTEs.

2. Materials:
    a. The preliminary design assumed the cost of three new precast actuator vaults. Prior to construction, the design was changed to three cast-in-place vaults fabricated by the mechanical contractor in the field. The lids for these vaults were procured by the contractor.
    b. The initial estimate included the cost of a new precast blowdown vault. During construction, the existing blowdown vault was able to be re-used.
3. Mechanical Construction Contractor:
    a. Detailed engineering, design, and planning activities led to enhancements in the Project design and addressed key engineering factors. As a result, the preliminary cost estimate did not fully capture the final scope of work. The Target Price Estimate (TPE) developed by SoCalGas and the Construction Contractor before construction incorporated these adjustments and refinements reflecting a detailed design [redacted] the construction estimate to [redacted].
    b. Activities to address or mitigate conditions encountered during construction are detailed in Section III. Part C, resulted in approximately $307,000 in change orders.
    c. The Project Team assumed the use of pre-cast components prior to construction, however cast-in-place vaults were required which led to additional on-site labor and material costs.
    d. For the Cherry site, the contractor planned a ten-hour day, five days a week schedule to meet a specific tie-in date in order to minimize customer impacts. However, an eight hour per day, five days a week work schedule was originally anticipated.
    e. Delays occurred due to the discovery of unmarked communications conduit installed above the pipeline, necessitating a redesign. The required field changes extended the time needed for excavation and fabrication.

   f. The Project Team experienced protracted easement negotiations with a commercial landowner that led to additional cost for the construction contractor to remobilize and complete the project.

4. Electrical Construction Contractor: The electrical contractor's estimate included scope that was covered by the mechanical contractor including excavation, backfill, and traffic control.
5. Construction Management & Support:
   a. The Project required an additional mobilization to complete electrical construction after the new easement was obtained, resulting in additional costs of approximately $20,000.
   b. The Project unexpectedly required CNG services for the tie-in operation.
   c. Unknown substructures found during construction resulted in a field design change near the east tie-in point, causing the site excavation area to be extended, which necessitated additional welds and increased the effort required for Non-Destructive Examination (NDE). These changes led to a construction schedule delay.
   d. There were multiple inspectors required on site during construction due to the complexity of construction methods, leading to approximate additional costs of $248,000.
6. Engineering & Design:
   a. Additional costs were charged because survey was required for the additional mobilization to complete the electrical installation.
   b. The Engineering and Design firms completed activities originally identified as Project Management & Services in the initial estimate while the actual costs of $250,000 were recognized under Engineering and Design.
7. Project Management & Services: The engineering firms provided Project Management & Services activities which were originally estimated under Project Management and Services, but approximately $250,000 of these costs were recognized in Engineering and Design.

8. Land & ROW:
    a. Due to protracted negotiations with a commercial landowner and a redesign that necessitated an additional easement, the effort needed to secure electrical easements exceeded initial expectations. This resulted in a schedule delay of about two and a half years, between the end of mechanical construction and start of electrical construction, and two construction mobilizations, leading to additional costs of approximately $85,000.
    b. Additional permits were required to remobilize and complete electrical construction, resulting in an approximate cost increase of $5,000.

V. CONCLUSION

SoCalGas enhanced the safety of its natural gas system by prudently executing the Line 1014 Olympic Valve Enhancement Project. Through this Valve Enhancement Project, SoCalGas successfully installed and automated four valves, and installed two check valves to achieve the objective of enabling rapid system isolation of portions of Line 1014 and 512, and Supply Line 42-72, in the Cities of Lakewood and Long Beach. The total loaded cost of the Project is $8,374,835.

SoCalGas executed this project prudently through designing and executing the project to support achievement of Valve Enhancement Plan isolation objectives, bundling two geographically proximate valve project sites together to capture efficiencies, and installing equipment necessary to bring power and communication capabilities to these sites to enable rapid system isolation to a portion of Lines 1014, 512, and 42-72 located in Los Angeles County.

SoCalGas engaged in prudent cost avoidance efforts to complete this safety enhancement at a reasonable cost by carefully planning and coordinating construction activities to maximize efficiencies and reduce customer and community impacts.

End of Line 1014 Olympic Valve Enhancement Project Final Report

I. LINE 1018 VALVE ENHANCEMENT PROJECT – ALIPAZ STREET

A. Background and Summary

The Line 1018 Valve Enhancement Project – Alipaz Street consists of valve enhancements made to an existing mainline valve (MLV) located in the City of San Juan Capistrano. Through this project, SoCalGas enhanced the safety of their integrated gas transmission system by enabling the rapid detection of a significant change in pipeline pressure and remote isolation and depressurization of a portion of Line 1018 in the event of a pipeline rupture. SoCalGas installed a new actuator, a new vault to house the actuator, new power equipment, new communications equipment, and the necessary automation equipment at the site. The total loaded project cost is $1,870,680.

The Line 1018 Valve Enhancement Project – Alipaz Street construction site is in a residential area on the corner of Alipaz Street and Del Obispo Street next to the Trabuco Creek. There are multiple houses near the site. SoCalGas bundled this valve project with six additional valve projects, Line 1018 Valve Enhancement Projects – Avery Parkway, Burt Road, Camino Capistrano, Dana Point, El Toro Road, and Harvard and Alton, to gain efficiencies in engineering, planning, and construction activities. This workpaper speaks to the Line 1018 Valve Enhancement Project – Alipaz Street site.

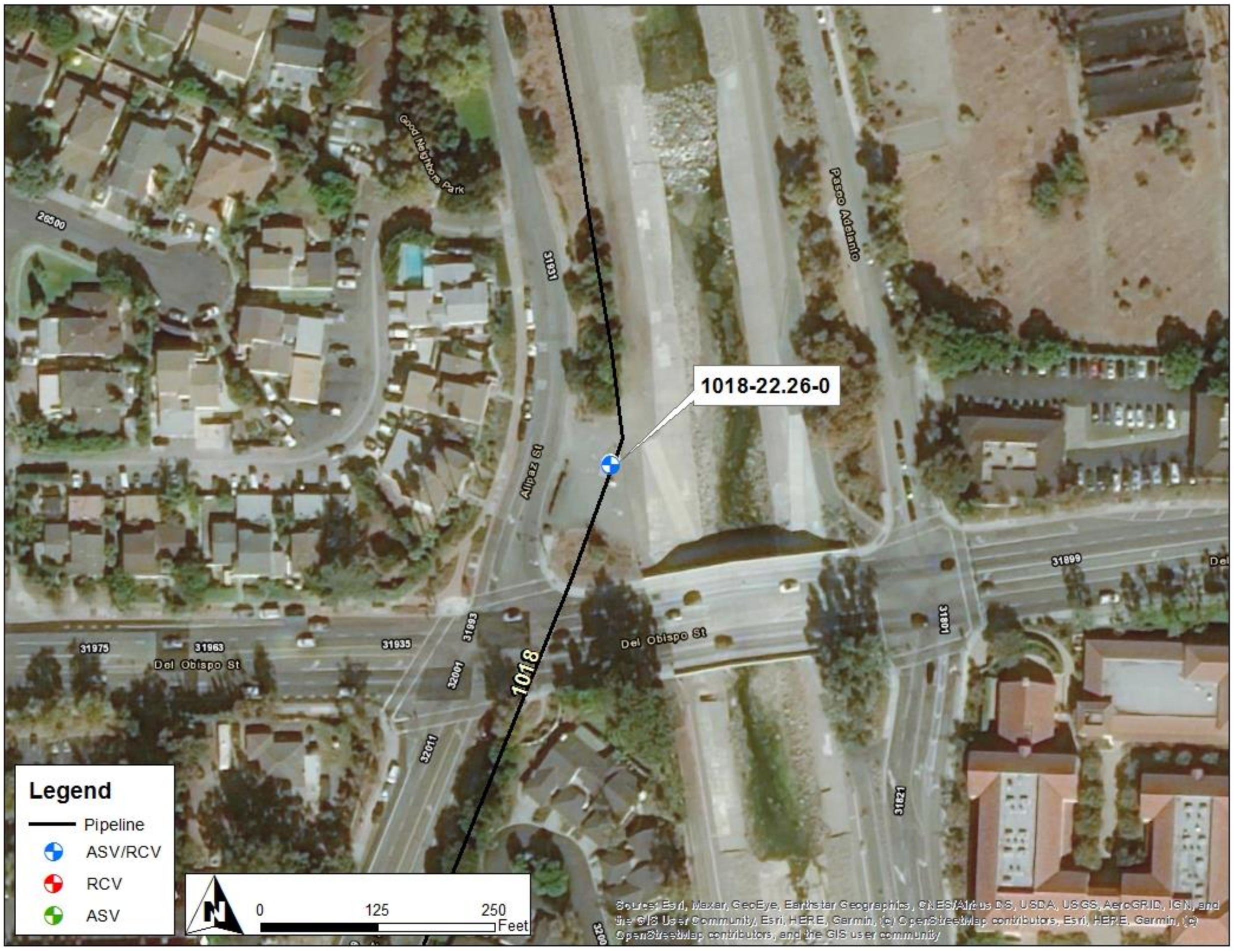
Table 1: General Project Information

Line 1018 Valve Enhancement Project – Alipaz Street			
Location	City of San Juan Capistrano		
Days on Site	47 days		
Construction Start	05/07/2018		
Construction Finish	07/31/2018		
Commissioning Date	04/24/2019		
Valve Upgrades			
Valve Number	1018-22.26-0		
Valve Type	Existing – Ball		
Actuator	New		
Actuator Above-/Below-Grade	Below-Grade		
ASV	Yes		
RCV	Yes		
Site Upgrades			
Vault	New		
Power	New – Utility		
Communication	New – Radio		
SCADA Panel	New		
Equipment Shelter	None		
Fencing/Wall	None		
Project Costs ($)	**Capital**	**O&M**	**Total**
Loaded Project Costs	1,870,680	-	1,870,680
Disallowed Costs	-	-	-

B. Maps and Images

Figure 1: Line 1018 Bundle Overview

Figure 2: Satellite Image of Line 1018 Valve Enhancement Project – Alipaz Street



II. ENGINEERING, DESIGN, AND PLANNING

A. Project Scope

SoCalGas presented a conceptual project scope in workpapers supporting the Valve Enhancement Plan in the 2011 filing.[1] This conceptual scope did not include this project. SoCalGas reviewed available information, performed a detailed system flow analysis, and identified this valve as a candidate for enhancement to provide the planned isolation. The final project scope is summarized in Table 2 below.

1. 2011 PSEP Filing: SoCalGas did not identify this valve for automation to achieve the objective of rapid system isolation.
2. Updated Scope: SoCalGas determined that the automation of MLV 1018-22.26-0 would enable rapid isolation, thereby achieving Valve Enhancement Plan objectives.
3. Engineering, Design, and Constructability: No notable engineering adjustments were required to the standard design.
4. Final Project Scope: The final project scope consists of the automation of one valve, that included the installation of one new actuator, the installation of a new vault to house the actuator, the installation of power equipment, the installation of communications equipment, and the installation of the necessary automation equipment at the site.

Table 2: Final Project Scope

Final Project Scope					
Line	Mile	Valve #	Valve Size (*confidential*)	Installation Type	Function
1018	22.26	0	[redacted]	A/VT	ASV/RCV

[1] *See* Workpapers supporting Amended Pipeline Safety Enhancement Plan (PSEP) of SoCalGas and SDG&E, submitted on December 2, 2011, at WP-IX-2-14 through WP-IX-2-25 (A.11-11-002 Exh. SCG-32).

B. Site Evaluation and Planning

SoCalGas initiated the planning process for the Line 1018 Valve Enhancement Project by performing a pre-design site walk to determine the existing conditions and assess any potential impact on the design. Key factors that influenced the engineering and design of this project are as follows:

1. Site Description: The site is in a residential area on the corner of Alipaz Street and Del Obispo Street next to the Trabuco Creek.
2. Land Issues: The Project Team utilized land on the other side Trabuco Creek as a laydown yard.
3. DOT Class: This project site is in a Class 3 location.
4. Power Source: There was no preexisting power equipment. The Project Team installed new power equipment.
5. Communication Technology: There was no preexisting communications equipment. The Project Team installed new communications equipment.

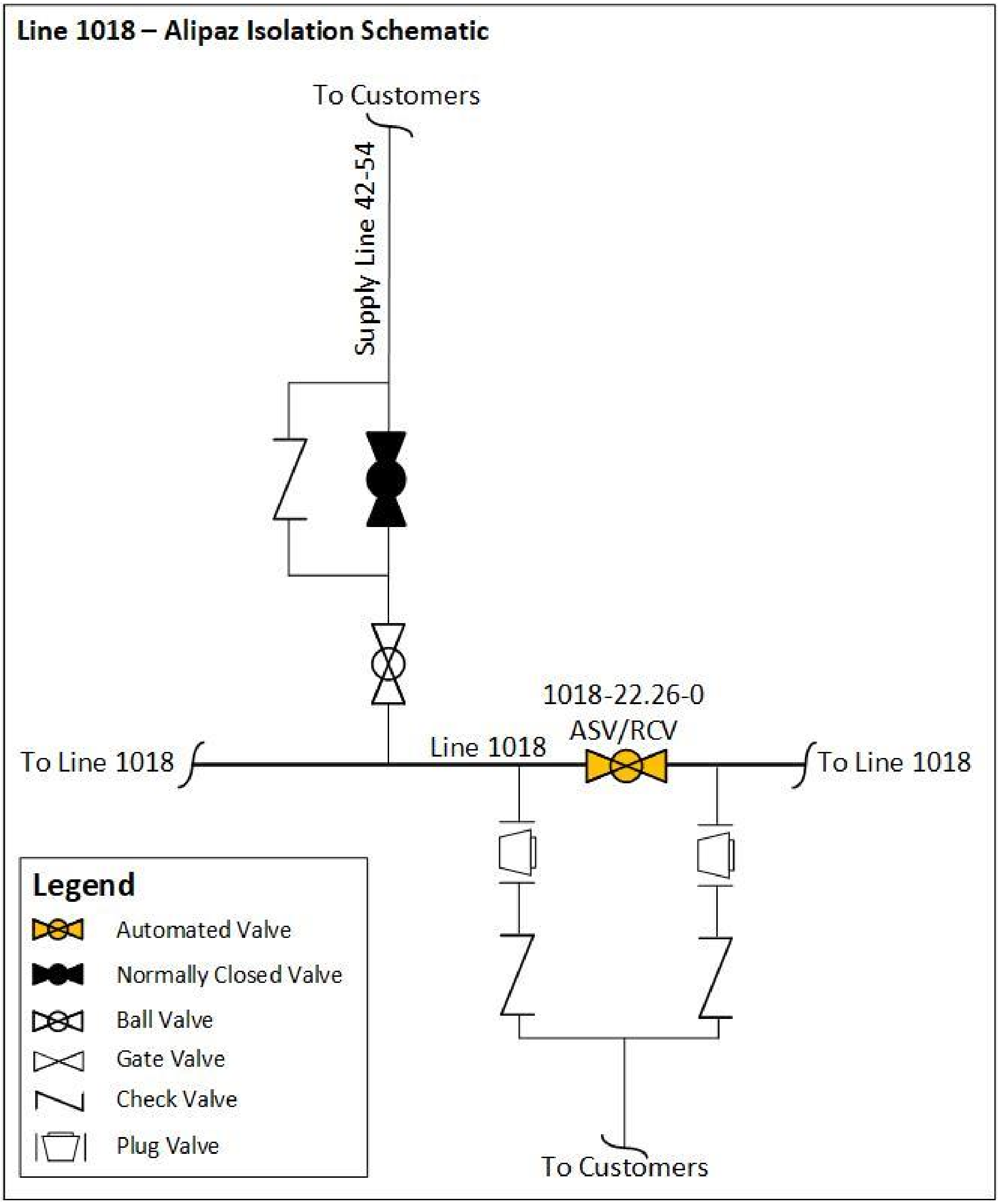
C. Engineering, Design, and Planning Factors

SoCalGas reviewed drawings and records, contacted internal planning groups, communicated with external stakeholders, conducted survey activity, performed potholing of the area to identify the presence of underground utilities and substructures, and completed a site walk. Key factors that influenced the engineering and design of the Project are as follows:

1. Engineering Assessment: During the site evaluation, the Project Team confirmed the existing technology. There were no items of note that affected the design.
2. Valve Details: The existing valve was a manually operated Class 300 Ball valve, which was reused by the Project Team.
3. Actuator Details: The preexisting actuator was incompatible with PSEP linebreak technology, so the Project Team installed a new actuator.

4. Customer Impact: The Project Team did not anticipate service disruptions to customers.
5. Community Impact: The Project Team did not anticipate any notable impact to the community from this project.
6. Substructures: The Project Team did not identify any existing substructures that affected the design and engineering at this site.
7. Environmental: The Project Team identified a nesting duck near the construction site. The duck relocated prior to the start of construction. An environmental monitor performed spot checks during construction.
8. Permit Restrictions: The Project Team acquired a flood control permit from the City of San Juan Capistrano.
9. Land Use: The Project Team utilized land on the other side Trabuco Creek as a laydown yard.
10. Traffic Control: The Project Team did not identify any traffic control needs at the site.

Figure 3: Line 1018 Valve Enhancement Project – Alipaz Street Schematic



D. Scope Changes

SoCalGas did not make any notable scope changes during detailed design.

III. CONSTRUCTION

A. Construction Contractor Selection

The Project Team prepared an initial cost estimate based on the preliminary design. Following completion of the engineering, design, and planning activities described above, the Project Team directed the Performance Partner (Mechanical Construction Contractor) and Alliance Partner (Electrical Contractor) to prepare cost estimates based on a more detailed engineering design package. As indicated above, there were no notable changes in scope between the time when the Project Team prepared the preliminary cost estimate and when the Performance Partner and Alliance Partner prepared and submitted their estimates.

1. <u>SoCalGas' Preliminary Mechanical Construction Contractor Estimate *(confidential)*:</u> SoCalGas' preliminary cost estimate for construction was [redacted].

2. <u>Mechanical Construction Contractor's Target Price Estimate *(confidential)*:</u> The Mechanical Construction Contractor's cost estimate was [redacted], which was [redacted] than SoCalGas' preliminary cost estimate for construction.

3. <u>SoCalGas' Preliminary Electrical Contractor Estimate *(confidential)*:</u> SoCalGas' preliminary cost estimate for construction was [redacted].

4. <u>Electrical Contractor's Estimate *(confidential)*:</u> The Electrical Contractor's estimate was [redacted], which was [redacted] than SoCalGas' preliminary cost estimate.

B. Construction Schedule

Table 3: Construction Timeline

Construction Start Date	05/07/2018
Construction Completion Date	07/31/2018
Days on Site	47 days
Commissioning Date	04/24/2019

The Project Team completed all construction activities as soon as practicable prior to commissioning. SoCalGas' finalization of commissioning activities is dependent on electrical utility connections, and system and/or resource availability.

C. Changes During Construction

The conditions summarized below were encountered during construction. Activities to address or mitigate these conditions resulted in approximately $213,000 in change orders.

1. Field Design Change:
   a. SoCalGas requested that the Mechanical Construction Contractor pour the new vault in place. This was not included in the Scope of Work. The initial scope of work called for the installation of a precast vault.
   b. The Project Team requested that the Mechanical Construction Contractor excavate and backfill the trench used to connect the site to the new utility power.
2. Schedule Delay: Due to the previously discussed Field Design Changes, construction extended beyond the estimated 16 days by 24 days.

Figure 4: New Concrete Vault

D. Commissioning and Site Restoration

Commissioning activities included site restoration, final inspections, and placement of the valve into service. During this stage, SoCalGas successfully performed site acceptance testing, and conducted point-to-point verification with Gas Control personnel for the newly-automated valve, and transferred ownership of the new equipment to Field Operations. Closeout activities included development of final drawings, the reconciliation package, and updates to company recordkeeping systems to reflect the completed scope of work. The site was commissioned on April 24, 2019, as summarized in Table 3.

IV. PROJECT COSTS

A. Cost Avoidance Actions

SoCalGas exercised due diligence in the design, planning, and construction activities for this project to minimize or avoid costs when prudent to do so. As discussed above, the Project Team reviewed existing records, communicated with external stakeholders, and conducted a site walk to incorporate the known site conditions in the project plan and design. SoCalGas grouped this site with six additional sites, Avery Parkway, Burt Road, Camino Capistrano, Dana Point, El Toro Road, and Harvard and Alton, into a single valve bundle to gain efficiencies in engineering, planning, and construction activities. The Project Team tracked the projects separately to more effectively track costs and streamline project closeout for individual sites.

B. Cost Estimates

Based on the preliminary design, once the preliminary project scope was confirmed and engineering, design, and planning activities were underway, SoCalGas prepared an estimate of the Direct Costs of the Project in the amount of $1,806,412. The Project Team considered the conditions known at the time to prepare the preliminary Direct Cost estimate. This estimate reflects the projected Labor, Material, and Services costs anticipated to be incurred to execute the Project, based on initial design plans.

SoCalGas estimated Indirect Costs of the Project based on the estimated Direct Costs and other project-related variables.

C. Actual Direct and Indirect Costs

Actual Direct Costs reflect the Labor, Material, and Services costs incurred to execute the Project. Actual Indirect Costs reflect costs for incremental overhead loaders in accordance with Company overhead allocation policies. The total loaded cost of the Project is $1,870,680.

Table 4: Estimated and Actual Direct Costs and Variances[2]

Direct Costs ($)	Estimate	Actuals	Delta Over/(Under)
Company Labor	362,104	108,680	(253,424)
Materials	250,481	126,179	(124,302)
Mechanical Construction Contractor	449,043	534,657	85,614
Electrical Contractor	112,861	99,382	(13,479)
Construction Management & Support	67,585	100,913	33,328
Environmental	13,925	53,690	39,765
Engineering & Design	199,788	300,707	100,919
Project Management & Services	84,272	26,063	(58,209)
ROW & Permits	75,403	43,470	(31,933)
GMA	190,950	204,711	13,761
Total Direct Costs	**1,806,412**	**1,598,452**	**(207,960)**

Table 5: Estimated and Actual Indirect Costs, Total Costs, and Variances[3]

Indirect Costs/Total Costs ($)	Estimate	Actuals	Delta Over/(Under)
Overheads	164,724	222,726	58,002
AFUDC	104,839	42,660	(62,179)
Property Taxes	24,623	6,842	(17,781)
Total Indirect Costs	**294,186**	**272,228**	**(21,958)**
Total Direct Costs	**1,806,412**	**1,598,452**	**(207,960)**
Total Loaded Costs	**2,100,598**	**1,870,680**	**(229,918)**

The Actual Full-Time Equivalent[4] (FTE) for this Project is 0.58.

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[2] Values may not add to total due to rounding.
[3] Ibid.
[4] Full-time equivalents (FTEs) are included in GRC forecasts to provide context to requested amounts for company labor. FTEs are calculated by measuring the number of hours charged over a given time period. For example, one FTE is equal to 40 hours per week, or typically 2,080 hours per year. The calculation of

D. Cost Impacts

Consistent with one of the overarching objectives of PSEP to maximize the cost effectiveness of safety enhancement investments, SoCalGas effectively planned, designed, and completed construction activities for this project. Each pipeline project is unique in scope and inherently complex due to a variety of factors including terrain, environmental and permitting constraints, scope changes during detailed design, material cost fluctuations, regulatory changes, and more. These complexities can lead to variances between initial estimates and actual costs. Consistent with prudent management at the time, the Project Team successfully mitigated these variances whenever feasible through the implementation of effective project management practices, thorough planning, and continuous monitoring.

At the completion of the Line 1018 Valve Enhancement Project – Alipaz Street, Actual Direct Costs came within the AACE Class 3 Total Installed Cost (TIC) accuracy range, adhering to the standard industry practices defined by the Association for the Advancement of Cost Engineering (AACE) International. The Actual Direct Costs were less than the preliminary estimate by $207,960. This variance can be attributed to several factors including: SoCalGas bundled this valve project with six additional valve projects to gain efficiencies in company labor, engineering, planning, and construction activities; the initial project estimate included electrical components under Materials, which was realized and provided by the Electrical Contractor; and the Engineering and Design firms completed activities originally identified as Project Management & Services in the initial estimate while the actual costs were recognized under Engineering & Design.

FTEs includes overtime hours. Therefore, if one employee works 60 hours per week, he or she would be recorded as 1.5 FTEs.

V. CONCLUSION

SoCalGas enhanced the safety of their integrated natural gas system by prudently executing the Line 1018 Valve Enhancement Project – Alipaz Street. Through this Valve Enhancement Project, SoCalGas successfully automated one MLV to achieve the objective of enabling rapid system isolation in the City of San Juan Capistrano. The total loaded cost of the Project is $1,870,680.

SoCalGas executed this project prudently through designing and executing the project to support achievement of Valve Enhancement Plan isolation objectives, bundling seven projects together to capture efficiencies through coordinated engineering, coordinating the shut-in with the local power plant, avoiding the need for CNG, LNG, or a temporary bypass, and by installing the equipment necessary to enable rapid system isolation to portions of Line 1018 in the City of San Juan Capistrano.

SoCalGas engaged in prudent cost avoidance efforts to complete this safety enhancement at a reasonable cost by carefully planning and coordinating engineering and construction activities to maximize efficiencies and reduce customer and community impacts, engaging in reasonable efforts to promote competitive and market based rates for contractor services and materials, and using a reasonable amount of company and contractor resources to complete this safety enhancement as soon as practicable.

End of Line 1018 Valve Enhancement Project – Alipaz Street Final Report

I. LINE 1018 VALVE ENHANCEMENT PROJECT – AVERY PARKWAY

A. Background and Summary

The Line 1018 Valve Enhancement Project – Avery Parkway consists of the installation of one check valve located in the City of Mission Viejo in Orange County. Through this project, SoCalGas enhanced the safety of its natural gas transmission system by enabling backflow prevention between Line 1018 and Supply Line 42-54 in the event of a pipeline rupture. SoCalGas installed a new check valve, a new ball valve, and new bypass piping at the project site. The total loaded project cost is $1,256,515.

The Line 1018 Valve Enhancement Project – Avery Parkway construction site is on Marguerite Parkway, a heavily trafficked roadway in the City of Mission Viejo. SoCalGas bundled this site with six additional sites, Line 1018 Valve Enhancement Projects – Alipaz Street, Burt Road, Camino Capistrano, Dana Point, El Toro Road, and Harvard and Alton to gain efficiencies in engineering, planning, and construction activities. This workpaper describes the construction activities and costs of the Line 1018 Valve Enhancement Project – Avery Parkway.

Table 1: General Project Information

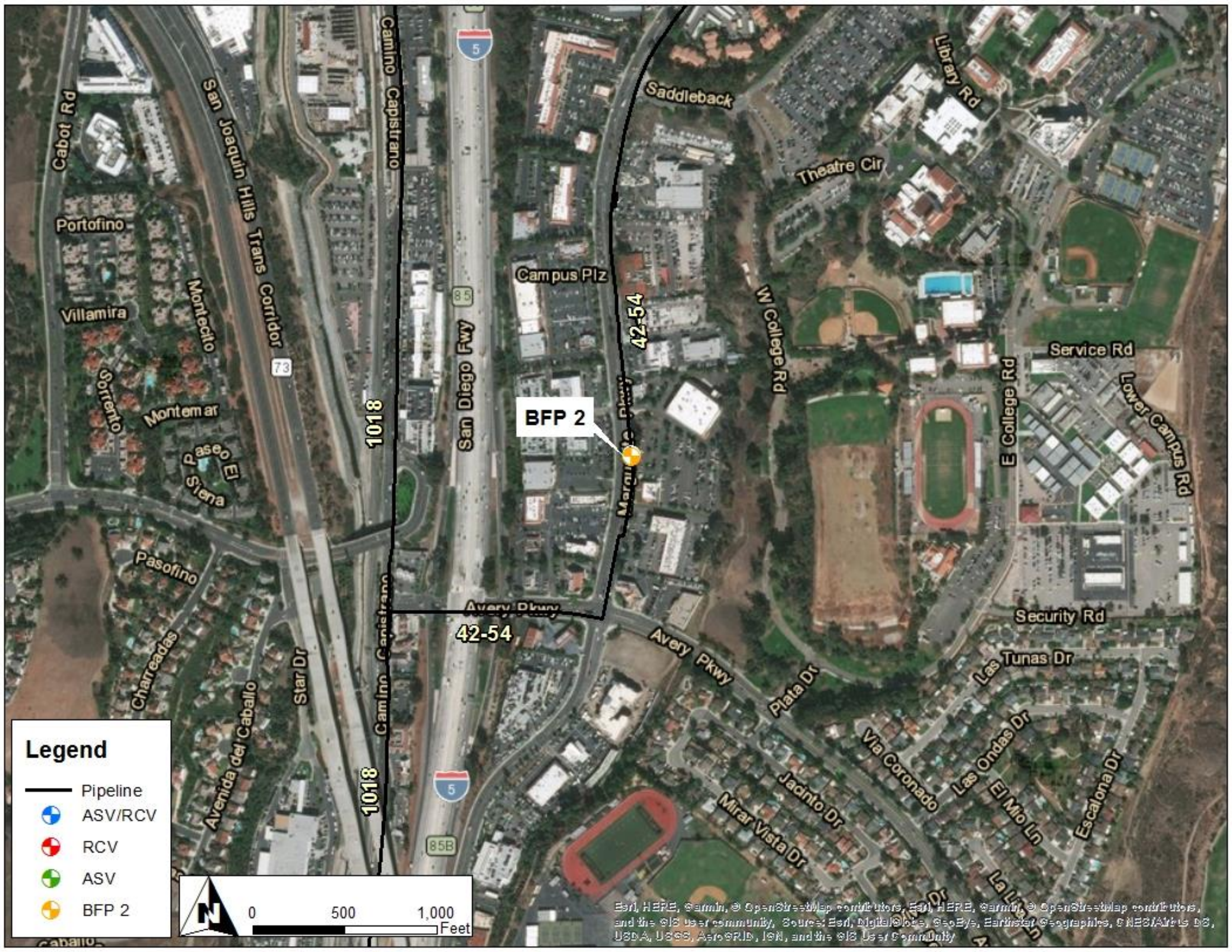
Line 1018 Parkway Valve Enhancement Project – Avery Parkway			
Location	City of Mission Viejo		
Days on Site	34 days		
Construction Start	02/07/2018		
Construction Finish	03/30/2018		
Commissioning Date	03/12/2018		
Valve Upgrades			
Valve Number	N/A[1]		
Valve Type	New – Check		
Actuator	N/A		
Actuator Above-/Below-Grade	N/A		
ASV	N/A		
RCV	N/A		
Site Upgrades			
Vault	None		
Power	None		
Communication	None		
SCADA Panel	None		
Equipment Shelter	None		
Fencing/Wall	None		
Project Costs ($)	**Capital**	**O&M**	**Total**
Loaded Project Costs	1,256,515	-	1,256,515
Disallowed Costs	-	-	-

[1] Check valves are not numbered.

B. Maps and Images

Figure 1: Line 1018 Bundle Overview

Figure 2: Satellite Image of Line 1018 Valve Enhancement Project – Avery Parkway



II. ENGINEERING, DESIGN, AND PLANNING

A. Project Scope

SoCalGas presented a conceptual project scope in workpapers supporting the Valve Enhancement Plan in the 2011 PSEP filing.[2] This conceptual scope did not identify this project. SoCalGas reviewed available information, performed a detailed system flow analysis, and identified this check valve as a candidate for installation to provide the planned isolation. The final project scope is summarized in Table 2 below.

1. <u>2011 PSEP Filing:</u> SoCalGas did not identify this valve for installation to achieve the objective of rapid system isolation.
2. <u>Updated Scope:</u> SoCalGas determined that it was necessary to install a check valve on Supply Line 42-54 to enhance the ability to eliminate gas flow from Supply Line 42-54 into Line 1018 during a rapid isolation event, thereby achieving Valve Enhancement Plan objectives.
3. <u>Engineering, Design, and Constructability:</u>
   a. SoCalGas initially planned to install a new check valve at the intersection of Avery Parkway and Camino Capistrano. The Project Team determined that shutting down that section of road would restrict access to a gas station located on the corner. The Project Team determined that moving the check valve installation to Marguerite Parkway would achieve the Valve Enhancement Plan objectives while minimizing the impact to the gas station and the surrounding community.
   b. The Project Team determined it was also necessary to install a new bypass and a new valve on the bypass to provide improved operational flexibility.

[2] *See* Workpapers supporting Amended Pipeline Safety Enhancement Plan (PSEP) of SoCalGas and SDG&E, submitted on December 2, 2011, at WP-IX-2-14 through WP-IX-2-25 (A.11-11-002 Exh. SCG-32).

4. Final Project Scope: The final project scope consists of the installation of a new check valve, he installation of a new ball valve, the installation of new bypass piping, at the project site.

Table 2: Final Project Scope

Final Project Scope					
Line	Mile	Valve #	Valve Size (*confidential*)	Installation Type	Function
42-54	0.00	N/A	[redacted]	NV	BFP2

B. Site Evaluation and Planning

SoCalGas initiated the planning process for the Line 1018 Valve Enhancement Project Avery Parkway by performing a pre-design site walk to determine the existing conditions and assess any potential impact on the design. Key factors that influenced the engineering and design of this project are as follows:

1. Site Description: The site is located in a commercial area on heavily trafficked Marguerite Parkway, north of Avery Parkway in the City of Mission Viejo.
2. Land Issues: During the pre-design site walk, the Project Team noted that excavations would occur in the street. The Project Team utilized the parking lot of a nearby restaurant as a laydown yard.
3. DOT Class: This project site is in a Class 3 location.
4. Power Source: The scope of work for this project site did not require any power equipment.
5. Communication Technology: The scope of work for this project site did not require any communications equipment.

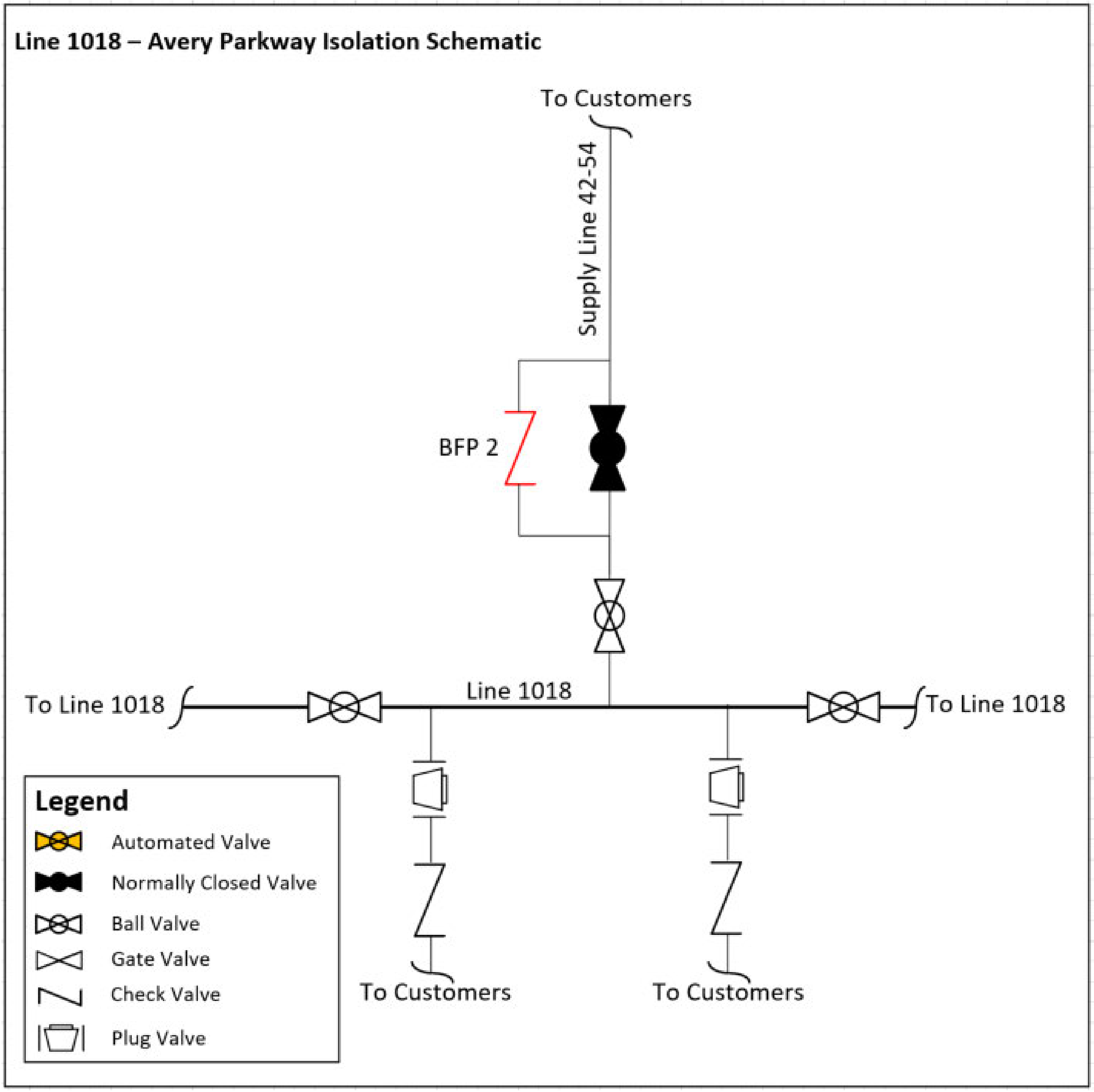
C. Engineering, Design, and Planning Factors

SoCalGas reviewed drawings and records, contacted internal planning groups, communicated with external stakeholders, conducted survey activity, and completed a site walk. Key factors that influenced the engineering and design of the Project are as follows:

1. Engineering Assessment: The Project Team noted that Supply Line services multiple customers. The Project Team determined that it was necessary to install the new check valve and bypass valve. The Project Team utilized stopples to maintain service during the tie-ins.
2. Valve Details: There were no preexisting check valves. The Project Team installed a new check valve.
3. Actuator Details: The scope of work for this project site did not require the installation of an actuator.
4. Customer Impact: The Project Team did not identify any anticipated service disruptions to customers. The Project Team utilized stopples and a bypass to maintain service to customers during the installation of the new valves.
5. Community Impact: The Project Team performed construction during nighttime hours to limit the impact to traffic and local businesses during construction. The Project Team plated the excavation to allow traffic to pass through unimpeded during non-construction hours.
6. Substructures: The Project Team did not identify any existing substructures that affected the design and engineering at this site.
7. Environmental: The Project Team did not identify any notable environmental concerns at the site. An environmental monitor performed routine site visits during construction.
8. Permit Restrictions: The Project Team obtained an encroachment permit from the City of Mission Viejo that included the Traffic Control requirements. The permit limited lane closures from 9:00pm to 5:00am Sunday through Thursday.

9. Land Use: The Project Team utilized a nearby restaurant parking lot as a laydown yard. The Project Team performed all work during hours when the restaurant was closed.
10. Traffic Control: The Project Team closed one lane of Marguerite Parkway during construction hours. The Project Team plated the excavation to allow traffic to pass through unimpeded during non-construction hours.

Figure 3: Line 1018 Valve Enhancement Project – Avery Parkway Schematic



D. Scope Changes

SoCalGas did not make any notable scope changes during detailed design.

III. CONSTRUCTION

A. Construction Contractor Selection

The Project Team prepared an initial cost estimate based on the preliminary design. Following completion of the engineering, design, and planning activities described above, the Project Team directed the Performance Partner (Mechanical Construction Contractor) to prepare a cost estimate based on a more detailed engineering design package, which included the updated design described in the discussion of notable changes in scope above.

1. SoCalGas' Preliminary Mechanical Construction Contractor Estimate *(confidential)*: SoCalGas' preliminary cost estimate for construction was [redacted].

2. Mechanical Construction Contractor's Target Price Estimate *(confidential)*: The Mechanical Construction Contractor's cost estimate was [redacted], which was [redacted] than SoCalGas' preliminary cost estimate for construction.

B. Construction Schedule

Table 3: Construction Timeline

Construction Start Date	02/07/2018
Construction Completion Date	03/30/2018
Days on Site	34 days
Commissioning Date	03/12/2018

The Project Team completed all construction activities as soon as practicable prior to commissioning. Finalization of commissioning activities is dependent on electrical utility connections, and system and/or resource availability.

C. Changes During Construction

SoCalGas successfully mitigated field conditions during construction in a manner that minimized potential impacts on project scope, cost, and schedule. As a result, these conditions did not result in any notable change orders.

Figure 4: Excavation, New Check Valve and Two Stopple Fittings

D. Commissioning and Site Restoration

Commissioning activities included site restoration, final inspections, and placement of the valve into service, and transferred ownership of the new equipment to Field Operations. Closeout activities included development of final drawings, the reconciliation package, and updates to company recordkeeping systems to reflect the completed scope of work. The site was commissioned on March 12, 2018, as summarized in Table 3.

IV. PROJECT COSTS

A. Cost Avoidance Actions

SoCalGas exercised due diligence in the design, planning, and construction activities for this project to minimize or avoid costs when prudent to do so. As discussed above, the Project Team reviewed existing records, communicated with external stakeholders, and conducted a site walk to incorporate the known site conditions in the project plan and design. The Project Team designed the new piping configuration so that Supply Line 42-54 is piggable to minimize costs for the benefit of the customers.

B. Cost Estimates

Based on the preliminary design, once the preliminary project scope was confirmed and engineering, design, and planning activities were underway, SoCalGas prepared an estimate of the Direct Costs of the Project in the amount of $1,867,392. The Project Team considered the conditions known at the time to prepare the preliminary Direct Cost estimate. This estimate reflects the projected Labor, Material, and Services costs anticipated to be incurred to execute the Project, based on initial design plans.

SoCalGas estimated Indirect Costs of the Project based on the estimated Direct Costs and other project-related variables.

C. Actual Direct and Indirect Costs

Actual Direct Costs reflect the Labor, Material, and Services costs incurred to execute the Project. Actual Indirect Costs reflect costs for incremental overhead loaders in accordance with Company overhead allocation policies. The total loaded cost of the Project is $1,256,515.

Table 4: Estimated and Actual Direct Costs and Variances[3]

Direct Costs ($)	Estimate	Actuals	Delta Over/(Under)
Company Labor	423,368	92,441	(330,927)
Materials	95,455	86,802	(8,653)
Mechanical Construction Contractor	632,518	389,108	(243,410)
Electrical Contractor	-	-	-
Construction Management & Support	43,528	103,093	59,565
Environmental	35,462	6,048	(29,414)
Engineering & Design	137,145	213,578	76,433
Project Management & Services	215,376	18,972	(196,404)
ROW & Permits	81,304	50,756	(30,548)
GMA	203,236	124,837	(78,399)
Total Direct Costs	**1,867,392**	**1,085,635**	**(781,757)**

Table 5: Estimated and Actual Indirect Costs, Total Costs, and Variances[4]

Indirect Costs/Total Costs ($)	Estimate	Actuals	Delta Over/(Under)
Overheads	412,381	155,582	(267,799)
AFUDC	92,592	13,470	(79,122)
Property Taxes	21,623	1,829	(19,794)
Total Indirect Costs	**537,596**	**170,880**	**(366,716)**
Total Direct Costs	**1,867,392**	**1,085,635**	**(781,757)**
Total Loaded Costs	**2,404,988**	**1,256,515**	**(1,148,473)**

The Actual Full-Time Equivalent[5] (FTE) for this Project is 0.45.

[3] Values may not add to total due to rounding.
[4] Ibid.
[5] Full-time equivalents (FTEs) are included in GRC forecasts to provide context to requested amounts for company labor. FTEs are calculated by measuring the number of hours charged over a given time period. For example, one FTE is equal to 40 hours per week, or typically 2,080 hours per year. The calculation of FTEs includes overtime hours. Therefore, if one employee works 60 hours per week, he or she would be recorded as 1.5 FTEs.

D. Cost Impacts

Consistent with one of the overarching objectives of PSEP to maximize the cost effectiveness of safety enhancement investments, SoCalGas effectively planned, designed, and completed construction activities for this project. Each pipeline project is unique in scope and inherently complex due to a variety of factors including terrain, environmental and permitting constraints, scope changes during detailed design, material cost fluctuations, regulatory changes, and more. These complexities can lead to variances between initial estimates and actual costs. Consistent with prudent management at the time, the Project Team successfully mitigated these variances whenever feasible through the implementation of effective project management practices, thorough planning, and continuous monitoring.

At the completion of the Line 1018 Valve Enhancement Project – Avery Parkway, Actual Direct Costs exceeded the preliminary estimate by $781,757. This variance is attributable to a variety of factors including: SoCalGas bundled this site with six additional sites to gain efficiencies in engineering, planning, and construction activities; the Project Team originally anticipated an increase in construction costs due to night work and working on a distribution line that has only one feed; the Engineering and Design firms completed activities originally identified as Project Management & Services in the initial estimate while the actual costs were recognized under Engineering and Design.

V. CONCLUSION

SoCalGas enhanced the safety of their integrated natural gas system by prudently executing the Line 1018 Valve Enhancement Project – Avery Parkway. Through this Valve Enhancement Project, SoCalGas successfully installed one check valve and bypass piping to achieve the objective of enabling rapid system isolation of a portion of Line 1018 and Supply Line 42-54 located in the City of Mission Viejo. The total loaded cost of the Project is $1,256,515.

SoCalGas executed this project prudently through designing and executing the project to support achievement of Valve Enhancement Plan isolation objectives, bundling seven projects together to capture efficiencies through coordinated engineering and construction planning, installing a bypass to make sure that this portion of Supply Line 42-54 is piggable, and by installing the equipment necessary to enable rapid system isolation to portions of Line 1018 and Supply Line 42-54 in the City of Mission Viejo.

SoCalGas engaged in prudent cost avoidance efforts to complete this safety enhancement at a reasonable cost by carefully planning and coordinating engineering and construction activities to maximize efficiencies and reduce customer and community impacts, engaging in reasonable efforts to promote competitive and market based rates for contractor services and materials, and using a reasonable amount of company and contractor resources to complete this safety enhancement as soon as practicable.

End of Line 1018 Valve Enhancement Project – Avery Parkway Final Report

I. LINE 1018 VALVE ENHANCEMENT PROJECT – BURT ROAD

A. Background and Summary

The Line 1018 Valve Enhancement Project – Burt Road consists of valve enhancements made to an existing mainline valve (MLV) and the installation of one check valve located within the City of Irvine in Orange County. Through this project, SoCalGas enhanced the safety of its integrated gas transmission system by enabling the rapid detection of a significant change in pipeline pressure and remote isolation and depressurization of a portion of Line 1018 and Supply Line 42-87 in the event of a pipeline rupture. SoCalGas installed a new actuator, new power equipment, new communications equipment, the necessary automation equipment at the site, and one new check valve. The total loaded project cost is $2,824,352.

The Line 1018 Valve Enhancement Project – Burt Road construction site is located in a commercial area on Burt Road next to Interstate 5. SoCalGas bundled this site with six additional sites, Line 1018 Valve Enhancement Projects – Alipaz Street, Avery Parkway, Camino Capistrano, Dana Point, El Toro Road, and Harvard and Alton to gain efficiencies in engineering, planning, and construction activities. This workpaper speaks to the Burt Road site.

Final Report for Line 1018 Valve Enhancement Project – Burt Road

Table 1: General Project Information

Line 1018 Valve Enhancement Project – Burt Road			
Location	City of Irvine		
Days on Site	57		
Construction Start	07/05/2017		
Construction Finish	05/07/2018		
Commissioning Date	04/03/2019		
Valve Upgrades			
Valve Number	1018-7.33-0		
Valve Type	Existing – Ball		
Actuator	New		
Actuator Above-/Below-Grade	Below-Grade		
ASV	Yes		
RCV	Yes		
Valve Number	N/A[1]		
Valve Type	New – Check		
Actuator	N/A		
Actuator Above-/Below-Grade	N/A		
ASV	N/A		
RCV	N/A		
Site Upgrades			
Vault	New		
Power	New – Utility		
Communication	New – Radio		
SCADA Panel	New		
Equipment Shelter	None		
Fencing/Wall	None		
Project Costs ($)	**Capital**	**O&M**	**Total**
Loaded Project Costs	2,824,352	-	2,824,352
Disallowed Costs	-	-	-

[1] Check valves are not numbered.

B. Maps and Images

Figure 1: Line 1018 Bundle Overview

Figure 2: Satellite Image of Line 1018 Valve Enhancement Project – Burt Road

II. ENGINEERING, DESIGN, AND PLANNING

A. Project Scope

SoCalGas presented a conceptual project scope for the Line 1018 Valve Enhancement Project – Burt Road in workpapers supporting the Valve Enhancement Plan in the 2011 PSEP filing.[2] This conceptual scope identified MLV 1018-7.33-0 for automation to enable remote isolation to a portion of Line 1018 and Supply Line 42-87. Prior to initiating execution of the Project, SoCalGas reviewed available information and performed a detailed system flow analysis to validate the scope of the Project and identified a check valve installation to provide the planned isolation. The final project scope is summarized in Table 2 below.

1. <u>2011 PSEP Filing:</u> SoCalGas identified MLV 1018-7.33-0 for automation to achieve the objective of rapid system isolation.
2. <u>Updated Scope:</u> Upon project initiation, SoCalGas reviewed the conceptual project scope and determined that the automation of this MLV alone would not achieve the transmission isolation objectives set forth in the Valve Enhancement Plan. SoCalGas determined it was also necessary to install a check valve to prevent backflow from Supply Line 42-87 to Line 1018. Together, the automation the valve identified in the filing and the installation of the check valve enabled rapid isolation, thereby achieving Valve Enhancement Plan objectives.
3. <u>Engineering, Design, and Constructability:</u>
    a. During the pre-design site walk discussed below, The Project Team determined the existing vaults were not large enough to house and service the new actuators; however, some of the existing instrument piping could be reused. The Project

[2] *See* Workpapers supporting Amended Pipeline Safety Enhancement Plan (PSEP) of SoCalGas and SDG&E, submitted on December 2, 2011, at WP-IX-2-14 through WP-IX-2-25 (A.11-11-002 Exh. SCG-32).

Team took measurements during the pre-design site walk to facilitate continued use of the existing instrument piping.

   b. Supply Line 42-87 services a CNG station utilized by local buses. The Project Team determined service to the CNG station could not be interrupted. The Project Team maintained service to the CNG station during the check valve installation by utilizing stopple fittings and a bypass.

4. Final Project Scope: The final project scope consists of the automation of one valve, which included the installation of a new actuator, the installation of a new vault to house the actuator, the installation of new power equipment, the installation of communications equipment, the installation of the necessary automation equipment at the site, and the installation of one new check valve.

Table 2: Final Project Scope

Final Project Scope					
Line	Mile	Valve #	Valve Size (*confidential*)	Installation Type	Function
1018	7.33	0	[redacted]	A/VT	ASV/RCV
42-87	0	N/A	[redacted]	NV	BFP2

B. Site Evaluation and Planning

SoCalGas initiated the planning process for the Line 1018 Valve Enhancement Project – Burt Road by performing a pre-design site walk to determine the existing conditions and assess any potential impact on the design. Key factors that influenced the engineering and design of this project are as follows:

1. Site Description: This site is in a high-density commercial area. The valve is next to Burt Road and is positioned on its side. The valve stem extends into a vault.
2. Land Issues: During the pre-design site walk, the Project Team noted that excavations will impact the street as well as the adjacent sidewalk.
3. DOT Class: This project site is in a Class 3 location.

4. Power Source: There was no preexisting power equipment at the site. The Project Team installed new power equipment.
5. Communication Technology: There was no preexisting communications equipment at the site. The Project Team installed new communications equipment.

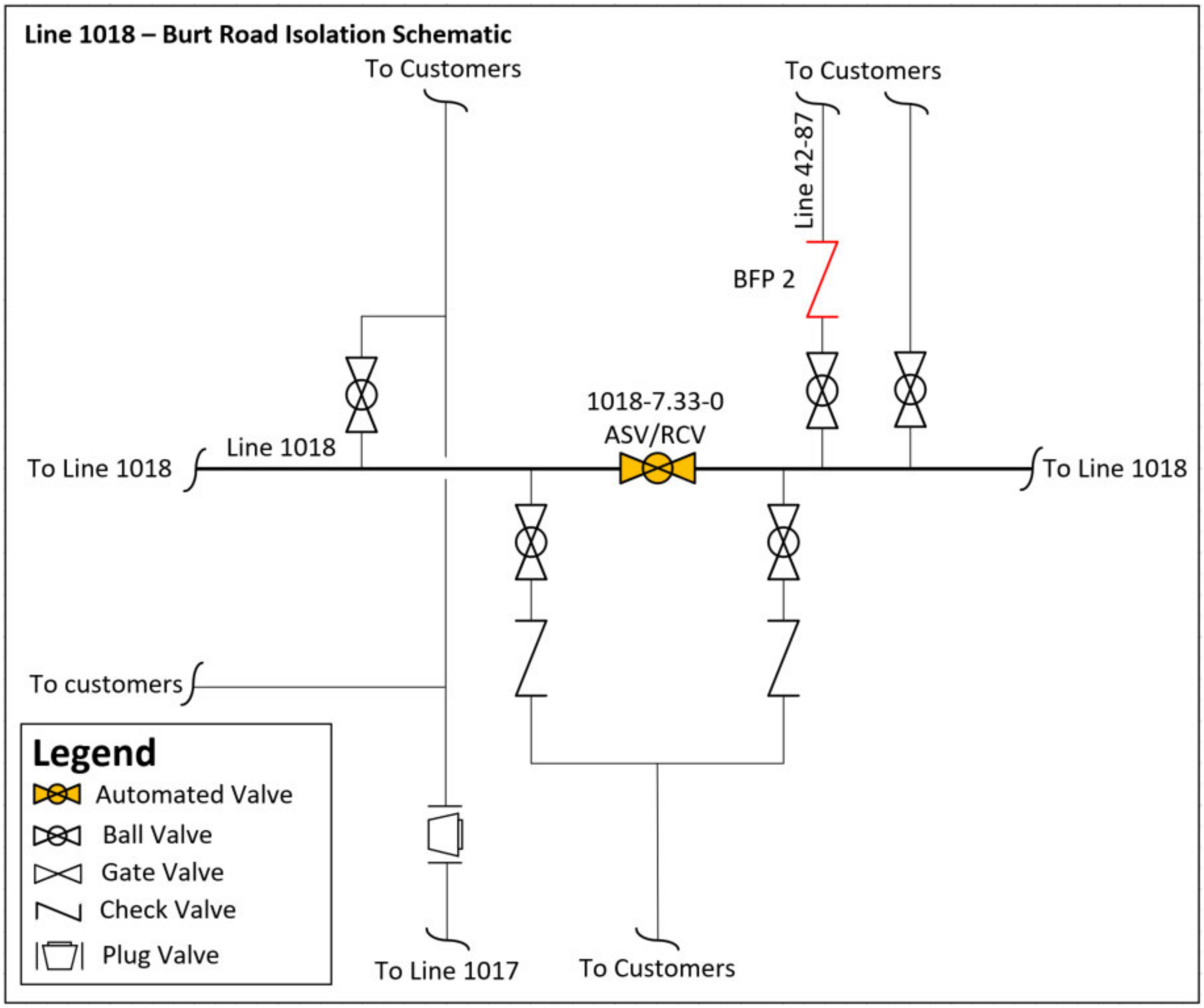
C. Engineering, Design, and Planning Factors

SoCalGas reviewed drawings and records, contacted internal planning groups, communicated with external stakeholders, conducted survey activity, performed potholing of the area to identify the presence of underground utilities and substructures, and completed a site walk. Key factors that influenced the engineering and design of the Project are as follows:

1. Engineering Assessment: During the site evaluation, the Project Team confirmed the preexisting technology and measurements of the preexisting vault. Based on the specifications of the new actuator to be installed, the Project Team determined that the preexisting vault did not provide sufficient space to house and operate the new actuator. The Project Team noted that this work required a shut-in of Supply Line 42-87 which services a CNG station. Service was maintained to the CNG station via a bypass and stopple fittings.
2. Valve Details:
   a. 1018-7.33-0: The existing valve is a Class 300 ball valve that the Project Team reused.
   b. There was no preexisting check valve.
3. Actuator Details: The preexisting actuator was incompatible with PSEP linebreak technology. The Project Team installed a new actuator.
4. Customer Impact: The Project Team did not identify any anticipated service disruptions to customers. The Project Team utilized stopples and a bypass to maintain service to customers during the installation of the new valves.

5. Community Impact: The Project Team restricted public access to the sidewalk and the shoulder of Burt Road during construction. The Project Team also closed one lane of Burt Road intermittently during construction.
6. Substructures: The Project Team analyzed the preexisting vault to design the new vault to utilize existing taps. Aside from the preexisting vault, the Project Team identified no substructures during this phase that would affect the design.
7. Environmental: The Project Team did not identify any notable environmental concerns at the site. An environmental monitor performed routine site visits during construction.
8. Permit Restrictions: The Project Team obtained an engineering permit from the City of Irvine.
9. Land Use: The Project Team originally utilized the parking lot of a nearby business center as a laydown yard.
10. Traffic Control: The Project Team restricted public access to the shoulder of Burt Road during construction. The Project Team also closed one lane of Burt Road intermittently during construction.

Figure 3: Line 1018 Valve Enhancement Project Schematic – Burt Road



D. Scope Changes

SoCalGas did not make any notable scope changes during detailed design.

III. CONSTRUCTION

A. Construction Contractor Selection

The Project Team prepared an initial cost estimate based on the preliminary design. Following completion of the engineering, design, and planning activities described above, the Project Team directed the Performance Partner (Mechanical Construction Contractor) and Alliance Partner (Electrical Contractor) to prepare cost estimates based on a more detailed engineering design package. As indicated above, there were no notable changes in scope between the time when the Project Team prepared the preliminary cost estimate and when the Performance Partner and Alliance Partner prepared and submitted their estimates.

1. <u>SoCalGas' Preliminary Mechanical Construction Contractor Estimate *(confidential)*:</u> SoCalGas' preliminary cost estimate for construction was [redacted].

2. <u>Mechanical Construction Contractor's Target Price Estimate *(confidential)*:</u> The Mechanical Construction Contractor's cost estimate was [redacted], which was [redacted] than SoCalGas' preliminary cost estimate for construction.

3. <u>SoCalGas' Preliminary Electrical Contractor Estimate *(confidential)*:</u> SoCalGas' preliminary cost estimate for construction was [redacted].

4. <u>Electrical Contractor's Estimate (*confidential*):</u> The Electrical Contractor's estimate was [redacted], which was [redacted] than SoCalGas' preliminary cost estimate.

B. Construction Schedule

Table 3: Construction Timeline

Construction Start Date	07/05/2017
Construction Completion Date	05/07/2018
Days on Site	57 days
Commissioning Date	04/03/2019

The Project Team completed all construction activities as soon as practicable prior to commissioning. SoCalGas' finalization of commissioning activities is dependent on electrical utility connections, and system and/or resource availability.

C. Changes During Construction

The conditions summarized below were encountered during construction. Activities to address or mitigate these conditions resulted in approximately $165,000 in change orders.

1. Field Design Change: During the design phase, The Project Team planned to obtain utility power from a source on the same side of the road as the project site. The Project Team had to locate an alternate power source on the other side of Burt Road during construction. The Mechanical Construction Contractor potholed for 12 structures and performed a horizontal directional bore and open trenching across Burt Road to install the new electrical conduit.

Figure 4: Project Site Post-Construction, New Vault in the Foreground, New Automation Equipment Cabinets in the Background

D. Commissioning and Site Restoration

Commissioning activities included site restoration, final inspections, and placement of the valves into service. During this stage, SoCalGas successfully performed site acceptance testing and conducted point-to-point verification with Gas Control personnel for the newly-automated valve, and transferred ownership of the new equipment to Field Operations. Closeout activities included development of final drawings, the reconciliation package, and updates to company recordkeeping systems to reflect the completed scope of work. The site was commissioned on April 3, 2019, as summarized in Table 3.

IV. PROJECT COSTS

A. Cost Avoidance Actions

SoCalGas exercised due diligence in the design, planning, and construction activities for this project to minimize or avoid costs when prudent to do so. As discussed above, the Project Team reviewed existing records, communicated with external stakeholders, and conducted a site walk to incorporate the known site conditions in the project plan and design. The Project Team bundled this project with six other projects, coordinating engineering activities between the project sites.

B. Cost Estimates

Based on the preliminary design, once the preliminary project scope was confirmed and engineering, design, and planning activities were underway, SoCalGas prepared an estimate of the Direct Costs of the Project in the amount of $2,290,385. The Project Team considered the conditions known at the time to prepare the preliminary Direct Cost estimate. This estimate reflects the projected Labor, Material, and Services costs anticipated to be incurred to execute the Project, based on initial design plans.

SoCalGas estimated Indirect Costs of the Project based on the estimated Direct Costs and other project-related variables.

C. Actual Direct and Indirect Costs

Actual Direct Costs reflect the Labor, Material, and Services costs incurred to execute the Project. Actual Indirect Costs reflect costs for incremental overhead loaders in accordance with Company overhead allocation policies. The total loaded cost of the Project is $2,824,352.

Table 4: Estimated and Actual Direct Costs and Variances[3]

Direct Costs ($)	Estimate	Actuals	Delta Over/(Under)
Company Labor	230,695	158,482	(72,213)
Materials	206,068	200,315	(5,753)
Mechanical Construction Contractor	955,925	1,027,480	71,555
Electrical Contractor	219,450	62,423	(157,027)
Construction Management & Support	78,549	149,381	70,832
Environmental	51,264	68,095	16,831
Engineering & Design	217,435	304,466	87,031
Project Management & Services	87,440	29,459	(57,981)
ROW & Permits	38,804	70,881	32,077
GMA	204,755	319,681	114,926
Total Direct Costs	**2,290,385**	**2,390,663**	**100,278**

Table 5: Estimated and Actual Indirect Costs, Total Costs, and Variances[4]

Indirect Costs/Total Costs ($)	Estimate	Actuals	Delta Over/(Under)
Overheads	280,214	292,390	12,176
AFUDC	151,250	124,016	(27,234)
Property Taxes	35,526	17,284	(18,242)
Total Indirect Costs	**466,990**	**433,689**	**(33,301)**
Total Direct Costs	**2,290,385**	**2,390,663**	**100,278**
Total Loaded Costs	**2,757,375**	**2,824,352**	**66,977**

The Actual Full-Time Equivalents[5] (FTEs) for this Project are 0.77.

[3] Values may not add to total due to rounding.

[4] Ibid.

[5] Full-time equivalents (FTEs) are included in GRC forecasts to provide context to requested amounts for company labor. FTEs are calculated by measuring the number of hours charged over a given time period. For example, one FTE is equal to 40 hours per week, or typically 2,080 hours per year. The calculation of FTEs includes overtime hours. Therefore, if one employee works 60 hours per week, he or she would be recorded as 1.5 FTEs.

D. Cost Impacts

Consistent with one of the overarching objectives of PSEP to maximize the cost effectiveness of safety enhancement investments, SoCalGas effectively planned, designed, and completed construction activities for this project. Each pipeline project is unique in scope and inherently complex due to a variety of factors including terrain, environmental and permitting constraints, scope changes during detailed design, material cost fluctuations, regulatory changes, and more. These complexities can lead to variances between initial estimates and actual costs. Consistent with prudent management at the time, the Project Team successfully mitigated these variances whenever feasible through the implementation of effective project management practices, thorough planning, and continuous monitoring.

At the completion of the Line 1018 Valve Enhancement Project - Burt Road, Actual Direct Costs came within the AACE Class 3 Total Installed Cost (TIC) accuracy range, adhering to the standard industry practices defined by the Association for the Advancement of Cost Engineering (AACE) International. The Actual Direct Costs exceeded the preliminary estimate by $100,278. This variance can be attributed to several factors including: additional potholing and excavation was required to utilize a different power source during construction; company labor was not utilized for construction inspection or valve automation as originally planned, increasing costs for contractor support.

V. CONCLUSION

SoCalGas enhanced the safety of its integrated natural gas system by prudently executing the Line 1018 Valve Enhancement Project – Burt Road. Through this Valve Enhancement Project, SoCalGas successfully automated one mainline valve and installed one check valve to achieve the objective of enabling rapid system isolation of a portion of Line 1018 and Supply Line 42-87 located in the City of Irvine. The total loaded cost of the Project is $2,824,352.

SoCalGas executed this project prudently through designing and executing the project to support achievement of Valve Enhancement Plan isolation objectives, bundling seven projects together to capture efficiencies through coordinated engineering and construction planning, and by installing the equipment necessary to enable rapid system isolation to portions of Line 1018 and Supply Line 42-87 in the City of Irvine.

SoCalGas engaged in prudent cost avoidance efforts to complete this safety enhancement at a reasonable cost by carefully planning and coordinating engineering and construction activities to maximize efficiencies and reduce customer and community impacts, engaging in reasonable efforts to promote competitive and market based rates for contractor services and materials, and using a reasonable amount of company and contractor resources to complete this safety enhancement as soon as practicable.

End of Line 1018 Valve Enhancement Project – Burt Road Final Report

I. LINE 1018 VALVE ENHANCEMENT PROJECT – CAMINO CAPISTRANO

A. Background and Summary

The Line 1018 Valve Enhancement Project – Camino Capistrano consists of valve enhancements made to one new mainline valve (MLV) located in the city of Mission Viejo in Orange County. Through this project, SoCalGas enhanced the safety of its natural gas transmission system by enabling the rapid detection of a significant change in pipeline pressure and remote isolation and depressurization of a portion of Line 1018 in the event of a pipeline rupture. SoCalGas installed a new valve, new actuator, a new vault to house the actuator, new power equipment, new communications equipment, and the necessary automation equipment at the site. The total loaded project cost is $4,373,913.

The Line 1018 Valve Enhancement Project – Camino Capistrano construction site is in a commercial area next to a flood control zone along Camino Capistrano in Mission Viejo. SoCalGas bundled this valve project with six additional valve projects, Line 1018 Valve Enhancement Projects – Alipaz Street, Avery Parkway, Burt Road, Dana Point, El Toro Road, and Harvard and Alton, to gain efficiencies in engineering, planning, and construction activities. This workpaper speaks to the Line 1018 Valve Enhancement Project – Camino Capistrano site.

Final Report for Line 1018 Valve Enhancement Project – Camino Capistrano

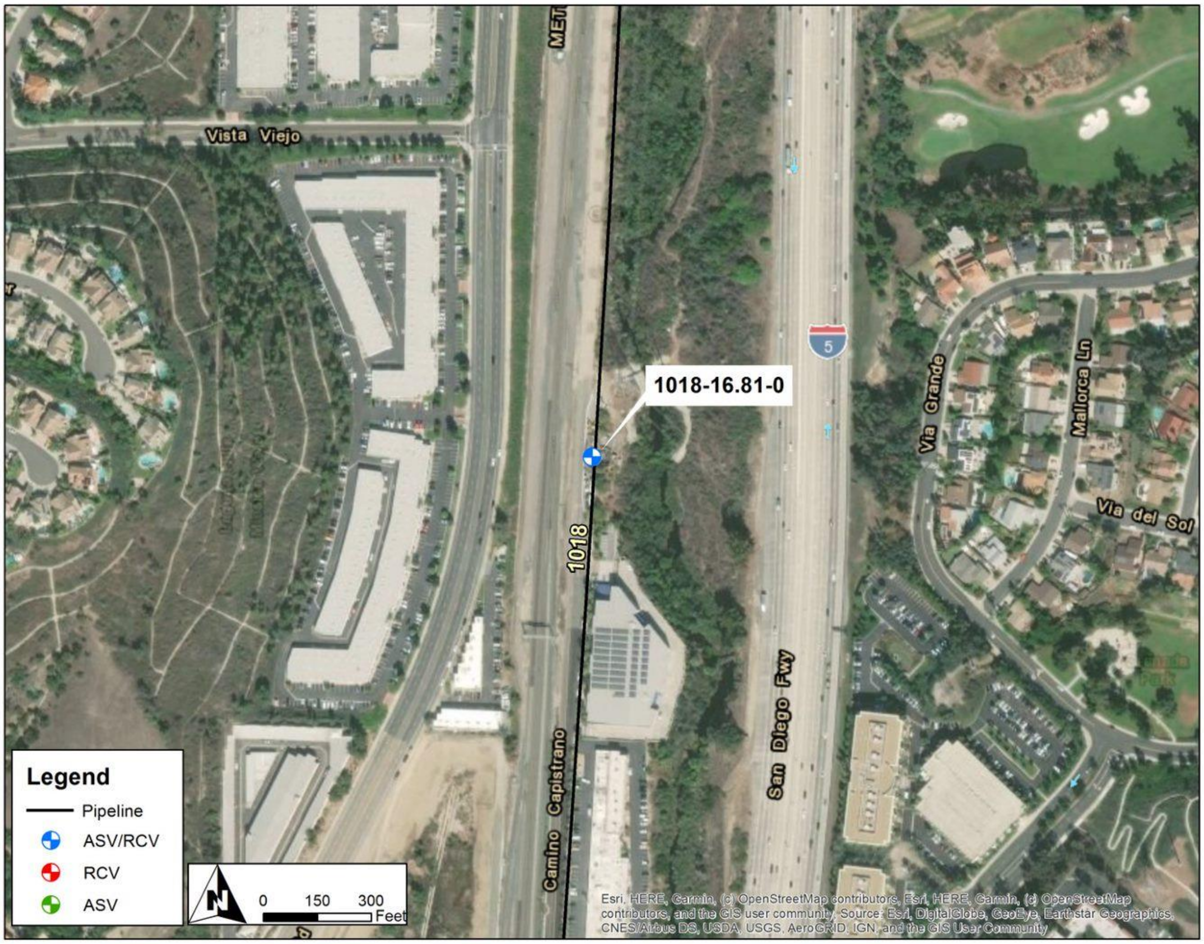
Table 1: General Project Information

Line 1018 Valve Enhancement Project – Camino Capistrano			
Location	Mission Viejo		
Days on Site	57 days		
Construction Start	08/06/2018		
Construction Finish	11/27/2018		
Commissioning Date	06/18/2019		
Valve Upgrades			
Valve Number	1018-16.81-0		
Valve Type	New – Ball		
Actuator	New		
Actuator Above-/Below-Grade	Below-Grade		
ASV	Yes		
RCV	Yes		
Camino Capistrano Site Upgrades			
Vault	New		
Power	New – Utility		
Communication	New – Radio		
SCADA Panel	New		
Equipment Shelter	None		
Fencing/Wall	None		
Project Costs ($)	**Capital**	**O&M**	**Total**
Loaded Project Costs	4,373,913	-	4,373,913
Disallowed Costs	-	-	-

B. Maps and Images

Figure 1: Line 1018 Bundle Overview

Figure 2: Satellite Image of Line 1018 Valve Enhancement Project – Camino Capistrano



II. ENGINEERING, DESIGN, AND PLANNING

A. Project Scope

SoCalGas and SDG&E presented a conceptual project scope for the Line 1018 Valve Enhancement Project – Camino Capistrano in workpapers supporting the Valve Enhancement Plan in the 2011 PSEP filing.[1] This conceptual scope identified MLV 1018-17.55-0 for automation to enable remote isolation to a portion of Line 1018. Prior to initiating execution of the Project, SoCalGas reviewed available information and performed a detailed system flow analysis to validate the scope of the Project, and confirmed that this valve enhancement will provide the planned isolation. The final project scope is summarized in Table 2 below.

1. 2011 PSEP Filing: SoCalGas identified MLV 1018-17.55-0 for automation to achieve the objective of rapid system isolation.
2. Updated Scope: Upon project initiation, SoCalGas reviewed the conceptual project scope and determined that this isolation point would enable rapid isolation, thereby achieving Valve Enhancement Plan objectives.
3. Engineering, Design, and Constructability: The Project Team initially identified MLV 1018-17.55-0 for automation. During the site evaluation, the Project Team determined that the existing actuator was incompatible with PSEP linebreak technology and would need to be replaced. Based on the specifications of the new actuator, the Project Team determined that the existing vault did not provide sufficient space to house and operate the new actuator. The new vault would necessitate a redesign of the existing bridle resulting in a shut-in of Line 1018 and Supply line 35-6405. A shut-in at this location would require the use of compressed natural gas (CNG) to prevent any service disruptions to customers. The Project Team determined that the installation

[1] *See* Workpapers supporting Amended Pipeline Safety Enhancement Plan (PSEP) of SoCalGas and SDG&E, submitted on December 2, 2011, at WP-IX-2-14 through WP-IX-2-25 (A.11-11-002 Exh. SCG-32).

of a new valve north of the previously identified valve would also enable rapid isolation at a lower cost. The Project Team revised the scope to the installation and automation of a new MLV at the new location.

4. Final Project Scope: The final project scope consists of the automation of one new MLV that included the installation of a new actuator, a new vault to house the actuator, new power equipment, new communications equipment, and the installation of the necessary automation equipment at the site.

Table 2: Final Project Scope

Final Project Scope					
Line	Mile	Valve #	Valve Size (*confidential*)	Installation Type	Function
1018	16.81	0	[redacted]	NV/VT	ASV/RCV

B. Site Evaluation and Planning

SoCalGas initiated the planning process for the Line 1018 Valve Enhancement Project – Camino Capistrano Valve Enhancement Project by performing a pre-design site walk to determine the existing conditions and assess any potential impact on the design. Key factors that influenced the engineering and design of this project are as follows:

1. Site Description: This site is in a commercial area, next to a flood control zone along Camino Capistrano. There are railroad tracks on the opposite side of the street.
2. Land Issues: During the pre-design of this project, the Project Team noted that excavations will impact the street as well as the adjacent sidewalk.
3. DOT Class: This project site is in a class 3 location.
4. Power Source: There was no preexisting power source. The Project Team installed new power equipment at the site.
5. Communication Technology: There was no preexisting communications equipment. The Project Team installed new communications equipment.

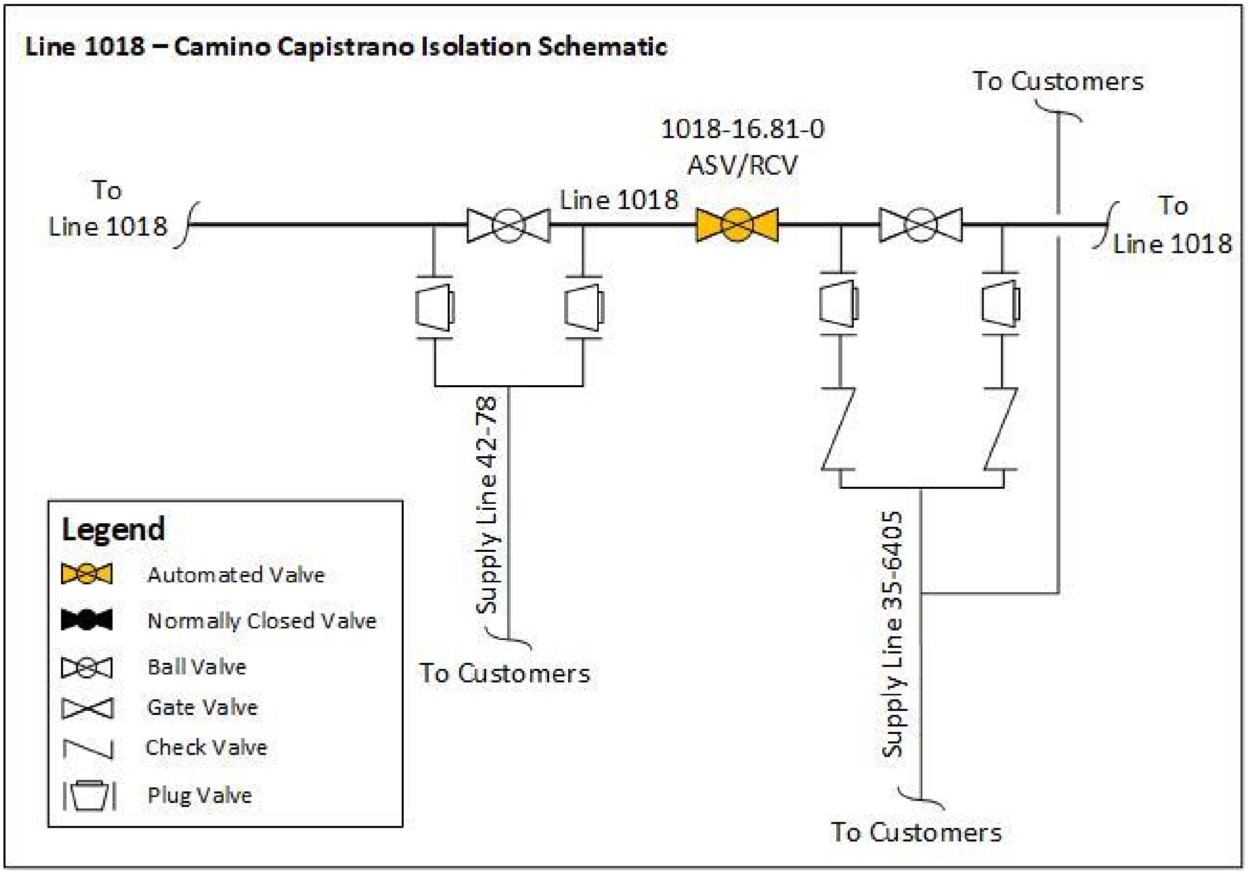
C. Engineering, Design, and Planning Factors

SoCalGas reviewed drawings and records, contacted internal planning groups, communicated with external stakeholders, conducted survey activity, performed potholing of the area to identify the presence of underground utilities and substructures, and completed a site walk. Key factors that influenced the engineering and design of the Project are as follows:

1. Engineering Assessment: During the site evaluation, the Project Team determined that the existing actuator was incompatible with PSEP linebreak technology and would need to be replaced. Based on the specifications of the new actuator, the Project Team determined that the existing vault did not provide sufficient space to house and operate the new actuator. The new vault would necessitate a redesign of the existing bridle, resulting in a shut-in of Line 1018 and Supply line 35-6405. A shut-in at this location would require the use of CNG to prevent any service disruptions to customers. The Project Team determined that the installation of a new valve north of the previously identified valve would also enable rapid isolation at a lower cost. The Project Team revised the scope to the installation and automation of a new MLV at the new location.
2. Valve Details: There was no existing valve. The Project Team installed a new Class 600 ball valve.
3. Actuator Details: There was no existing actuator. The Project Team installed a new actuator.
4. Customer Impact: The installation of the new MLV required a shut-in of Line 1018. The Santa Margarita Water District is serviced by this section of Line 1018. The Project Team utilized CNG to avoid any service disruption to the customer.
5. Community Impact: The Project Team restricted public access to the sidewalk during construction.

6. Substructures: The Project Team did not identify any existing substructures that affected the design and engineering at this site.
7. Environmental: The Project Team did not identify any notable environmental concerns at the site. An environmental monitor performed routine site visits during construction.
8. Permit Restrictions: The Project Team obtained permits from the City of Laguna Niguel and the City of Mission Viejo.
9. Land Use: The Project Team acquired an easement from the US Storage Center adjacent to the site. The Project Team utilized the same laydown yard as Line 1018 Harvard and Alton project in Costa Mesa for one month. After the completion of the first month of construction, The Project Team utilized the area around the construction site as a laydown yard.
10. Traffic Control: The Project Team closed one lane of Camino Capistrano during construction.

Figure 3: Line 1018 Valve Enhancement Project – Camino Capistrano Schematic



D. Scope Changes

SoCalGas did not make any notable scope changes during detailed design.

III. CONSTRUCTION

A. Construction Contractor Selection

The Project Team prepared an initial cost estimate based on the preliminary design. Following completion of the engineering, design, and planning activities described above, the Project Team directed the Performance Partner (Mechanical Construction Contractor) and Alliance Partner (Electrical Contractor) to prepare cost estimates based on a more detailed engineering design package. As indicated above, there were no notable changes in scope between the time when the Project Team prepared the preliminary cost estimate and when the Performance Partner and Alliance Partner prepared and submitted their estimates.

1. SoCalGas' Preliminary Mechanical Construction Contractor Estimate *(confidential)*: SoCalGas' preliminary cost estimate for construction was [redacted]
2. Mechanical Construction Contractor's Target Price Estimate (TPE) *(confidential)*: The Mechanical Construction Contractor's cost estimate was [redacted], which was [redacted] than SoCalGas' preliminary cost estimate for construction.
3. SoCalGas' Preliminary Electrical Contractor Estimate *(confidential)*: SoCalGas' preliminary cost estimate for construction was [redacted].
4. Electrical Contractor's Estimate (*confidential*): The Electrical Contractor's estimate was [redacted], which was [redacted] than SoCalGas' preliminary cost estimate.

B. Construction Schedule

Table 3: Construction Timeline

Construction Start Date	08/06/2018
Construction Completion Date	11/27/2018
Days on Site	57 days
Commissioning Date	06/18/2019

The Project Team completed all construction activities as soon as practicable prior to commissioning. Finalization of commissioning activities is dependent on electrical utility connections, and system and/or resource availability.

C. Changes During Construction

The conditions summarized below were encountered during construction. Activities to address or mitigate these conditions resulted in approximately $324,000 in change orders.

1. Restoration: The City of Mission Viejo requested SoCalGas extend the repaving limits of the street and the sidewalk. This request was made after the finalization of the TPE.
2. Materials: Materials arrived on site without the proper coating. The Project Team requested that the Mechanical Construction Contractor apply the proper coating to the material.
3. Substructures: During excavation, the Project Team encountered a 12-inch abandoned sewer line and communications fiber that had not previously been identified. The Mechanical Construction Contractor cut and capped the sewer line and extended the excavation to provide adequate clearance from the communications fiber.
4. Tie-In:
   a. Tie-in activities were extended due to weather.

   b. The Project Team requested that the Mechanical Construction Contractor provide additional support during the tie-in.

5. <u>Design Change:</u>
   a. SoCalGas received the design from the local electric utility after the finalization of the TPE. The Mechanical Construction Contractor had to extend the limits of the excavation to accommodate the final design. The local electric utility approved electrical run design plans that were different from what was anticipated in the TPE.
   b. The Project Team added additional pipe supports to the design after the finalization of the TPE.
6. <u>Equipment:</u>
   a. The Mechanical Construction Contractor encountered unanticipated groundwater during excavations and utilized additional excavation equipment to install the support beams and prevent the excavation from collapsing.
   b. The Project Team requested that the Mechanical Construction Contractor provide an office trailer and generator at the laydown yard. This was not included in the TPE.
   c. The installation of the new vault and the vault lid took two days. The initial schedule allocated one day for installation.

Figure 4: New Valve Assembly and Concrete Supports

D. Commissioning and Site Restoration

Commissioning activities included site restoration, final inspections, and placement of the valve into service. During this stage, SoCalGas successfully performed site acceptance testing and conducted point-to-point verification with SoCalGas Gas Control personnel for the newly-automated valve, and transferred ownership of the new equipment to Field Operations. Closeout activities included development of final drawings, the reconciliation package, and updates to company recordkeeping systems to reflect the completed scope of work. The site was commissioned on June 18, 2019, as summarized in Table 3.

IV. PROJECT COSTS

A. Cost Avoidance Actions

SoCalGas exercised due diligence in the design, planning, and construction activities for this project to minimize or avoid costs when prudent to do so. As discussed above, the Project Team reviewed existing records, communicated with external stakeholders, and conducted a site walk to incorporate the site conditions in the project plan and design. Specific examples of cost avoidance actions taken on this project were:

1. Bundling of Projects: SoCalGas bundled this valve project with six additional valve projects, Line 1018 Valve Enhancement Projects – Alipaz Street, Avery Parkway, Burt Road, Dana Point, El Toro Road, and Harvard and Alton, to gain efficiencies in engineering, planning, and construction activities.
2. Land Use: The Project Team shared laydown yard with Valve Line 1018 Harvard and Alton project.

B. Cost Estimates

Based on the preliminary design, once the preliminary project scope was confirmed and engineering, design, and planning activities were underway, SoCalGas prepared an estimate of the Direct Costs of the Project in the amount of $3,514,723. The Project Team considered the conditions known at the time to prepare the preliminary Direct Cost estimate. This estimate reflects the projected Labor, Material, and Services costs anticipated to be incurred to execute the Project, based on initial design plans.

SoCalGas estimated Indirect Costs of the Project based on the estimated Direct Costs and other project-related variables.

C. Actual Direct and Indirect Costs

Actual Direct Costs reflect the Labor, Material, and Services costs incurred to execute the Project. Actual Indirect Costs reflect costs for incremental overhead loaders in accordance with Company overhead allocation policies. The total loaded cost of the Project is $4,373,913.

Table 4: Estimated and Actual Direct Costs and Variances[2]

Direct Costs ($)	Estimate	Actuals	Delta Over/(Under)
Company Labor	368,028	235,345	(132,683)
Materials	281,253	486,417	205,164
Mechanical Construction Contractor	1,527,585	1,853,474	325,889
Electrical Contractor	113,953	76,144	(37,809)
Construction Management & Support	279,347	178,759	(100,588)
Environmental	44,159	74,060	29,901
Engineering & Design	222,820	441,775	218,955
Project Management & Services	236,938	41,376	(195,562)
ROW & Permits	43,556	96,983	53,427
GMA	397,084	326,147	(70,937)
Total Direct Costs	**3,514,723**	**3,810,482**	**295,759**

Table 5: Estimated and Actual Indirect Costs, Total Costs, and Variances[3]

Indirect Costs/Total Costs ($)	Estimate	Actuals	Delta Over/(Under)
Overheads	565,910	438,976	(126,934)
AFUDC	259,567	107,113	(152,454)
Property Taxes	61,434	17,342	(44,092)
Total Indirect Costs	**886,911**	**563,431**	**(323,480)**
Total Direct Costs	**3,514,723**	**3,810,482**	**295,759**
Total Loaded Costs	**4,401,634**	**4,373,913**	**(27,721)**

[2] Values may not add to total due to rounding.
[3] Values may not add to total due to rounding.

The Actual Full-Time Equivalent[4] (FTE) for this Project is 0.93.

D. Cost Impacts

Consistent with one of the overarching objectives of PSEP to maximize the cost effectiveness of safety enhancement investments, SoCalGas effectively planned, designed, and completed construction activities for this project. Each pipeline project is unique in scope and inherently complex due to a variety of factors including terrain, environmental and permitting constraints, scope changes during detailed design, material cost fluctuations, regulatory changes, and more. These complexities can lead to variances between initial estimates and actual costs. Consistent with prudent management at the time, the Project Team successfully mitigated these variances whenever feasible through the implementation of effective project management practices, thorough planning, and continuous monitoring.

At the completion of the Line 1018 Valve Enhancement Project – Camino Capistrano Project, Actual Direct Costs came within the AACE Class 3 Total Installed Cost (TIC) accuracy range, adhering to the standard industry practices defined by the Association for the Advancement of Cost Engineering (AACE) International. The Actual Direct Costs exceeded the preliminary estimate by $295,759. This variance can be attributed to several factors including: during excavation, the Project Team encountered an unmarked 12-inch abandoned sewer line and communications fiber, which the Mechanical Construction Contractor cut and capped, extending the excavation to ensure adequate clearance from the communications fiber; the Mechanical Construction Contractor encountered unexpected groundwater during excavations and employed additional shoring equipment to install support beams, preventing the excavation from collapsing;

[4] Full-time equivalents (FTEs) are included in GRC forecasts to provide context to requested amounts for company labor. FTEs are calculated by measuring the number of hours charged over a given time period. For example, one FTE is equal to 40 hours per week, or typically 2,080 hours per year. The calculation of FTEs includes overtime hours. Therefore, if one employee works 60 hours per week, he or she would be recorded as 1.5 FTEs.

and the Engineering and Design firms completed activities originally identified as Project Management & Services in the initial estimate while the actual costs were recognized under Engineering and Design.

V. CONCLUSION

SoCalGas enhanced the safety of their integrated natural gas system by prudently executing the Line 1018 Valve Enhancement Project – Camino Capistrano Project. Through this Valve Enhancement Project, SoCalGas successfully installed and automated one MLV to achieve the objective of enabling rapid system isolation to a portion of Line 1018 in the City of Mission Viejo. The total loaded cost of the Project is $4,373,913.

SoCalGas executed this project prudently through designing and executing the project to support achievement of Valve Enhancement Plan isolation objectives, bundling seven projects together to capture efficiencies through coordinated engineering, coordinating the shut-in with the local water district, minimizing the need for CNG, and by installing the equipment necessary to enable rapid system isolation to portions of Line 1018 in the City of Mission Viejo.

SoCalGas engaged in prudent cost avoidance efforts to complete this safety enhancement at a reasonable cost by carefully planning and coordinating engineering and construction activities to maximize efficiencies and reduce customer and community impacts, engaging in reasonable efforts to promote competitive and market based rates for contractor services and materials, and using a reasonable amount of company and contractor resources to complete this safety enhancement as soon as practicable.

End of Line 1018 Valve Enhancement Project – Camino Capistrano Final Report

I. LINE 1018 VALVE ENHANCEMENT PROJECT – EL TORO ROAD

A. Background and Summary

The Line 1018 Valve Enhancement Project – El Toro Road consists of valve enhancements made to an existing mainline valve (MLV) located in City of Lake Forest in Orange County. Through this project, SoCalGas enhanced the safety of its natural gas transmission system by enabling the rapid detection of a significant change in pipeline pressure and remote isolation and depressurization of a portion of Line 1018 in the event of a pipeline rupture. SoCalGas created a new facility, installed a new actuator, new fencing, new power equipment, new communications equipment, and the necessary automation equipment at the site. The total loaded project cost is $2,410,516.

The Line 1018 Valve Enhancement Project – El Toro Road construction site is in a new SoCalGas facility adjacent to railroad tracks within a residential area in the City of Lake Forest. SoCalGas bundled this valve project with six additional valve projects, Line 1018 Valve Enhancement Projects – Alipaz Street, Avery Parkway, Burt Road, Camino Capistrano, Dana Point, and Harvard and Alton, to gain efficiencies in engineering, planning, and construction activities. This workpaper speaks to the Line 1018 Valve Enhancement Project – El Toro Road site.

Final Report for Line 1018 Valve Enhancement Project – El Toro Road

Table 1: General Project Information

Line 1018 Valve Enhancement Project – El Toro Road			
Location	City of Lake Forest		
Days on Site	48 days		
Construction Start	12/03/2018		
Construction Finish	03/28/2019		
Commissioning Date	10/10/2019		
Valve Upgrades			
Valve Number	1018-12.27-0		
Valve Type	Existing – Ball Valve		
Actuator	New		
Actuator Above-/Below-Grade	Above-Grade		
ASV	Yes		
RCV	Yes		
El Toro Road Site Upgrades			
Vault	None		
Power	New – Utility		
Communication	New – Radio		
SCADA Panel	New		
Equipment Shelter	None		
Fencing	New		
Project Costs ($)	**Capital**	**O&M**	**Total**
Loaded Project Costs	2,410,516	-	2,410,516
Disallowed Costs	-	-	-

B. Maps and Images

Figure 1: Line 1018 Bundle Overview

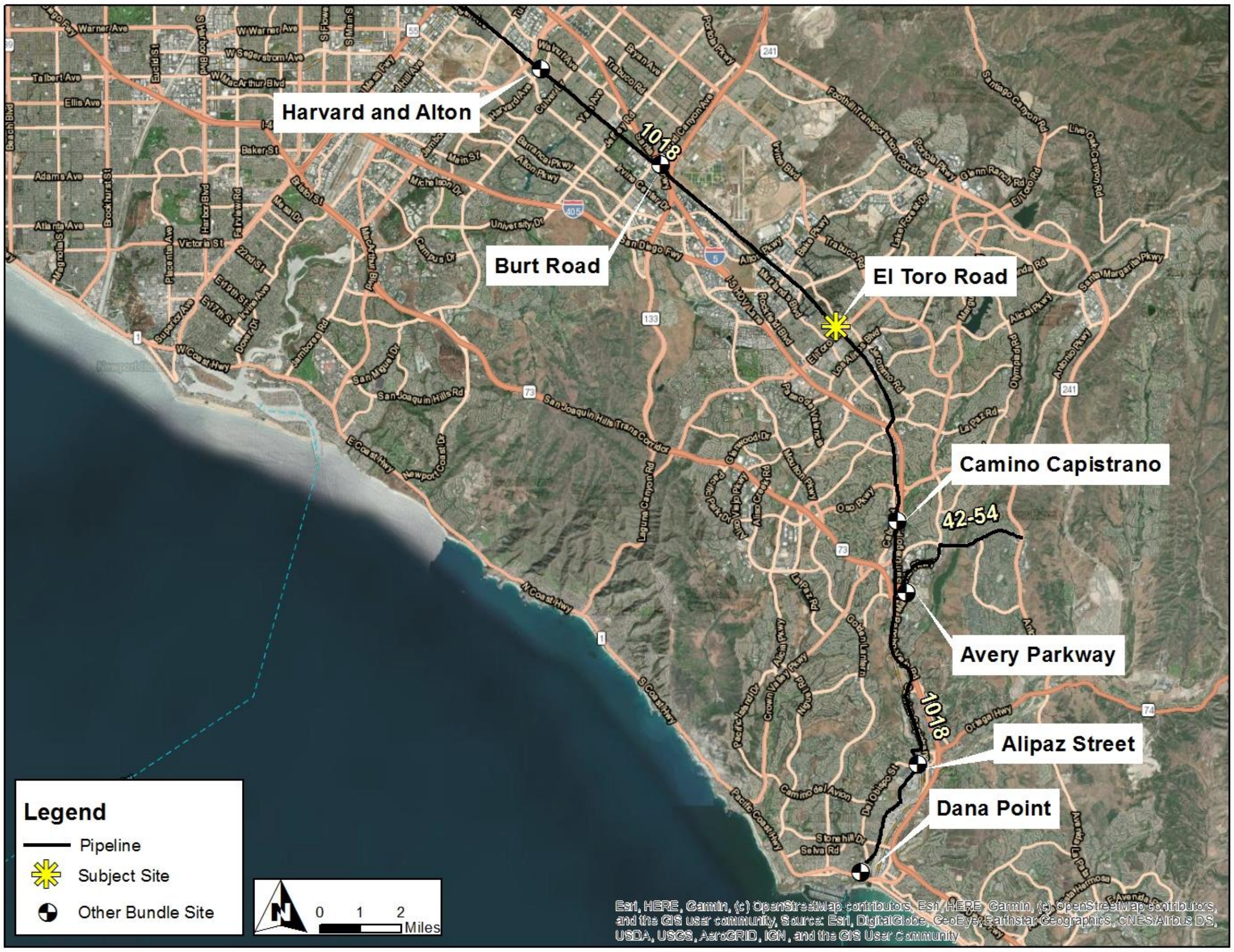
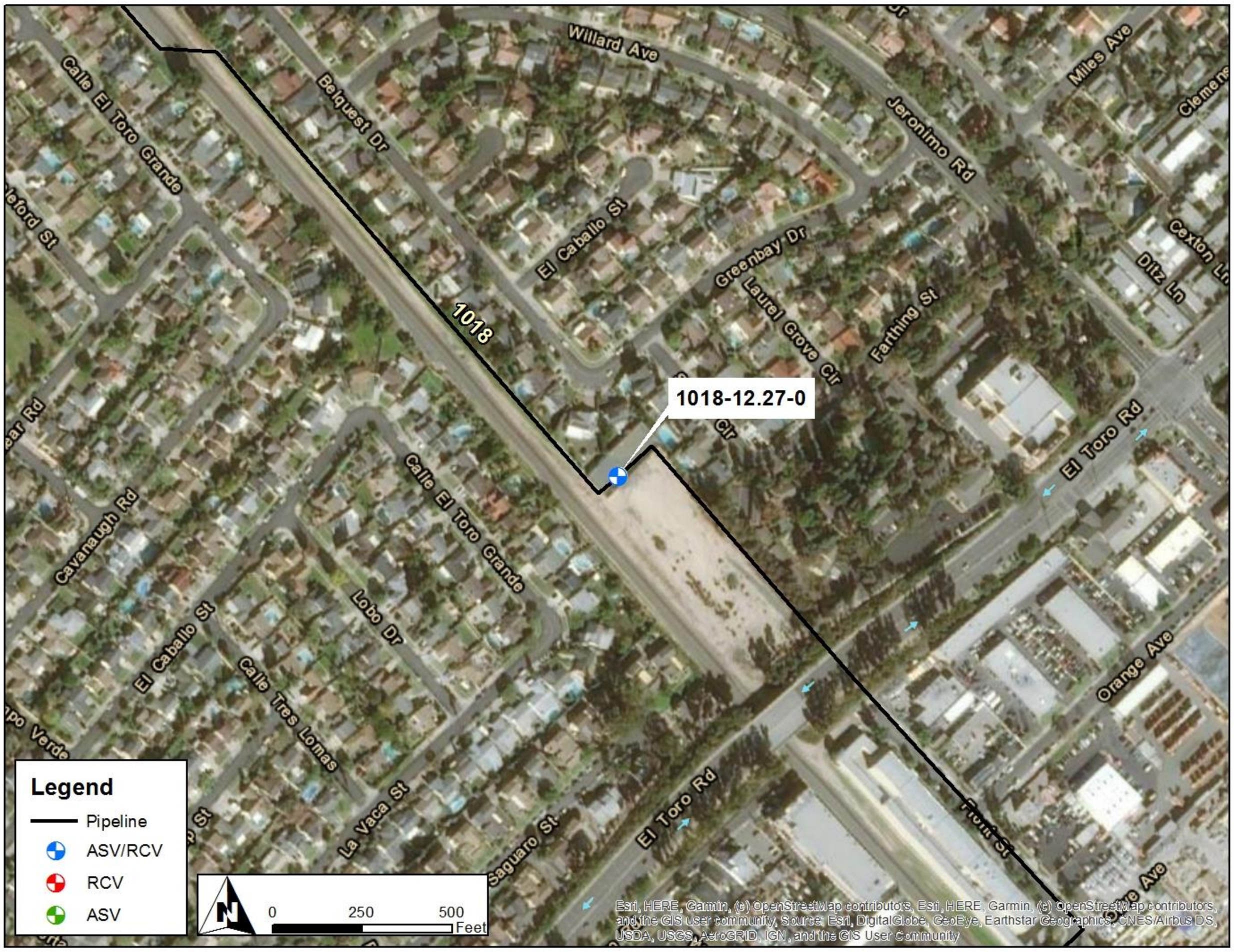


Figure 2: Satellite Image of Line 1018 Valve Enhancement Project – El Toro Road



II. ENGINEERING, DESIGN, AND PLANNING

A. Project Scope

SoCalGas and SDG&E presented a conceptual project scope for the Line 1018 Valve Enhancement Project – El Toro Road in workpapers supporting the Valve Enhancement Plan in the 2011 PSEP filing.[1] This conceptual scope identified MLV 1018-12.27-0, for automation to enable remote isolation to a portion of Lines 1018. Prior to initiating execution of the Project, SoCalGas reviewed available information and performed a detailed system flow analysis to validate the scope of the Project. The final project scope is summarized in Table 2 below.

1. 2011 PSEP Filing: SoCalGas and SDG&E identified MLV 1018-12.27-0 for automation to achieve the objective of rapid system isolation.
2. Updated Scope: Upon project initiation, SoCalGas reviewed the conceptual project scope and determined that this isolation point would enable rapid isolation, thereby achieving Valve Enhancement Plan objectives.
3. Engineering, Design, and Constructability: The Project Team purchased the land surrounding the existing site in order to change the scope from actuator in a vault to actuator above ground.
4. Final Project Scope: The final project scope consists of the automation of one MLV, the installation of new fencing, the installation of a new actuator, the installation of power equipment, the installation of communications equipment, and the installation of the necessary automation equipment at the site.

[1] *See* Workpapers supporting Amended Pipeline Safety Enhancement Plan (PSEP) of SoCalGas and SDG&E, submitted on December 2, 2011, at WP-IX-2-14 through WP-IX-2-25 (A.11-11-002 Exh. SCG-32).

Table 2: Final Project Scope

Final Project Scope					
Line	Mile	Valve #	Valve Size (*confidential*)	Installation Type	Function
1018	12.27	0	[redacted]	A/AG	ASV/ RCV

B. Site Evaluation and Planning

SoCalGas initiated the planning process for the Line 1018 Valve Enhancement Project – El Toro Road by performing a pre-design site walk to determine the existing conditions and assess any potential impact on the design. Key factors that influenced the engineering and design of this project are as follows:

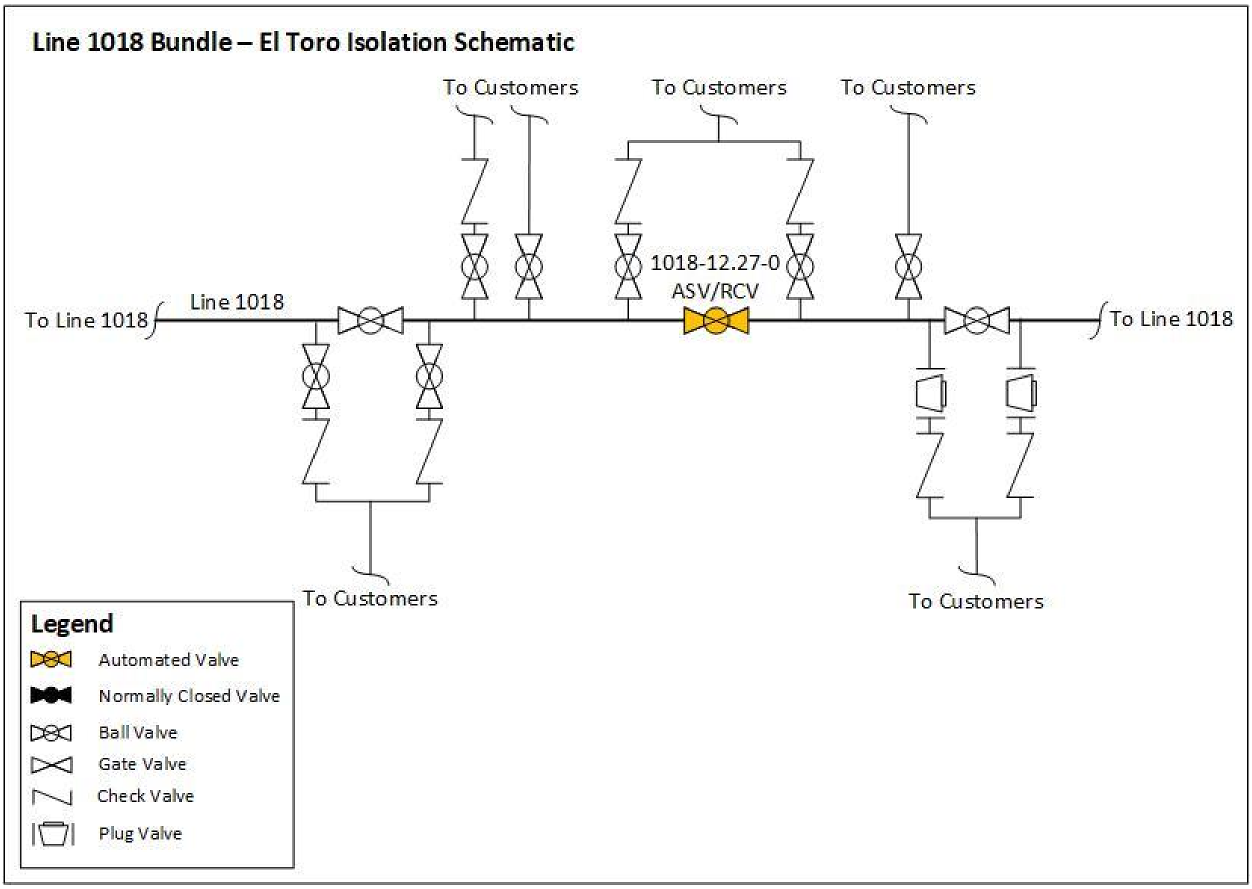
1. Site Description: The site is in a residential area that is adjacent to railroad tracks.
2. Land Issues: During the pre-design site walk, the Project Team determined that the new equipment should be enclosed in a fence to increase security and to improve public safety. The Project Team purchased new land to create a new facility.
3. DOT Class: This project site is in a Class 3 location.
4. Power Source: There was no preexisting power equipment at the site. The Project Team installed new power equipment.
5. Communication Technology: There was no preexisting communications equipment. The Project Team installed new communications equipment at the site.

C. Engineering, Design, and Planning Factors

SoCalGas reviewed drawings and records, contacted internal planning groups, communicated with external stakeholders, conducted survey activity, and completed a site walk. Key factors that influenced the engineering and design of the Project are as follows:

1. Engineering Assessment: During the site evaluation, the Project Team confirmed that the preexisting technology and verified that the existing easement can accommodate the new equipment. The Project Team determined that the preexisting vault and the new equipment should be installed above grade and enclosed in a fence to increase security and improve public safety.
2. Valve Details: The existing valve is a Class 300 ball valve that the Project Team reused.
3. Actuator Details: The preexisting actuator was incompatible with PSEP linebreak technology. The Project Team installed a new actuator.
4. Customer Impact: The Project Team did not identify any anticipated service disruptions to customers.
5. Community Impact: The Project Team did not anticipate any notable impact to the community from this project.
6. Substructures: The Project Team determined that the preexisting vault should be removed.
7. Environmental: The Project Team did not identify any notable environmental concerns at the site. An environmental monitor performed routine site visits during construction.
8. Permit Restrictions: The Project Team obtained a building and Safety Permit from the City of Lake Forrest for the installation of the new meter for the utility power.
9. Land Use: SoCalGas purchased new land to create the new facility. The Project Team utilized a neighboring church for access to the project site during construction.
10. Traffic Control: The Project Team did not identify any traffic control needs at the site.

Figure 3: Line 1018 Valve Enhancement Project – El Toro Road Schematic



D. Scope Changes

SoCalGas did not make any notable scope changes during detailed design.

III. CONSTRUCTION

A. Construction Contractor Selection

The Project Team prepared an initial cost estimate based on the preliminary design. Following completion of the engineering, design, and planning activities described above, the Project Team directed the Performance Partner (Mechanical Construction Contractor) and Alliance Partner (Electrical Contractor) to prepare cost estimates based on a more detailed engineering design package. As indicated above, there were no notable changes in scope between the time when the Project Team prepared the preliminary cost estimate and when the Performance Partner and Alliance Partner prepared and submitted their estimates.

1. <u>SoCalGas' Preliminary Mechanical Construction Contractor Estimate *(confidential)*:</u> SoCalGas' preliminary cost estimate for construction was [redacted].

2. <u>Mechanical Construction Contractor's Target Price Estimate *(confidential)*:</u> The Mechanical Construction Contractor's cost estimate was [redacted], which was [redacted] than SoCalGas' preliminary cost estimate for construction.

3. <u>SoCalGas' Preliminary Electrical Contractor Estimate *(confidential)*:</u> SoCalGas' preliminary cost estimate for construction was [redacted].

4. <u>Electrical Contractor's Estimate (*confidential*):</u> The Electrical Contractor's estimate was [redacted], which was [redacted] to SoCalGas' preliminary cost estimate.

B. Construction Schedule

Table 3: Construction Timeline

Construction Start Date	12/03/2018
Construction Completion Date	03/28/2019
Days on Site	48 days
Commissioning Date	10/10/2019

The Project Team completed all construction activities as soon as practicable prior to commissioning. Finalization of commissioning activities is dependent on electrical utility and communications connections, and system and/or resource availability.

C. Changes During Construction

The conditions summarized below were encountered during construction. Activities to address or mitigate these conditions resulted in approximately $116,000 in change orders.

1. Design Change:
   a. The Project Team requested that the Construction Contractor install a 3/4-inch rock and a weed barrier inside the new facility. This was not included in the Scope of Work.
   b. The City of Lake Forrest requested modifications to the fencing during construction.
   c. The Project Team added additional pipe supports to the design after the finalization of the TPE.
2. Weather: The Project experienced occurrences of standby due to weather, which included rain and led the Project to incur standby charges of equipment rental.
3. Equipment: The Project Team requested that the Construction Contractor provide plates to minimize impact to the parking lot of a nearby church that was used for access to the project site.

4. Environmental Mitigation: The original permit that was obtained by the Project Team did not cover the complete removal of the vault. The Construction Contractor was on standby while the Project Team obtained an updated permit.
5. Gas Handling: SoCalGas restricted work on Line 1018 during construction. This resulted in a delay in the backfill, resulting in additional days of security for the construction site.

Figure 4: Dewatering of Excavation

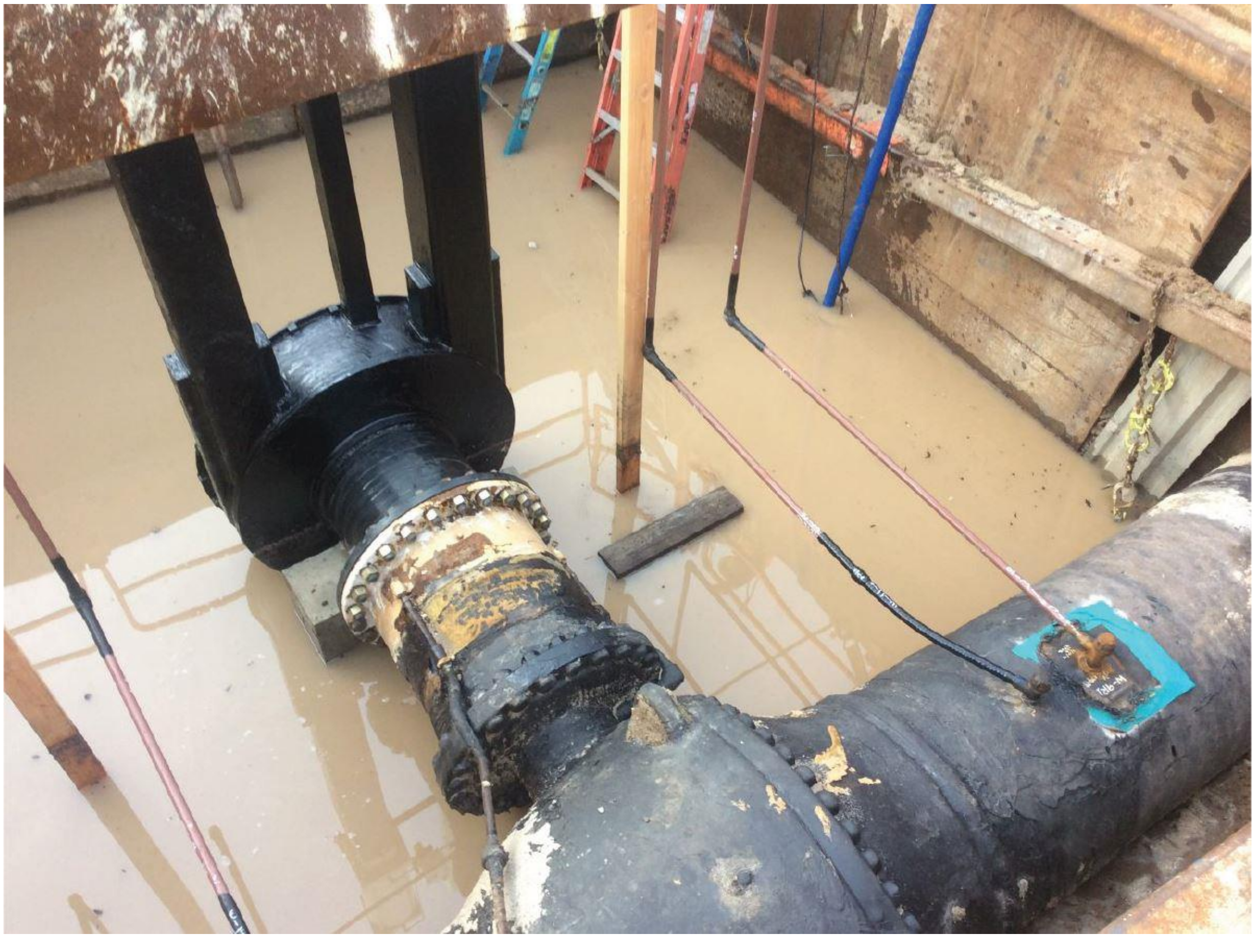
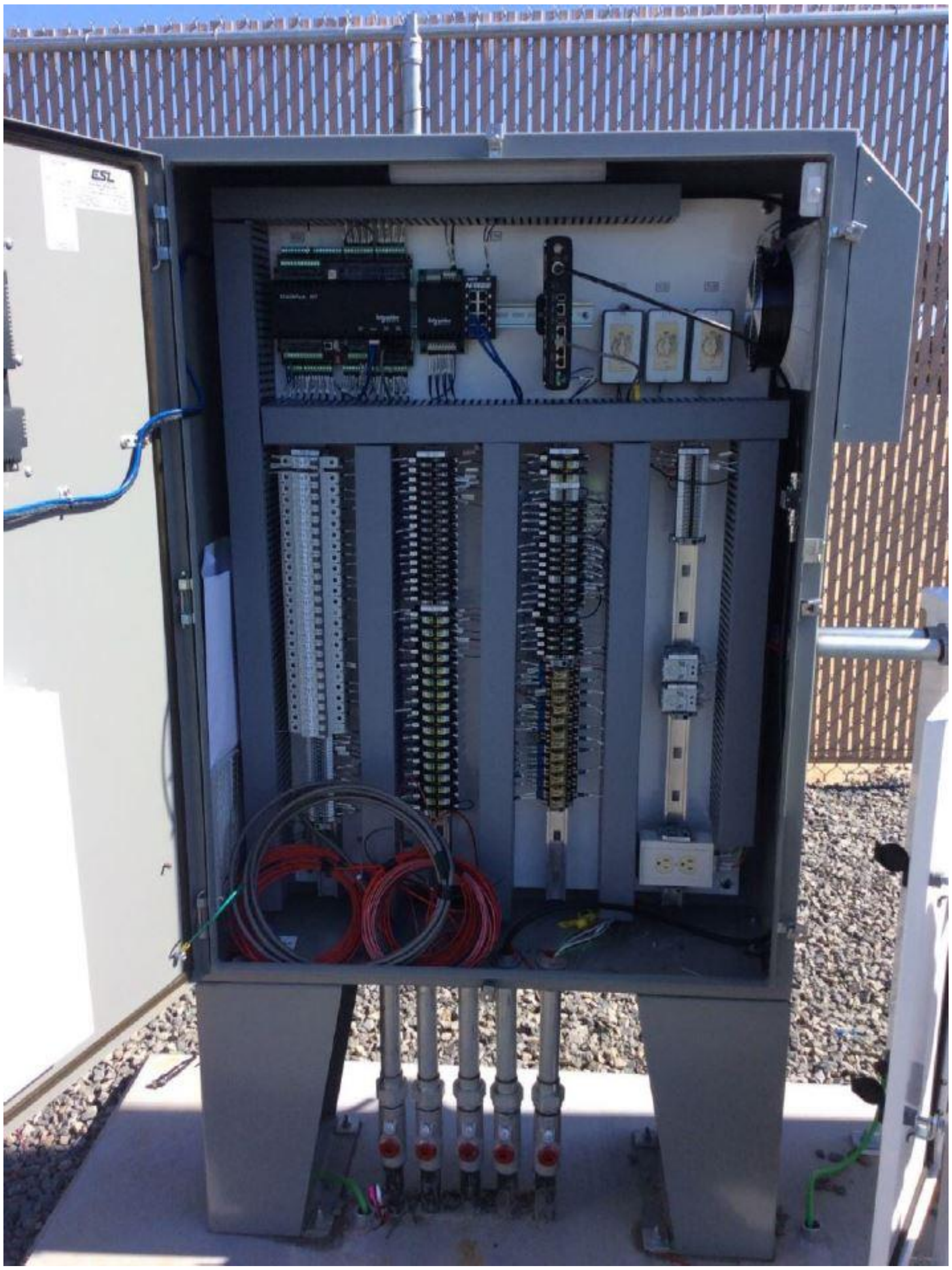


Figure 5: SCADA Setup at Project Site



D. Commissioning and Site Restoration

Commissioning activities included site restoration, final inspections, and placement of the valve into service. During this stage, SoCalGas successfully performed site acceptance testing, and conducted point-to-point verification with SoCalGas Gas Control personnel for the newly-automated valve, and transferred ownership of the new equipment to Field Operations. Closeout activities included development of final drawings, the reconciliation package, and updates to company recordkeeping systems to reflect the completed scope of work. The site was commissioned on October 10, 2019, as summarized in Table 3.

IV. PROJECT COSTS

A. Cost Avoidance Actions

SoCalGas exercised due diligence in the design, planning, and construction activities for this project to minimize or avoid costs when prudent to do so. As discussed above, the Project Team reviewed existing records, communicated with external stakeholders, and conducted a site walk to incorporate the site conditions in the project plan and design. SoCalGas grouped this site with six additional sites, Avery Parkway, Burt Road, Camino Capistrano, Dana Point, El Toro Road, and Harvard and Alton, into a single valve bundle to gain efficiencies in engineering, planning, and construction activities. The Project Team tracked the projects separately to more effectively track costs and streamline project closeout for individual sites.

B. Cost Estimates

Based on the preliminary design, once the preliminary project scope was confirmed and engineering, design, and planning activities were underway, SoCalGas prepared an estimate of the Direct Costs of the Project in the amount of $1,935,248. The Project Team considered the conditions known at the time to prepare the preliminary Direct Cost estimate. This estimate reflects the projected Labor, Material, and Services costs anticipated to be incurred to execute the Project, based on initial design plans.

SoCalGas estimated Indirect Costs of the Project based on the estimated Direct Costs and other project-related variables.

C. Actual Direct and Indirect Costs

Actual Direct Costs reflect the Labor, Material, and Services costs incurred to execute the Project. Actual Indirect Costs reflect costs for incremental overhead loaders in accordance with Company overhead allocation policies. The total loaded cost of the Project is $2,410,516 .

Table 4: Estimated and Actual Direct Costs and Variances[2]

Direct Costs ($)	Estimate	Actuals	Delta Over/(Under)
Company Labor	374,641	167,888	(206,753)
Materials	138,116	117,710	(20,406)
Mechanical Construction Contractor	437,760	515,731	77,971
Electrical Contractor	165,240	136,323	(28,917)
Construction Management & Support	57,354	132,884	75,530
Environmental	21,057	55,758	34,701
Engineering & Design	155,368	469,853	314,485
Project Management & Services	192,676	20,158	(172,518)
ROW & Permits	192,456	226,339	33,883
GMA	200,580	188,716	(11,864)
Total Direct Costs	**1,935,248**	**2,031,360**	**96,112**

Table 5: Estimated and Actual Indirect Costs, Total Costs, and Variances[3]

Indirect Costs/Total Costs ($)	Estimate	Actuals	Delta Over/(U115n der)
Overheads	165,166	283,835	118,669
AFUDC	94,887	82,330	(12,557)
Property Taxes	22,282	12,992	(9,290)
Total Indirect Costs	**282,335**	**379,157**	**96,822**
Total Direct Costs	**1,935,248**	**2,031,360**	**96,112**
Total Loaded Costs	**2,217,583**	**2,410,516**	**192,933**

The Actual Full-Time Equivalent[4] (FTE) for this Project is 0.57.

[2] Values may not add to total due to rounding.
[3] Ibid.
[4] Full-time equivalents (FTEs) are included in GRC forecasts to provide context to requested amounts for company labor. FTEs are calculated by measuring the number of hours charged over a given time period. For example, one FTE is equal to 40 hours per week, or typically 2,080 hours per year. The calculation of

D. Cost Impacts

Consistent with one of the overarching objectives of PSEP as stated in testimony to maximize the cost effectiveness of safety enhancement investments, SoCalGas effectively planned, designed, and completed construction activities for this project. Each pipeline project is unique in scope and inherently complex due to a variety of factors including terrain, environmental and permitting constraints, scope changes during detailed design, material cost fluctuations, regulatory changes, and more. These complexities may lead to variances between the initial estimate and actuals. The Project Team successfully mitigated these variances whenever feasible through the implementation of effective project management practices, thorough planning, and continuous monitoring.

At the completion of the Line 1018 Valve Enhancement Project – El Toro Road, Actual Direct Costs came within the AACE Class 3 Total Installed Cost (TIC) accuracy range, adhering to the standard industry practices defined by the Association for the Advancement of Cost Engineering (AACE) International. The Actual Direct Costs exceeded the preliminary estimate by $96,112. the Project Team determined additional pipe supports would be required in detailed design; the additional work detailed in Section III. Part C extended the construction duration, increasing costs for construction management and inspectors; an additional abatement permit was needed to cover the additional square footage for debris that was removed; and the Engineering and Design firms completed activities originally identified as Project Management & Services in the initial estimate while the actual costs were recognized under Engineering and Design.

FTEs includes overtime hours. Therefore, if one employee works 60 hours per week, he or she would be recorded as 1.5 FTEs.

V. CONCLUSION

SoCalGas enhanced the safety of their integrated natural gas system by prudently executing the Line 1018 Valve Enhancement Project – El Toro Road. Through this Valve Enhancement Project, SoCalGas successfully automated one mainline valve to achieve the objective of enabling rapid system isolation to a portion of Line 1018 in the City of Lake Forest. The total loaded cost of the Project is $2,410,516.

SoCalGas executed this project prudently through designing and executing the project to support achievement of Valve Enhancement Plan isolation objectives, bundling seven projects together to capture efficiencies through coordinated engineering, and installing equipment necessary to bring power and communication capabilities to the site to enable rapid system isolation of a portion of Line 1018 located in the City of Lake Forest.

SoCalGas engaged in prudent cost avoidance efforts to complete this safety enhancement at a reasonable cost by carefully planning and coordinating engineering and construction activities to maximize efficiencies and reduce customer and community impacts, engaging in reasonable efforts to promote competitive and market based rates for contractor services and materials, and using a reasonable amount of company and contractor resources to complete this safety enhancement as soon as practicable.

End of Line 1018 Valve Enhancement Project – El Toro Road Final Report

I. LINE 1018 VALVE ENHANCEMENT PROJECT – HARVARD AND ALTON

A. Background and Summary

The Line 1018 Valve Enhancement Project – Harvard and Alton consists of valve enhancements made to one existing mainline valve (MLV) and the replacement of two valves located in the City of Tustin in Orange County. Through this project, SoCalGas enhanced the safety of its natural gas transmission system by enabling the rapid detection of a significant change in pipeline pressure and remote isolation and depressurization of a portion of Line 1018 and Supply Line 35-6520 in the event of a pipeline rupture. SoCalGas installed a new crossover valve, a new check valve, two new actuators, two new vaults to house the actuators, new blowdown piping, new power equipment, new communications equipment, and the necessary automation equipment at the site. The total loaded project cost is $3,102,515.

The Line 1018 Valve Enhancement Project – Harvard and Alton construction site is on Walnut Trail in a high density residential area adjacent to a railroad in the City of Tustin, there is a river approximately 120 feet northeast of the project site. SoCalGas bundled this site with six additional sites, Line 1018 Valve Enhancement Projects – Alipaz Street, Avery Parkway, Burt Road, Camino Capistrano, Dana Point, and El Toro Road to gain efficiencies in engineering, planning, and construction activities. This workpaper describes the construction activities and costs of the Line 1018 Valve Enhancement Project – Harvard and Alton. This Project's costs were shared by PSEP and the Operating District, with the Operating District funding the costs of the installation the new crossover valve and the new check valve, and PSEP Funding the activities that provided system isolation through the automation of the valves.

Final Report for Line 1018 Valve Enhancement Project - Harvard and Alton

Table 1: General Project Information

Line 1018 Valve Enhancement Project - Harvard and Alton			
Location	City of Tustin		
Days on Site	48 days		
Construction Start	07/02/2018		
Construction Finish	11/19/2018		
Commissioning Date	08/06/2019		
Valve Upgrades			
Valve Number	1018-4.13-0		
Valve Type	Existing – Ball		
Actuator	New		
Actuator Above-/Below-Grade	Below-Grade		
ASV	Yes		
RCV	Yes		
Valve Number	1018-4.13-4		
Valve Type	New – Ball[1]		
Actuator	New		
Actuator Above-/Below-Grade	Below-Grade		
ASV	No		
RCV	Yes		
Valve Number	N/A		
Valve Type	New – Check[2]		
Actuator	N/A		
Actuator Above-/Below-Grade	N/A		
ASV	N/A		
RCV	N/A		
Site Upgrades			
Vault	New – Two		
Power	New – Utility		
Communication	New – Radio		
SCADA Panel	New		
Equipment Shelter	None		
Fencing/Wall	None		
Project Costs ($)	**Capital**	**O&M**	**Total**
Loaded Project Costs	3,102,515	-	3,102,515
Disallowed Costs	-	-	-

[1] The Operating District funded the installation of the new valve.
[2] Ibid.

B. Maps and Images

Figure 1: Line 1018 Bundle Overview

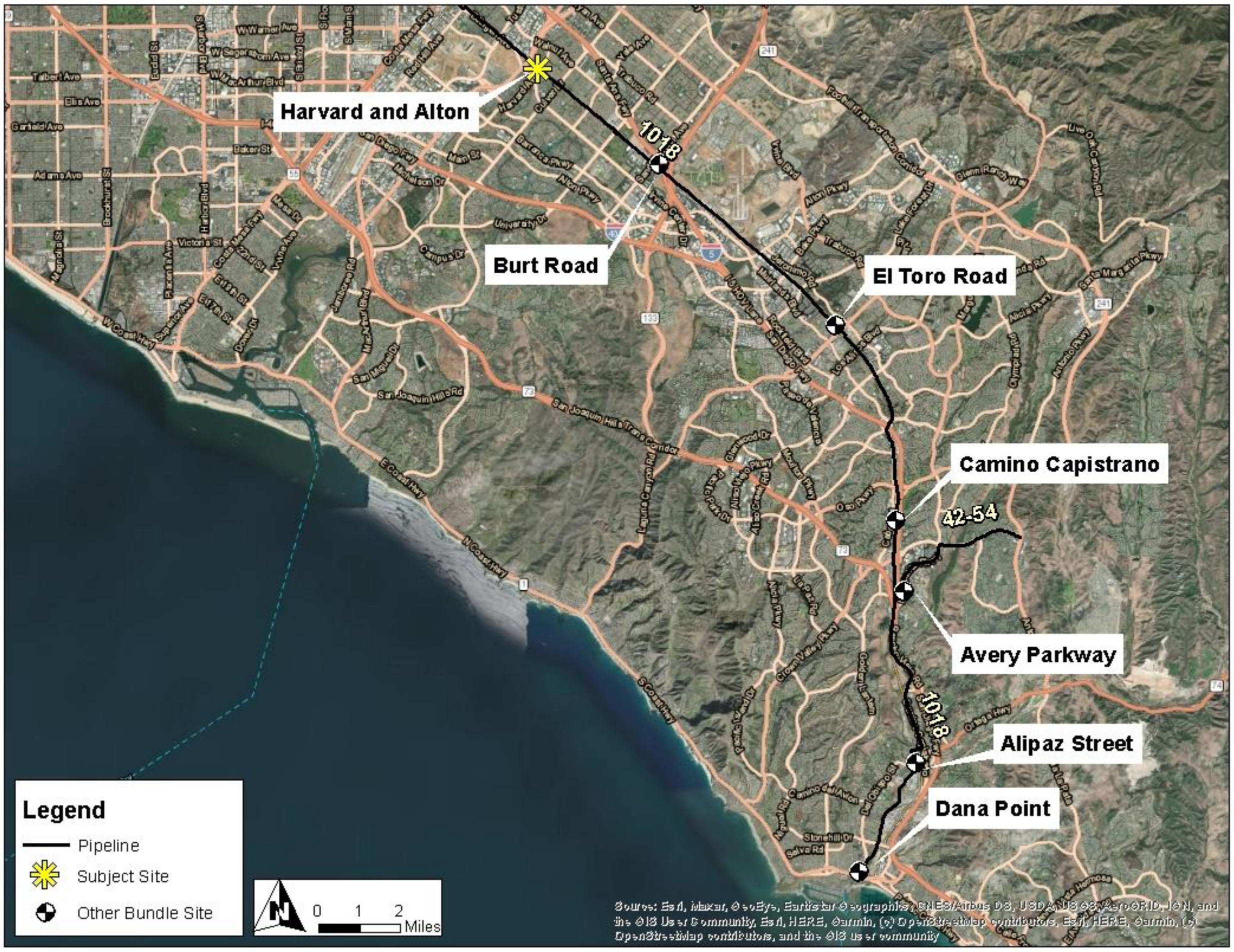
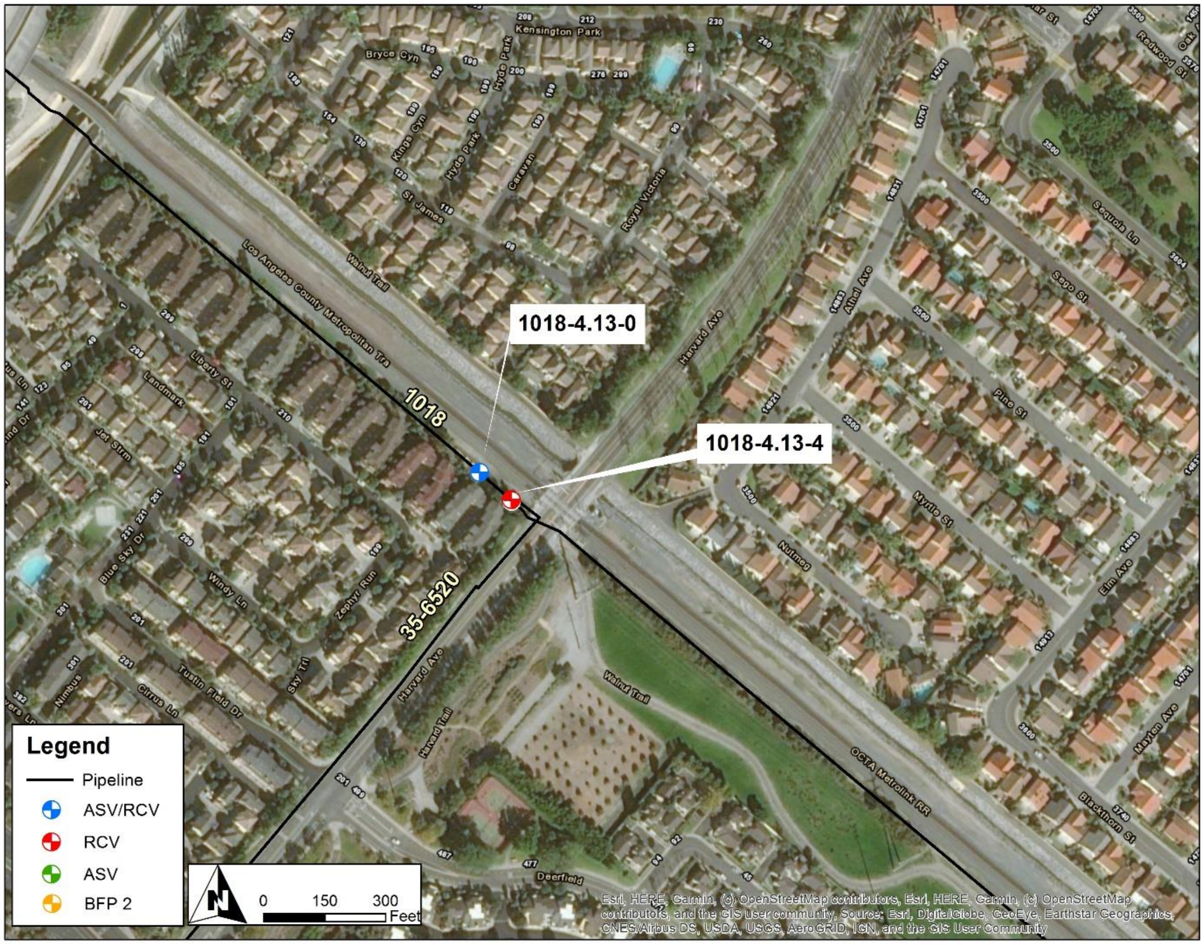


Figure 2: Satellite Image of Line 1018 Valve Enhancement Project - Harvard and Alton



II. ENGINEERING, DESIGN, AND PLANNING

A. Project Scope

SoCalGas presented a conceptual project scope in workpapers supporting the Valve Enhancement Plan in the 2011 filing. This conceptual scope did not include this project. SoCalGas reviewed available information, performed a detailed system flow analysis, and identified this valve as a candidate for enhancement to provide the planned isolation. The final project scope is summarized in Table 2 below.

1. <u>2011 PSEP Filing:</u> SoCalGas did not identify this valve for automation to achieve the objective of rapid system isolation.
2. <u>Updated Scope:</u> SoCalGas determined that the automation of valves 1018-4.13-0 and 1018-4.13-4 would enable rapid isolation, thereby achieving Valve Enhancement Plan objectives.
3. <u>Engineering, Design, and Constructability:</u>
    a. The Operating District had scheduled valve 1018-4.13-4 for replacement. This valve was replaced during construction. The Operating District funded the activites related to the installation of the new valve.
    b. The Operating District requested that a check valve be installed downstream of valve 1018-4.13-4 for increased operational flexibility. The Operating District funded the activites related to the installation of the new check valve.
4. <u>Final Project Scope:</u> The final project scope consists of the automation of two valves, that included the installation of two new actuators, the installation of two new vaults to house the actuators, the installation of power equipment, the installation of communications equipment, and the installation of the necessary automation equipment at the site.

Table 2: Final Project Scope

Final Project Scope					
Line	Mile	Valve #	Valve Size (*confidential*)	Installation Type	Function
1018	4.13	0	[redacted]	A/VT	ASV/RCV
1018	4.13	4	[redacted]	NV/VT	RCV
1018	4.13	N/A	[redacted]	NV	BFP2

B. Site Evaluation and Planning

SoCalGas initiated the planning process for the Line 1018 Valve Enhancement Project - Harvard and Alton by performing a pre-design site walk to determine the existing conditions and assess any potential impact on the design. Key factors that influenced the engineering and design of this project are as follows:

1. Site Description: The site is on Walnut Trail in a high density residential area adjacent to a railroad in the City of Tustin, there is a river approximately 120 feet northeast of the project site.
2. Land Issues: During the pre-design sitewalk, the Project Team noted that a Temporary Right of Entry would be necessary to complete construction.
3. DOT Class: This project site is in a Class 3 location.
4. Power Source: There was no preexisting power equipment. The Project Team installed new power equipment at the site.
5. Communication Technology: There was no preexisting communications equipment. The Project Team installed new communications equipment at the site.

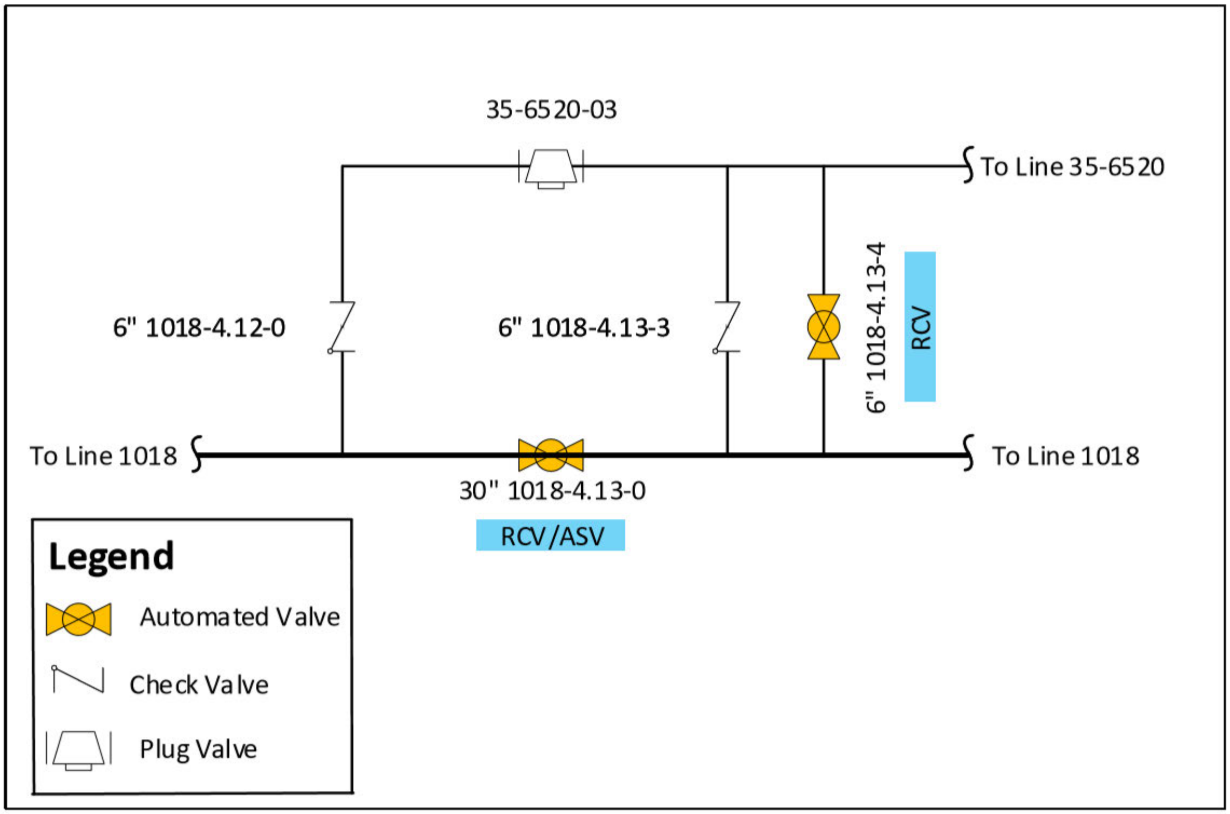
C. Engineering, Design, and Planning Factors

SoCalGas reviewed drawings and records, contacted internal planning groups, communicated with external stakeholders, conducted survey activity, performed potholing of the area to identify the presence of underground utilities and substructures, and completed a site walk. Key factors that influenced the engineering and design of the Project are as follows:

1. Engineering Assessment: During the site evaluation, the Project Team confirmed the existing technology. Based on the specifications of the new actuators, the Project Team determined that the preexisting vaults did not provide sufficient space to house and operate the new actuator. The Project Team noted that preexisting blowdown piping configuration interfered with the installation of the new vault. The Project Team redesigned the preexisting blowdown piping.
2. Valve Details:
   a. 1018-4.13-0: The existing valve is a manually operated Class 300 ball valve that the Project Team reused.
   b. 1018-4.13-4: The preexisting valve was a manually operated ball valve which was replaced by the project team.
3. Actuator Details:
   a. 1018-4.13-0: The preexisting actuator was incompatible with PSEP linebreak technology. The Project Team installed a new actuator.
   b. 1018-4.13-4: There was no preexisting actuator. The Project Team installed a new actuator.
4. Customer Impact: The Project Team utilized alternate feeds to maintain service to customers during the tie-in.
5. Community Impact: The Project Team did not anticipate any notable impact to the community from this project.
6. Substructures: The Project Team noted that preexisting blowdown piping configuration interfered with the installation of the new vault. The Project Team redesigned the preexisting blowdown piping.
7. Environmental: The Project Team did not identify any notable environmental concerns at the site. An environmental monitor performed routine site visits during construction.
8. Permit Restrictions: The Project Team obtained an encroachment permit from the City of Tustin. The City of Tustin restricted working hours from 9:00am to 3:00pm.

9. Land Use: The Project Team obtained temporary easements for the trenching and the laydown yard and a permanent easement for the new electrical conduit. The Project Team shared a laydown yard with Line 1018 Valve Enhancement Project – Camino Capistrano.
10. Traffic Control: The Project Team closed the western side of Harvard Avenue during construction.

Figure 2: Line 1018 Valve Enhancement Project Harvard and Alton Valve Enhancement Project Schematic



D. Scope Changes

SoCalGas did not make any notable scope changes during detailed design. No Scope change remained the same during this stage.

III. CONSTRUCTION

A. Construction Contractor Selection

The Project Team prepared an initial cost estimate based on the preliminary design. Following completion of the engineering, design, and planning activities described above, the Project Team directed the Performance Partner (Mechanical Construction Contractor) and Alliance Partner (Electrical Contractor) to prepare cost estimates based on a more detailed engineering design package. As indicated above, there were no notable changes in scope between the time when the Project Team prepared the preliminary cost estimate and when the Performance Partner and Alliance Partner prepared and submitted their estimates. The estimated values below represent both PSEP and non-PSEP activities.

1. <u>SoCalGas' Preliminary Mechanical Construction Contractor Estimate *(confidential)*:</u> SoCalGas' preliminary cost estimate for construction was [redacted].

2. <u>Mechanical Construction Contractor's Target Price Estimate *(confidential)*:</u> The Mechanical Construction Contractor's cost estimate was [redacted], which was [redacted] than SoCalGas' preliminary cost estimate for construction.

3. <u>SoCalGas' Preliminary Electrical Contractor Estimate *(confidential)*:</u> SoCalGas' preliminary cost estimate for construction was [redacted].

4. <u>Electrical Contractor's Estimate (*confidential*):</u> The Electrical Contractor's estimate was [redacted], which was [redacted] than SoCalGas' preliminary cost estimate.

B. Construction Schedule

Table 3: Construction Timeline

Construction Start Date	07/02/2018
Construction Completion Date	11/19/2018
Days on Site	48 days
Commissioning Date	08/06/2019

The Project Team completed all construction activities as soon as practicable prior to commissioning. Finalization of commissioning activities is dependent on electrical utility connections, and system and/or resource availability.

C. Changes During Construction

The conditions summarized below were encountered during construction. Activities to address or mitigate these conditions resulted in approximately $157,696 in change orders.

1. Substructure: During excavation, the Construction Contractor identified a previously unidentified abandoned vault. The Construction Contractor removed a portion of the existing vault to facilitate the installation of the new instrument taps.
2. Scope: The removal of a ball valve was not included in the TPE.
3. Tie-In: SoCalGas requested additional personnel to support with equipment installation, and fire watch, during the tie-in due to complicated gas handling procedures. The tie-in also extended beyond what was planned in the TPE.
4. Schedule Delay: The construction duration extended three weeks beyond what was planned. This resulted in additional charges for shoring, equipment, security, and other overheads during construction.
5. Paving: The City of Tustin requested additional site restoration beyond what was included the TPE.

6. Constructability: The Construction Contractor removed existing pipe supports to allow space for the necessary shoring equipment. The pipe supports were replaced prior to backfill.
7. Work Hours: The City of Tustin restricted work hours to 9:00 am to 3:00 pm to minimize the impact to local residents. These hour restrictions were not included in the TPE.

Figure 3: Fabrication of the New Blowdown Assembly

D. Commissioning and Site Restoration

Commissioning activities included site restoration, final inspections, and placement of the valves into service. During this stage, SoCalGas successfully performed site acceptance testing, and conducted point-to-point verification with SoCalGas Gas Control personnel for the newly-automated valves, and transferred ownership of the new equipment to Field Operations. Closeout activities included development of final drawings, the reconciliation package, and updates to company recordkeeping systems to reflect the completed scope of work. The site was commissioned on August 6, 2019, as summarized in Table 3.

IV. PROJECT COSTS

A. Cost Avoidance Actions

SoCalGas exercised due diligence in the design, planning, and construction activities for this project to minimize or avoid costs when prudent to do so. As discussed above, the Project Team reviewed existing records, communicated with external stakeholders, and conducted a site walk to incorporate the site conditions in the project plan and design. Specific examples of cost avoidance actions taken on this project were:

1. Bundling of Projects: SoCalGas bundled this valve project with six additional valve projects, Line 1018 Valve Enhancement Projects – Alipaz Street, Avery Parkway, Burt Road, Dana Point, El Toro Road, and Harvard and Alton, to gain efficiencies in engineering, planning, and construction activities.
2. Project Design: The Project Team avoided the need to install a check valve by providing bi-directional flow capabilities, resulting in cost avoidance.
3. Schedule Coordination: The Project Team avoided mobilizing costs by starting construction directly after another project had finished completion.
4. Land Use: The Project Team shared a laydown yard with the Line 1018 Camino Capistrano Project.

B. Cost Estimates

Based on the preliminary design, once the preliminary project scope was confirmed and engineering, design, and planning activities were underway, SoCalGas prepared an estimate of the Direct Costs of the Project in the amount of $2,436,985. The Project Team considered the conditions known at the time to prepare the preliminary Direct Cost estimate. This estimate reflects the projected Labor, Material, and Services costs anticipated to be incurred to execute the Project, based on initial design plans.

SoCalGas estimated Indirect Costs of the Project based on the estimated Direct Costs and other project-related variables.

C. Actual Direct and Indirect Costs

Actual Direct Costs reflect the Labor, Material, and Services costs incurred to execute the Project. Actual Indirect Costs reflect costs for incremental overhead loaders in accordance with Company overhead allocation policies. The total loaded cost of the Project is $3,102,515.

Table 4: Estimated and Actual Direct Costs and Variances[3, 4]

Direct Costs ($)	Estimate	Actuals	Delta Over/(Under)
Company Labor	410,241	205,874	(204,367)
Materials	150,843	247,768	96,925
Mechanical Construction Contractor	725,201	910,741	185,540
Electrical Contractor	103,108	104,782	1,674
Construction Management & Support	76,070	132,747	56,677
Environmental	44,601	60,307	15,706
Engineering & Design	207,796	519,322	311,526
Project Management & Services	280,155	40,825	(239,329)
ROW & Permits	159,226	116,704	(42,522)
GMA	279,744	302,249	22,505
Total Direct Costs	**2,436,985**	**2,641,320**	**204,335**

Table 5: Estimated and Actual Indirect Costs, Total Costs, and Variances[5, 6]

Indirect Costs/Total Costs ($)	Estimate	Actuals	Delta Over/(Under)
Overheads	757,372	374,609	(382,763)
AFUDC	93,767	86,587	(7,180)
Property Taxes	18,221	-	(18,221)
Total Indirect Costs	**869,360**	**461,195**	**(408,165)**
Total Direct Costs	**2,436,985**	**2,641,320**	**204,335**
Total Loaded Costs	**3,306,345**	**3,102,515**	**(203,830)**

3 Values may not add to total due to rounding.
4 Values in table represent PSEP costs only.
5 Values may not add to total due to rounding.
6 Values in table represent PSEP costs only.

The Actual Full-Time Equivalents[7] (FTEs) for this Project are 1.09.

D. Cost Impacts

Consistent with one of the overarching objectives of PSEP to maximize the cost effectiveness of safety enhancement investments, SoCalGas effectively planned, designed, and completed construction activities for this project. Each pipeline project is unique in scope and inherently complex due to a variety of factors including terrain, environmental and permitting constraints, scope changes during detailed design, material cost fluctuations, regulatory changes, and more. These complexities can lead to variances between initial estimates and actual costs. Consistent with prudent management at the time, the Project Team successfully mitigated these variances whenever feasible through the implementation of effective project management practices, thorough planning, and continuous monitoring.

At the completion of the Line 1018 Valve Enhancement Project – Harvard and Alton, Actual Direct Costs came within the AACE Class 3 Total Installed Cost (TIC) accuracy range, adhering to the standard industry practices defined by the Association for the Advancement of Cost Engineering (AACE) International. The Actual Direct Costs exceeded the preliminary estimate by $204,335. This variance can be attributed to several factors including: during excavation, the Construction Contractor identified an unidentified abandoned vault and removed a portion of it to facilitate the installation of new instrument taps; and the Engineering and Design firms completed activities originally identified as Project Management & Services in the initial estimate while the actual costs were recognized under Engineering and Design.

[7] Full-time equivalents (FTEs) are included in GRC forecasts to provide context to requested amounts for company labor. FTEs are calculated by measuring the number of hours charged over a given time period. For example, one FTE is equal to 40 hours per week, or typically 2,080 hours per year. The calculation of FTEs includes overtime hours. Therefore, if one employee works 60 hours per week, he or she would be recorded as 1.5 FTEs.

V. CONCLUSION

SoCalGas enhanced the safety of their integrated natural gas system by prudently executing the Line 1018 Valve Enhancement Project – Harvard and Alton. Through this Valve Enhancement Project, SoCalGas successfully automated two valves to achieve the objective of enabling rapid system isolation to a portion of Line 1018 in the City of Tustin. The total loaded cost of the Project is $3,102,515.

SoCalGas executed this project prudently through identification and automation of multiple valves to enable rapid system isolation of a a portion of Line 1018 located in Tustin.

SoCalGas engaged in prudent cost avoidance efforts to complete this safety enhancement at a reasonable cost by coordinating schedules and sharing laydown yards with other projects, enhancing future maintenance simplicity, and reducing the need for additional check valves.

End of Line 1018 Valve Enhancement Project - Harvard and Alton

I. LINE 2000 BEAUMONT RIVERSIDE 2016 VALVE ENHANCEMENT PROJECT BUNDLE

A. Background and Summary

The Line 2000 Beaumont Riverside 2016 Valve Enhancement Project Bundle consists of valve enhancements made to four existing mainline valves (MLVs) located in the Cities of Corona, Moreno Valley, and Riverside, in Riverside County. Through this project, SoCalGas enhanced the safety of its natural gas transmission system by enabling the rapid detection of a significant change in pipeline pressure and remote isolation and depressurization of portions of Line 2000 in the event of a pipeline rupture. SoCalGas relocated an existing blowdown, installed new fencing, new power equipment, new communications equipment, and the necessary automation equipment at the sites. The total loaded project cost is $5,943,664.

The Line 2000 Beaumont Riverside 2016 Valve Enhancement Project Bundle is separated into four construction sites that are in urban areas. The MLV 16 construction site is located on the northwest corner of Brodiaea Avenue and Perris Boulevard in the City of Moreno Valley. There are multiple residential developments nearby. The MLV 18 construction site is located in a desert environment adjacent to Van Buren Boulevard and Equestrian Drive in the City of Riverside. There are several residential structures across the street from the project site. The MLV 19 construction site is within an existing SoCalGas facility located in a commercial area near Magnolia Avenue and Pierce Street in the City of Riverside. The MLV 20.7 construction site is within an existing SoCalGas facility located in an industrial area north of Railroad Street and Monica Circle in the City of Corona.

Final Report for Line 2000 Beaumont Riverside 2016 Valve Enhancement Project Bundle

Table 1: General Project Information

Line 2000 Beaumont Riverside 2016 Valve Enhancement Project Bundle				
Site	MLV 16	MLV 18	MLV 19	MLV 20.7
Location	City of Moreno Valley	City of Riverside	City of Riverside	City of Corona
Days on Site	26 days	31 days	46 days	50 days
Construction Start	11/13/2018	07/24/2017	02/05/2018	06/19/2017
Construction Finish	01/14/2019	08/30/2017	04/19/2018	09/12/2017
Commissioning Date	06/20/2019	05/14/2018	07/30/2018	09/03/2019
Valve Upgrades				
Valve Number	2000-161.14-0	2000-172.31-0	2000-177.28-0	2000-184.29-0
Valve Type	Existing – Ball	Existing – Ball	Existing – Ball	Existing – Ball
Actuator	Existing	Existing	Existing	New
Actuator Above-/Below-Grade	Below-Grade	Below-Grade	Above-Grade	Above-Grade
ASV	Yes	Yes	Yes	Yes
RCV	Yes	Yes	Yes	Yes
Site Upgrades				
Vault	Existing	Existing	None	None
Power	New – Utility	New – Utility	New – Utility	New – Utility
Communication	New – Radio	New – Radio	New – VSAT	New – VSAT
SCADA Panel	New	New	New	New
Equipment Shelter	None	None	New	New
Fencing	None	New	Expanded	Expanded

Project Costs ($)	Capital	O&M	Total
Loaded Project Costs	5,943,664	-	5,943,664
Disallowed Costs	-	-	-

B. Maps and Images

Figure 1: Beaumont Riverside 2016 Bundle Overview

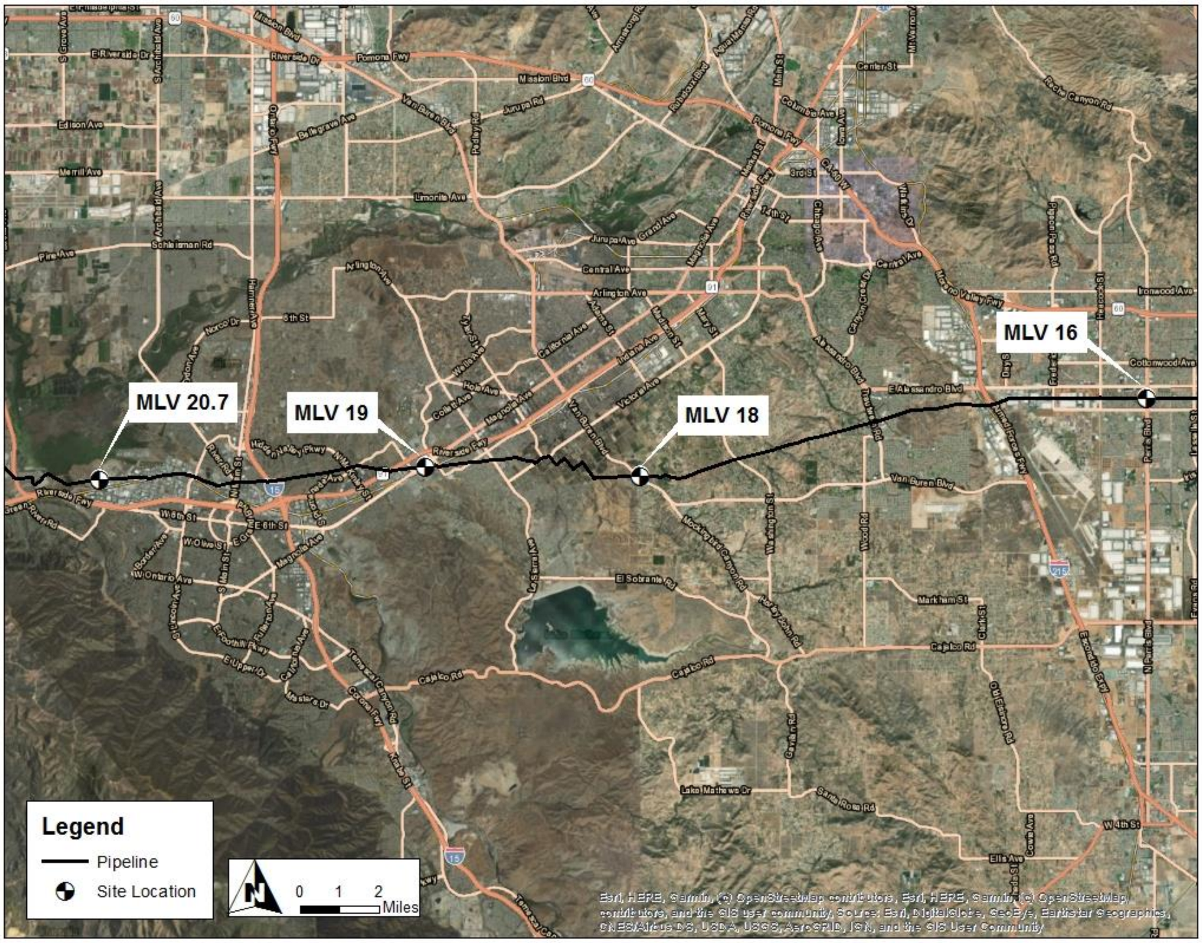


Figure 2: Satellite Image of MLV 16

Figure 3: Satellite Image of MLV 18

Figure 4: Satellite Image of MLV 19

Figure 5: Satellite Image of MLV 20.7

II. ENGINEERING, DESIGN, AND PLANNING

A. Project Scope

SoCalGas presented a conceptual project scope for the Line 2000 Beaumont Riverside 2016 Valve Enhancement Project Bundle in workpapers supporting the Valve Enhancement Plan in the 2011 PSEP filing.[1] This conceptual scope identified three MLVs for automation to enable remote isolation to a portion of Line 2000. Prior to initiating execution of the Project, SoCalGas reviewed available information, performed a detailed system flow analysis to validate the scope of the Project, and identified an additional valve for enhancement to provide the planned isolation. The final project scope is summarized in Table 2 below.

1. 2011 PSEP Filing: SoCalGas identified MLVs 2000-161.14-0, 2000-172.31-0, and 2000-177.28-0 for automation to achieve the objective of rapid system isolation.
2. Updated Scope: Upon project initiation, SoCalGas reviewed the conceptual project scope and determined that these isolation points alone would not achieve the transmission isolation objectives set forth in the Valve Enhancement Plan. SoCalGas determined it was also necessary to automate MLV 2000-184.29-0. Together, the automation of these valves enables rapid isolation, thereby achieving Valve Enhancement Plan objectives.
3. Engineering, Design, and Constructability: No notable engineering adjustments were required to the standard design.

[1] *See* Workpapers supporting Amended Pipeline Safety Enhancement Plan (PSEP) of SoCalGas and SDG&E, submitted on December 2, 2011, at WP-IX-2-14 through WP-IX-2-25 (A.11-11-002 Exh. SCG-32).

4. Final Project Scope: The final project scope consists of the automation of four MLVs, the installation of new fencing, the relocation of an existing blowdown, the installation of a new actuator, the installation of new power equipment, the installation of new communications equipment, and the installation of the necessary automation equipment at the sites.

Table 2: Final Project Scope

Final Project Scope					
Line	Mile	Valve #	Valve Size (*confidential*)	Installation Type	Function
2000	161.14	0	[redacted]	C/P	ASV/RCV
2000	172.31	0	[redacted]	C/P	ASV/RCV
2000	177.28	0	[redacted]	C/P	ASV/RCV
2000	184.29	0	[redacted]	A/AG	ASV/RCV

B. Site Evaluation and Planning

SoCalGas initiated the planning process for the Line 2000 Beaumont Riverside 2016 Valve Enhancement Project by performing a pre-design site walk to determine the existing conditions and assess any potential impact on the design. Key factors that influenced the engineering and design of this project are as follows:

MLV 16

1. Site Description: This site is located on the northwest corner of Brodiaea Avenue and Perris Boulevard in the City of Moreno Valley. There are multiple residential developments nearby. The existing actuator is in a vault.
2. Land Issues: During the pre-design site walk, the Project Team confirmed the existing site conditions. The Project Team identified an area next to the valve that could accommodate the necessary automation equipment.
3. DOT Class: This project site is in a Class 3 location.

4. Power Source: The site had preexisting solar power. The Project Team installed new utility power equipment to accommodate the increased loads from the new automation equipment.
5. Communication Technology: There was no preexisting communications equipment. The Project Team installed new communications equipment at the site.

MLV 18

1. Site Description: The site is located in a desert environment adjacent to Van Buren Boulevard and Equestrian Drive in the City of Riverside. There are several residential structures across the street from the project site. The existing actuator is in a vault.
2. Land Issues: The Project Team determined that the new equipment should be enclosed in a fence to increase security and improve public safety.
3. DOT Class: This project site is in a Class 2 location. SoCalGas selected this valve for automation in order to isolate Class 3 locations upstream and downstream of the isolation point.
4. Power Source: There was no preexisting power equipment. The Project Team installed new power equipment at the site.
5. Communication Technology: There was no preexisting communications equipment. The Project Team installed new communications equipment at the site.

MLV 19

1. Site Description: The construction site is within an existing SoCalGas facility located in a commercial area near Magnolia Avenue and Pierce Street in the City of Riverside.
2. Land Issues: During the site evaluation, the Project Team noted that the existing station would need to be expanded to accommodate the additional equipment.
3. DOT Class: This project site is in a Class 3 location.
4. Power Source: The site had preexisting solar power. The Project Team installed new utility power equipment to accommodate the increased loads from the new automation equipment.

5. Communication Technology: There was no preexisting communications equipment. The Project Team installed new communications equipment at the site.

MLV 20.7

1. Site Description: The site is within an existing SoCalGas facility located in an industrial area north of Railroad Street and west of Monica Circle in the City of Corona.
2. Land Issues: During the site evaluation, the Project Team noted that the existing station would need to be expanded to accommodate the additional equipment.
3. DOT Class: This project site is in a Class 3 location.
4. Power Source: The site had preexisting solar power. The Project Team installed new utility power equipment to accommodate the increased loads from the new automation equipment.
5. Communication Technology: There was no preexisting communications equipment. The Project Team installed new communications equipment at the site.

C. Engineering, Design, and Planning Factors

SoCalGas reviewed drawings and records, contacted internal planning groups, communicated with external stakeholders, conducted survey activity, and completed a site walk. Key factors that influenced the engineering and design of the Project are as follows:

MLV 16

1. Engineering Assessment: During the site evaluation, the Project Team confirmed the existing technology and the measurements of the existing vault. The Project Team determined that the existing vault and actuator were in good working condition and could be reused.
2. Valve Details: The existing valve was a manually actuated Class 600 ball valve, which was reused by the Project Team.

3. Actuator Details: The existing actuator was a double-acting pneumatic actuator, which was reused by the Project Team.
4. Customer Impact: The Project Team did not identify any anticipated service disruptions to customers from this project.
5. Community Impact: The Project Team did not anticipate any notable impacts to the community from this project.
6. Substructures: The Project Team did not identify any existing substructures that affected the design and engineering at this site.
7. Environmental: The Project Team did not anticipate environmental impact from this project. An environmental monitor performed routine site visits during construction.
8. Permit Restrictions: The Project Team obtained an encroachment permit and an electrical permit from the City of Moreno Valley.
9. Land Use: The Project Team performed all construction activity within the existing easement. The Project Team closed the shoulder of the corner of Brodiaea Avenue and Perris Boulevard during construction. This area was utilized as a laydown yard.
10. Traffic Control: The Project Team closed the shoulder of the corner of Brodiaea Avenue and Perris Boulevard during construction. This area was utilized as a laydown yard.

MLV 18

1. Engineering Assessment: During the site evaluation, the Project Team confirmed the existing technology and the measurements of the existing vault. The Project Team determined that the existing vault and actuator were in good working condition and could be reused.
2. Valve Details: The existing valve was a manually actuated Class 600 ball valve, which was reused by the Project Team.
3. Actuator Details: The existing actuator was a double-acting pneumatic actuator, which was reused by the Project Team.

4. Customer Impact: The Project Team did not identify any anticipated service disruptions to customers from this project.
5. Community Impact: The Project Team did not anticipate any notable community impacts from this project.
6. Substructures: The Project Team did not identify any existing substructures that affected the design and engineering at this site.
7. Environmental: The Project Team did not anticipate environmental impact from this project. An environmental monitor performed routine site visits during construction.
8. Permit Restrictions: The Project Team obtained a Temporary Right of Entry (TRE) from the State of California Parks and Recreation Department. Per the TRE, SoCalGas could not:
    a. Cut, prune, or remove any native trees or brush, except for routine fire protection, trail clearing, maintenance, or the elimination of safety hazards without written permission.
    b. Disturb, move, or remove any rocks or boulders, except for routine fire protection, trail clearing, maintenance, or the elimination of safety hazards without written permission.
    c. Grade, regrade, or alter the ground surface, except for regarding the roads for routine fire protection, trail clearing, maintenance, or the elimination of safety hazards without written permission.
    d. Enter the park during Red Flag conditions.
9. Land Use: The Project Team obtained a Temporary Right of Entry from the State of California Parks and Recreation Department.
10. Traffic Control: The Project Team did not identify any traffic control needs at the site.

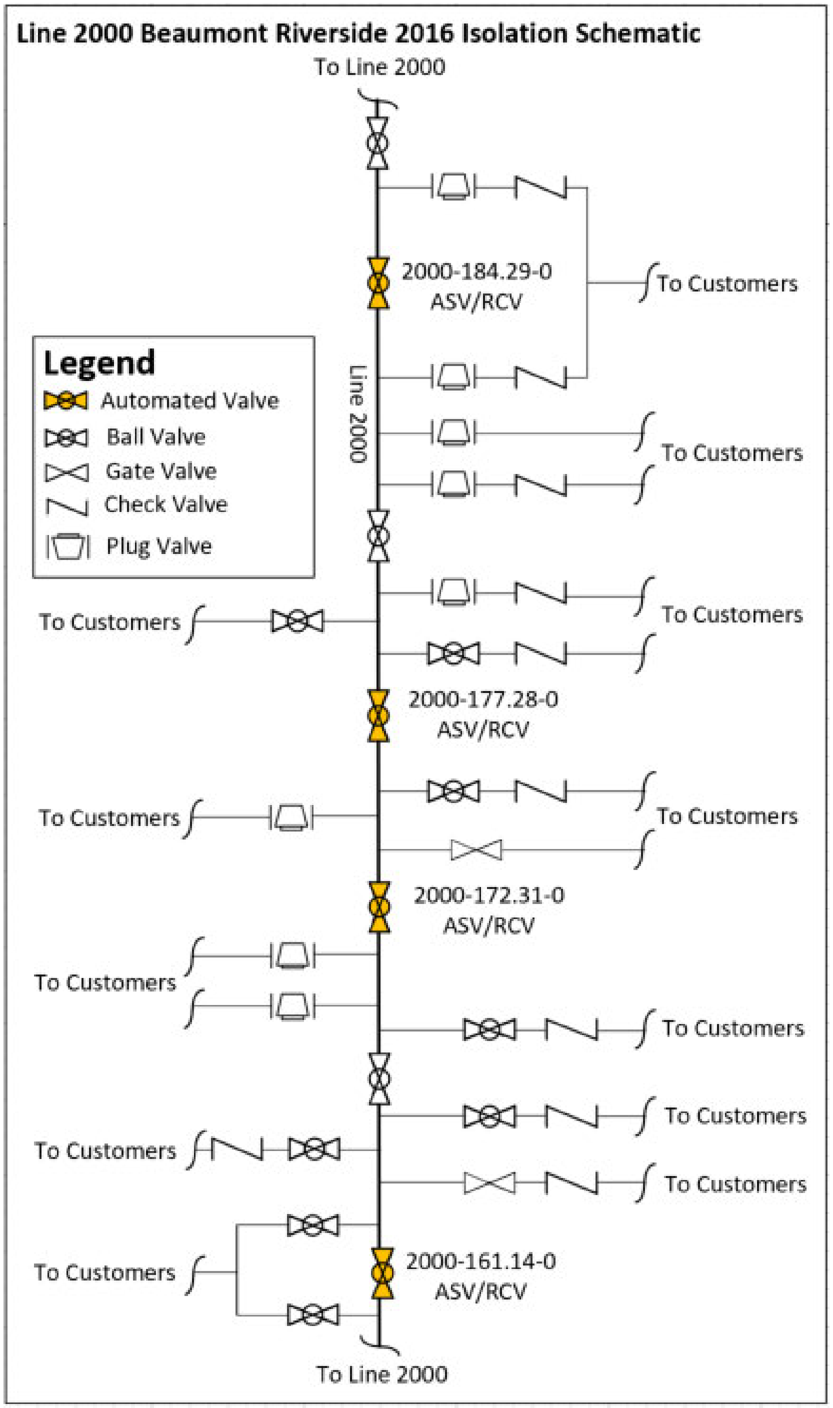
MLV 19

1. Engineering Assessment: During the site evaluation, the Project Team confirmed the existing technology and verified the need to expand the existing station to accommodate the new equipment. The Project Team determined that the existing blowdown and associated piping required a redesign in order to accommodate the necessary automation equipment.
2. Valve Details: The existing valve is a manually actuated Class 600 ball valve, which was reused by the Project Team.
3. Actuator Details: The existing actuator was a double-acting pneumatic actuator, which was reused by the Project Team.
4. Customer Impact: The Project Team did not identify any anticipated service disruptions to customers from this project.
5. Community Impact: The Project Team closed portions of Magnolia Boulevard during a portion of construction. One lane was kept open at all times.
6. Substructures: The Project Team did not identify any existing substructures that affected the design and engineering at this site.
7. Environmental: The Project Team did not anticipate environmental impact from this project. An environmental monitor performed routine site visits during construction.
8. Permit Restrictions: The Project Team obtained an encroachment permit from the City of Riverside Public Works Department.
9. Land Use: The Project Team obtained a new exclusive easement to expand the existing facility. The Project Team also obtained a new, non-exclusive easement to install the new electrical conduit. A TRE was obtained from the neighboring landowner for the duration of construction for a laydown yard and workspace.
10. Traffic Control: The Project Team closed the lanes on Magnolia Boulevard while excavating and backfilling the trench for the electrical conduit. One lane was kept open at all times.

MLV 20.7

1. Engineering Assessment: During the site evaluation, the Project Team confirmed the existing technology and verified the need to expand the existing station to accommodate the new equipment.
2. Valve Details: The existing valve is a manually actuated Class 600 ball valve, which was reused by the Project Team.
3. Actuator Details: The preexisting actuator was incompatible with PSEP linebreak technology. The Project Team installed a new actuator.
4. Customer Impact: The Project Team did not identify any anticipated service disruptions to customers from this project.
5. Community Impact: The Project Team closed portions of Monica Circle Boulevard during a portion of construction. One lane was kept open at all times.
6. Substructures: The Project Team did not identify any existing substructures that affected the design and engineering at this site.
7. Environmental: The Project Team did not anticipate environmental impact from this project. An environmental monitor performed routine site visits during construction.
8. Permit Restrictions: The Project Team obtained an encroachment permit from the City of Corona and a TRE from the United States Army Corps of Engineers. The Project Team also entered into a license agreement with the Army Corps of Engineers.
9. Land Use: The Project Team obtained a TRE from the Army Corps of Engineers.
10. Traffic Control: The Project Team anticipated traffic control involving two phases of single lane closure on Monica Circle.

Figure 6: Line 2000 Beaumont Riverside 2016 Valve Enhancement Project Bundle Schematic



D. Scope Changes

SoCalGas did not make any notable scope changes during detailed design.

III. CONSTRUCTION

A. Construction Contractor Selection

The Project Team prepared an initial cost estimate based on the preliminary design. Following completion of the engineering, design, and planning activities described above, the Project Team directed the Performance Partner (Mechanical Construction Contractor) and Alliance Partner (Electrical Contractor) to prepare cost estimates based on a more detailed engineering design package. As indicated above, there were no notable changes in scope between the time when the Project Team prepared the preliminary cost estimate and when the Performance Partner and Alliance Partner prepared and submitted their estimates.

1. SoCalGas' Preliminary Mechanical Construction Contractor Estimate *(confidential)*: SoCalGas' preliminary cost estimate for construction was [redacted].

2. Mechanical Construction Contractor's Target Price Estimate *(confidential)*: The Mechanical Construction Contractor's cost estimate was [redacted], which was [redacted] than SoCalGas' preliminary cost estimate for construction.

3. SoCalGas' Preliminary Electrical Contractor Estimate *(confidential)*: SoCalGas' preliminary cost estimate for the electrical contractor was [redacted].

4. Electrical Contractor's Estimate (*confidential*): The Electrical Contractor's estimate was [redacted], which was [redacted] than SoCalGas' preliminary cost estimate.

B. Construction Schedule

Table 3: Construction Timeline

MLV 16	
Construction Start Date	11/13/2018
Construction Completion Date	01/14/2019
Days on Site	26 days
Commissioning Date	06/20/2019
MLV 18	
Construction Start Date	07/24/2017
Construction Completion Date	08/30/2017
Days on Site	31 days
Commissioning Date	05/14/2018
MLV 19	
Construction Start Date	02/05/2018
Construction Completion Date	04/19/2018
Days on Site	46 days
Commissioning Date	07/30/2018
MLV 20.7	
Construction Start Date	06/19/2017
Construction Completion Date	09/12/2017
Days on Site	50 days
Commissioning Date	09/03/2019

The Project Team completed all construction activities as soon as practicable prior to commissioning. Finalization of commissioning activities is dependent on electrical utility connections, and system and/or resource availability.

C. Changes During Construction

SoCalGas successfully mitigated field conditions during construction in a manner that minimized potential impacts on project scope, cost, and schedule. As a result, these conditions did not result in any notable change orders.

Figure 7: MLV 16 – Site With Temporary Fencing

Figure 8: MLV 18 – New Linebreak Cabinet and Power Pole in New Fenced in Station

Figure 9: MLV 19 – Existing Actuator in New Fenced in Station

Figure 10: MLV 20.7 – New Actuator in Foreground, Trenching in Background

D. Commissioning and Site Restoration

Commissioning activities included site restoration, final inspections, and placement of the valve back into service. During this stage, SoCalGas successfully performed site acceptance testing and conducted point-to-point verification with Gas Control personnel for the newly-automated valves and transferred ownership of the new equipment to Field Operations. Closeout activities included development of final drawings, the reconciliation package, and updates to company recordkeeping systems to reflect the completed scope of work. The sites were commissioned on May 14, 2018, July 30, 2018, June 20, 2019, and September 3, 2019, as summarized in Table 3.

IV. PROJECT COSTS

A. Cost Avoidance Actions

SoCalGas exercised due diligence in the design, planning, and construction activities for this project to minimize or avoid costs when prudent to do so. As discussed above, the Project Team reviewed existing records, communicated with external stakeholders, and conducted a site walk to incorporate known site conditions in the project plan and design. Specific examples of cost avoidance actions taken on this project were:

1. Bundling of Projects: SoCalGas combined four sites into a single valve bundle to gain efficiencies in engineering, planning, and construction activities.
2. Future Maintenance: The Project Team installed gravel and a weed barrier at the MLV 18 and MLV 20.7 sites in order to minimize future maintenance costs.
3. Construction Execution: The Mechanical Construction Contractor utilized a prefabricated nitrogen test manifold at the MLV 18 and MLV 20.7 sites to save on testing costs.
4. Land Use: The Project Team retrofitted the preexisting linebreak cabinets at the MLV 16 site instead of ordering new electrical cabinets.

B. Cost Estimates

Based on the preliminary design, once the preliminary project scope was confirmed and engineering, design, and planning activities were underway, SoCalGas prepared an estimate of the Direct Costs of the Project in the amount of $5,026,210. The Project Team considered the conditions known at the time to prepare the preliminary Direct Cost estimate. This estimate reflects the projected Labor, Material, and Services costs anticipated to be incurred to execute the Project, based on initial design plans.

SoCalGas estimated Indirect Costs of the Project based on the estimated Direct Costs and other project-related variables.

C. Actual Direct and Indirect Costs

Actual Direct Costs reflect the Labor, Material, and Services costs incurred to execute the Project. Actual Indirect Costs reflect costs for incremental overhead loaders in accordance with Company overhead allocation policies. The total loaded cost of the Project is $5,943,664.

Table 4: Estimated and Actual Direct Costs and Variances[2]

Direct Costs ($)	Estimate	Actuals	Delta Over/(Under)
Company Labor	553,768	403,931	(149,837)
Materials	358,135	302,093	(56,042)
Mechanical Construction Contractor	1,307,266	1,312,428	5,162
Electrical Contractor	360,688	543,453	182,765
Construction Management & Support	157,446	297,238	139,792
Environmental	458,009	17,038	(440,971)
Engineering & Design	595,972	1,240,328	644,356
Project Management & Services	209,711	78,161	(131,550)
ROW & Permits	466,747	156,453	(310,294)
GMA	558,468	607,109	48,641
Total Direct Costs	**5,026,210**	**4,958,232**	**(67,978)**

Table 5: Estimated and Actual Indirect Costs, Total Costs, and Variances[3]

Indirect Costs/Total Costs ($)	Estimate	Actuals	Delta Over/(Under)
Overheads	676,932	681,691	4,759
AFUDC	477,877	265,465	(212,412)
Property Taxes	107,066	38,276	(68,790)
Total Indirect Costs	**1,261,875**	**985,432**	**(276,443)**
Total Direct Costs	**5,026,210**	**4,958,232**	**(67,978)**
Total Loaded Costs	**6,288,085**	**5,943,664**	**(344,421)**

[2] Values may not add to total due to rounding.
[3] Ibid.

The Actual Full-Time Equivalents[4] (FTEs) for this Project are 1.50.

D. Cost Impacts

Consistent with one of the overarching objectives of PSEP to maximize the cost effectiveness of safety enhancement investments, SoCalGas effectively planned, designed, and completed construction activities for this project. Each pipeline project is unique in scope and inherently complex due to a variety of factors including terrain, environmental and permitting constraints, scope changes during detailed design, material cost fluctuations, regulatory changes, and more. These complexities can lead to variances between initial estimates and actual costs. Consistent with prudent management at the time, the Project Team successfully mitigated these variances whenever feasible through the implementation of effective project management practices, thorough planning, and continuous monitoring.

At the completion of the Line 2000 Beaumont Riverside 2016 Valve Enhancement Project Bundle, Actual Direct Costs came within the AACE Class 3 Total Installed Cost (TIC) accuracy range, adhering to the standard industry practices defined by the Association for the Advancement of Cost Engineering (AACE) International. The Actual Direct Costs were less than the preliminary estimate by $67,978. This variance can be attributed to several factors including: the project estimate initially anticipated construction activities to take place within an environmentally sensitive location which included, but not limited to, costs associated with contaminated soil, asbestos abatement and hazardous material disposal, which during construction was less extensive or deemed unnecessary and the location was redefined; the engineering firms provided Project Management & Services

[4] Full-time equivalents (FTEs) are included in GRC forecasts to provide context to requested amounts for company labor. FTEs are calculated by measuring the number of hours charged over a given time period. For example, one FTE is equal to 40 hours per week, or typically 2,080 hours per year. The calculation of FTEs includes overtime hours. Therefore, if one employee works 60 hours per week, he or she would be recorded as 1.5 FTEs.

activities which were originally estimated under Project Management and Services, but were recognized in Engineering and Design.

V. CONCLUSION

SoCalGas enhanced the safety of its natural gas system by prudently executing the Line 2000 Beaumont Riverside 2016 Valve Enhancement Project Bundle. Through this Valve Enhancement Project, SoCalGas successfully automated four mainline valves to achieve the objective of enabling rapid system isolation of a portion of Line 2000 in the Cities of Corona, Moreno Valley and Riverside. The total loaded cost of the Project is $5,943,664.

SoCalGas executed this project prudently through designing and executing the project to support achievement of Valve Enhancement Plan isolation objectives, bundling seven projects together to capture efficiencies through coordinated engineering, and installing equipment necessary to bring power and communication capabilities to the sites to enable rapid system isolation of a portion of Line 2000 in the Cities of Riverside and Corona.

SoCalGas engaged in prudent cost avoidance efforts to complete this safety enhancement at a reasonable cost by carefully planning and coordinating engineering and construction activities to maximize efficiencies and reduce customer and community impacts, engaging in reasonable efforts to promote competitive and market based rates for contractor services and materials, and using a reasonable amount of company and contractor resources to complete this safety enhancement as soon as practicable.

End of Line 2000 Beaumont Riverside 2016 Valve Enhancement Project Bundle Final Report

I. LINE 4000 VALVE ENHANCEMENT PROJECT – CAMP ROCK ROAD

A. Background and Summary

The Line 4000 Valve Enhancement Project – Camp Rock Road consists of valve enhancements made to one existing mainline valve (MLV) located in San Bernardino County. Through this project, SoCalGas enhanced the safety of its natural gas transmission system by enabling the rapid detection of a significant change in pipeline pressure and remote isolation and depressurization of a portion of Line 4000 in the event of a pipeline rupture. SoCalGas expanded an existing facility, installed a new actuator, new power equipment, new communications equipment, new fencing, and the necessary automation equipment at the site. The total loaded project cost is $1,339,624.

The Line 4000 Valve Enhancement Project – Camp Rock Road construction site is within an existing SoCalGas facility in a desert environment in San Bernardino County. SoCalGas bundled this valve project with three additional valve projects, Line 4000 Valve Enhancement Project – Desert View Road, Devore Station, and Powerline Road to gain efficiencies in engineering, planning, and construction activities. This workpaper describes the construction activities and costs of the Line 4000 Valve Enhancement Project – Camp Rock Road.

Final Report for Line 4000 Valve Enhancement Project – Camp Rock Road

Table 1: General Project Information

Line 4000 Valve Enhancement Project – Camp Rock Road			
Location	San Bernardino County		
Days on Site	26 days		
Construction Start	01/29/2019		
Construction Finish	03/28/2019		
Commissioning Date	08/28/2019		
Valve Upgrades			
Valve Number	4000-11.03-0		
Valve Type	Existing – Ball		
Actuator	New		
Actuator Above-/Below-Grade	Above-Grade		
ASV	Yes		
RCV	Yes		
Camp Rock Road Site Upgrades			
Vault	None		
Power	New – Solar		
Communication	New – Radio		
SCADA Panel	New		
Equipment Shelter	New		
Fencing	Yes – Expanded		
Project Costs ($)	**Capital**	**O&M**	**Total**
Loaded Project Costs	1,339,624	-	1,339,624
Disallowed Costs	-	-	-

B. Maps and Images

Figure 1: Satellite Image of Line 4000 Valve Enhancement Project

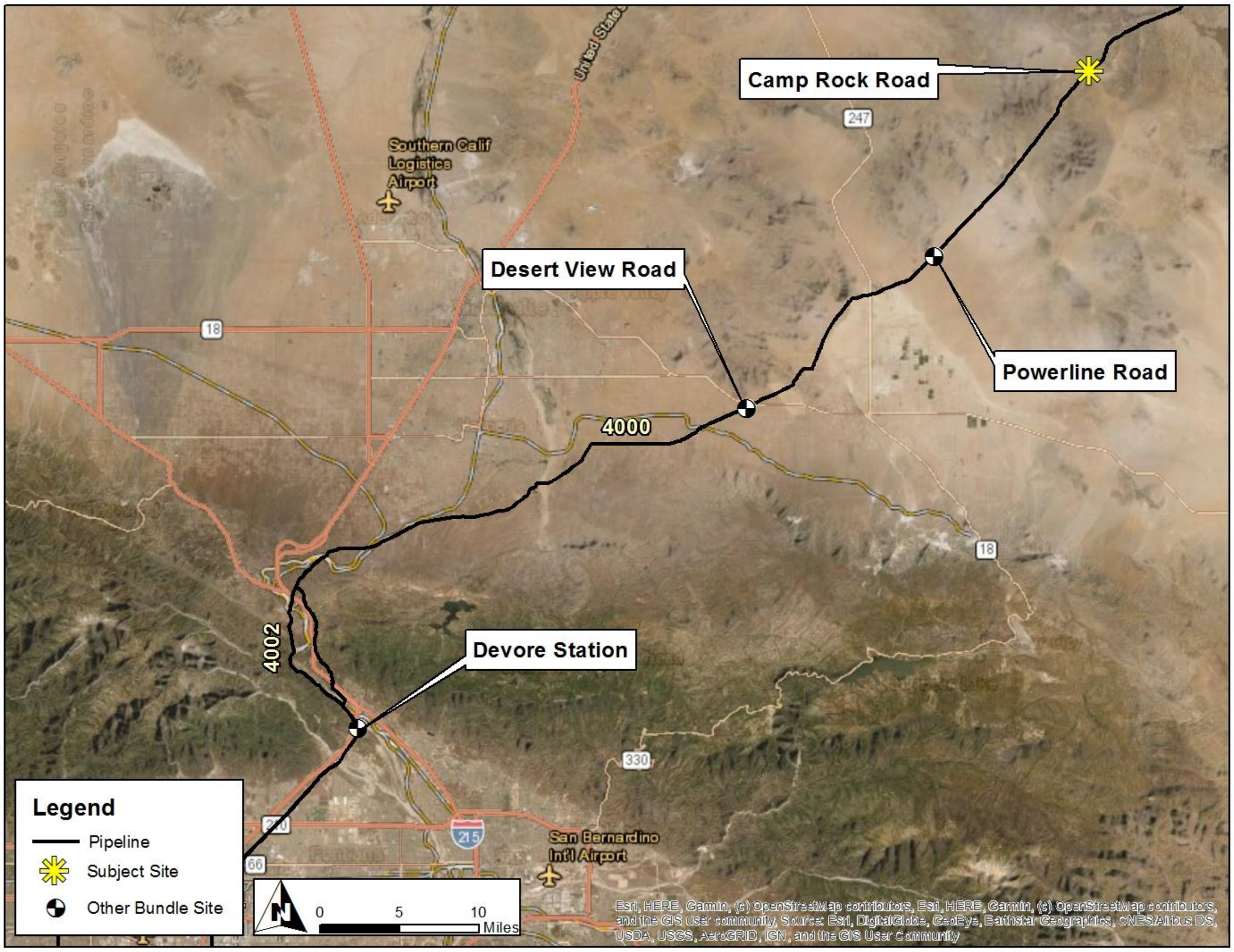


Figure 2: Satellite Image of Line 4000 Valve Enhancement Project – Camp Rock Road

II. ENGINEERING, DESIGN, AND PLANNING

A. Project Scope

SoCalGas and SDG&E presented a conceptual project scope in workpapers supporting the Valve Enhancement Plan in the 2011 filing.[1] This conceptual scope did not include this project. SoCalGas reviewed available information, performed a detailed system flow analysis, and identified this valve as a candidate for enhancement to provide the planned isolation. The final project scope is summarized in Table 2 below.

1. 2011 PSEP Filing: SoCalGas and SDG&E did not identify this valve for automation to achieve the objective of rapid system isolation.
2. Updated Scope: SoCalGas determined that the automation of MLV 4000-11.03-0 was necessary to enable rapid isolation, thereby achieving Valve Enhancement Plan objectives.
3. Engineering, Design, and Constructability: No notable engineering adjustments were required to the standard design.
4. Final Project Scope: The final project scope consists of the automation of one existing MLV, that included the installation of one new actuator, the installation of new fencing, the installation of power equipment, the installation of communications equipment, and the installation of the necessary automation equipment at the site.

Table 2: Final Project Scope

Final Project Scope					
Line	Mile	Valve #	Valve Size (*confidential*)	Installation Type	Function
4000	11.03	0	[redacted]	A/AG	ASV/RCV

[1] See Workpapers supporting Amended Pipeline Safety Enhancement Plan (PSEP) of SoCalGas and SDG&E, submitted on December 2, 2011, at WP-IX-2-14 through WP-IX-2-25 (A.11-11-002 Exh. SCG-32).

B. Site Evaluation and Planning

SoCalGas initiated the planning process for the Line 4000 Valve Enhancement Project – Camp Rock Road by performing a pre-design site walk to determine the existing conditions and assess any potential impact on the design. Key factors that influenced the engineering and design of this project are as follows:

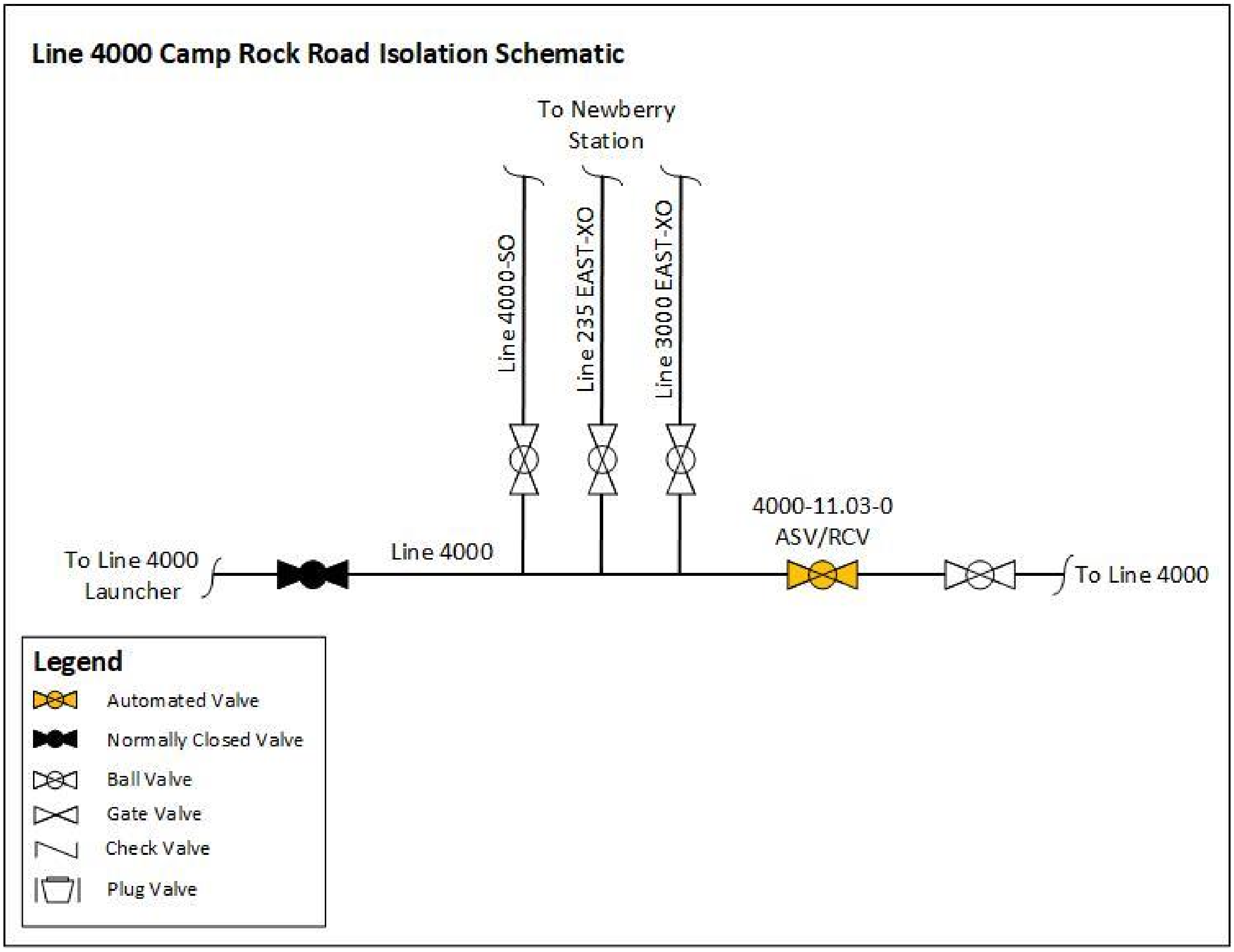
1. Site Description: The site is an existing SoCalGas facility in a desert environment in San Bernardino County.
2. Land Issues: During the site evaluation, the Project Team noted that the existing station would need to be expanded to accommodate the additional equipment. The Project Team also noted that this project is located on lands owned by the Bureau of Land Management (BLM).
3. DOT Class: This project is in a Class 1 location. SoCalGas selected this MLV for automation to isolate Class 1 High Consequence Areas (HCA) upstream and downstream of this valve. Additionally, there are active earthquake surface fault crossings upstream and downstream.
4. Power Source: There was no preexisting power equipment at this site. The Project Team installed new power equipment.
5. Communication Technology: There were no preexisting communications at this site. The Project Team installed new communications equipment.

C. Engineering, Design, and Planning Factors

SoCalGas reviewed drawings and records, contacted internal planning groups, communicated with external stakeholders, conducted survey activity of the area to identify the presence of underground utilities and substructures, and completed a site walk. Key factors that influenced the engineering and design of the Project are as follows:

1. Engineering Assessment: During the site evaluation, the Project Team confirmed the existing technology and verified the need to expand the existing station to accommodate the new equipment.
2. Valve Details: The existing valve was a manually operated Class 400 ball valve, which was reused by the Project Team.
3. Actuator Details: The preexisting actuator could not be automated. The Project Team installed a new actuator.
4. Customer Impact: The Project Team did not identify any anticipated service disruptions to customers.
5. Community Impact: The Project Team did not anticipate any notable impacts to the community during the project.
6. Substructures: The Project Team did not identify any existing substructures that affected the design and engineering at this site.
7. Environmental: The Project Team identified the potential for desert tortoises in the surrounding area The Project Team installed permanent desert tortoise fencing at the site.
8. Permit Restrictions: The Project Team obtained a permit from the Bureau of Land Management for this project site.
9. Land Use: The Project Team completed all work within the existing easement of the existing SoCalGas facility. The Project Team utilized the existing pipeline easement for the laydown yard.
10. Traffic Control: The Project Team did not identify any traffic control needs at the site.

Figure 3: Line 4000 Valve Enhancement Project Schematic – Camp Rock Road



D. Scope Changes

SoCalGas did not make any notable scope changes during detailed design.

III. CONSTRUCTION

A. Construction Contractor Selection

The Project Team prepared an initial cost estimate based on the preliminary design. Following completion of the engineering, design, and planning activities described above, the Project Team directed the Performance Partner (Mechanical Construction Contractor) and Alliance Partner (Electrical Contractor) to prepare cost estimates based on a more detailed engineering design package. As indicated above, there were no notable changes in scope between the time when the Project Team prepared the preliminary cost estimate and when the Performance Partner and Alliance Partner prepared and submitted their estimates.

1. SoCalGas' Preliminary Mechanical Construction Contractor Estimate *(confidential)*: SoCalGas' preliminary cost estimate for construction was [redacted].

2. Mechanical Construction Contractor's Target Price Estimate *(confidential)*: The Mechanical Construction Contractor's cost estimate was [redacted], which was [redacted] SoCalGas' preliminary cost estimate for construction.

3. SoCalGas Preliminary Electrical Contractor Estimate *(confidential)*: SoCalGas preliminary cost estimate for construction was [redacted].

4. Electrical Contractor's Estimate (*confidential*): The Electrical Contractor's estimate was [redacted], which was [redacted] to SoCalGas' preliminary cost estimate.

B. Construction Schedule

Table 3: Construction Timeline

Construction Start Date	01/29/2019
Construction Completion Date	03/28/2019
Days on Site	26 days
Commissioning Date	08/28/2019

The Project Team completed all construction activities as soon as practicable prior to commissioning. Finalization of commissioning activities is dependent on electrical utility connections, and system and/or resource availability.

C. Changes During Construction

SoCalGas successfully mitigated field conditions during construction in a manner that minimized potential impacts on project scope, cost, and schedule. As a result, these conditions did not result in any notable change orders.

Figure 3: New Mainline Valve Actuator

D. Commissioning and Site Restoration

Commissioning activities included site restoration, final inspections, and placement of the valve into service. During this stage, SoCalGas successfully performed site acceptance testing, and conducted point-to-point verification with SoCalGas Gas Control personnel for the newly-automated valve, and transferred ownership of the new equipment to Field Operations. Closeout activities included development of final drawings, the reconciliation package, and updates to company recordkeeping systems to reflect the completed scope of work. The site was commissioned on August 28, 2019, as summarized in Table 3.

IV. PROJECT COSTS

A. Cost Avoidance Actions

SoCalGas' exercised due diligence in the design, planning, and construction activities for this project to minimize or avoid costs when prudent to do so. As discussed above, the Project Team reviewed existing records, communicated with external stakeholders, and conducted a site walk to incorporate the site conditions in the project plan and design. The Project Team bundled this project with the Line 4000 Valve Enhancement Project – Desert View Road, Devore Station, and Powerline Road, to gain efficiencies in engineering, planning, and construction activities.

B. Cost Estimates

Based on the preliminary design, once the preliminary project scope was confirmed and engineering, design, and planning activities were underway, SoCalGas' prepared an estimate of the Direct Costs of the Project in the amount of $1,338,614. The Project Team considered the conditions known at the time to prepare the preliminary Direct Cost estimate. This estimate reflects the projected Labor, Material, and Services costs anticipated to be incurred to execute the Project, based on initial design plans.

SoCalGas' estimated Indirect Costs of the Project based on the estimated Direct Costs and other project-related variables.

C. Actual Direct and Indirect Costs

Actual Direct Costs reflect the Labor, Material, and Services costs incurred to execute the Project. Actual Indirect Costs reflect costs for incremental overhead loaders in accordance with Company overhead allocation policies. The total loaded cost of the Project is $1,339,624.

Table 4: Estimated and Actual Direct Costs and Variances[2]

Direct Costs ($)	Estimate	Actuals	Delta Over/(Under)
Company Labor	224,532	88,481	(136,052)
Materials	121,281	105,035	(16,246)
Mechanical Construction Contractor	272,578	292,881	20,303
Electrical Contractor	129,000	112,224	(16,776)
Construction Management & Support	59,911	96,233	36,322
Environmental	140,963	107,070	(33,893)
Engineering & Design	143,434	181,822	38,388
Project Management & Services	72,622	11,639	(60,983)
ROW & Permits	30,218	7,831	(22,387)
GMA	144,074	131,237	(12,837)
Total Direct Costs	**1,338,614**	**1,134,453**	**(204,161)**

Table 5: Estimated and Actual Indirect Costs, Total Costs, and Variances[3]

Indirect Costs/Total Costs ($)	Estimate	Actuals	Delta Over/(Under)
Overheads	322,392	162,099	(160,293)
AFUDC	190,796	37,399	(153,397)
Property Taxes	44,296	5,673	(38,623)
Total Indirect Costs	**557,484**	**205,171**	**(352,313)**
Total Direct Costs	**1,338,614**	**1,134,453**	**(204,161)**
Total Loaded Costs	**1,896,098**	**1,339,624**	**(556,474)**

The Actual Full-Time Equivalent[4] (FTE) for this Project is 0.38.

[2] Values may not add to total due to rounding.
[3] Ibid
[4] Full-time equivalents (FTEs) are included in GRC forecasts to provide context to requested amounts for company labor. FTEs are calculated by measuring the number of hours charged over a given time period. For example, one FTE is equal to 40 hours per week, or typically 2,080 hours per year. The calculation of FTEs includes overtime hours. Therefore, if one employee works 60 hours per week, he or she would be recorded as 1.5 FTEs.

D. Cost Impacts

Consistent with one of the overarching objectives of PSEP to maximize the cost effectiveness of safety enhancement investments, SoCalGas effectively planned, designed, and completed construction activities for this project. Each pipeline project is unique in scope and inherently complex due to a variety of factors including terrain, environmental and permitting constraints, scope changes during detailed design, material cost fluctuations, regulatory changes, and more. These complexities can lead to variances between initial estimates and actual costs. Consistent with prudent management at the time, the Project Team successfully mitigated these variances whenever feasible through the implementation of effective project management practices, thorough planning, and continuous monitoring.

At the completion of Line 4000 Valve Enhancement Project – Camp Rock Road, Actual Direct Costs came within the AACE Class 3 Total Installed Cost (TIC) accuracy range, adhering to the standard industry practices defined by the Association for the Advancement of Cost Engineering (AACE) International. The Actual Direct Costs were less than the preliminary estimate by $204,161. This variance can be attributed to several factors including: SoCalGas bundled this valve project with three additional valve projects to gain efficiencies in company labor, engineering, planning, and construction activities; the Engineering and Design firms completed activities originally identified as Project Management & Services in the initial estimate while the actual costs were recognized under Engineering & Design; activities associated with project abatement was anticipated in the initial project estimate, which during construction was determined to not be required; the project estimate initially anticipated Permit acquisition, but the Project Team was able to leverage an existing easement and did not require permits.

V. CONCLUSION

SoCalGas enhanced the safety of their integrated natural gas system by prudently executing the Line 4000 Valve Enhancement Project – Camp Rock Road. Through this Valve Enhancement Project, SoCalGas successfully automated one mainline valve to achieve the objective of enabling rapid system isolation to a portion of Line 4000 in San Bernardino County. The total loaded cost of the Project is $1,339,624.

SoCalGas executed this project prudently through designing and executing the project to support achievement of Valve Enhancement Plan isolation objectives, installing the necessary automation equipment, and installing equipment necessary to bring power and communication capabilities to the site to enable rapid system isolation of a portion of Line 4000 located in San Bernardino County .

SoCalGas engaged in prudent cost avoidance efforts to complete this safety enhancement at a reasonable cost by carefully planning and coordinating engineering and construction activities to maximize efficiencies and reduce customer and community impacts, engaging in reasonable efforts to promote competitive and market based rates for contractor services and materials, and using a reasonable amount of company and contractor resources to complete this safety enhancement as soon as practicable.

End of Line 4000 Valve Enhancement Project – Camp Rock Road Final Report

I. LINE 4000 VALVE ENHANCEMENT PROJECT – DESERT VIEW ROAD

A. Background and Summary

The Line 4000 Valve Enhancement Project Desert View Road consists of valve enhancements made to one existing mainline valve (MLV) located near the unincorporated community of Lucerne Valley. Through this project, SoCalGas enhanced the safety of its natural gas transmission system by enabling the rapid detection of a significant change in pipeline pressure and remote isolation and depressurization of a portion of Line 4000 in the event of a pipeline rupture. SoCalGas installed a new actuator, new power equipment, new communications equipment, a new wall, and the necessary automation equipment. The total loaded project cost is $1,952,674.

The Line 4000 Valve Enhancement Project – Desert View Road construction site is within an existing SoCalGas facility in a desert environment near the unincorporated community of the Lucerne Valley. SoCalGas bundled this valve project with three additional valve projects, Line 4000 Valve Enhancement Project – Camp Rock Road, Devore Station, and Powerline Road to gain efficiencies in engineering, planning, and construction activities. This workpaper describes the construction activities and costs of the Line 4000 Valve Enhancement Project – Desert View Road site.

Final Report for Line 4000 Valve Enhancement Project – Desert View Road

Table 1: General Project Information

Line 4000 Valve Enhancement Project – Desert View Road			
Location	San Bernardino County		
Days on Site	52 days		
Construction Start	10/08/2018		
Construction Finish	02/11/2019		
Commissioning Date	08/05/2019		
Valve Upgrades			
Valve Number	4000-36.93-0		
Valve Type	Existing – Ball		
Actuator	New		
Actuator Above-/Below-Grade	Above-Grade		
ASV	Yes		
RCV	Yes		
Site Upgrades			
Vault	None		
Power	New – Solar		
Communication	New – Radio		
SCADA Panel	New		
Equipment Shelter	New		
Wall	New		
Project Costs ($)	**Capital**	**O&M**	**Total**
Loaded Project Costs	1,952,674	-	1,952,674
Disallowed Costs			

B. Maps and Images

Figure 1: Line 4000 Bundle Overview

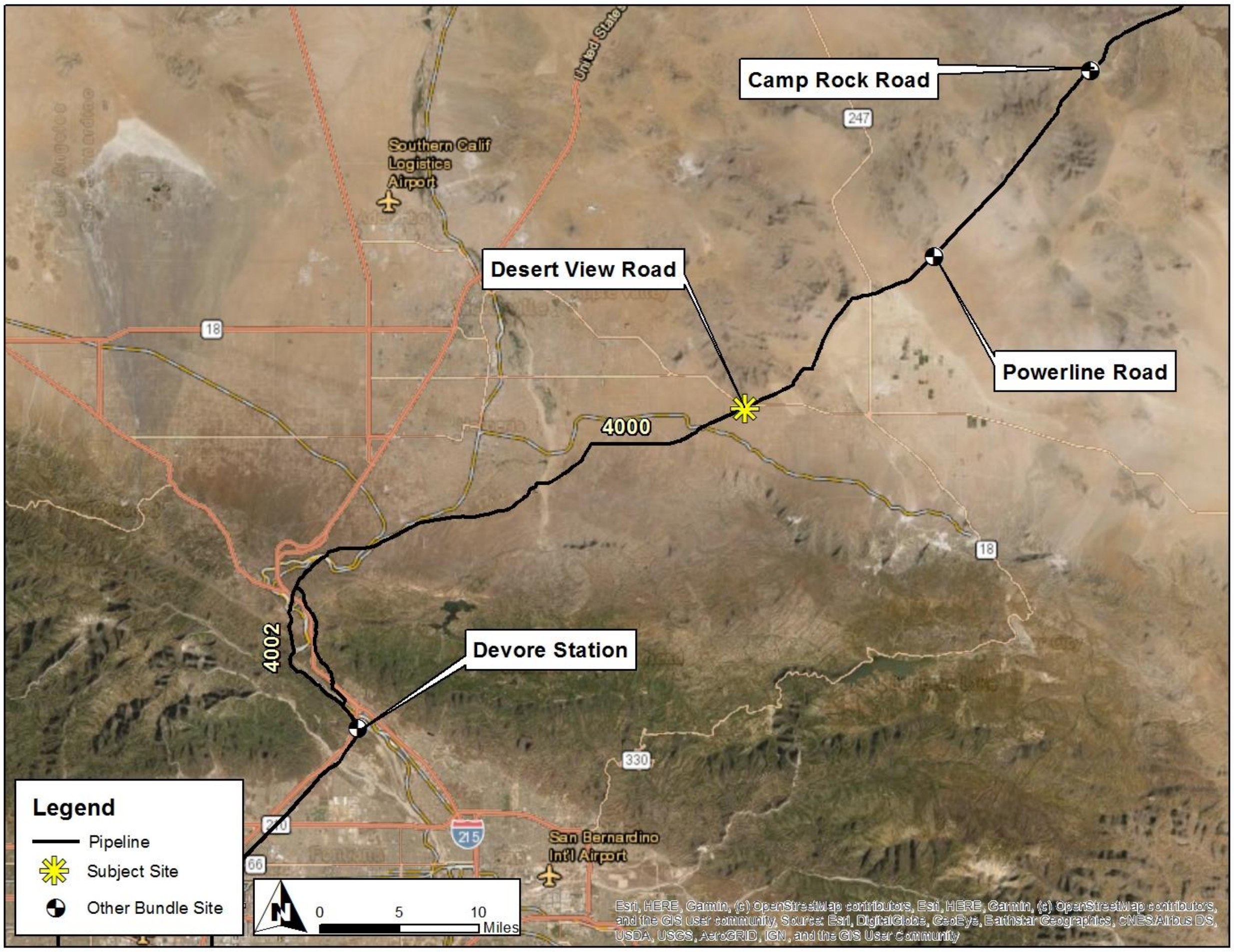


Figure 2: Satellite Image of Line 4000 Valve Enhancement Project – Desert View Road

II. ENGINEERING, DESIGN, AND PLANNING

A. Project Scope

SoCalGas and SDG&E presented a conceptual project scope 4000-36.93-0 in workpapers supporting the Valve Enhancement Plan in the 2011 filing.[1] This conceptual scope identified MLV 4000-36.93-0 for automation to enable remote isolation of a portion of Line 4000. Prior to initiating execution of the Project, SoCalGas reviewed available information, performed a detailed system flow analysis to validate the scope of the Project, and confirmed that this valve enhancement will provide the planned isolation. The final project scope is summarized in Table 2 below.

1. <u>2011 PSEP Filing:</u> SoCalGas and SDG&E identified MLV 4000-36.93-0 for automation to achieve the objective of rapid system isolation.
2. <u>Updated Scope:</u> Upon project initiation, SoCalGas reviewed the conceptual project scope and determined that this isolation point would enable rapid isolation, thereby achieving Valve Enhancement Plan objectives.
3. <u>Engineering, Design, and Constructability:</u> No notable engineering adjustments were required to the standard design.
4. <u>Final Project Scope:</u> The final project scope consists of the automation of one MLV, that included the installation of one new actuator, the installation of power equipment, the installation of communications equipment, and the installation of the necessary automation equipment at the site.

[1] *See* Workpapers supporting Amended Pipeline Safety Enhancement Plan (PSEP) of SoCalGas and SDG&E, submitted on December 2, 2011, at WP-IX-2-14 through WP-IX-2-25 (A.11-11-002 Exh. SCG-32).

Table 2: Final Project Scope

Final Project Scope					
Line	Mile	Valve #	Valve Size (*confidential*)	Installation Type	Function
4000	36.93	0	[redacted]	A/AG	ASV/RCV

B. Site Evaluation and Planning

SoCalGas initiated the planning process for the Line 4000 Valve Enhancement Project – Desert View Road by performing a pre-design site walk to determine the existing conditions and assess any potential impact on the design. Key factors that influenced the engineering and design of this project are as follows:

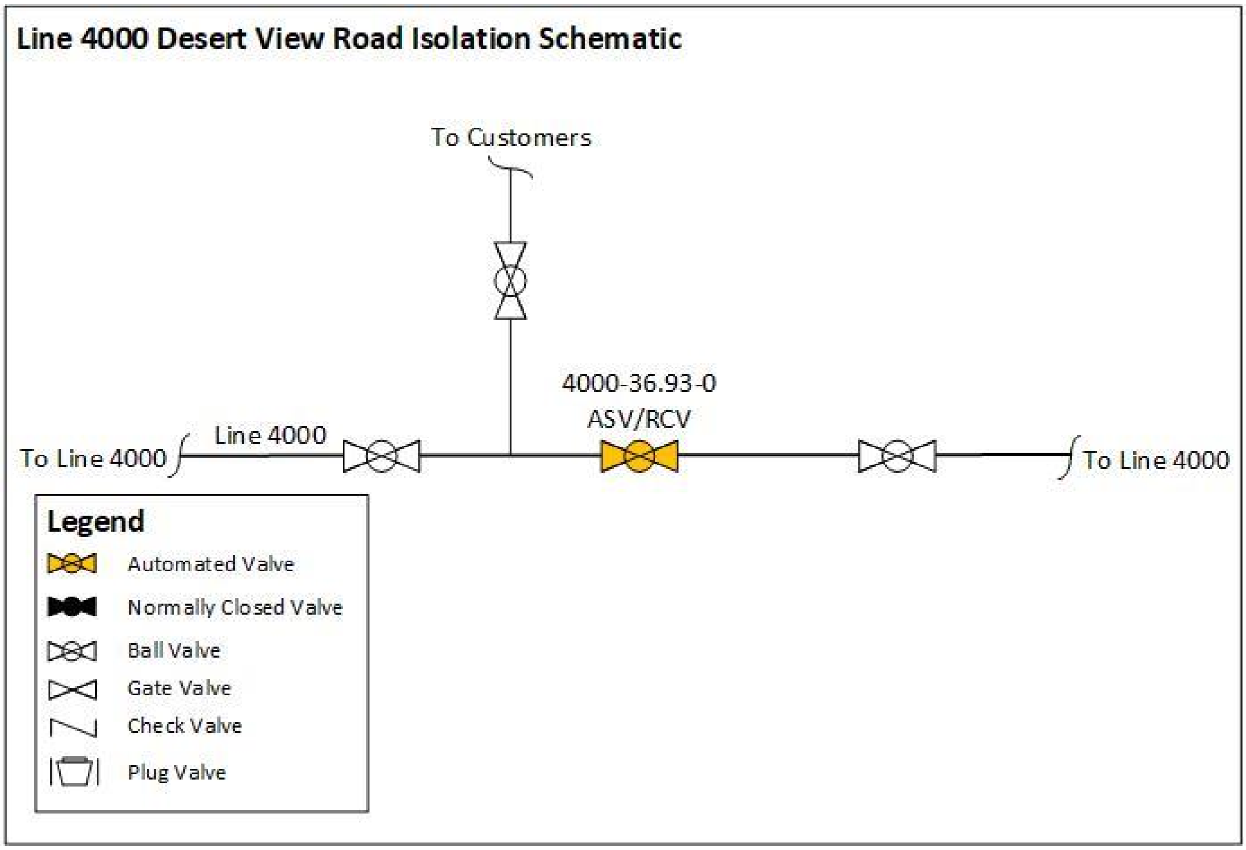
1. Site Description: The site is an existing SoCalGas facility in a desert environment west of the unincorporated community of Lucerne Valley.
2. Land Issues: During the site evaluation, the Project Team noted that the existing station would need to be expanded within the easement to accommodate the additional equipment. The Project Team also noted that this project is located on land owned by the Bureau of Land Management (BLM).
3. DOT Class: This project is in a Class 3 location.
4. Power Source: There was no preexisting power equipment at this site. The Project Team installed new power equipment.
5. Communication Technology: There was no preexisting communications equipment. The Project Team installed communications equipment at the site.

C. Engineering, Design, and Planning Factors

SoCalGas reviewed drawings and records, contacted internal planning groups, communicated with external stakeholders, conducted survey activity of the area to identify the presence of underground utilities and substructures, and completed a site walk. Key factors that influenced the engineering and design of the Project are as follows:

1. Engineering Assessment: During the site evaluation the Project Team confirmed the existing technology and verified the need to expand the existing station to accommodate the new equipment.
2. Valve Details: The existing valve was a manually operated Class 400 ball valve, which was reused by the Project Team.
3. Actuator Details: The preexisting actuator was incompatible with PSEP communications technology, so the Project Team installed a new actuator.
4. Customer Impact: The Project Team did not identify any anticipated service disruptions to customers.
5. Community Impact: The Project Team did not anticipate any notable impact to the community from this Project.
6. Substructures: The Project Team did not identify any existing substructures that affected the design and engineering at this site.
7. Environmental: The Project Team did not identify any notable environmental concerns at the site. An environmental monitor performed routine site visits during construction.
8. Permit Restrictions: There were no special permits or permit restrictions for this project site.
9. Land Use: The Project Team expanded the existing facility to accommodate the new automation equipment.
10. Traffic Control: The Project Team did not identify any traffic control needs at the site.

Figure 3: L4000 Valve Enhancement Project Schematic – Desert View Road



D. Scope Changes

SoCalGas did not make any notable scope changes during detailed design.

III. CONSTRUCTION

A. Construction Contractor Selection

The Project Team prepared an initial cost estimate based on the preliminary design. Following completion of the engineering, design, and planning activities described above, the Project Team directed the Performance Partner (Mechanical Construction Contractor) and Alliance Partner (Electrical Contractor) to prepare cost estimates based on a more detailed engineering design package. As indicated above, there were no notable changes in scope between the time when the Project Team prepared the preliminary cost estimate and when the Performance Partner and Alliance Partner prepared and submitted their estimates.

1. <u>SoCalGas' Preliminary Mechanical Construction Contractor Estimate *(confidential)*:</u> SoCalGas' preliminary cost estimate for construction was [redacted]

2. <u>Mechanical Construction Contractor's Target Price Estimate *(confidential)*:</u> The Mechanical Construction Contractor's cost estimate was [redacted], which was [redacted] than SoCalGas' preliminary cost estimate for construction.

3. <u>SoCalGas' Preliminary Electrical Contractor Estimate *(confidential)*:</u> SoCalGas' preliminary cost estimate for construction was [redacted]

4. <u>Electrical Contractor's Estimate (*confidential*):</u> The Electrical Contractor's estimate was [redacted], which was [redacted] than SoCalGas' preliminary cost estimate.

B. Construction Schedule

Table 3: Construction Timeline

Construction Start Date	10/08/2018
Construction Completion Date	02/11/2019
Days on Site	52 days
Commissioning Date	08/05/2019

The Project Team completed all construction activities as soon as practicable prior to commissioning. Finalization of commissioning activities is dependent on electrical utility connections, and system and/or resource availability.

C. Changes During Construction

SoCalGas successfully mitigated field conditions during construction in a manner that minimized potential impacts on project scope, cost, and schedule. As a result, these conditions did not result in any notable change orders.

Figure 4: New Actuator

D. Commissioning and Site Restoration

Commissioning activities included site restoration, final inspections, and placement of the valve into service. During this stage, SoCalGas successfully performed site acceptance testing, and conducted point-to-point verification with SoCalGas Gas Control personnel for the newly-automated valve, and transferred ownership of the new equipment to Field Operations. Closeout activities included development of final drawings, the reconciliation package, and updates to company recordkeeping systems to reflect the completed scope of work. The site was commissioned on August 5, 2019, as summarized in Table 3.

IV. PROJECT COSTS

A. Cost Avoidance Actions

SoCalGas exercised due diligence in the design, planning, and construction activities for this project to minimize or avoid costs when prudent to do so. As discussed above, the Project Team reviewed existing records, communicated with external stakeholders, and conducted a site walk to incorporate the site conditions in the project plan and design. SoCalGas bundled this valve project with three additional valve projects, Line 4000 Valve Enhancement Project – Camp Rock Road, Devore Station, and Powerline Road to gain efficiencies in engineering, planning, and construction activities.

B. Cost Estimates

Based on the preliminary design, once the preliminary project scope was confirmed and engineering, design, and planning activities were underway, SoCalGas prepared an estimate of the Direct Costs of the Project in the amount of $1,988,945. The Project Team considered the conditions known at the time to prepare the preliminary Direct Cost estimate. This estimate reflects the projected Labor, Material, and Services costs anticipated to be incurred to execute the Project, based on initial design plans.

SoCalGas estimated Indirect Costs of the Project based on the estimated Direct Costs and other project-related variables.

C. Actual Direct and Indirect Costs

Actual Direct Costs reflect the Labor, Material, and Services costs incurred to execute the Project. Actual Indirect Costs reflect costs for incremental overhead loaders in accordance with Company overhead allocation policies. The total loaded cost of the Project is $1,952,674.

Table 4: Estimated and Actual Direct Costs and Variances[2]

Direct Costs ($)	Estimate	Actuals	Delta Over/(Under)
Company Labor	261,146	106,450	(154,696)
Materials	122,295	103,468	(18,827)
Mechanical Construction Contractor	818,039	725,255	(92,784)
Electrical Contractor	149,006	97,111	(51,895)
Construction Management & Support	57,963	110,795	52,832
Environmental	108,545	100,811	(7,734)
Engineering & Design	175,135	221,926	46,791
Project Management & Services	50,273	9,904	(40,369)
ROW & Permits	29,116	16,811	(12,305)
GMA	217,427	193,333	(24,094)
Total Direct Costs	**1,988,945**	**1,685,862**	**(303,083)**

Table 5: Estimated and Actual Indirect Costs, Total Costs, and Variances[3]

Indirect Costs/Total Costs ($)	Estimate	Actuals	Delta Over/(Under)
Overheads	389,710	210,837	(178,873)
AFUDC	274,943	46,967	(227,976)
Property Taxes	63,833	9,008	(54,825)
Total Indirect Costs	**728,486**	**266,812**	**(461,674)**
Total Direct Costs	**1,988,945**	**1,685,862**	**(303,083)**
Total Loaded Costs	**2,717,431**	**1,952,674**	**(764,757)**

The Actual Full-Time Equivalents[4] (FTEs) for this Project are 0.52.

[2] Values may not add to total due to rounding.
[3] Ibid.
[4] Full-time equivalents (FTEs) are included in GRC forecasts to provide context to requested amounts for company labor. FTEs are calculated by measuring the number of hours charged over a given time period. For example, one FTE is equal to 40 hours per week, or typically 2,080 hours per year. The calculation of FTEs includes overtime hours. Therefore, if one employee works 60 hours per week, he or she would be recorded as 1.5 FTEs.

D. Cost Impacts

Consistent with one of the overarching objectives of PSEP to maximize the cost effectiveness of safety enhancement investments, SoCalGas effectively planned, designed, and completed construction activities for this project. Each pipeline project is unique in scope and inherently complex due to a variety of factors including terrain, environmental and permitting constraints, scope changes during detailed design, material cost fluctuations, regulatory changes, and more. These complexities can lead to variances between initial estimates and actual costs. Consistent with prudent management at the time, the Project Team successfully mitigated these variances whenever feasible through the implementation of effective project management practices, thorough planning, and continuous monitoring.

At the completion of the Line 4000 Valve Enhancement Project Desert View Road, Actual Direct Costs came within the AACE Class 3 Total Installed Cost (TIC) accuracy range, adhering to the standard industry practices defined by the Association for the Advancement of Cost Engineering (AACE) International. The Actual Direct Costs were less than the preliminary estimate by $303,083. This variance can be attributed to several factors including: SoCalGas bundled this valve project with three additional valve projects, Line 4000 Valve Enhancement Project – Camp Rock Road, Devore Station, and Powerline Road, to gain efficiencies in engineering, planning, and construction activities; the project estimate anticipated company labor support for the engineering activities, but it was supported by a third-party engineering firm; the Engineering and Design firms completed activities originally identified as Project Management & Services in the initial estimate while the actual costs were recognized under Engineering & Design; and a portion of the materials used by the electrical contractor were included under Materials while the actual costs were recognized under the Electrical Contractor.

V. CONCLUSION

SoCalGas enhanced the safety of their integrated natural gas system by prudently executing the Line 4000 Valve Enhancement Project – Desert View Road. Through this Valve Enhancement Project, SoCalGas successfully automated one mainline valve to achieve the objective of enabling rapid system isolation to a portion of Line 4000 near the unincorporated community of Lucerne Valley. The total loaded cost of the Project is $1,952,674.

SoCalGas executed this project prudently through designing and executing the project to support achievement of Valve Enhancement Plan isolation objectives, expanding the existing site to accommodate the new equipment, installing the necessary automation equipment, and installing equipment necessary to bring power and communication capabilities to the site to enable rapid system isolation of a portion of Line 4000 located in an unincorporated community near the Lucerne Valley.

SoCalGas engaged in prudent cost avoidance efforts to complete this safety enhancement at a reasonable cost by carefully planning and coordinating engineering and construction activities to maximize efficiencies and reduce customer and community impacts, engaging in reasonable efforts to promote competitive and market based rates for contractor services and materials, and using a reasonable amount of company and contractor resources to complete this safety enhancement as soon as practicable.

End of Line 4000 Valve Enhancement Project – Desert View Road Final Report

I. LINE 4000 VALVE ENHANCEMENT PROJECT – DEVORE STATION

A. Background and Summary

The Line 4000 Valve Enhancement Project – Devore Station consists of valve enhancements made to two mainline valves (MLVs) located in an unincorporated area of San Bernardino County. Through this project, SoCalGas enhanced the safety of its natural gas transmission system by enabling the rapid detection of a significant change in pipeline pressure and remote isolation and depressurization of a portion of Lines 4000 and 4002 in the event of a pipeline rupture. SoCalGas installed a new shelter, new fencing, new communications equipment, and the necessary automation equipment at the site. The total loaded project cost is $1,547,927.

The Line 4000 Valve Enhancement Project – Devore Station construction site is within an existing SoCalGas facility in an unincorporated area of San Bernardino County. There are some residential and commercial buildings nearby. SoCalGas bundled this valve project with three additional valve projects, Line 4000 Valve Enhancement Project – Camp Rock Road, Desert View Road, and Powerline Road to gain efficiencies in engineering, planning, and construction activities. This workpaper describes the construction activities and costs of the Line 4000 Valve Enhancement Project – Devore Station site.

Final Report for Line 4000 Valve Enhancement Project – Devore Station

Table 1: General Project Information

Line 4000 Valve Enhancement Project – Devore Station			
Location	Count of San Bernardino		
Days on Site	42 days		
Construction Start	09/17/2018		
Construction Finish	12/18/2018		
Commissioning Date	09/09/2019		
Valve Upgrades			
Valve Number	4000-72.70-0		
Valve Type	Existing – Ball		
Actuator	Existing		
Actuator Above-/Below-Grade	Above-Grade		
ASV	Yes		
RCV	Yes		
Valve Number	4002-72.70-0		
Valve Type	Existing – Ball		
Actuator	Existing		
Actuator Above-/Below-Grade	Above-Grade		
ASV	Yes		
RCV	Yes		
Devore Station Site Upgrades			
Vault	Existing		
Power	Existing – Utility		
Communication	New – VSAT		
SCADA Panel	New		
Equipment Shelter	New		
Fencing	Expanded		
Project Costs ($)	**Capital**	**O&M**	**Total**
Loaded Project Costs	1,547,927	-	1,547,927
Disallowed Costs	-	-	-

B. Maps and Images

Figure 1: Line 4000 Bundle Overview

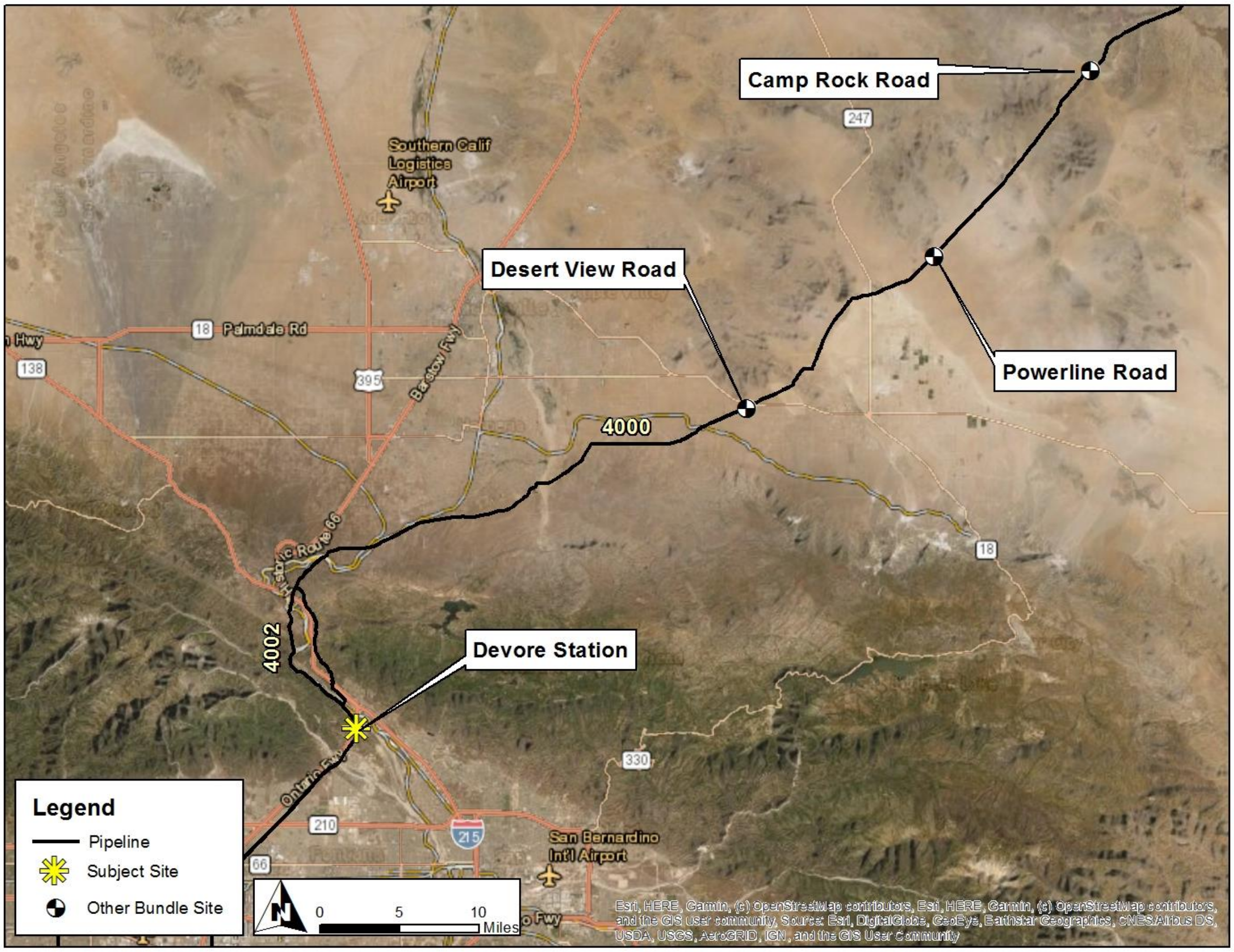


Figure 2: Satellite Image of Line 4000 Valve Enhancement Project – Devore Station Enlarged

II. ENGINEERING, DESIGN, AND PLANNING

A. Project Scope

SoCalGas and SDG&E presented conceptual project scope for the Line 4000 Valve Enhancement Project – Devore Station in workpapers supporting the Valve Enhancement Plan in the 2011 filing.[1] These conceptual scopes identified MLV-4000-72.70-0 and MLV-4002-72.70-0 for automation to enable remote isolation to a portion of Lines 4000 and 4002. Prior to initiating execution of the Project, SoCalGas reviewed available information and performed a detailed system flow analysis to validate the scope of the Project and confirmed that these valve enhancements will provide the planned isolation. The final project scope is summarized in Table 2 below.

1. <u>2011 PSEP Filing:</u> SoCalGas identified MLVs 4000-72.70-0 and 4002-72.70-0 for automation to achieve the objective of rapid system isolation.
2. <u>Updated Scope:</u> Upon project initiation, SoCalGas reviewed the conceptual project scope and determined that these isolation points would achieve the transmission isolation objectives set forth in the Valve Enhancement Plan.
3. <u>Engineering, Design, and Constructability:</u> No notable engineering adjustments were required to the standard design.
4. <u>Final Project Scope:</u> The final project scope consists of the automation of two MLVs, the installation of a new shelter, the installation of communications equipment, and the installation of the necessary automation equipment at the site.

[1] *See* Workpapers supporting Amended Pipeline Safety Enhancement Plan (PSEP) of SoCalGas and SDG&E, submitted on December 2, 2011, at WP-IX-2-14 through WP-IX-2-25 (A.11-11-002 Exh. SCG-32).

Table 2: Final Project Scope

Final Project Scope					
Line	Mile	Valve #	Valve Size (*confidential*)	Installation Type	Function
4000	72.70	0	[redacted]	C/P	ASV/RCV
4002	72.70	0	[redacted]	C/P	ASV/RCV

B. Site Evaluation and Planning

SoCalGas initiated the planning process for the Line 4000 Valve Enhancement Project – Devore Station by performing a pre-design site walk to determine the existing conditions and assess any potential impact on the design. Key factors that influenced the engineering and design of this project are as follows:

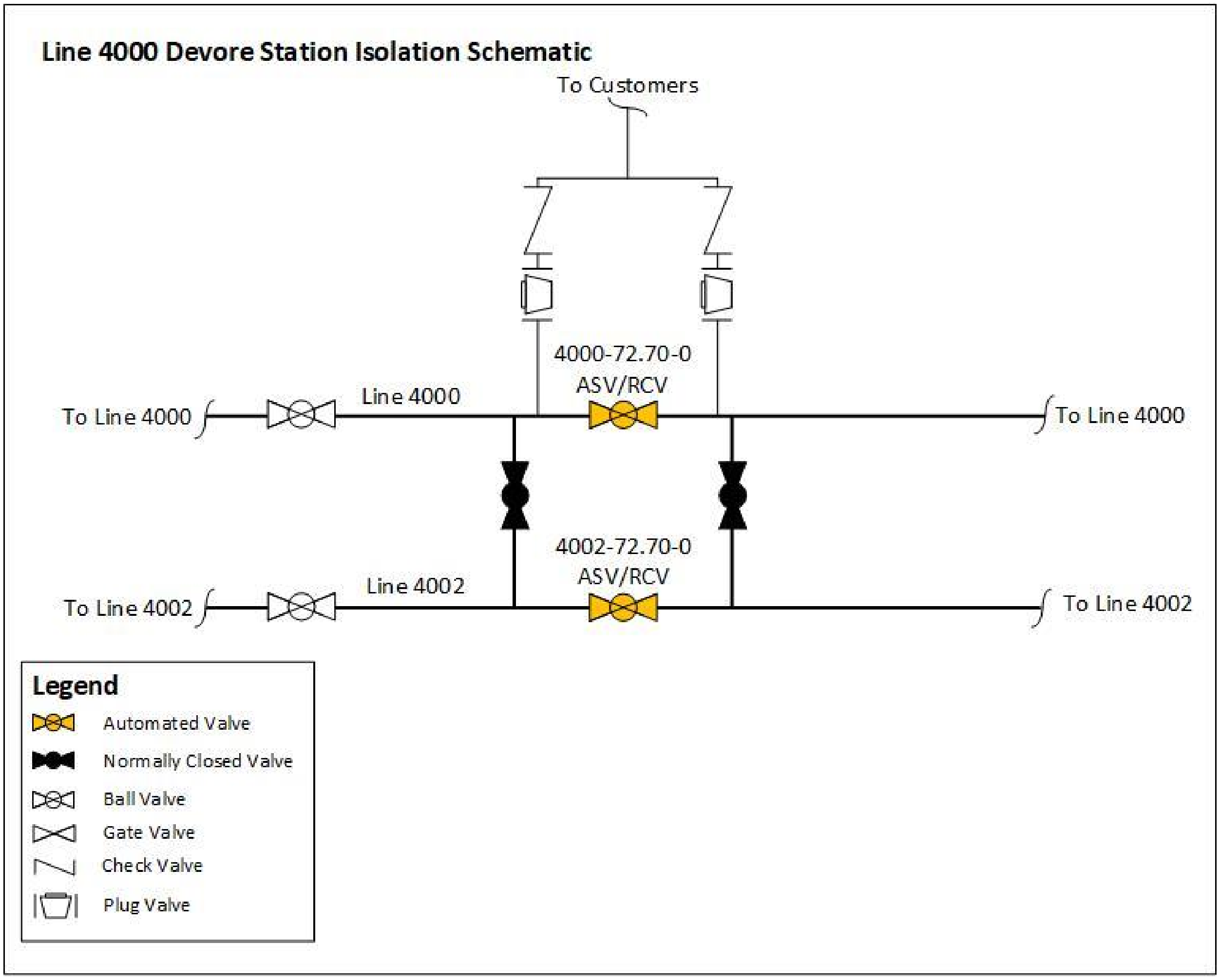
1. <u>Site Description:</u> The site is an existing SoCalGas facility in an unincorporated area of San Bernardino County. There are some residential and commercial buildings nearby.
2. <u>Land Issues:</u> During the pre-design site walk, the Project Team noted that the existing facility can accommodate the new equipment.
3. <u>DOT Class:</u> This project is in a Class 3 location.
4. <u>Power Source:</u> The site had existing utility power.
5. <u>Communication Technology</u>: There was no preexisting communications equipment. The Project Team installed new communications equipment.

C. Engineering, Design, and Planning Factors

SoCalGas reviewed drawings and records, contacted internal planning groups, communicated with external stakeholders, and completed a site walk. Key factors that influenced the engineering and design of the Project are as follows:

1. Engineering Assessment: During the site evaluation, the Project Team confirmed the existing technology and determined that all work will be performed within the existing facility.
2. Valve Details:
   a. 4000-72.70-0: The existing MLV was a manually actuated Class 600 ball valve, which was reused by the Project Team.
   b. 4002-72.70-0: The existing MLV was a manually actuated Class 600 ball valve, which was reused by the Project Team.
3. Actuator Details:
   a. 4000-72.70-0: The existing actuator was a double-acting pneumatic actuator, which was reused by the Project Team
   b. 4002-72.70-0: The existing actuator was a double-acting pneumatic actuator, which was reused by the project team.
4. Customer Impact: The Project Team did not identify any anticipated service disruptions to customers.
5. Community Impact: The Project Team did not anticipate any notable impacts to the community during the project.
6. Substructures: The Project Team did not identify any existing substructures that affected the design and engineering at this site.
7. Environmental: The Project Team did not identify any notable environmental concerns at the site. An environmental monitor performed routine site visits during construction.
8. Permit Restrictions: There were no special permits or permit restrictions for this project.
9. Land Use: All work was completed in the existing SoCalGas facility.
10. Traffic Control: The Project Team did not identify any traffic control needs at the site.

Figure 2: Line 4000 Valve Enhancement Project – Devore Station Schematic



D. Scope Changes

Through engineering, design, and planning activities, SoCalGas determined that changes in scope were appropriate to enhance the design of the Project and address engineering factors. As a result, the preliminary cost estimate does not fully reflect the final scope. The Operating District planned on replacing MLV 4000-72.70-0, the Project Team determined that a new actuator would be necessary to automate the new MLV. After creation of the preliminary estimate but prior to construction, the Operating District determined that MLV 4000-72.70-0 did not need to be replaced. The Project Team determined that the existing actuator was sufficient and that the purchase and installation of a new actuator was no longer necessary.

III. CONSTRUCTION

A. Construction Contractor Selection

The Project Team prepared an initial cost estimate based on the preliminary design. Following completion of the engineering, design, and planning activities described above, the Project Team directed the Performance Partner (Mechanical Construction Contractor) and Alliance Partner (Electrical Contractor) to prepare cost estimates based on a more detailed engineering design package, which included the updated design described in the discussion of notable changes in scope above.

1. <u>SoCalGas' Preliminary Mechanical Construction Contractor Estimate *(confidential)*:</u> SoCalGas' preliminary cost estimate for construction was [redacted].

2. <u>Mechanical Construction Contractor's Target Price Estimate *(confidential)*:</u> The Mechanical Construction Contractor's cost estimate was [redacted], which was [redacted] than SoCalGas' preliminary cost estimate for construction.

3. <u>SoCalGas' Preliminary Electrical Contractor Estimate *(confidential)*:</u> SoCalGas' preliminary cost estimate for construction was [redacted].

4. <u>Electrical Contractor's Estimate *(confidential)*:</u> The Electrical Contractor's estimate was [redacted], which was [redacted] than SoCalGas' preliminary cost estimate.

B. Construction Schedule

Table 3: Construction Timeline

Construction Start Date	09/17/2018
Construction Completion Date	12/18/2018
Days on Site	42 days
Commissioning Date	09/09/2019

The Project Team completed all construction activities as soon as practicable prior to commissioning. Finalization of commissioning activities is dependent on electrical utility and communications connections, and system and/or resource availability.

C. Changes During Construction

The conditions summarized below were encountered during construction. Activities to address or mitigate these conditions resulted in approximately $68,000 in change orders.

1. Constructability: The Project Team requested the contractor to remove all existing 1-inch rock inside the valve station and replace it with a mixture of crushed rock.
2. Field Design Change: The Project Team requested the Mechanical Construction Contractor install a platform around the actuator on MLV 4002-72-40-0.

Figure 3: Existing Mainline Valve 4002-72.70-0 With Actuator

D. Commissioning and Site Restoration

Commissioning activities included site restoration, final inspections, and placement of the valves into service. During this stage, SoCalGas successfully performed site acceptance testing, and conducted point-to-point verification with SoCalGas Gas Control personnel for the newly automated valves, and transferred ownership of the new equipment to Field Operations. Closeout activities included development of final drawings, the reconciliation package, and updates to company recordkeeping systems to reflect the completed scope of work. The site was commissioned on September 9, 2019, as summarized in Table 3.

IV. PROJECT COSTS

A. Cost Avoidance Actions

SoCalGas exercised due diligence in the design, planning, and construction activities for this project to minimize or avoid costs when prudent to do so. As discussed above, the Project Team reviewed existing records, communicated with external stakeholders, and conducted a site walk to incorporate the site conditions in the project plan and design. SoCalGas bundled this valve project with three additional valve projects, Line 4000 Valve Enhancement Project – Camp Rock Road, Desert View Road, and Powerline Road to gain efficiencies in engineering, planning, and construction activities.

B. Cost Estimates

Based on the preliminary design, once the preliminary project scope was confirmed and engineering, design, and planning activities were underway, SoCalGas prepared an estimate of the Direct Costs of the Project in the amount of $1,015,658. The Project Team considered the conditions known at the time to prepare the preliminary Direct Cost estimate. This estimate reflects the projected Labor, Material, and Services costs anticipated to be incurred to execute the Project, based on initial design plans.

SoCalGas estimated Indirect Costs of the Project based on the estimated Direct Costs and other project-related variables.

C. Actual Direct and Indirect Costs

Actual Direct Costs reflect the Labor, Material, and Services costs incurred to execute the Project. Actual Indirect Costs reflect costs for incremental overhead loaders in accordance with Company overhead allocation policies. The total loaded cost of the Project is $1,547,927.

Table 4: Estimated and Actual Direct Costs and Variances[2]

Direct Costs ($)	Estimate	Actuals	Delta Over/(Under)
Company Labor	127,097	120,819	(6,278)
Materials	176,862	107,214	(69,648)
Mechanical Construction Contractor	329,110	412,745	83,635
Electrical Contractor	78,241	126,692	48,451
Construction Management & Support	49,477	96,760	47,283
Environmental	14,138	35,448	21,310
Engineering & Design	62,158	210,572	148,414
Project Management & Services	68,287	17,563	(50,724)
ROW & Permits	616	2,116	1,500
GMA	109,671	160,031	50,360
Total Direct Costs	**1,015,658**	**1,289,961**	**274,303**

Table 5: Estimated and Actual Indirect Costs, Total Costs, and Variances[3]

Indirect Costs/Total Costs ($)	Estimate	Actuals	Delta Over/(Under)
Overheads	191,838	200,881	9,043
AFUDC	122,322	49,318	(73,005)
Property Taxes	28,564	7,768	(20,796)
Total Indirect Costs	**342,724**	**257,966**	**(84,758)**
Total Direct Costs	**1,015,658**	**1,289,961**	**274,303**
Total Loaded Costs	**1,358,382**	**1,547,927**	**189,544**

The Actual Full-Time Equivalent[4] (FTE) for this Project is 0.58.

[2] Values may not add to total due to rounding.
[3] Ibid.
[4] Full-time equivalents (FTEs) are included in GRC forecasts to provide context to requested amounts for company labor. FTEs are calculated by measuring the number of hours charged over a given time period. For example, one FTE is equal to 40 hours per week, or typically 2,080 hours per year. The calculation of FTEs includes overtime hours. Therefore, if one employee works 60 hours per week, he or she would be recorded as 1.5 FTEs.

D. Cost Impacts

Consistent with one of the overarching objectives of PSEP to maximize the cost effectiveness of safety enhancement investments, SoCalGas effectively planned, designed, and completed construction activities for this project. Each pipeline project is unique in scope and inherently complex due to a variety of factors including terrain, environmental and permitting constraints, scope changes during detailed design, material cost fluctuations, regulatory changes, and more. These complexities can lead to variances between initial estimates and actual costs. Consistent with prudent management at the time, the Project Team successfully mitigated these variances whenever feasible through the implementation of effective project management practices, thorough planning, and continuous monitoring.

At the completion of the Line 4000 Valve Enhancement Project, Actual Direct Costs came within the AACE Class 3 Total Installed Cost (TIC) accuracy range, adhering to the standard industry practices defined by the Association for the Advancement of Cost Engineering (AACE) International. The Actual Direct Costs were more than the preliminary estimate by $274,303. This variance can be attributed to several factors including: additional Mechanical Construction Contractor support was required to remove and replace valve station rock base as well as install a platform around the actuator on a MLV to increase the safety of the site; the project initially anticipated coordination and cost sharing between District Operations, however when the existing valve was repaired and not replaced, the new actuator was no longer necessary, resulting in the project being entirely PSEP; and engineering firms provided Project Management & Services activities which were originally estimated under Project Management and Services, however were recognized in Engineering and Design.

V. CONCLUSION

SoCalGas enhanced the safety of their integrated natural gas system by prudently executing the Line 4000 Valve Enhancement Project – Devore Station. Through this Valve Enhancement Project, SoCalGas successfully automated two mainline valves to achieve the objective of enabling rapid system isolation to a portion of Lines 4000 and 4002 in an unincorporated area of San Bernardino County. The total loaded cost of the Project is $1,547,927.

SoCalGas executed this project prudently through designing and executing the project to support achievement of Valve Enhancement Plan isolation objectives, installing the necessary automation equipment, and installing equipment to bring communication capabilities to the site to enable rapid system isolation of a portion of Lines 4000 and 4002 located in an unincorporated area of San Bernardino County.

SoCalGas engaged in prudent cost avoidance efforts to complete this safety enhancement at a reasonable cost by carefully planning and coordinating engineering and construction activities to maximize efficiencies and reduce customer and community impacts, engaging in reasonable efforts to promote competitive and market based rates for contractor services and materials, and using a reasonable amount of company and contractor resources to complete this safety enhancement as soon as practicable.

End of Line 4000 Valve Enhancement Project – Devore Station Final Report

I. LINE 4000 VALVE ENHANCEMENT PROJECT – POWERLINE ROAD

A. Background and Summary

The Line 4000 Valve Enhancement Project – Powerline Road consists of valve enhancements made to one existing mainline valve (MLV) located in the unincorporated community of the Lucerne Valley in San Bernardino County. Through this project, SoCalGas enhanced the safety of its natural gas transmission system by enabling the rapid detection of a significant change in pipeline pressure and remote isolation and depressurization of a portion of Line 4000 in the event of a pipeline rupture. SoCalGas installed a new actuator, new power equipment, new communications equipment, new fencing, and the necessary automation equipment at the site. The total loaded project cost is $1,401,954.

The Line 4000 Valve Enhancement Project – Powerline Road construction site is within an existing SoCalGas facility in a desert environment near the unincorporated community of the Lucerne Valley. SoCalGas bundled this valve project with three additional valve projects, Line 4000 Valve Enhancement Project – Camp Rock Road, Desert View Road, and Devore Station to gain efficiencies in engineering, planning, and construction activities. This workpaper describes the construction activities and costs of the Line 4000 Valve Enhancement Project – Powerline Road site.

Final Report for Line 4000 Valve Enhancement Project – Powerline Road

Table 1: General Project Information

Line 4000 Valve Enhancement Project – Powerline Road			
Location	San Bernardino County		
Days on Site	45 days		
Construction Start	11/26/2018		
Construction Finish	02/21/2019		
Commissioning Date	06/12/2019		
Valve Upgrades			
Valve Number	4000-23.65-0		
Valve Type	Existing – Ball		
Actuator	New		
Actuator Above-/Below-Grade	Above-Grade		
ASV	Yes		
RCV	Yes		
Powerline Road Site Upgrades			
Vault	None		
Power	New – Solar		
Communication	New – VSAT		
SCADA Panel	New		
Equipment Shelter	New		
Fencing	Yes – Expanded		
Project Costs ($)	**Capital**	**O&M**	**Total**
Loaded Project Costs	1,401,954	-	1,401,954
Disallowed Costs	-	-	-

B. Maps and Images

Figure 1: Line 4000 Bundle Overview

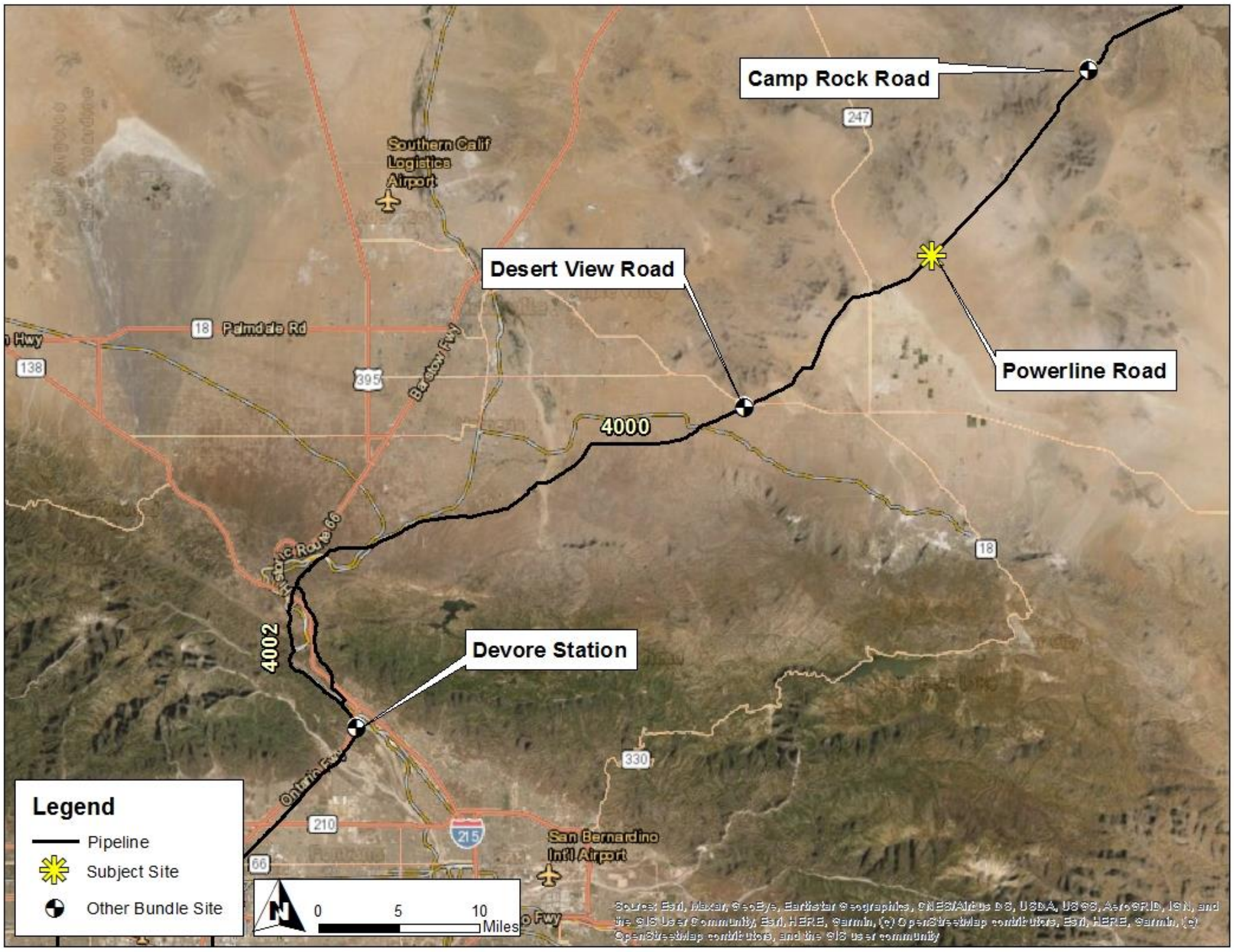


Figure 2: Satellite Image of Line 4000 Valve Enhancement Project – Powerline Road

II. ENGINEERING, DESIGN, AND PLANNING

A. Project Scope

SoCalGas and SDG&E presented a conceptual project scope in workpapers supporting the Valve Enhancement Plan in the 2011 filing.[1] This conceptual scope did not include this project. SoCalGas reviewed available information, performed a detailed system flow analysis, and identified this valve as a candidate for enhancement to provide the planned isolation. The final project scope is summarized in Table 2 below.

1. 2011 PSEP Filing: SoCalGas and SDG&E did not identify this valve for automation to achieve the objective of rapid system isolation.
2. Updated Scope: SoCalGas determined that the automation of MLV 4000-23.65-0 would enable rapid isolation, thereby achieving Valve Enhancement Plan objectives.
3. Engineering, Design, and Constructability: No notable engineering adjustments were required to the standard design.
4. Final Project Scope: The final project scope consists of the automation of one MLV, the installation of one new actuator, the installation of power equipment, the installation of communications equipment, and the installation of the necessary automation equipment at the site.

Table 2: Final Project Scope

Final Project Scope					
Line	Mile	Valve #	Valve Size (*confidential*)	Installation Type	Function
4000	23.65	0	[redacted]	A/AG	ASV/RCV

[1] *See* Workpapers supporting Amended Pipeline Safety Enhancement Plan (PSEP) of SoCalGas and SDG&E, submitted on December 2, 2011, at WP-IX-2-14 through WP-IX-2-25 (A.11-11-002 Exh. SCG-32).

B. Site Evaluation and Planning

SoCalGas initiated the planning process for the Line 4000 Valve Enhancement Project Powerline Road by performing a pre-design site walk to determine the existing conditions and assess any potential impact on the design. Key factors that influenced the engineering and design of this project are as follows:

1. Site Description: The site is an existing SoCalGas facility in a desert environment near the unincorporated community of the Lucerne Valley.
2. Land Issues: During the site evaluation, the Project Team noted that the existing station would need to be expanded to accommodate the new equipment. The Project team also noted that this project is located on lands owned by the Bureau of Land Management (BLM).
3. DOT Class: This project site is in a Class 1 location. SoCalGas selected this MLV for automation to isolate multiple High Consequence Areas (HCA) downstream of this valve.
4. Power Source: There was no preexisting power equipment at this site. The Project Team installed new power equipment.
5. Communication Technology: There was no preexisting communications. The Project Team installed communications equipment at the site.

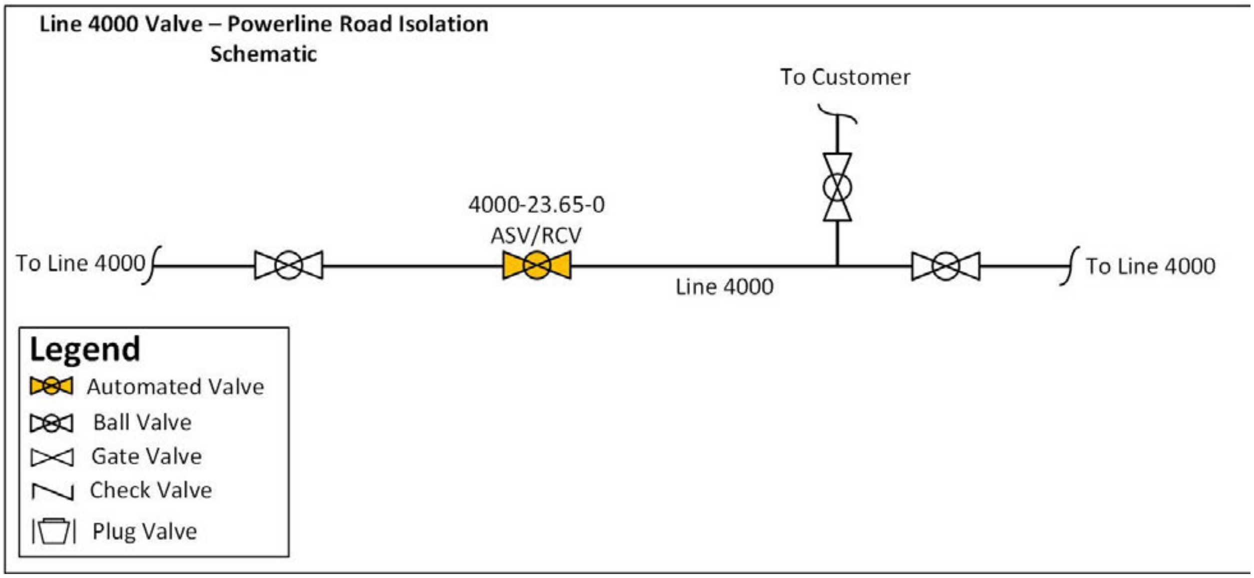
C. Engineering, Design, and Planning Factors

SoCalGas reviewed drawings and records, contacted internal planning groups, communicated with external stakeholders, and conducted survey activity of the area to identify the presence of underground utilities and substructures, and completed a site walk. Key factors that influenced the engineering and design of the Project are as follows:

1. Engineering Assessment: During the site evaluation the Project Team confirmed the existing technology and verified the need to expand the existing station to accommodate the new equipment.

2. Valve Details: The existing valve was a manually operated Class 400 ball valve, which was reused by the Project Team.
3. Actuator Details: The preexisting actuator was incompatible with PSEP communications technology, so the Project Team installed a new actuator.
4. Customer Impact: The Project Team did not identify any anticipated service disruptions to customers.
5. Community Impact: The Project Team did not anticipate any notable impacts to the community during the project.
6. Substructures: The Project Team did not identify any existing substructures that affected the design and engineering at this site.
7. Environmental: The Project Team identified the potential for desert tortoises in the surrounding area. A biological monitor was on-site full time during construction.
8. Permit Restrictions: There were no special permits or permit restrictions for this project site.
9. Land Use: The Project Team obtained a new easement for the expansion of the existing SoCalGas facility. The Project Team utilized the area around the facility as a laydown yard.
10. Traffic Control: The Project Team did not identify any traffic control needs at the site.

Figure 3: Line 4000 Valve Enhancement Project – Powerline Road Schematic



D. Scope Changes

SoCalGas did not make any notable scope changes during detailed design.

III. CONSTRUCTION

A. Construction Contractor Selection

The Project Team prepared an initial cost estimate based on the preliminary design. Following completion of the engineering, design, and planning activities described above, the Project Team directed the Performance Partner (Mechanical Construction Contractor) and Alliance Partner (Electrical Contractor) to prepare cost estimates based on a more detailed engineering design package. As indicated above, there were no notable changes in scope between the time when the Project Team prepared the preliminary cost estimate and when the Performance Partner and Alliance Partner prepared and submitted their estimates.

1. <u>SoCalGas Preliminary Mechanical Construction Contractor Estimate *(confidential)*:</u> SoCalGas' preliminary cost estimate for construction was [redacted]

2. <u>Mechanical Construction Contractor's Target Price Estimate *(confidential)*:</u> The Mechanical Construction Contractor's cost estimate was [redacted], which was [redacted] than SoCalGas' preliminary cost estimate for construction.

3. <u>SoCalGas Preliminary Electrical Contractor Estimate *(confidential)*:</u> SoCalGas' preliminary cost estimate for construction was [redacted].

4. <u>Electrical Contractor's Estimate (*confidential*):</u> The Electrical Contractor's estimate was [redacted], which was [redacted] to SoCalGas' preliminary cost estimate.

B. Construction Schedule

Table 3: Construction Timeline

Construction Start Date	11/26/2018
Construction Completion Date	02/21/2019
Days on Site	45 days
Commissioning Date	06/12/2019

The Project Team completed all construction activities as soon as practicable prior to commissioning. Finalization of commissioning activities is dependent on electrical utility connections, and system and/or resource availability.

C. Changes During Construction

SoCalGas successfully mitigated field conditions during construction in a manner that minimized potential impacts on project scope, cost, and schedule. As a result, these conditions did not result in any notable change orders.

Figure 4: Excavation For New Sense Lines and Conduit

D. Commissioning and Site Restoration

Commissioning activities included site restoration, final inspections, and placement of the valve into service. During this stage, SoCalGas successfully performed site acceptance testing, and conducted point-to-point verification with SoCalGas Gas Control personnel for the newly-automated valve, and transferred ownership of the new equipment to Field Operations. Closeout activities included development of final drawings, the reconciliation package, and updates to company recordkeeping systems to reflect the completed scope of work. The site was commissioned on June 12, 2019, as summarized in Table 3.

IV. PROJECT COSTS

A. Cost Avoidance Actions

SoCalGas exercised due diligence in the design, planning, and construction activities for this project to minimize or avoid costs when prudent to do so. As discussed above, the Project Team reviewed existing records, communicated with external stakeholders, and conducted a site walk to incorporate the site conditions in the project plan and design. SoCalGas bundled this valve project with three additional valve projects, Line 4000 Valve Enhancement Project – Camp Rock Road, Desert View Road, and Devore Station to gain efficiencies in engineering, planning, and construction activities.

B. Cost Estimates

Based on the preliminary design, once the preliminary project scope was confirmed and engineering, design, and planning activities were underway, SoCalGas prepared an estimate of the Direct Costs of the Project in the amount of $1,325,861. The Project Team considered the conditions known at the time to prepare the preliminary Direct Cost estimate. This estimate reflects the projected Labor, Material, and Services costs anticipated to be incurred to execute the Project, based on initial design plans.

SoCalGas estimated Indirect Costs of the Project based on the estimated Direct Costs and other project-related variables.

C. Actual Direct and Indirect Costs

Actual Direct Costs reflect the Labor, Material, and Services costs incurred to execute the Project. Actual Indirect Costs reflect costs for incremental overhead loaders in accordance with Company overhead allocation policies. The total loaded cost of the Project is $1,401,954.

Table 4: Estimated and Actual Direct Costs and Variances[2]

Direct Costs ($)	Estimate	Actuals	Delta Over/(Under)
Company Labor	223,050	110,705	(112,345)
Materials	121,281	117,967	(3,314)
Mechanical Construction Contractor	272,728	269,498	(3,230)
Electrical Contractor	132,000	131,885	(115)
Construction Management & Support	59,911	132,274	72,363
Environmental	132,624	96,796	(35,828)
Engineering & Design	134,734	179,346	44,612
Project Management & Services	76,059	7,109	(68,950)
ROW & Permits	30,218	9,502	(20,716)
GMA	143,256	135,795	(7,461)
Total Direct Costs	**1,325,861**	**1,190,876**	**(134,985)**

Table 5: Estimated and Actual Indirect Costs, Total Costs, and Variances[3]

Indirect Costs/Total Costs ($)	Estimate	Actuals	Delta Over/(Under)
Overheads	320,157	175,799	(144,358)
AFUDC	189,077	29,933	(159,144)
Property Taxes	43,897	5,345	(38,552)
Total Indirect Costs	**553,131**	**211,077**	**(342,054)**
Total Direct Costs	**1,325,861**	**1,190,876**	**(134,985)**
Total Loaded Costs	**1,878,994**	**1,401,954**	**(477,038)**

The Actual Full-Time Equivalent[4] (FTE) for this Project is 0.48.

[2] Values may not add to total due to rounding.
[3] Ibid.
[4] Full-time equivalents (FTEs) are included in GRC forecasts to provide context to requested amounts for company labor. FTEs are calculated by measuring the number of hours charged over a given time period. For example, one FTE is equal to 40 hours per week, or typically 2,080 hours per year. The calculation of FTEs includes overtime hours. Therefore, if one employee works 60 hours per week, he or she would be recorded as 1.5 FTEs.

D. Cost Impacts

Consistent with one of the overarching objectives of PSEP to maximize the cost effectiveness of safety enhancement investments, SoCalGas effectively planned, designed, and completed construction activities for this project. Each pipeline project is unique in scope and inherently complex due to a variety of factors including terrain, environmental and permitting constraints, scope changes during detailed design, material cost fluctuations, regulatory changes, and more. These complexities can lead to variances between initial estimates and actual costs. Consistent with prudent management at the time, the Project Team successfully mitigated these variances whenever feasible through the implementation of effective project management practices, thorough planning, and continuous monitoring.

At the completion of the Line 4000 Valve Enhancement Project, Actual Direct Costs came within the AACE Class 3 Total Installed Cost (TIC) accuracy range, adhering to the standard industry practices defined by the Association for the Advancement of Cost Engineering (AACE) International. The Actual Direct Costs were less than the preliminary estimate by $134,985. This variance can be attributed to several factors including: the project assumed to encounter a larger amount of abatement and hazardous materials; there was less environmental monitoring required during construction than what was anticipated; and the engineering firms that provided Project Management & Services activities which were originally estimated under Project Management and Services, but these costs were recognized in Engineering and Design.

V. CONCLUSION

SoCalGas enhanced the safety of their integrated natural gas system by prudently executing the Line 4000 Valve Enhancement Project – Powerline Road. Through this Valve Enhancement Project, SoCalGas successfully automated one mainline valve to achieve the objective of enabling rapid system isolation to a portion of Line 4000 located in the unincorporated community of the Lucerne Valley in San Bernardino County. The total loaded cost of the Project is $1,401,954.

SoCalGas executed this project prudently through designing and executing the project to support achievement of Valve Enhancement Plan isolation objectives, expanding the existing site to accommodate the new equipment, installing the necessary automation equipment, and installing equipment necessary to bring power and communication capabilities to the site to enable rapid system isolation of a portion of Line 4000 located in the unincorporated town of the Lucerne Valley in the County of San Bernardino.

SoCalGas engaged in prudent cost avoidance efforts to complete this safety enhancement at a reasonable cost by carefully planning and coordinating engineering and construction activities to maximize efficiencies and reduce customer and community impacts, engaging in reasonable efforts to promote competitive and market based rates for contractor services and materials, and using a reasonable amount of company and contractor resources to complete this safety enhancement as soon as practicable.

End of Line 4000 Valve Enhancement Project – Powerline Road Final Report

I. LINE 4002 FONTANA VALVE ENHANCEMENT PROJECT – ETIWANDA AND 4TH

A. Background and Summary

The Line 4002 Fontana Valve Enhancement Project – Etiwanda and 4th consists of valve enhancements made to an existing mainline valve (MLV) located within the City of Ontario in San Bernardino County. Through this project, SoCalGas enhanced the safety of its natural gas transmission system by enabling the rapid detection of a significant change in pipeline pressure and remote isolation and depressurization of a portion of Line 4002 in the event of a pipeline rupture. SoCalGas installed a new actuator, a new bridle around the existing MLV, new power equipment, new communications equipment, and the necessary automation equipment at the site. The total loaded project cost is $1,266,385.

The Line 4002 Fontana Valve Enhancement Project – Etiwanda and 4th construction site is located on Etiwanda Avenue, a heavily trafficked roadway in the City of Ontario. The Project site is in an urban area near a commercial distribution center. The site is also next to a flood control canal. Etiwanda is the border between the Cities of Ontario and Rancho Cucamonga, and construction activities impacted both cities. SoCalGas bundled this valve project with two additional valve projects, Line 4002 Fontana Valve Enhancement Projects – Benson and 7th, and Benson and Chino, to gain efficiencies in engineering, planning, and construction activities. This workpaper describes the construction activities and costs of the Line 4002 Fontana Valve Enhancement Project – Etiwanda and 4th. This project was designed and executed as one project. This Project's costs were shared by PSEP and the Operating District with the Operating District funding the costs of the new bridle around the existing MLV and with PSEP funding the activities that provided system isolation through the automation of the existing mainline valve.

Final Report for Line 4002 Fontana Valve Enhancement Project – Etiwanda and 4th

Table 1: General Project Information

Line 4002 Fontana Valve Enhancement Project – Etiwanda and 4th			
Location	City of Ontario		
Days on Site	49 days		
Construction Start	04/10/2017		
Construction Finish	05/04/2018		
Commissioning Date	05/07/2018		
Valve Upgrades			
Valve Number	4002-84.56-0		
Valve Type	Existing – Ball		
Actuator	New		
Actuator Above-/Below-Grade	Below-Grade		
ASV	Yes		
RCV	Yes		
Site Upgrades			
Vault	Existing		
Power	New – Utility		
Communication	New – Radio		
SCADA Panel	New		
Equipment Shelter	None		
Fencing/Wall	None		
Project Costs ($)	**Capital**	**O&M**	**Total**
Loaded Project Costs	1,266,385	-	1,266,385
Disallowance	-	-	-

B. Maps and Images

Figure 1: Satellite Image of Line 4002 Fontana Valve Enhancement Project Overview

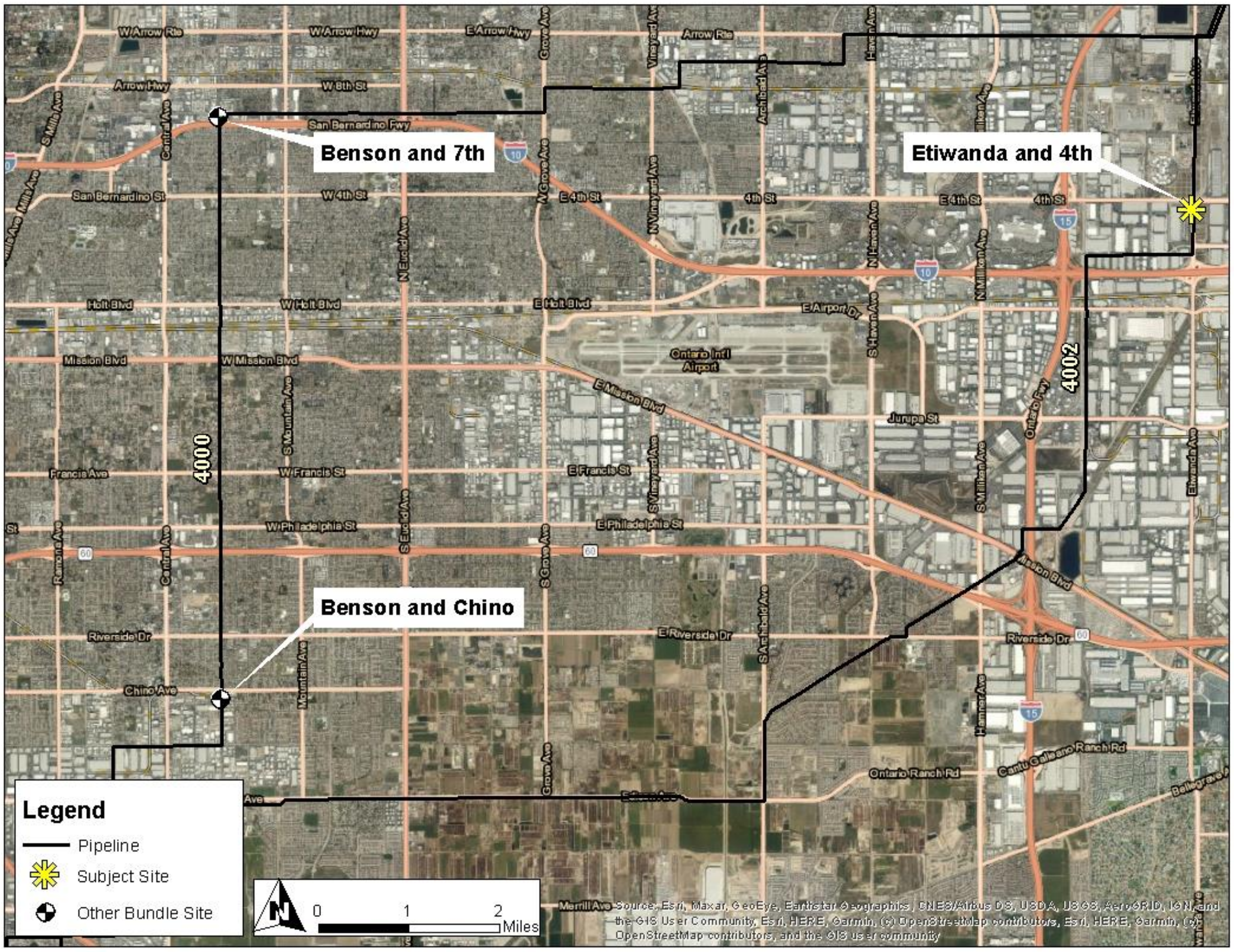


Figure 2: Satellite Image of Line 4002 Fontana Valve Enhancement Project – Etiwanda and 4th

II. ENGINEERING, DESIGN, AND PLANNING

A. Project Scope

SoCalGas presented a conceptual project scope for the Line 4002 Fontana Valve Enhancement Project – Etiwanda and 4th in workpapers supporting the Valve Enhancement Plan in the 2011 PSEP filing.[1] This conceptual scope identified MLV 4002-84.56-0 for automation to enable remote isolation of a portion of Line 4002. Prior to initiating execution of the Project, SoCalGas reviewed available information, performed a detailed system flow analysis to validate the scope of the Project, and confirmed that this valve enhancement will provide the planned isolation. The final project scope is summarized in Table 2 below.

1. 2011 PSEP Filing: SoCalGas identified MLV 4002-84.56-0 for automation to achieve the objective of rapid system isolation.
2. Updated Scope: Upon project initiation, SoCalGas reviewed the conceptual project scope and determined that this isolation point would achieve the transmission isolation objectives set forth in the Valve Enhancement Plan.
3. Engineering, Design, and Constructability: The Operating District planned to install a bridle around the existing MLV. The Project Team consulted with the Operating District and incorporated this installation in the drawings. The installation was executed by the same construction team. The Operating District incurred the costs related to the installation of the new bridle.
    a. The installation was executed by the same construction team. The Operating District incurred the costs related to the installation of the new bridle.

[1] *See* Workpapers supporting Amended Pipeline Safety Enhancement Plan (PSEP) of SoCalGas and SDG&E, submitted on December 2, 2011, at WP-IX-2-14 through WP-IX-2-25 (A.11-11-002 Exh. SCG-32).

b. The Project Team determined that the existing vault was in good working condition. The Project Team altered the Standard PSEP design to incorporate an electric actuator that could fit in the existing vault.

4. Final Project Scope: The final PSEP project scope consisted of the installation of a new actuator, the installation of new power equipment, the installation of new communications equipment, and the installation of the necessary automation equipment at the project site.

Table 2: Final Project Scope

Final Project Scope					
Line	Mile	Valve #	Valve Size (*confidential*)	Installation Type	Function
4002	84.56	0	[redacted]	A/VT	ASV/RCV

B. Site Evaluation and Planning

SoCalGas initiated the planning process for the Line 4002 Fontana Valve Enhancement Project – Etiwanda and 4th by performing a pre-design site walk to determine the existing conditions and assess any potential impact on the design. Key factors that influenced the engineering and design of this project are as follows:

1. Site Description: The site is located in an urban area near a commercial distribution center on Etiwanda Avenue, a heavily trafficked roadway in the City of Ontario. The valve is in Etiwanda Avenue and is positioned on its side. The valve stem extends into a vault.
2. Land Issues: During the pre-design site walk, the Project Team noted that there would not be space in the immediate area for a laydown yard. The Project Team noted that excavations will impact the adjacent sidewalk.

3. DOT Class: This project site is in a Class 2 location. SoCalGas selected this MLV for automation to isolate HCA Class 3 locations upstream and downstream of the valve, and to satisfy the PSEP Valve Enhancement Plan spacing criteria.
4. Power Source: There was no preexisting power source. The Project Team installed new power equipment at the site.
5. Communication Technology: There was no preexisting communications equipment. The Project Team installed new communications equipment at the site.

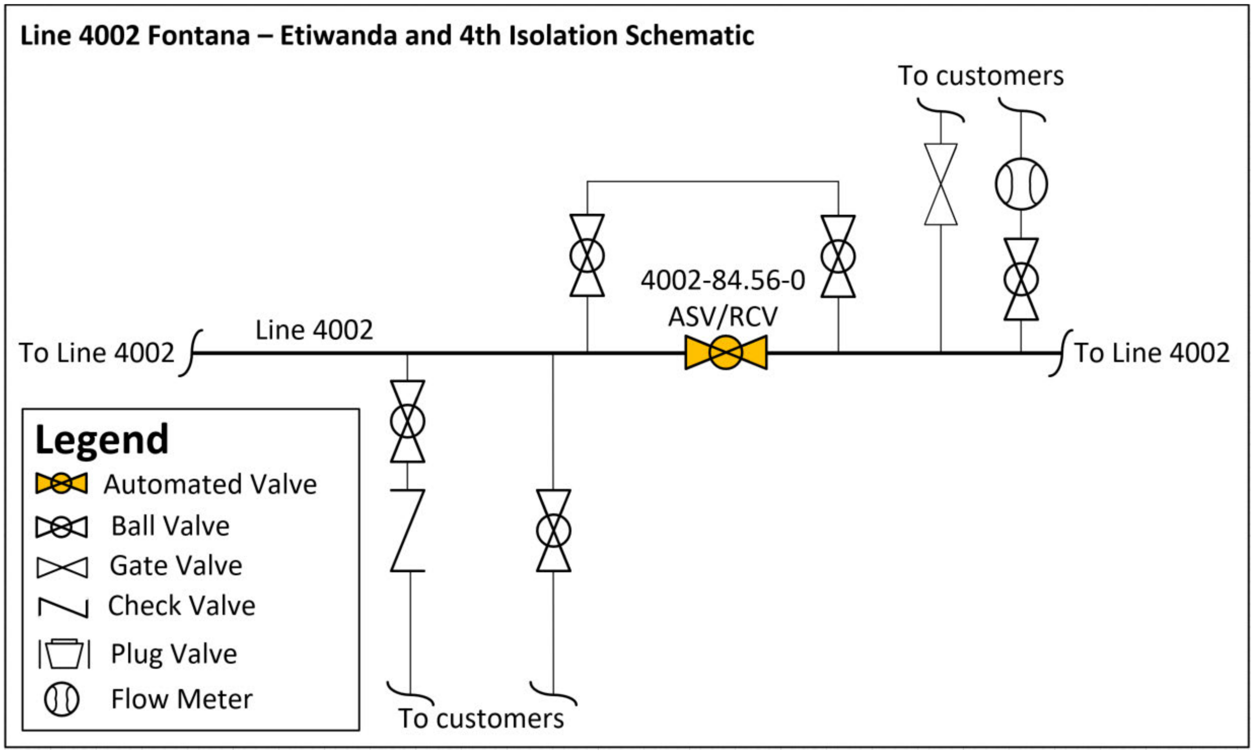
C. Engineering, Design, and Planning Factors

SoCalGas reviewed drawings and records, contacted internal planning groups, communicated with external stakeholders, conducted survey activity, and completed a site walk. Key factors that influenced the engineering and design of the Project are as follows:

1. Engineering Assessment: During the site evaluation, the Project Team confirmed the existing technology and the measurements of the existing vault. The Project Team determined that the existing vault was in good working condition. The Project Team altered the standard PSEP design to incorporate an electric actuator that could fit in the existing vault.
2. Valve Details: The existing valve was a manually actuated Class 400 ball valve, which was reused by the Project Team.
3. Actuator Details: The preexisting actuator was incompatible with PSEP linebreak technology, so the Project Team installed a new actuator.
4. Customer Impact: The Project Team did not identify any anticipated service disruptions to customers. The Project Team installed the new bridle around the existing MLV by performing two hot taps on Line 4002.
5. Community Impact: The Project Team restricted public access to the sidewalk during construction. The Project Team rerouted the preexisting sidewalk to accommodate the new automation equipment.

6. Substructures: The Project Team did not identify any existing substructures that affected the design and engineering at the site.
7. Environmental: The Project Team identified an environmentally sensitive area near the site. An environmental monitor performed routine site visits during construction.
8. Permit Restrictions: The Project Team obtained Engineering and Encroachment permits from the City of Ontario. The Project Team also obtained a Construction Permit from the City of Rancho Cucamonga.
9. Land Use: There was limited space around the construction site for a laydown yard. The Project Team obtained Temporary Right of Entry from a nearby business.
10. Traffic Control: The Project Team obtained Traffic Control Permits from the Cities of Ontario and Rancho Cucamonga. The Project Team shut down the sidewalk and two lanes on Etiwanda Avenue for a portion of construction.

Figure 3: Line 4002 Fontana Valve Enhancement Project – Etiwanda and 4th Schematic



D. Scope Changes

SoCalGas did not make any notable scope changes during detailed design.

III. CONSTRUCTION

A. Construction Contractor Selection

The Project Team prepared an initial cost estimate based on the preliminary design. Following completion of the engineering, design, and planning activities described above, the Project Team directed the Performance Partner (Mechanical Construction Contractor) and Alliance Partner (Electrical Contractor) to prepare cost estimates based on a more detailed engineering design package. As indicated above, there were no notable changes in scope between the time when the Project Team prepared the preliminary cost estimate and when the Performance Partner and Alliance Partner prepared and submitted their estimates. The estimated values below include PSEP and non-PSEP work, whereas Tables 4 and 5 include estimated and actual values for PSEP work only.

1. <u>SoCalGas' Preliminary Mechanical Construction Contractor Estimate *(confidential)*:</u> SoCalGas' preliminary cost estimate for construction was [redacted]

2. <u>Mechanical Construction Contractor's Target Price Estimate *(confidential)*:</u> The Mechanical Construction Contractor's cost estimate was [redacted], which was [redacted] than SoCalGas' preliminary cost estimate for construction.

3. <u>SoCalGas' Preliminary Electrical Contractor Estimate *(confidential)*:</u> SoCalGas' preliminary cost estimate for construction was [redacted].

4. <u>Electrical Contractor's Estimate (*confidential*):</u> The Electrical Contractor's estimate was [redacted], which was [redacted] than SoCalGas' preliminary cost estimate.

B. Construction Schedule

Table 3: Construction Timeline

Construction Start Date	04/10/2017
Construction Completion Date	05/04/2018
Days on Site	49 days
Commissioning Date	05/07/2018

The Project Team completed all construction activities as soon as practicable prior to commissioning. Finalization of commissioning activities is dependent on electrical utility connections, and system and/or resource availability.

C. Changes During Construction

SoCalGas successfully mitigated field conditions during construction in a manner that minimized potential impacts on project scope, cost, and schedule. As a result, these conditions did not result in any notable change orders.

Figure 4: New SCADA Cabinet in the Foreground, New Battery Cabinet and Linebreak Cabinet in the Background

D. Commissioning and Site Restoration

Commissioning activities included site restoration, final inspections, and placement of the valve into service. During this stage, SoCalGas successfully performed site acceptance testing and conducted point-to-point verification with Gas Control personnel for the newly-automated valve, and transferred ownership of the new equipment to Field Operations Closeout activities included development of final drawings, the reconciliation package, and updates to company recordkeeping systems to reflect the completed scope of work. The site was commissioned on May 7, 2018, as summarized in Table 3.

IV. PROJECT COSTS

A. Cost Avoidance Actions

SoCalGas exercised due diligence in the design, planning, and construction activities for this project to minimize or avoid costs when prudent to do so. As discussed above, the Project Team reviewed existing records, communicated with external stakeholders, and conducted a site walk to incorporate the known site conditions in the project plan and design. Specific examples of cost avoidance actions taken on this project were:

1. <u>Tie-in:</u> The Project Team installed the new bridle by performing a hot-tap, avoiding a shut-in of that portion of Line 4002.
2. <u>Project Design:</u> The Project Team replaced the existing actuator with a new electric actuator avoiding the need to replace the existing vault.
3. <u>Utility Coordination:</u> The Project Team changed the installation method for the electrical conduit, boring underneath landscaping next to the sidewalk as opposed to trenching which would have resulted in higher restoration costs.

B. Cost Estimates

Based on the preliminary design, once the preliminary project scope was confirmed and engineering, design, and planning activities were underway, SoCalGas prepared an estimate of the Direct Costs of the Project in the amount of $861,675. The Project Team considered the conditions known at the time to prepare the preliminary Direct Cost estimate. This estimate reflects the projected Labor, Material, and Services costs anticipated to be incurred to execute the Project, based on initial design plans.

SoCalGas estimated Indirect Costs of the Project based on the estimated Direct Costs and other project-related variables.

C. Actual Direct and Indirect Costs

Actual Direct Costs reflect the Labor, Material, and Services costs incurred to execute the Project. Actual Indirect Costs reflect costs for incremental overhead loaders in accordance with Company overhead allocation policies. The total loaded cost of the Project is $1,266,385.

Table 4: Estimated and Actual Direct Costs and Variances[2]

Direct Costs ($)	Estimate	Actuals	Delta Over/(Under)
Company Labor	103,393	179,362	75,969
Materials	140,751	112,465	(28,286)
Mechanical Construction Contractor	188,427	255,834	67,407
Electrical Contractor	149,160	60,827	(88,333)
Construction Management & Support	65,120	82,274	17,154
Environmental	34,623	8,717	(25,906)
Engineering & Design	40,389	137,205	96,816
Project Management & Services	52,953	20,246	(32,707)
ROW & Permits	8,525	18,327	9,802
GMA	78,334	101,804	23,470
Total Direct Costs	**861,675**	**977,060**	**115,385**

Table 5: Estimated and Actual Indirect Costs, Total Costs, and Variances[3]

Indirect Costs/Total Costs ($)	Estimate	Actuals	Delta Over/(Under)
Overheads	284,660	189,100	(95,560)
AFUDC	326,884	94,095	(232,789)
Property Taxes	73,617	6,130	(67,487)
Total Indirect Costs	**685,161**	**289,324**	**(395,837)**
Total Direct Costs	**861,675**	**977,060**	**115,385**
Total Loaded Costs	**1,546,836**	**1,266,385**	**(280,451)**

[2] Values may not add to total due to rounding.
[3] Ibid.

The Actual Full-Time Equivalents[4] (FTEs) for this Project are 1.27.

D. Cost Impacts

Consistent with one of the overarching objectives of PSEP to maximize the cost effectiveness of safety enhancement investments, SoCalGas effectively planned, designed, and completed construction activities for this project. Each pipeline project is unique in scope and inherently complex due to a variety of factors including terrain, environmental and permitting constraints, scope changes during detailed design, material cost fluctuations, regulatory changes, and more. These complexities can lead to variances between initial estimates and actual costs. Consistent with prudent management at the time, the Project Team successfully mitigated these variances whenever feasible through the implementation of effective project management practices, thorough planning, and continuous monitoring.

At the completion of the Line 4002 Fontana Valve Enhancement Project – Etiwanda and 4th, Actual Direct Costs came within the AACE Class 3 Total Installed Cost (TIC) accuracy range, adhering to the standard industry practices defined by the Association for the Advancement of Cost Engineering (AACE) International. The Actual Direct Costs were more than the preliminary estimate by $115,385. This variance can be attributed to several factors including: the Project Team anticipated the engineering firm would support with the entire design, however, some of that work was transferred and completed by SoCalGas engineering; the Project Team originally planned to utilize the standard PSEP design for actuator installation, but during project initiation the design was altered to incorporate an actuator that could fit inside the existing vault, which required additional field visits and review of project designs; and the Engineering and Design firms completed

[4] Full-time equivalents (FTEs) are included in GRC forecasts to provide context to requested amounts for company labor. FTEs are calculated by measuring the number of hours charged over a given time period. For example, one FTE is equal to 40 hours per week, or typically 2,080 hours per year. The calculation of FTEs includes overtime hours. Therefore, if one employee works 60 hours per week, he or she would be recorded as 1.5 FTEs.

activities originally identified as Project Management & Services in the initial estimate while the actual costs were recognized under Engineering & Design.

V. CONCLUSION

SoCalGas enhanced the safety of its natural gas system by prudently executing the Line 4002 Fontana Valve Enhancement Project – Etiwanda and 4th. Through this Valve Enhancement Project, SoCalGas successfully upgraded one mainline valve to achieve the objective of enabling rapid system isolation of a portion of Line 4002 in the City of Ontario. The total loaded cost of the Project is $1,266,385.

SoCalGas executed this project prudently through designing and executing the Project to support Valve Enhancement Plan isolation objectives, bundling three geographically proximate projects together to capture efficiencies through coordinated engineering and construction planning, coordinating work with transmission work at the same location, performing a hot tap for the new bridle to avoid a shut-down of Line 4002, adjusting the PSEP standard design to install an electric actuator so as to avoid the need to replace the existing vault, and installing equipment necessary to bring power and communication capabilities to the site to enable rapid system isolation of a portion of Line 4002 in the City of Ontario.

SoCalGas engaged in prudent cost avoidance efforts to complete this safety enhancement at a reasonable cost by carefully planning and coordinating engineering and construction activities to maximize efficiencies and reduce customer and community impacts.

End of Line 4002 Fontana Valve Enhancement Project – Etiwanda and 4th Final Report

I. LINE 7000 VALVE ENHANCEMENT PROJECT – BEECH AND HIGHWAY 46

A. Background and Summary

The Line 7000 Valve Enhancement Project – Beech and Highway 46 consists of valve enhancements made to one new mainline valve (MLV) located in an unincorporated area within Kern County. Through this project, SoCalGas enhanced the safety of its natural gas transmission system by enabling the rapid detection of a significant change in pipeline pressure and remote isolation and depressurization of a portion of Line 7000 in the event of a pipeline rupture. SoCalGas installed one new mainline valve, one new actuator, one new vault to house the actuator, the reconfiguration of the existing bridle assembly, new power equipment, new communications equipment, and the necessary automation equipment at the site. The total loaded project cost is $3,559,720.

The Line 7000 Valve Enhancement Project – Beech and Highway 46 is located in an agricultural area on a private farm road near the City of Wasco. SoCalGas bundled this valve project with six additional valve projects, Line 7000 Valve Enhancement Projects – Delano Station, Melcher and Elmo, Road 68 and Avenue 232, Road 96 and Avenue 198, Tipton, and Visalia Station, to gain efficiencies in engineering, planning, and construction activities. This workpaper describes the construction activities and costs of the Line 7000 Valve Enhancement Project – Beech and Highway 46.

Final Report for Line 7000 Valve Enhancement Project – Beech and Highway 46

Table 1: General Project Information

Line 7000 Valve Enhancement Project – Beech and Highway 46			
Location	City of Wasco		
Days on Site	53 days		
Construction Start	03/19/2018		
Construction Finish	08/08/2018		
Commissioning Date	04/18/2019		
Valve Upgrades			
Valve Number	7000-10.65-0		
Valve Type	New – Ball		
Actuator	New		
Actuator Above-/Below-Grade	Below-Grade		
ASV	Yes		
RCV	Yes		
Site Upgrades			
Vault	New		
Power	New – Utility		
Communication	New – VSAT		
SCADA Panel	New		
Equipment Shelter	None		
Fencing/Wall	None		
Project Costs ($)	**Capital**	**O&M**	**Total**
Loaded Project Costs	3,559,720	-	3,559,720
Disallowed Costs	-	-	-

B. Maps and Images

Figure 1: Line 7000 Bundle Overview

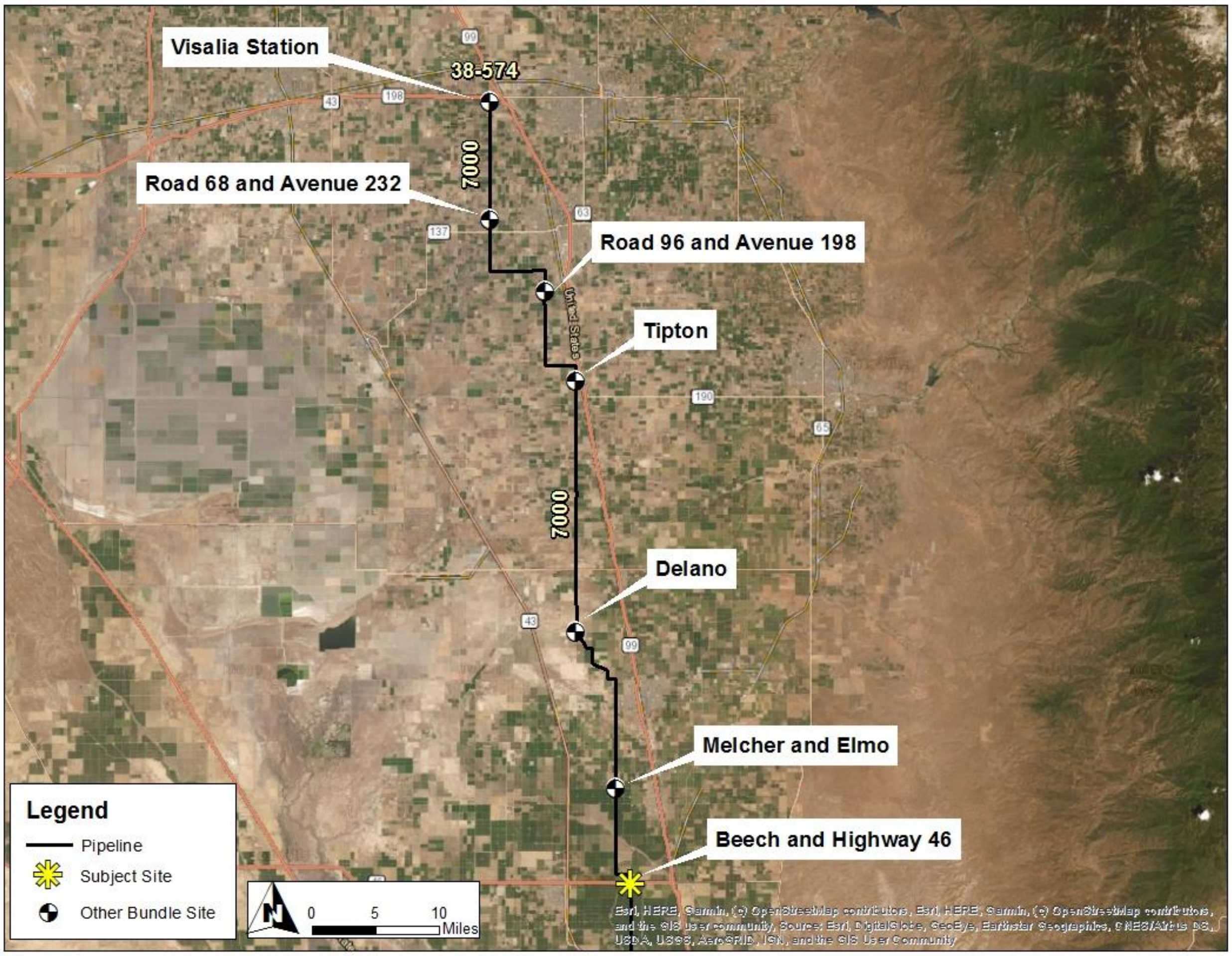
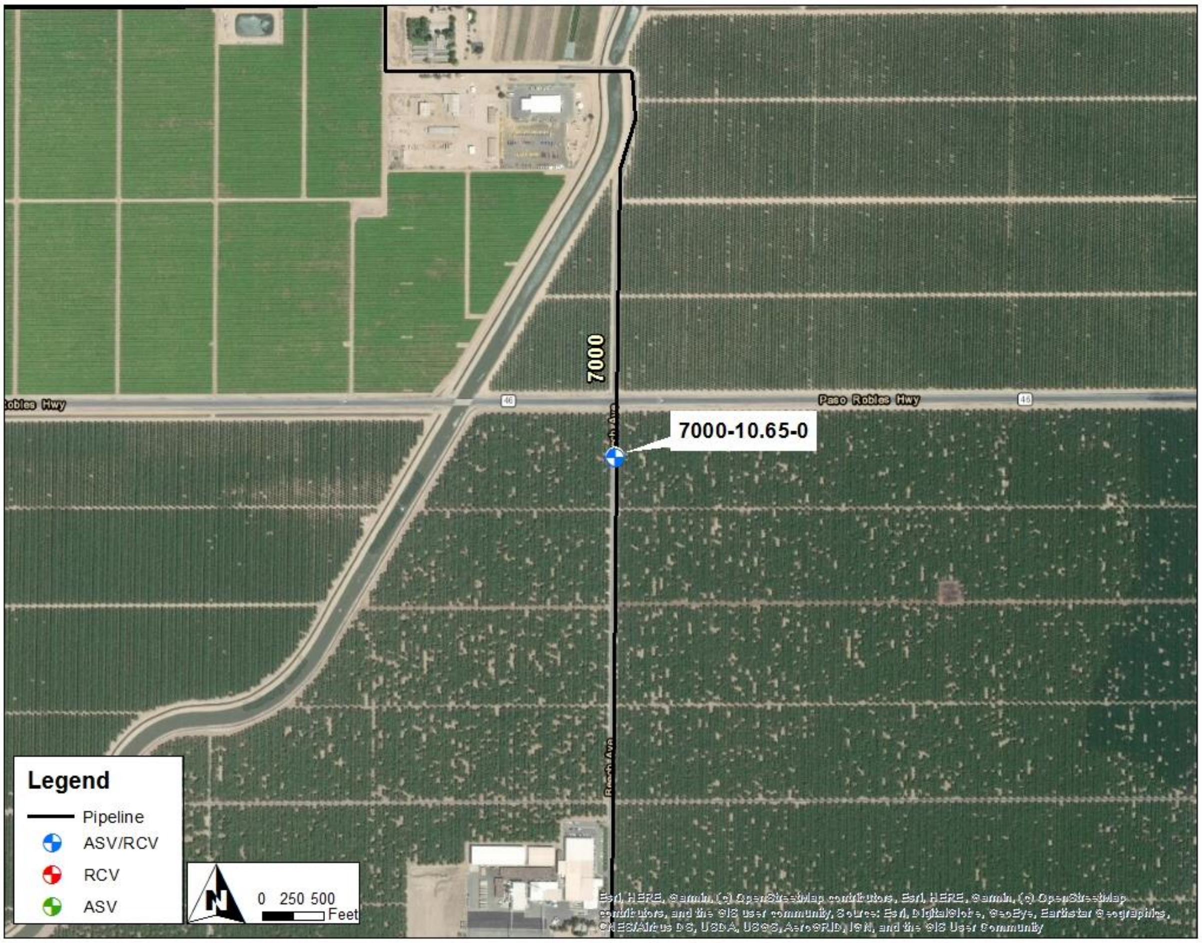


Figure 2: Satellite Image of Line 7000 Valve Enhancement Project – Beech and Highway 46



II. ENGINEERING, DESIGN, AND PLANNING

A. Project Scope

SoCalGas presented a conceptual project scope for the Line 7000 Valve Enhancement Project – Beech and Highway 46 in workpapers supporting the Valve Enhancement Plan in the 2011 PSEP filing.[1] This conceptual scope identified MLV 7000-10.65-0 for automation to enable remote isolation to a portion of Line 7000. Prior to initiating execution of the Project, SoCalGas reviewed available information, performed a detailed system flow analysis, and confirmed that this valve enhancement will provide the planned isolation. The final project scope is summarized in Table 2 below.

1. 2011 PSEP Filing: SoCalGas identified MLV 7000-10.65-0 for automation to achieve the objective of rapid system isolation.
2. Updated Scope: Upon project initiation, SoCalGas reviewed the conceptual project scope and determined that this isolation point would enable rapid isolation, thereby achieving Valve Enhancement Plan objectives.
3. Engineering, Design, and Constructability: SoCalGas initially planned to reuse the existing valve and vault and install a new actuator. During the pre-design site walk, The Project Team noted that the existing piping configuration would interfere with the installation of the new actuator. The Project Team altered the project scope to include the installation of a new valve and the reconfiguration of the existing bridle assembly.
4. Final Project Scope: The final project scope consists of the automation and installation of one new MLV that included the installation of a new actuator, the installation of a new vault to house the actuator, the installation of new power equipment, the installation of new communications equipment, the reconfiguration of

[1] *See* Workpapers supporting Amended Pipeline Safety Enhancement Plan (PSEP) of SoCalGas and SDG&E, submitted on December 2, 2011, at WP-IX-2-14 through WP-IX-2-25 (A.11-11-002 Exh. SCG-32).

the existing bridle assembly, and the installation of the necessary automation equipment at the site.

Table 2: Final Project Scope

Final Project Scope					
Line	Mile	Valve #	Valve Size (*confidential*)	Installation Type	Function
7000	10.65	0	[redacted]	NV/VT	ASV/RCV

B. Site Evaluation and Planning

SoCalGas initiated the planning process for the Line 7000 Valve Enhancement Project by performing a pre-design site walk to determine the existing conditions and assess any potential impact on the design. Key factors that influenced the engineering and design of this project are as follows:

1. Site Description: The site is located in a rural area adjacent to agricultural fields near the City of Wasco near the intersection of Beech Avenue and Highway 46.
2. Land Issues: During the pre-design site walk, the Project Team determined that an additional easement and a temporary right of entry for a laydown yard would be necessary at this site.
3. DOT Class: This project site is in a Class 1 location. SoCalGas selected this MLV for automation to satisfy the PSEP Valve Enhancement Plan spacing criteria and to isolate a Class 3 location downstream of this valve.
4. Power Source: There was no preexisting power source. The Project Team installed new power equipment at the site.
5. Communication Technology: There was no preexisting communications equipment. The Project Team installed new communications equipment at the site.

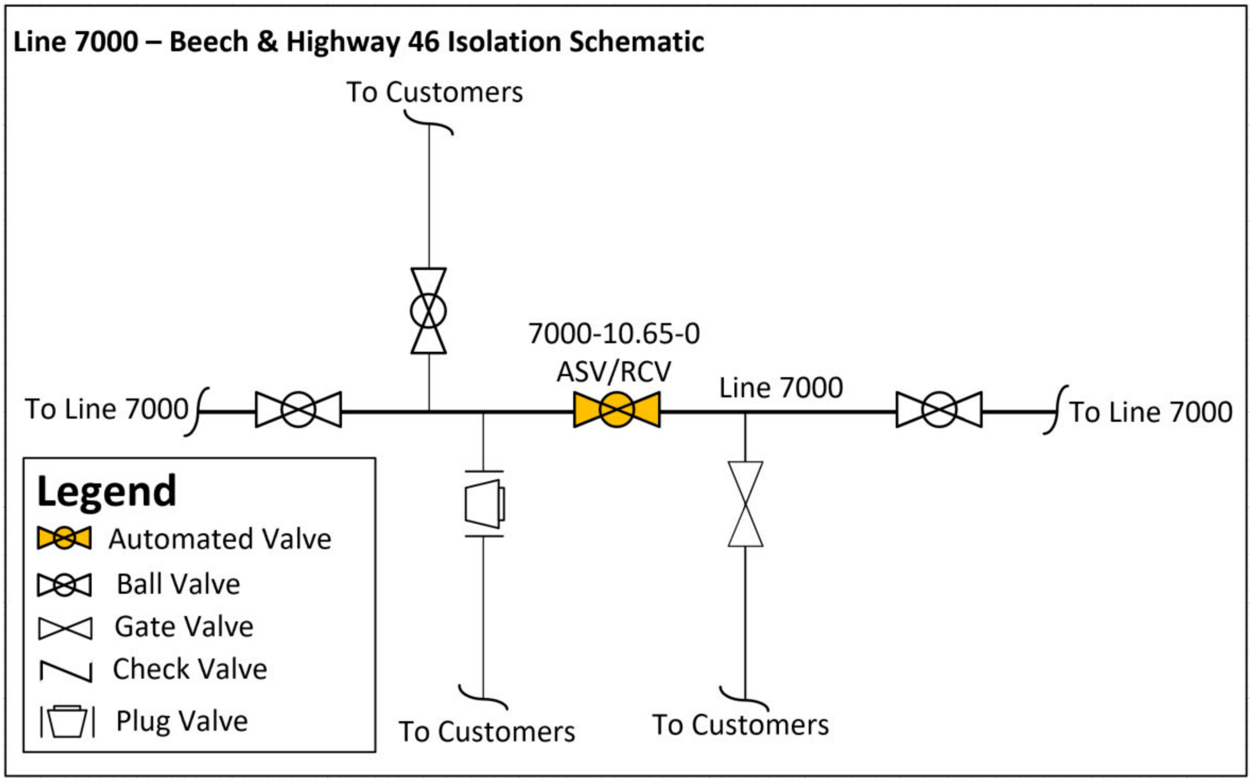
C. Engineering, Design, and Planning Factors

SoCalGas reviewed drawings and records, contacted internal planning groups, communicated with external stakeholders, conducted survey activity, performed potholing of the area to identify the presence of underground utilities and substructures, and completed a site walk. Key factors that influenced the engineering and design of the Project are as follows:

1. Engineering Assessment: During the site evaluation, the Project Team confirmed the preexisting technology and measurements of the preexisting vault. The Project Team determined that a new MLV, vault, and bridle assembly were necessary.
2. Valve Details: The valve was a manually operated Class 600 ball valve that the Project Team replaced.
3. Actuator Details: There was no preexisting actuator. The Project Team installed a new actuator.
4. Customer Impact: The Project Team did not identify any anticipated service disruptions to customers. The Project Team utilized stopples and a bypass to maintain service to customers during the installation of new valves.
5. Community Impact: The Project Team did not anticipate any notable impacts to the community from this project. The Project Team utilized a neighboring farm field as a laydown yard and closed one lane on Beech Avenue during construction.
6. Substructures: The Project Team did not identify any existing substructures that affected the design and engineering at this site.
7. Environmental: The Project Team did not identify any notable environmental concerns at the site. An environmental monitor performed routine site visits during construction.
8. Permit Restrictions: The Project Team acquired an additional easement to accommodate the new equipment.

9. Land Use: The Project Team utilized a neighboring agriculture field for a laydown yard. The Project Team scheduled the work so that the mechanical construction work did not impact the start of farming operations in 2018 per the request of the land owner. The remaining five days of mechanical and electrical work were completed without the use of the laydown yard.
10. Traffic Control: The Project closed one lane on Beech Avenue during construction. Flag men and signage were utilized along Beech Avenue to direct traffic.

Figure 3: Line 7000 Valve Enhancement Project – Beech and Highway 46 Schematic



D. Scope Changes

SoCalGas did not make any notable scope changes during detailed design.

III. CONSTRUCTION

A. Construction Contractor Selection

The Project Team prepared an initial cost estimate based on the preliminary design. Following completion of the engineering, design, and planning activities described above, the Project Team directed the Performance Partner (Mechanical Construction Contractor) and Alliance Partner (Electrical Contractor) to prepare cost estimates based on a more detailed engineering design package. As indicated above, there were no notable changes in scope between the time when the Project Team prepared the preliminary cost estimate and when the Performance Partner and Alliance Partner prepared and submitted their estimates.

1. SoCalGas' Preliminary Mechanical Construction Contractor Estimate *(confidential)*: SoCalGas' preliminary cost estimate for construction was [redacted].

2. Mechanical Construction Contractor's Target Price Estimate *(confidential)*: The Mechanical Construction Contractor's cost estimate was [redacted], which was [redacted] than SoCalGas' preliminary cost estimate for construction.

3. SoCalGas' Preliminary Electrical Contractor Estimate *(confidential)*: SoCalGas' preliminary cost estimate for the electrical contractor was [redacted].

4. Electrical Contractor's Estimate (*confidential*): The Electrical Contractor's estimate was [redacted], which was [redacted] than SoCalGas' preliminary cost estimate.

B. Construction Schedule

Table 3: Construction Timeline

Construction Start Date	03/19/2018
Construction Completion Date	08/08/2018
Days on Site	53 days
Commissioning Date	04/18/2019

The Project Team completed all construction activities as soon as practicable prior to commissioning. Finalization of commissioning activities is dependent on electrical utility connections, and system and/or resource availability.

C. Changes During Construction

SoCalGas successfully mitigated field conditions during construction in a manner that minimized potential impacts on project scope, cost, and schedule. As a result, these conditions did not result in any notable change orders.

Figure 4: New Vault, Cabinets, and Bollards

D. Commissioning and Site Restoration

Commissioning activities included site restoration, final inspections, and placement of the valve into service. During this stage, SoCalGas successfully performed site acceptance testing and conducted point-to-point verification with Gas Control personnel for the newly-automated valve, and transferred ownership of the new equipment to Field Operations. Closeout activities included development of final drawings, the reconciliation package, and updates to company recordkeeping systems to reflect the completed scope of work. The site was commissioned on April 18, 2019, as summarized in Table 3.

IV. PROJECT COSTS

A. Cost Avoidance Actions

SoCalGas exercised due diligence in the design, planning, and construction activities for this project to minimize or avoid costs when prudent to do so. As discussed above, the Project Team reviewed existing records, communicated with external stakeholders, and conducted a site walk to incorporate the known site conditions in the project plan and design. SoCalGas grouped this site with six additional sites, Delano Station, Melcher and Elmo, Road 68 and Avenue 232, Road 96 and Avenue 198, Tipton, and Visalia Station, into a single valve bundle to gain efficiencies in engineering, planning, and construction costs to minimize costs for the benefit of customers.

B. Cost Estimates

Based on the preliminary design, once the preliminary project scope was confirmed and engineering, design, and planning activities were underway, SoCalGas prepared an estimate of the Direct Costs of the Project in the amount of $2,700,951. The Project Team considered the conditions known at the time to prepare the preliminary Direct Cost estimate. This estimate reflects the projected Labor, Material, and Services costs anticipated to be incurred to execute the Project, based on initial design plans.

SoCalGas estimated Indirect Costs of the Project based on the estimated Direct Costs and other project-related variables.

C. Actual Direct and Indirect Costs

Actual Direct Costs reflect the Labor, Material, and Services costs incurred to execute the Project. Actual Indirect Costs reflect costs for incremental overhead loaders in accordance with Company overhead allocation policies. The total loaded cost of the Project is $3,559,720.

Table 4: Estimated and Actual Direct Costs and Variances[2]

Direct Costs ($)	Estimate	Actuals	Delta Over/(Under)
Company Labor	195,859	207,108	11,250
Materials	354,626	249,106	(105,520)
Mechanical Construction Contractor	1,219,424	1,246,773	27,349
Electrical Contractor	61,907	103,224	41,317
Construction Management & Support	138,352	242,274	103,922
Environmental	43,070	85,694	42,624
Engineering & Design	262,952	449,255	186,303
Project Management & Services	161,071	58,226	(102,845)
ROW & Permits	18,150	37,208	19,058
GMA	245,541	348,407	102,866
Total Direct Costs	**2,700,951**	**3,027,276**	**326,325**

Table 5: Estimated and Actual Indirect Costs, Total Costs, and Variances[3]

Indirect Costs/Total Costs ($)	Estimate	Actuals	Delta Over/(Under)
Overheads	259,438	426,953	167,515
AFUDC	201,031	92,439	(108,592)
Property Taxes	47,914	13,052	(34,862)
Total Indirect Costs	**508,383**	**532,444**	**24,061**
Total Direct Costs	**2,700,951**	**3,027,276**	**326,325**
Total Loaded Costs	**3,209,334**	**3,559,720**	**350,386**

The Actual Full-Time Equivalents[4] (FTEs) for this Project are 0.87.

[2] Values may not add to total due to rounding.
[3] Ibid.
[4] Full-time equivalents (FTEs) are included in GRC forecasts to provide context to requested amounts for company labor. FTEs are calculated by measuring the number of hours charged over a given time period. For example, one FTE is equal to 40 hours per week, or typically 2,080 hours per year. The calculation of FTEs includes overtime hours. Therefore, if one employee works 60 hours per week, he or she would be recorded as 1.5 FTEs.

A. Cost Impacts

Consistent with one of the overarching objectives of PSEP to maximize the cost effectiveness of safety enhancement investments, SoCalGas effectively planned, designed, and completed construction activities for this project. Each pipeline project is unique in scope and inherently complex due to a variety of factors including terrain, environmental and permitting constraints, scope changes during detailed design, material cost fluctuations, regulatory changes, and more. These complexities can lead to variances between initial estimates and actual costs. Consistent with prudent management at the time, the Project Team successfully mitigated these variances whenever feasible through the implementation of effective project management practices, thorough planning, and continuous monitoring.

At the completion of the Line 7000 Valve Enhancement Project – Beech and Highway 46, Actual Direct Costs came within the AACE Class 3 Total Installed Cost (TIC) accuracy range, adhering to the standard industry practices defined by the Association for the Advancement of Cost Engineering (AACE) International. The Actual Direct Costs were more than the preliminary estimate by $326,325. This variance can be attributed to several factors including: the project estimate anticipated one full time inspector for 13 weeks, but the project required two to three inspectors were needed on-site to improve constructability; and the Engineering and Design firms completed activities originally identified as Project Management & Services in the initial estimate while the actual costs were recognized under Engineering and Design.

V. CONCLUSION

SoCalGas enhanced the safety of its natural gas system by prudently executing the Line 7000 Valve Enhancement Project – Beech and Highway 46. Through this Valve Enhancement Project, SoCalGas successfully installed and automated one mainline valve to achieve the objective of enabling rapid system isolation of a portion of Line 7000 located in an unincorporated area within Kern County. The total loaded cost of the Project is $3,559,720.

SoCalGas executed this project prudently through designing and executing the project to support achievement of Valve Enhancement Plan isolation objectives, bundling seven geographically proximate projects together to capture efficiencies through coordinated engineering, and installing equipment necessary to bring power and communication capabilities to the site to enable rapid system isolation to a portion of Line 7000 in Kern County.

SoCalGas engaged in prudent cost avoidance efforts to complete this safety enhancement at a reasonable cost by carefully planning and coordinating engineering and construction activities to maximize efficiencies and reduce customer and community impacts, engaging in reasonable efforts to promote competitive and market based rates for contractor services and materials, and using a reasonable amount of company and contractor resources to complete this safety enhancement as soon as practicable.

End of Line 7000 Valve Enhancement Project – Beech and Highway 46 Final Report

I. LINE 7000 VALVE ENHANCEMENT PROJECT – MELCHER AND ELMO

A. Background and Summary

The Line 7000 Valve Enhancement Project – Melcher and Elmo consists of valve enhancements made to one new mainline valve (MLV) and the installation of two check valves located in an unincorporated area within Kern County. Through this project, SoCalGas enhanced the safety of its natural gas transmission system by enabling the rapid detection of a significant change in pipeline pressure and remote isolation and depressurization of a portion of Line 7000 in the event of a pipeline rupture. SoCalGas installed one new MLV, two new check valves, one new actuator, one new vault to house the actuator, new power equipment, new communications equipment, and the necessary automation equipment at the site. The total loaded project cost is $3,830,828.

The Line 7000 Valve Enhancement Project – Melcher and Elmo is located in an agricultural environment near the intersection of Melcher Road and Elmo Highway in Kern County. SoCalGas bundled this site with six additional sites, Line 7000 Valve Enhancement Projects – Beech and Highway 46, Delano Station, Road 68 and Avenue 232, Road 98 and Avenue 198, Tipton, and Visalia Station, to gain efficiencies in engineering, planning, and construction activities. This workpaper describes the construction activities and costs of the Line 7000 Valve Enhancement Project – Melcher and Elmo.

Final Report for Line 7000 Valve Enhancement Project – Melcher and Elmo

Table 1: General Project Information

Line 7000 Valve Enhancement Project – Melcher and Elmo			
Location	Kern County		
Days on Site	68 days		
Construction Start	06/4/2018		
Construction Finish	10/24/2018		
Commissioning Date	04/18/2019		
Valve Upgrades			
Valve Number	7000-17.79-0		
Valve Type	New – Ball		
Actuator	New		
Actuator Above-/Below-Grade	Below-Grade		
ASV	Yes		
RCV	Yes		
Valve Number	N/A		
Valve Type	New – Check		
Actuator	N/A		
Actuator Above-/Below-Grade	N/A		
ASV	N/A		
RCV	N/A		
Valve Number	N/A		
Valve Type	New – Check		
Actuator	N/A		
Actuator Above-/Below-Grade	N/A		
ASV	N/A		
RCV	N/A		
Site Upgrades			
Vault	New		
Power	New – Utility		
Communication	New – Radio		
SCADA Panel	New		
Equipment Shelter	None		
Fencing/Wall	None		
Project Costs ($)	**Capital**	**O&M**	**Total**
Loaded Project Costs	3,830,828	-	3,830,828
Disallowed Costs	-	-	-

B. Maps and Images

Figure 1: Line 7000 Bundle Overview

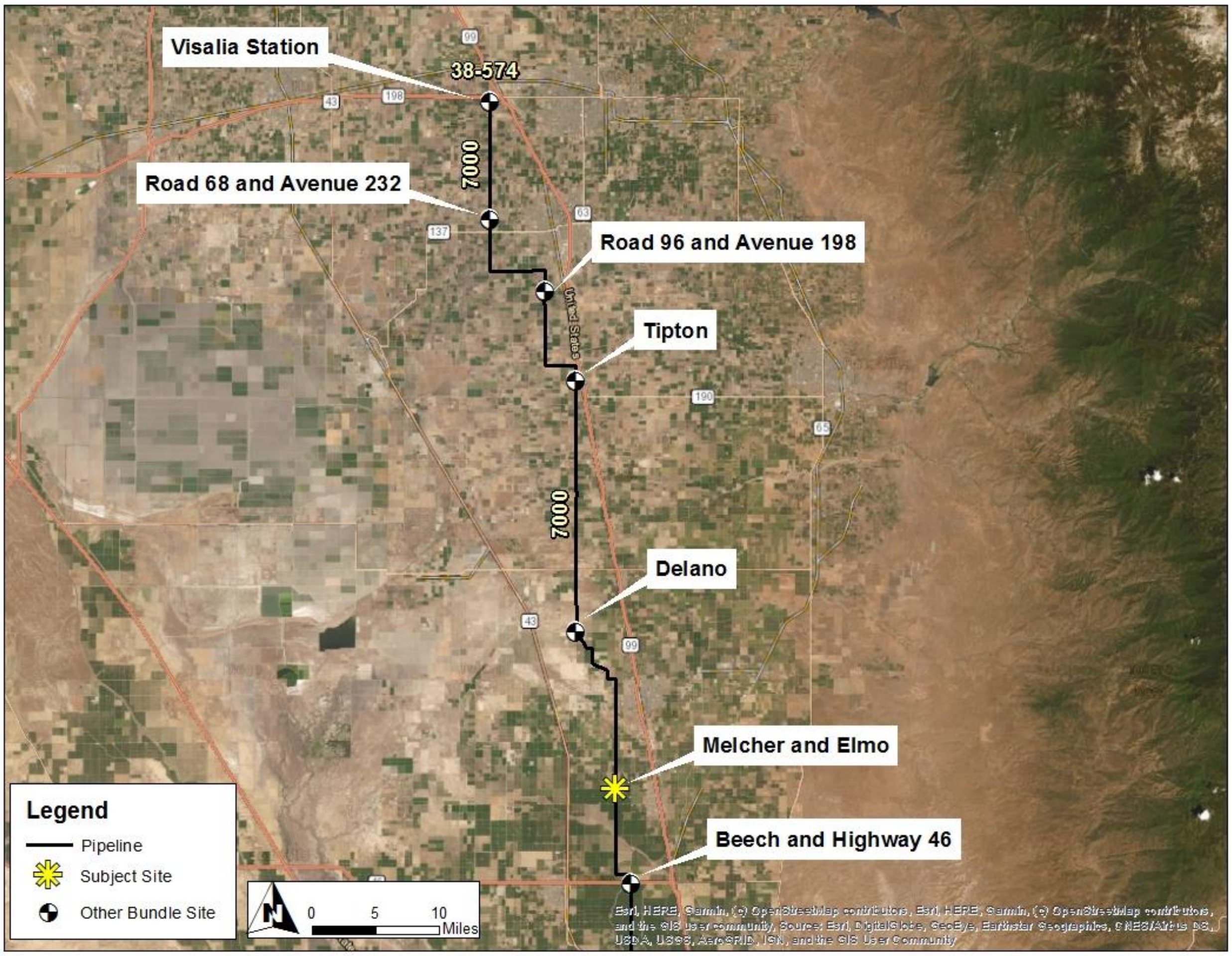


Figure 2: Satellite Image of Line 7000 Valve Enhancement Project – Melcher and Elmo

II. ENGINEERING, DESIGN, AND PLANNING

A. Project Scope

SoCalGas presented a conceptual project scope of the Line 7000 Valve Enhancement Project – Melcher and Elmo in workpapers supporting the Valve Enhancement Plan in the 2011 PSEP filing.[1] This conceptual scope identified MLV 7000-17.79-0 for automation to enable remote isolation of a portion of Line 7000. Prior to initiating execution of the Project, SoCalGas reviewed available information and performed a detailed system flow analysis to validate the scope of the Project. This resulted in the identification of two check valve installations to provide the planned isolation. The final project scope is summarized in Table 2 below.

1. <u>2011 PSEP Filing:</u> SoCalGas identified MLV 7000-17.79-0 for automation to achieve the objective of rapid system isolation.
2. <u>Updated Scope:</u> Upon project initiation, SoCalGas reviewed the conceptual project scope and determined that the automation of MLV 7000-17.79-0 alone would not achieve the transmission isolation objectives set forth in the Valve Enhancement Plan. SoCalGas determined it was also necessary to install two check valves downstream of bridle valves 7000-17.79-3 and 7000-17.79-4. Together, the automation of this MLV and the installation of the two check valves enables rapid isolation, thereby achieving Valve Enhancement Plan objectives.
3. <u>Engineering, Design, and Constructability:</u> During the pre-design site walk discussed below, the Project Team determined the existing MLV 7000-17.79-0, bridle configuration, and vault would not allow for the installation of an actuator. The Project Team updated the scope to include the installation of a new vault.

[1] *See* Workpapers supporting Amended Pipeline Safety Enhancement Plan (PSEP) of SoCalGas and SDG&E, submitted on December 2, 2011, at WP-IX-2-14 through WP-IX-2-25 (A.11-11-002 Exh. SCG-32).

4. Final Project Scope: The final project scope consists of the automation and installation of one new MLV that included the installation of a new actuator, the installation of a new vault to house the actuator, the installation of new power equipment, the installation of new communications equipment, the installation of the necessary automation equipment, and the installation of two check valves.

Table 2: Final Project Scope

Final Project Scope					
Line	Mile	Valve #	Valve Size (*confidential*)	Installation Type	Function
7000	17.79	0	[redacted]	NV/VT	ASV/RCV
7000	17.79	N/A	[redacted]	NV	BFP2
7000	17.79	N/A	[redacted]	NV	BFP2

B. Site Evaluation and Planning

SoCalGas initiated the planning process for the Line 7000 Valve Enhancement Project Melcher and Elmo by performing a pre-design site walk to determine the existing conditions and assess any potential impact on the design. Key factors that influenced the engineering and design of this project are as follows:

1. Site Description: The site is located in an agricultural area near the intersection of Melcher Road and Elmo Highway next to a PG&E distribution center in Kern County.
2. Land Issues: During the pre-design site walk, the Project Team noted that additional easements would be necessary to accommodate the new equipment.
3. DOT Class: This project site is in a Class 1 location. SoCalGas selected this MLV for automation to satisfy the PSEP Valve Enhancement Plan spacing criteria.
4. Power Source: There was no preexisting power source. The Project Team installed new power equipment at the site.
5. Communication Technology: There was no preexisting communications equipment. The Project Team installed new communications equipment at the site.

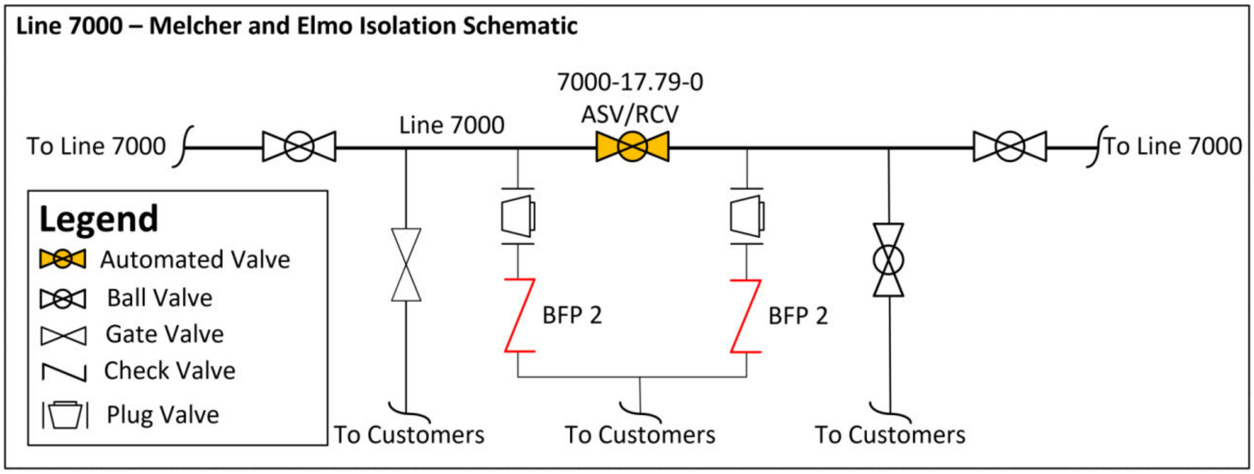
C. Engineering, Design, and Planning Factors

SoCalGas reviewed drawings and records, contacted internal planning groups, communicated with external stakeholders, conducted survey activity, performed potholing of the area to identify the presence of underground utilities and substructures, and completed a site walk. Key factors that influenced the engineering and design of the Project are as follows:

1. Engineering Assessment: During the site evaluation, the Project Team confirmed the preexisting technology and measurements of the preexisting vault. The Project Team determined that a new MLV, vault, and bridle assembly would need to be installed to accommodate a new actuator.
2. Valve Details: The existing valve was a manually operated Class 600 ball valve that the Project Team replaced.
3. Actuator Details: There was no preexisting actuator. The Project Team installed a new actuator.
4. Customer Impact: The Project Team did not identify any anticipated service disruptions to customers. The Project Team utilized stopples and a bypass to maintain service to customers during the installation of new valves.
5. Community Impact: The Project Team did not anticipate any notable impacts to the community from this project. The Project Team closed the southbound lane of Melcher Road for the duration of construction.
6. Substructures: The Project Team did not identify any existing substructures that affected the design and engineering at this site.
7. Environmental: The Project Team did not identify any notable environmental concerns at the site. An environmental monitor performed routine site visits during construction.
8. Permit Restrictions: There were no special permits or permit restrictions for this project site.

9. Land Use: The Project Team acquired a temporary right of entry from the private land owners adjacent to the site. The Project Team utilized a nearby site as a laydown yard for the duration of construction.
10. Traffic Control: The Project Team closed the southbound lane of Melcher Road for the duration of construction.

Figure 3: Line 7000 Valve Enhancement Project – Melcher and Elmo Schematic



D. Scope Changes

SoCalGas did not make any notable scope changes during detailed design.

III. CONSTRUCTION

A. Construction Contractor Selection

The Project Team prepared an initial cost estimate based on the preliminary design. Following completion of the engineering, design, and planning activities described above, the Project Team directed the Performance Partner (Mechanical Construction Contractor) and Alliance Partner (Electrical Contractor) to prepare cost estimates based on a more detailed engineering design package. As indicated above, there were no notable changes in scope between the time when the Project Team prepared the preliminary cost estimate and when the Performance Partner and Alliance Partner prepared and submitted their estimates.

1. <u>SoCalGas' Preliminary Mechanical Construction Contractor Estimate *(confidential)*:</u> SoCalGas' preliminary cost estimate for construction was [redacted].

2. <u>Mechanical Construction Contractor's Target Price Estimate *(confidential)*:</u> The Mechanical Construction Contractor's cost estimate was [redacted], which was [redacted] than SoCalGas' preliminary cost estimate for construction.

3. <u>SoCalGas' Preliminary Electrical Contractor Estimate *(confidential)*:</u> SoCalGas' preliminary cost estimate for the electrical contractor was [redacted].

4. <u>Electrical Contractor's Estimate (*confidential*):</u> The Electrical Contractor's estimate was [redacted], which was [redacted] than SoCalGas' preliminary cost estimate.

B. Construction Schedule

Table 3: Construction Timeline

Construction Start Date	06/4/2018
Construction Completion Date	10/24/2018
Days on Site	68 days
Commissioning Date	04/18/2019

The Project Team completed all construction activities as soon as practicable prior to commissioning. Finalization of commissioning activities is dependent on electrical utility connections, and system and/or resource availability.

C. Changes During Construction

SoCalGas successfully mitigated field conditions during construction in a manner that minimized potential impacts on project scope, cost, and schedule. As a result, these conditions did not result in any notable change orders.

Figure 4: Stopple Fitting with Temporary Bypass

Figure 5: New Mainline Valve

D. Commissioning and Site Restoration

Commissioning activities included site restoration, final inspections, and placement of the valves into service. During this stage, SoCalGas successfully performed site acceptance testing and conducted point-to-point verification with SoCalGas Gas Control personnel for the newly-automated valve, and transferred ownership of the new equipment to Field Operations. Closeout activities included development of final drawings, the reconciliation package, and updates to company recordkeeping systems to reflect the completed scope of work. The site was commissioned on April 18, 2019, as summarized in Table 3.

IV. PROJECT COSTS

A. Cost Avoidance Actions

SoCalGas exercised due diligence in the design, planning, and construction activities for this project to minimize or avoid costs when prudent to do so. As discussed above, the Project Team reviewed existing records, communicated with external stakeholders, and conducted a site walk to incorporate the known site conditions in the project plan and design. SoCalGas grouped this site with six additional sites, Beech and Highway 46, Delano Station, Road 68 and Avenue 232, Road 98 and Avenue 198, Tipton, and Visalia Station, into a single valve bundle to gain efficiencies in engineering, planning, and construction costs to minimize costs for the benefit of customers.

B. Cost Estimates

Based on the preliminary design, once the preliminary project scope was confirmed and engineering, design, and planning activities were underway, SoCalGas prepared an estimate of the Direct Costs of the Project in the amount of $2,838,421. The Project Team considered the conditions known at the time to prepare the preliminary Direct Cost estimate. This estimate reflects the projected Labor, Material, and Services costs anticipated to be incurred to execute the Project, based on initial design plans.

SoCalGas estimated Indirect Costs of the Project based on the estimated Direct Costs and other project-related variables.

C. Actual Direct and Indirect Costs

Actual Direct Costs reflect the Labor, Material, and Services costs incurred to execute the Project. Actual Indirect Costs reflect costs for incremental overhead loaders in accordance with Company overhead allocation policies. The total loaded cost of the Project is $3,830,828.

Table 4: Estimated and Actual Direct Costs and Variances[2]

Direct Costs ($)	Estimate	Actuals	Delta Over/(Under)
Company Labor	200,831	241,753	40,922
Materials	339,417	313,883	(25,534)
Mechanical Construction Contractor	1,341,232	1,307,003	(34,229)
Electrical Contractor	61,907	99,316	37,409
Construction Management & Support	138,352	309,564	171,212
Environmental	39,710	95,506	55,796
Engineering & Design	273,612	398,401	124,789
Project Management & Services	167,172	60,723	(106,449)
ROW & Permits	18,150	40,186	22,036
GMA	258,038	364,804	106,766
Total Direct Costs	**2,838,421**	**3,231,141**	**392,720**

Table 5: Estimated and Actual Indirect Costs, Total Costs, and Variances[3]

Indirect Costs/Total Costs ($)	Estimate	Actuals	Delta Over/(Under)
Overheads	267,727	463,034	195,308
AFUDC	211,615	117,902	(93,713)
Property Taxes	50,436	18,751	(31,685)
Total Indirect Costs	**529,777**	**599,687**	**69,910**
Total Direct Costs	**2,838,421**	**3,231,141**	**392,720**
Total Loaded Costs	**3,368,198**	**3,830,828**	**462,630**

The Actual Full-Time Equivalent[4] (FTE) for this Project is 0.89.

[2] Values may not add to total due to rounding.
[3] Values may not add to total due to rounding.
[4] Full-time equivalents (FTEs) are included in GRC forecasts to provide context to requested amounts for company labor. FTEs are calculated by measuring the number of hours charged over a given time period. For example, one FTE is equal to 40 hours per week, or typically 2,080 hours per year. The calculation of FTEs includes overtime hours. Therefore, if one employee works 60 hours per week, he or she would be recorded as 1.5 FTEs.

D. Cost Impacts

Consistent with one of the overarching objectives of PSEP to maximize the cost effectiveness of safety enhancement investments, SoCalGas effectively planned, designed, and completed construction activities for this project. Each pipeline project is unique in scope and inherently complex due to a variety of factors including terrain, environmental and permitting constraints, scope changes during detailed design, material cost fluctuations, regulatory changes, and more. These complexities can lead to variances between initial estimates and actual costs. Consistent with prudent management at the time, the Project Team successfully mitigated these variances whenever feasible through the implementation of effective project management practices, thorough planning, and continuous monitoring.

At the completion of the Line 7000 Valve Enhancement Project – Melcher and Elmo, Actual Direct Costs came within the AACE Class 3 Total Installed Cost (TIC) accuracy range, adhering to the standard industry practices defined by the Association for the Advancement of Cost Engineering (AACE) International. The Actual Direct Costs were higher than the preliminary estimate by $392,720. This variance can be attributed to several factors including: two to three construction inspectors were required simultaneously for project completion instead of only one for the various work areas; costs for NDE/X-ray and hydrotest contracted services were higher than expected; environmental requirements for asbestos abatement and management were higher than anticipated in preliminary design.

V. CONCLUSION

SoCalGas enhanced the safety of its natural gas system by prudently executing the Line 7000 Valve Enhancement Project – Melcher and Elmo. Through this Valve Enhancement Project, SoCalGas successfully installed and automated one mainline valve and installed two check valves to achieve the objective of enabling rapid system isolation of a portion of Line 7000 in an unincorporated area within Kern County. The total loaded cost of the Project is $3,830,828.

SoCalGas executed this project prudently through designing and executing the project to support achievement of Valve Enhancement Plan isolation objectives, bundling seven projects together to capture efficiencies through coordinated engineering, and installing equipment necessary to bring power and communication capabilities to the site to enable rapid system isolation of a portion of Line 7000 located in an unincorporated area of Kern County.

SoCalGas engaged in prudent cost avoidance efforts to complete this safety enhancement at a reasonable cost by carefully planning and coordinating engineering and construction activities to maximize efficiencies and reduce customer and community impacts, engaging in reasonable efforts to promote competitive and market based rates for contractor services and materials, and using a reasonable amount of company and contractor resources to complete this safety enhancement as soon as practicable.

End of Line 7000 Valve Enhancement Project – Melcher and Elmo
Final Report

I. LINE 7000 VALVE ENHANCEMENT PROJECT – ROAD 68 AND AVENUE 232

A. Background and Summary

The Line 7000 Valve Enhancement Project – Road 68 and Avenue 232 consists of valve enhancements made to an existing mainline valve (MLV) located in Tulare County. Through this project, SoCalGas enhanced the safety of its natural gas transmission system by enabling the rapid detection of a significant change in pipeline pressure and remote isolation and depressurization of a portion of Line 7000 in the event of a pipeline rupture. SoCalGas installed a new actuator, a new vault to house the actuator, new power equipment, new communications equipment, and the necessary automation equipment at the site. The total loaded project cost is $2,000,400.

The Line 7000 Valve Enhancement Project – Road 68 and Avenue 232 is located in a rural area in an agricultural field. There is an access road located adjacent to the below-ground valve. SoCalGas grouped this site with six additional sites, Line 7000 Valve Enhancement Projects – Beech and Highway 46, Delano Station, Melcher and Elmo, Road 96 and Avenue 198, Tipton Station, and Visalia Station to gain efficiencies in engineering, planning, and construction activities. This workpaper describes the construction activities and costs of the Line 7000 Valve Enhancement Project – Road 68 and Avenue 232. This project was designed and executed as one cohesive project. The project costs were shared by PSEP and the Operating District, with the Operating District funding the costs associated with welding and installation of valve body bleeds.

Table 1: General Project Information

Line 7000 Valve Enhancement Project - Road 68 and Avenue 232			
Location	Tulare County		
Days on Site	43 days		
Construction Start	01/10/2018		
Construction Finish	03/19/2018		
Commissioning Date	08/20/2018		
Valve Upgrades			
Valve Number	7000-61.38-0		
Valve Type	Existing – Ball		
Actuator	New		
Actuator Above-/Below-Grade	Below-Grade		
ASV	Yes		
RCV	Yes		
Site Upgrades			
Vault	New		
Power	New – Utility		
Communication	New – Radio		
SCADA Panel	New		
Equipment Shelter	None		
Fencing/Wall	None		
Project Costs ($)	**Capital**	**O&M**	**Total**
Loaded Project Costs	2,000,400	-	2,000,400
Disallowance	-	-	-

B. Maps and Images

Figure 1: Line 7000 Bundle Overview

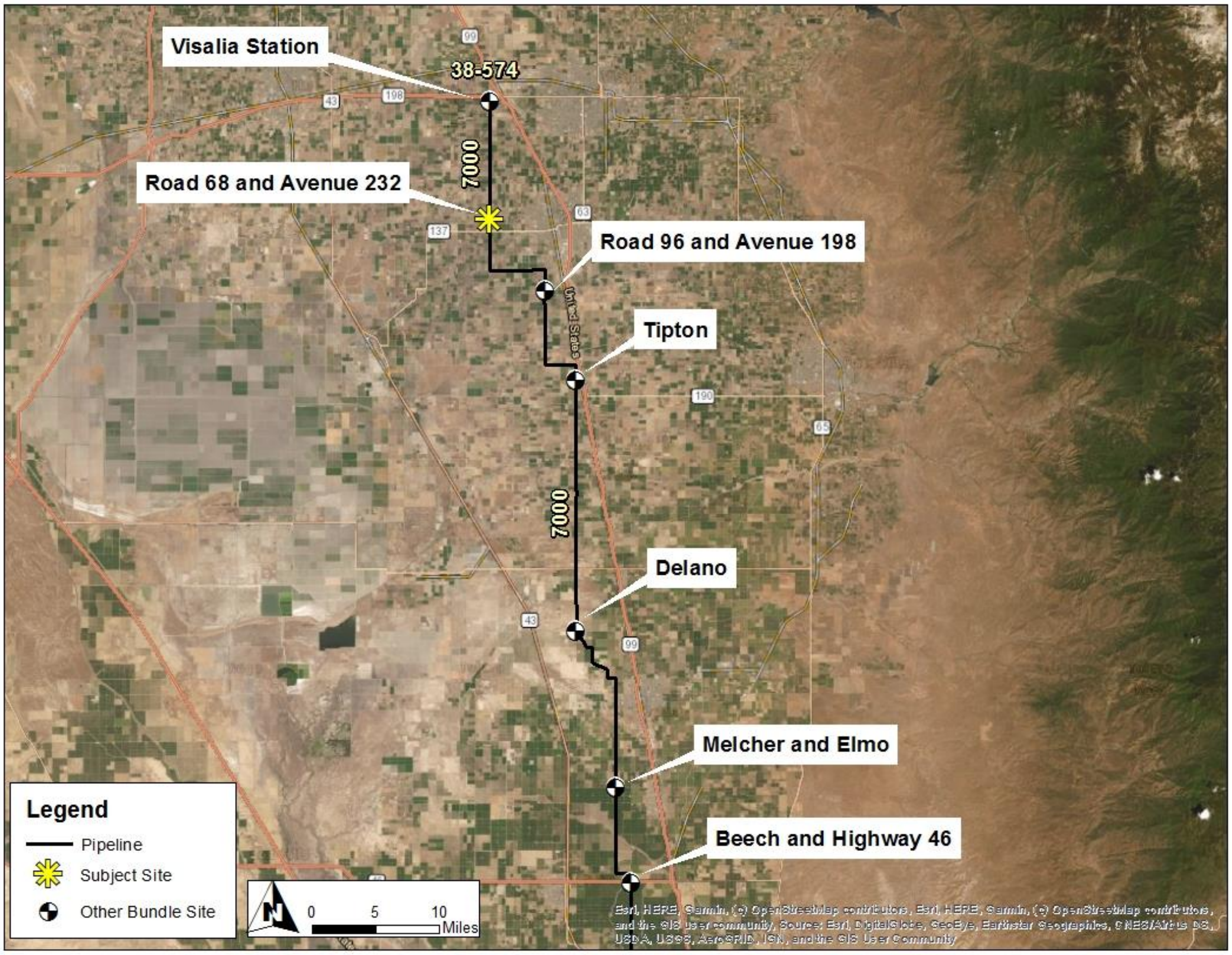


Figure 2: Satellite Image of Line 7000 Valve Enhancement Project – Road 68 and Avenue 232

II. ENGINEERING, DESIGN, AND PLANNING

A. Project Scope

SoCalGas presented a conceptual project scope for the Line 7000 Valve Enhancement Project – Road 68 and Avenue 232 in workpapers supporting the Valve Enhancement Plan in the 2011 PSEP filing.[1] This conceptual scope identified MLV 7000-61.38-0 for automation to enable remote isolation to a portion of Line 7000. Prior to initiating execution of the Project, SoCalGas reviewed available information and performed a detailed system flow analysis to validate the scope of the Project. The final project scope is summarized in Table 2 below.

1. 2011 PSEP Filing: SoCalGas identified MLV 7000-61.38-0 for automation to achieve the objective of rapid system isolation.
2. Updated Scope: Upon project initiation, SoCalGas reviewed the conceptual project scope and determined that this isolation point would achieve the transmission isolation objectives set forth in the Valve Enhancement Plan.
3. Engineering, Design, and Constructability: The Project Team did not make any notable changes in scope to the engineering and design of this project.
4. Final Project Scope: The final project scope consists of the installation of a new actuator, the installation of a vault to house the actuator, the installation of power equipment, the installation of communications equipment, and the installation of the necessary automation equipment at the site.

[1] *See* Workpapers supporting Amended Pipeline Safety Enhancement Plan (PSEP) of SoCalGas and SDG&E, submitted on December 2, 2011, at WP-IX-2-14 through WP-IX-2-25 (A.11-11-002 Exh. SCG-32).

Table 2: Final Project Scope

Final Project Scope					
Line	Mile	Valve #	Valve Size (*confidential*)	Installation Type	Function
7000	61.38	0	[redacted]	A/VT	ASV/RCV

B. Site Evaluation and Planning

SoCalGas initiated the planning process for the Line 7000 Valve Enhancement Project – Road 68 and Avenue 232 site by performing a pre-design site walk to determine the existing conditions and assess any potential impact on the design. Key factors that influenced the engineering and design of this project are as follows:

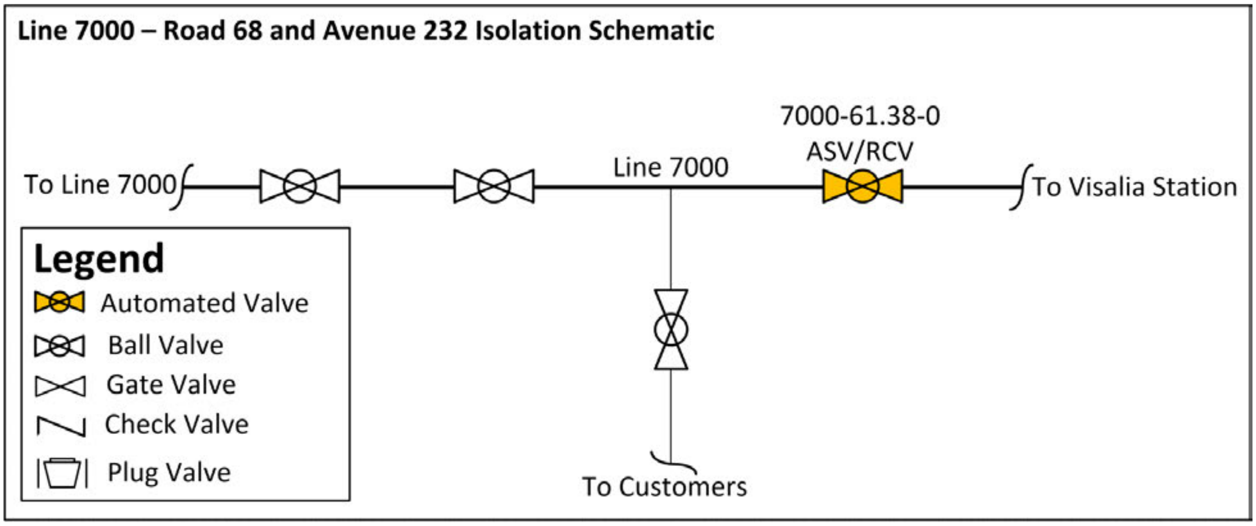
1. Site Description: The site is located in a rural area next to an agricultural field on Road 68 in Tulare County.
2. Land Issues: During the pre-design site walk, The Project Team confirmed the existing site conditions and determined that the new actuator required the installation of a new vault.
3. DOT Class: This project site is in a Class 1 location. SoCalGas selected this MLV for automation to isolate a Class 3 HCA location upstream of this valve.
4. Power Source: There was no preexisting power equipment. The Project Team installed new power equipment at the site.
5. Communication Technology: There was no preexisting communications equipment. The Project Team installed new communications equipment at the site.

C. Engineering, Design, and Planning Factors

SoCalGas reviewed drawings and records, contacted internal planning groups, communicated with external stakeholders, conducted survey activity, and completed a site walk. Key factors that influenced the engineering and design of the Project are as follows:

1. Engineering Assessment: During the site evaluation, the Project Team determined that a new actuator and vault were required.
2. Valve Details: The existing valve was a manually operated Class 600 ball valve, which was reused by the Project Team.
3. Actuator Details: There was no preexisting actuator. The Project Team installed a new actuator.
4. Customer Impact: The Project Team did not identify any anticipated service disruptions to customers from this Project.
5. Community Impact: The Project Team did not anticipate any notable impact to the community from this project.
6. Substructures: The Project Team did not identify any existing substructures that affected the design and engineering at this site.
7. Environmental: The Project Team did not anticipate environmental impact from this project. An environmental monitor performed routine site visits during construction.
8. Permit Restrictions: The Project Team acquired an encroachment permit from Tulare County.
9. Land Use: The Project Team acquired a Temporary Right of Entry for the duration of the construction period.
10. Traffic Control: The Project Team closed one northbound lane of Road 68 for the duration of construction.

Figure 3: Line 7000 Valve Enhancement Project – Road 68 and Avenue 232 Schematic



D. Scope Changes

SoCalGas did not make any notable scope changes during detailed design.

III. CONSTRUCTION

A. Construction Contractor Selection

The Project Team prepared an initial cost estimate based on the preliminary design. Following completion of the engineering, design, and planning activities described above, the Project Team directed the Performance Partner (Mechanical Construction Contractor) and Alliance Partner (Electrical Contractor) to prepare cost estimates based on a more detailed engineering design package. As indicated above, there were no notable changes in scope between the time when the Project Team prepared the preliminary cost estimate and when the Performance Partner and Alliance Partner prepared and submitted their estimates. The estimated vales below represent PSEP work only.

1. <u>SoCalGas' Preliminary Mechanical Construction Contractor Estimate *(confidential)*:</u> SoCalGas' preliminary cost estimate for construction was [redacted].

2. <u>Mechanical Construction Contractor's Target Price Estimate *(confidential)*:</u> The Mechanical Construction Contractor's cost estimate was [redacted], which was [redacted] than SoCalGas' preliminary cost estimate for construction.

3. <u>SoCalGas' Preliminary Electrical Contractor Estimate *(confidential)*:</u> SoCalGas' preliminary cost estimate for construction was [redacted].

4. <u>Electrical Contractor's Estimate (*confidential*):</u> The Electrical Contractor's estimate was [redacted], which was [redacted] than SoCalGas' preliminary cost estimate.

B. Construction Schedule

Table 3: Construction Timeline

Construction Start Date	01/10/2018
Construction Completion Date	03/19/2018
Days on Site	43 days
Commissioning Date	08/20/2018

The Project Team completed all construction activities as soon as practicable prior to commissioning. Finalization of commissioning activities is dependent on electrical utility connections, and system and/or resource availability.

C. Changes During Construction

SoCalGas successfully mitigated field conditions during construction in a manner that minimized potential impacts on project scope, cost, and schedule. As a result, these conditions did not result in any notable change orders.

Figure 4: Excavation around Mainline Valve Assembly

D. Commissioning and Site Restoration

Commissioning activities included site restoration, final inspections, and placement of the valve back into service. During this stage, SoCalGas successfully performed site acceptance testing and conducted point-to-point verification with Gas Control personnel for the newly-automated valve, and transferred ownership of the new equipment to Field Operations. Closeout activities included development of final drawings, the reconciliation package, and updates to company recordkeeping systems to reflect the completed scope of work. The site was commissioned on August 20, 2018, as summarized in Table 3.

IV. PROJECT COSTS

A. Cost Avoidance Actions

SoCalGas exercised due diligence in the design, planning, and construction activities for this project to minimize or avoid costs when prudent to do so. As discussed above, the Project Team reviewed existing records, communicated with external stakeholders, and conducted a site walk to incorporate known site conditions in the project plan and design. SoCalGas grouped this site with six additional sites, Line 7000 Valve Enhancement Projects – Beech and Highway 46, Delano, Melcher and Elmo, Road 96 and Avenue 198, Tipton Station, and Visalia Station to gain efficiencies in engineering, planning, and construction activities to minimize costs for the benefit of customers.

B. Cost Estimates

Based on the preliminary design, once the preliminary project scope was confirmed and engineering, design, and planning activities were underway, SoCalGas prepared an estimate of the Direct Costs of the Project in the amount of $1,203,185. The Project Team considered the conditions known at the time to prepare the preliminary Direct Cost estimate. This estimate reflects the projected Labor, Material, and Services costs anticipated to be incurred to execute the Project, based on initial design plans.

SoCalGas estimated Indirect Costs of the Project based on the estimated Direct Costs and other project related variables.

C. Actual Direct and Indirect Costs

Actual Direct Costs reflect the Labor, Material, and Services costs incurred to execute the Project. Actual Indirect Costs reflect costs for incremental overhead loaders in accordance with Company overhead allocation policies. The total loaded cost of the Project is $2,000,400.

Table 4: Estimated and Actual Direct Costs and Variances[2, 3]

Direct Costs ($)	Estimate	Actuals	Delta Over/(Under)
Company Labor	82,249	109,920	27,671
Materials	170,982	141,128	(29,854)
Mechanical Construction Contractor	447,161	713,017	265,856
Electrical Contractor	61,907	96,257	34,350
Construction Management & Support	63,011	119,138	56,127
Environmental	9,900	43,650	33,750
Engineering & Design	167,361	266,852	99,491
Project Management & Services	73,084	40,471	(32,613)
ROW & Permits	18,150	25,331	7,181
GMA	109,380	179,731	70,351
Total Direct Costs	**1,203,185**	**1,735,495**	**532,310**

Table 5: Estimated and Actual Indirect Costs, Total Costs, and Variances[4, 5]

Indirect Costs/Total Costs ($)	Estimate	Actuals	Delta Over/(Under)
Overheads	110,645	233,619	122,975
AFUDC	91,822	26,566	(65,256)
Property Taxes	21,885	4,720	(17,165)
Total Indirect Costs	**224,351**	**264,905**	**40,554**
Total Direct Costs	**1,203,185**	**1,735,495**	**531,310**
Total Loaded Costs	**1,427,536**	**2,000,400**	**572,864**

The Actual Full-Time Equivalent[6] (FTE) for this Project is 0.59.

[2] Values may not add to total due to rounding.
[3] Values in table include PSEP work only.
[4] Values may not add to total due to rounding.
[5] Values in table include PSEP work only.
[6] Full-time equivalents (FTEs) are included in GRC forecasts to provide context to requested amounts for company labor. FTEs are calculated by measuring the number of hours charged over a given time period. For example, one FTE is equal to 40 hours per week, or typically 2,080 hours per year. The calculation of FTEs includes overtime hours. Therefore, if one employee works 60 hours per week, he or she would be recorded as 1.5 FTEs.

D. Cost Impacts

Consistent with one of the overarching objectives of PSEP to maximize the cost effectiveness of safety enhancement investments, SoCalGas effectively planned, designed, and completed construction activities for this project. Each pipeline project is unique in scope and inherently complex due to a variety of factors including terrain, environmental and permitting constraints, scope changes during detailed design, material cost fluctuations, regulatory changes, and more. These complexities can lead to variances between initial estimates and actual costs. Consistent with prudent management at the time, the Project Team successfully mitigated these variances whenever feasible through the implementation of effective project management practices, thorough planning, and continuous monitoring.

At the completion of the Line 7000 Valve Enhancement Project – Road 68 and Avenue 232, Actual Direct Costs exceeded the preliminary estimate by $532,310. This variance is attributable to a variety of factors including:

1. <u>Company Labor:</u>
   a. The Project Team initially assumed that contractors would handle project management activities. These activities were performed by Company labor.
2. <u>Materials:</u>
   a. The electrical contractor planned to incur the costs for the electrical materials.
3. <u>Mechanical Construction Contractor:</u>
   a. Detailed engineering, design, and planning activities led to enhancements in the Project estimate and addressed key construction factors in field overheads, including site facilities, traffic control, site excavation, backfill excavation, and site restoration. As a result, the preliminary cost estimate did not fully capture the final scope of work. The Target Price Estimate (TPE) developed by SoCalGas and the Construction Contractor before construction incorporated these adjustments and refinements reflecting a detailed design, [redacted] the construction estimate to [redacted].

4. Electrical Construction Contractor:
   a. The Electrical Construction Contractor accounted for the cost of electrical materials originally identified in the materials category.
5. Construction Management & Support:
   a. Inspection costs increased due to the complexity of construction methods that led to the requirement of two to three inspectors at the construction location during construction, rather than the anticipated single inspector for nine total weeks.
   b. The engineering firms provided Construction Management & Support activities which were originally estimated under Construction Management and Support, but approximately $8,000 of these costs were recognized in Engineering and Design.
6. Environmental:
   a. The preliminary design did not anticipate additional environmental monitoring costs.
7. Engineering & Design:
   a. The engineering firm cost was higher than originally anticipated.
   b. The survey work was more extensive than initially projected.
   c. The Engineering and Design firms completed activities originally identified as Project Management & Services in the initial estimate while the actual costs of approximately $15,000 were recognized under Engineering and Design.
   d. The Engineering and Design firms completed activities originally identified as Construction Management & Support in the initial estimate while the actual costs of approximately $8,000 were recognized under Engineering and Design.
8. Project Management & Services:
   a. It was initially planned for contractors to complete project management activities. However, these were ultimately carried out by Company labor resources and resulted in additional cost savings.
   b. The engineering firms provided Project Management & Services activities which were originally estimated under Project Management and Services, but approximately $15,000 of these costs were recognized in Engineering and Design.

V. CONCLUSION

SoCalGas enhanced the safety of its natural gas system by prudently executing the Line 7000 Valve Enhancement Project – Road 68 and Avenue 232. Through this Valve Enhancement Project, SoCalGas successfully automated one mainline valve to achieve the objective of enabling rapid system isolation of a portion of Line 7000 in Tulare County. The total loaded cost of the Project is $2,000,400.

SoCalGas executed this project prudently through designing and executing the project to support achievement of Valve Enhancement Plan isolation objectives, bundling seven projects together to capture efficiencies through coordinated engineering, and installing equipment necessary to bring power and communication capabilities to this valve to enable rapid system isolation of a portion of Line 7000.

SoCalGas engaged in prudent cost avoidance efforts to complete this safety enhancement at a reasonable cost by carefully planning and coordinating engineering and construction activities to maximize efficiencies and reduce customer and community impacts, engaging in reasonable efforts to promote competitive and market based rates for contractor services and materials, and using a reasonable amount of company and contractor resources to complete this safety enhancement as soon as practicable.

End of Line 7000 Valve Enhancement Project – Road 68 and Avenue 232 Final Report

I. LINE 7000 VALVE ENHANCEMENT PROJECT – ROAD 96 AND AVENUE 198

A. Background and Summary

The Line 7000 Valve Enhancement Project – Road 96 and Avenue 198 consists of valve enhancements made to an existing mainline valve (MLV) located in an unincorporated area within Tulare County. Through this project, SoCalGas enhanced the safety of its natural gas transmission system by enabling the rapid detection of a significant change in pipeline pressure and remote isolation and depressurization of a portion of Line 7000 in the event of a pipeline rupture. SoCalGas installed a new actuator, a new vault to house the actuator, new power equipment, new communications equipment, and the necessary automation equipment at the site. The total loaded project cost is $2,224,777.

The Line 7000 Valve Enhancement Project – Road 96 and Avenue 198 construction site is located in a rural area adjacent to an agricultural field and a local irrigation ditch. SoCalGas bundled this valve project with six additional valve projects, the Line 7000 Valve Enhancement Projects – Beech and Highway 46; Delano Station; Melcher and Elmo; Road 68 and Avenue 232; Tipton; and Visalia Station, to gain efficiencies in engineering, planning, and construction activities. This workpaper describes the construction activities and costs of the Line 7000 Valve Enhancement Project – Road 96 and Avenue 198.

Final Report for Line 7000 Valve Enhancement Project – Road 96 and Avenue 198

Table 1: General Project Information

Line 7000 Valve Enhancement Project – Road 96 and Avenue 198			
Location	Tulare County		
Days on Site	45 days		
Construction Start	10/23/2017		
Construction Finish	01/05/2018		
Commissioning Date	08/21/2018		
Valve Upgrades			
Valve Number	7000-53.27-0		
Valve Type	Existing – Ball		
Actuator	New		
Actuator Above-/Below-Grade	Below-Grade		
ASV	Yes		
RCV	Yes		
Site Upgrades			
Vault	New		
Power	New – Utility		
Communication	New – Radio		
SCADA Panel	New		
Equipment Shelter	None		
Fencing/Wall	None		
Project Costs ($)	**Capital**	**O&M**	**Total**
Loaded Project Costs	2,224,777	-	2,224,777
Disallowed Costs	-	-	-

B. Maps and Images

Figure 1: Line 7000 Bundle Overview

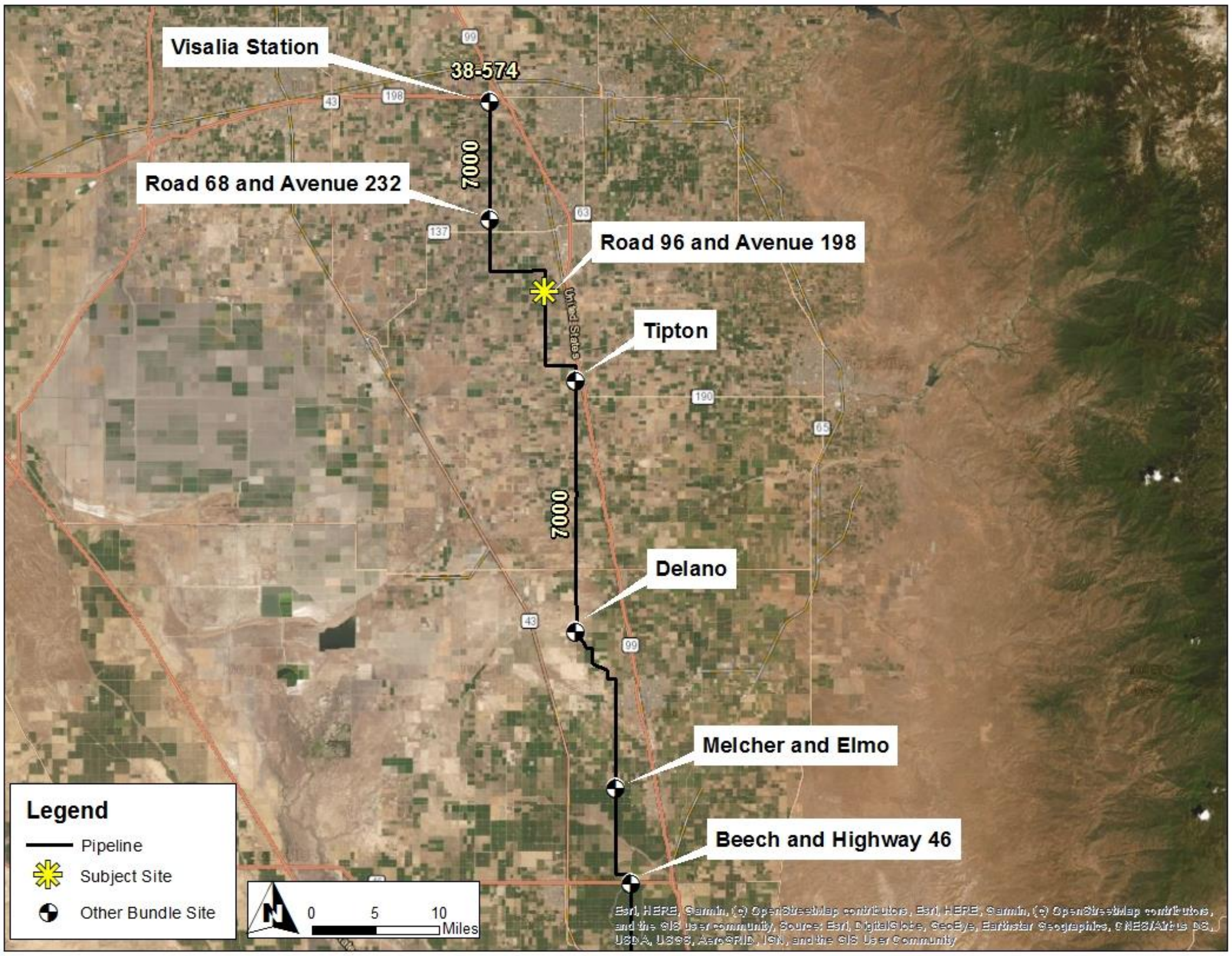


Figure 2: Satellite Image of Line 7000 Valve Enhancement Project – Road 96 and Avenue 198

II. ENGINEERING, DESIGN, AND PLANNING

A. Project Scope

SoCalGas presented a conceptual project scope for the Line 7000 Valve Enhancement Project – Road 96 and Avenue 198 in workpapers supporting the Valve Enhancement Plan in the 2011 PSEP filing.[1] This conceptual scope identified MLV 7000-53.27-0 for automation to enable remote isolation to a portion of Line 7000. Prior to initiating execution of the Project, SoCalGas reviewed available information, performed a detailed system flow analysis to validate the scope of the Project, and confirmed that this valve enhancement will provide the planned isolation. The final project scope is summarized in Table 2 below.

1. <u>2011 PSEP Filing:</u> SoCalGas identified MLV 7000-53.27-0 for automation to achieve the objective of rapid system isolation.
2. <u>Updated Scope:</u> Upon project initiation, SoCalGas reviewed the conceptual project scope and determined that this isolation point would achieve the transmission isolation objectives set forth in the Valve Enhancement Plan.
3. <u>Engineering, Design, and Constructability:</u> The Project Team did not make any notable changes in scope to the engineering and design of this project.
4. <u>Final Project Scope:</u> The final project scope consists of the automation of one valve, which included the installation of a new actuator, the installation of a new vault to house the actuator, the installation of new power equipment, the installation of new communications equipment, and the installation of the necessary automation equipment at the site.

[1] *See* Workpapers supporting Amended Pipeline Safety Enhancement Plan (PSEP) of SoCalGas and SDG&E, submitted on December 2, 2011, at WP-IX-2-14 through WP-IX-2-25 (A.11-11-002 Exh. SCG-32).

Table 2: Final Project Scope

Final Project Scope					
Line	Mile	Valve #	Valve Size (*confidential*)	Installation Type	Function
7000	53.27	0	[redacted]	A/VT	ASV/RCV

B. Site Evaluation and Planning

SoCalGas initiated the planning process for the Line 7000 Valve Enhancement Project – Road 96 and Avenue 198 by performing a pre-design site walk to determine the existing conditions and assess any potential impact on the design. Key factors that influenced the engineering and design of this project are as follows:

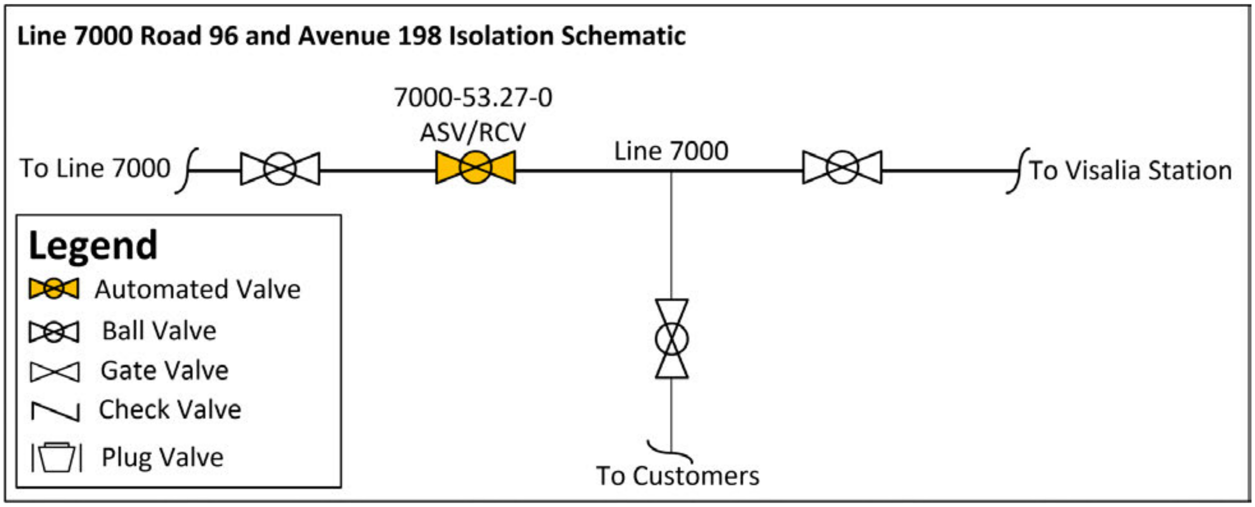
1. Site Description: This site is located in a rural area adjacent to an agricultural field and a local irrigation ditch in Tulare County at the intersection of Road 96 and Avenue 198.
2. Land Issues: During the pre-design site walk the Project Team confirmed the existing site conditions and determined that the new actuator required the installation of a new vault.
3. DOT Class: This project site is in a Class 2 location. SoCalGas selected this MLV for automation to isolate HCA locations upstream and downstream of this valve.
4. Power Source: There was no preexisting power equipment at the site. The Project Team installed new power equipment.
5. Communication Technology: There was no preexisting communications equipment. The Project Team installed new communications equipment at the site.

C. Engineering, Design, and Planning Factors

SoCalGas reviewed drawings and records, contacted internal planning groups, communicated with external stakeholders, conducted survey activity, and completed a site walk. Key factors that influenced the engineering and design of the Project are as follows:

1. Engineering Assessment: During the site evaluation, the Project Team confirmed the preexisting technology. There were no items of note that affected the design.
2. Valve Details: The existing valve was a manually operated Class 600 ball valve, which was reused by the Project Team.
3. Actuator Details: There was no preexisting actuator. The Project Team installed a new actuator.
4. Customer Impact: The Project Team did not identify any anticipated service disruptions to customers.
5. Community Impact: The Project Team did not anticipate any notable impacts to the community from this project. The Project Team utilized a neighboring farm field as a laydown yard.
6. Substructures: The Project Team did not identify any existing substructures that affected the design and engineering at this site.
7. Environmental: The Project Team did not identify any notable environmental concerns at the site. An environmental monitor performed routine site visits during construction.
8. Permit Restrictions: The Project Team obtained an encroachment permit from Tulare County.
9. Land Use: The Project Team utilized a neighboring agriculture field for a laydown yard. The Project Team scheduled the work so that the mechanical construction work did not impact the start of farming operations in 2018 per the request of the land owner. The remaining five days of mechanical and electrical work were completed without the use of the laydown yard.
10. Traffic Control: The Project Team placed signs along Road 96 to notify the community of construction. The Project Team did not close any lanes on Road 96 or Avenue 198.

Figure 3: Line 7000 Valve Enhancement Project Road 96 Avenue 198 Schematic



D. Scope Changes

SoCalGas did not make any notable scope changes during detailed design.

III. CONSTRUCTION

A. Construction Contractor Selection

The Project Team prepared an initial cost estimate based on the preliminary design. Following completion of the engineering, design, and planning activities described above, the Project Team directed the Performance Partner (Mechanical Construction Contractor) and Alliance Partner (Electrical Contractor) to prepare cost estimates based on a more detailed engineering design package. As indicated above, there were no notable changes in scope between the time when the Project Team prepared the preliminary cost estimate and when the Performance Partner and Alliance Partner prepared and submitted their estimates.

1. <u>SoCalGas Preliminary Mechanical Construction Contractor Estimate *(confidential)*:</u> SoCalGas' preliminary cost estimate for construction was [redacted].

2. <u>Mechanical Construction Contractor's Target Price Estimate *(confidential)*:</u> The Mechanical Construction Contractor's cost estimate was [redacted], which was [redacted] than SoCalGas' preliminary cost estimate for construction.

3. <u>SoCalGas and SDG&E's Preliminary Electrical Contractor Estimate *(confidential)*:</u> SoCalGas' preliminary cost estimate for the electrical contractor was [redacted].

4. <u>Electrical Contractor's Estimate (*confidential*):</u> The Electrical Contractor's estimate was [redacted], which was [redacted] than SoCalGas' preliminary cost estimate.

B. Construction Schedule

Table 3: Construction Timeline

Construction Start Date	10/23/2017
Construction Completion Date	01/05/2018
Days on Site	45 days
Commissioning Date	08/21/2018

The Project Team completed all construction activities as soon as practicable prior to commissioning. Finalization of commissioning activities is dependent on electrical utility connections, and system and/or resource availability.

C. Changes During Construction

SoCalGas successfully mitigated field conditions during construction in a manner that minimized potential impacts on project scope, cost, and schedule. As a result, these conditions did not result in any notable change orders.

Figure 4: Excavation Around Existing Valve Assembly

D. Commissioning and Site Restoration

Commissioning activities included site restoration, final inspections, and placement of the valve into service. During this stage, SoCalGas successfully performed site acceptance testing and conducted point-to-point verification with Gas Control personnel for the newly-automated valve, and transferred ownership of the new equipment to Field Operations. Closeout activities included development of final drawings, the reconciliation package, and updates to company recordkeeping systems to reflect the completed scope of work. The site was commissioned on August 21, 2018, as summarized in Table 3.

IV. PROJECT COSTS

A. Cost Avoidance Actions

SoCalGas exercised due diligence in the design, planning, and construction activities for this project to minimize or avoid costs when prudent to do so. As discussed above, the Project Team reviewed existing records, communicated with external stakeholders, and conducted a site walk to incorporate known site conditions in the project plan and design. SoCalGas grouped this site with six additional sites, Beech and Highway 46, Delano Station, Melcher and Elmo, Road 68 and Avenue 232, Tipton, and Visalia Station, into a single valve bundle to gain efficiencies in engineering, planning, and construction costs to minimize costs for the benefit of customers.

B. Cost Estimates

Based on the preliminary design, once the preliminary project scope was confirmed and engineering, design, and planning activities were underway, SoCalGas prepared an estimate of the Direct Costs of the Project in the amount of $1,221,107. The Project Team considered the conditions known at the time to prepare the preliminary Direct Cost estimate. This estimate reflects the projected Labor, Material, and Services costs anticipated to be incurred to execute the Project, based on initial design plans.

SoCalGas estimated Indirect Costs of the Project based on the estimated Direct Costs and other project-related variables.

C. Actual Direct and Indirect Costs

Actual Direct Costs reflect the Labor, Material, and Services costs incurred to execute the Project. Actual Indirect Costs reflect costs for incremental overhead loaders in accordance with Company overhead allocation policies. The total loaded cost of the Project is $2,224,777.

Table 4: Estimated and Actual Direct Costs and Variances[2]

Direct Costs ($)	Estimate	Actuals	Delta Over/(Under)
Company Labor	82,872	137,443	54,571
Materials	170,470	136,201	(34,269)
Mechanical Construction Contractor	447,161	728,388	281,227
Electrical Contractor	75,450	96,387	20,937
Construction Management & Support	63,011	190,856	127,845
Environmental	9,900	43,204	33,304
Engineering & Design	168,664	307,155	138,491
Project Management & Services	74,419	33,251	(41,168)
ROW & Permits	18,150	37,342	19,192
GMA	111,010	217,291	106,281
Total Direct Costs	**1,221,107**	**1,927,519**	**706,412**

Table 5: Estimated and Actual Indirect Costs, Total Costs, and Variances[3]

Indirect Costs/Total Costs ($)	Estimate	Actuals	Delta Over/(Under)
Overheads	111,700	249,610	137,910
AFUDC	93,159	39,632	(53,527)
Property Taxes	22,204	8,016	(14,188)
Total Indirect Costs	**227,063**	**297,258**	**70,195**
Total Direct Costs	**1,221,107**	**1,927,519**	**706,412**
Total Loaded Costs	**1,448,170**	**2,224,777**	**776,607**

The Actual Full-Time Equivalents[4] (FTEs) for this Project are 0.70.

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[2] Values may not add to total due to rounding.
[3] Values may not add to total due to rounding.
[4] Full-time equivalents (FTEs) are included in GRC forecasts to provide context to requested amounts for company labor. FTEs are calculated by measuring the number of hours charged over a given time period. For example, one FTE is equal to 40 hours per week, or typically 2,080 hours per year. The calculation of FTEs includes overtime hours. Therefore, if one employee works 60 hours per week, he or she would be recorded as 1.5 FTEs.

D. Cost Impacts

Consistent with one of the overarching objectives of PSEP to maximize the cost effectiveness of safety enhancement investments, SoCalGas effectively planned, designed, and completed construction activities for this project. Each pipeline project is unique in scope and inherently complex due to a variety of factors including terrain, environmental and permitting constraints, scope changes during detailed design, material cost fluctuations, regulatory changes, and more. These complexities can lead to variances between initial estimates and actual costs. Consistent with prudent management at the time, the Project Team successfully mitigated these variances whenever feasible through the implementation of effective project management practices, thorough planning, and continuous monitoring.

At the completion of the Line 7000 Valve Enhancement Project, Actual Direct Costs exceeded the preliminary estimate by $706,411. This variance is attributable to a variety of factors including:

1. Company Labor:
   a. The Project Team initially assumed that contractors would handle project management activities. These activities were performed by Company labor, increasing associated costs by approximately $16,000.
   b. While excavating the valve during construction, it was determined that the associated blowdown piping required modifications. This resulted in approximately $12,000 in increased union costs to support the modifications.

2. Mechanical Construction Contractor:
   a. Detailed engineering, design, and planning activities led to enhancements in the Project estimate and addressed key construction factors in field overheads, including site facilities, traffic control, site excavation, backfill excavation, and site restoration. As a result, the preliminary cost estimate did not fully capture the final scope of work. The Target Price Estimate (TPE) developed by SoCalGas and the Construction Contractor before construction incorporated these adjustments and refinements reflecting a detailed design, [redacted] the construction estimate to [redacted].
3. Construction Management & Support:
   a. Inspection costs increased by approximately $116,000 due to the complexity of construction methods that led to the requirement of two to three inspectors at the construction location during construction, rather than the anticipated single inspector for nine total weeks.
4. Environmental:
   a. The preliminary design did not anticipate additional environmental monitoring costs.
5. Engineering & Design:
   a. The engineering firm's cost was higher than originally anticipated.
   b. The survey work was more extensive than initially projected.
   c. The complexity of construction required a field engineer on site during construction for this project and incurred additional costs.
   d. The Engineering and Design firms completed activities originally identified as Project Management & Services in the initial estimate while the actual costs of $15,000 were recognized under Engineering and Design.
6. Project Management & Services:
   a. It was initially planned for contractors to complete project management activities. However, these were ultimately carried out by Company labor resources and resulted in additional cost savings.

b. The inclusion of estimating services resulted in an additional cost.
c. The engineering firms provided Project Management & Services activities which were originally estimated under Project Management and Services, but approximately $15,000 of these costs were recognized in Engineering and Design.

V. CONCLUSION

SoCalGas enhanced the safety of its natural gas system by prudently executing the Line 7000 Valve Enhancement Project – Road 96 and Avenue 198. Through this Valve Enhancement Project, SoCalGas successfully automated one mainline valve to achieve the objective of enabling rapid system isolation to a portion of Line 7000 located in an unincorporated area within Tulare County. The total loaded cost of the Project is $2,224,777.

SoCalGas executed this project prudently through designing and executing the project to support achievement of Valve Enhancement Plan isolation objectives, bundling seven geographically proximate projects together to capture efficiencies through coordinated engineering, and installing equipment necessary to bring power and communication capabilities to the site to enable rapid system isolation to a portion of Line 7000 in Tulare County.

SoCalGas engaged in prudent cost avoidance efforts to complete this safety enhancement at a reasonable cost by carefully planning and coordinating engineering and construction activities to maximize efficiencies and reduce customer and community impacts, engaging in reasonable efforts to promote competitive and market based rates for contractor services and materials, and using a reasonable amount of company and contractor resources to complete this safety enhancement as soon as practicable.

End of Line 7000 Valve Enhancement Project – Road 96 and Avenue 198 Final Report