PIPELINE SAFETY AND ENHANCEMENT PLAN (PSEP)

2017 FORECAST APPLICATION A.17-03-XXX

WORKPAPERS

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(Costs and Seven Stage Review Process)

SoCal Gas and SDG&E 2017 Forecast Application

Workpapers Supporting the Testimony of Ronn Gonzalez (Chapter II)

I. INTRODUCTION

The project workpapers that follow provide detailed information regarding the forecasted cost for each of the nine Phase 1B and three Phase 2A projects included in this Application. As stated in Chapter II, the methodology used to develop these forecasted costs include components that follow the guiding principles of Stages One (Project Initiation) through Three (Begin Detailed Planning) for the Seven Stage Review process, which was established to promote efficient project execution.

Each workpaper is organized as follows to capture the key elements of the estimate:

Cost and Project Summary – provides an overview of the project scope and costs.

Alternatives Considered – for Phase 1B replacement projects, describes the options to replacement (de-rating, abandonment).

Forecast Methodology – describes the basis of the cost estimated and the categories of costs considered in developing all project estimates.

Schedule – describes the basis for the schedule used across all project estimates.

Project Satellite and Topographic Map – two maps are provided (when applicable): a conventional map to provide the reader with general location of the project, and a satellite map that shows the type of terrain (urban, rural, river crossings, highways, etc.) the project traverses.

Mileage Table – the mileage for the project broken down by phase and accelerated and incidental miles, as defined in the testimony of Ronn Gonzalez in Chapter II.

Material Costs - estimate based on the type and quantities of material required for each project.

Construction Costs – based upon input from construction contractors, assumptions made in the development of the construction component of the project, which generally account for approximately 50% of total project cost. General assumptions include a geographically based construction cost estimate, estimated construction schedule duration, working days and hours taking into consideration any working hour restrictions, type of pipe installation method for replacement projects, and other pertinent construction assumptions. Additional detailed construction information, including site mobilization/facilities, site management, material handling, traffic control, substructure location, post-construction pressure test, final pipeline tie-in, abandonment of existing pipeline, paving, site restoration, site demobilization, and construction field overhead assumptions.

Environmental Costs - based upon evaluation of the project by PSEP Environmental Services, assumptions and associated costs regarding anticipated permitting, surveys, and monitoring,

hazardous/non-hazardous waste containment/disposal, Permit fees, and mitigation fees. Identified environmental issues unique to the project are also listed.

Land/Right of Way Costs – assumptions include need for new easements, construction yards for the storage of material and construction trailers and associated permits and legal services.

Company Labor Costs – anticipated activity and level of effort for SoCalGas management and represented personnel in support of the project.

Other Costs – estimated costs of contracted Project Management and Engineering services.

GMA Costs – Calculated General Management and Administration (GMA) costs as explained in the testimony of Jose Pech in Chapter III.

Indirect Costs – Applicable Company overheads as explained in the testimony of Jose Pech in Chapter III. Indirect costs do not include Allowance for Funds used During Construction (AFUDC) or Property Tax.

Included in each of the above key elements are the assumptions used to form the basis of estimate.

Appendix A contains a **Glossary** that will assist in defining specific terminology used throughout the workpapers.

The Summary Table of Projects provides a summary of relevant data for each project included in this Application (Line Number, Phase, project type (replacement, pressure test, abandonment, de-rate), line type (Transmission, Distribution), costs (loaded O&M costs, loaded capital costs and total loaded costs), mileage, and diameter.

PSEP Seven Stage Review Process[1]

As explained in testimony, the Seven Stage Review Process sequences and schedules PSEP project workflow deliverables.[2] The Seven Stage Review Process consists of seven stages with specific objectives for each stage and an evaluation gate at the end of each stage to verify that objectives have been met before proceeding to the next stage.[3]

Below is a description of the common activities that occur within each stage:

Stage 1 (Project Initiation) is where the Phase 1 WOA is initiated. The Phase 1 WOA is used to track costs for the early stage investigation and validation of Category 4 Criteria mileage and to fund

[1] Stages 1-3 have been completed for the projects included in this application

[2] The Seven Stage Review Process was implemented by the PSEP Organization beginning in the Second Quarter of 2013.

[3] Certain stages are condensed or combined for valve and small pipeline projects.

enough preliminary project scoping and design to develop an initial cost estimate (Phase 2 WOA). The Project Initiation Stage is where mileage originally included for remediation may be decreased due to scope validation efforts, reduction in Maximum Allowable Operating Pressure (MAOP), or abandonment of lines that are no longer required from a gas operating system perspective.

Stage 2 (Test or Replace Analysis) is where SoCalGas and SDG&E analyze data for selection of testing or replacement and focus on achieving PSEP's four objectives. Project execution options are presented and considered prior to proceeding to the next stage.

Stage 3 (Begin Detailed Planning) is where a project execution plan is finalized, baseline schedules are developed, funding estimates are developed, and project funding is obtained. The preliminary design estimates or Total Installed Costs (TIC) are estimated in direct dollars. Based on the TIC direct estimate, a Phase 2 WOA which adds in the indirects is populated. At the end of Stage 3 a preliminary design of the project is complete.

Stage 4 (Detailed Design/Procurement) is where design and construction documents are completed, necessary permits and authorizations are attained, a construction contractor is selected, and pipeline materials are purchased, received, and prepared for turnover to contractors.

Stage 5 (Construction) is where construction contractors are mobilized and monitored to (1) document progress and compliance; (2) conduct testing; and (3) maintain project scope quality, budget, and schedule.

Stage 6 (Place into Service) is where commissioning and operating activities are performed to achieve completion certification for the project.

Stage 7 (Closeout) is where regulatory, contractual, archival activities are performed to close the project in an orderly manner and issue acceptance certificates.

WP-SCS-1-13

Appendix A – Standard Construction Summary for Replacement and Hydrotest Projects

APPENDIX A

Standard Construction Summary for Replacement and Hydrotest

The following information provides an overview of the typical construction activities that occur during SoCalGas and SDG&E PSEP pipeline replacement and hydrotest projects.

It should be noted that there are some projects that may differ from the general activities described below, as project activities depend on the unique characteristics of each particular project.

This first section describes the typical activities of a replacement project. The following section will discuss the differences seen in a hydrotest project as compared to a replacement project.

Replacement Project

1. Permits – Typically Stages 3 or 4

One of the initial construction activities that affect project decisions is the securing of permits. PSEP projects are in a variety of locations: congested urban areas, highways/freeways, railroads/light rails, bridges, environmentally and culturally sensitive areas, coastal zone, commercial centers, private land, hillsides, airport zones, etc., and, as such, there are usually many permits required for a project. Each area will present unique requirements that are necessary for successful and safe construction which also must follow the specific requirements, such as requiring night work (see Figure 4), as stated in each of the specific permits pulled for a project. Permits may take many months to secure and the requirements of the permit may not be known until construction is about to begin. The permits may be local, state, or federal permits and clearances and they address all natural resources — land, air, water, vegetation, and wildlife — as well as the interests of the general public such as noise. Some of the most common agencies involved are local municipalities, Caltrans, local tribal organizations, U.S. Army Corps of Engineers, Bureau of Land Management, environmental agencies, etc.

2. Surveying and Locating – Stages 3 or 4

Surveying and locating activities will typically take place during Stages 3-4 and determine the right of way (ROW) and pipeline location. The ROW is a narrow strip of land (public or private property) that contains the pipeline(s) and is where all onsite construction activities occur. Before any construction activities can begin, survey and locate & mark crews carefully survey and mark out the construction right of way for the existing pipeline and other substructure locations.

Since it is critical that the exact pipeline location and substructures are known prior to the start of construction, potholing is also typically completed during Stage 4, but there are times when this activity cannot start until Stage 5 (construction). Potholing involves excavating a small hole over the pipeline to validate the location of an existing substructure.

Surveying and locating activities help to determine what will be needed for the temporary construction easements, possible substructure conflicts within the desired replacement location, and other issues that will need to be accounted for in the project design.

In Stage 4, the land acquisition team is evaluating nearby locations for a lay-down yard and field construction office which will stage the equipment, material, fabrication space, water for hydrotests, work trailer, etc. for several weeks. Ideally, the yard will be at least 50,000 square feet or about the size of a football field (See Figure 5).

Lastly, during Stages 3 and 4, affected customers are identified and communication materials are generated and sent out which notify customers of the upcoming construction activities in the area. This notification takes place earlier enough in the process so as to allow for customer input and changes to construction as needed.

3. Clearing and Grading Construction and Lay-down Yard - beginning Stage 5

At the beginning of Stage 5 (Construction) the clearing/grading activities typically take place for projects in the non-paved locations. A few require extensive work due to work being located on hillsides. Clearing is the removal of all brush from the construction work area. Grading is required to provide a relatively level surface to allow safe operation of the heavy equipment. It should be noted before any construction activity takes place an environmental inspection may be required of the laydown yard and the pipeline construction area.

4. Trenching and Excavating – Stage 5

Trenching and excavating activity takes place in Stage 5 (Construction). The trenching operation in pavement begins with a saw-cutting crew which cuts the pavement for excavation. Once the pavement is removed from the area, the trenching can begin. The trenching crew typically uses a backhoe to dig the replacement pipe trench. The trench is excavated to a depth that provides sufficient cover over the pipeline after backfilling. Typically, the trench is about 4 to 6 feet wide in stable soils and at least 5-feet deep (depends on the pipeline's diameter and DOT Class location to actual depth). This depth allows for the required minimum 36 inches of cover.

Many pipelines are located at a depth which requires elaborate shoring systems to be installed for construction. The shoring is necessary when the excavation is more than 5 feet deep or is in sandy soil conditions (see Figure 6). The shoring can limit the work area due to beams and other structures that obstruct the construction process which slows down production (see Figure 1). An example of why greater pipeline depth is needed is a railroad crossing or storm drain conflict.

Given the work that needs to take place on the existing pipeline, the excavation may require, per code, hand-digging over the gas pipeline to expose the pipe and other potential utility substructures in the area. The hand- digging process can be labor and time intensive. For example, if the trench that the pipeline must be installed within is running laterally with another utility structure and the distance is under the legal threshold for mechanical excavation, the entire length must be hand excavated.

There are also many requirements that have to be met during the excavation process that are governed by the various permits issued for a project. For example, when excavating in traveled roadways, steel plates will be needed to cover the open trench at the end of each day. The process of moving the plates on the trench and welding them together at the end of the day and then removing them each morning takes additional time that may decrease productivity depending on the available working hours set by the permitting agency.

Some installations require a bore operation when the pipeline needs to go under a structure and an open trench cannot be dug, for example for crossing a freeway/highway, or railroad, or to avoid disrupting traffic across a busy intersection. In this case, there is only an excavation at the start and end of the bore route; however, these bore pits are typically 30 feet x 15 feet and at a minimum depth of 20 feet (oftentimes greater). This activity requires extensive bell-hole preparation and is a complicated process that necessitates a specialized crew and equipment (see Figures 7 and 8).

Often, each replaced pipeline has taps that feed an individual customer or a regulator station which need to be connected to the new pipeline once put into service. Each tap location requires an excavation which is on average approximately 5 feet x 8 feet and takes a crew approximately 1 day per hole to excavate depending on the soil conditions (shoring may also be needed). Those excavations will be plated and left open until the new pipeline section is tested and gassed up. Then these tap connections can be completed and backfilled.

Lastly, there are some municipalities that require the existing pipeline to be removed and the new pipeline to be installed in the same location. This also might be necessary if the pipeline right of way is not large enough for the replacement pipeline. This removal step can greatly add to the complexity and time for the project.

5. Pipeline Laying, Bending, Welding - Stage 5

The pipe sections, fittings and other pipeline components are laid out on the job site for installation as construction proceeds. In order to follow the correct route the pipe's direction is changed by either bends or welding in segmented ells (see Figure 9). In some cases the joints are welded together and placed on temporary supports. The pipe crew and a welding crew are responsible for the welding process. The pipe crew typically uses special pipeline equipment called side booms to pick up each joint of pipe, align it with another joint, and make the first part of the weld (a pass called the stringer bead). Additional filler passes are made by welders who immediately follow the stringer bead. There could be different welders for the different welds needed: stringer, hot-pass, and capping welders make up the typical welding crew, and they are often followed by tie-in welders.

6. Non Destructive Evaluation (NDE) - Stage 5

As part of the quality assurance process, each welder must pass qualification tests (Operator Qualification) to work on a particular pipeline job, and each weld procedure must be approved for use on that job in accordance with federally adopted welding standards.

The welds undergo visual and radiographic inspection (a.k.a., X-ray), as outlined in 49 CFR Part 192 by qualified technicians and inspectors. The technicians take X-rays of the pipe welds to ensure that the completed welds meet federally prescribed quality standards. The X-ray technician processes the film in a small, portable darkroom at the site. If the technician detects any unacceptable flaws, the weld is repaired or cut out, and a new weld is made as per code requirements.

7. Lowering Pipe into the Trench - Stage 5

Depending on the length of pipe to replace, lowering the welded pipe into the trench demands close coordination and skilled operators (see Figure 9). Using a series of side booms (tractor designed to move pipelines into place), operators simultaneously lift and carefully lower the welded pipe sections into the trench. The bottom of the trench is shaded with at least 6 inches of sand to protect the pipe and coating from damage. Lastly, cathodic protection test stations may be installed on the pipeline before backfilling.

8. Field Coating - Stage 5

Pipelines are externally coated to prevent moisture from coming into direct contact with the steel and causing corrosion. Typically, coated pipelines are delivered with uncoated areas three to six inches from each end to prevent the coating from interfering with the welding process. Once the welds are completed, a coating crew coats the remaining portion of the pipeline. Prior to this coating application, the coating crew thoroughly cleans the bare pipe with a power wire brush or a sandblast machine to remove any dirt, mill scale, or debris. The crew then applies the coating and allows it to dry. Once dry, the coating of the pipeline is inspected to ensure it is free of defects: it is electronically inspected, or "jeeped," for faults or voids in the epoxy coating and visually inspected for faults, scratches, or other coating defects.

9. Backfilling and Paving - Stage 5

After all welds have passed NDE, coating is completed and passes inspection, and survey crews record the location of the pipe and various valves/fittings, crews begin the backfilling process. As with previous construction crews, the backfilling crew takes care to protect the pipeline and coating by using a minimum of 12 inches of zero-sack slurry (sand and water mixture) on top of the top pipe. Then the remainder of the backfill material is placed over the pipe. The final step is paving.

10. Hydrostatic Testing - Stage 5

Depending on the varying elevation of the terrain along the pipeline and the location of available water sources, the pipeline may be divided into sections to facilitate the test. Each section is filled with water and pressured up to DOT requirements and held for a specified period of time to determine if the pipeline meets the design strength requirements and if any leaks are present (see Figures 10 and 11 for hydrotest set ups). Once a section successfully passes the hydrostatic test, water is emptied from the pipeline and the pipeline is dried to ensure that no water is present when natural gas begins to flow.

The drying out of the pipeline is completed using large compressors and foam tools (pigs). A pig launcher and receiver are installed at the ends to facilitate this process. The team will continue to pass the pig through the system until the desired dew point is reached as prescribed by engineering. Once achieved, the final tie-ins and commissioning activities can commence. This drying process usually takes 3 days, more or less depending on the length and geometry of the pipeline.

The used water is tested by environmental services for disposal purposes. Containers such as Baker Tanks are used to store the water before disposal while water testing results are being evaluated (see Figures 10, 11, and 12). Filtration equipment is used to remove organic and inorganic material to permit disposal levels. The water may be disposed of at a sewer, transported to a disposal facility via a truck or provided to a third party for non- potable reuse. How the water is disposed often times depends on permit requirements.

11. Final Tie-in and commissioning - Stage 5 and 6

Following successful hydrostatic testing and drying process, the final pipeline tie-ins are made and inspected (see Figure 13). The line is then odorized which is a process that will take up to 2 days or more to complete. After odorization is achieved, the tie-in process is completed with flow being opened to all taps. Any customers who were being fed by CNG/LNG have their service switched to being fed from the new pipeline.

The process for the abandonment of the original line also needs to take place. It begins by purging, isolating the ends and taps, and permanently decommissioning the line which could take a few days to complete.

12. Cleanup and Restoration - Stage 5 and 6

The final step in the construction process is to restore the street, right-of-way, easement land and lay-down yard as closely as possible to its original condition. This step involves cleaning up the lay-down yard, completing the paving repairs or land restoration as required by the issued permit or land owner. Careful attention is paid to ensure future erosion issues are addressed for non-paving involved installations.

This next section describes the hydrotest project activities as they differ from a pipeline replacement project.

Hydrotest Project

a. The trenching/excavating activity for a hydrotest project will involve exposing the pipeline to be tested as follows:
b. Identified pipeline features will be removed. The removal process in general will also involve welding and NDE (see Figure 14).
c. All non-piggable pipeline features will be removed.
d. All pipeline features that cannot be pressure tested will be replaced/removed.
e. All tap locations (customer lines, regulator station taps, etc.) that are off the main line will be excavated because they need to be isolated before a hydrotest.
f. Each end of the project will be exposed to install test heads. This will require a minimum of a 10 foot x 20 foot bell hole.

There is a small amount of replacement work during a hydrotest project that is necessary to isolate the pipe and install the test heads. This replacement activity requires the following:

a. The small section of pipe is removed at each end.
b. The non-tested line must be welded with a cap that will be cut out after testing is completed.
c. The test heads are welded into place and NDE follows.
d. The pipe is hydrotested.
e. The test heads are cut out and the pig launcher/receiver is installed. The drying process takes place after water is removed
f. The pig launcher/receiver is removed and a new tested section of pipe is installed. All taps and main line ties are completed using the welding process.

Lastly, since the pipeline is being taken out of service, there could be CNG/LCG activities: deliveries, installation, management and eventually removal required for the individual customers fed off the pipeline being tested (see Figure 15).

See the following link for a video describing the process.

https://www.youtube.com/watch?v=lRFWeTRAcCU

This concludes the overview of the general construction activities that take place with PSEP replacement and hydrotest projects.

Note: the following photos were taken on PSEP jobs performed by SoCalGas and SDGE.

Figure 1: Trenching in Urban Location

Figure 2: Lowering Pipe in Congested City Area

Figure 3: Installing Pipe in Trench with Existing Substructures

Figure 4: Night Work Construction Site

Figure 5: Construction Laydown Yard

Figure 6: Shoring

Figure 7: Jack and Bore Pit

Figure 8: Jack and Bore Operation

Figure 9: Lowering Section of Pipe into Trench

Figure 10: Hydrotest Equipment

Figure 11: Hydrotest Set Up with Sound Proofing to Minimize Noise Complaints (located behind Baker tank)

Figure 12 – Baker Tanks

Figure 13: L-2000 Tie-In Construction

Figure 14: Feature to be Removed from L-2000W Before Hydrotest

Figure 15: CNG for Temporary Bypass

WP-G-1-4

Appendix B – Glossary of Terms

APPENDIX B

GLOSSARY OF TERMS

The following list of acronyms, terms and high level definitions are intended to accompany the workpapers that support SoCalGas and SDG&E's 2017 PSEP Forecast Application and specifically testimony Chapter II. These terms describe cost, gas operations, construction and land use terms that may not be commonly understood. They also provide the full name for less common acronyms that are referenced in these workpapers. This is not a comprehensive or detailed glossary of utility and construction terms. It is assumed that the reader is familiar with basic utility industry and regulatory terms, and as such, those terms and acronyms have been intentionally omitted from this list.

Acronym	Term	Definition
AFUDC	Allowance for Funds Used During Construction	Net costs for borrowed funds used for construction purposes
	Category 1	Includes those pipelines and pipeline segments that have documentation of hydrostatic pressure testing per NTSB Safety Recommendation P-10-2 (Urgent).
	Category 2	Includes those pipelines and pipeline segments that have documentation of pressure testing using a medium other than water.
	Category 3	Includes those pipelines and pipeline segments that have a documented highest historical operating pressure that is at least 1.25 times the current MAOP.
	Category 4	Includes pipelines that lack sufficient documentation of a post-construction strength test to 1.25xMAOP. All Category 4 pipeline segments were prioritized for further analysis and action per NTSB Safety Recommendation P-10-4.
	Class 1	An offshore area; or any class location unit that has 10 or fewer buildings intended for human occupancy.
	Class 2	Any class location unit that has more than 10 buildings but fewer than 46 buildings intended for human occupancy.

	Class 3	A Class Location unit that has 46 or more buildings intended for human occupancy or is an area where the pipeline lies within 100 yards (300 feet) of any of the following: building, a small well defined outside area, outdoor theater, or other place of public assembly) that is occupied by 20 or more persons on at least 5 days a week for 10 weeks in any 12-month period. (The days and weeks need not be consecutive.)
	Class 4	A Class 4 location is any class location unit where buildings with four or more stories above ground are prevalent.
GMA	General Management and Administration	Means by which to track PSEP programmatic costs incurred in support of PSEP project execution. The PSEP GMA was created in order to create a process by which to track, monitor, and allocate PSEP support costs to the various PSEP projects
HDD	Horizontal Directional Drilling	A trenchless method of installing underground pipe.
	Hot Tap	The method of making a connection to existing piping without the interruption of emptying that section of pipe. The pipe can continue to be in operation while maintenance or modifications are being done to it.
	Hot Tie-in	Activity that connects two pipelines together while the source pipeline still contains natural gas.
	Jack-and-Bore	Method of horizontal boring sewer construction. Construction crews drill a hole underground horizontally between two points without disturbing the surface between sending and receiving pits.
	Jute matting	Netting used for erosion control.
	K-rail	A term borrowed from the California Department of Transportation specification for temporary concrete traffic barriers.
	Line-seasoning	Also referred to as “pickling” the line, the pre-odorization of gas pipelines to maintain the odorant level of the pipeline.
	Loaded Costs	Direct costs and indirect costs

MLV	Mainline Valve	A valve positioned at a location along the pipeline system that can be closed down to isolate a line section in an emergency or for maintenance purposes.
MAOP	Maximum Allowable Operating Pressure	The maximum pressure at which a pipeline or segment of a pipeline may be operated under [49 CFR 192] and the provisions of ASME B31.8.
	Nipple	A short stub of pipe, usually threaded steel, brass, chlorinated polyvinyl chloride (CPVC) or copper; occasionally just bare copper.
NDE	Nondestructive Examination or Nondestructive Testing (NDT)	An analysis technique used in science and industry to evaluate the properties of a material, component or system without causing damage. This testing is performed on pipelines during construction.
O&M	Operations and Maintenance	Costs that support activity that is related to operation and maintenance activities on an asset.
	Overheads	The different loaders applied to direct costs
	Piggable	A piggable pipeline is a pipeline that is designed to allow a standard inspection tool to negotiate it.
RER	Request for Engineering Review	Formal process by which the engineering department reviews pipeline change requests and determines system impacts based on engineering analysis.
ROW	Right of Way	A strip of land on which pipelines, railroads, power lines, and other similar facilities are constructed. It secures the right to pass over property owned by others and ROW agreements only allow the right of ingress and egress for the operation and maintenance of the facility.
	Seven stage project life cycle	Also referenced as the Seven Stage Review Process.
SMYS	Specified Minimum Yield Strength	The specified minimum yield strength for steel pipe manufactured in accordance with a listed specification.
	Stopple	A plug which can stop the flow of gas.

	Subpart J	Subpart J refers to CFR 49 Part 192, Subpart J – Test requirements, which is a section of the Code of Federal Regulations (CFR) that prescribes minimum leak-test and strength-test requirements for pipelines.
SL	Supply Line	A distribution supply line can be either a transmission line or a distribution main and is operated at a pressure more than 60 psig, and: a) Supplies one or more distribution regulator stations, or supplies three or more customers.
	Test Head	A piece of equipment through which water is pumped to conduct a pressure test. A pipeline that will be pressure tested has a test head welded to the end of a pipeline segment.
TIC	Total Installed Cost	Estimated forecast of a projects final direct costs.
TRE	Temporary Right of Entry	Legal documentation to access public or private property to pass or do work with prior obtained permit, lease, or right-to-entry.

WP-II-A1-A118

Pipeline Hydrotest, Replacement,

Abandon and De-Rate projects

WORKPAPER SUMMARY

PSEP FORECAST APPLICATION PIPELINE PROJECTS

Project Line	Pipe Diameter (inch)	Phase	Project Type	Line Type	Total Miles	Loaded O&M Costs	Loaded Capital Costs	Total Loaded Costs[1]
127	[redacted]	1B	Replacement	Transmission	0.003 mi		$1,830,070	$1,830,070
7043	[redacted]	1B	Replacement	Transmission	0.001 mi		$1,807,206	$1,807,206
36-37 Section 11	[redacted]	1B	Replacement	Distribution	7.635 mi		$64,672,023	$64,672,023
36-1001/45-1001	[redacted]	1B	Replacement	Distribution	1.579 mi		$14,981,271	$14,981,271
38-514	[redacted]	1B	Replacement	Distribution	1.387 mi		$9,991,572	$9,991,572
38-960	[redacted]	1B	Replacement	Distribution	6.112 mi		$24,423,344	$24,423,344
43-121	[redacted]	1B	Replacement	Distribution	0.258 mi		$11,059,941	$11,059,941
38-556	[redacted]	2A	Replacement	Distribution	5.571 mi		$17,356,705	$17,356,705
36-37 Section 12	[redacted]	1B	De-Rate/Abandonment	Distribution	30.916 mi		$20,933,670	$20,933,670
36-1002	[redacted]	1B	De-Rate	Distribution	16.683 mi		$6,372,013	$6,372,013
2000-C	[redacted]	2A	Test	Transmission	22.943 mi	$27,401,653	$4,601,654	$32,003,307
2000-D	[redacted]	2A	Test	Transmission	14.038 mi	$29,637,870	$6,083,856	$35,721,726
				Total	**107.126 mi**	**$57,039,523**	**184,113,325**	**241,152,848**

[1] Costs Exclude AFUDC/Property tax of $13,375,000

Pipeline Safety Enhancement Plan Workpaper Supporting Chapter II

LINE 127 REPLACEMENT PROJECT

PROJECT COST	Prior to 2018*	2018	2019	2020	Total
DIRECT LABOR	$91,416	$17,254	$103,523	$114,160	$326,353
DIRECT NON-LABOR	$325,213	$82,890	$497,339	$230,440	$1,135,882
TOTAL DIRECT COSTS	$416,629	$100,144	$600,862	$344,600	$1,462,235
TOTAL INDIRECT COSTS	$79,019	$20,538	$135,210	$133,068	$367,835
TOTAL (Capital)	$495,648	$120,682	$736,072	$477,668	$1,830,070

*Actual costs incurred associated with planning and engineering design work are included in the project cost estimates

Project Description

Line 127 project is entirely within Goleta Storage Field located off More Ranch Road in the City of Goleta. It is in the district of Santa Barbara.

The [redacted] pipe segment of 15 feet in length and [redacted] is located at the beginning of L-127 inside the Goleta Storage Field. This pipe segment was installed in 1944 with MAOP [redacted].

If the pipe segment is remediated, L-127 will be shut-in between GT-NG-044-012, GT-NG-044-002, GT-NG-044-003 and MLV 124-0.00-0 to perform the work. This shut-in shall be kept to a maximum of 2 days.

Alternatives Considered

Abandonment of this section was not considered as it was not a viable option from a capacity planning perspective. Line 127 is one of two lines between Goleta Storage Field and the Ventura Compressor Station. The redundancy in having two lines allows for one line to be taken out of service without impacting the larger system.

Derating the line was not a viable option from a capacity planning perspective due to the Goleta Storage Field.

A diameter change of this section was considered but the short replacement length did not justify a diameter change.

Non Destructive Examination (NDE) was considered as a viable option in lieu of replacement and SoCalGas and SDG&E seek the Commission's consideration of this alternative. The 15-foot segment has a record of pressure test and the records also indicate that this is a seamless segment. Considering the specific pipeline characteristics and documentation, conducting a NDE would provide reasonable assurance regarding the condition of this 15-foot segment and would cost significantly less than replacement at an estimated cost of $700,000. The primary drivers behind the lower cost to perform an NDE include lower construction, company labor, engineering & design, and project management costs. That said, SoCalGas and SDG&E are prepared to proceed with the replacement of this section if the Commission deems replacement to be the more prudent action following the Decision Tree principles approved in D.14-06-007.

Gas Control has indicated that L-127 can be taken out of service only after April in the year that the work is being done. The Ventura Compressor Station would be holding up the entire coastal system when L-127 is out of service. The shut-in period will be kept to a maximum of 2 days.

Forecast Methodology

SoCalGas developed a Total Installed Cost (TIC) estimate to implement the above scope of work. The TIC estimate includes costs associated with project management, engineering and design, environmental permitting, land acquisition, material and equipment procurement, and construction.

Estimates include consideration of the following categories of costs: site mobilization, site facilities, site management, materials, site activities, scope of work, pressure testing, tie-ins, site restoration, and field overheads and support.

Schedule

The schedule was developed based on the seven stage project life cycle as defined by PSEP. The key project deliverables were identified to create a work breakdown structure. This work breakdown structure was then sequenced and predecessor and successor tasks were linked to each task. Finally, durations were added to each task to provide a total project duration.

The preliminary Stage 5 Construction Schedule received additional planning and stakeholder input considering that typically 50% of the project costs are expended during the construction phase. Construction schedules assumed to be 10 working days.

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LINE 127 REPLACEMENT PROJECT

Project Map for Line 127

PROJECT MILEAGE TABLE

PHASE	MILEAGE
PHASE 1B	15 ft
ACCELERATED - PHASE 2A	0.0
ACCELERATED - PHASE 2B	0.0
INCIDENTAL	0.0
TOTAL MILEAGE	15 ft

The direct costs for each area are summarized below.

Material					
PROJECT COST	Prior to 2018	2018	2019	2020	Total
DIRECT LABOR	$0	$0	$0	$0	$0
DIRECT NON-LABOR	$ 0	$ 1,295	$ 7,772	$ 1,943	$ 11,010
TOTAL DIRECT COSTS	$ 0	$ 1,295	$ 7,772	$ 1,943	$ 11,010

Assumptions

Materials for this project will not be purchased until final internal authorization has been granted to purchase long lead time material. This will allow for material to be procured, inspected and delivered to coincide with the anticipated construction start date.

Construction					
PROJECT COST	Prior to 2018	2018	2019	2020	Total
DIRECT LABOR	$0	$0	$0	$0	$0
DIRECT NON-LABOR	$ 0	$ 43,057	$ 258,337	$ 64,584	$365,978
TOTAL DIRECT COSTS	$ 0	$ 43,057	$ 258,337	$ 64,584	$365,978

General Assumptions

In the development of the construction estimate, the following assumptions and clarifications have been made:

- Pricing is based on current construction costs in Ventura California.
- Construction schedules assumed to be 10 working days.
- One mobilization and one demobilization.
- Contractor's work has been scheduled as day work, using one 10-hour shifts per day, and a five-day work week calendar.
- Work will be scheduled Monday through Friday.
- There will be one laydown yard within Goleta Station but exact location is yet to be determined.
- Material will be received at the Goleta Station. One load of material is expected to be received.
- Mechanical excavation is not authorized. Hand excavation will be utilized for all excavation requirements.
- All new pipe being installed for Isolation or permanent replacement shall be tested prior to installation.
- Pipeline backfill will be 100% screened sand for pipe bedding, zero sack slurry for pipeline shading, and remainder of trench zone will receive one sack slurry.

- A minimum of 16 hours have been included for each of the Main Pipeline Tie-In point locations that will be performed.
- Pipeline seasoning is not required.
- All spoils to be loaded and hauled away to a disposal site, assume 2-hour round trip.
- Hydro Testing of the pipe will be performed on site.

Additional Construction Information

- Site Mobilization / Site Facilities
  - Site facility costs cover one-month duration.
  - 500 linear feet of Temporary Fencing has been included for the laydown yards.
  - Stormwater Best Management Practices will be implemented.

- Site Management
  - 10 crew hours have been included for installation of Best Management Practices (BMP's).
  - Fiber rolls, sand bags, reinforced poly sheeting, and silt fencing will be procured.

- SoCalGas / Company Furnished Material Handling
  - It is being assumed that one load of SoCalGas furnished material will be unloaded by the contractor.

- Traffic Control
  - No traffic control is required.

- Utility Locates
  - Not required as hand excavation will be performed to expose existing pipe.

- Pipeline Installation
  - Re-excavation for the placement of bedding material will be performed.
  - All pipeline installation will be covered in tie-in activities as pipe segment is 15 linear feet in length.

- Isolate Existing Pipeline
  - This pipeline will be isolated utilizing existing valves.

- Pressure Test Pipeline
  - Two test caps will be installed.
  - Pipeline will be hydro tested in one complete segment.
  - Filling of the pipeline and allowing its stabilization will take one standard day.
  - Testing of the pipeline will occur over a 12-hour period during one-day.

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LINE 127 REPLACEMENT PROJECT

- Tie-In Pipeline
  - The tie-in has been allowed a 16-hour window, to perform stiff tie-in of 15 linear foot of pipe.

- Retire / Abandon Existing Pipeline
  - 15 linear feet of existing [redacted] pipeline at Goleta Storage Field to be removed.
  - 2 cut points have been identified to be hand excavated for abatement and cutting of pipe.
  - 6 crew hours for asbestos abatement support has been included.
  - 4 crew hours for cutting and removing existing pipe has been included.
  - 30 tons of native material is anticipated to be excavated and disposed offsite.

- Paving
  - 80 square feet of repair to concrete pad has been included within estimate.

- Site Restoration
  - 500 linear feet of temporary fencing will be removed from the laydown yard.
  - All disturbed/Impacted Right of Way will be restored to its original condition.

- Site Demobilization
  - One load of excess piping will be hauled to SoCalGas designated yard.
  - All crews and equipment will be demobilized.

- Field Overhead
  - One Project Manager at half time, one Cost Controller, one Superintendent, one Safety Personnel have been included for the full project duration and one Scheduler for part time.
  - One water truck with driver are included for full project duration.
  - One rough terrain reach lift has been included for full project duration.
  - 100% per diem for field personnel and project management team for full project duration.

Environmental Survey/Permitting/Monitoring					
PROJECT COST	**Prior to 2018**	**2018**	**2019**	**2020**	**Total**
DIRECT LABOR	$0	$0	$0	$0	$0
DIRECT NON-LABOR	$ 9,864	$ 10,444	$ 62,667	$ 15,667	$ 98,642
TOTAL DIRECT COSTS	$ 9,864	$ 10,444	$ 62,667	$ 15,667	$ 98,642

Assumptions

- In generating the cost estimate, the following items were considered:
- SoCalGas Environmental Project Management, from planning and permitting through project close-out.
- Assumes full-time monitoring or part-time monitoring and a pre-construction biological survey.

- Assumes additional planning time to clean the project for construction.
- Abatement Support is included.
- Water Treatment has been included.
- Contaminated Soil Allowance.
- Environmental discharge permits, dust control plan, and Incidental Take Permit (ITP).
- California Department of Fish and Wildlife (CDFW) Compensatory Mitigation.

Land & Right-of-Way Acquisition					
PROJECT COST	**Prior to 2018**	**2018**	**2019**	**2020**	**Total**
DIRECT LABOR	$0	$0	$0	$0	$0
DIRECT NON-LABOR	$0	$0	$0	$0	$0
TOTAL DIRECT COSTS	$0	$0	$0	$0	$0

Assumptions

- Land and right of way acquisition is not required.

Company Labor					
PROJECT COST	**Prior to 2018**	**2018**	**2019**	**2020**	**Total**
DIRECT LABOR	$ 85,565	$ 16,599	$ 99,594	$ 109,467	$ 311,225
DIRECT NON-LABOR	$0	$0	$0	$0	$0
TOTAL DIRECT COSTS	$ 85,565	$ 16,599	$ 99,594	$ 109,467	$ 311,225

Assumptions

SoCalGas Labor - Management, Engineering, and Non-Union Labor

SoCalGas Non-Union Labor is estimated based upon activity level of effort and is divided into the following categories:

- Project Management
- Project Field Management
- Environmental Services
- Construction Management

SoCalGas Labor - Union Labor

SoCalGas Union Labor costs were developed with the guidance of SoCalGas Construction Management and whose costs are duration dependent and activity specific.

Pipeline Safety Enhancement Plan Workpaper Supporting Chapter II

LINE 127 REPLACEMENT PROJECT

Other Costs					
PROJECT COST	Prior to 2018	2018	2019	2020	Total
DIRECT LABOR	$0	$0	$0	$0	$0
DIRECT NON-LABOR	$ 268,015	$ 22,795	$ 136,771	$ 110,273	$ 537,854
TOTAL DIRECT COSTS	$ 268,015	$ 22,795	$ 136,771	$ 110,273	$ 537,854

Assumptions

Other costs assume use of contracted Project Management, Engineering, Survey and Design service.

GMA Costs					
PROJECT COST	Prior to 2018	2018	2019	2020	Total
DIRECT LABOR	$ 5,850	$ 655	$ 3,929	$ 4,693	$ 15,128
DIRECT NON-LABOR	$ 47,334	$ 5,299	$ 31,792	$ 37,973	$ 122,398
TOTAL DIRECT COSTS	$ 53,185	$ 5,953	$ 35,721	$ 42,667	$ 137,526

Assumptions

GMA costs are costs that support overall PSEP execution.

Indirect Costs					
PROJECT COST	Prior to 2018	2018	2019	2020	Total
COMPANY OVERHEADS	$79,019	$20,538	$135,210	$133,068	$367,835
TOTAL INDIRECTS	$79,019	$20,538	$135,210	$133,068	$367,835

Assumptions

Indirect costs do not include AFUDC or Property Tax.

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LINE 7043 REPLACEMENT PROJECT

PROJECT COST	Prior to 2018*	2018	2019	2020	Total
DIRECT LABOR	$86,107	$18,092	$108,551	$122,859	$335,609
DIRECT NON-LABOR	$202,293	$90,449	$542,696	$250,821	$1,086,260
TOTAL DIRECT COSTS	$288,400	$108,541	$651,247	$373,681	$1,421,869
TOTAL INDIRECT COSTS	$75,039	$21,936	$144,570	$143,792	$385,337
TOTAL (Capital)	$363,439	$130,477	$795,817	$517,473	$1,807,206

* Actual costs incurred associated with planning and engineering design work are included in the project cost estimates.

Project Description

The Line 7043 Replacement project, 7.5 feet of [redacted] will be installed. Line 7043 is a high pressure pipeline which was installed in 1928. The pipeline has an MAOP of [redacted].

The scope includes replacement of 7.5 feet of pipeline within Kettleman Measuring Station located off of Skyline Road, on the east side of highway 269, in the City of Avenal. It is in the district of Taft. The replacement will be at the end of L-7043 at Kettleman Measuring Station. It will replace in place 5.5 feet of [redacted] pipe and 2 feet of incidental [redacted] pipe. With the exception of approximately 2 feet of pipe, most of the replacement will be above grade.

Alternatives Considered

Abandonment of this section was not considered as it was not a viable option from a capacity planning perspective. Line 7043 is the sole interconnect between Line 85 North and Line 800, a critical transmission trunk line supplying gas to the northern most sector of the San Joaquin Valley.

Likewise, derating of this section was not considered as it was not a viable option from a capacity planning perspective. Line 7043 is the sole interconnect between Line 85 North and Line 800, a critical transmission trunk line supplying gas to the northern most sector of the San Joaquin Valley.

A diameter change of this section was considered but the short replacement length did not justify a diameter change.

Alternative remediation was also considered, however, this section did not have a test record. Therefore, replacing or hydrotesting the section were the only two acceptable options.

Two non-core customers will be impacted. The line can be taken out of service during Spring Season when the demand is at its lowest. A back-up feed from PG&E's Burrell Tap will be utilized in case the shut-in does not align with the maintenance schedule of the 2 power plants. The cost of providing this back-up feed was captured in the Total Installed Cost (TIC) cost estimate.

Forecast Methodology

SoCalGas developed a TIC estimate to implement the above scope of work. The TIC estimate includes costs associated with project management, engineering and design, environmental permitting, land acquisition, material and equipment procurement, and construction.

Estimates includes consideration of the following categories of costs: site mobilization, site facilities, site management, materials, site activities, scope of work, pressure testing, tie-ins, site restoration, and field overheads and support. Estimates includes consideration of the following categories of costs: site mobilization, site facilities, site management, materials, site activities, scope of work, pressure testing, tie-ins, site restoration, and field overheads and support.

Schedule

The schedule was developed based on the seven stage project life cycle as defined by PSEP. The key project deliverables were identified to create a work breakdown structure. This work breakdown structure was then sequenced and predecessor and successor tasks were linked to each task. Finally, durations were added to each task to provide a total project duration.

The preliminary Stage 5 Construction Schedule received additional planning and stakeholder input to develop considering that typically 50% of the project costs are expended during the construction phase. Construction schedules assumed to be 10 working days.

Pipeline Safety Enhancement Plan Workpaper Supporting Chapter II

LINE 7043 REPLACEMENT PROJECT

Project Map for Line 7043

PROJECT MILEAGE TABLE

PHASE	MILEAGE
PHASE 1B	5.5 ft
ACCELERATED - PHASE 2A	0
ACCELERATED - PHASE 2B	0
INCIDENTAL	2 ft
TOTAL MILEAGE	**7.5 ft**

The direct costs for each area are summarized below:

Material					
PROJECT COST	**Prior to 2018**	**2018**	**2019**	**2020**	**Total**
DIRECT LABOR	$0	$0	$0	$0	$0
DIRECT NON-LABOR	$141	$272	$1,632	$407	$2,452
TOTAL DIRECT COSTS	$141	$272	$1,632	$407	$2,452

Assumptions

Materials for this project will not be purchased until final authorization has been granted to proceed. The longest lead material on this project is pipe and has been estimated to take twenty weeks to procure, inspect and deliver. The material lead time will set the start date for construction.

Construction					
PROJECT COST	**Prior to 2018**	**2018**	**2019**	**2020**	**Total**
DIRECT LABOR	$0	$0	$0	$0	$0
DIRECT NON-LABOR	$0	$32,885	$197,311	$49,328	$279,524
TOTAL DIRECT COSTS	$0	$32,885	$197,311	$49,328	$279,524

General Assumptions

In the development of the construction estimate, the following assumptions and clarifications have been made:

- Pricing is based on current construction costs in Kern County, California.
- Construction schedules assumed to be 10 working days.
- One mobilization and one demobilization.
- Contractor work has been scheduled using a 10-hour per day, five-day work week calendar.
- One shift per day.
- Work will be scheduled Monday through Friday.
- Access to work site shall be continuous once project commences. No equipment will be allowed in the station. A crane outside the station will be used to install the pipe.
- A laydown yard will be located at north end of Skyline Road. Site parking will be located at the access road approximately 500 feet from the station.
- Material will be received at the main yard. One load of material is expected to be received.
- Hand excavation only is authorized within the station. The pipeline will be shaded with zero sack slurry. Backfill will be one sack slurry. Existing surface rock will be replaced in kind.
- Tie-in will be performed by shutting down L-7043.
- Hydro Testing of the pipe will be performed off site.
- Hydroseeding will not be required of Construction Contractor.

- Restoration of disturbed soil at yards to be done by contractor.

Additional Construction Information

- Site Mobilization / Site Facilities
  - One Connex Trailer has been included for management and inspection personnel.
  - Site facility costs cover a one-month duration.
  - No fencing has been included for the laydown yards.

- Site Management
  - 5 crew hours have been included for installation of Best Management Practices (BMP's) and Environmental Protection Measures.
  - Fiber rolls, sand bags and reinforced poly sheeting will be procured.

- SoCalGas / Company Furnished Material Handling
  - One load of company furnished material will be unloaded by the contractor.

- Traffic Control
  - No traffic control is required.

- Utility Locates
  - 0 days have been included for exposure of foreign line crossings and identifying alignment of existing gas facilities.

- Pressure Test Pipeline
  - Two test caps will be installed.
  - Replacement pipeline will be hydro tested in one complete segment.
  - Filling of the pipeline and allowing its stabilization will take one standard day.
  - Testing of the pipeline will occur over a 12-hour period during one day.

- Tie-In Pipeline
  - The pipeline will be tied-in by shutting down L-7043.
  - The tie-in procedure has been allowed a 24-hour window to complete.

- Site Restoration
  - Restoration of surface rock inside station is included.

- Site Demobilization
  - Removal of one Connex office has been included.
  - All crews and equipment will be demobilized.

- Field Overhead
  - One Project Engineer, one Superintendent, and one Safety Personnel have been included for full project duration.
  - 100% per diem for field personnel and project management team for full project duration.

Environmental Survey/Permitting/Monitoring					
PROJECT COST	**Prior to 2018**	**2018**	**2019**	**2020**	**Total**
DIRECT LABOR	$0	$0	$0	$0	$0
DIRECT NON-LABOR	$9,864	$10,444	$62,667	$15,667	$98,642
TOTAL DIRECT COSTS	$9,864	$10,444	$62,667	$15,667	$98,642

Assumptions

A cost estimating spreadsheet was used to obtain the total estimated cost for L-7043. The cost estimating spreadsheet considered the following functions:

- SoCalGas Environmental Project Management, from planning and permitting through project close-out.
- Abatement Support.
- Assumes contaminated soil may be present.
- Assumes no impacts requiring agency consultation.
- Assumes full-time monitoring during construction and site restoration.
- Additional time to create planning and project clearance.

The estimate includes survey support staff for project and site facility layout and as-builts.

Land & Right-of-Way Acquisition					
PROJECT COST	**Prior to 2018**	**2018**	**2019**	**2020**	**Total**
DIRECT LABOR	$0	$0	$0	$0	$0
DIRECT NON-LABOR	$12,307	$4,343	$26,061	$6,515	$49,226
TOTAL DIRECT COSTS	$12,307	$4,343	$26,061	$6,515	$49,226

Assumptions

The project requires two Laydown Yards. The cost estimate was generated using a detailed spreadsheet covering items such as:

- Labor
- Legal Services
- Permitting Fees
- Temporary Right of Entry (TRE) - Construction yards
- Temporary Right of Entry (TRE) - Workspace

Factors such as location, zoning, current market price and square footage are considered to determine a final estimated value specific to easements and temporary rights of entry permits. Previous project experience specific to the Bakersfield area was also considered in generating the cost estimate.

Company Labor					
PROJECT COST	**Prior to 2018**	**2018**	**2019**	**2020**	**Total**
DIRECT LABOR	$81,974	$17,374	$104,246	$117,717	$321,311
DIRECT NON-LABOR	$0	$0	$0	$0	$0
TOTAL DIRECT COSTS	$81,974	$17,374	$104,246	$117,717	$321,311

Assumptions

SoCalGas Labor - Management, Engineering, and Non-Union Labor

SoCalGas Non-Union Labor is estimated based upon activity level of effort and is divided into the following categories:

- Project Management
- Project Field Management
- Environmental Services
- Construction Management

SoCalGas Labor - Union Labor

SoCalGas Union Labor costs were developed with the guidance of SoCalGas Construction Management and whose costs are duration dependent and activity specific.

Other Costs					
PROJECT COST	**Prior to 2018**	**2018**	**2019**	**2020**	**Total**
DIRECT LABOR	$0	$0	$0	$0	$0
DIRECT NON-LABOR	$146,531	$36,699	$220,197	$137,304	$540,731
TOTAL DIRECT COSTS	$146,531	$36,699	$220,197	$137,304	$540,731

Assumptions

Other costs assume use of contracted Project Management, Engineering, Survey and Design service.

Pipeline Safety Enhancement Plan Workpaper Supporting Chapter II

LINE 7043 REPLACEMENT PROJECT

GMA Costs					
PROJECT COST	**Prior to 2018**	**2018**	**2019**	**2020**	**Total**
DIRECT LABOR	$4,134	$718	$4,305	$5,142	$14,298
DIRECT NON-LABOR	$33,449	$5,805	$34,829	$41,602	$115,685
TOTAL DIRECT COSTS	$37,583	$6,523	$39,134	$46,743	$129,983

Assumptions

GMA costs are costs that support overall PSEP execution.

Indirect Costs					
PROJECT COST	**Prior to 2018**	**2018**	**2019**	**2020**	**Total**
COMPANY OVERHEADS	$75,039	$21,936	$144,570	$143,792	$385,337
TOTAL INDIRECTS	$75,039	$21,936	$144,570	$143,792	$385,337

Assumptions

Indirect costs do not include AFUDC or Property Tax.

Pipeline Safety Enhancement Plan Workpaper Supporting Chapter II

SUPPLY LINE 36-37 SECTION 11 REPLACEMENT PROJECT

Project Costs	Prior to 2018*	2018	2019	2020	2021	Total
DIRECT LABOR	$424,958	$42,412	$254,470	$946,466	$723,617	$2,391,922
DIRECT NON-LABOR	$2,379,251	$710,966	$4,265,796	$34,784,488	$11,768,663	$53,909,165
TOTAL DIRECT COSTS	$2,804,209	$753,378	$4,520,266	$35,730,954	$12,492,281	$56,301,087
TOTAL INDIRECT COSTS	$418,440	$89,576	$612,449	$5,004,318	$2,246,152	$8,370,936
TOTAL (Capital)	$3,222,649	$842,953	$5,132,715	$40,735,273	$14,738,433	$64,672,023

* Actual costs incurred associated with planning and engineering design work are included in the project cost estimates.

Project Description

The Supply Line (SL) 36-37 Section 11 Replacement project will install 7.635 miles of [redacted] pipe. SL 36-37 is a high pressure transmission pipeline, which was installed in 1927.

The scope includes replacement of 7.635 miles of pipeline starting at the intersection of Mills Rd & Telegraph Rd in the City of Ventura and continues eastward to the intersection of Los Angeles Ave & Santa Clara Ave in Ventura County. This portion would have 7.585 Phase 1B mileage and 0.050 accelerated mileage. The following is a general scope of work required for the project:

- Install [redacted] pipeline from intersection of Mills Rd & Telegraph Rd to intersection of Main St & Telephone Rd. A pressure control fitting will be installed on the existing pipeline to assist with gas handling. A mainline valve will be installed on the new line to also assist with gas handling. All existing regulator stations will be transferred to the replacement pipeline.

- Install [redacted] pipeline from intersection of Copland Dr & Telephone Rd to the 16" pipeline that was installed in 2014[1].

- Install [redacted] pipeline from the [redacted] pipeline to west of Telephone Rd & Wells Rd. All existing regulator stations will be transferred to the replacement pipeline. The bridle assembly located at Telephone Rd & Victoria Ave will be replaced with a new bridle assembly located outside of the intersection. The bridle assembly located at west of Telephone Rd & Petit Ave will be replaced with a new bridle assembly.

- Install [redacted] pipeline from intersection of just south of Vineyard Ave (HWY 232) & Los Angeles Ave (HWY 118) to Los Angeles Ave & Clubhouse Dr. A mainline valve will be installed on the new line because the existing valve will be abandoned. The existing regulator station located at Los Angeles Ave & Clubhouse Dr will be utilized to feed the existing [redacted] pipeline, which will be used to feed medium pressure customers in the location. All other existing regulators stations will be abandoned thereafter. Install deep anode for cathodic protection.

[1] The 2014 installation is described in the 2016 Reasonableness Review workpapers (A.16-09-005).

Considerations unique to the project are as follows:

- Large shopping complexes exist on both the east and the west side of the pipeline alignment. Due to the surrounding businesses, work on this section will significantly impact traffic.

- The Mills Rd & Main St is a heavily traveled intersection. Two Highway 101 (and Highway 126) ramps are located approximately 400 feet east of this intersection. The pipeline then crosses a Highway 101 overpass. Another Highway 101 ramp is located approximately 500 feet east of the overpass. Another Highway 101 ramp is located 1,600 feet east of the preceding ramp. Lastly, another Highway 101 ramp is located at the intersection of Main St & Telephone Rd. Every ramp and overpass is considered Caltrans right-of-way. Due to the surrounding businesses and highway ramps, work on this section will significantly impact traffic.

- Portions of Telephone Rd have surrounding businesses and highway ramps, so work on this section will significantly impact traffic.

- A shopping complex is located shortly before the intersection of Victoria Rd & Telephone Rd. The City of Ventura Permitting Department considered the Victoria Rd & Telephone Rd intersection to be a high traffic intersection. The city attributed this congestion to City Hall and the Courthouse, both of which are located northeast of the intersection. Due to the surrounding businesses, work near Victoria Rd & Telephone Rd will significantly impact traffic.

- A portion of the alignment is located on State Route 118, which is considered Caltrans right-of-way. State Route 118 is a one-lane (in each direction) highway. As a result, work on this section will significantly impact traffic. State Route 118 is a major thoroughfare into the City of Ventura and is therefore a highly congested road. State Route 118 is often used by large trucks transporting agricultural goods.

Alternatives Considered

The entire pipeline can not be abandoned or de-rated because certain segments of SL-36-37 serve as the only source of feed to nearby customers. However, certain segments of the pipeline can be abandoned or de-rated. As a result, the final scope of SL-36-37 was determined to be a combination of three remediation methods: replacement, de-rate, and abandonment.

Supply Line 33-37 is the adjoining line to SL-36-37. The delinating factor is the Los Angeles county and Ventura county border and, similar to SL-36-37, the entire length of SL-33-37 cannot be abandoned because the pipeline serves as the only source of feed to nearby customers. However, The pipeline can be de-rated to an operating pressure less than 20% SMYS and still serve nearby customers.

The project scope was then divided into sections based on remediation action. The replacement scope is Section 11. The abandonment and de-rate scope is Section 12.

The replacement section consists of 51 segments. These segments consist of [redacted], [redacted], and [redacted] pipe. PSEP chose [redacted] diameter pipe for the replacement because [redacted] is a nonstandard size and [redacted] will support piggability.
Section 11 provides natural gas supply to nine regulator stations, most of which supplies the City of Ventura. Work

has been sequenced to affect the least amount of customers through gas handling. As a result, no customers have been impacted in this estimate.

Forecast Methodology

SoCalGas developed a Total Installed Cost (TIC) estimate to implement the above scope of work. The TIC estimate includes costs associated with project management, engineering and design, environmental permitting, land acquisition, material and equipment procurement, and construction.

Estimates includes consideration of the following categories of costs: site mobilization, site facilities, site management, materials, site activities, scope of work, pressure testing, tie-ins, abandonment of existing pipeline activities, site restoration, and field overheads and support.

Schedule

The schedule was developed based on a seven stage project life cycle as defined by PSEP. The key project deliverables were identified to create a work breakdown structure. This work breakdown structure was then sequenced and predecessor and successor tasks were linked to each task. Finally, durations were added to each task to provide a total project duration.

The preliminary Stage 5 Construction Schedule received additional planning and stakeholder input to develop considering that typically 50% of the project costs are expended during the construction phase. Construction schedules assumed to be 189 working days.

Pipeline Safety Enhancement Plan Workpaper Supporting Chapter II

SUPPLY LINE 36-37 SECTION 11 REPLACEMENT PROJECT

Project Map for Line 36-37 Section 11

PROJECT MILEAGE TABLE

PHASE	MILEAGE
PHASE 1B	7.585
ACCELERATED - PHASE 2A	0.0
ACCELERATED - PHASE 2B	0.050
INCIDENTAL	0.0
TOTAL MILEAGE	7.635

Pipeline Safety Enhancement Plan Workpaper Supporting Chapter II

SUPPLY LINE 36-37 SECTION 11 REPLACEMENT PROJECT

The direct cost for each area are summarized below.

Material						
Project Costs	**Prior to 2018**	**2018**	**2019**	**2020**	**2021**	**Total**
DIRECT LABOR	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0
DIRECT NON-LABOR	$ 368,112	$ 524,340	$ 3,146,040	$ 1,310,850	$ 0	$ 5,349,342
TOTAL DIRECT COSTS	$ 368,112	$ 524,340	$ 3,146,040	$ 1,310,850	$ 0	$ 5,349,342

Assumptions

Materials for this project will not be purchased until final internal authorization has been granted to purchase long lead time material. This will allow for material to be procured, inspected and delivered to coincide with the anticipated construction start date.

Construction						
Project Costs	**Prior to 2018**	**2018**	**2019**	**2020**	**2021**	**Total**
DIRECT LABOR	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0
DIRECT NON-LABOR	$ 0	$ 0	$ 0	$ 30,630,352	$ 8,751,529	$ 39,381,881
TOTAL DIRECT COSTS	$ 0	$ 0	$ 0	$ 30,630,352	$ 8,751,529	$ 39,381,881

General Assumptions

In the development of the construction estimate, the following assumptions and clarifications have been made:

- Pricing is based on current construction costs in Ventura County, California.
- Construction schedules assumed to be 189 working days.
- One mobilization and one demobilization.
- Contractor's work has been scheduled in Phases, using two 8-hour shifts per day, and a five-day work week calendar.
- Night working Hours will be from 9 PM to 4 AM, for Special Street & Utility Crossings, including work on Caltrans Right of Way (ROW)/State Hwy.
- Work will be scheduled Monday through Friday.
- Construction sequencing will follow flow chart identified in the reference documents.
- There will be a total of one laydown yard.
- Material will be received at the Laydown Yard. 59 loads of material are expected to be received.
- Mechanical excavation is authorized with the exception of areas within two feet of existing gas facilities.
- Pipeline backfill will be 100% screened sand for pipe bedding, zero sack slurry for pipeline shading, and Remainder of trench zone will receive two Sac Slurry up to one inch bellow the existing pavement for the pipeline backfill.
- A Minimum of 16 hours have been included for each of the Main Pipeline Tie-Ins that will be performed.
- All spoils to be loaded and hauled away to a disposal site.

- Twenty-one Baker water holding tanks will be set up with the support of the contractor for hydrotest water storage. The placement of these tanks, it is assumed, will occur near one of the tie-in points (staging area has not yet been identified). Hard piping from test head to tank manifold will not exceed 100 linear feet.
- Restoration of disturbed soil at yards to be done by contractor.
- Restoration of grade along ROW will be restored at the end of the project.

Additional Construction Information

- Site Mobilization / Site Facilities
  - Two Office Trailers have been included for management and inspection personnel.
  - Site facility costs cover a nine-month duration.
  - 300 tons of crushed rock have been included for the laydown yards.
  - 2,200 linear feet (LF) of Temporary Fencing has been included for the laydown yards.
  - Track-out plates have been included at street access points.

- Site Management
  - Storm Water Pollution Prevention Plan (SWPPP) has not yet been developed.
  - 60 crew hours have been included for installation of Best Management Practices (BMP's).
  - Fiber rolls, sand bags, reinforced poly sheeting, and silt fencing will be procured.

- SoCalGas / Company Furnished Material Handling
  - It is being assumed that 59 loads of SoCalGas furnished material will be unloaded by the contractor along the pipeline route.

- Traffic Control
  - Traffic control has been included for all activities occurring within roadways.

- Utility Locates
  - 220 Crew days have been included for exposure of foreign line crossings and to identify alignment of existing gas facilities.

- Isolate Existing Pipeline
  - Pipeline will be isolated according to the isolation sequencing chart provided.

- Pressure Test Pipeline
  - Contractor will assist with the setup of Water Storage Tanks & Equipment.
  - Two test heads (four segments: B, C, A & D) will be installed for each segment being tested.
  - Pipeline will be hydro tested in four separate segments.
  - Filling each pipeline segment and allowing its stabilization will take one 10-hour day.
  - Testing of the pipeline will occur over a 12-hour period during one day.
  - Dewater and drying of the pipeline will occur over a two 12-hour day period.

- Tie-In Pipeline
  - The tie-in procedure has been allowed a 16-hour window and will take place during one continuous operation.
  - Pipeline seasoning has been included for a two-day period.
  - Existing services will continue to be fed from de-rated line, and will not require any tie-overs.

- Retire / Abandon Existing Pipeline
  - Existing pipeline will have ten plates installed and will be filled with nitrogen.

- Paving
  - 474,624 square feet of existing pavement will be restored.

- Site Restoration
  - 2,200 linear feet of temporary fencing will be removed from the laydown yards.
  - All disturbed/Impacted Right of Way will be restored to its original condition.

- Site Demobilization
  - 370 tons of crushed rock will be hauled off and disposed from laydown yards.
  - Removal of two office trailers has been included.
  - One load of excess piping will be hauled to SoCalGas designated yard.
  - All crews and equipment will be demobilized.

- Field Overhead
  - One Project Manager, one Cost Controller, one Superintendent, one Project Engineer and one Safety Personnel have been included for full project duration.
  - One water truck with driver, forklift and lowbed hauler are included for full project duration.
  - Two site security person has been employed for all non-working hours.
  - 100% per diem for field personnel and project management team for full project duration.

Environmental Survey/Permitting/Monitoring						
Project Costs	**Prior to 2018**	**2018**	**2019**	**2020**	**2021**	**Total**
DIRECT LABOR	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0
DIRECT NON-LABOR	$ 52,818	$ 16,679	$ 100,075	$ 288,180	$ 70,423	$ 528,175
TOTAL DIRECT COSTS	$ 52,818	$ 16,679	$ 100,075	$ 288,180	$ 70,423	$ 528,175

Assumptions

A cost estimating spreadsheet was used to obtain the total estimated cost for SL-36-37 Section 11. The cost estimating spreadsheet considered the following functions:

- Environmental Services (Permitting, surveys and monitoring)
- Abatement (Asbestos & Lead)

- Hazardous and Non-hazardous Waste Containment/ Disposal
- Water treatment and disposal
- Permit fees
- Mitigation fees

Environmental considerations are as follows:

- Assumes the Construction General Permit will be applicable to the project and preparation and implementation of a Storm Water Pollution Prevention Plan will be required.
- Assumes that environmental monitoring will not be required on a full-time.
- Estimate assumes that the laydown area chosen will have adequate space to store the abated pipe and up to 10 bins of soil for sampling and disposal.
- It is assumed that focused and protocol surveys for special-status species will not be required.
- It is the assumption that resource management agency permits, including a Streambed Alteration Agreement (SAA) from the California Department of Fish and Wildlife (CDFW), or a Clean Water Act (CWA) Section 404 Permit from the United States Army Corps of Engineers (USACE), will not be required.
- Impacted soil or soil vapor may be present in the vicinity of Project work areas. Discovery of impacted soil or soil vapor may result in construction timing delays for portions of the Project where these obstacles occur.
- Assumes Caltrans Aerial Deposited Lead (ADL) will not be required.

Land & Right-of-Way Acquisition						
Project Costs	**Prior to 2018**	**2018**	**2019**	**2020**	**2021**	**Total**
DIRECT LABOR	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0
DIRECT NON-LABOR	$ 25,000	$ 7,792	$ 46,753	$ 19,480	$ 0	$ 99,025
TOTAL DIRECT COSTS	$ 25,000	$ 7,792	$ 46,752	$ 19,480	$ 0	$ 99,025

Assumptions

The cost estimate was generated using a detailed spreadsheet covering items such as:

- Labor
- Legal Services
- Permitting Fees
- Temporary Right of Entry - Construction yards
- Temporary Right of Entry - Workspace

Factors such as location, zoning, current market price and square footage are considered to determine a final estimated value specific to easements and temporary rights of entry permits. Previous project experience specific to the Bakersfield area was also considered in generating the cost estimate.

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SUPPLY LINE 36-37 SECTION 11 REPLACEMENT PROJECT

Company Labor						
Project Costs	**Prior to 2018**	**2018**	**2019**	**2020**	**2021**	**Total**
DIRECT LABOR	$ 282,058	$ 27,700	$ 166,198	$ 822,722	$ 531,054	$ 1,829,732
DIRECT NON-LABOR	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0
TOTAL DIRECT COSTS	$ 282,058	$ 27,700	$ 166,198	$ 822,722	$ 531,054	$ 1,829,732

Assumptions

SoCalGas Labor - Management, Engineering, and Non-Union Labor

SoCalGas Non-Union Labor is estimated based upon activity level of effort and is divided into the following categories:

- Project Management
- Project Field Management
- Environmental Services
- Construction Management

SoCalGas Labor - Union Labor

SoCalGas Union Labor costs were developed with the guidance of SoCalGas Construction Management and whose costs are duration dependent and activity specific.

Other Costs						
Project Costs	**Prior to 2018**	**2018**	**2019**	**2020**	**2021**	**Total**
DIRECT LABOR	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0
DIRECT NON-LABOR	$ 777,139	$ 43,122	$ 258,729	$ 1,534,425	$ 1,388,700	$ 4,002,115
TOTAL DIRECT COSTS	$ 777,139	$ 43,122	$ 258,729	$ 1,534,425	$ 1,388,700	$ 4,002,115

Assumptions

Other costs assume use of contracted Project Management, Engineering, Survey and Design service.

GMA Costs						
Project Costs	**Prior to 2018**	**2018**	**2019**	**2020**	**2021**	**Total**
DIRECT LABOR	$ 142,899	$ 14,712	$ 88,272	$ 123,744	$ 192,563	$ 562,190
DIRECT NON-LABOR	$ 1,156,183	$ 119,033	$ 714,199	$ 1,001,201	$ 1,558,011	$ 4,548,627
TOTAL DIRECT COSTS	$ 1,299,082	$ 133,745	$ 802,471	$ 1,124,945	$ 1,750,574	$ 5,110,817

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SUPPLY LINE 36-37 SECTION 11 REPLACEMENT PROJECT

Assumptions

GMA costs are costs that support overall PSEP execution.

Indirect Costs						
Project Costs	**Prior to 2018**	**2018**	**2019**	**2020**	**2021**	**Total**
COMPANY OVERHEAD	$418,440	$89,576	$612,449	$5,004,318	$2,246,152	$8,370,936
TOTAL INDIRECTS	$418,440	$89,576	$612,449	$5,004,318	$2,246,152	$8,370,936

Assumptions

Indirect costs do not include AFUDC or Property Tax.

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SUPPLY LINE 36-1001/45-1001 REPLACEMENT PROJECT

PROJECT COST	Prior to 2018*	2018	2019	2020	Total
DIRECT LABOR	$188,718	$33,772	$309,183	$275,298	$806,971
DIRECT NON-LABOR	$1,354,982	$391,572	$7,695,173	$2,911,785	$12,353,512
TOTAL DIRECT COSTS	$1,543,700	$425,344	$8,004,356	$3,187,083	$13,160,483
TOTAL INDIRECT COSTS	$183,779	$58,279	$1,016,626	$562,104	$1,820,788
TOTAL (Capital)	$1,727,479	$483,623	$9,020,982	$3,749,187	$14,981,271

* Actual costs incurred associated with planning and engineering design work are included in the project cost estimates.

Project Description

The Supply Line (SL) 36-1001 and SL-45-1001 Replacement project will install 1.579 miles of [redacted] pipe. Supply Line 36-1001 and SL-45-1001 is a high pressure transmission pipeline installed in 1925 and 1926. The pipeline has an MAOP of [redacted]

The scope includes replacement of 1.579 miles of pipeline within undeveloped property located in Ventura County and Los Angeles County. Supply Line-36-1001 and SL-45-1001 are one continuous pipeline; the delineating point is the Los Angeles County and Ventura County border. These segments have been grouped into one project section based on location. Included in the 1.579 miles of replacement is 0.350 miles to reroute and avoid mountainous terrain and sensitive habitats. Beginning at SL-36-1001 and heading east, the new pipeline installed will parallel the existing alignment for approximately 0.50 miles of SL-36-1001 and SL-45-1001. The 0.50 miles of the existing pipe will be removed. The alignment will be rerouted and will run along an existing access road for approximately 1.08 miles until tying into the existing SL-45-1001. The reroute avoids or minimizes impact to the property owner's mitigation areas, protected oak trees, electrical towers, and environmentally sensitive habitats. The line will be isolated through the shut-in of mainline valves. There are two producers and no customer taps within the segment to be replaced.

Alternatives Considered

The line cannot be abandoned as it serves as a bi-directional feed to Piru, Fillmore, and Santa Paula. If the line was abandoned, those areas would only have a one way feed to the west. Two producers also deliver gas into the line. The line cannot be de-rated as it maintains pressures within the system and, as indicated above, serves as a bi-directional feed.

Supply Line 36-1001 and SL-45-1001 can be temporarily taken out of service during any time of year for the duration necessary to complete the replacement. The recommended months for isolation are from April to September as there is minimal impact to surrounding pressures during this timeframe. The line will be isolated through the shut-in of mainline valves. There are no customer taps within the segment to be replaced. The supply to SL-36-1001 will be maintained through Mills Road Station and supply to SL-45-1001 will be maintained from Newhall Station through SL-45-163.

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SUPPLY LINE 36-1001/45-1001 REPLACEMENT PROJECT

Forecast Methodology

SoCalGas developed a Total Installed Cost (TIC) estimate to implement the above scope of work. The TIC estimate includes costs associated with project management, engineering and design, environmental permitting, land acquisition, material and equipment procurement, and construction.

Estimates includes consideration of the following categories of costs: site mobilization, site facilities, site management, materials, site activities, scope of work, pressure testing, tie-ins, abandonment of existing pipeline activities, site restoration, and field overheads and support.

Schedule

The schedule was developed based on the seven stage project life cycle as defined by PSEP. The key project deliverables were identified to create a work breakdown structure. This work breakdown structure was then sequenced and predecessor and successor tasks were linked to each task. Finally, durations were added to each task to provide a total project duration.

The preliminary Stage 5 Construction Schedule received additional planning and stakeholder input considering that typically 50% of the project costs are expended during the construction phase. Construction schedules assumed to be 85 working days.

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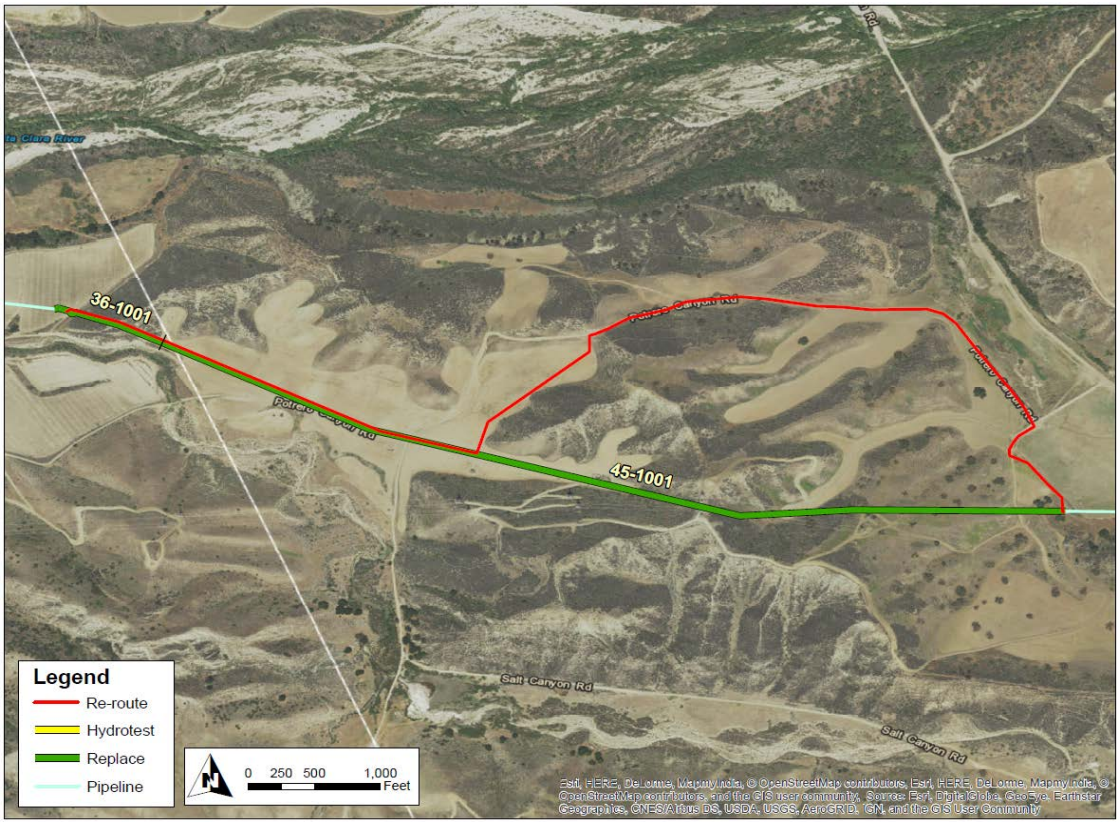
SUPPLY LINE 36-1001/45-1001 REPLACEMENT PROJECT

Project Map for SL 36-1001/45-1001



PROJECT MILEAGE TABLE

PHASE	MILEAGE
PHASE 1B	1.229
ACCELERATED - PHASE 2A	0
ACCELERATED - PHASE 2B	0
INCIDENTAL*	0.350
TOTAL MILEAGE	1.579
** Incidental mileage included due to re-route*	

Pipeline Safety Enhancement Plan Workpaper Supporting Chapter II

SUPPLY LINE 36-1001/45-1001 REPLACEMENT PROJECT

The direct costs for each area are summarized below.

Material					
PROJECT COST	Prior to 2018	2018	2019	2020	Total
DIRECT LABOR	$0	$0	$0	$0	$0
DIRECT NON-LABOR	$ 69,435	$ 154,829	$ 696,732	$ 0	$ 920,996
TOTAL DIRECT COSTS	$ 69,435	$ 154,829	$ 696,732	$ 0	$ 920,996

Assumptions

Materials for this project will not be purchased until final internal authorization has been granted to purchase long lead time material. This will allow for material to be procured, inspected and delivered to coincide with the anticipated construction start date.

Construction					
PROJECT COST	Prior to 2018	2018	2019	2020	Total
DIRECT LABOR	$0	$0	$0	$0	$0
DIRECT NON-LABOR	$ 0	$ 0	$ 4,769,774	$ 1,589,925	$ 6,359,698
TOTAL DIRECT COSTS	$ 0	$ 0	$ 4,769,774	$ 1,589,925	$ 6,359,698

General Assumptions

In the development of the construction estimate, the following assumptions and clarifications have been made:

- Pricing is based on current construction costs in Ventura County and Los Angeles County, California.
- Construction schedules assumed to be 85 working days.
- One mobilization and one demobilization.
- Work hours assumed to be from 7:00 am to 5:00 pm. One shift per day.
- Contractor work has been scheduled using a 10-hour per day, five-day work week calendar.
- Work will be scheduled Monday through Friday.
- Access to work site shall utilize Salt Creek Road.
- The main yard location will be located at the West end of the project.
- Estimate assumes steep grades to be encountered during pipeline excavation and installation. Estimate includes the utilization of crawler tractors and a D8 dozer to be utilized for traversing and securing equipment on steep slopes.
- Mechanical excavation is authorized except for areas within two feet of existing gas facilities.
- All excavation work will utilize water truck.
- Pipeline will be padded utilizing bedding sand, shaded with zero sack slurry around the pipe to one foot above pipeline and native backfill to grade.

- Estimate assumes that excess native material will be disposed of offsite.
- Tie-In will be a cold connection.
- Existing gas line crossings will be potholed prior to trench excavation. Slot trenching will not be performed.
- All excavated material to be hauled off site.
- Three Baker Tanks will be set up for the hydro test with contractor supporting their installation.
- Hydroseeding of disturbed area(s) has been accounted for.
- Restoration of disturbed soil at yards to be done by contractor.
- Restoration of grade along Right of Way (ROW) will be restored at the end of the project.

Additional Construction Information

- Site Mobilization / Site Facilities
  - Two office Trailers have been included for management and inspection personnel.
  - Site facility costs cover a four-month duration.
  - 2,500 linear feet of Temporary Fencing has been included for the laydown yards.
  - Track-out plates have been included at street access points.

- Site Management / Best Management Practices (BMP's)
  - Storm Water Pollution Prevention Plan (SWPPP) has not yet been developed.
  - 250 crew hours have been included for installation of BMP's and Environmental Protection Measures.
  - Fiber rolls, sand bags, reinforced poly sheeting, jute matting and silt fencing will be procured.

- SoCalGas / Company Furnished Material Handling
  - It is being assumed that 14 loads of SoCalGas furnished material will be unloaded by the contractor at the Main Yard.

- Traffic Control
  - Traffic control is not required because there are no roads within the project scope.

- Site ROW Clearing
  - 9,068 square yards of ROW Clearing and Grubbing will be performed.
  - Two separate sections of fencing will be removed.
  - No trees have been identified to be removed from temporary ROW.

- Utility Locates
  - Two days have been included for exposure of foreign line crossings and identifying alignment of existing gas facilities.

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SUPPLY LINE 36-1001/45-1001 REPLACEMENT PROJECT

- Pipeline Installation – Unimproved Area
  - 7,624 linear feet is being installed.
  - Backfill utilizing import of bedding sand, 0-Sack slurry for pipe shading and or sand being jetted on steep slopes and native backfill for remainder.
  - Estimate assumes all excess native material to be disposed of offsite.

- Trenchless Technology
  - 673 linear feet of Horizontal Directional Drilling (HDD) has been included.

- Cathodic Protection
  - Nine Electrolysis test stations were defined to be installed.

- Pipeline Markers
  - 20 Pipeline Markers were assumed to be installed.

- Isolate Existing Pipeline
  - The line will be isolated through the shut-in of main line valves.

- Pressure Test Pipeline
  - Contractor will assist with the set up of three Baker Tanks.
  - Two goose necks and test heads will be installed.
  - Pipeline will be hydro tested in one complete segment.
  - Filling of the pipeline and allowing its stabilization will take one day.
  - Testing of the pipeline will occur over a 10-hour period during one day.
  - Dewater and drying of the pipeline will take two days.

- Tie-In Pipeline
  - Five 2” Fire Control Fittings are estimated to be installed.
  - The tie-in procedure has been allowed a 24-hour window to complete.
  - Pipeline seasoning has been included for a two-day period.

- Retire / Abandon Existing Pipeline
  - Estimate assumes the clearing and building of an access route to access pipeline to be cut and removed.
  - Existing pipeline will be purged, cut and capped.
  - 2,660 feet of Pipeline removal has been assumed. Contractor to support asbestos abatement and removal.
  - Pipeline to be cut into [redacted] sections and placed into roll off containers.
  - Estimate assumes the grading and hydroseeding disturbed access routes. Including the placement of jute matting on steep slopes.

- Site Restoration
  - 2,500 linear feet of temporary fencing will be removed from the laydown yards.
  - 9,068 square yards of Right of Way will be graded and restored to its original condition.
  - 3,000 square yards of jute matting is assumed to be installed on steep slopes.
  - 11,078 square yards of Right of Way will be hydroseeded.
  - Replacement of 107 linear feet of fencing is assumed.

- Site Demobilization
  - Removal of two office trailers has been included.
  - One load of excess piping will be hauled to SoCalGas designated yard.
  - All crews and equipment will be demobilized.

- Field Overhead
  - One Project Manager, one Cost Controller, one Superintendent, one Safety Personnel and one Scheduler (Part Time) have been included for full project duration.
  - One water truck, one Motor Grader, one 10k LB All-Terrain Forklift, and one Baker Tank have been included for project duration.
  - Water Delivery / Management has been included in Field Overhead.
  - One site security person has been employed for all non-working hours.
  - 100% per diem for field personnel and project management team for full project duration.

Environmental Survey/Permitting/Monitoring					
PROJECT COST	**Prior to 2018**	**2018**	**2019**	**2020**	**Total**
DIRECT LABOR	$0	$0	$0	$0	$0
DIRECT NON-LABOR	$ 46,708	$ 25,477	$ 324,831	$ 70,061	$ 467,077
TOTAL DIRECT COSTS	$ 46,708	$ 25,477	$ 324,831	$ 70,061	$ 467,077

Assumptions

In generating the total estimated cost for SL-36-1001 and SL-45-1001 the following items were considered:

- Environmental Services (Permitting, surveys and monitoring)
- Abatement (Asbestos & Lead)
- Hazardous and Non-hazardous Waste Containment/ Disposal
- Water treatment and disposal
- Permit fees
- Mitigation

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SUPPLY LINE 36-1001/45-1001 REPLACEMENT PROJECT

The following assumptions for SL-36-1001 & SL-45-1001 were considered as follows:

- A portion of the Project is near the riparian corridor of Salt Creek and a streambed area in Potrero Canyon that are jurisdictional waters. Assumes jurisdictional boundaries will not be impacted and therefore permits from U.S. Army Corps of Engineers (USACE), California Department of Fish and Wildlife (CDFW), or Los Angeles Regional Water Quality Control Board (RWQCB) will not be required prior to use of this road for the Project.

- Access to the Project site is from State Route (SR) 126 at Potrero Canyon Road (unpaved). The road crosses critical habitat in the Santa Clara River via a seasonal agricultural culvert road crossing. This environmental review assumed that SoCalGas will be able to use the access road in a manner similar to existing operations and that access would not affect listed species or critical habitat. Therefore, permits from USACE, CDFW, or Los Angeles RWQCB would not be required prior to use of this road for the Project.

- A single valley oak tree has been identified in a location that overhangs the proposed trenching alignment. Assumes an arborist will be consulted for guidance regarding techniques that avoid impacts to this tree. Other oak trees near the alignment should be protected by exclusion fencing at the canopy dripline plus a five-foot buffer (equivalent to the “Tree Protection Zone” as defined by the County) to prevent inadvertent impacts to the root zones during construction. Oak tree mitigation is not anticipated.

- Assumes the property owner will require full-time biological monitoring.

- Assumes SoCalGas Environmental Project Management, from planning and permitting through project close-out.

- Assumes a pre-construction biological survey of all work areas and staging locations will be performed within seven days prior to the construction start date. If special-status wildlife species are observed in the work area, a qualified biologist will determine the appropriate steps to avoid impacts.

- Assumes existing pipeline will be abandoned in place.

- Assumes construction will require coverage under the Construction General Permit and will require preparation and implementation of a Stormwater Pollution Prevention Plan.

- It is assumed that hydrostatic test water will be pumped into tanks or vacuum trucks, then discharged as allowed under an existing permit (e.g., dust control) or hauled off for disposal at a SoCalGas approved and permitted disposal facility.

- Discovery of impacted soil, soil vapor, or groundwater may result in construction timing delays for portions of the Project where these impacts occur.

- Potential costs to address discoveries of buried cultural resources are not anticipated, and therefore not

included in the estimate.

Land & Right-of-Way Acquisition					
PROJECT COST	Prior to 2018	2018	2019	2020	Total
DIRECT LABOR	$0	$0	$0	$0	$0
DIRECT NON-LABOR	$ 156,847	$ 75,730	$ 340,785	$ 0	$ 573,362
TOTAL DIRECT COSTS	$ 156,847	$ 75,730	$ 340,785	$ 0	$ 573,362

Assumptions

In generating the total estimated cost for SL 36-1001 and SL 45-1001 the following items were considered:

- Labor
- Legal Services
- Permitting Fees
- New Easement costs
- Temporary Right of Entry - Construction yards
- Temporary Right of Entry – Workspace

Factors such as location, zoning, current market price and square footage are considered to determine a final estimated value specific to easements and temporary rights of entry permits.
Previous project experience specific to the Ventura and Los Angeles areas were also considered in generating the cost estimate.

Company Labor					
PROJECT COST	Prior to 2018	2018	2019	2020	Total
DIRECT LABOR	$ 154,090	$ 27,885	$ 263,266	$ 229,969	$ 675,210
DIRECT NON-LABOR	$0	$0	$0	$0	$0
TOTAL DIRECT COSTS	$ 154,090	$ 27,885	$ 263,266	$ 229,969	$ 675,210

Assumptions

SoCalGas Labor - Management, Engineering, and Non-Union Labor

SoCalGas Non-Union Labor is estimated based upon activity level of effort and is divided into the following categories:

- Project Management
- Project Field Management
- Environmental Services
- Construction Management

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SUPPLY LINE 36-1001/45-1001 REPLACEMENT PROJECT

SoCalGas Labor - Union Labor

SoCalGas Union Labor costs were developed with the guidance of SoCalGas Construction Management and whose costs are duration dependent and activity specific.

Other Costs					
PROJECT COST	Prior to 2018	2018	2019	2020	Total
DIRECT LABOR	$0	$0	$0	$0	$0
DIRECT NON-LABOR	$ 801,835	$ 87,906	$ 1,191,538	$ 885,048	$ 2,966,327
TOTAL DIRECT COSTS	$ 801,835	$ 87,906	$ 1,191,538	$ 885,048	$ 2,966,327

Assumptions

Other costs assume use of contracted Project Management, Engineering and Design service.

GMA Costs					
PROJECT COST	Prior to 2018	2018	2019	2020	Total
DIRECT LABOR	$ 34,626	$ 5,887	$ 45,917	$ 45,329	$ 131,759
DIRECT NON-LABOR	$ 280,159	$ 47,630	$ 371,514	$ 366,751	$ 1,066,054
TOTAL DIRECT COSTS	$ 314,785	$ 53,517	$ 417,431	$ 412,080	$ 1,197,813

Assumptions

GMA costs are costs that support overall PSEP execution.

Indirect Costs					
PROJECT COST	Prior to 2018	2018	2019	2020	Total
COMPANY OVERHEADS	$183,779	$58,279	$1,016,626	$562,104	$1,820,788
TOTAL INDIRECTS	$183,779	$58,279	$1,016,626	$562,104	$1,820,788

Assumptions

Indirect costs do not include AFUDC or Property Tax.

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SUPPLY LINE 38-514 REPLACEMENT PROJECT

PROJECT COST*	Prior to 2018	2018	2019	2020	2021	Total
DIRECT LABOR	$245,249	$24,111	$144,666	$493,897	$86,799	$994,722
DIRECT NON-LABOR	$565,980	$80,654	$483,924	$6,013,509	$152,023	$7,296,089
TOTAL DIRECT COSTS	$811,229	$104,765	$628,589	$6,507,406	$238,822	$8,290,811
TOTAL INDIRECT COSTS	$212,611	$26,738	$172,128	$1,185,230	$104,053	$1,700,761
TOTAL (Capital)	$1,023,840	$131,503	$800,718	$7,692,636	$342,876	$9,991,572

*Actual costs incurred associated with planning and engineering design work are included in the project cost estimates.

Project Description

Supply Line (SL) 38-514 Section 3 Replacement project will install 1.387 miles of [redacted] pipe. Supply Line 38-514 is a high pressure transmission pipeline installed in 1945 located in Fresno County. The pipeline has an MAOP of [redacted] The original pipe diameter is [redacted] and the replacement pipe diameter will be [redacted]. Analysis determined upsizing the line was appropriate to meet system demand and reliability. The region will be responsible for the additional reliability to upsize the line from [redacted] to [redacted]. The difference between the cost of a [redacted] replacement and a [redacted] replacement will be determined upon completion of the project and a credit will be applied to PSEP costs commensurate with the cost to upsize the line.

The scope includes replacement of 1.387 miles of pipeline along W. Excelsior Avenue beginning at approximately 500 feet west of the 19 ½ Avenue and ending at approximately 500 feet west of 21st Avenue/West Avenue. The replacement pipeline will be installed via open trench except for approximately 70 feet that will be installed under an irrigation canal via a bore.

Supply Line 38-514 Section 3 is a single feed system that feeds multiple core and non-core customers in the section and downstream, therefore, abandonment or derating are not viable options.

Alternatives Considered

Abandonment, de-rate, and replacement of the same diameter were considered. However, system demands and reliability eliminated these alternative options.

Forecast Methodology

SoCalGas developed a Total Installed Cost (TIC) estimate to implement the above scope of work. The TIC estimate includes costs associated with project management, engineering and design, environmental permitting, land acquisition, material and equipment procurement, and construction.

Estimates includes consideration of the following categories of costs: site mobilization, site facilities, site management, materials, site activities, scope of work, pressure testing, tie-ins, abandonment of existing pipeline activities, site restoration, and field overheads and support.

Schedule

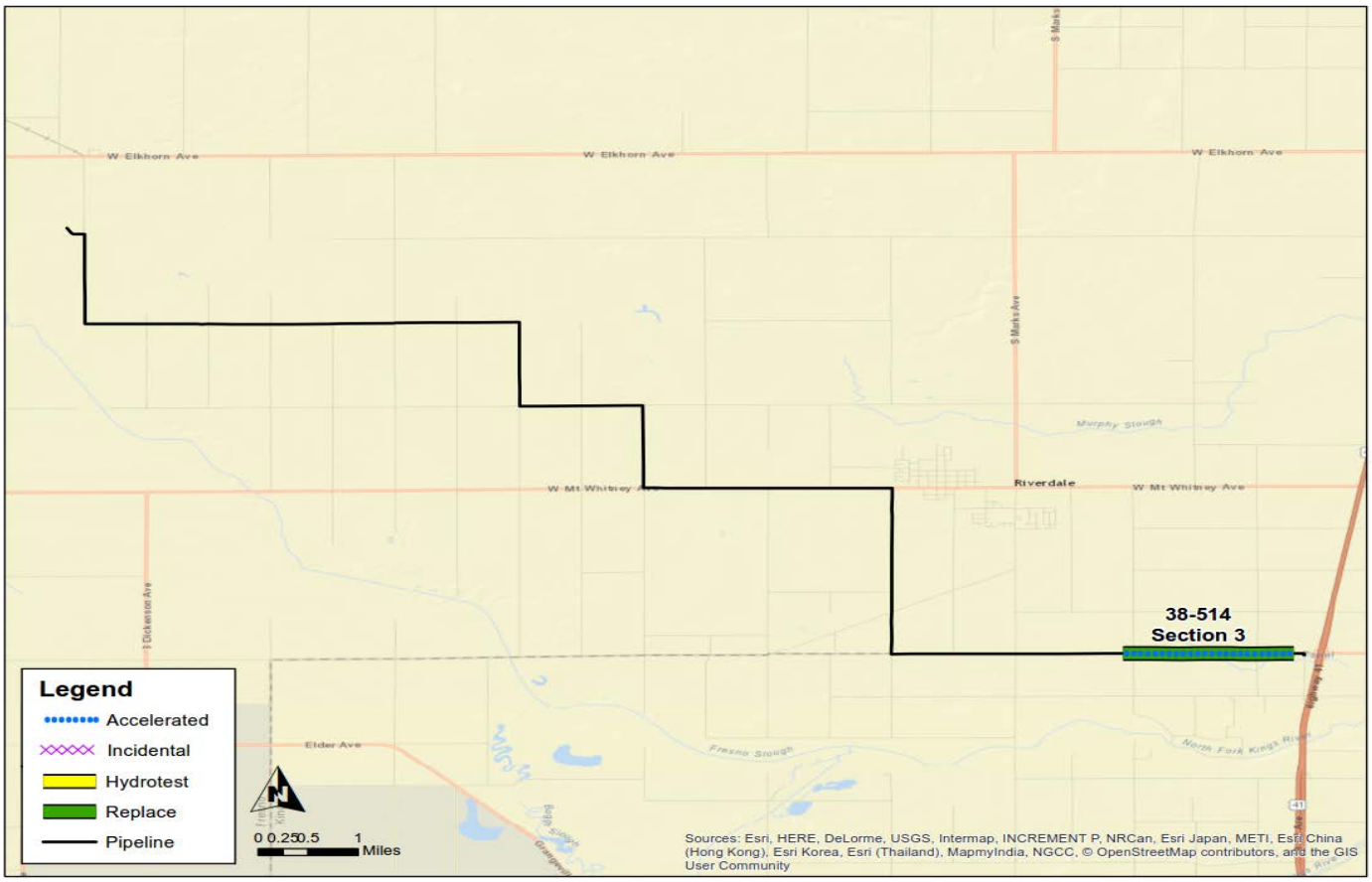
The schedule was developed based on the seven stage project life cycle as defined by PSEP. The key project deliverables were identified to create a work breakdown structure. This work breakdown structure was then sequenced and predecessor and successor tasks were linked to each task. Finally, durations were added to each task to provide a total project duration.

The preliminary Stage 5 Construction Schedule received additional planning and stakeholder input considering that typically 50% of the project costs are expended during the construction phase. Construction schedules assumed to be 48 working days.

Pipeline Safety Enhancement Plan Workpaper Supporting Chapter II

SUPPLY LINE 38-514 REPLACEMENT PROJECT

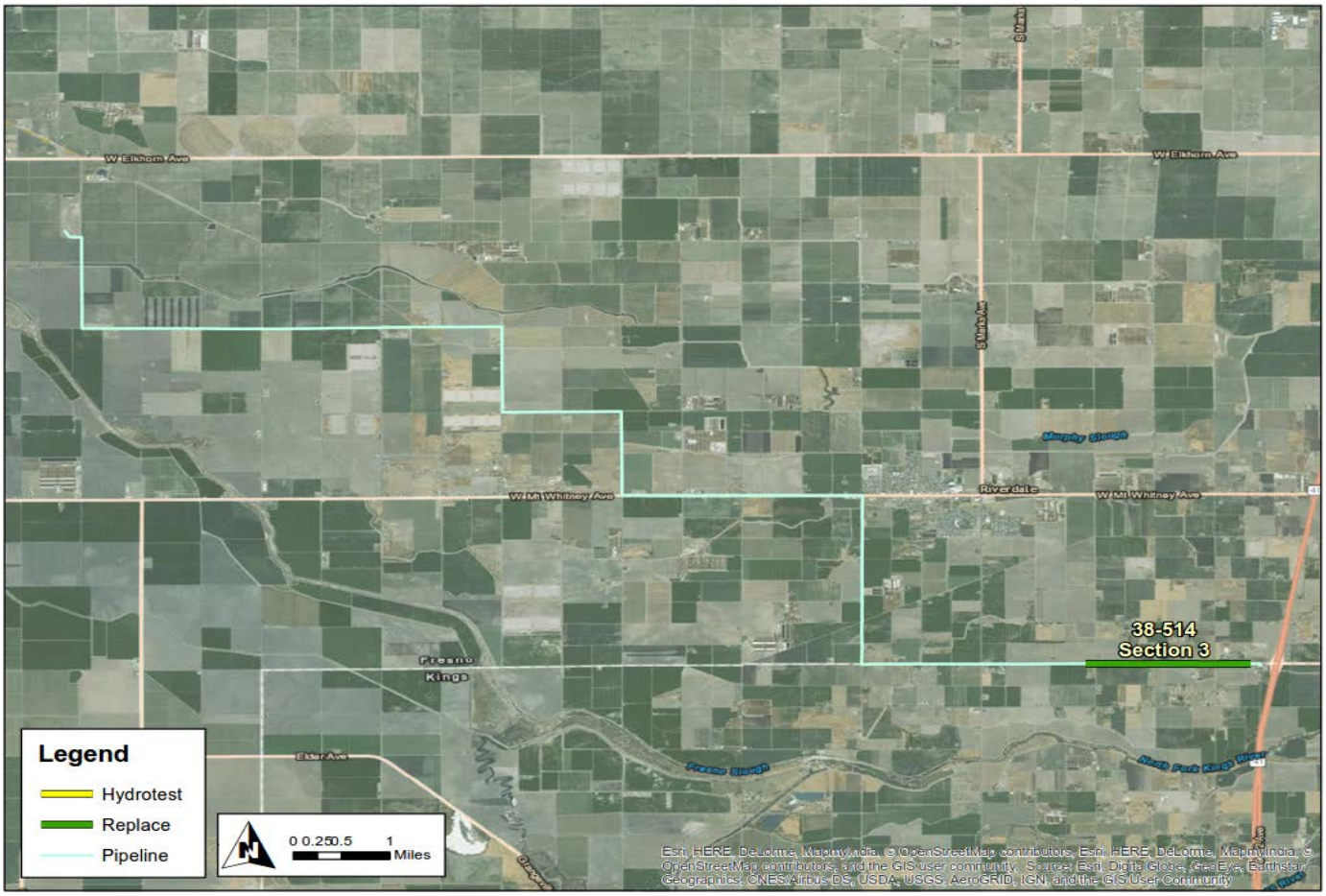
Project Map for Line 38-514



Pipeline Safety Enhancement Plan Workpaper Supporting Chapter II

SUPPLY LINE 38-514 REPLACEMENT PROJECT

Project Map for Line 38-514



PROJECT MILEAGE TABLE

PHASE	MILEAGE
PHASE 1B	1.382
ACCELERATED - PHASE 2A	0
ACCELERATED - PHASE 2B	0
INCIDENTAL	0.005
TOTAL MILEAGE	1.387

Pipeline Safety Enhancement Plan Workpaper Supporting Chapter II

SUPPLY LINE 38-514 REPLACEMENT PROJECT

The direct costs for each area are summarized below.

Material						
PROJECT COST	**Prior to 2018**	**2018**	**2019**	**2020**	**2021**	**Total**
DIRECT LABOR	$0	$0	$0	$0	$0	$0
DIRECT NON-LABOR	$27,343	$11,028	$66,166	$33,082	$0	$137,619
TOTAL DIRECT COSTS	$27,343	$11,028	$66,166	$33,082	$0	$137,619

Assumptions

Materials for this project will not be purchased until final internal authorization has been granted to purchase long lead time material. This will allow for material to be procured, inspected and delivered to coincide with the anticipated construction start date.

Construction						
PROJECT COST	**Prior to 2018**	**2018**	**2019**	**2020**	**2021**	**Total**
DIRECT LABOR	$0	$0	$0	$0	$0	$0
DIRECT NON-LABOR	$0	$0	$0	$4,611,159	$0	$4,611,159
TOTAL DIRECT COSTS	$0	$0	$0	$4,611,159	$0	$4,611,159

General Assumptions

In the development of the construction estimate, the following assumptions and clarifications have been made:

- Pricing is based on current construction costs in Kern County, California.
- Construction schedules assumed to be 48 working days.
- One mobilization and one demobilization.
- Contractor work has been scheduled using a 10-hour per day, five-day work week calendar.
- One shift per day.
- Work will be scheduled Monday through Friday.
- Access to work site shall be continuous once project commences. No restrictions on work space has been considered.
- Pipeline can be strung along Right of Way (ROW) without restriction.
- Primary laydown yard will be at Hanford Armona Rd. and auxiliary yard will be established on west end of the project near tie-in point for hydrotest water holding tanks.
- It is being assumed that 13 loads of SoCalGas furnished material will be unloaded by the contractor along the ROW during construction.
- Existing taps will be excavated and gas will be supplied by the PG&E Tap (Burrel station tap at ID 6107N) until final tie over to the new line. Compresssed Natural (CNG) will be supplied during the duration of the tie over.
- Pipeline will be shaded with zero sack slurry. Remainder of trench zone will receive native backfill with 90%

relative compaction.

- A 70 Linear Foot (LF) Shallow Horizontal Directional Drill will be performed across an irrigation canal.
- Full mechanical excavation is authorized except for areas within two feet of existing gas facilities.
- Overhead electrical in the area near the shallow Horizontal Directional Drill are expected to interfere with construction. Mitigation of risk in this area has not been considered.
- One lane/shoulder can be closed during construction and re-opened during non working hours.
- Traffic control will be supplied daily by 3rd party and will include the use of flaggers to direct traffic.
- Tie-in will be performed using two Pressure Control Fitting (PCF) Bottom-Out Fittings.
- Potholing of existing pipeline will be performed in 500' intervals when within 10' of new pipeline alignment.
- Excavated material can be stockpiled alongside open trench.
- Hydroseeding will not be required on this project.
- Restoration of disturbed farm land at laydown yards will be performed by the contractor (payment of crops will be covered by SoCalGas Land Services).
- Restoration of grade along Right of Way will be performed at the end of the project.

Additional Construction Information

- Site Mobilization / Site Facilities
  - Two Office Trailers have been included for management and inspection personnel.
  - Site facility costs cover a 3 month duration.
  - 500 tons of crushed rock have been included for the primary laydown yard.
  - 3,710 LF of Temporary Fencing has been included for primary laydown yard.
  - Track-out plates have been included at the laydown yard only.

- Traffic Control
  - Traffic control will be provided by a 3rd party contractor and will be onsite daily to perform shoulder and single lane closure. Flaggers will be utilized to direct traffic.

- Utility Locates
  - Four days have been included for exposure of foreign line crossings and identifying alignment of existing gas facilities.

- Isolate Existing Pipeline
  - Pipeline isolation includes the excavation of existing taps in preparation for tie-overs only.

- Pressure Test Pipeline
  - Contractor will assist with the set up of five Baker Tanks.
  - Pipeline will be hydrotested in one complete segment.
  - Two goose necks and two test heads will be installed.
  - Filling of the pipeline and allowing its stabilization will take one standard day.

- Testing of the pipeline will occur over a 16-hour period during one day.
- Dewater and drying of the pipeline will occur over a three standard day period.

- Tie-in Pipeline
  - The pipeline will be tied in using two pressure control fitting (PCF) Bottom-Out Fittings.
  - The tie-in procedure has been allowed a 24-hour window to complete.
  - Pipeline seasoning has been included for a two day period.
  - Tie-over of existing 16 services will be performed over an eight day, continuous period.

- Retire / Abandon Existing Pipeline
  - Existing pipeline will have two plates installed and will be filled with nitrogen for abandonment.

- Paving
  - Paving restoration will be performed at driveways and street crossings.

- Site Restoration
  - 3,710 Linear Feet (LF) of temporary fencing will be removed from the laydown yards.
  - 7,400 Linear Feet (LF) of Right of Way will be grade and restored to its original condition.

- Site Demobilization
  - 500 tons of crushed rock will be hauled off and disposed from laydown yards.
  - Removal of four office trailers has been included.
  - Two loads of excess piping will be hauled to SoCalGas designated yard.
  - Transportation of excess piping will be covered by others.
  - All crews and equipment will be demobilized.

- Field Overhead
  - One Project Manager, one Project Engineer, one Superintendent, and one Safety Personnel have been included for full project duration.
  - Two water trucks and drivers are included for full project duration for dust suppression.
  - Two site security personnel have been employed for all non-working hours.
  - Laydown yard support personnel include one operator with a forklift; one truck driver with a water truck and lowboy hauler.
  - 100% per diem for field personnel and project management team for full project duration.

Environmental Survey/Permitting/Monitoring						
PROJECT COST	**Prior to 2018**	**2018**	**2019**	**2020**	**2021**	**Total**
DIRECT LABOR	$0	$0	$0	$0	$0	$0
DIRECT NON-LABOR	$39,163	$11,749	$70,493	$270,222	$0	$391,626
TOTAL DIRECT COSTS	$39,163	$11,749	$70,493	$270,222	$0	$391,626

Pipeline Safety Enhancement Plan Workpaper Supporting Chapter II

SUPPLY LINE 38-514 REPLACEMENT PROJECT

Assumptions

In generating the cost estimate, the following items were considered:

- Environmental Services (Permitting, surveys and monitoring). Includes costs for preparing a dust control plan for the San Joaquin Valley Air Pollution Control District (SJVAPCD) Stormwater Pollution Prevention Plan and associated permit application fees.
- Abatement Support.
- Assumes waste sampling and Waste Material Containment and Disposal.
- Water treatment and disposal – Assumed water treatment will not be required and water will be hauled offsite for disposal.
- Mitigation fees
- Assumes full-time Environmental monitoring and pre-construction biological surveys for nesting birds as well as completing protocol nesting bird surveys for Swainson's hawk.

Land & Right-of-Way Acquisition						
PROJECT COST	**Prior to 2018**	**2018**	**2019**	**2020**	**2021**	**Total**
DIRECT LABOR	$0	$0	$0	$0	$0	$0
DIRECT NON-LABOR	$68,920	$20,676	$124,055	$62,028	$0	$275,679
TOTAL DIRECT COSTS	$68,920	$20,676	$124,055	$62,028	$0	$275,679

Assumptions

In generating the cost estimate, the following areas were addressed:

- Labor
- Legal Services
- Permitting Fees
- New Easement costs
- Temporary Right of Entry (TRE) - Construction yards
- Temporary Right of Entry (TRE) - Workspace

Factors such as location, zoning, current market price and square footage are considered to determine a final estimated value specific to easements and temporary rights of entry permits.
Previous project experience specific to the Kern County area was also considered in generating the cost estimate.

Pipeline Safety Enhancement Plan Workpaper Supporting Chapter II

SUPPLY LINE 38-514 REPLACEMENT PROJECT

Company Labor						
PROJECT COST	**Prior to 2018**	**2018**	**2019**	**2020**	**2021**	**Total**
DIRECT LABOR	$224,514	$22,040	$132,240	$453,722	$79,344	$911,861
DIRECT NON-LABOR	$0	$0	$0	$0	$0	$0
TOTAL DIRECT COSTS	$224,514	$22,040	$132,240	$453,722	$79,344	$911,861

Assumptions

SoCalGas Labor - Management, Engineering, and Non-Union Labor

SoCalGas Non-Union Labor is estimated based upon activity level of effort and is divided into the following categories:

- Project Management
- Project Field Management
- Environmental Services
- Construction Management

SoCalGas Labor - Union Labor

SoCalGas Union Labor costs were developed with the guidance of SoCalGas Construction Management and whose costs are duration dependent and activity specific.

Other Costs						
PROJECT COST	**Prior to 2018**	**2018**	**2019**	**2020**	**2021**	**Total**
DIRECT LABOR	$0	$0	$0	$0	$0	$0
DIRECT NON-LABOR	$262,790	$20,446	$122,678	$711,967	$91,704	$1,209,587
TOTAL DIRECT COSTS	$262,790	$20,446	$122,678	$711,967	$91,704	$1,209,587

Assumptions

Other costs assumes use of contracted Project Management, Engineering and Design service.

GMA Costs						
PROJECT COST	**Prior to 2018**	**2018**	**2019**	**2020**	**2021**	**Total**
DIRECT LABOR	$20,735	$2,071	$12,425	$40,175	$7,455	$82,861
DIRECT NON-LABOR	$167,764	$16,755	$100,531	$325,050	$60,319	$670,419
TOTAL DIRECT COSTS	$188,499	$18,826	$112,956	$365,225	$67,774	$753,280

Pipeline Safety Enhancement Plan Workpaper Supporting Chapter II

SUPPLY LINE 38-514 REPLACEMENT PROJECT

Assumptions

GMA costs are costs that support overall PSEP execution.

Indirect Costs						
PROJECT COST	**Prior to 2018**	**2018**	**2019**	**2020**	**2021**	**Total**
COMPANY OVERHEADS	$212,611	$26,738	$172,128	$1,185,230	$104,053	$1,700,761
TOTAL INDIRECTS	$212,611	$26,738	$172,128	$1,185,230	$104,053	$1,700,761

Assumptions

Indirect costs do not include AFUDC or Property Tax.

Pipeline Safety Enhancement Plan Workpaper Supporting Chapter II

SUPPLY LINE 38-960 REPLACEMENT PROJECT

PROJECT COST	Prior to 2018*	2018	2019	2020	Total
DIRECT LABOR	$408,941	$76,734	$825,841	$96,684	$1,408,200
DIRECT NON-LABOR	$2,422,768	$1,346,922	$16,145,757	$293,432	$20,208,879
TOTAL DIRECT COSTS	$2,831,709	$1,423,655	$16,971,597	$390,116	$21,617,078
TOTAL INDIRECT COSTS	$363,473	$166,596	$2,156,062	$120,136	$2,806,267
TOTAL (Capital)	$3,195,182	$1,590,251	$19,127,659	$510,253	$24,423,344

* Actual costs incurred associated with planning and engineering design work are included in the project cost estimates

Project Description

The Supply Line (SL) 38-960 Replacement project will install 6.112 miles of [redacted] pipe. Supply Line 38-960 is a high pressure transmission pipeline which includes x feet of reconditioned 1928 manufactured pipe reinstalled in 1963. This reconditioned pipe was operated as part of Line 101 from 1928 to 1962. After Line 101 was removed from service, this pipe was removed, tested, and reconditioned for reuse on Line 38-960.

The project is in a rural area and the pipe will be installed via open trench, except for approximately 250 feet under a county road which will be installed via a trenchless bore. Specifically, the scope includes replacement of 6.112 miles of pipeline starting at Monolith Junction which is located on A street in Arvin, CA. The pipeline continues along a farm road crossing Wheeler Ridge Road and terminating at Rancho Road. One trenchless bore will be required to cross Wheeler Ridge Rd. The remaining pipe will be installed using the open trench method. Three service tie-overs will be performed to reconnect the existing customers.

Alternatives Considered

Supply Line (SL) 38-960 is the primary feed to the high pressure system and feeds multiple Core and Non-Core customers, therefore, abandonment or de-rating is not an option. There are existing customers within the replacement segment. In addition, the system could not support the permanent abandonment of SL-38-960 since it would impact all downstream customers.

The replacement pipe must have a diameter of [redacted] as the line serves as the primary feed to the system.

There are several Core and Non-Core customers both within the replacement segment and downstream of the replacement segment that must be considered before an outage could be taken. The line can be taken out of service during warm spring and summer conditions. Three residential customers were identified within the segment. For the line to be taken out of service, these three customers would require Compressed Natural Gas (CNG) to be supplied during the outage. The remaining downstream customers can be back fed by the existing pipe network during warm spring and summer conditions only.

Pipeline Safety Enhancement Plan Workpaper Supporting Chapter II

SUPPLY LINE 38-960 REPLACEMENT PROJECT

Forecast Methodology

SoCalGas developed a TIC estimate to implement the above scope of work. The TIC estimate includes costs associated with project management, engineering and design, environmental permitting, land acquisition, material and equipment procurement, and construction.

Estimates includes consideration of the following categories of costs: site mobilization, site facilities, site management, materials, site activities, scope of work, pressure testing, tie-ins, abandonment of existing pipeline activities, site restoration, and field overheads and support

Schedule

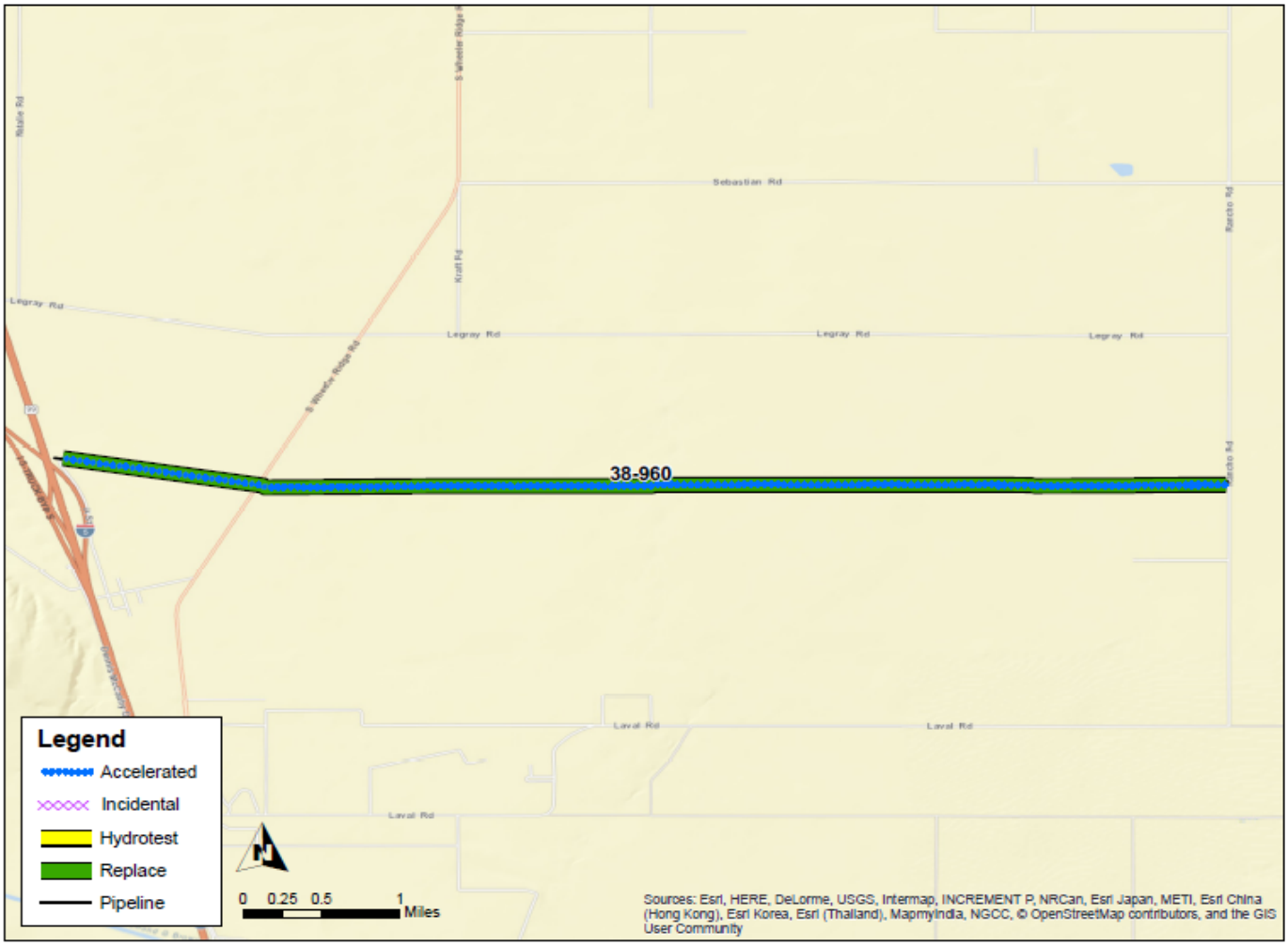
The schedule was developed based on the seven stage project life cycle as defined by PSEP. The key project deliverables were identified to create a work breakdown structure. This work breakdown structure was then sequenced and predecessor and successor tasks were linked to each task. Finally, durations were added to each task to provide a total project duration.

The preliminary Stage 5 Construction Schedule received additional planning and stakeholder input considering that typically 50% of the project costs are expended during the construction phase. Construction schedules assumed to be 79 working days.

Pipeline Safety Enhancement Plan Workpaper Supporting Chapter II

SUPPLY LINE 38-960 REPLACEMENT PROJECT

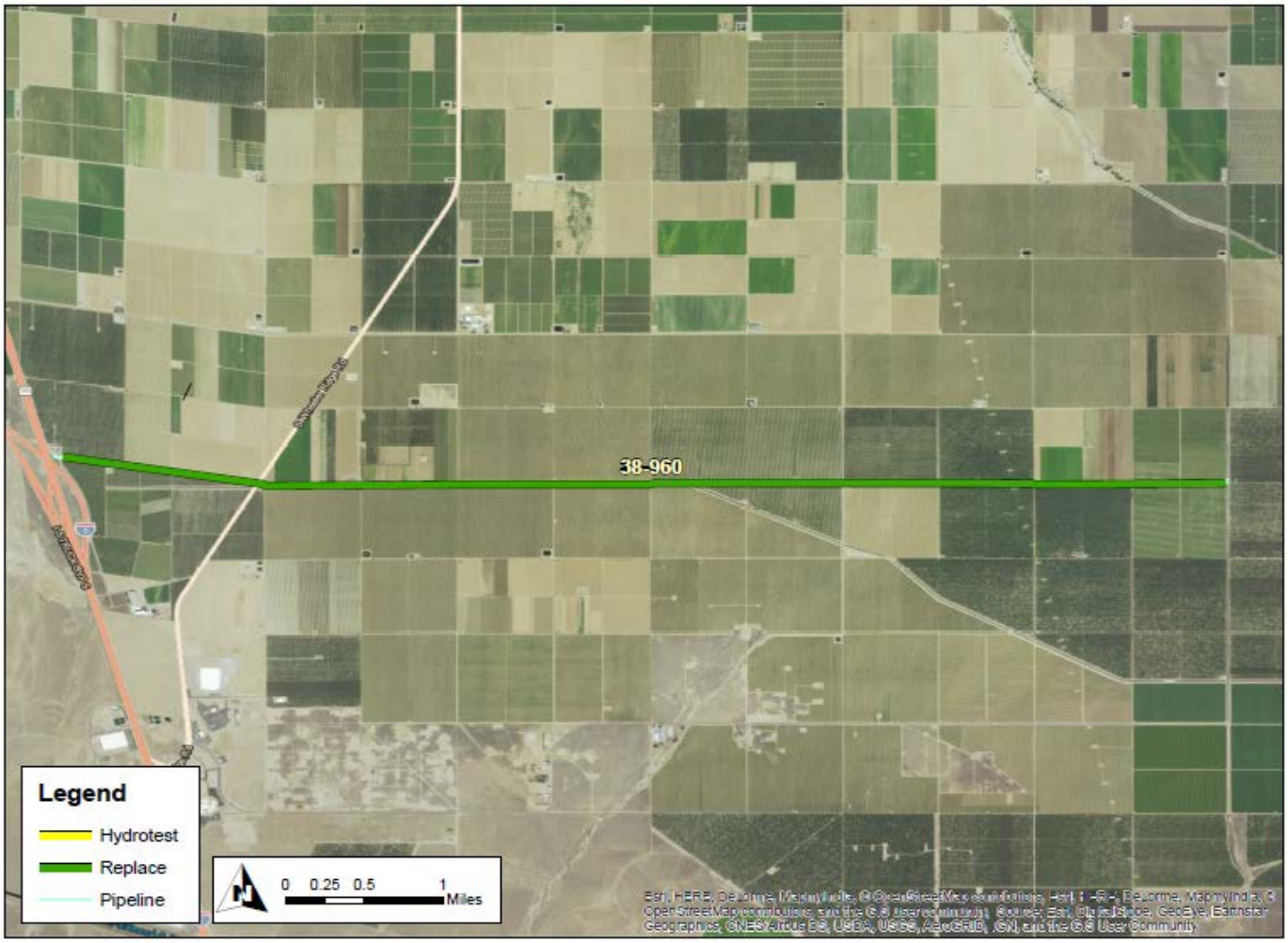
Project Map for Line 38-960



Pipeline Safety Enhancement Plan Workpaper Supporting Chapter II

SUPPLY LINE 38-960 REPLACEMENT PROJECT

Project Map for Line 38-960



PROJECT MILEAGE TABLE

PHASE	MILEAGE
PHASE 1B	6.108
ACCELERATED - PHASE 2A	0.0
ACCELERATED - PHASE 2B	0.004
INCIDENTAL	0.0
TOTAL MILEAGE	6.112

Pipeline Safety Enhancement Plan Workpaper Supporting Chapter II

SUPPLY LINE 38-960 REPLACEMENT PROJECT

The direct costs for each area are summarized below.

Material					
PROJECT COST	**Prior to 2018**	**2018**	**2019**	**2020**	**Total**
DIRECT LABOR	$0	$0	$0	$0	$0
DIRECT NON-LABOR	$ 117,768	$ 793,906	$ 1,984,766	$ 0	$ 2,896,440
TOTAL DIRECT COSTS	$ 117,768	$ 793,906	$ 1,984,766	$ 0	$ 2,896,440

Assumptions

Materials for this project will not be purchased until final internal authorization has been granted to purchase long lead time material. This will allow for material to be procured, inspected and delivered to coincide with the anticipated construction start date.

Construction					
PROJECT COST	**Prior to 2018**	**2018**	**2019**	**2020**	**Total**
DIRECT LABOR	$0	$0	$0	$0	$0
DIRECT NON-LABOR	$ 0	$ 0	$ 9,928,387	$ 0	$ 9,928,387
TOTAL DIRECT COSTS	$ 0	$ 0	$ 9,928,387	$ 0	$ 9,928,387

General Assumptions

In the development of the construction estimate, the following assumptions and clarifications have been made:

- Pricing is based on current construction costs in Kern County, California.
- Construction schedules assumed to be 79 working days.
- One mobilization and one demobilization.
- Contractor work has been scheduled using a 10-hour per day, five-day work week calendar.
- One shift per day.
- Work will be scheduled Monday through Friday.
- No restrictions on work space has been considered.
- Pipeline can be placed along Right of Way (ROW) without restriction.
- There will be a total of two laydown yards.
- 42 loads of material are expected to be received.
- Existing taps will be excavated and placed on CNG prior to tying in the new SL-38-960.
- A 250 linear feet Shallow Horizontal Directional Drilling (HDD) will be performed across Wheeler Ridge Road.
- Tie-In will be performed using two Pressure Control Fittings (PCF) Bottom-Out Fittings.

- Slot trenching will be performed in 500' intervals when existing gas line is within 10 feet of new pipeline alignment.
- Field bends will be performed in lieu of fabricated fittings.
- Excavated materials can be placed along side of open trench.
- 12 Baker Tanks will be set up for hydrotest with contractor supporting their installation.
- A water tower will be installed near Wheeler Ridge Road for construction use and dust suppression.
- Vegetation Restoration will not be required on this project.
- Restoration of disturbed farm land at laydown yards will be performed by the contractor.
- Restoration of grade along ROW will be restored at the end of the project.

Additional Construction Information

- Site Mobilization / Site Facilities
  - Four Office Trailers have been included for management and inspection personnel.
  - Site facility costs cover a four-month duration.
  - Crushed rock has been included for the laydown yards.
  - Temporary Fencing has been included for the laydown yards.
  - Track-out plates have been included at street access points.

- Site Management
  - Storm Water Pollution Prevention Plan (SWPPP) has not yet been developed.
  - 60 crew hours have been included for environmental mitigation activities.

- SoCalGas / Company Furnished Material Handling
  - 42 loads of company furnished material will be unloaded by the contractor.

- Traffic Control
  - Signs, cones and barricades have been included at S. Wheeler Ridge Road during the HDD operation.

- Utility Locates
  - 10 days have been included for exposure of foreign line crossings and identifying alignment of existing gas facilities.

- Pressure Test Pipeline
  - Two sets of connecting pipe and test heads will be installed.
  - Pipeline will be hydrotested in one complete segment.
  - Filling of the pipeline and allowing its stabilization will take one standard day.
  - Testing of the pipeline will occur over a 16-hour period during one-day.
  - Dewatering and drying of the pipeline will occur over a standard three-day period.

Pipeline Safety Enhancement Plan Workpaper Supporting Chapter II

SUPPLY LINE 38-960 REPLACEMENT PROJECT

- Tie-In Pipeline
  - The pipeline will be tied-in using two Pressure Control Fitting (PCF) Bottom-Out Fittings.
  - The tie-in procedure has been allowed a 24-hour window to complete.
  - Pipeline seasoning has been included for a three-day period.
  - Existing services will be tied-over during the course of a three-day period.

- Retire / Abandon Existing Pipeline
  - Existing pipeline will have two plates installed and will be filled with nitrogen for abandonment.

- Paving
  - There will be no paving restoration on this project. Construction will occur entirely in unimproved areas.

- Site Restoration
  - Temporary fencing will be removed from the laydown yards.
  - Right of Way will be graded and restored to its original condition, including but not limited to the placement of crushed rock along 30% of the Righto of Way (ROW).

- Site Demobilization
  - Crushed rock will be hauled off and disposed from laydown yards.
  - Removal of four office trailers has been included.
  - Three loads of excess piping will be hauled to SoCalGas designated yard.

- Field Overhead
  - One Project Manager, one Project Engineer, one Superintendent, and one Safety Personnel have been included for the full project duration.
  - Two water trucks and drivers are included for the full project duration for dust suppression.
  - Two site security personnel have been employed for all non-working hours.
  - Laydown yard support personnel include one operator with a forklift; one truck driver with a water truck and lowboy hauler; and a motor grader for ROW clean up.
  - 100% per diem for field personnel and project management team for the full project duration.

Environmental Survey/Permitting/Monitoring					
PROJECT COST	**Prior to 2018**	**2018**	**2019**	**2020**	**Total**
DIRECT LABOR	$0	$0	$0	$0	$0
DIRECT NON-LABOR	$ 97,374	$ 83,463	$ 792,903	$ 0	$ 973,740
TOTAL DIRECT COSTS	$ 97,374	$ 83,463	$ 792,903	$ 0	$ 973,740

Pipeline Safety Enhancement Plan Workpaper Supporting Chapter II

SUPPLY LINE 38-960 REPLACEMENT PROJECT

Assumptions

In generating the cost estimate, the following items were considered:

- Environmental Services (Permitting, surveys and monitoring)
- Abatement (Asbestos & Lead)
- Hazardous and Non-hazardous Waste Containment/ Disposal
- Water treatment and disposal
- Permit fees
- Mitigation fees

The following environmental issues and/or items were addressed in the cost estimate:

- The project requires a Stormwater Pollution Prevention Plan and Dust Control Plan.
- Preconstruction environmental surveys will be completed prior to the start of construction.
- An unknown petroleum line parallels the alignment for approximately one mile. Based on project related experience and expertise, it is assumed that contaminated soils will be encountered and will require disposal.
- Pesticide storage containers located along the route are assumed to have contaminated soils and will require containment and or disposal.
- Assumes the project will require onsite environmental monitor support during construction and site restoration for the duration of the project.
- The actual construction start date will dictate whether additional biological surveys are required.
- SoCalGas Environmental Project Management, from planning and permitting through project close-out.

Land & Right-of-Way Acquisition					
PROJECT COST	**Prior to 2018**	**2018**	**2019**	**2020**	**Total**
DIRECT LABOR	$0	$0	$0	$0	$0
DIRECT NON-LABOR	$ 328,382	$ 250,803	$ 627,006	$ 0	$ 1,206,191
TOTAL DIRECT COSTS	$ 328,382	$ 250,803	$ 627,006	$ 0	$ 1,206,191

Assumptions

In generating the cost estimate, the following items were considered:

- Labor
- Legal Services
- Permitting Fees
- New Easement costs
- Temporary Right of Entry (TRE) - Construction yards
- Temporary Right of Entry (TRE) - Workspace

Factors such as location, zoning, current market price and square footage are considered to determine a final estimated value specific to easements and temporary rights of entry permits. Previous project experience specific to the Bakersfield area was also considered in generating the cost estimate.

Pipeline Safety Enhancement Plan Workpaper Supporting Chapter II

SUPPLY LINE 38-960 REPLACEMENT PROJECT

Company Labor					
PROJECT COST	**Prior to 2018**	**2018**	**2019**	**2020**	**Total**
DIRECT LABOR	$0	$0	$0	$0	$0
DIRECT NON-LABOR	$ 344,893	$ 62,196	$ 706,050	$ 78,367	$ 1,191,505
TOTAL DIRECT COSTS	$ 344,893	$ 62,196	$ 706,050	$ 78,367	$ 1,191,505

Assumptions

SoCalGas Labor - Management, Engineering, and Non-Union Labor

SoCalGas Non-Union Labor is estimated based upon activity level of effort and is divided into the following categories:

- Project Management
- Project Field Management
- Environmental Services
- Construction Management

SoCalGas Labor - Union Labor

SoCalGas Union Labor costs were developed with the guidance of SoCalGas Construction Management and whose costs are duration dependent and activity specific.

Other Costs					
PROJECT COST	**Prior to 2018**	**2018**	**2019**	**2020**	**Total**
DIRECT LABOR	$0	$0	$0	$0	$0
DIRECT NON-LABOR	$ 1,361,041	$ 101,125	$ 1,843,476	$ 145,226	$ 3,450,869
TOTAL DIRECT COSTS	$ 1,361,041	$ 101,125	$ 1,843,476	$ 145,226	$ 3,450,869

Assumptions

Other costs assume use of contracted Project Management, Engineering and Design service.

GMA Costs					
PROJECT COST	**Prior to 2018**	**2018**	**2019**	**2020**	**Total**
DIRECT LABOR	$ 64,048	$ 14,538	$ 119,791	$ 18,318	$ 216,694
DIRECT NON-LABOR	$ 518,203	$ 117,624	$ 969,219	$ 148,206	$ 1,753,252
TOTAL DIRECT COSTS	$ 582,251	$ 132,161	$ 1,089,010	$ 166,523	$ 1,969,946

Assumptions

GMA costs are costs that support overall PSEP execution.

Pipeline Safety Enhancement Plan Workpaper Supporting Chapter II

SUPPLY LINE 38-960 REPLACEMENT PROJECT

Indirect Costs					
PROJECT COST	**Prior to 2018**	**2018**	**2019**	**2020**	**Total**
COMPANY OVERHEADS	$363,473	$166,596	$2,156,062	$120,136	$2,806,267
TOTAL INDIRECTS	$363,473	$166,596	$2,156,062	$120,136	$2,806,267

Assumptions

Indirect costs do not include AFUDC or Property Tax.

Pipeline Safety Enhancement Plan Workpaper Supporting Chapter II

SUPPLY LINE 43-121 REPLACEMENT PROJECT

PROJECT COST	Prior to 2018*	2018	2019	2020	Total
DIRECT LABOR	$253,544	$27,388	$470,577	$82,165	$833,675
DIRECT NON-LABOR	$711,073	$188,689	$7,442,380	$407,483	$8,749,625
TOTAL DIRECT COSTS	$964,618	$216,077	$7,912,957	$489,648	$9,583,300
TOTAL INDIRECT COSTS	$213,852	$37,629	$1,104,815	$120,345	$1,476,641
TOTAL (Capital)	$1,178,470	$253,706	$9,017,772	$609,993	$11,059,941

* Actual costs incurred associated with planning and engineering design work are included in the project cost estimates

Project Description

Through the Supply Line (SL)-43-121 Replacement project, 0.258 miles of [redacted] pipe will be installed. Supply Lines 43-121 is a high pressure transmission pipeline, which was installed in 1930. The pipeline has an MAOP of [redacted]

The scope includes replacement of 0.258 miles. The existing line is [redacted] and [redacted] pipe and will be replaced entirely with [redacted] pipe. The existing [redacted] and [redacted] pipelines will be removed and the new [redacted] pipeline will be installed in the same location because of congested underground utilities in the area. The project begins at the intersection of Sepulveda Blvd & Bel Air Crest Rd and continues south along Sepulveda Blvd, parallel to the I-405 freeway in the City of Los Angeles. There are several pipelines operated by other companies in close proximity to Line SL- 43-121, which results in an extremely tight working area. Additionally, the pipeline is located on a major thoroughfare which results in significant working hour limitations and traffic control conditions.

Alternatives Considered

Abandonment of this section of SL-43-121 is not a viable option since there is no parallel line that could support the system. SL-43-121 is a critical high pressure distribution pipeline that supplies natural gas to a large co-generation plant that serves a hospital and Pressure District 43003, two feeds that cannot be shut down at any time.

Derating this section of SL-43-121 (MAOP [redacted]) is not a viable option since it would impact other customers during the peak season, including the co-generation plant and Pressure District 43003.

The new SL-43-121 pipe diameter will be reduced from [redacted] to [redacted]. A [redacted] diameter pipeline is an adequate pipe size for current demands that will affect the pressures in the surrounding area by less than [redacted]. The [redacted] pipe is consistent with the company's efforts to standardize pipe diameters where appropriate. The [redacted] pipe will match the pipe installed on several other SL-43-121 Phase 1A projects and is favorable for pigging operations.

There are no Distribution taps or valves within this section. Analysis of customer impacts indicates that this section of SL-43-121 can be isolated during both summer and winter conditions. While the line is isolated, the co-generation plant must be fed from Crenshaw Station (ID 479T). Within the limits of isolation, there are four customers that would require compressed natural gas (CNG)/liquefied natural gas (LNG). The cost of providing CNG/LNG is captured in the Total Installed Cost (TIC) estimate.

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SUPPLY LINE 43-121 REPLACEMENT PROJECT

Forecast Methodology

SoCalGas developed a TIC estimate to implement the above scope of work. The TIC estimate includes costs associated with project management, engineering and design, environmental permitting, land acquisition, material and equipment procurement, and construction. Estimates include consideration of the following categories of costs: site mobilization, site facilities, site management, materials, site activities, scope of work, pressure testing, tie-ins, removal of existing pipeline activities, site restoration, and field overheads and support.

Schedule

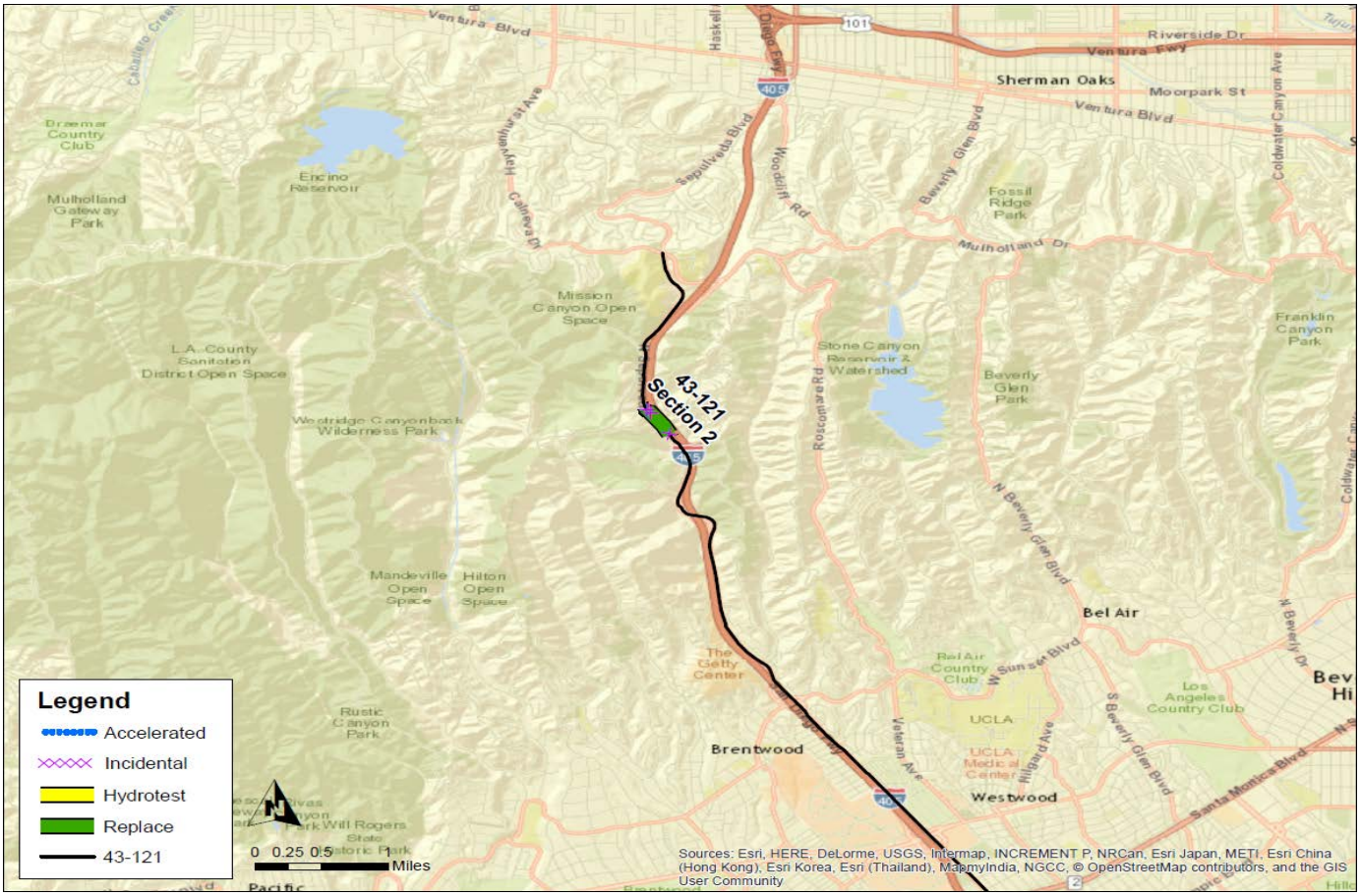
The schedule was developed based on the seven stage project life cycle as defined by PSEP. The key project deliverables were identified to create a work breakdown structure. This work breakdown structure was then sequenced and predecessor and successor tasks were linked to each task. Finally, durations were added to each task to provide a total project duration.

The preliminary Stage 5 Construction Schedule received additional planning and stakeholder input considering that typically 50% of the project costs are expended during the construction phase. Construction schedule assumed to be 66 working days.

Pipeline Safety Enhancement Plan Workpaper Supporting Chapter II

SUPPLY LINE 43-121 REPLACEMENT PROJECT

Project Map for Line 43-121



PROJECT MILEAGE TABLE

PHASE	MILEAGE
PHASE 1B	0.249
ACCELERATED - PHASE 2A	0.0
ACCELERATED - PHASE 2B	0.0
INCIDENTAL	0.009
TOTAL MILEAGE	0.258

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SUPPLY LINE 43-121 REPLACEMENT PROJECT

The direct costs for each area are summarized below.

Material					
PROJECT COST	**Before 2018**	**2018**	**2019**	**2020**	**Total**
DIRECT LABOR	$0	$0	$0	$0	$0
DIRECT NON-LABOR	$ 2,105	$ 28,174	$ 112,695	$ 0	$ 142,974
TOTAL DIRECT COSTS	$ 2,105	$ 28,174	$ 112,695	$ 0	$ 142,974

Assumptions

Materials for this project will not be purchased until final internal authorization has been granted to purchase long lead time material. This will allow for material to be procured, inspected and delivered to coincide with the anticipated construction start date.

Construction					
PROJECT COST	**Before 2018**	**2018**	**2019**	**2020**	**Total**
DIRECT LABOR	$0	$0	$0	$0	$0
DIRECT NON-LABOR	$0	$0	$5,017,424	$0	$5,017,424
TOTAL DIRECT COSTS	$0	$0	$5,017,424	$0	$5,017,424

General Assumptions

In the development of the construction estimate, the following assumptions and clarifications have been made:

- Pricing is based on current construction costs in Los Angeles County, California.
- Construction schedule assumed to be 66 working days.
- One mobilization and one demobilization.
- Contractor work has been scheduled as night work, using one 8-hour shift per day and a five-day work week calendar.
- Work will be scheduled Monday through Friday.
- Pipeline cannot be placed along Right of Way (ROW) without restriction.
- There will be one laydown yard.
- Material will be received at the laydown yard. Four loads of material are expected to be received.
- Mechanical excavation is authorized except for areas within two feet of existing gas facilities.
- All new pipe being installed shall be tested prior to installation onto pipeline.
- Pipeline backfill will be 100% screened sand for pipe bedding, zero sack slurry for pipeline shading, and remainder of trench zone will receive 1-sack slurry up to one inch below the existing pavement for the pipeline backfill.
- A minimum of 12 hours has been included for each of the main pipeline tie-in point locations that will be performed.

- All spoils to be loaded and hauled away to a disposal site, assume 2-hour round trip.
- Two Baker water holding tanks will be set up with the contractor support for hydro-test water storage. The placement of the tank, it is assumed, will occur near one of the tie-in points. Hard piping from test head to tank manifold will not exceed 100 linear feet.
- All asphalt pavement restoration to be replaced like kind.
- Site security personnel has been identified as being needed for non-working hours.

Additional Construction Information

- Site Mobilization / Site Facilities
  - Two office trailers have been included for management and inspection personnel.
  - Site facility costs cover a three-month duration.
  - Utilize existing laydown yard from previous Phase 1A work.
  - 1,100 linear feet of temporary fencing has been included for the laydown yards.
  - Track-out plates have been included at street access points.

- Site Management
  - Storm Water Pollution Prevention Plan (SWPPP) has not yet been developed.
  - Twenty crew hours have been included for environmental mitigation activities.

- SoCalGas / Company Furnished Material Handling
  - Four loads of company furnished material will be unloaded by the contractor along the pipeline route.

- Traffic Control
  - 63 crew days for a 3-man, third-party traffic control subcontractor.

- Utility Locates
  - 12 crew hours have been included for exposure of three foreign line crossings and identifying alignment of existing gas facilities.

- Pressure Test Pipeline
  - Contractor will assist with the set up of water storage tanks and equipment.
  - Two test heads and caps will be installed, one at each tie-in location.
  - Pipeline will be hydrotested in one complete segment.
  - Filling of the pipeline and allowing its stabilization will take one standard day.

- Tie-In Pipeline
  - The tie-in procedure has been allowed a 24-hour window, depending on the number of tie-in's/tie-overs and will take place during one continuous operation.
  - Existing services will continue to be fed from the District providing LNG /CNG to the remote customers identified.

Pipeline Safety Enhancement Plan Workpaper Supporting Chapter II

SUPPLY LINE 43-121 REPLACEMENT PROJECT

- Retire / Abandon Existing Pipeline
  - 1,384 linear feet of existing [redacted] pipeline under Sepulveda Blvd to be removed.
  - 70 cut points have been identified to be hand excavated for abatement and cutting of pipe.
  - 70 crew hours for asbestos abatement support has been included.
  - 70 crew hours for cutting and removing existing pipe has been included.
  - 1,916 tons of native material are anticipated to be excavated and disposed offsite.
  - 10 night openings for material disposal has been included.

- Paving
  - 16,920 square feet of existing pavement will be restored.
  - Four traffic loops to be repaired.

- Site Restoration
  - 1,100 linear feet of temporary fencing will be removed from the laydown yard.
  - All disturbed/impacted Right of Way will be restored to its original condition.

- Site Demobilization
  - Removal of two office trailers has been included.
  - One load of excess piping will be hauled to SoCalGas designated yard.
  - All crews and equipment will be demobilized.

- Field Overhead
  - One Project Manager, one Project Engineer, one Superintendent and one Safety Personnel have been included for the full project duration and one Scheduler for part time.
  - One water truck with driver has been included for full project duration.
  - One lowboy hauler has been included for full project duration.
  - One rough terrain reach lift has been included for full project duration.
  - Eight light towers have been included for full project duration.
  - 264 hours of a third-party subcontractor has been included to provide street sweeping daily for the project duration.
  - 100% per diem for field personnel and project management team for full project duration.

Environmental Survey/Permitting/Monitoring					
Project Cost	**Before 2018**	**2018**	**2019**	**2020**	**Total**
DIRECT LABOR	$0	$0	$0	$0	$0
DIRECT NON-LABOR	$ 28,868	$ 17,321	$ 242,495	$ 0	$288,684
TOTAL DIRECT COSTS	$ 28,868	$ 17,321	$ 242,495	$ 0	$288,684

Pipeline Safety Enhancement Plan Workpaper Supporting Chapter II

SUPPLY LINE 43-121 REPLACEMENT PROJECT

Assumptions

In generating the cost estimate, the following items were considered:

- Environmental Services (Permitting, surveys and monitoring, project restoration and closeout support)
- Abatement (Asbestos & Lead)
- Hazardous and Non-hazardous Waste Containment/ Disposal
- Water treatment and disposal
- Permit fees
- Mitigation fees

The following environmental issues and/or items were addressed in the cost estimate

- Assumes preconstruction environmental surveys will be completed prior to the start of construction. The actual construction start date will dictate whether biological surveys are required.
- A petroleum line parallels the alignment. Based on project related experience and expertise, it is assumed that contaminated soils will be encountered and will require disposal.
- Assumes the project will require onsite environmental monitor support during construction and site restoration for the duration of the project. Please note that full-time monitoring is not proposed for the full duration of the construction project.
- SoCalGas Environmental Project Management, from planning and permitting through project close-out.

Land & Right-of-Way Acquisition					
Project Cost	**Before 2018**	**2018**	**2019**	**2020**	**Total**
DIRECT LABOR	$0	$0	$0	$0	$0
DIRECT NON-LABOR	$ 60,572	$ 36,343	$ 145,372	$ 0	$242,287
TOTAL DIRECT COSTS	$ 60,572	$ 36,343	$ 145,372	$ 0	$242,287

Assumptions

In generating the cost estimate, the following items were considered:

- Labor
- Legal Services
- Permitting Fees
- New Easement costs
- Temporary Right of Entry (TRE) - Construction yards
- Temporary Right of Entry (TRE) - Workspace

Factors such as location, zoning, current market price and square footage are considered to determine a final estimated value specific to easements and temporary rights of entry permits. Previous project experience specific to the laydown yard being utilized was also considered in generating the cost estimate.

Pipeline Safety Enhancement Plan Workpaper Supporting Chapter II

SUPPLY LINE 43-121 REPLACEMENT PROJECT

Company Labor					
Project Cost	**Before 2018**	**2018**	**2019**	**2020**	**Total**
DIRECT LABOR	$228,144	$ 22,685	$ 418,844	$68,056	$737,729
DIRECT NON-LABOR	$0	$0	$0	$0	$0
TOTAL DIRECT COSTS	$228,144	$ 22,685	$ 418,844	$68,056	$ 737,729

Assumptions

SoCalGas Labor - Management, Engineering, and Non-Union Labor

SoCalGas Non-Union Labor is estimated based upon activity level of effort and is divided into the following categories:

- Project Management
- Project Field Management
- Environmental Services
- Construction Management

SoCalGas Labor - Union Labor

SoCalGas Union Labor costs were developed with the guidance of SoCalGas Construction Management and whose costs are duration dependent and activity specific.

Other Costs					
Project Cost	**Before 2018**	**2018**	**2019**	**2020**	**Total**
DIRECT LABOR	$0	$0	$0	$0	$0
DIRECT NON-LABOR	$ 414,017	$ 68,799	$ 1,505,822	$ 293,327	$ 2,281,965
TOTAL DIRECT COSTS	$ 414,017	$ 68,799	$ 1,505,822	$ 293,327	$ 2,281,965

Assumptions

Other costs assume use of contracted Project Management, Engineering and Design services.

GMA Costs					
Project Cost	**Before 2018**	**2018**	**2019**	**2020**	**Total**
DIRECT LABOR	$25,400	$4,703	$51,734	$14,109	$95,946
DIRECT NON-LABOR	$205,512	$38,052	$418,571	$114,156	$776,291
TOTAL DIRECT COSTS	$230,912	$42,755	$470,305	$128,265	$872,237

Assumptions

GMA costs are costs that support overall PSEP execution.

Pipeline Safety Enhancement Plan Workpaper Supporting Chapter II

SUPPLY LINE 43-121 REPLACEMENT PROJECT

Indirect Costs					
Project Cost	**Before 2018**	**2018**	**2019**	**2020**	**Total**
COMPANY OVERHEADS	$213,852	$37,629	$1,104,815	$120,345	$1,476,641
TOTAL DIRECT COSTS	$213,852	$37,629	$1,104,815	$120,345	$1,476,641

Assumptions

Indirect costs do not include AFUDC or Property Tax.

Pipeline Safety Enhancement Plan Workpaper Supporting Chapter II

SUPPLY LINE 38-556 REPLACEMENT PROJECT

PROJECT COST	Prior to 2018*	2018	2019	Total
DIRECT LABOR	$245,870	$89,529	$699,150	$1,034,548
DIRECT NON-LABOR	$1,255,224	$851,349	$12,201,743	$14,308,316
TOTAL DIRECT COSTS	$1,501,094	$940,878	$12,900,893	$15,342,865
TOTAL INDIRECT COSTS	$220,641	$140,539	$1,652,660	$2,013,840
TOTAL (Capital)	$1,721,735	$1,081,417	$14,553,553	$17,356,705

* Actual costs incurred associated with planning and engineering design work are included in the project cost estimates.

Project Description

The Supply Line (SL) 38-556 Replacement project will install 5.571 miles of [redacted] pipe. Supply Line 38-556 is a high pressure transmission pipeline installed in 1954 and 1956 that operates in the Northern Region in Tulare County. The pipeline has an MAOP of [redacted]

The project is in a rural area and will be installed via open trench, with the exception of approximately 1,750 feet which will be installed via horizontal directional drill due to restrictions put forth by the county based on the fact that the pipeline is crossing five roads that have been paved recently. Additionally, 175 feet will be installed via the jack-and-bore method due to the eastern tie-in location's proximity to an intersection. Specifically, the scope includes replacement of 5.571 miles in order to maintain high pressure to downstream customers. The [redacted] pipeline replacement will be installed along Ave 152/Olive St beginning at approximately 2,500 feet east of Callison Rd and ending at approximately 70 feet east of Woodville Rd. Approximately 27,490 feet of pipe will be replaced via open-trench installation, 1,925' will be replaced via trenchless boring method. The east and west tie-ins will be completed by installing a [redacted] and [redacted] bottom out fittings.

There are 14 core customers within this section. SL-38-556 is the lone feed for one pressure system and is the major trunk line delivering gas to three additional pressure systems. Shut-in is not possible as it would cause pressures within these zones to fall below acceptable levels. Approximately 1,520 customers would need to be supported by alternative means such as compressed natural gas (CNG)/liquefied natural gas (LNG) if the line were shut-in.

Alternatives Considered

A test vs replace analysis determined that the cost to hydrotest was approximately three times the cost to replace primarily due to the number of core customers that will have to be supplied with compressed natural gas (CNG). In addition, the existing pipeline is not piggable.

It was determined that SL-38-556 cannot be shut in at any time throughout the year due to significant pressure loss at downstream pressure systems. As such, abandonment or de-rate of the section is not a viable option.

Forecast Methodology

SoCalGas developed a Total Installed Cost (TIC) estimate to implement the above scope of work. The TIC estimate includes costs associated with project management, engineering and design, environmental permitting, land acquisition, material and equipment procurement, and construction.

Estimates includes consideration of the following categories of costs: site mobilization, site facilities, site management, materials, site activities, scope of work, pressure testing, tie-ins, abandonment of existing pipeline activities, site restoration, and field overheads and support.

Schedule

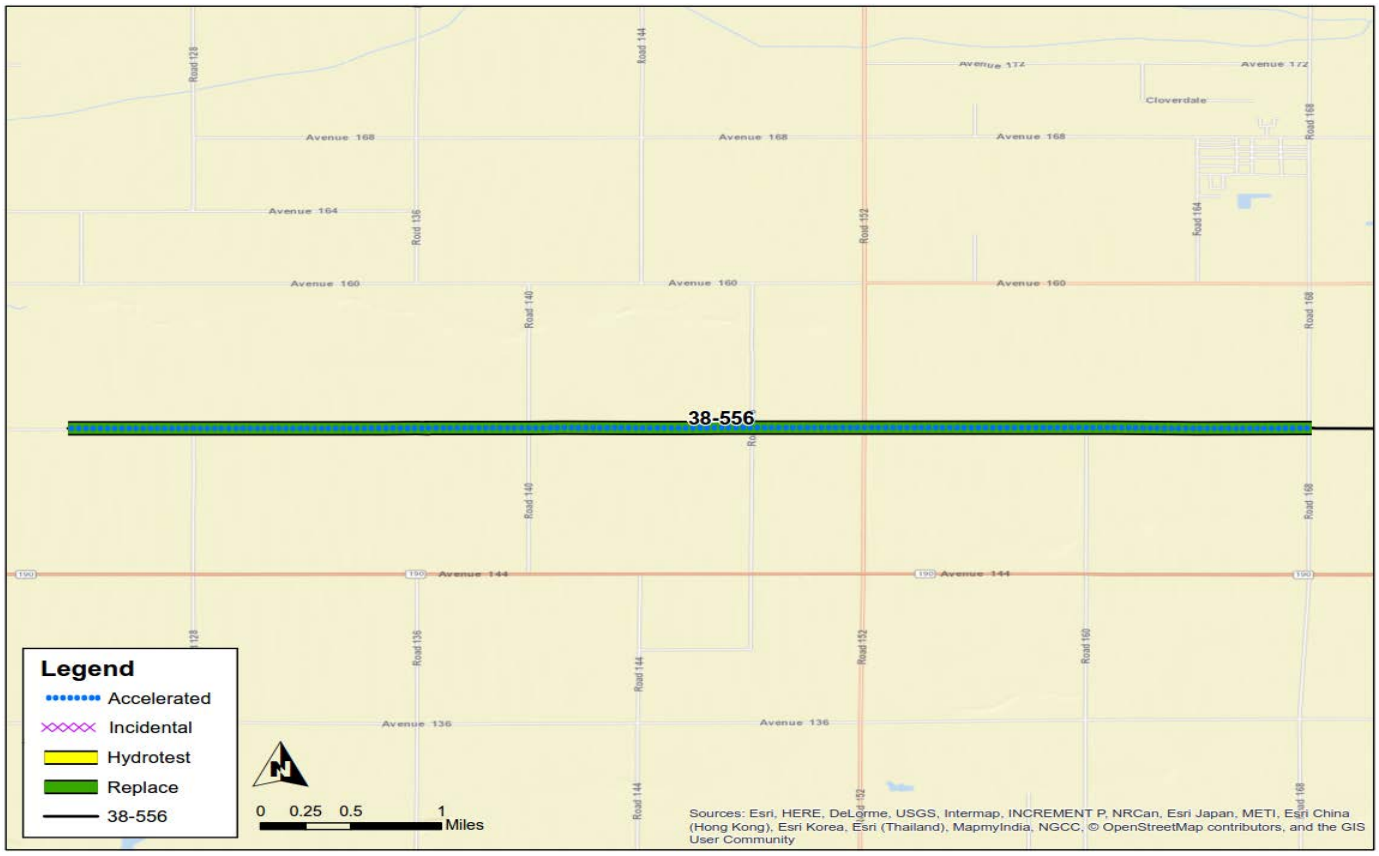
The schedule was developed based on the seven stage project life cycle as defined by PSEP. The key project deliverables were identified to create a work breakdown structure. This work breakdown structure was then sequenced and predecessor and successor tasks were linked to each task. Finally, durations were added to each task to provide a total project duration.

The preliminary Stage 5 Construction Schedule received additional planning and stakeholder input to develop considering that typically 50% of the project costs are expended during the construction phase. Construction schedules assumed to be 68 working days.

Pipeline Safety Enhancement Plan Workpaper Supporting Chapter II

SUPPLY LINE 38-556 REPLACEMENT PROJECT

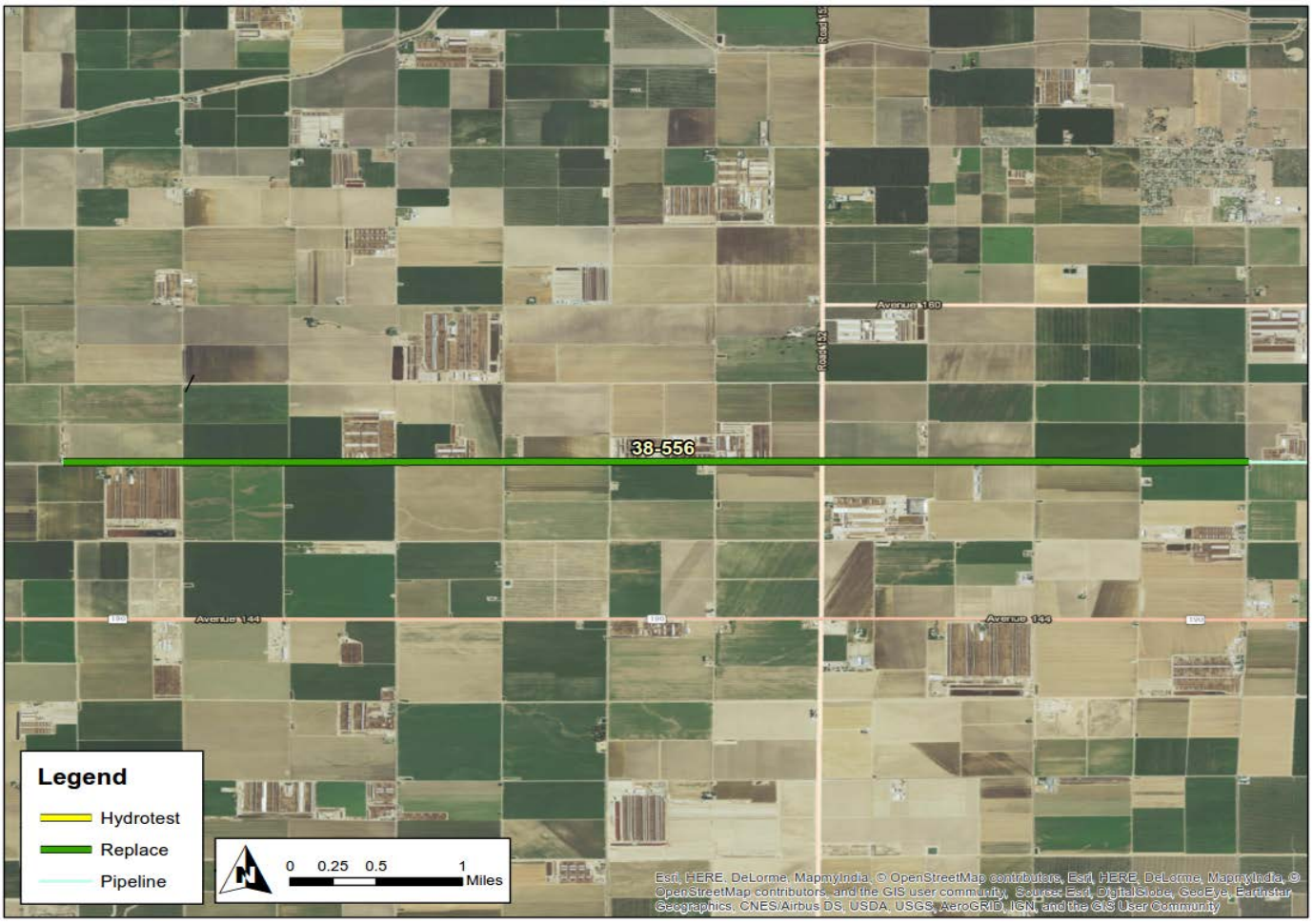
Project Map for Line 38-556



Pipeline Safety Enhancement Plan Workpaper Supporting Chapter II

SUPPLY LINE 38-556 REPLACEMENT PROJECT

Project Map for Line 38-556



PROJECT MILEAGE TABLE

PHASE	MILEAGE
PHASE 1B	0.0
ACCELERATED - PHASE 2A	5.564
ACCELERATED - PHASE 2B	0.0
INCIDENTAL	0.007
TOTAL MILEAGE	5.571

The direct costs for each area are summarized below.

Material				
PROJECT COST	**Prior to 2018**	**2018**	**2019**	**Total**
DIRECT LABOR	$0	$0	$0	$0
DIRECT NON-LABOR	$107,326	$524,031	$786,046	$1,417,403
TOTAL DIRECT COSTS	$107,326	$524,031	$786,046	$1,417,403

ASSUMPTION

Materials for this project will not be purchased until final internal authorization has been granted to purchase long lead time material. This will allow for material to be procured, inspected and delivered to coincide with the anticipated construction start date.

Construction				
PROJECT COST	**Prior to 2018**	**2018**	**2019**	**Total**
DIRECT LABOR	$0	$0	$0	$0
DIRECT NON-LABOR	$0	$0	$8,576,630	$8,576,630
TOTAL DIRECT COSTS	$0	$0	$8,576,630	$8,576,630

General Assumptions

In the development of the construction estimate, the following assumptions and clarifications have been made:

- Pricing is based on current construction costs in Kern County, California.
- Construction schedules assumed to be 68 working days.
- One mobilization and one demobilization.
- Contractor work has been scheduled using a 10-hour per day, five-day work week calendar.
- One shift per day.
- Work will be scheduled Monday through Friday.
- Access to work site shall be continuous once project commences.
- Pipeline can be placed along Right of Way (ROW) without restriction.
- There will be a total of two laydown yards.
- Material will be received at the along pipeline route. Nine loads of material are expected to be received.
- Mechanical excavation is authorized with the exception of areas within two feet of existing gas facilities.
- Pipeline will be shaded with zero sack slurry. Remainder of trench zone will receive native backfill.
- There will be five shallow Horizontal Directional Drill (HDD) crossings that will be performed for the installation of the new SL-38-556. This design is required due to restrictions set by the County of Tulare where trenching and excavation of new pavement is not preferred when crossing intersections. Horizontal Directional Drilling (HDD) will be utilized to install the new pipeline at the following locations: Rd 140 on Olive St., East of Rd 140 on Olive St., Rd 152 on Olive St., Rd 160 on Olive St. and West of Woodville Rd. on Olive St.

- At the east tie-in, a jack and bore method was chosen over an HDD method due to the east tie-in's location and proximity to the intersection. There was a concern that the HDD method could lead to complications to tie-in to the existing pipe due to proximity to the intersection. A Jack and Bore will be utilized to install the new pipeline across Rd 168/Woodville Rd.
- All excavated material can be spread and graded on- site. This will increase elevation by less than 1/10 of a foot.
- An estimated total of seven Baker Tanks will be set up with contractor support for hydrotest water storage. The placement of these tanks, it is assumed, will occur near one of the tie-in points (staging area has not yet been identified). Hard piping from test head to tank manifold will not exceed 100 linear feet (LF).
- Hydroseeding will not be required on this project.
- Restoration of disturbed soil at yards to be done by contractor.
- Restoration of grade along ROW will be restored at the end of the project.

Additional Construction Information

- Site Mobilization / Site Facilities
  - Two Office Trailers have been included for management and inspection personnel.
  - Site facility costs cover a four-month duration.
  - Crushed rock has been included for the laydown yards.
  - Temporary Fencing has been included for the laydown yards.
  - Track-out plates have been included at street access points.

- Site Management
  - 20 crew hours have been included for environmental mitigation activities.

- SoCalGas / Company Furnished Material Handling
  - It is being assumed that 9 loads of SoCalGas furnished material will be unloaded by the contractor along the pipeline route.

- Traffic Control
  - 70 Crew days for a three-man, third-party traffic control subcontractor.

- Utility Locates
  - Five Crew days have been included for exposure of foreign line crossings and to identify alignment of existing gas facilities.

- Pressure Test Pipeline
  - Contractor will assist with the set up of seven Baker Tanks.
  - Two test heads will be installed.
  - Pipeline will be hydrotested in one complete segment.
  - Prepping the pipeline will take one standard day.
  - Filling of the pipeline and allowing its stabilization will take one day.
  - Testing of the pipeline will occur over a 24-hour period during one day.

- Dewater and drying of the pipeline will occur over a three day period.

- Tie-In Pipeline
  - The pipeline will be tied-in using one pressure control fitting (PCF) on the east end and one PCF on the west end.

- Agencies
  - The county of Tulare requirements are as follows:
  - Remain within 5' of Edge of payment.
  - 95% compaction (top 18" of soil).
  - 90% compaction (below 18" of soil).
  - Prefer no open cuts to cross intersections with new pavement. If open cuts are a must, additional mitigation will be required such as widen t-cut and widen overlay (50 feet).

- Paving
  - 736 square feet square feet (SF) of existing driveways will be restored.

- Site Restoration
  - 1,184 linear feet (LF) of temporary fencing will be removed from the laydown yards.
  - 580,000 SF of Right of Way will be grade and restored to its original condition.

- Site Demobilization
  - 370 tons of crushed rock will be hauled off and disposed from laydown yards.
  - Removal of two office trailers has been included.
  - One load of excess piping will be hauled to SoCalGas designated yard.
  - All crews and equipment will be demobilized.

- Field Overhead
  - One Project Manager, one Cost Controller, one Superintendent, one Project Engineer and one Safety Personnel have been included for full project duration.
  - One water truck with driver, forklift and lowbed hauler are included for full project duration.
  - Two site security person has been employed for all non-working hours.
  - 100% per diem for field personnel and project management team for full project duration.

Environmental Survey/Permitting/Monitoring				
PROJECT COST	**Prior to 2018**	**2018**	**2019**	**Total**
DIRECT LABOR	$0	$0	$0	$0
DIRECT NON-LABOR	$38,391	$46,070	$299,452	$383,913
TOTAL DIRECT COSTS	$38,391	$46,070	$299,452	$383,913

Pipeline Safety Enhancement Plan Workpaper Supporting Chapter II

SUPPLY LINE 38-556 REPLACEMENT PROJECT

Assumptions

In generating the cost estimate, the following items were considered:

- Environmental Services (Permitting, surveys and monitoring)
- Abatement (Asbestos & Lead)
- Hazardous and Non-hazardous Waste Containment/ Disposal
- Water treatment and disposal
- Permit fees
- Mitigation fees
- Assumes full-time environmental monitoring will be implemented and pre-construction bio surveys will be completed.
- Costs to prepare a dust control plan and associated permit application fees for the San Joaquin Valley Air Pollution Control District are included.
- Assumes water treatment will not be required and water will be hauled offsite for disposal.

Land & Right-of-Way Acquisition				
PROJECT COST	**Prior to 2018**	**2018**	**2019**	**Total**
DIRECT LABOR	$0	$0	$0	$0
DIRECT NON-LABOR	$25,954	$30,755	$46,132	$102,841
TOTAL DIRECT COSTS	$25,954	$30,755	$46,132	$102,841

Assumptions

In generating the cost estimate, the following items were considered:

- Labor
- Legal Services
- Permitting Fees
- New Easement costs
- Temporary Right of Entry (TRE) - Construction yards
- Temporary Right of Entry (TRE) - Workspace

Factors such as location, zoning, current market price and square footage are considered to determine a final estimated value specific to easements and temporary rights of entry permits.
Previous project experience specific to the Bakersfield area was also considered in generating the cost estimate.

Pipeline Safety Enhancement Plan Workpaper Supporting Chapter II

SUPPLY LINE 38-556 REPLACEMENT PROJECT

Company Labor				
PROJECT COST	**Prior to 2018**	**2018**	**2019**	**Total**
DIRECT LABOR	$205,366	$74,582	$601,993	$881,941
DIRECT NON-LABOR	$0	$0	$0	$0
TOTAL DIRECT COSTS	$205,366	$74,582	$601,993	$881,941

Assumptions

SoCalGas Labor - Management, Engineering, and Non-Union Labor

SoCalGas Non-Union Labor is estimated based upon activity level of effort and is divided into the following categories:

- Project Management
- Project Field Management
- Environmental Services
- Construction Management

SoCalGas Labor - Union Labor

SoCalGas Union Labor costs were developed with the guidance of SoCalGas Construction Management whose costs are duration dependent and activity specific.

Other Costs				
PROJECT COST	**Prior to 2018**	**2018**	**2019**	**Total**
DIRECT LABOR	$0	$0	$0	$0
DIRECT NON-LABOR	$755,843	$129,557	$1,707,395	$2,592,795
TOTAL DIRECT COSTS	$755,843	$129,557	$1,707,395	$2,592,795

Assumptions

Other costs assume use of contracted Project Management, Engineering and Design services.

GMA Costs				
PROJECT COST	**Prior to 2018**	**2018**	**2019**	**Total**
DIRECT LABOR	$40,503	$14,947	$97,157	$152,608
DIRECT NON-LABOR	$327,710	$120,937	$786,088	$1,234,734
TOTAL DIRECT COSTS	$368,213	$135,884	$883,244	$1,387,342

Assumptions

GMA costs are costs that support overall PSEP execution.

Indirect Costs				
PROJECT COST	**Prior to 2018**	**2018**	**2019**	**Total**
COMPANY OVERHEADS	$220,641	$140,539	$1,652,660	$2,013,840
TOTAL INDIRECTS	$220,641	$140,539	$1,652,660	$2,013,840

Assumptions

Indirect costs do not include AFUDC or Property Tax.

Pipeline Safety Enhancement Plan Workpaper Supporting Chapter II

SUPPLY LINE 36-37 SECTION 12 DE-RATE/ABANDON PROJECT

PROJECT COST	Prior to 2018*	2018	2019	2020	2021	2022	Total
DIRECT LABOR	$324,820	$23,699	$142,191	$142,191	$581,844	$664,762	$1,879,506
DIRECT NON-LABOR	$1,151,343	$96,173	$577,037	$577,037	$8,167,006	$4,648,590	$15,217,185
TOTAL DIRECT COSTS	$1,476,163	$119,871	$719,228	$719,228	$8,748,850	$5,313,352	$17,096,691
TOTAL INDIRECT COSTS	$292,218	$27,544	$178,379	$200,649	$1,724,288	$1,413,899	$3,836,979
TOTAL (Capital)	$1,768,381	$147,415	$897,607	$919,877	$10,473,138	$6,727,252	$20,933,670

* Actual costs incurred associated with planning and engineering design work are included in the project cost estimates.

Project Description

Supply Line (SL) 36-37 Section 12[1] project will de-rate and abandon a total of 30.916 miles. SL 36-37 is a high pressure transmission pipeline, which was installed in 1927.

Supply Line 36-37 Section 12 will require three actions: de-rate to medium pressure, abandon, and de-rate to high pressure. The first de-rate portion begins at the intersection of Los Angeles Ave & Santa Clara Ave in Ventura County and continues eastward towards the intersection of Santa Rosa Rd & Hilltop Lane in Ventura County. This portion will have 8.594 of Phase 1B mileage, 0.293 accelerated mileage, and 0.522 incidental mileage. The abandonment portion begins at the intersection of Santa Rosa Rd & Hilltop Lane in Ventura County and continues eastward to the intersection of Kanan Rd & Deerhill Rd in Ventura County. This portion will have 9.226 of Phase 1B mileage, 2.065 of accelerated mileage, and 2.546 of incidental mileage. The final de-rate portion begins at the intersection of Kanan Rd & Deerhill Rd in Ventura County and continues eastward to near the intersection of Calabasas Rd & Parkway Calabasas in the City of Calabasas. This portion will have 2.814 of Phase 1B mileage, 3.350 of accelerated mileage, and 1.506 of incidental mileage.

De-rating and abandoning this line avoids the higher cost associated with replacement.

Scope development determined 15 sites that would require construction activity. The following is a summary of the work for each site:

- Detailed Site 1 – Remove existing pipe and install caps on both ends. This location will be the physical separation between the replacement and the de-rate sections.

- Detailed Site 2 – Abandon the existing regulator station. Convert pipeline to SL-36-37 medium pressure.

[1] Supply Line 36-37 and SL-33-37 are one continuous pipeline. The delineating factor is the Los Angeles County and Ventura County border. For purposes of this workpaper, the project is presented as SL-36-37 Section 12 and the mileage de-rated includes 2.333 Phase 1B mileage for SL-33-37 which is being de-rated as part of the overall project.

- Detailed Site 3 – Abandon the existing regulator station. Install deep-well anode bed. Convert SL-36-37 pipeline to medium pressure.

- Detailed Site 4 – Abandon the existing regulator station. Convert SL-36-37 pipeline to medium pressure.

- Detailed Site 5 – Install new regulator station to feed medium pressure district.

- Detailed Site 6 – Install new pressure limiting station to feed existing lateral supply line. This new limiting station will require approximately 800 feet of [redacted] pipe and 500 feet of [redacted] pipe. Abandon existing regulator station. Convert SL-36-37 pipeline to medium pressure. Install deep-well anode bed.

- Detailed Site 7 – Abandon existing regulator station. Convert SL-36-37 pipeline to medium pressure.

- Detailed Site 8 – Transfer the feed to the existing regulator station from SL-36-37 to Line 404. Requalify regulator station to new MAOP. This location will be the physical separation between the de-rate and the abandonment sections. Abandon SL-36-37 pipeline east of the regulator station.

- Detailed Site 9 – Transfer the feed to the existing regulator station from SL-36-37 to Line 404. Requalify regulator station to new MAOP. Abandon SL-36-37 pipeline.

- Detailed Site 10 – Remove existing bridle valves associated with SL-36-37 and make a physical separation between SL-36-08-M and SL-36-37. Abandon SL-36-37 pipeline.

- Detailed Site 11 – Transfer the feed to the existing regulator station from SL-36-37 to Line 404. Remove existing bridle valves associated with SL-36-37 and install new connection between SL-44-737 to SL-36-37-J. Abandon SL-36-37 pipeline.

- Detailed Site 12 – Transfer the feed to the existing regulator station from SL-36-37 to Lines 404 and 406. This location will be the physical separation between the abandonment and the de-rate sections. Abandon SL-36-37 pipeline west of the regulator station. See Risks and Considerations for more details.

- Detailed Site 13 – Remove existing mainline valve. Install plastic main to supply the existing customers from the medium pressure district.

- Detailed Site 14 – A portion of the abandonment section of SL-36-37 is located across HWY 23. Per normal Caltrans requests associated with pipelines across highways, SoCalGas and San Diego Gas & Electric assumed that Caltrans would require filling the portion that crosses the highway with slurry.

- Detailed Site 15 – A portion of the abandonment section of SL-36-37 is exposed, likely due to erosion on a hillside. SoCalGas assumed the owner would require physical removal of the exposed portion.

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SUPPLY LINE 36-37 SECTION 12 DE-RATE/ABANDON PROJECT

Alternatives Considered

The decision to de-rate and abandon this section on the pipeline was based on engineering analysis conducted during Stage 2 of the Seven Stage Review Process that indicated that customers could be served utilizing existing pipelines such that these sections of SL-36-37 and SL-33-37 were either not necessary or could be lowered in pressure. The engineering analysis considered customer demand associated with summer, normal, and extreme winter conditions. The analysis also considered eliminating possible redundancies when applicable without significantly increasing risk to natural gas systems.

The analysis for SL-36-37 concluded that the entire pipeline could not be abandoned or de-rated because certain segments of SL-36-37 served as the only source of feed to nearby customers. However, it did conclude that certain segments of the pipeline could be abandoned or de-rated. The final scope of SL-36-37 was determined to be a combination of three remediation methods: replacement, de-rate, and abandonment.

The analysis for SL-33-37, which is the same line but was historically split from SL-36-37 due to county boundaries, concluded that the entire pipeline could not be abandoned because the pipeline served as the only source of feed to nearby customers. However, the analysis concluded that the pipeline could be de-rated to an operating pressure less than 20% SMYS and still serve nearby customers.

The project scope was then divided into sections based on remediation action. The replacement scope became Section 11. The abandonment and de-rate scope was bundled into Section 12.

Section 12 provides natural gas supply to 11 regulator stations, most of which supplies the County of Ventura and City of Thousand Oaks. Because the scope of Section 12 includes abandonment and de-rating, the project has the potential to impact gas service to customers. The work for Section 12 was sequenced to mitigate the impact to customers through gas handling and compressed natural gas (CNG). The estimate included costs to minimize the customer impact.

Forecast Methodology

SoCalGas developed a Total Installed Cost (TIC) estimate to implement the above scope of work. The TIC estimate includes costs associated with project management, engineering and design, environmental permitting, land acquisition, material and equipment procurement, and construction.

Estimates includes consideration of the following categories of costs: site mobilization, site facilities, site management, materials, site activities, scope of work, pressure testing, tie-ins, abandonment of existing pipeline activities, site restoration, and field overheads and support.

Schedule

The schedule was developed based on the seven stage project life cycle as defined by PSEP. The key project deliverables were identified to create a work breakdown structure. This work breakdown structure was then sequenced and predecessor and successor tasks were linked to each task. Finally, durations were added to each task to provide a total project duration.

The preliminary Stage 5 Construction Schedule received additional planning and stakeholder input to develop considering that typically 50% of the project costs are expended during the construction phase. Construction schedules assumed to be 234 working days.

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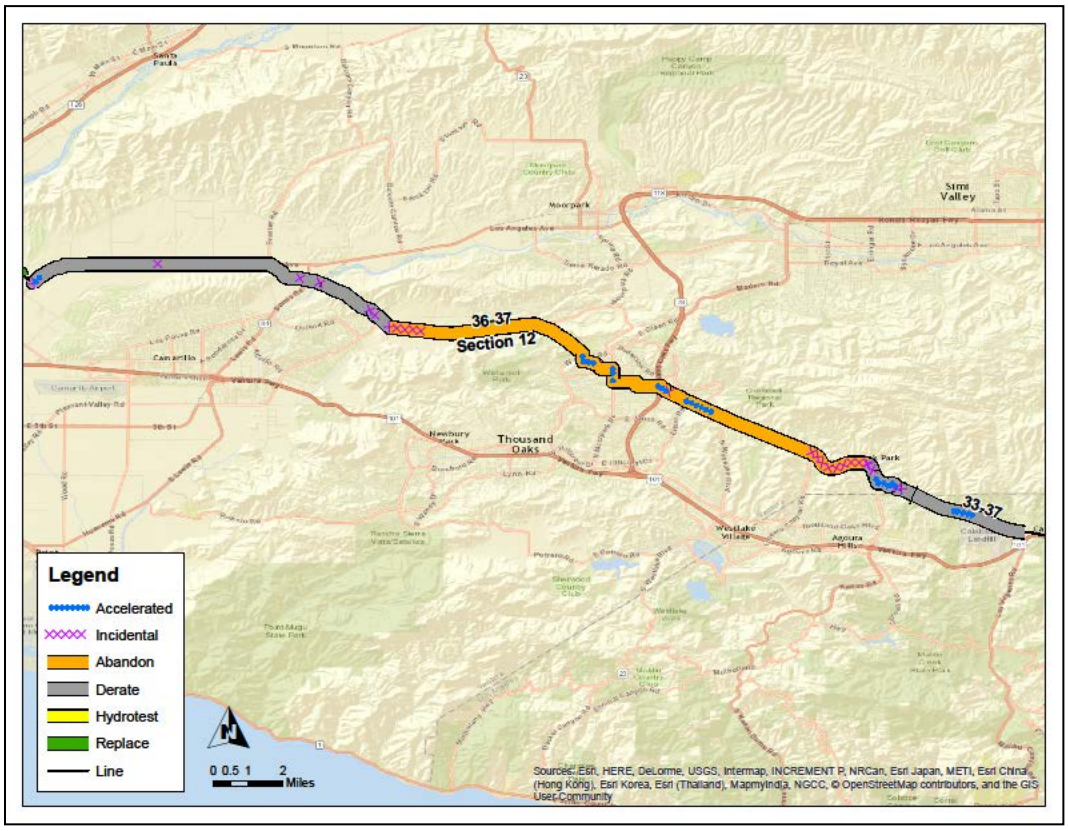
SUPPLY LINE 36-37 SECTION 12 DE-RATE/ABANDON PROJECT

Project Map for Line 36-37 Section 12



PROJECT MILEAGE TABLE

PHASE	MILEAGE
PHASE 1B	20.634
ACCELERATED - PHASE 2A	0
ACCELERATED - PHASE 2B	5.708
INCIDENTAL	4.574
TOTAL MILEAGE	30.916

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SUPPLY LINE 36-37 SECTION 12 DE-RATE/ABANDON PROJECT

The direct costs for each area are summarized below.

Material							
PROJECT COST	**Prior to 2018**	**2018**	**2019**	**2020**	**2021**	**2022**	**Total**
DIRECT LABOR	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0
DIRECT NON-LABOR	$ 30,479	$ 23,166	$ 138,994	$ 138,994	$ 57,914	$ 0	$ 389,548
TOTAL DIRECT COSTS	$ 30,479	$ 23,166	$ 138,994	$ 138,994	$ 57,914	$ 0	$ 389,548

Assumptions

Materials for this project will not be purchased until final internal authorization has been granted to purchase long lead time material. This will allow for material to be procured, inspected and delivered to coincide with the anticipated construction start date.

Construction							
PROJECT COST	**Prior to 2018**	**2018**	**2019**	**2020**	**2021**	**2022**	**Total**
DIRECT LABOR	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0
DIRECT NON-LABOR	$ 0	$ 0	$ 0	$ 0	$ 5,410,889	$ 2,318,952	$ 7,729,841
TOTAL DIRECT COSTS	$ 0	$ 0	$ 0	$ 0	$ 5,410,889	$ 2,318,952	$ 7,729,841

General Assumptions

In the development of the construction estimate, the following assumptions and clarifications have been made:

- Pricing is based on current construction costs in Ventura County, California.
- Construction schedules assumed to be 234 working days.
- One mobilization and one demobilization.
- Contractor's work has been scheduled in Phases, using one 8-hour shifts per day, and a five-day work week calendar.
- Work will be scheduled Monday through Friday.
- There will be at least one laydown yard.
- Material will be received at the Laydown Yard, once identified. 13 loads of material are expected to be received.
- Mechanical excavation is authorized except for areas within two feet of existing gas facilities.
- All new pipe being installed shall be tested prior to installation on to pipeline.
- Pipeline backfill will be 100% screened sand for pipe bedding, zero sack slurry for pipeline shading, and Remainder of trench zone will receive two Sac Slurry up to one inch bellow the existing pavement for the pipeline backfill.
- A Minimum of eight hours have been included for each of the Main Pipeline Tie-In point locations that will be

performed.
- Pipeline seasoning is not required.
- All spoils will be loaded and hauled away to a disposal site, less than two hour round trip.
- One Baker water holding tank will be set up with the contractor support for hydro-test water storage. The placement of these tanks, it is assumed, will occur near one of the tie-in points (staging area has not yet been identified). Hard piping from test head to tank manifold will not exceed 100 linear feet.
- Restoration of disturbed soils to be done by contractor.
- All Asphalt pavement restoration to be replaced like kind.
- Restoration of grade along Right of Way (ROW) will be restored at the end of the project.
- No site security personnel have been identified as being needed for non-working hours.

Additional Construction Information

- Site Mobilization / Site Facilities
  - Two office trailers have been included for management and inspection personnel.
  - Site facility costs cover a 11-month duration.
  - 100 tons of crushed rock have been included for the laydown yards.
  - 2,300 linear feet of Temporary Fencing has been included for the laydown yards.
  - Track-out plates have been included at street access points.

- Site Management / Best Management Practices (BMP's)
  - Storm Water Pollution Prevention Plan (SWPPP) has not yet been developed.
  - 120 crew hours have been included for installation of BMP's.
  - Fiber rolls, sand bags, reinforced poly sheeting, and silt fencing will be procured.

- SoCalGas / Company Furnished Material Handling
  - It is being assumed that 13 loads of SoCalGas furnished material will be unloaded by the contractor along the pipeline route.

- Traffic Control
  - 175 Crew days for a three-man, third-party traffic control subcontractor.

- Utility Locates
  - 177 Crew hours have been included for exposure of foreign line crossings and to identify alignment of existing gas facilities.

- Isolate Existing Pipeline
  - This pipeline will be tied over using Pressure Control Bottom-Out fittings and will not require system isolation.

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SUPPLY LINE 36-37 SECTION 12 DE-RATE/ABANDON PROJECT

- Pressure Test Pipeline
  - Contractor will assist with the setup of Water Storage Tanks & Equipment.
  - Tie-in's two test heads/Caps will be installed for each Regulator station being tested, depending on pipe size.
  - Pipeline will be hydro tested, at each of the Identified locations, as one single segment.
  - Filling each pipeline segment and allowing its stabilization will take one half day, five hr. period.
  - Testing of the pipeline will occur over a 10-hour period during one day.
  - Dewater and drying of the pipeline will occur over a one 10 hr. day period.

- Tie-In Pipeline
  - The tie-in procedure has been allowed a 16 to 24-hour window, depending on the number of tie-in's/tie-overs and will take place during one continuous operation.
  - Existing services will continue to be fed from the de-rated line, and or by the District providing LNG /CNG to the remote customers identified.

- Retire / Abandon Existing Pipeline
  - 626 linear feet of existing [redacted] pipeline under Hwy #23 to be Abandoned, with two plates installed and injected with Mud/Grout.
  - 71,850 linear feet of existing [redacted], & [redacted] pipeline to be abandoned with abandonment plates twelve each and will be purged using nitrogen gas.

- Paving
  - 11,757 square feet of existing pavement will be restored.

- Site Restoration
  - 2,300 linear feet of temporary fencing will be removed from the laydown yards.
  - All disturbed/Impacted Right of Way will be restored to its original condition.

- Site Demobilization
  - 100 tons of crushed rock will be hauled off and disposed from laydown yards.
  - Removal of two office trailers has been included.
  - One load of excess piping will be hauled to SoCalGas designated yard.
  - All crews and equipment will be demobilized.

- Field Overhead
  - One Project Manager & one Project Engineer have been included for half of the project duration and one Superintendent, one Safety Personnel have been included for the full project duration.
  - One water truck with driver are included for full project duration.
  - 100% per diem for field personnel and project management team for full project duration.

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SUPPLY LINE 36-37 SECTION 12 DE-RATE/ABANDON PROJECT

Environmental Survey/Permitting/Monitoring							
PROJECT COST	**Prior to 2018**	**2018**	**2019**	**2020**	**2021**	**2022**	**Total**
DIRECT LABOR	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0
DIRECT NON-LABOR	$ 70,111	$ 13,570	$ 81,420	$ 81,420	$ 328,393	$ 126,200	$ 701,114
TOTAL DIRECT COSTS	$ 70,111	$ 13,570	$ 81,420	$ 81,420	$ 328,393	$ 126,200	$ 701,114

Assumptions

A cost estimating spreadsheet was used to obtain the total estimated cost for SL-36-37 Section 12. The cost estimating spreadsheet considered the following functions:

- Environmental Services (Permitting, surveys and monitoring)
- Abatement (Asbestos & Lead)
- Hazardous and Non-hazardous Waste Containment/ Disposal
- Water treatment and disposal
- Discovery of contaminated groundwater is not included in this estimate.
- Permit fees
- Mitigation fees
- This estimate does not include land services time coordinating with the landowner for access for preconstruction surveys and mitigation.

Environmental considerations unique to the project are as follows:

- Several former contamination cases exist in the project vicinity. It was assumed that approximately 103 cubic yards of non-hazardous contaminated soil will require disposal.
- It is assumed that SoCalGas Environmental Project Management, from planning and permitting through project close-out will be required.
- It is assumed the mitigation fees will be required for habitat impacts.
- It is assumed the monitoring will not be required full time.
- It was determined that a Construction General Permit will be required and preparation of a Storm Water Pollution Prevention Plan will be required.
- Only one area was identified as requiring authorization from the Los Angeles Regional Water Quality Control Board (RWQCB) in the form of Waste Discharge Requirements (WDR). Due to the small magnitude of this overlap, it is expected that any impacts to this feature will be eligible for coverage under the Statewide General Waste Discharge Requirements for Dredged or Fill Discharges to Waters Deemed by the U.S. Army Corps of Engineers to be Outside of Federal Jurisdiction (Order No. 2004-0004-DWQ) issued by the State Water Resources Control Board (SWRCB). No permits from US Army Corps of Engineers or California Department of Fish and Wildlife are expected or included in this estimate.
- It is assumed that a preconstruction biological survey will be conducted in the project area.
- It is assumed that the Cultural Resources survey will be negative. Unanticipated discoveries may require recovery and agency/Native American consultation and have the potential to impact project permitting and

timing.

- Requirements by the landowner for impacts at site 15 are unknown, however native vegetation will likely be impacted, therefore cost for mitigation for coastal sage scrub is included in this estimate. Mitigation costs are presented in the form of bank or in-lieu fee payments, however costs may be analogous to costs for onsite habitat restoration, if required.

Land & Right-of-Way Acquisition							
PROJECT COST	**Prior to 2018**	**2018**	**2019**	**2020**	**2021**	**2022**	**Total**
DIRECT LABOR	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0
DIRECT NON-LABOR	$ 22,628	$ 4,380	$ 26,278	$ 26,278	$ 10,949	$ 0	$ 90,512
TOTAL DIRECT COSTS	$ 22,628	$ 4,380	$ 26,278	$ 26,278	$ 10,949	$ 0	$ 90,512

Assumptions

The cost estimate was generated using a detailed spreadsheet covering items such as:

- Labor
- Legal Services
- Permitting Fees
- New Easement costs
- Temporary Right of Entry (TRE) - Construction yards
- Temporary Right of Entry (TRE) - Workspace

Factors such as location, zoning, current market price and square footage are considered to determine a final estimated value specific to easements and temporary rights of entry permits.
Previous project experience specific to the Ventura area was also considered in generating the cost estimate.

Company Labor							
PROJECT COST	**Prior to 2018**	**2018**	**2019**	**2020**	**2021**	**2022**	**Total**
DIRECT LABOR	$ 324,820	$ 20,956	$ 125,737	$ 125,737	$ 551,184	$ 603,552	$ 1,751,985
DIRECT NON-LABOR	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0
TOTAL DIRECT COSTS	$ 324,820	$ 20,956	$ 125,737	$ 125,737	$ 551,184	$ 603,552	$ 1,751,985

Assumptions

SoCalGas Labor - Management, Engineering, and Non-Union Labor

SoCalGas Non-Union Labor is estimated based upon activity level of effort and is divided into the following

categories:

- Project Management
- Project Field Management
- Environmental Services
- Construction Management

SoCalGas Labor - Union Labor

SoCalGas Union Labor costs were developed with the guidance of SoCalGas Construction Management and whose costs are duration dependent and activity specific.

Other Costs							
PROJECT COST	**Prior to 2018**	**2018**	**2019**	**2020**	**2021**	**2022**	**Total**
DIRECT LABOR	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0
DIRECT NON-LABOR	$ 641,698	$ 32,869	$ 197,215	$ 197,215	$ 2,110,796	$ 1,708,193	$ 4,887,986
TOTAL DIRECT COSTS	$ 641,698	$ 32,869	$ 197,215	$ 197,215	$ 2,110,796	$ 1,708,193	$ 4,887,986

Assumptions

Other costs assume use of contracted Project Management, Engineering and Design services.

GMA Costs							
PROJECT COST	**Prior to 2018**	**2018**	**2019**	**2020**	**2021**	**2022**	**Total**
DIRECT LABOR	$ 42,507	$ 2,742	$ 16,454	$ 16,454	$ 30,660	$ 61,210	$ 170,028
DIRECT NON-LABOR	$ 343,919	$ 22,188	$ 133,130	$ 133,130	$ 248,066	$ 495,244	$ 1,375,678
TOTAL DIRECT COSTS	$ 386,426	$ 24,931	$ 149,584	$ 149,584	$ 278,726	$ 556,454	$ 1,545,705

Assumptions

GMA costs are costs that support overall PSEP execution.

Indirect Costs							
PROJECT COST	**Prior to 2018**	**2018**	**2019**	**2020**	**2021**	**2022**	**Total**
COMPANY OVERHEADS*	$292,218	$27,544	$178,379	$200,649	$1,724,288	$1,413,899	$3,836,979
TOTAL INDIRECTS	$292,218	$27,544	$178,379	$200,649	$1,724,288	$1,413,899	$3,836,979

Assumptions

Indirect costs do not include AFUDC or Property Tax.

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SUPPLY LINE 36-1002 DE-RATE PROJECT

PROJECT COST	Prior to 2018*	2018	2019	2020	Total
DIRECT LABOR	$118,606	$28,617	$313,455	$27,472	$488,150
DIRECT NON-LABOR	$904,082	$230,059	$3,782,505	$152,430	$5,069,076
TOTAL DIRECT COSTS	$1,022,688	$258,676	$4,095,960	$179,902	$5,557,226
TOTAL INDIRECT COSTS	$111,847	$41,777	$619,816	$41,347	$814,787
TOTAL (Capital)	$1,134,535	$300,453	$4,715,776	$221,249	$6,372,013

* Actual costs incurred associated with planning and engineering design work are included in the project cost estimates

Project Description

Supply Line (SL) 36-1002 project will derate 16.683 miles of existing pipe including 1.770 miles of Phase 1B pipe, 6.797 miles of accelerated Phase 2 pipe, and 8.116 miles of incidental pipe at an MAOP of [redacted] in the city of Goleta, CA. The existing SL-36-1002 was originally installed in 1928. SL-36-1002 is located along the coast and parallels the 101 freeway in between the city of Goleta and Gaviota Station.

The scope includes:

- Derating 16.683 miles of SL-36-1002.
- Modification of Gaviota Station to distribute medium pressure to SL-36-1002.
- Removal of three existing District Regulator Stations (DRS).
- Installation of new piping at each DRS removal location.
- Disconnection of the existing[redacted] cross-over SL-44-251 from SL-36-1002.
- Removal of twenty (20) existing First Stage Regulators (FSR).
- Installation of a new high pressure regulator station between Transmission Line 247 and SL-36-1002 to deliver high pressure to the remaining section of SL-36-1002 that will not be derated.

De-rating this line avoids the higher cost of replacing pipe through environmentally sensitive areas along the coast.

Alternatives Considered

Abandonment of this section of SL-36-1002 is not a viable option since there is no parallel distribution line that can support the number of customers along this stretch of coast line between the city of Goleta and Gaviota Station. Supply Line 36-1002 feeds high pressure and volume to the Ellwood Station power plant.

Supply Line 36-1002 will be derated from high pressure [redacted] to medium pressure [redacted] This 16.683 mile section of SL-36-1002 contains a low number of customers and can be merged into one medium pressure district which can adequately supply natural gas to all customers.

During removal of the three District Regulator Stations, multiple customers at each existing pressure district will require a temporary compressed natural gas (CNG)/ liquefied natural gas (LNG) supply.

Pipeline Safety Enhancement Plan Workpaper Supporting Chapter II

SUPPLY LINE 36-1002 DE-RATE PROJECT

Forecast Methodology

SoCalGas developed a TIC estimate to implement the above scope of work. The TIC estimate includes costs associated with project management, engineering and design, environmental permitting, land acquisition, material and equipment procurement, and construction.

Estimate includes consideration of the following categories of costs: site mobilization, site facilities, site management, materials, site activities, scope of work, pressure testing, tie ins, removal of existing pipeline activities, site restoration, and field overheads and support.

Schedule

The schedule was developed based on the seven stage project life cycle as defined by PSEP. The key project deliverables were identified to create a work breakdown structure. This work breakdown structure was then sequenced and predecessor and successor tasks were linked to each task. Finally, durations were added to each task to provide a total project duration.

The preliminary Stage 5 Construction Schedule received additional planning and stakeholder input to develop considering that typically 50% of the project costs are expended during the construction phase. Construction schedule assumed to be 32 working days.

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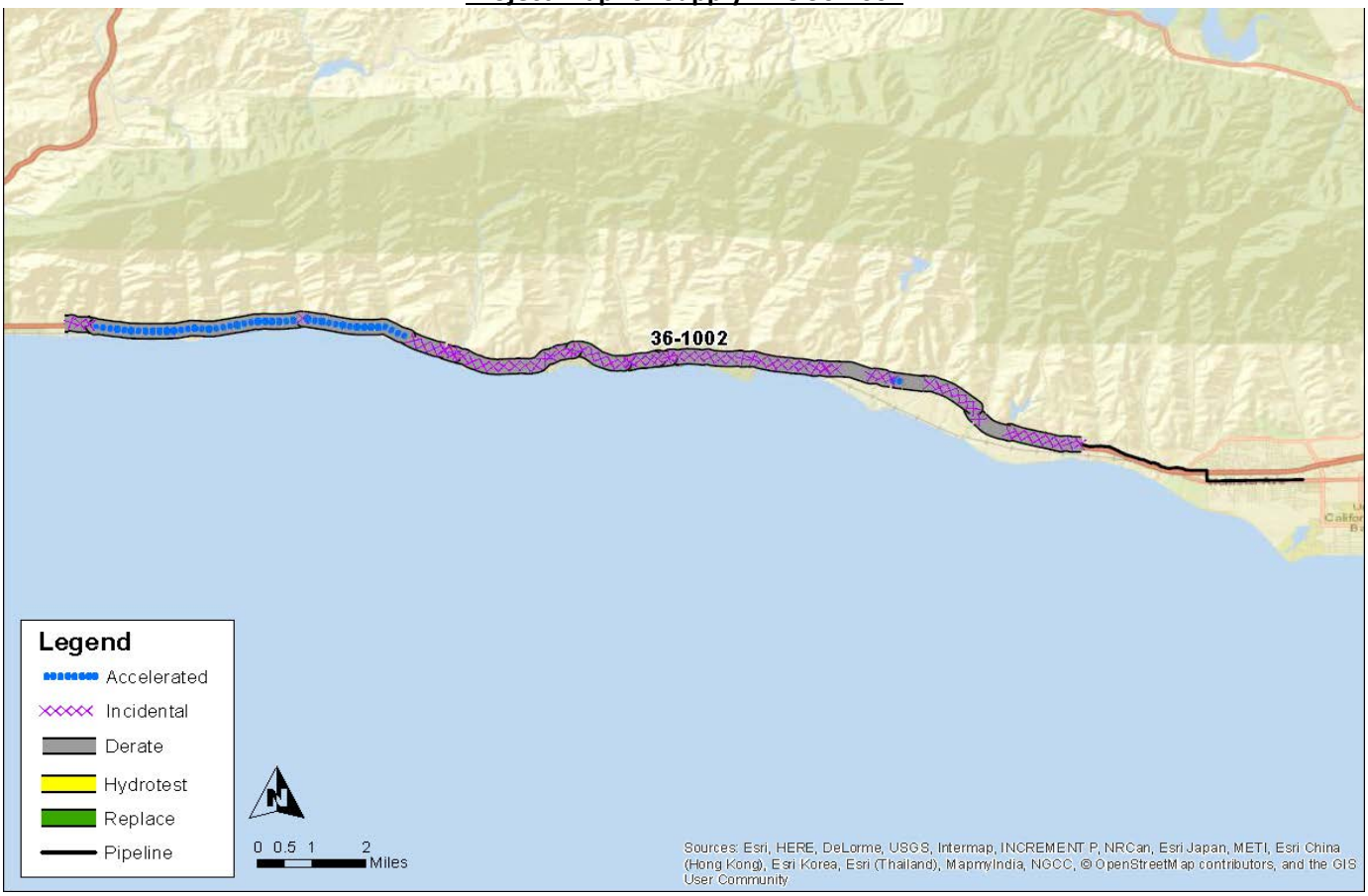
SUPPLY LINE 36-1002 DE-RATE PROJECT

Project Map for Supply Line 36-1002



PROJECT MILEAGE TABLE

PHASE	MILEAGE
PHASE 1B	1.770
ACCELERATED - PHASE 2A	4.987
ACCELERATED - PHASE 2B	1.810
INCIDENTAL	8.116
TOTAL MILEAGE	16.683

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SUPPLY LINE 36-1002 DE-RATE PROJECT

The direct costs for each area are summarized below.

Material					
PROJECT COST	**Prior to 2018**	**2018**	**2019**	**2020**	**Total**
DIRECT LABOR	$0	$0	$0	$0	$0
DIRECT NON-LABOR	$ 36,628	$ 29,662	$ 88,985	$ 0	$ 155,275
TOTAL DIRECT COSTS	$ 36,628	$ 29,662	$ 88,985	$ 0	$ 155,275

Assumptions

Materials for this project will not be purchased until final internal authorization has been granted to purchase long lead time material. This will allow for material to be procured, inspected and delivered to coincide with the anticipated construction start date.

Construction					
PROJECT COST	**Prior to 2018**	**2018**	**2019**	**2020**	**Total**
DIRECT LABOR	$0	$0	$0	$0	$0
DIRECT NON-LABOR	$ 0	$ 0	$ 1,776,019	$ 0	$ 1,776,019
TOTAL DIRECT COSTS	$ 0	$ 0	$ 1,776,019	$ 0	$ 1,776,019

General Assumptions

In the development of the construction estimate, the following assumptions and clarifications have been made:

- Pricing is based on current construction costs in Santa Barbara County, California.
- Construction schedule assumed to be 32 working days.
- One mobilization and one demobilization.
- Work hours assumed to be from 7:00 am to 5:00 pm.
- Contractor work has been scheduled using a 10-hour per day, five-day work week calendar. One shift per day.
- Work will be scheduled Monday through Friday.
- Access to work sites shall utilize Highway 101 to access Calle Real for New High-to-High Reg Station, Naples Access Road for ID 2540, El Capitan Ranch Road for ID 2669 and the SL 44-251 Crossover, Access Road for ID 7002, and Mariposa Reina for ID 403-T.
- The main yard location will be located at the east end of the project at the Calle Real laydown yard. There is only one laydown yard assumed to be utilized for this project.
- Estimate assumes hand excavation to be performed to expose all existing gas piping within existing District Regulator Stations, at the crossover tee and at First Stage Regulators.
- Estimate assumes fabrication of all pipe will be performed at each site.
- Mechanical excavation is authorized except for areas within two feet of existing gas facilities.
- Pipeline will be padded utilizing bedding sand, shaded with zero sack slurry around the pipe to 1’ above

pipeline and 1 sack slurry above.

- Estimate assumes the installation of one District Regulator Station High to High Reg Station after removing existing piping.
- Estimate assumes modifying of one District Regulator Station at Gaviota Station.
- Estimate assumes the removal of three District Regulator Stations, cut and cap existing laterals to the abandoned DRS's and tie-in directly to the pressure district piping.
- Estimate assumes the removal of twenty First Stage Regulators.
- Tie-ins are assumed to be cold tie-ins.
- Existing gas line crossings will be potholed prior to trench excavation. Slot trenching of any kind will not be performed.

Additional Construction Information

- Site Mobilization / Site Facilities
  - Two office trailers have been included for management and inspection personnel.
  - Site facility costs cover a two-month duration.
  - 800 linear feet of temporary fencing has been included for the laydown yards.

- Site Management
  - Storm Water Pollution Prevention Plans (SWPPP) has not yet been developed.
  - 70 crew hours have been included for installation of Environmental Mitigation Measures.

- SoCalGas / Company Furnished Material Handling
  - Two loads of company furnished material will be unloaded by the contractor at the main laydown yard.

- Traffic Control
  - Estimate assumes utilizing a third-party traffic control subcontractor at District Regulator Station ID 2540 for work within Naples Access Road.

- Utility Locates
  - No locates have been identified within this estimate as excavations will be hand excavated.

- Isolate Existing Pipeline
  - Pipeline isolation will be performed by closing existing valves.

- Pressure Test Pipeline
  - Contractor will assist with five 1.5-hour nitrogen tests.
  - Estimate assumes no hydrotesting to be performed.

- Tie-In Pipeline
  - The tie-in procedure has been allowed a ten-hour window to complete at each site.

- Retire / Abandon Existing Pipeline
  - Existing pipeline will be purged and plated.
  - Estimate assumes that asbestos will be encountered and has provided an asbestos abatement support crew to assist abatement contractor.
  - All pipe will be cut, wrapped and placed into a roll off container to be transported offsite.
  - Concrete vaults will be demoed and disposed of offsite.

- Paving
  - Paving has been included at District Regulator Station ID 2540.
  - Estimate assumes a total of 257 square feet of paving.

- Site Restoration
  - 800 linear feet of temporary fencing will be removed from the laydown yards.
  - 7,147 square yard of Right of Way will be graded and restored to its original condition.

- Site Demobilization
  - Removal of two office trailers has been included.
  - One load of excess piping will be hauled to SoCalGas designated yard.
  - All crews and equipment will be demobilized.

- Field Overhead
  - One Project Manager half time, one Cost Controller, one Superintendent, one Safety Personnel and one Scheduler (part time) have been included for the full project duration.
  - One water truck, one all-terrain forklift, and one baker tank have been included for the project duration.
  - Water delivery / management has been included in field overhead.
  - One site security person has been employed for all non-working hours.
  - 100% per diem for field personnel and project management team for full project duration.

Environmental Survey/Permitting/Monitoring					
PROJECT COST	**Prior to 2018**	**2018**	**2019**	**2020**	**Total**
DIRECT LABOR	$0	$0	$0	$0	$0
DIRECT NON-LABOR	$ 23,405	$ 17,555	$ 193,101	$ 0	$ 234,061
TOTAL DIRECT COSTS	$ 23,405	$ 17,555	$ 193,101	$ 0	$ 234,061

Assumptions

- In generating the cost estimate, the following items were considered:
- Environmental Services (Permitting, surveys and monitoring)
- Abatement (Asbestos & Lead)
- Hazardous and Non-hazardous Waste Containment/ Disposal
- Water treatment and disposal

- Permit fees
- Mitigation fees

Environmental considerations unique to the project are as follows:

- Exempt for Coastal Development Permit
- Assume part time monitor during construction.
- Assume pre-construction cultural investigation.
- Assumes the Construction General Permit will be applicable to the project and preparation and implementation of a Storm Water Pollution Prevention Plan will be required.
- Assume biological survey for nesting birds.

Land & Right-of-Way Acquisition					
PROJECT COST	**Prior to 2018**	**2018**	**2019**	**2020**	**Total**
DIRECT LABOR	$0	$0	$0	$0	$0
DIRECT NON-LABOR	$ 28,964	$ 21,723	$ 65,168	$ 0	$ 115,855
TOTAL DIRECT COSTS	$ 28,964	$ 21,723	$ 65,168	$ 0	$ 115,855

Assumptions

In generating the cost estimate, the following items were considered:

- Labor
- Legal Services
- Permitting Fees
- New Easement costs
- Temporary Right of Entry (TRE) - Construction yards
- Temporary Right of Entry (TRE) - Workspace

Factors such as location, zoning, current market price and square footage are considered to determine a final estimated value specific to easements and temporary rights of entry permits. Previous project experience specific to the Santa Barbara area was also considered in generating the cost estimate.

Company Labor					
PROJECT COST	**Prior to 2018**	**2018**	**2019**	**2020**	**Total**
DIRECT LABOR	$ 104,705	$ 25,148	$ 278,630	$ 24,142	$ 432,625
DIRECT NON-LABOR	$0	$0	$0	$0	$0
TOTAL DIRECT COSTS	$ 104,705	$ 25,148	$ 278,630	$ 24,142	$ 432,625

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SUPPLY LINE 36-1002 DE-RATE PROJECT

Assumptions

SoCalGas Labor - Management, Engineering, and Non-Union Labor

SoCalGas Non-Union Labor is estimated based upon activity level of effort and is divided into the following categories:

- Project Management
- Project Field Management
- Environmental Services
- Construction Management

SoCalGas Labor - Union Labor

SoCalGas Union Labor costs were developed with the guidance of SoCalGas Construction Management and whose costs are duration dependent and activity specific.

Other Costs					
PROJECT COST	**Prior to 2018**	**2018**	**2019**	**2020**	**Total**
DIRECT LABOR	$0	$0	$0	$0	$0
DIRECT NON-LABOR	$ 702,613	$ 133,055	$ 1,377,462	$ 125,488	$ 2,338,618
TOTAL DIRECT COSTS	$ 702,613	$ 133,055	$ 1,377,462	$ 125,488	$ 2,338,618

Assumptions

Other costs assume use of contracted Project Management, Engineering and Design services.

GMA Costs					
PROJECT COST	**Prior to 2018**	**2018**	**2019**	**2020**	**Total**
DIRECT LABOR	$ 13,901	$ 3,469	$ 34,825	$ 3,330	$ 55,525
DIRECT NON-LABOR	$ 112,471	$ 28,065	$ 281,770	$ 26,942	$ 449,248
TOTAL DIRECT COSTS	$ 126,372	$ 31,533	$ 316,595	$ 30,272	$ 504,772

Assumptions

GMA costs are costs that support overall PSEP execution.

Indirect Costs					
PROJECT COST	**Prior to 2018**	**2018**	**2019**	**2020**	**Total**
COMPANY OVERHEADS	$111,847	$41,777	$619,816	$41,347	$814,787
TOTAL INDIRECTS	$111,847	$41,777	$619,816	$41,347	$814,787

Assumptions

Indirect costs do not include AFUDC or Property Tax.

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LINE 2000 C HYDROTEST PROJECT

PROJECT COST – O&M	Prior to 2018*	2018	2019	2020	Total
DIRECT LABOR	$398,424	$0	$577,341	$835,944	$1,811,709
DIRECT NON-LABOR	$2,479,450	$0	$9,117,143	$11,113,802	$22,710,395
TOTAL DIRECT COSTS	$2,877,874	$0	$9,694,484	$11,949,746	$24,522,104
TOTAL INDIRECT COSTS	$322,289	$0	$1,053,101	$1,504,158	$2,879,549
TOTAL O&M	$3,200,163	$0	$10,747,585	$13,453,904	$27,401,653

* Actual costs incurred associated with planning and engineering design work are included in the project cost estimates.

PROJECT COST – CAPITAL	Prior to 2018*	2018	2019	2020	Total
DIRECT LABOR	$64,827	$0	$93,938	$136,014	$294,779
DIRECT NON-LABOR	$403,426	$0	$1,483,429	$1,808,301	$3,695,155
TOTAL DIRECT COSTS	$468,252	$0	$1,577,367	$1,944,315	$3,989,934
TOTAL INDIRECT COSTS	$61,085	$0	$229,305	$321,330	$611,720
TOTAL CAPITAL	$529,337	$0	$1,806,672	$2,265,646	$4,601,654

* Actual costs incurred associated with planning and engineering design work are included in the project cost estimates.

TOTAL PROJECT COST	Prior to 2018*	2018	2019	2020	Total
DIRECT LABOR	$463,251	$0	$671,279	$971,958	$2,106,488
DIRECT NON-LABOR	$2,882,875	$0	$10,600,572	$12,922,104	$26,405,551
TOTAL DIRECT COSTS	$3,346,126	$0	$11,271,852	$13,894,062	$28,512,039
TOTAL INDIRECT COSTS	$383,374	$0	$1,282,406	$1,825,488	$3,491,268
TOTAL**	$3,729,500	$0	$12,554,258	$15,719,550	$32,003,307

* Actual costs incurred associated with planning and engineering design work are included in the project cost estimates.
** Individual component tables display total direct costs (Capital and O&M).

Project Description

Line 2000 is a [redacted] diameter high pressure natural gas pipeline that runs from Blythe to Los Angeles, CA. Line 2000 was originally proposed in A.11-11-002 as one hydrotest project consisting of 117.6 miles. To more efficiently execute this large project, L-2000 was divided into the following projects: L-2000-A, L-2000-Bridge, L-2000-C, L-2000 Chino Hills, L-2000-D, L-2000-E, L-2000 East of Cactus City, and L-2000-West.

The L-2000-C Phase 2 project will hydrostatically test 22.943 miles of [redacted] pipe that was installed in 1947. The physical scope contains 16 planned individual hydrostatic tests covering approximately 22.910 miles of Phase 2 mileage and approximately 0.033 miles of incidental pipe. Each individual test section varies in length due to restrictions in elevation changes and environmental impact mitigation. The lowest and highest elevations are 120 feet and 1,090 feet, respectively. The project begins in Indio at MLV 8 and runs west to the city of Whitewater, CA

(Whitewater Station, MLV 12).

The capital work of this project includes the replacement of 5 taps, 3 wrinkle bends, and 20 short sections of pipe totaling 1,010 feet to facilitate the hydrotesting procedure.

Alternatives Considered

Abandonment is not an option because this is a backbone line that is critical for the Transmission system operational needs.

Forecast Methodology

SoCalGas developed a Total Installed Cost (TIC) estimate to implement the above scope of work. The TIC estimate includes costs associated with project management, engineering and design, environmental permitting, land acquisition, material and equipment procurement, and construction.

Estimates include consideration of the following categories of costs: site mobilization, site facilities, site management, materials, site activities, scope of work, pressure testing, tie-ins, abandonment of existing pipeline activities, site restoration, field overheads and support.

Schedule

The schedule was developed based on the seven stage project life cycle as defined by PSEP. The key project deliverables were identified to create a work breakdown structure. This work breakdown structure was then sequenced and predecessor and successor tasks were linked to each task. Finally, durations were added to each task to provide a total project duration.

The preliminary Stage 5 Construction Schedule received additional planning and stakeholder input considering that typically 50% of the project costs are expended during the construction phase. Construction schedule is assumed to be 129 working days.

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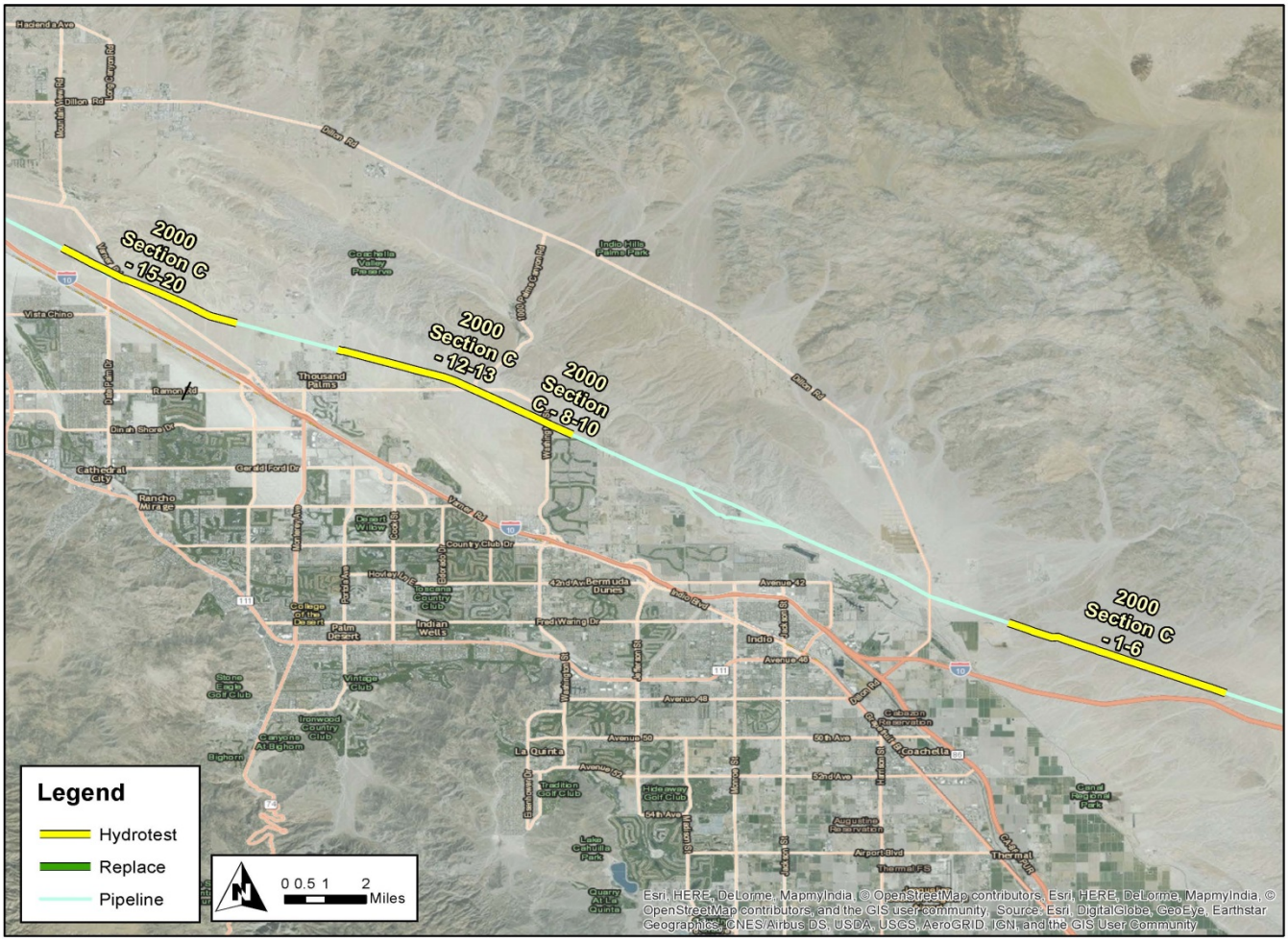
LINE 2000 C HYDROTEST PROJECT

Project Map for Line 2000 C



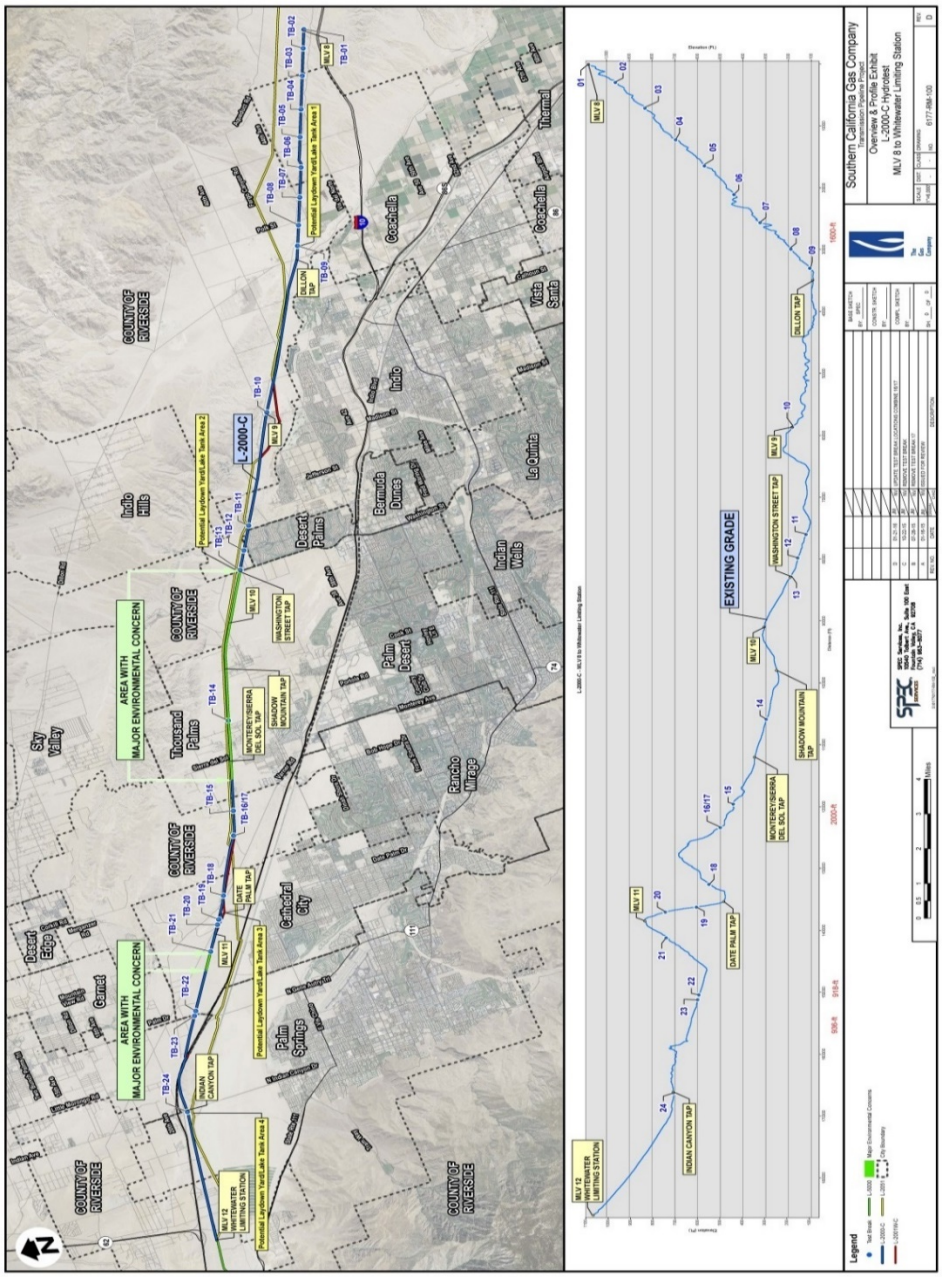
PROJECT MILEAGE TABLE

PHASE	MILEAGE
PHASE 1B	0.0
ACCELERATED - PHASE 2A	22.910
ACCELERATED - PHASE 2B	0.0
INCIDENTAL	0.033
TOTAL MILEAGE	22.943

Pipeline Safety Enhancement Plan Workpaper Supporting Chapter II

LINE 2000 C HYDROTEST PROJECT

Elevation Map for Line 2000 C



Pipeline Safety Enhancement Plan Workpaper Supporting Chapter II

LINE 2000 C HYDROTEST PROJECT

The direct costs for each area are summarized below.

Material					
PROJECT COST	**Prior to 2018**	**2018**	**2019**	**2020**	**Total**
DIRECT LABOR	$0	$0	$0	$0	$0
DIRECT NON-LABOR	$173,936	$0	$1,768,530	$0	$1,942,466
TOTAL DIRECT COSTS	$173,936	$0	$1,768,530	$0	$1,942,466

Assumptions

Materials for this project will not be purchased until final internal authorization has been granted to purchase long lead time material. This will allow for material to be procured, inspected and delivered to coincide with the anticipated construction start date.

Construction					
PROJECT COST	**Prior to 2018**	**2018**	**2019**	**2020**	**Total**
DIRECT LABOR	$0	$0	$0	$0	$0
DIRECT NON-LABOR	$3,598	$0	$3,784,872	$7,569,745	$11,358,215
TOTAL DIRECT COSTS	$3,598	$0	$3,784,872	$7,569,745	$11,358,215

General Assumptions

In the development of the construction estimate, the following assumptions and clarifications have been made:

- Pricing is based on current construction costs in Riverside County, California.
- Construction schedule is assumed to be 129 working days.
- One mobilization and one demobilization.
- Contractor work has been scheduled using a 10-hour per day, five-day work week calendar.
- One shift per day.
- Work will be scheduled Monday through Friday.
- Access road grading will be performed in two phases.
- Laydown Yards will be established at Dillon Road, Washington Street, Date Palm Drive and Indian Canyon Drive.
- Lake tanks will be installed at the Date Palm and Dillon Yards (total of two). Material will be received at the Date Palm Yard. Twelve loads of material are expected to be received.
- Traffic control is only assumed to install the temporary water piping across Date Palm Drive for the lake tank fill piping.
- Complete mechanical excavation of test breaks will be authorized once L-2000-C has been isolated/shut-in.
- All excavations will be backfilled with zero sack slurry to one foot above pipeline. Remainder of backfill will be performed using native soil.
- Existing taps will be excavated and isolated prior to L-2000-C isolation/shut-in.
- Each excavation site will be covered with plywood and fenced off at the end of each work day.

- A total of 12 days have been included to mitigate debris fields.
- Water will be reused for each section.
- Tie-In durations have been assumed as 24 hours per hot tie-in.
- Mainline isolation has been assumed as a 24-hour duration.
- Line taps will be fabricated and then reconnected after line is brought back into service.
- Hydrotest water will be procured by construction contractor.
- Paving restoration is limited to one thoroughfare.
- Following the successful completion of all test groups, Best Management Practices (BMP's) will be removed and laydown yards will all be returned to original condition.
- Hydrotest water will be dispersed onsite by contractor water trucks.
- 100% per diem for field labor and project management teams.

Additional Construction Information

- Site Mobilization / Site Facilities
  - Office Trailers will be placed at Date Palm Yard (two trailers with 45kV generator) and Dillon Yard (one trailer with 25 kV generator).
  - Site facility costs cover a 6 ½ month duration.
  - 16,200 tons of crushed rock have been included for the laydown yards.
  - 1,117 tons of sand have been included for the lake tank pads.
  - 94,361 square yard of geotextile fabric has been included for environmental protection at the laydown yards and will be placed beneath crushed rock.
  - 1,350 linear feet of temporary fill piping will be installed from the Date Palm Yard on the east side of the road to Test Break 19.
  - 735,642 square yard of access road and laydown yard rough grading with 40 tons of vegetation disposal.
  - 15 loads of timber mats have been included to protect existing washes.

- SoCalGas / Company Furnished Material Handling
  - 12 loads of SoCalGas furnished material will be unloaded by the contractor at the Date Palm Yard.

- Traffic Control
  - Traffic control will cover a two-day period for the excavation and installation of temporary lake tank fill piping and for the restoration of Date Palm Drive.

- Pressure Test Pipeline
  - 18 cold tie-ins will be performed at each of the test break sections except for Test Break 1 and Test Break 24.
  - Two hot tie-ins will be performed (Test Break 1 and Test Break 24).
  - 133 welds will be x-rayed (this includes gooseneck/test loops, tie-in piping, and tap piping only).
  - 107 welds will be coated using two-part epoxy (tie-in and tap piping welds).
  - A total of 20 test breaks will be excavated for test head installation.
  - 16 individual tests will be performed.
  - Test sections already covered in Phase 1A or previously tested are not included.

- A total of 5,607 cubic yards of soil will be excavated with 4,731 tons of the material being hauled to disposal facility within 2-hour turnaround.
- 13 transfer piping assemblies will be fabricated and re-used between sections (12 welds per assembly) with minor rework before each reuse to accommodate test break site conditions.
- A total of 5 electrolysis testing station (ETS) stations will be installed.
- Three wrinkle bends will be cut out and field bends will be made and installed in their place.
- Approximately 2,000,000 gallons of water has been included and purchased as a part of the contractor cost.
- 20 Baker Tanks and two Lake Tanks for water management.

- Utility Locates
  - Four days have been included for identifying SoCalGas utilities.

- Isolate Existing Pipeline
  - Tap Isolation Sites Include:
  - Indian Canyon Tap (near Test Break 24)
  - MLV 11 crossover piping / taps
  - Indian Canyon Tap (near Test Break 24)
  - MLV 11 crossover piping / taps
  - Date Palm Tap
  - Sierra Del Sol Tap
  - Shadow Mountain Tap
  - MLV 10 crossover piping / taps
  - Washington St Tap
  - MLV 9 Sensing Lines
  - Dillon Tap
  - MLV 8 crossover piping / taps and blow-off piping

- Paving
  - AC Paving will be restored at impacted tap isolation site.

- Site Restoration
  - 615 linear feet of chain link fencing will be installed at tap sites and stations where existing fencing was removed.
  - Approximately 1,800,000 gallons of water will be removed from Dillon Lake Tank and will be dispersed at the site using contractor water trucks.
  - 16,200 tons of crushed rock will be removed, hauled off, and disposed from laydown yards.
  - An allowance has been included for hydroseeding at Laydown Yards.

- Site Demobilization
  - All site facilities will be demobilized.
  - Three loads of excess material will be hauled to SoCalGas designated yard.
  - Timber mats at wash areas will be hauled off.
  - Crew and equipment will be demobilized.

- Field Overhead
  - One Project Manager, one Superintendent, one Cost Controller, and two Safety Personnel have been included for full project duration.
  - Two water trucks and drivers are included for full project duration for dust suppression.
  - Two site security personnel have been employed for all non-working hours.
  - 100% per diem for field personnel and project management team for full project duration.

Environmental Survey/Permitting/Monitoring					
PROJECT COST	**Prior to 2018**	**2018**	**2019**	**2020**	**Total**
DIRECT LABOR	$0	$0	$0	$0	$0
DIRECT NON-LABOR	$597,803	$0	$2,989,013	$2,391,211	$5,978,027
TOTAL DIRECT COSTS	$597,803	$0	$2,989,013	$2,391,211	$5,978,027

Assumptions

In generating the total estimated cost for L-2000 C the following Environmental services items were considered:

- SoCalGas Environmental Project Management, from planning and permitting through project close-out.
- Environmental Consultants for dust control planning, permit process, water discharge monitoring plans and Surface Water Encounters (Permitting, surveys and monitoring).
- Environmental Monitors include biological monitoring only.
- Abatement Support is based upon SME recommendations (Asbestos & Lead).
- Water transportation, treatment, disposal, and water Sampling is assumed at each test break.
- Cleaning of Lake Tanks Hazardous and Non-hazardous Waste Containment, Transportation, and Disposal Contaminated Soil Allowance.
- Environmental discharge permits, dust control plan, and ITP.
- California Department of Fish and Wildlife (CDFW) Compensatory Mitigation.
- The National Environmental Policy Act of 1969 (NEPA)/ (California Environmental Quality Act (CEQA) Report.
- Permit fees (included are the anticipated cost for all local, state and federal permits).
- Mitigation fees.
- Site Management / Best Management Practices (BMP's)
  - 70 crew hours have been included for installation of BMP's.

Based on the project scope, the following assumptions were considered:

- Multiple pipeline spans cross potentially jurisdictional boundaries that will require surveys and permits to identify and mitigate the potential impacts to jurisdictional waters. Permits from U.S. Army Corps of Engineers (USACE), California Department of Fish and Wildlife (CDFW), and the Santa Ana Regional Water Quality Control Board (RWQCB) are anticipated for the work required to support the pipeline spans during the hydrotests.

- SoCalGas will seek coverage under existing programmatic permits for work areas within the California Desert Conservation Area (CDCA).

- Some work areas are located within federal lands and will require temporary use permits from the Bureau of Land Management (BLM). At minimum, U.S. General Services Administration Form 299, Application for Transportation and Utility Systems and Facilities on Federal Lands, should be completed and submitted. This potential need for a temporary use permit from BLM could trigger an expanded environmental review under the National Environmental Policy Act of 1969 (NEPA) and Section 106 of the National Historic Preservation Act (NHPA), since portions of the project are located on federal land.

- A Class III intensive field survey consistent with the standards in the Secretary of the Interior's Standards and Guidelines for Archeology and Historic Preservation will be performed. It is assumed that any cultural resources identified can be avoided.

- Costs assume six full time monitors for the duration of construction.

- Protocol and/or focused surveys for species covered by SoCalGas' CDCA will also be performed per the permit requirements:
  - Coachella Valley Milk Vetch
  - Coachella Valley Fringe Toed Lizard
  - Desert Tortoise
  - Burrowing Owl

- South Coast Air Quality Management District (SCAQMD) linear dust control plan will be required for the project and a site-specific dust control plan for the Cathedral City yard will also be required.

- Environmental monitors and/or biologists will complete a pre-construction biological survey of all work areas and staging locations should be performed within seven days prior to the construction start date. If special-status species are observed in the work area, a qualified biologist will determine whether species removal, exclusion fencing, establishment of a work exclusion zone or work stoppage is required. If occurrences of unexpected endangered species are encountered, coordination with the appropriate wildlife agencies may be required to determine the best avoidance buffers, minimization, and compliance measures for detected special-status species.

- A potable water source may not be available adjacent to hydrotest breaks so water may need to be trucked to tanks at staging areas. Permitting may be required for discharges of hydrostatic test water, as well as

groundwater, if encountered. Alternatively, water can be shipped to a disposal facility. It is assumed that hydrostatic test water will be pumped into tanks or vacuum trucks, tested, treated (if necessary), then discharged as allowed under an existing permit (e.g., programmatic permits to discharge to land or surface waters) or hauled off for disposal at a SoCalGas-approved and permitted disposal facility.

Land & Right-of-Way Acquisition					
PROJECT COST	**Prior to 2018**	**2018**	**2019**	**2020**	**Total**
DIRECT LABOR	$0	$0	$0	$0	$0
DIRECT NON-LABOR	$42,181	$0	$126,544	$0	$168,725
TOTAL DIRECT COSTS	$42,181	$0	$126,544	$0	$168,725

Assumptions

This estimate has assumed that Temporary Right of Entry (TRE's) will be acquired for all 24 test breaks indicated in the project drawings and based upon schedule durations. Laydown yards will be acquired at the site along Indian Canyon Drive, Date Palm Drive, Washington Street, and Dillon Road as depicted in Land Exhibit documents. All necessary anticipated labor effort costs to perform these services has been included.

Company Labor					
PROJECT COST	**Prior to 2018**	**2018**	**2019**	**2020**	**Total**
DIRECT LABOR	$394,296	$0	$583,937	$852,437	$1,830,670
DIRECT NON-LABOR	$0	$0	$0	$0	$0
TOTAL DIRECT COSTS	$394,296	$0	$583,937	$852,437	$1,830,670

Assumptions

SoCalGas Labor - Management, Engineering, and Non-Union Labor

SoCalGas Non-Union Labor is estimated based upon activity level of effort and is divided into the following categories:

- Project Management
- Project Field Management
- Environmental Services
- Construction Management

SoCalGas Labor - Union Labor

SoCalGas Union Labor costs were developed with the guidance of SoCalGas Construction Management and whose costs are duration dependent and activity specific.

Pipeline Safety Enhancement Plan Workpaper Supporting Chapter II

LINE 2000 C HYDROTEST PROJECT

Other Costs					
PROJECT COST	**Prior to 2018**	**2018**	**2019**	**2020**	**Total**
DIRECT LABOR	$0	$0	$0	$0	$0
DIRECT NON-LABOR	$1,507,451	$0	$1,224,932	$1,994,112	$4,726,495
TOTAL DIRECT COSTS	$1,507,451	$0	$1,224,932	$1,994,112	$4,726,495

Assumptions

Other costs assume use of contracted Project Management, Engineering, Survey and Design service.

GMA Costs					
PROJECT COST	**Prior to 2018**	**2018**	**2019**	**2020**	**Total**
DIRECT LABOR	$68,955	$0	$87,343	$119,521	$275,818
DIRECT NON-LABOR	$557,906	$0	$706,680	$967,036	$2,231,622
TOTAL DIRECT COSTS	$626,860	$0	$794,023	$1,086,558	$2,507,441

Assumptions

GMA costs are costs that support overall PSEP execution.

Indirect Costs					
PROJECT COST	**Prior to 2018**	**2018**	**2019**	**2020**	**Total**
COMPANY OVERHEADS	$383,374	$0	$1,282,406	$1,825,488	$3,491,268
TOTAL INDIRECTS	$383,374	$0	$1,282,406	$1,825,488	$3,491,268

Assumptions

Indirect costs do not include AFUDC or Property Tax.

Pipeline Safety Enhancement Plan Workpaper Supporting Chapter II

LINE 2000-D HYDROTEST PROJECT

PROJECT COST – O&M	Prior to 2018*	2018	2019	2020	Total
DIRECT LABOR	$235,651	$37,824	$745,072	$113,473	$1,132,020
DIRECT NON-LABOR	$2,913,731	$656,928	$21,795,944	$794,499	$26,161,103
TOTAL DIRECT COSTS	$3,149,382	$694,752	$22,541,016	$907,972	$27,293,123
TOTAL INDIRECT COSTS	$199,854	$60,116	$1,924,340	$160,438	$2,344,747
TOTAL O&M	$3,349,236	$754,868	$24,465,356	$1,068,410	$29,637,870

* Actual costs incurred associated with planning and engineering design work are included in the project cost estimates.

PROJECT COST – CAPITAL	Prior to 2018*	2018	2019	2020	Total
DIRECT LABOR	$46,877	$7,524	$148,215	$22,572	$225,188
DIRECT NON-LABOR	$579,618	$130,681	$4,335,786	$158,047	$5,204,132
TOTAL DIRECT COSTS	$626,495	$138,205	$4,484,001	$180,619	$5,429,320
TOTAL INDIRECT COSTS	$51,198	$16,152	$548,135	$39,051	$654,536
TOTAL CAPITAL	$677,693	$154,357	$5,032,136	$219,670	$6,083,856

* Actual costs incurred associated with planning and engineering design work are included in the project cost estimates.

TOTAL PROJECT COST	Prior to 2018*	2018	2019	2020	Total
DIRECT LABOR	$282,528	$45,348	$893,287	$136,045	$1,357,208
DIRECT NON-LABOR	$3,493,349	$787,609	$26,131,730	$952,546	$31,365,235
TOTAL DIRECT COSTS	$3,775,877	$832,957	$27,025,017	$1,088,591	$32,722,443
TOTAL INDIRECT COSTS	$251,052	$76,268	$2,472,475	$199,489	$2,999,283
TOTAL**	$ 4,026,929	$ 909,225	$ 29,497,492	$ 1,288,080	$ 35,721,726

* Actual costs incurred associated with planning and engineering design work are included in the project cost estimates.
** Individual component tables display total direct costs (Capital and O&M).

Project Description

Line 2000 is a [redacted] diameter high pressure natural gas pipeline that runs from Blythe to Los Angeles, CA. Line 2000 was originally filed as one project consisting of 117.6 miles of Hydrotest. To execute the project efficiently, L-2000 was divided into the following projects: L-2000-A, Line 2000-Bridge, L-2000-C, L-2000-Chino Hills, L-2000-D, L-2000-E, L-2000-East of Cactus City, and L-2000-West.

Line 2000-D will hydrostatically test 14.038 miles of [redacted] Pipe that was installed in 1947. The physical scope contains 15 planned individual hydrostatic test covering 14.036 of Phase 2 mileage and 0.002 miles of incidental mileage as defined and identified by SoCalGas. Each individual test section varies in length due to restrictions in elevation changes and environmental impact mitigation. The lowest and highest elevations are 1,050 feet and 2,640 feet,

respectively. The access to the pipeline is very limited in this section based upon the terrain. The project begins at White Water Pressure Limiting Station (MLV 12) running west to Moreno Station (MLV 15) involving approximately 20 work excavations. For elevation details refer to the elevation map.

There are currently 10 active taps between the isolation points for this project.

This project also includes the following capital work: a) 200 feet replacement of [redacted] pipe and laterals to Line 2051 and L-2001-W at Whitewater Station; b) 250 feet replacement of [redacted] pipe and Two [redacted] valves at Moreno Station; c) replacement of 4 wrinkle bends; d) replacement of 5 taps; e) replacement of 20 short section of pipe totaling 980 feet to facilitate the hydrotesting procedure.

Alternatives Considered

Abandonment is not an option because this is a backbone line that is critical for the Transmission system operational needs.

Forecast Methodology

SoCalGas developed a Total Installed Cost (TIC) estimate to implement the above scope of work. The TIC estimate includes costs associated with project management, engineering and design, environmental permitting, land acquisition, material and equipment procurement, and construction.

Estimates includes consideration of the following categories of costs: site mobilization, site facilities, site management, materials, site activities, scope of work, pressure testing, tie-ins, abandonment of existing pipeline activities, site restoration, and field overheads and support.

Schedule

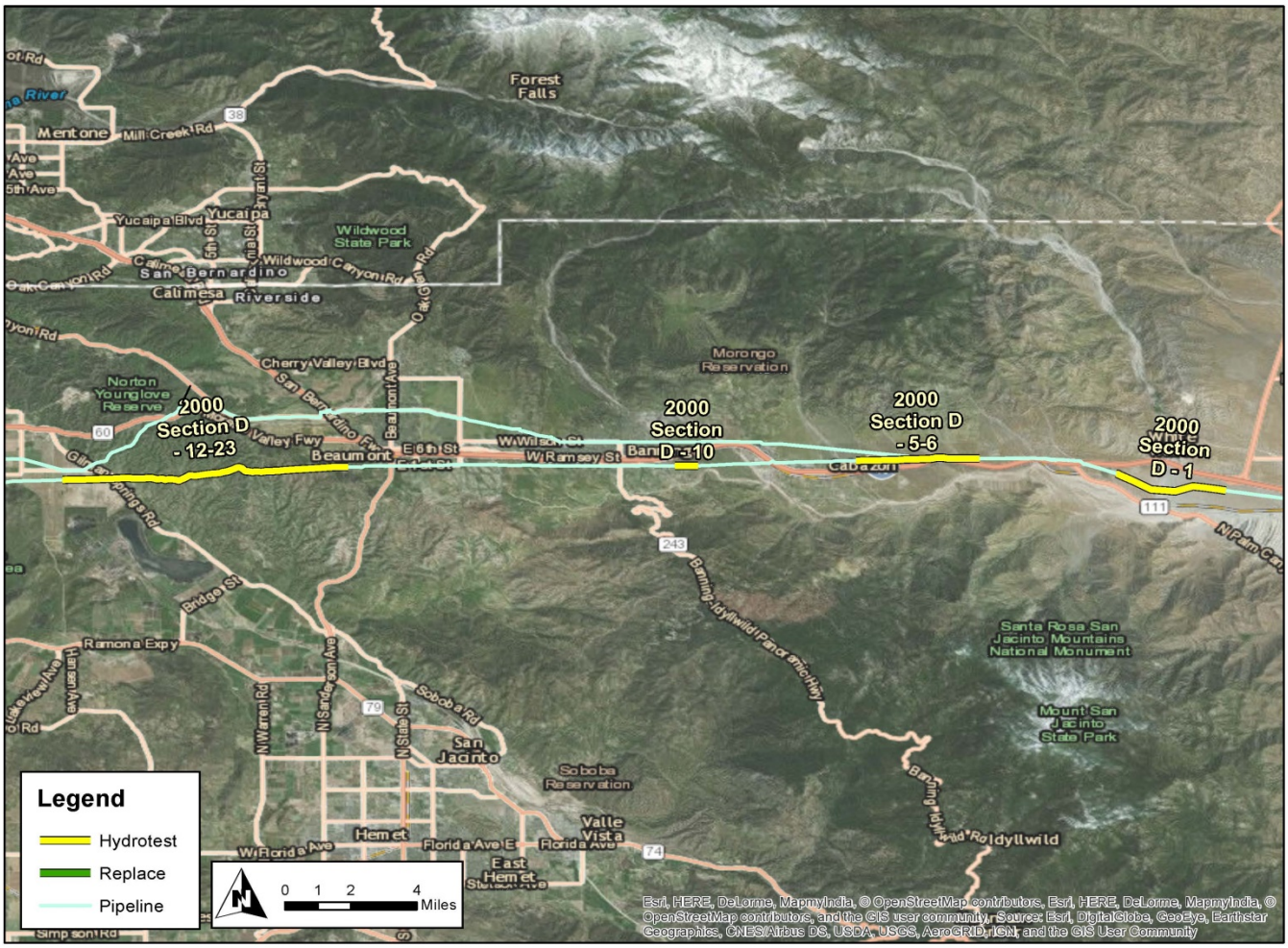
The schedule was developed based on the seven stage project life cycle as defined by PSEP. The key project deliverables were identified to create a work breakdown structure. This work breakdown structure was then sequenced and predecessor and successor tasks were linked to each task. Finally, durations were added to each task to provide a total project duration.

The Stage 5 Construction Schedule received additional planning and stakeholder input to develop considering that typically 50% of the project costs are expended during the construction phase. Construction schedule is assumed to be 134 working days.

Pipeline Safety Enhancement Plan Workpaper Supporting Chapter II

LINE 2000-D HYDROTEST PROJECT

Project Map for Line 2000 D Desert Hydrotest



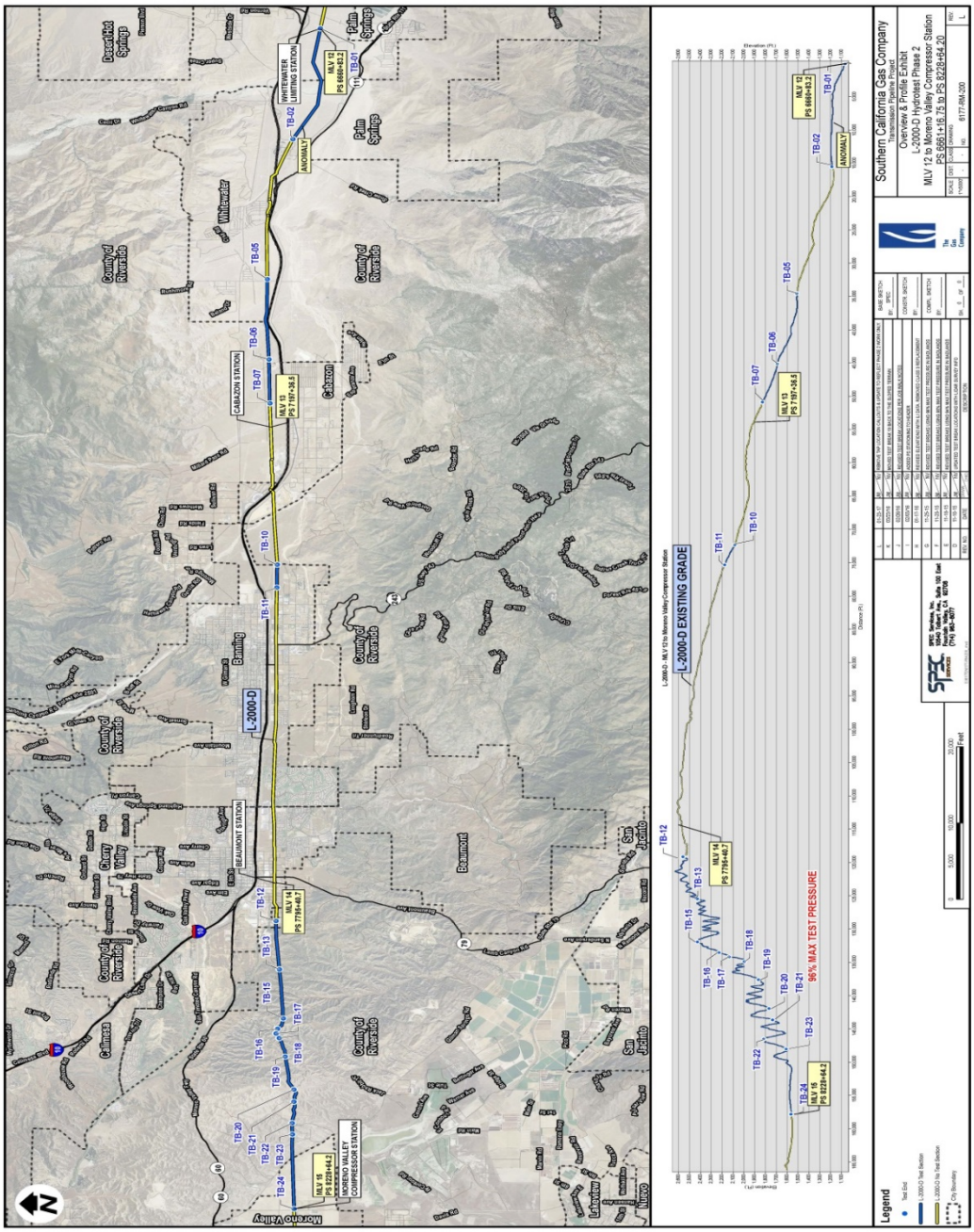
PROJECT MILEAGE TABLE

PHASE	MILEAGE
PHASE 1B	0.0
ACCELERATED - PHASE 2A	13.684
ACCELERATED - PHASE 2B	0.352
INCIDENTAL	0.002
TOTAL MILEAGE	14.038

Pipeline Safety Enhancement Plan Workpaper Supporting Chapter II

LINE 2000-D HYDROTEST PROJECT

Elevation Map for Line 2000 D Desert Hydrotest



The direct costs for each area are summarized below.

Materials					
PROJECT COST	**Prior to 2018**	**2018**	**2019**	**2020**	**Total**
DIRECT LABOR	$0	$0	$0	$0	$0
DIRECT NON-LABOR	$357,201	$148,347	$593,388	$0	$1,098,937
TOTAL DIRECT COSTS	$357,201	$148,347	$593,388	$0	$1,098,937

Assumptions

Materials for this project will not be purchased until final internal authorization has been granted to purchase long lead time material. This will allow for material to be procured, inspected and delivered to coincide with the anticipated construction start date.

Construction					
PROJECT COST	**Prior to 2018**	**2018**	**2019**	**2020**	**Total**
DIRECT LABOR	$0	$0	$0	$0	$0
DIRECT NON-LABOR	$3,598	$0	$14,116,474	$0	$14,120,072
TOTAL DIRECT COSTS	$3,598	$0	$14,116,474	$0	$14,120,072

General Assumptions

In the development of the construction estimate, the following assumptions and clarifications have been made:

- Pricing is based on current construction costs in Riverside County, California.
- Construction schedule is assumed to be 134 working days.
- One mobilization and one demobilization.
- Contractor work has been scheduled using a 10-hour per day, five-day work week calendar.
- One shift per day.
- Work will be scheduled Monday through Friday.
- Laydown Yards will be established at the Moreno Valley Yard with additional yards at Rushmore Ave., Hathaway St., Highland Springs Ave., Alessandro Blvd., and Gilman Springs Rd.
- Lake tanks will be installed at the Rushmore Ave. Lake Tank Laydown Yard #1 and at Virginia Rd. at or near Test Break 5.
- Material will be received at the Moreno Valley Yard. Sixteen loads of material are expected to be received.
- Mechanical excavation will only be authorized to within two feet of the existing pipe. Remaining excavation will be hand dug.
- All excavations will be backfilled with zero sack slurry to one foot above pipeline. Remainder of backfill will be performed using native soil.
- Existing taps will be excavated and isolated prior to L-2000-D isolation/shut-in.

- 11 days have been included to mitigate debris fields.
- Test heads have already been fabricated and pre-tested.
- Hydrostatic testing will begin from west end (Test Break 24 / Group 1) and work their way east. Once all groups have been tested and test breaks have been replaced, the line will be returned to service.
- A hot tie-in will be performed at both Moreno Valley and Whitewater Station.
- Tie-in has been assumed for a 24-hour duration.
- Mainline isolation has been assumed for a 24-hour duration.
- Line taps will be fabricated and then reconnected after line is brought back into service.
- Hydrotest water will be procured by construction contractor.
- Following the successful completion of all test groups, Best Management Practices (BMP's) will be removed and laydown yards will all be returned to original condition, including hydroseeding where applicable.
- Hydrotest water will be dispersed onsite by contractor water truck.s
- 100% per-diem for field labor and project management teams Site Mobilization / Site Facilities.

Additional Construction Information

- Site Mobilization / Site Facilities
  - Office Trailers will be placed at Moreno Valley Yard near Test Break #23 (two trailers with 100kV generator) and Rushmore Ave. Laydown yard near Test Break #5 (one trailer with 45 kV generator).
  - Site facility costs cover a 6-month duration.
  - 3,234 tons of crushed rock have been included for the laydown yards.
  - 1,200 linear feet (LF) of temporary fill piping will be installed from Tank to Test Head. 800 LF from fire hydrant to Lank Tank at Test Break #23 and 450 LF from fire hydrant to Lake Tank at Test Break 5.
  - 10,880 LF of Temporary Fencing to be installed for identified laydown yards.
  - 2,000 LF of Temporary Fencing to secure open cut excavation from public.

- SoCalGas / Company Furnished Material Handling
  - 16 loads of SoCalGas furnished material will be unloaded by the contractor at the Moreno Valley Laydown Yard.

- Traffic Control
  - Traffic control is not required.

- Utility Locates
  - Two days have been included for identifying SoCalGas utilities.

- Pressure Test Pipeline
  - A total of 19 test breaks will be excavated for the installation of test heads / isolation caps.
  - An additional excavation will be performed for the replacement of a section of pipe found to contain an anomaly.
  - 15 individual tests will be performed.
  - Test sections will be filled in groups of two.

- 37 Baker tanks and 2 Lake Tanks for water management.

- Tie-In Pipeline
  - Test breaks will have replacement piping tied in cold.
  - A hot tie-in will be performed at Moreno Valley / Test Break 1 and Whitewater / Test Break 24.

- Paving
  - AC Paving will be restored at impacted tap isolation site.

- Site Restoration
  - Replace 100 ton of station rock at Whitewater Station.
  - 250 Linear Feet (LF) of chain link fencing will be repaired / restored.
  - Remove timbers for pipe supports.
  - Remove 13,210 LF of temporary fencing.
  - Laydown yards and any impacted work areas will be restored to their original condition.

- Site Demobilization
  - All site facilities will be demobilized.
  - 5 loads of excess piping will be hauled to SoCalGas designated yard.
  - Crew and Equipment will be demobilized.

- Field Overhead
  - One Project Manager, one Superintendent, one Cost Controller, and two Safety Personnel have been included for full project duration.
  - Two water trucks and drivers are included for full project duration for dust suppression.
  - Three site security personnel have been employed for all non-working hours.
  - 100% per diem for field personnel and project management team for full project duration.

Environmental Survey/Permitting/Monitoring					
PROJECT COST	**Prior to 2018**	**2018**	**2019**	**2020**	**Total**
DIRECT LABOR	$0	$0	$0	$0	$0
DIRECT NON-LABOR	$665,593	$328,677	$4,601,471	$0	$5,595,741
TOTAL DIRECT COSTS	$665,593	$328,677	$4,601,471	$0	$5,595,741

Assumptions

In generating the total estimated cost for L-2000-D the following items were considered:

- Environmental Services (Permitting, surveys and monitoring)
- Abatement (Asbestos & Lead)
- Hazardous and Non-hazardous Waste Containment, Transportation and Disposal
- Water transportation, treatment and disposal

- Permit fees
- Mitigation fees

Based on the project scope, the following assumptions were considered:

- Multiple pipeline spans cross potentially jurisdictional boundaries that will require surveys and permits to identify and mitigate the potential impacts to jurisdictional waters. Permits from U.S. Army Corps of Engineers (USACE), California Department of Fish and Wildlife (CDFW), and the Santa Ana Regional Water Quality Control Board (RWQCB) are anticipated for the work required to support the pipeline spans during the hydrotests.

- SoCalGas will seek coverage under existing programmatic permits for work areas within the California Desert Conservation Area (CDCA).

- Work areas west of Banning have the potential for Stephens Kangaroo Rat, a state and federally listed species. It is assumed that an Incidental Take Permit (ITP) will be acquired from the California Department of Fish and Wildlife (CDFW) and a Biological Opinion (BO) will be acquired from the United States Fish and Wildlife Service (USFWS) for potential impacts to the species. The cost estimate includes protocol surveys at all work sites west of Banning and pitfall trapping for 25 acres of work space as well as the preparation of documents and technical studies required to support the California Environmental Quality Act (CEQA) and National Environmental Policy Act (NEPA) processes triggered by these discretionary permits.

- Some work areas are located within federal lands and will require temporary use permits from the Bureau of Land Management (BLM). At minimum, U.S. General Services Administration Form 299, Application for Transportation and Utility Systems and Facilities on Federal Lands, should be completed and submitted. This potential need for a temporary use permit from BLM could trigger an expanded environmental review under the National Environmental Policy Act of 1969 and Section 106 of the National Historic Preservation Act (NHPA), since portions of the project are located on federal land.

- Portions of the project lie within Native American tribal land including Agua Caliente Off-Reservation Trust Land and the Morongo Reservation. Coordination with tribes will be required. Native American monitoring is anticipated at these locations. It is assumed that these locations will have one biological monitor and one Native American monitor for work at these areas. If the land disturbance on tribal land is greater than one acre, an Environmental Protection Agency (EPA) approved Stormwater Pollution Prevention Plan will be required.

- A Class 3 field survey consistent with the standards in the Secretary of the Interior's Standards and Guidelines for Archeology and Historic Preservation will be performed. It is assumed that any cultural resources identified can be avoided.

- Costs assume six full time monitors for the duration of construction.

- Protocol and/or focused surveys for species covered by SoCalGas's CDCA will also be performed per the permit requirements:

- Coachella Valley Milk Vetch
- Coachella Valley Fringe Toed Lizard
- Desert Tortoise
- Stephen's kangaroo rat
- Burrowing Owl
- Coastal California Gnatcatcher

- South Coast Air Quality Management District (SCAQMD) linear dust control plan will be required for eastern portions of the project.

- Several oak trees are likely to occur adjacent to or in separate work areas. It is assumed that oak trees can be avoided and oak tree mitigation is not anticipated.

- Environmental monitors and/or biologists will complete a pre-construction biological survey of all work areas and staging locations should be performed within seven days prior to the construction start date. If special-status species are observed in the work area, a qualified biologist will determine whether species removal, exclusion fencing, establishment of a work exclusion zone or work stoppage is required. If occurrences of unexpected endangered species are encountered, coordination with the appropriate wildlife agencies may be required to determine the best avoidance buffers, minimization, and compliance measures for detected special-status species.

- A potable water source may not be available adjacent to hydrotest breaks so water may need to be trucked to tanks at staging areas. Permitting may be required for discharges of hydrostatic test water, as well as groundwater, if encountered. Alternatively, water can be shipped to a disposal facility. It is assumed that hydrostatic test water will be pumped into tanks or vacuum trucks, tested, treated (if necessary), then discharged as allowed under an existing permit (e.g., programmatic permits to discharge to land or surface waters) or hauled off for disposal at a SoCalGas-approved and permitted disposal facility.

Land & Right-of-Way Acquisition					
PROJECT COST	**Prior to 2018**	**2018**	**2019**	**2020**	**Total**
DIRECT LABOR	$0	$0	$0	$0	$0
DIRECT NON-LABOR	$71,051	$42,631	$170,522	$0	$284,204
TOTAL DIRECT COSTS	$71,051	$42,631	$170,522	$0	$284,204

Assumptions

This estimate has assumed that Temporary Right of Entry (TRE's) will be acquired for all test breaks indicated in the project drawings and based upon schedule durations.

Additionally, laydown yards and work areas will be acquired as indicated in the provided land exhibits.
All necessary anticipated labor effort costs to acquire these services have been included.

Pipeline Safety Enhancement Plan Workpaper Supporting Chapter II

LINE 2000-D HYDROTEST PROJECT

Company Labor					
PROJECT COST	**Prior to 2018**	**2018**	**2019**	**2020**	**Total**
DIRECT LABOR	$203,436	$29,530	$719,284	$88,590	$1,040,840
DIRECT NON-LABOR	$0	$0	$0	$0	$0
TOTAL DIRECT COSTS	$203,436	$29,530	$719,284	$88,590	$1,040,840

Assumptions

SoCalGas Labor - Management, Engineering, and Non-Union Labor

SoCalGas Non-Union Labor is estimated based upon activity level of effort and is divided into the following categories:

- Project Management
- Project Field Management
- Environmental Services
- Construction Management

SoCalGas Labor - Union Labor

SoCalGas Union Labor costs were developed with the guidance of SoCalGas Construction Management and whose costs are duration dependent and activity specific.

Other Costs					
PROJECT COST	**Prior to 2018**	**2018**	**2019**	**2020**	**Total**
DIRECT LABOR	$0	$0	$0	$0	$0
DIRECT NON-LABOR	$1,755,980	$139,968	$5,242,035	$568,590	$7,706,573
TOTAL DIRECT COSTS	$1,755,980	$139,968	$5,242,035	$568,590	$7,706,573

Assumptions

Other costs assume use of contracted Project Management, Engineering, Survey and Design service.

GMA Costs					
PROJECT COST	**Prior to 2018**	**2018**	**2019**	**2020**	**Total**
DIRECT LABOR	$79,092	$15,818	$174,003	$47,455	$316,368
DIRECT NON-LABOR	$639,927	$127,985	$1,407,839	$383,956	$2,559,707
TOTAL DIRECT COSTS	$719,019	$143,804	$1,581,842	$431,411	$2,876,076

Pipeline Safety Enhancement Plan Workpaper Supporting Chapter II

LINE 2000-D HYDROTEST PROJECT

Assumptions

GMA costs are costs that support overall PSEP execution.

Indirect Cost					
PROJECT COST	**Prior to 2018**	**2018**	**2019**	**2020**	**Total**
COMPANY OVERHEADS	$251,052	$76,268	$2,472,475	$199,489	$2,999,283
TOTAL INDIRECTS	$251,052	$76,268	$2,472,475	$199,489	$2,999,283

Assumptions

Indirect costs do not include AFUDC or Property Tax.

WP-1-1 – WP-4-7-6

Workpapers Supporting the Testimony of

Karen Chan, Chapter IV

WORKPAPER TITLE
Overhead Factor Application
WITNESS
Karen C. Chan

		Capital Non-Union Labor	Capital Union Labor	Capital Non-Labor	O&M Non-Union Labor	O&M Union Labor	O&M Non-Labor
Overhead Category	**Dec 2016 Planning Rate**						
Vacation & Sick	[redacted]	x	x		x	x	
Payroll Tax	[redacted]	x	x		x	x	
Benefits (non-balanced)	[redacted]	x	x		x	x	
Workers' Compensation	[redacted]	x	x		x	x	
Public Liability/Property Damage	[redacted]	x	x		x	x	
ICP - management only	[redacted]	x			x		
Purchased Services and Materials	[redacted]			x			x
Administrative & General - Capital	[redacted]	x	x	x			
Factor %		[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

WORKPAPER TITLE
Annual Escalation Rates and Factors
WITNESS
Karen C. Chan

		% Change					
		2017	2018	2019	2020	2021	2022
Cost Category							
Gas Distribution - Capital	Gas Distribution Plant	2.48%	2.68%	2.51%	2.44%	2.52%	2.54%
Gas Transmission - Capital	Gas Transmission Plant	2.41%	2.71%	2.89%	3.10%	2.95%	2.73%
O&M (Labor)	Gas Utility O&M Labor	2.15%	2.34%	3.14%	3.10%	2.90%	2.80%
O&M (Non-Labor)	Gas Utility O&M Non-Labor	1.97%	1.93%	2.19%	2.28%	2.26%	2.21%

		Escalation Factor (2017 Base)					
		2017	2018	2019	2020	2021	2022
Cost Category							
Gas Distribution - Capital	Gas Distribution Plant	1.0000	1.0248	1.0523	1.0788	1.1051	1.1330
Gas Transmission - Capital	Gas Transmission Plant	1.0000	1.0241	1.0518	1.0822	1.1157	1.1487
O&M (Labor)	Gas Utility O&M Labor	1.0000	1.0215	1.0454	1.0783	1.1117	1.1439
O&M (Non-Labor)	Gas Utility O&M Non-Labor	1.0000	1.0197	1.0394	1.0621	1.0863	1.1108

Factors shown above are from escalation indices published in the IHS Global Insight 3rd Quarter 2016 Utility Cost Forecast.

WORKPAPER TITLE
Fully Loaded and Escalated Costs
WITNESS
Karen C. Chan

($ millions)

	Total	2015	2016	2017	2018	2019	2020	2021	2022
FERC 376 Distribution Mains									
Capital - Non-Labor	151.6	0.9	5.5	4.6	4.2	57.4	50.6	22.9	5.4
Capital - Labor	18.2	0.1	0.3	3.6	0.6	5.8	3.8	2.6	1.3
Capital - Property Tax	1.3	0.0	0.0	0.1	0.2	0.4	0.3	0.3	0.0
Capital - AFUDC	11.1	0.0	0.2	1.2	1.4	3.2	2.6	2.0	0.4
Subtotal FERC 376	182.2	0.9	6.1	9.6	6.4	66.9	57.3	27.9	7.1
FERC 367 Transmission Mains									
Capital - Backbone Non-Labor	10.0	-	-	1.2	0.2	6.3	2.2	-	-
Capital - Backbone Labor	1.5	-	-	0.3	0.0	0.6	0.5	-	-
Capital - Local Non-Labor	2.2	-	0.1	0.2	0.1	1.2	0.5	-	-
Capital - Local Labor	0.7	-	0.0	0.2	0.0	0.2	0.3	-	-
Capital - Property Tax	0.1	-	0.0	0.0	0.0	0.0	0.0	-	-
Capital - AFUDC	0.9	-	0.0	0.2	0.2	0.4	0.1	-	-
Subtotal FERC 367	15.3	-	0.1	2.1	0.6	8.8	3.6	-	-
Total Capital	**197.5**	**0.9**	**6.2**	**11.7**	**7.0**	**75.7**	**60.9**	**27.9**	**7.1**
O&M									
O&M - Non-Labor	51.7	-	-	5.4	0.7	32.8	12.8	-	-
O&M - Labor	5.3	-	-	1.1	0.1	2.4	1.8	-	-
Total O&M	**57.0**	**-**	**-**	**6.5**	**0.8**	**35.2**	**14.5**	**-**	**-**
Total Capital and O&M	**254.5**	**0.9**	**6.2**	**18.3**	**7.8**	**110.9**	**75.4**	**27.9**	**7.1**

*Numbers may not add due to rounding.

WORKPAPER TITLE
Revenue Requirement Summary ($ in Millions of Dollars)

WITNESS
Karen C. Chan

	Total	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027-2090
Revenue Requirement - Total	531.0	-	-	6.8	0.8	38.4	28.2	22.4	26.9	27.4	26.6	25.8	25.0	302.8
FF&U:	9.1	-	-	0.1	0.0	0.7	0.5	0.4	0.5	0.5	0.5	0.4	0.4	5.2
O&M:	57.0	-	-	6.5	0.8	35.2	14.5	-	-	-	-	-	-	-
Working Capital:	0.9	-	-	0.1	0.0	0.5	0.3	(0.0)	0.0	(0.0)	0.0	(0.0)	0.0	(0.0)
Depreciation:	352.4	-	-	-	-	0.4	2.5	4.1	5.0	5.2	5.2	5.2	5.2	319.5
Return on Common:	79.5	-	-	-	-	0.8	4.5	7.6	9.0	8.9	8.5	8.2	7.8	24.3
Return on Preferred:	2.2	-	-	-	-	0.0	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.7
Return On Debt:	39.8	-	-	-	-	0.4	2.2	3.8	4.5	4.5	4.3	4.1	3.9	12.2
Federal Taxes:	(34.2)	-	-	-	-	0.4	2.8	4.5	5.1	5.0	4.8	4.6	4.4	(66.0)
State Taxes:	5.2	-	-	-	-	(0.0)	0.5	0.8	0.9	0.9	0.9	0.9	0.9	(0.7)
Property Taxes:	19.0	-	-	-	-	-	0.4	1.0	1.6	2.1	2.1	2.1	2.0	7.7

	Total	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027-2090
Revenue Requirement - Distribution	431.1	-	-	-	-	2.0	11.3	20.3	24.9	25.4	24.7	23.9	23.2	275.5
FF&U:	7.4	-	-	-	-	0.0	0.2	0.3	0.4	0.4	0.4	0.4	0.4	4.7
O&M:	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Working Capital:	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Depreciation:	327.9	-	-	-	-	0.4	2.1	3.8	4.7	4.8	4.8	4.8	4.8	297.6
Return on Common:	71.0	-	-	-	-	0.7	3.8	6.8	8.3	8.3	7.9	7.6	7.3	20.3
Return on Preferred:	1.9	-	-	-	-	0.0	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.6
Return On Debt:	35.6	-	-	-	-	0.4	1.9	3.4	4.2	4.1	4.0	3.8	3.6	10.1
Federal Taxes:	(33.9)	-	-	-	-	0.4	2.4	4.1	4.7	4.7	4.5	4.3	4.1	(63.1)
State Taxes:	4.4	-	-	-	-	(0.0)	0.4	0.8	0.9	0.9	0.9	0.9	0.9	(1.3)
Property Taxes:	16.9	-	-	-	-	-	0.4	0.9	1.4	1.9	2.0	1.9	1.8	6.6

	Total	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027-2084
Revenue Requirement - Backbone Transı	85.6	-	-	6.1	0.7	32.8	15.0	1.6	1.6	1.6	1.5	1.5	1.4	21.7
FF&U:	1.5	-	-	0.1	0.0	0.6	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.4
O&M:	51.3	-	-	5.9	0.7	31.7	13.1	-	-	-	-	-	-	-
Working Capital:	0.8	-	-	0.1	0.0	0.5	0.2	(0.0)	0.0	(0.0)	0.0	(0.0)	0.0	(0.0)
Depreciation:	19.5	-	-	-	-	0.0	0.3	0.3	0.3	0.3	0.3	0.3	0.3	17.4
Return on Common:	6.8	-	-	-	-	0.0	0.5	0.6	0.5	0.5	0.5	0.5	0.5	3.2
Return on Preferred:	0.2	-	-	-	-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Return On Debt:	3.4	-	-	-	-	0.0	0.3	0.3	0.3	0.3	0.2	0.2	0.2	1.6
Federal Taxes:	(0.2)	-	-	-	-	0.0	0.3	0.3	0.3	0.3	0.3	0.3	0.3	(2.3)
State Taxes:	0.7	-	-	-	-	(0.0)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5
Property Taxes:	1.6	-	-	-	-	-	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.9

	Total	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027-2084
Revenue Requirement - Local Transmissi	14.3	-	-	0.7	0.1	3.6	1.9	0.4	0.4	0.4	0.4	0.4	0.4	5.6
FF&U:	0.2	-	-	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
O&M:	5.7	-	-	0.7	0.1	3.5	1.5	-	-	-	-	-	-	-
Working Capital:	0.1	-	-	0.0	0.0	0.1	0.0	(0.0)	0.0	(0.0)	0.0	(0.0)	0.0	(0.0)
Depreciation:	5.0	-	-	-	-	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	4.5
Return on Common:	1.8	-	-	-	-	0.0	0.1	0.2	0.1	0.1	0.1	0.1	0.1	0.8
Return on Preferred:	0.0	-	-	-	-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Return On Debt:	0.9	-	-	-	-	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.4
Federal Taxes:	(0.1)	-	-	-	-	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	(0.6)
State Taxes:	0.2	-	-	-	-	(0.0)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Property Taxes:	0.4	-	-	-	-	-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2

WORKPAPER TITLE
FF&U Summary ($ in Millions of Dollars)

WITNESS
Karen C. Chan

	Total	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027-2090
O&M	57.0	-	-	6.5	0.8	35.2	14.5	-	-	-	-	-	-	-
Working Capital	0.9	-	-	0.1	0.0	0.5	0.3	(0.0)	0.0	(0.0)	0.0	(0.0)	0.0	(0.0)
Depreciation	352.4	-	-	-	-	0.4	2.5	4.1	5.0	5.2	5.2	5.2	5.2	319.5
Return on Common	79.5	-	-	-	-	0.8	4.5	7.6	9.0	8.9	8.5	8.2	7.8	24.3
Return on Preferred	2.2	-	-	-	-	0.0	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.7
Return On Debt	39.8	-	-	-	-	0.4	2.2	3.8	4.5	4.5	4.3	4.1	3.9	12.2
Federal Taxes	(34.2)	-	-	-	-	0.4	2.8	4.5	5.1	5.0	4.8	4.6	4.4	(66.0)
State Taxes	5.2	-	-	-	-	(0.0)	0.5	0.8	0.9	0.9	0.9	0.9	0.9	(0.7)
Property Taxes	19.0	-	-	-	-	-	0.4	1.0	1.6	2.1	2.1	2.1	2.0	7.7
Sum	522.0	-	-	6.6	0.8	37.7	27.7	22.0	26.5	26.9	26.2	25.3	24.5	297.6
FF&U Rate		-	-	1.74%	1.74%	1.74%	1.74%	1.74%	1.74%	1.74%	1.74%	1.74%	1.74%	1.74%
FF&U	9.1	-	-	0.1	0.0	0.7	0.5	0.4	0.5	0.5	0.5	0.4	0.4	5.2

WORKPAPER TITLE
O&M and Working Capital ($ in Millions of Dollars)

WITNESS
Karen C. Chan

	Total	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027-2090
O&M All In	57.0	-	-	6.5	0.8	35.2	14.5	-	-	-	-	-	-	-

Working Capital	**Total**	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027-2090
O&M	57.0	-	-	6.5	0.8	35.2	14.5	-	-	-	-	-	-	-
Average Monthly O&M		-	-	6.5	0.8	35.2	14.5	-	-	-	-	-	-	
WC Requirement	85.6	-	-	9.8	1.1	52.8	21.8	-	-	-	-	-	-	-
Average WC Reqiurement		-	-	7.4	1.1	48.2	26.5	-	-	-	-	-	-	-
Return on Debt for WC	0.2	-	-	0.0	0.0	0.1	0.1	-	-	-	-	-	-	-
Return on Preferred for WC	0.0	-	-	0.0	0.0	0.0	0.0	-	-	-	-	-	-	-
Return on Common WC	0.4	-	-	0.0	0.0	0.2	0.1	-	-	-	-	-	-	-
Book Income Pre-tax		-	-	0.1	0.0	0.5	0.2	(0.0)	0.0	(0.0)	0.0	(0.0)	0.0	(0.0)
Federal income tax for WC	0.2	-	-	0.0	0.0	0.1	0.1	(0.0)	0.0	(0.0)	0.0	(0.0)	0.0	(0.0)
State Income tax for WC	0.1	-	-	0.0	0.0	0.0	0.0	(0.0)	0.0	(0.0)	0.0	(0.0)	0.0	(0.0)
Property taxes for WC	0.1	-	-	0.0	0.0	0.1	0.0	-	-	-	-	-	-	-
Total Rev Req of Working Cash	0.9	-	-	0.1	0.0	0.5	0.3	(0.0)	0.0	(0.0)	0.0	(0.0)	0.0	(0.0)

WORKPAPER TITLE
Rate Base and Return ($ in Millions of Dollars)
WITNESS
Karen C. Chan

	Total	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027-2090
Average Monthly Rate Base		-	-	-	-	14.7	85.0	143.8	171.3	169.8	162.7	155.8	149.2	
Return on Equity ($)	79.5	-	-	-	-	0.8	4.5	7.6	9.0	8.9	8.5	8.2	7.8	24.3
Weighted Return on Equity (%)		-	-	-	-	5.25%	5.25%	5.25%	5.25%	5.25%	5.25%	5.25%	5.25%	
Return on Preferred ($)	2.2	-	-	-	-	0.0	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.7
Weighted Return on Preferred (%)		-	-	-	-	0.14%	0.14%	0.14%	0.14%	0.14%	0.14%	0.14%	0.14%	
Return on Debt ($)	39.8	-	-	-	-	0.4	2.2	3.8	4.5	4.5	4.3	4.1	3.9	12.2
Weighted Return on Debt (%)		-	-	-	-	2.63%	2.63%	2.63%	2.63%	2.63%	2.63%	2.63%	2.63%	
Total Return	121.6	-	-	-	-	1.2	6.8	11.5	13.7	13.6	13.1	12.5	12.0	37.1
Total Rate of Return		-	-	-	-	8.02%	8.02%	8.02%	8.02%	8.02%	8.02%	8.02%	8.02%	

WORKPAPER TITLE
Property Taxes ($ in Millions of Dollars)

WITNESS
Karen C. Chan

	Total	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027-2090
Average of Month-End Rate Base		-	-	-	-	-	14.4	84.8	143.5	171.0	169.5	162.4	155.5	148.9	
Property Tax Rate	1.43%	-	-	-	-	-	0.00%	0.46%	0.69%	0.94%	1.24%	1.32%	1.32%	1.32%	
Property Tax	19.0	-	-	-	-	-	-	0.4	1.0	1.6	2.1	2.1	2.1	2.0	7.7

WORKPAPER TITLE
Income Taxes ($ in Millions of Dollars)
WITNESS
Karen C. Chan

	Total	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
Revenue	531.0	-	-	6.8	0.8	38.4	28.2	22.4	26.9	27.4	26.6	25.8	25.0
Operational Costs	(438.4)	-	-	(6.8)	(0.8)	(36.8)	(18.1)	(5.5)	(7.1)	(7.8)	(7.8)	(7.7)	(7.6)
EBIT	358.2	-	-	-	-	1.6	10.1	16.8	19.8	19.6	18.8	18.1	17.4
Income Taxes	28.9	-	-	-	-	(0.4)	(3.3)	(5.3)	(6.1)	(6.0)	(5.8)	(5.6)	(5.4)
NOI	121.6	-	-	-	-	1.2	6.8	11.5	13.7	13.6	13.1	12.5	12.0
Interest	(39.8)	-	-	-	-	(0.4)	(2.2)	(3.8)	(4.5)	(4.5)	(4.3)	(4.1)	(3.9)
Interest During Construction	(12.0)	(0.0)	(0.2)	(1.4)	(1.6)	(3.6)	(2.7)	(2.0)	(0.4)	-	-	-	-
Preferred Dividends	(2.2)	-	-	-	-	(0.0)	(0.1)	(0.2)	(0.2)	(0.2)	(0.2)	(0.2)	(0.2)
Earnings for Common	67.6	(0.0)	(0.2)	(1.4)	(1.6)	(2.9)	1.8	5.5	8.6	8.9	8.5	8.2	7.8

FIT Detail	**Total**	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027-2090
EBIT	92.6	-	-	-	-	1.6	10.1	16.8	19.8	19.6	18.8	18.1	17.4	
Difference in Depreciation	6.3	-	-	-	-	0.0	0.1	0.2	0.2	0.2	0.2	0.2	0.2	
State Taxes (Prior Period)	8.1	-	-	-	-	-	(0.0)	0.5	0.8	0.9	0.9	0.9	0.9	
Salvage	148.6	-	-	-	-	-	-	-	-	-	-	-	-	
Interest	39.8	-	-	-	-	0.4	2.2	3.8	4.5	4.5	4.3	4.1	3.9	
Total Federal EBT Adjustments	(190.2)	-	-	-	-	(0.4)	(2.1)	(4.1)	(5.1)	(5.2)	(5.0)	(4.8)	(4.6)	
Federal EBT	(97.6)	-	-	-	-	1.2	8.0	12.8	14.7	14.4	13.8	13.3	12.7	
Federal Tax Rate		-	-	-	-	35.0%	35.0%	35.0%	35.0%	35.0%	35.0%	35.0%	35.0%	
FIT	(34.2)	-	-	-	-	0.4	2.8	4.5	5.1	5.0	4.8	4.6	4.4	(66.0)

SIT Detail	**Total**	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027-2090
EBIT	92.6	-	-	-	-	1.6	10.1	16.8	19.8	19.6	18.8	18.1	17.4	
Difference in Depreciation	154.9	-	-	-	-	(1.6)	(2.5)	(3.6)	(4.7)	(4.6)	(4.0)	(3.4)	(2.9)	
Salvage	148.6	-	-	-	-	-	-	-	-	-	-	-	-	
Interest	39.8	-	-	-	-	0.4	2.2	3.8	4.5	4.5	4.3	4.1	3.9	
Total State EBT Adjustments	(33.5)	-	-	-	-	(1.9)	(4.7)	(7.3)	(9.2)	(9.0)	(8.2)	(7.5)	(6.8)	
State EBT	59.1	-	-	-	-	(0.4)	5.4	9.5	10.6	10.6	10.6	10.6	10.5	
State Tax Rate		-	-	-	-	8.84%	8.84%	8.84%	8.84%	8.84%	8.84%	8.84%	8.84%	
SIT	5.2	-	-	-	-	(0.0)	0.5	0.8	0.9	0.9	0.9	0.9	0.9	(0.7)

WORKPAPER TITLE
Rate Base Detail ($ in Millions of Dollars)
WITNESS
Karen C. Chan

		2014	2015	2016	2017	2018	2019	2020	2021	2022
January	Historical Costs		-	-	-	-	-	69.3	105.7	175.2
	Accumulated Depreciation		-	-	-	-	-	(0.6)	(3.1)	(7.4)
	Deferred Taxes Impacting Rate Base		-	-	-	-	-	(7.4)	(8.3)	(9.9)
	Month End Rate Base		-	-	-	-	-	61.3	94.3	157.8
	New Investment		-	-	-	-	-	0.5	0.1	-
	Average Monthly Rate Base		**-**	**-**	**-**	**-**	**-**	**61.4**	**94.5**	**158.1**
February	Historical Costs		-	-	-	-	-	85.0	105.8	175.2
	Accumulated Depreciation		-	-	-	-	-	(0.8)	(3.4)	(7.8)
	Deferred Taxes Impacting Rate Base		-	-	-	-	-	(7.5)	(8.4)	(10.1)
	Month End Rate Base		-	-	-	-	-	76.8	94.1	157.3
	New Investment		-	-	-	-	-	15.8	0.1	-
	Average Monthly Rate Base		**-**	**-**	**-**	**-**	**-**	**76.9**	**94.3**	**157.6**
March	Historical Costs		-	-	-	-	-	90.3	106.0	175.2
	Accumulated Depreciation		-	-	-	-	-	(0.9)	(3.6)	(8.2)
	Deferred Taxes Impacting Rate Base		-	-	-	-	-	(7.5)	(8.5)	(10.3)
	Month End Rate Base		-	-	-	-	-	81.8	93.9	156.7
	New Investment		-	-	-	-	-	5.3	0.1	-
	Average Monthly Rate Base		**-**	**-**	**-**	**-**	**-**	**82.0**	**94.0**	**157.0**
April	Historical Costs		-	-	-	-	-	94.3	173.5	196.2
	Accumulated Depreciation		-	-	-	-	-	(1.2)	(4.0)	(8.6)
	Deferred Taxes Impacting Rate Base		-	-	-	-	-	(7.6)	(8.6)	(10.4)
	Month End Rate Base		-	-	-	-	-	85.5	160.9	177.2
	New Investment		-	-	-	-	-	4.0	67.6	21.0
	Average Monthly Rate Base		**-**	**-**	**-**	**-**	**-**	**85.7**	**161.2**	**177.5**
May	Historical Costs		-	-	-	-	-	94.7	174.0	196.5
	Accumulated Depreciation		-	-	-	-	-	(1.4)	(4.3)	(9.1)
	Deferred Taxes Impacting Rate Base		-	-	-	-	-	(7.6)	(8.8)	(10.6)
	Month End Rate Base		-	-	-	-	-	85.7	160.8	176.8
	New Investment		-	-	-	-	-	0.5	0.4	0.3
	Average Monthly Rate Base		**-**	**-**	**-**	**-**	**-**	**85.9**	**161.1**	**177.1**
June	Historical Costs		-	-	-	-	-	95.0	174.4	196.7
	Accumulated Depreciation		-	-	-	-	-	(1.6)	(4.7)	(9.5)
	Deferred Taxes Impacting Rate Base		-	-	-	-	-	(7.7)	(8.9)	(10.8)
	Month End Rate Base		-	-	-	-	-	85.7	160.7	176.4
	New Investment		-	-	-	-	-	0.3	0.4	0.3
	Average Monthly Rate Base		**-**	**-**	**-**	**-**	**-**	**85.9**	**161.0**	**176.7**
July	Historical Costs		-	-	-	-	-	95.3	174.8	197.0
	Accumulated Depreciation		-	-	-	-	-	(1.8)	(5.1)	(9.9)
	Deferred Taxes Impacting Rate Base		-	-	-	-	-	(7.8)	(9.1)	(11.0)
	Month End Rate Base		-	-	-	-	-	85.7	160.6	176.1
	New Investment		-	-	-	-	-	0.3	0.4	0.3
	Average Monthly Rate Base		**-**	**-**	**-**	**-**	**-**	**85.9**	**160.9**	**176.4**
August	Historical Costs		-	-	-	-	18.1	95.4	175.2	197.2
	Accumulated Depreciation		-	-	-	-	(0.0)	(2.0)	(5.5)	(10.3)
	Deferred Taxes Impacting Rate Base		-	-	-	-	(0.4)	(7.8)	(9.2)	(11.2)
	Month End Rate Base		-	-	-	-	17.7	85.6	160.5	175.7
	New Investment		-	-	-	-	18.1	0.1	0.4	0.3
	Average Monthly Rate Base		**-**	**-**	**-**	**-**	**17.9**	**85.7**	**160.7**	**176.0**
September	Historical Costs		-	-	-	-	24.6	95.5	175.2	197.5
	Accumulated Depreciation		-	-	-	-	(0.1)	(2.2)	(5.9)	(10.8)
	Deferred Taxes Impacting Rate Base		-	-	-	-	(0.9)	(7.9)	(9.3)	(11.4)
	Month End Rate Base		-	-	-	-	23.6	85.4	160.0	175.3
	New Investment		-	-	-	-	6.5	0.1	-	0.3
	Average Monthly Rate Base		**-**	**-**	**-**	**-**	**23.9**	**85.5**	**160.2**	**175.7**
October	Historical Costs		-	-	-	-	24.9	105.4	175.2	197.5
	Accumulated Depreciation		-	-	-	-	(0.1)	(2.4)	(6.3)	(11.2)
	Deferred Taxes Impacting Rate Base		-	-	-	-	(1.5)	(8.0)	(9.5)	(11.5)
	Month End Rate Base		-	-	-	-	23.3	94.9	159.4	174.7
	New Investment		-	-	-	-	0.3	9.9	-	-
	Average Monthly Rate Base		**-**	**-**	**-**	**-**	**23.6**	**95.1**	**159.7**	**175.0**
November	Historical Costs		-	-	-	-	50.8	105.5	175.2	197.5
	Accumulated Depreciation		-	-	-	-	(0.3)	(2.7)	(6.7)	(11.6)
	Deferred Taxes Impacting Rate Base		-	-	-	-	(3.4)	(8.1)	(9.6)	(11.7)
	Month End Rate Base		-	-	-	-	47.1	94.7	158.9	174.1
	New Investment		-	-	-	-	25.9	0.1	-	-
	Average Monthly Rate Base		**-**	**-**	**-**	**-**	**48.1**	**94.9**	**159.2**	**174.4**
December	Historical Costs	-	-	-	-	-	68.8	105.6	175.2	197.5
	Accumulated Depreciation	-	-	-	-	-	(0.4)	(2.9)	(7.0)	(12.1)
	Deferred Taxes Impacting Rate Base	-	-	-	-	-	(7.4)	(8.2)	(9.8)	(11.9)
	Year End Rate Base	-	-	-	-	-	61.0	94.5	158.4	173.5
	New Investment	-	-	-	-	-	18.0	0.1	-	-
	Average Monthly Rate Base		**-**	**-**	**-**	**-**	**63.1**	**94.7**	**158.6**	**173.8**
Average of Month-End Rate Base		**-**	**-**	**-**	**-**	**-**	**14.4**	**84.8**	**143.5**	**171.0**
Average Monthly Rate Base		**#DIV/0!**	**-**	**-**	**-**	**-**	**14.7**	**85.0**	**143.8**	**171.3**

2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036
197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5
(12.5)	(17.7)	(22.9)	(28.1)	(33.3)	(38.5)	(43.7)	(49.0)	(54.2)	(59.4)	(64.6)	(69.8)	(75.0)	(80.2)
(12.1)	(14.2)	(15.9)	(17.4)	(18.7)	(19.8)	(20.8)	(21.8)	(22.7)	(23.7)	(24.7)	(25.6)	(26.5)	(27.3)
172.9	165.6	158.6	151.9	145.4	139.1	132.9	126.7	120.6	114.4	108.3	102.1	96.0	90.0
-	-	-	-	-	-	-	-	-	-	-	-	-	-
173.2	**165.9**	**158.9**	**152.2**	**145.7**	**139.4**	**133.2**	**127.0**	**120.8**	**114.7**	**108.5**	**102.4**	**96.2**	**90.3**
197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5
(13.0)	(18.2)	(23.4)	(28.6)	(33.8)	(39.0)	(44.2)	(49.4)	(54.6)	(59.8)	(65.0)	(70.2)	(75.4)	(80.6)
(12.3)	(14.3)	(16.1)	(17.5)	(18.8)	(19.9)	(20.9)	(21.9)	(22.8)	(23.8)	(24.7)	(25.7)	(26.6)	(27.3)
172.3	165.0	158.1	151.4	144.9	138.6	132.4	126.2	120.1	113.9	107.8	101.6	95.5	89.5
-	-	-	-	-	-	-	-	-	-	-	-	-	-
172.6	**165.3**	**158.4**	**151.7**	**145.2**	**138.9**	**132.7**	**126.5**	**120.3**	**114.2**	**108.0**	**101.9**	**95.7**	**89.8**
197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5
(13.4)	(18.6)	(23.8)	(29.0)	(34.2)	(39.4)	(44.6)	(49.8)	(55.0)	(60.2)	(65.4)	(70.6)	(75.8)	(81.1)
(12.4)	(14.5)	(16.2)	(17.7)	(18.9)	(20.0)	(21.0)	(21.9)	(22.9)	(23.9)	(24.8)	(25.8)	(26.6)	(27.4)
171.7	164.4	157.5	150.8	144.4	138.1	131.9	125.7	119.6	113.4	107.2	101.1	95.0	89.0
-	-	-	-	-	-	-	-	-	-	-	-	-	-
172.0	**164.7**	**157.8**	**151.1**	**144.6**	**138.3**	**132.1**	**126.0**	**119.8**	**113.7**	**107.5**	**101.3**	**95.2**	**89.3**
197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5
(13.8)	(19.0)	(24.2)	(29.4)	(34.6)	(39.8)	(45.0)	(50.3)	(55.5)	(60.7)	(65.9)	(71.1)	(76.3)	(81.5)
(12.6)	(14.6)	(16.3)	(17.8)	(19.0)	(20.1)	(21.1)	(22.0)	(23.0)	(23.9)	(24.9)	(25.8)	(26.7)	(27.5)
171.1	163.9	156.9	150.3	143.9	137.6	131.4	125.2	119.0	112.9	106.7	100.6	94.5	88.5
-	-	-	-	-	-	-	-	-	-	-	-	-	-
171.4	**164.2**	**157.2**	**150.6**	**144.1**	**137.8**	**131.6**	**125.5**	**119.3**	**113.1**	**107.0**	**100.8**	**94.8**	**88.8**
197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5
(14.3)	(19.5)	(24.7)	(29.9)	(35.1)	(40.3)	(45.5)	(50.7)	(55.9)	(61.1)	(66.3)	(71.5)	(76.7)	(81.9)
(12.8)	(14.8)	(16.4)	(17.9)	(19.1)	(20.2)	(21.1)	(22.1)	(23.1)	(24.0)	(25.0)	(25.9)	(26.8)	(27.5)
170.4	163.3	156.4	149.8	143.3	137.1	130.9	124.7	118.5	112.4	106.2	100.1	94.0	88.1
-	-	-	-	-	-	-	-	-	-	-	-	-	-
170.8	**163.6**	**156.7**	**150.0**	**143.6**	**137.3**	**131.1**	**125.0**	**118.8**	**112.6**	**106.5**	**100.3**	**94.3**	**88.3**
197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5
(14.7)	(19.9)	(25.1)	(30.3)	(35.5)	(40.7)	(45.9)	(51.1)	(56.3)	(61.5)	(66.7)	(71.9)	(77.1)	(82.4)
(13.0)	(14.9)	(16.6)	(18.0)	(19.2)	(20.2)	(21.2)	(22.2)	(23.1)	(24.1)	(25.1)	(26.0)	(26.8)	(27.6)
169.8	162.7	155.8	149.2	142.8	136.5	130.3	124.2	118.0	111.9	105.7	99.6	93.5	87.6
-	-	-	-	-	-	-	-	-	-	-	-	-	-
170.1	**163.0**	**156.1**	**149.5**	**143.1**	**136.8**	**130.6**	**124.4**	**118.3**	**112.1**	**106.0**	**99.8**	**93.8**	**87.8**
197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5
(15.1)	(20.3)	(25.5)	(30.7)	(35.9)	(41.1)	(46.4)	(51.6)	(56.8)	(62.0)	(67.2)	(72.4)	(77.6)	(82.8)
(13.1)	(15.1)	(16.7)	(18.1)	(19.3)	(20.3)	(21.3)	(22.3)	(23.2)	(24.2)	(25.1)	(26.1)	(26.9)	(27.6)
169.2	162.1	155.3	148.7	142.3	136.0	129.8	123.7	117.5	111.3	105.2	99.0	93.0	87.1
-	-	-	-	-	-	-	-	-	-	-	-	-	-
169.5	**162.4**	**155.5**	**148.9**	**142.5**	**136.3**	**130.1**	**123.9**	**117.8**	**111.6**	**105.4**	**99.3**	**93.3**	**87.3**
197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5
(15.6)	(20.8)	(26.0)	(31.2)	(36.4)	(41.6)	(46.8)	(52.0)	(57.2)	(62.4)	(67.6)	(72.8)	(78.0)	(83.2)
(13.3)	(15.2)	(16.8)	(18.2)	(19.4)	(20.4)	(21.4)	(22.3)	(23.3)	(24.3)	(25.2)	(26.1)	(27.0)	(27.7)
168.6	161.5	154.7	148.1	141.7	135.5	129.3	123.2	117.0	110.8	104.7	98.5	92.5	86.6
-	-	-	-	-	-	-	-	-	-	-	-	-	-
168.9	**161.8**	**155.0**	**148.4**	**142.0**	**135.8**	**129.6**	**123.4**	**117.2**	**111.1**	**104.9**	**98.8**	**92.8**	**86.8**
197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5
(16.0)	(21.2)	(26.4)	(31.6)	(36.8)	(42.0)	(47.2)	(52.4)	(57.6)	(62.8)	(68.0)	(73.2)	(78.4)	(83.7)
(13.5)	(15.4)	(16.9)	(18.3)	(19.5)	(20.5)	(21.5)	(22.4)	(23.4)	(24.3)	(25.3)	(26.2)	(27.0)	(27.7)
168.0	160.9	154.1	147.6	141.2	135.0	128.8	122.6	116.5	110.3	104.2	98.0	92.0	86.1
-	-	-	-	-	-	-	-	-	-	-	-	-	-
168.3	**161.2**	**154.4**	**147.9**	**141.5**	**135.2**	**129.1**	**122.9**	**116.7**	**110.6**	**104.4**	**98.3**	**92.3**	**86.3**
197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5
(16.4)	(21.6)	(26.8)	(32.0)	(37.2)	(42.4)	(47.7)	(52.9)	(58.1)	(63.3)	(68.5)	(73.7)	(78.9)	(84.1)
(13.7)	(15.5)	(17.1)	(18.4)	(19.6)	(20.6)	(21.5)	(22.5)	(23.5)	(24.4)	(25.4)	(26.3)	(27.1)	(27.8)
167.4	160.4	153.6	147.0	140.7	134.5	128.3	122.1	116.0	109.8	103.6	97.5	91.5	85.6
-	-	-	-	-	-	-	-	-	-	-	-	-	-
167.7	**160.7**	**153.9**	**147.3**	**141.0**	**134.7**	**128.5**	**122.4**	**116.2**	**110.1**	**103.9**	**97.8**	**91.8**	**85.8**
197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5
(16.9)	(22.1)	(27.3)	(32.5)	(37.7)	(42.9)	(48.1)	(53.3)	(58.5)	(63.7)	(68.9)	(74.1)	(79.3)	(84.5)
(13.8)	(15.7)	(17.2)	(18.5)	(19.6)	(20.7)	(21.6)	(22.6)	(23.5)	(24.5)	(25.5)	(26.4)	(27.2)	(27.9)
166.8	159.8	153.0	146.5	140.2	133.9	127.8	121.6	115.5	109.3	103.1	97.0	91.0	85.1
-	-	-	-	-	-	-	-	-	-	-	-	-	-
167.1	**160.1**	**153.3**	**146.8**	**140.4**	**134.2**	**128.0**	**121.9**	**115.7**	**109.5**	**103.4**	**97.3**	**91.3**	**85.4**
197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5
(17.3)	(22.5)	(27.7)	(32.9)	(38.1)	(43.3)	(48.5)	(53.7)	(58.9)	(64.1)	(69.3)	(74.5)	(79.7)	(85.0)
(14.0)	(15.8)	(17.3)	(18.6)	(19.7)	(20.7)	(21.7)	(22.7)	(23.6)	(24.6)	(25.5)	(26.4)	(27.2)	(27.9)
166.2	159.2	152.5	146.0	139.6	133.4	127.3	121.1	114.9	108.8	102.6	96.5	90.5	84.6
-	-	-	-	-	-	-	-	-	-	-	-	-	-
166.5	**159.5**	**152.7**	**146.2**	**139.9**	**133.7**	**127.5**	**121.4**	**115.2**	**109.0**	**102.9**	**96.8**	**90.8**	**84.9**
169.5	**162.4**	**155.5**	**148.9**	**142.5**	**136.3**	**130.1**	**123.9**	**117.8**	**111.6**	**105.4**	**99.3**	**93.3**	**87.3**
169.8	**162.7**	**155.8**	**149.2**	**142.8**	**136.5**	**130.3**	**124.2**	**118.0**	**111.9**	**105.7**	**99.6**	**93.5**	**87.6**

2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050
197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5
(85.4)	(90.6)	(95.8)	(101.0)	(106.2)	(111.4)	(116.6)	(121.8)	(127.0)	(132.2)	(137.4)	(142.6)	(147.9)	(153.1)
(28.0)	(28.7)	(29.3)	(29.7)	(29.4)	(28.5)	(26.9)	(25.1)	(23.4)	(21.6)	(19.9)	(18.1)	(16.4)	(14.6)
84.1	78.2	72.4	66.8	61.9	57.6	54.0	50.5	47.1	43.6	40.2	36.7	33.2	29.8
-	-	-	-	-	-	-	-	-	-	-	-	-	-
84.4	**78.5**	**72.6**	**67.0**	**62.0**	**57.7**	**54.1**	**50.7**	**47.2**	**43.8**	**40.3**	**36.8**	**33.4**	**29.9**
197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5
(85.8)	(91.0)	(96.2)	(101.4)	(106.6)	(111.8)	(117.1)	(122.3)	(127.5)	(132.7)	(137.9)	(143.1)	(148.3)	(153.5)
(28.0)	(28.7)	(29.4)	(29.6)	(29.4)	(28.3)	(26.7)	(25.0)	(23.2)	(21.5)	(19.7)	(18.0)	(16.3)	(14.5)
83.6	77.7	71.9	66.4	61.5	57.3	53.7	50.2	46.8	43.3	39.9	36.4	33.0	29.5
-	-	-	-	-	-	-	-	-	-	-	-	-	-
83.9	**78.0**	**72.1**	**66.6**	**61.7**	**57.4**	**53.8**	**50.4**	**46.9**	**43.5**	**40.0**	**36.6**	**33.1**	**29.6**
197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5
(86.3)	(91.5)	(96.7)	(101.9)	(107.1)	(112.3)	(117.5)	(122.7)	(127.9)	(133.1)	(138.3)	(143.5)	(148.7)	(153.9)
(28.1)	(28.8)	(29.4)	(29.6)	(29.3)	(28.2)	(26.6)	(24.8)	(23.1)	(21.3)	(19.6)	(17.9)	(16.1)	(14.4)
83.1	77.2	71.4	66.0	61.1	57.0	53.4	50.0	46.5	43.0	39.6	36.1	32.7	29.2
-	-	-	-	-	-	-	-	-	-	-	-	-	-
83.4	**77.5**	**71.7**	**66.2**	**61.3**	**57.1**	**53.6**	**50.1**	**46.6**	**43.2**	**39.7**	**36.3**	**32.8**	**29.4**
197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5
(86.7)	(91.9)	(97.1)	(102.3)	(107.5)	(112.7)	(117.9)	(123.1)	(128.3)	(133.5)	(138.7)	(143.9)	(149.2)	(154.4)
(28.1)	(28.8)	(29.4)	(29.6)	(29.2)	(28.1)	(26.4)	(24.7)	(22.9)	(21.2)	(19.5)	(17.7)	(16.0)	(14.2)
82.6	76.8	71.0	65.6	60.8	56.7	53.1	49.7	46.2	42.8	39.3	35.8	32.4	28.9
-	-	-	-	-	-	-	-	-	-	-	-	-	-
82.9	**77.0**	**71.2**	**65.8**	**61.0**	**56.8**	**53.3**	**49.8**	**46.4**	**42.9**	**39.4**	**36.0**	**32.5**	**29.1**
197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5
(87.1)	(92.3)	(97.5)	(102.7)	(107.9)	(113.1)	(118.4)	(123.6)	(128.8)	(134.0)	(139.2)	(144.4)	(149.6)	(154.8)
(28.2)	(28.9)	(29.5)	(29.6)	(29.1)	(27.9)	(26.3)	(24.6)	(22.8)	(21.1)	(19.3)	(17.6)	(15.8)	(14.1)
82.2	76.3	70.5	65.2	60.4	56.4	52.8	49.4	45.9	42.5	39.0	35.5	32.1	28.6
-	-	-	-	-	-	-	-	-	-	-	-	-	-
82.4	**76.5**	**70.7**	**65.4**	**60.6**	**56.5**	**53.0**	**49.5**	**46.1**	**42.6**	**39.1**	**35.7**	**32.2**	**28.8**
197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5
(87.6)	(92.8)	(98.0)	(103.2)	(108.4)	(113.6)	(118.8)	(124.0)	(129.2)	(134.4)	(139.6)	(144.8)	(150.0)	(155.2)
(28.3)	(29.0)	(29.5)	(29.6)	(29.1)	(27.8)	(26.2)	(24.4)	(22.7)	(20.9)	(19.2)	(17.4)	(15.7)	(13.9)
81.7	75.8	70.0	64.7	60.1	56.1	52.5	49.1	45.6	42.2	38.7	35.3	31.8	28.3
-	-	-	-	-	-	-	-	-	-	-	-	-	-
81.9	**76.0**	**70.3**	**64.9**	**60.2**	**56.2**	**52.7**	**49.2**	**45.8**	**42.3**	**38.9**	**35.4**	**31.9**	**28.5**
197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5
(88.0)	(93.2)	(98.4)	(103.6)	(108.8)	(114.0)	(119.2)	(124.4)	(129.6)	(134.8)	(140.0)	(145.2)	(150.5)	(155.7)
(28.3)	(29.0)	(29.5)	(29.6)	(29.0)	(27.7)	(26.0)	(24.3)	(22.5)	(20.8)	(19.0)	(17.3)	(15.5)	(13.8)
81.2	75.3	69.6	64.3	59.7	55.8	52.3	48.8	45.3	41.9	38.4	35.0	31.5	28.1
-	-	-	-	-	-	-	-	-	-	-	-	-	-
81.4	**75.5**	**69.8**	**64.5**	**59.9**	**55.9**	**52.4**	**48.9**	**45.5**	**42.0**	**38.6**	**35.1**	**31.7**	**28.2**
197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5
(88.4)	(93.6)	(98.8)	(104.0)	(109.2)	(114.5)	(119.7)	(124.9)	(130.1)	(135.3)	(140.5)	(145.7)	(150.9)	(156.1)
(28.4)	(29.1)	(29.5)	(29.6)	(28.9)	(27.6)	(25.9)	(24.1)	(22.4)	(20.6)	(18.9)	(17.1)	(15.4)	(13.6)
80.7	74.8	69.1	63.9	59.3	55.5	52.0	48.5	45.1	41.6	38.1	34.7	31.2	27.8
-	-	-	-	-	-	-	-	-	-	-	-	-	-
80.9	**75.0**	**69.3**	**64.1**	**59.5**	**55.6**	**52.1**	**48.7**	**45.2**	**41.7**	**38.3**	**34.8**	**31.4**	**27.9**
197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5
(88.9)	(94.1)	(99.3)	(104.5)	(109.7)	(114.9)	(120.1)	(125.3)	(130.5)	(135.7)	(140.9)	(146.1)	(151.3)	(156.5)
(28.4)	(29.1)	(29.6)	(29.5)	(28.8)	(27.4)	(25.7)	(24.0)	(22.2)	(20.5)	(18.7)	(17.0)	(15.2)	(13.5)
80.2	74.3	68.6	63.5	59.0	55.2	51.7	48.2	44.8	41.3	37.9	34.4	30.9	27.5
-	-	-	-	-	-	-	-	-	-	-	-	-	-
80.4	**74.5**	**68.9**	**63.7**	**59.2**	**55.3**	**51.8**	**48.4**	**44.9**	**41.5**	**38.0**	**34.5**	**31.1**	**27.6**
197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5
(89.3)	(94.5)	(99.7)	(104.9)	(110.1)	(115.3)	(120.5)	(125.7)	(130.9)	(136.1)	(141.3)	(146.5)	(151.8)	(157.0)
(28.5)	(29.2)	(29.6)	(29.5)	(28.8)	(27.3)	(25.6)	(23.8)	(22.1)	(20.3)	(18.6)	(16.8)	(15.1)	(13.3)
79.7	73.8	68.2	63.1	58.6	54.9	51.4	47.9	44.5	41.0	37.6	34.1	30.6	27.2
-	-	-	-	-	-	-	-	-	-	-	-	-	-
79.9	**74.1**	**68.4**	**63.3**	**58.8**	**55.0**	**51.5**	**48.1**	**44.6**	**41.2**	**37.7**	**34.3**	**30.8**	**27.3**
197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5
(89.7)	(94.9)	(100.1)	(105.3)	(110.5)	(115.8)	(121.0)	(126.2)	(131.4)	(136.6)	(141.8)	(147.0)	(152.2)	(157.4)
(28.6)	(29.2)	(29.6)	(29.5)	(28.7)	(27.2)	(25.4)	(23.7)	(21.9)	(20.2)	(18.4)	(16.7)	(14.9)	(13.2)
79.2	73.3	67.7	62.6	58.3	54.6	51.1	47.6	44.2	40.7	37.3	33.8	30.4	26.9
-	-	-	-	-	-	-	-	-	-	-	-	-	-
79.5	**73.6**	**67.9**	**62.8**	**58.4**	**54.7**	**51.3**	**47.8**	**44.3**	**40.9**	**37.4**	**34.0**	**30.5**	**27.0**
197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5
(90.2)	(95.4)	(100.6)	(105.8)	(111.0)	(116.2)	(121.4)	(126.6)	(131.8)	(137.0)	(142.2)	(147.4)	(152.6)	(157.8)
(28.6)	(29.3)	(29.7)	(29.5)	(28.6)	(27.0)	(25.3)	(23.5)	(21.8)	(20.0)	(18.3)	(16.5)	(14.8)	(13.0)
78.7	72.8	67.3	62.2	57.9	54.3	50.8	47.4	43.9	40.4	37.0	33.5	30.1	26.6
-	-	-	-	-	-	-	-	-	-	-	-	-	-
79.0	**73.1**	**67.5**	**62.4**	**58.1**	**54.4**	**51.0**	**47.5**	**44.0**	**40.6**	**37.1**	**33.7**	**30.2**	**26.8**
81.4	**75.5**	**69.8**	**64.5**	**59.9**	**55.9**	**52.4**	**48.9**	**45.5**	**42.0**	**38.6**	**35.1**	**31.7**	**28.2**
81.7	**75.8**	**70.0**	**64.7**	**60.1**	**56.1**	**52.5**	**49.1**	**45.6**	**42.2**	**38.7**	**35.3**	**31.8**	**28.3**

2051	2052	2053	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063	2064
197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5
(158.3)	(163.5)	(168.7)	(173.9)	(179.1)	(184.3)	(189.5)	(194.7)	(199.9)	(205.1)	(210.3)	(215.5)	(220.7)	(225.9)
(12.9)	(11.2)	(9.4)	(7.7)	(5.9)	(4.2)	(2.4)	(0.7)	1.1	2.8	4.6	6.3	8.1	9.8
26.3	22.9	19.4	16.0	12.5	9.0	5.6	2.1	(1.3)	(4.8)	(8.2)	(11.7)	(15.2)	(18.6)
-	-	-	-	-	-	-	-	-	-	-	-	-	-
26.5	**23.0**	**19.6**	**16.1**	**12.6**	**9.2**	**5.7**	**2.3**	**(1.2)**	**(4.6)**	**(8.1)**	**(11.6)**	**(15.0)**	**(18.5)**
197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5
(158.7)	(163.9)	(169.1)	(174.3)	(179.5)	(184.7)	(189.9)	(195.1)	(200.3)	(205.5)	(210.7)	(216.0)	(221.2)	(226.4)
(12.8)	(11.0)	(9.3)	(7.5)	(5.8)	(4.0)	(2.3)	(0.5)	1.2	3.0	4.7	6.5	8.2	10.0
26.0	22.6	19.1	15.7	12.2	8.8	5.3	1.8	(1.6)	(5.1)	(8.5)	(12.0)	(15.5)	(18.9)
-	-	-	-	-	-	-	-	-	-	-	-	-	-
26.2	**22.7**	**19.3**	**15.8**	**12.4**	**8.9**	**5.4**	**2.0**	**(1.5)**	**(4.9)**	**(8.4)**	**(11.9)**	**(15.3)**	**(18.8)**
197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5
(159.1)	(164.3)	(169.5)	(174.7)	(179.9)	(185.2)	(190.4)	(195.6)	(200.8)	(206.0)	(211.2)	(216.4)	(221.6)	(226.8)
(12.6)	(10.9)	(9.1)	(7.4)	(5.6)	(3.9)	(2.1)	(0.4)	1.4	3.1	4.9	6.6	8.4	10.1
25.8	22.3	18.8	15.4	11.9	8.5	5.0	1.5	(1.9)	(5.4)	(8.8)	(12.3)	(15.7)	(19.2)
-	-	-	-	-	-	-	-	-	-	-	-	-	-
25.9	**22.4**	**19.0**	**15.5**	**12.1**	**8.6**	**5.1**	**1.7**	**(1.8)**	**(5.2)**	**(8.7)**	**(12.1)**	**(15.6)**	**(19.1)**
197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5
(159.6)	(164.8)	(170.0)	(175.2)	(180.4)	(185.6)	(190.8)	(196.0)	(201.2)	(206.4)	(211.6)	(216.8)	(222.0)	(227.2)
(12.5)	(10.7)	(9.0)	(7.2)	(5.5)	(3.7)	(2.0)	(0.2)	1.5	3.3	5.0	6.8	8.5	10.3
25.5	22.0	18.5	15.1	11.6	8.2	4.7	1.3	(2.2)	(5.7)	(9.1)	(12.6)	(16.0)	(19.5)
-	-	-	-	-	-	-	-	-	-	-	-	-	-
25.6	**22.1**	**18.7**	**15.2**	**11.8**	**8.3**	**4.9**	**1.4**	**(2.1)**	**(5.5)**	**(9.0)**	**(12.4)**	**(15.9)**	**(19.3)**
197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5
(160.0)	(165.2)	(170.4)	(175.6)	(180.8)	(186.0)	(191.2)	(196.4)	(201.6)	(206.8)	(212.0)	(217.3)	(222.5)	(227.7)
(12.3)	(10.6)	(8.8)	(7.1)	(5.3)	(3.6)	(1.8)	(0.1)	1.7	3.4	5.2	6.9	8.7	10.4
25.2	21.7	18.3	14.8	11.3	7.9	4.4	1.0	(2.5)	(5.9)	(9.4)	(12.9)	(16.3)	(19.8)
-	-	-	-	-	-	-	-	-	-	-	-	-	-
25.3	**21.9**	**18.4**	**14.9**	**11.5**	**8.0**	**4.6**	**1.1**	**(2.3)**	**(5.8)**	**(9.3)**	**(12.7)**	**(16.2)**	**(19.6)**
197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5
(160.4)	(165.6)	(170.8)	(176.0)	(181.2)	(186.5)	(191.7)	(196.9)	(202.1)	(207.3)	(212.5)	(217.7)	(222.9)	(228.1)
(12.2)	(10.4)	(8.7)	(6.9)	(5.2)	(3.4)	(1.7)	0.1	1.8	3.6	5.3	7.0	8.8	10.5
24.9	21.4	18.0	14.5	11.1	7.6	4.1	0.7	(2.8)	(6.2)	(9.7)	(13.1)	(16.6)	(20.1)
-	-	-	-	-	-	-	-	-	-	-	-	-	-
25.0	**21.6**	**18.1**	**14.7**	**11.2**	**7.7**	**4.3**	**0.8**	**(2.6)**	**(6.1)**	**(9.5)**	**(13.0)**	**(16.5)**	**(19.9)**
197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5
(160.9)	(166.1)	(171.3)	(176.5)	(181.7)	(186.9)	(192.1)	(197.3)	(202.5)	(207.7)	(212.9)	(218.1)	(223.3)	(228.5)
(12.0)	(10.3)	(8.5)	(6.8)	(5.0)	(3.3)	(1.5)	0.2	2.0	3.7	5.4	7.2	8.9	10.7
24.6	21.1	17.7	14.2	10.8	7.3	3.9	0.4	(3.1)	(6.5)	(10.0)	(13.4)	(16.9)	(20.4)
-	-	-	-	-	-	-	-	-	-	-	-	-	-
24.7	**21.3**	**17.8**	**14.4**	**10.9**	**7.5**	**4.0**	**0.5**	**(2.9)**	**(6.4)**	**(9.8)**	**(13.3)**	**(16.8)**	**(20.2)**
197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5
(161.3)	(166.5)	(171.7)	(176.9)	(182.1)	(187.3)	(192.5)	(197.7)	(202.9)	(208.1)	(213.3)	(218.6)	(223.8)	(229.0)
(11.9)	(10.1)	(8.4)	(6.6)	(4.9)	(3.1)	(1.4)	0.3	2.1	3.8	5.6	7.3	9.1	10.8
24.3	20.9	17.4	13.9	10.5	7.0	3.6	0.1	(3.4)	(6.8)	(10.3)	(13.7)	(17.2)	(20.6)
-	-	-	-	-	-	-	-	-	-	-	-	-	-
24.5	**21.0**	**17.5**	**14.1**	**10.6**	**7.2**	**3.7**	**0.3**	**(3.2)**	**(6.7)**	**(10.1)**	**(13.6)**	**(17.0)**	**(20.5)**
197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5
(161.7)	(166.9)	(172.1)	(177.3)	(182.6)	(187.8)	(193.0)	(198.2)	(203.4)	(208.6)	(213.8)	(219.0)	(224.2)	(229.4)
(11.7)	(10.0)	(8.2)	(6.5)	(4.7)	(3.0)	(1.3)	0.5	2.2	4.0	5.7	7.5	9.2	11.0
24.0	20.6	17.1	13.6	10.2	6.7	3.3	(0.2)	(3.6)	(7.1)	(10.6)	(14.0)	(17.5)	(20.9)
-	-	-	-	-	-	-	-	-	-	-	-	-	-
24.2	**20.7**	**17.3**	**13.8**	**10.3**	**6.9**	**3.4**	**(0.0)**	**(3.5)**	**(7.0)**	**(10.4)**	**(13.9)**	**(17.3)**	**(20.8)**
197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5
(162.2)	(167.4)	(172.6)	(177.8)	(183.0)	(188.2)	(193.4)	(198.6)	(203.8)	(209.0)	(214.2)	(219.4)	(224.6)	(229.8)
(11.6)	(9.8)	(8.1)	(6.3)	(4.6)	(2.9)	(1.1)	0.6	2.4	4.1	5.9	7.6	9.4	11.1
23.7	20.3	16.8	13.4	9.9	6.4	3.0	(0.5)	(3.9)	(7.4)	(10.8)	(14.3)	(17.8)	(21.2)
-	-	-	-	-	-	-	-	-	-	-	-	-	-
23.9	**20.4**	**17.0**	**13.5**	**10.0**	**6.6**	**3.1**	**(0.3)**	**(3.8)**	**(7.2)**	**(10.7)**	**(14.2)**	**(17.6)**	**(21.1)**
197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5
(162.6)	(167.8)	(173.0)	(178.2)	(183.4)	(188.6)	(193.8)	(199.0)	(204.2)	(209.4)	(214.6)	(219.9)	(225.1)	(230.3)
(11.4)	(9.7)	(8.0)	(6.2)	(4.5)	(2.7)	(1.0)	0.8	2.5	4.3	6.0	7.8	9.5	11.3
23.4	20.0	16.5	13.1	9.6	6.2	2.7	(0.8)	(4.2)	(7.7)	(11.1)	(14.6)	(18.0)	(21.5)
-	-	-	-	-	-	-	-	-	-	-	-	-	-
23.6	**20.1**	**16.7**	**13.2**	**9.8**	**6.3**	**2.8**	**(0.6)**	**(4.1)**	**(7.5)**	**(11.0)**	**(14.4)**	**(17.9)**	**(21.4)**
197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5
(163.0)	(168.2)	(173.4)	(178.6)	(183.9)	(189.1)	(194.3)	(199.5)	(204.7)	(209.9)	(215.1)	(220.3)	(225.5)	(230.7)
(11.3)	(9.6)	(7.8)	(6.1)	(4.3)	(2.6)	(0.8)	0.9	2.7	4.4	6.2	7.9	9.7	11.4
23.2	19.7	16.2	12.8	9.3	5.9	2.4	(1.0)	(4.5)	(8.0)	(11.4)	(14.9)	(18.3)	(21.8)
-	-	-	-	-	-	-	-	-	-	-	-	-	-
23.3	**19.8**	**16.4**	**12.9**	**9.5**	**6.0**	**2.6**	**(0.9)**	**(4.4)**	**(7.8)**	**(11.3)**	**(14.7)**	**(18.2)**	**(21.6)**
24.7	**21.3**	**17.8**	**14.4**	**10.9**	**7.5**	**4.0**	**0.5**	**(2.9)**	**(6.4)**	**(9.8)**	**(13.3)**	**(16.8)**	**(20.2)**
24.9	**21.4**	**18.0**	**14.5**	**11.1**	**7.6**	**4.1**	**0.7**	**(2.8)**	**(6.2)**	**(9.7)**	**(13.1)**	**(16.6)**	**(20.1)**

2065	2066	2067	2068	2069	2070	2071	2072	2073	2074	2075	2076	2077	2078	2079
197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5
(231.1)	(236.3)	(241.5)	(246.7)	(252.0)	(257.2)	(262.4)	(267.6)	(272.8)	(278.0)	(283.2)	(288.4)	(293.6)	(298.8)	(304.0)
11.6	13.3	15.1	16.8	18.6	20.3	22.0	23.8	25.5	27.3	29.0	30.8	32.5	34.3	36.0
(22.1)	(25.5)	(29.0)	(32.5)	(35.9)	(39.4)	(42.8)	(46.3)	(49.7)	(53.2)	(56.7)	(60.1)	(63.6)	(67.0)	(70.5)
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
(21.9)	**(25.4)**	**(28.9)**	**(32.3)**	**(35.8)**	**(39.2)**	**(42.7)**	**(46.1)**	**(49.6)**	**(53.1)**	**(56.5)**	**(60.0)**	**(63.4)**	**(66.9)**	**(70.3)**
197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5
(231.6)	(236.8)	(242.0)	(247.2)	(252.4)	(257.6)	(262.8)	(268.0)	(273.2)	(278.4)	(283.6)	(288.8)	(294.0)	(299.2)	(304.4)
11.7	13.5	15.2	17.0	18.7	20.4	22.2	23.9	25.7	27.4	29.2	30.9	32.7	34.4	36.2
(22.4)	(25.8)	(29.3)	(32.7)	(36.2)	(39.7)	(43.1)	(46.6)	(50.0)	(53.5)	(56.9)	(60.4)	(63.9)	(67.3)	(70.8)
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
(22.2)	**(25.7)**	**(29.1)**	**(32.6)**	**(36.1)**	**(39.5)**	**(43.0)**	**(46.4)**	**(49.9)**	**(53.3)**	**(56.8)**	**(60.3)**	**(63.7)**	**(67.2)**	**(70.6)**
197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5
(232.0)	(237.2)	(242.4)	(247.6)	(252.8)	(258.0)	(263.2)	(268.4)	(273.6)	(278.8)	(284.1)	(289.3)	(294.5)	(299.7)	(304.9)
11.9	13.6	15.3	17.1	18.8	20.6	22.3	24.1	25.8	27.6	29.3	31.1	32.8	34.6	36.3
(22.7)	(26.1)	(29.6)	(33.0)	(36.5)	(39.9)	(43.4)	(46.9)	(50.3)	(53.8)	(57.2)	(60.7)	(64.1)	(67.6)	(71.1)
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
(22.5)	**(26.0)**	**(29.4)**	**(32.9)**	**(36.3)**	**(39.8)**	**(43.3)**	**(46.7)**	**(50.2)**	**(53.6)**	**(57.1)**	**(60.5)**	**(64.0)**	**(67.5)**	**(70.9)**
197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5
(232.4)	(237.6)	(242.8)	(248.0)	(253.3)	(258.5)	(263.7)	(268.9)	(274.1)	(279.3)	(284.5)	(289.7)	(294.9)	(300.1)	(305.3)
12.0	13.7	15.5	17.2	19.0	20.7	22.5	24.2	26.0	27.7	29.5	31.2	33.0	34.7	36.5
(22.9)	(26.4)	(29.9)	(33.3)	(36.8)	(40.2)	(43.7)	(47.1)	(50.6)	(54.1)	(57.5)	(61.0)	(64.4)	(67.9)	(71.4)
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
(22.8)	**(26.3)**	**(29.7)**	**(33.2)**	**(36.6)**	**(40.1)**	**(43.5)**	**(47.0)**	**(50.5)**	**(53.9)**	**(57.4)**	**(60.8)**	**(64.3)**	**(67.8)**	**(71.2)**
197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5
(232.9)	(238.1)	(243.3)	(248.5)	(253.7)	(258.9)	(264.1)	(269.3)	(274.5)	(279.7)	(284.9)	(290.1)	(295.3)	(300.5)	(305.7)
12.1	13.9	15.6	17.4	19.1	20.9	22.6	24.4	26.1	27.9	29.6	31.4	33.1	34.9	36.6
(23.2)	(26.7)	(30.1)	(33.6)	(37.1)	(40.5)	(44.0)	(47.4)	(50.9)	(54.4)	(57.8)	(61.3)	(64.7)	(68.2)	(71.6)
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
(23.1)	**(26.5)**	**(30.0)**	**(33.5)**	**(36.9)**	**(40.4)**	**(43.8)**	**(47.3)**	**(50.8)**	**(54.2)**	**(57.7)**	**(61.1)**	**(64.6)**	**(68.0)**	**(71.5)**
197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5
(233.3)	(238.5)	(243.7)	(248.9)	(254.1)	(259.3)	(264.5)	(269.7)	(274.9)	(280.1)	(285.4)	(290.6)	(295.8)	(301.0)	(306.2)
12.3	14.0	15.8	17.5	19.3	21.0	22.8	24.5	26.3	28.0	29.8	31.5	33.3	35.0	36.8
(23.5)	(27.0)	(30.4)	(33.9)	(37.4)	(40.8)	(44.3)	(47.7)	(51.2)	(54.6)	(58.1)	(61.6)	(65.0)	(68.5)	(71.9)
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
(23.4)	**(26.8)**	**(30.3)**	**(33.8)**	**(37.2)**	**(40.7)**	**(44.1)**	**(47.6)**	**(51.0)**	**(54.5)**	**(58.0)**	**(61.4)**	**(64.9)**	**(68.3)**	**(71.8)**
197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5
(233.7)	(238.9)	(244.1)	(249.3)	(254.6)	(259.8)	(265.0)	(270.2)	(275.4)	(280.6)	(285.8)	(291.0)	(296.2)	(301.4)	(306.6)
12.4	14.2	15.9	17.7	19.4	21.2	22.9	24.7	26.4	28.2	29.9	31.7	33.4	35.2	36.9
(23.8)	(27.3)	(30.7)	(34.2)	(37.6)	(41.1)	(44.6)	(48.0)	(51.5)	(54.9)	(58.4)	(61.8)	(65.3)	(68.8)	(72.2)
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
(23.7)	**(27.1)**	**(30.6)**	**(34.0)**	**(37.5)**	**(41.0)**	**(44.4)**	**(47.9)**	**(51.3)**	**(54.8)**	**(58.2)**	**(61.7)**	**(65.2)**	**(68.6)**	**(72.1)**
197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5
(234.2)	(239.4)	(244.6)	(249.8)	(255.0)	(260.2)	(265.4)	(270.6)	(275.8)	(281.0)	(286.2)	(291.4)	(296.6)	(301.8)	(307.0)
12.6	14.3	16.1	17.8	19.6	21.3	23.1	24.8	26.6	28.3	30.1	31.8	33.6	35.3	37.0
(24.1)	(27.6)	(31.0)	(34.5)	(37.9)	(41.4)	(44.8)	(48.3)	(51.8)	(55.2)	(58.7)	(62.1)	(65.6)	(69.0)	(72.5)
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
(24.0)	**(27.4)**	**(30.9)**	**(34.3)**	**(37.8)**	**(41.2)**	**(44.7)**	**(48.2)**	**(51.6)**	**(55.1)**	**(58.5)**	**(62.0)**	**(65.4)**	**(68.9)**	**(72.4)**
197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5
(234.6)	(239.8)	(245.0)	(250.2)	(255.4)	(260.6)	(265.8)	(271.0)	(276.2)	(281.4)	(286.7)	(291.9)	(297.1)	(302.3)	(307.5)
12.7	14.5	16.2	18.0	19.7	21.5	23.2	25.0	26.7	28.5	30.2	31.9	33.7	35.4	37.2
(24.4)	(27.8)	(31.3)	(34.8)	(38.2)	(41.7)	(45.1)	(48.6)	(52.0)	(55.5)	(59.0)	(62.4)	(65.9)	(69.3)	(72.8)
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
(24.2)	**(27.7)**	**(31.2)**	**(34.6)**	**(38.1)**	**(41.5)**	**(45.0)**	**(48.4)**	**(51.9)**	**(55.4)**	**(58.8)**	**(62.3)**	**(65.7)**	**(69.2)**	**(72.6)**
197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5
(235.0)	(240.2)	(245.4)	(250.7)	(255.9)	(261.1)	(266.3)	(271.5)	(276.7)	(281.9)	(287.1)	(292.3)	(297.5)	(302.7)	(307.9)
12.9	14.6	16.4	18.1	19.9	21.6	23.4	25.1	26.9	28.6	30.3	32.1	33.8	35.6	37.3
(24.7)	(28.1)	(31.6)	(35.0)	(38.5)	(42.0)	(45.4)	(48.9)	(52.3)	(55.8)	(59.3)	(62.7)	(66.2)	(69.6)	(73.1)
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
(24.5)	**(28.0)**	**(31.4)**	**(34.9)**	**(38.4)**	**(41.8)**	**(45.3)**	**(48.7)**	**(52.2)**	**(55.6)**	**(59.1)**	**(62.6)**	**(66.0)**	**(69.5)**	**(72.9)**
197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5
(235.5)	(240.7)	(245.9)	(251.1)	(256.3)	(261.5)	(266.7)	(271.9)	(277.1)	(282.3)	(287.5)	(292.7)	(297.9)	(303.1)	(308.3)
13.0	14.8	16.5	18.3	20.0	21.8	23.5	25.3	27.0	28.7	30.5	32.2	34.0	35.7	37.5
(25.0)	(28.4)	(31.9)	(35.3)	(38.8)	(42.3)	(45.7)	(49.2)	(52.6)	(56.1)	(59.5)	(63.0)	(66.5)	(69.9)	(73.4)
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
(24.8)	**(28.3)**	**(31.7)**	**(35.2)**	**(38.6)**	**(42.1)**	**(45.6)**	**(49.0)**	**(52.5)**	**(55.9)**	**(59.4)**	**(62.9)**	**(66.3)**	**(69.8)**	**(73.2)**
197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5
(235.9)	(241.1)	(246.3)	(251.5)	(256.7)	(261.9)	(267.1)	(272.3)	(277.5)	(282.7)	(288.0)	(293.2)	(298.4)	(303.6)	(308.8)
13.2	14.9	16.7	18.4	20.2	21.9	23.6	25.4	27.1	28.9	30.6	32.4	34.1	35.9	37.6
(25.3)	(28.7)	(32.2)	(35.6)	(39.1)	(42.5)	(46.0)	(49.5)	(52.9)	(56.4)	(59.8)	(63.3)	(66.7)	(70.2)	(73.7)
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
(25.1)	**(28.6)**	**(32.0)**	**(35.5)**	**(38.9)**	**(42.4)**	**(45.9)**	**(49.3)**	**(52.8)**	**(56.2)**	**(59.7)**	**(63.1)**	**(66.6)**	**(70.1)**	**(73.5)**
(23.7)	**(27.1)**	**(30.6)**	**(34.0)**	**(37.5)**	**(41.0)**	**(44.4)**	**(47.9)**	**(51.3)**	**(54.8)**	**(58.2)**	**(61.7)**	**(65.2)**	**(68.6)**	**(72.1)**
(23.5)	**(27.0)**	**(30.4)**	**(33.9)**	**(37.4)**	**(40.8)**	**(44.3)**	**(47.7)**	**(51.2)**	**(54.6)**	**(58.1)**	**(61.6)**	**(65.0)**	**(68.5)**	**(71.9)**

2080	2081	2082	2083	2084	2085	2086	2087	2088	2089	2090
197.5	197.5	197.5	197.5	191.2	182.2	182.2	182.2	119.2	91.8	22.3
(309.2)	(314.4)	(319.6)	(324.8)	(319.8)	(310.3)	(315.2)	(320.0)	(198.4)	(164.1)	(40.1)
37.8	39.5	41.3	43.0	43.5	43.3	44.9	46.5	26.8	24.4	6.0
(73.9)	(77.4)	(80.9)	(84.3)	(85.2)	(84.9)	(88.1)	(91.3)	(52.4)	(47.9)	(11.7)
-	-	-	-	-	-	-	-	-	-	-
(73.8)	**(77.3)**	**(80.7)**	**(84.2)**	**(85.1)**	**(84.8)**	**(88.0)**	**(91.2)**	**(56.5)**	**(47.8)**	**(11.7)**
197.5	197.5	197.5	197.5	191.1	182.2	182.2	182.2	103.5	91.6	22.3
(309.6)	(314.8)	(320.1)	(325.3)	(317.4)	(310.7)	(315.6)	(320.4)	(182.5)	(164.1)	(40.1)
37.9	39.7	41.4	43.2	42.6	43.4	45.0	46.6	26.7	24.5	6.0
(74.2)	(77.7)	(81.1)	(84.6)	(83.6)	(85.2)	(88.4)	(91.6)	(52.3)	(47.9)	(11.8)
-	-	-	-	-	-	-	-	-	-	-
(74.1)	**(77.5)**	**(81.0)**	**(84.5)**	**(84.4)**	**(85.0)**	**(88.2)**	**(91.4)**	**(52.3)**	**(47.9)**	**(11.8)**
197.5	197.5	197.5	197.5	186.4	182.2	182.2	182.2	103.0	91.5	22.3
(310.1)	(315.3)	(320.5)	(325.7)	(310.8)	(311.1)	(316.0)	(320.8)	(182.0)	(110.1)	(23.3)
38.1	39.8	41.6	43.3	42.0	43.5	45.2	46.8	26.7	6.4	0.4
(74.5)	(78.0)	(81.4)	(84.9)	(82.4)	(85.4)	(88.6)	(91.8)	(52.3)	(12.2)	(0.6)
-	-	-	-	-	-	-	-	-	-	-
(74.4)	**(77.8)**	**(81.3)**	**(84.8)**	**(83.0)**	**(85.3)**	**(88.5)**	**(91.7)**	**(52.3)**	**(30.1)**	**(6.2)**
197.5	197.5	197.5	197.5	182.7	182.2	182.2	182.2	102.7	23.9	1.3
(310.5)	(315.7)	(320.9)	(326.1)	(307.4)	(311.5)	(316.4)	(321.2)	(181.6)	(42.2)	(2.1)
38.2	40.0	41.7	43.5	42.1	43.7	45.3	46.9	26.7	6.2	0.3
(74.8)	(78.3)	(81.7)	(85.2)	(82.6)	(85.7)	(88.9)	(92.1)	(52.2)	(12.1)	(0.5)
-	-	-	-	-	-	-	-	-	-	-
(74.7)	**(78.1)**	**(81.6)**	**(85.0)**	**(82.5)**	**(85.6)**	**(88.8)**	**(92.0)**	**(52.2)**	**(12.1)**	**(0.6)**
197.5	197.5	197.5	197.5	182.5	182.2	182.2	182.2	102.4	23.5	1.0
(310.9)	(316.1)	(321.4)	(326.6)	(307.6)	(311.9)	(316.8)	(321.6)	(181.4)	(41.5)	(1.6)
38.4	40.1	41.9	43.6	42.2	43.8	45.4	47.0	26.7	6.1	0.2
(75.1)	(78.6)	(82.0)	(85.5)	(82.9)	(86.0)	(89.2)	(92.4)	(52.3)	(11.9)	(0.4)
-	-	-	-	-	-	-	-	-	-	-
(75.0)	**(78.4)**	**(81.9)**	**(85.3)**	**(82.8)**	**(85.8)**	**(89.0)**	**(92.2)**	**(52.3)**	**(12.0)**	**(0.5)**
197.5	197.5	197.5	197.5	182.4	182.2	182.2	182.2	102.2	23.1	0.8
(311.4)	(316.6)	(321.8)	(327.0)	(307.9)	(312.3)	(317.2)	(322.0)	(181.3)	(40.8)	(1.2)
38.5	40.2	42.0	43.7	42.4	43.9	45.6	47.2	26.8	6.0	0.1
(75.4)	(78.8)	(82.3)	(85.8)	(83.1)	(86.2)	(89.4)	(92.6)	(52.3)	(11.7)	(0.3)
-	-	-	-	-	-	-	-	-	-	-
(75.2)	**(78.7)**	**(82.2)**	**(85.6)**	**(83.0)**	**(86.1)**	**(89.3)**	**(92.5)**	**(52.3)**	**(11.8)**	**(0.3)**
197.5	197.5	197.5	197.5	182.3	182.2	182.2	182.2	102.0	22.7	0.5
(311.8)	(317.0)	(322.2)	(327.4)	(308.1)	(312.7)	(317.6)	(307.9)	(181.4)	(40.2)	(0.7)
38.6	40.4	42.1	43.9	42.5	44.1	45.7	42.5	26.9	5.9	0.1
(75.7)	(79.1)	(82.6)	(86.0)	(83.3)	(86.5)	(89.7)	(83.2)	(52.5)	(11.5)	(0.1)
-	-	-	-	-	-	-	-	-	-	-
(75.5)	**(79.0)**	**(82.4)**	**(85.9)**	**(83.2)**	**(86.4)**	**(89.6)**	**(87.9)**	**(52.4)**	**(11.6)**	**(0.2)**
197.5	197.5	197.5	197.5	182.2	182.2	182.2	164.0	102.0	22.3	0.3
(312.2)	(317.4)	(322.7)	(327.9)	(308.4)	(313.2)	(318.0)	(284.9)	(181.6)	(39.8)	(0.3)
38.8	40.5	42.3	44.0	42.6	44.2	45.8	40.8	26.9	5.9	0.0
(76.0)	(79.4)	(82.9)	(86.3)	(83.6)	(86.8)	(90.0)	(80.1)	(52.6)	(11.6)	0.0
-	-	-	-	-	-	-	-	-	-	-
(75.8)	**(79.3)**	**(82.7)**	**(86.2)**	**(83.4)**	**(86.6)**	**(89.8)**	**(81.6)**	**(52.6)**	**(11.6)**	**(0.1)**
197.5	197.5	197.5	197.5	182.2	182.2	182.2	157.6	102.0	22.3	(0.0)
(312.7)	(317.9)	(323.1)	(328.3)	(308.7)	(313.6)	(318.4)	(278.6)	(173.9)	(39.9)	0.0
38.9	40.7	42.4	44.2	42.7	44.4	46.0	40.9	24.3	5.9	0.0
(76.3)	(79.7)	(83.2)	(86.6)	(83.8)	(87.0)	(90.2)	(80.1)	(47.6)	(11.6)	0.0
-	-	-	-	-	-	-	-	-	-	-
(76.1)	**(79.6)**	**(83.0)**	**(86.5)**	**(83.7)**	**(86.9)**	**(90.1)**	**(80.1)**	**(50.1)**	**(11.6)**	**0.0**
197.5	197.5	197.5	197.5	182.2	182.2	182.2	157.3	92.1	22.3	(0.0)
(313.1)	(318.3)	(323.5)	(328.7)	(309.1)	(314.0)	(318.8)	(257.9)	(164.1)	(39.9)	0.0
39.1	40.8	42.6	44.3	42.9	44.5	46.1	34.1	24.3	6.0	0.0
(76.5)	(80.0)	(83.5)	(86.9)	(84.1)	(87.3)	(90.5)	(66.6)	(47.6)	(11.6)	0.0
-	-	-	-	-	-	-	-	-	-	-
(76.4)	**(79.9)**	**(83.3)**	**(86.8)**	**(84.0)**	**(87.2)**	**(90.4)**	**(73.4)**	**(47.6)**	**(11.6)**	**0.0**
197.5	197.5	197.5	197.5	182.2	182.2	182.2	131.4	92.0	22.3	(0.0)
(313.5)	(318.8)	(324.0)	(325.4)	(309.5)	(314.4)	(319.2)	(223.0)	(164.1)	(40.0)	0.0
39.2	41.0	42.7	43.2	43.0	44.6	46.2	31.0	24.4	6.0	0.0
(76.8)	(80.3)	(83.7)	(84.7)	(84.4)	(87.6)	(90.8)	(60.6)	(47.7)	(11.7)	0.0
-	-	-	-	-	-	-	-	-	-	-
(76.7)	**(80.1)**	**(83.6)**	**(85.8)**	**(84.2)**	**(87.4)**	**(90.6)**	**(63.6)**	**(47.7)**	**(11.7)**	**0.0**
197.5	197.5	197.5	191.2	182.2	182.2	182.2	119.7	91.9	22.3	(0.0)
(314.0)	(319.2)	(324.4)	(319.5)	(309.9)	(314.8)	(319.6)	(211.2)	(164.1)	(40.0)	0.0
39.4	41.1	42.9	43.3	43.1	44.8	46.4	30.9	24.4	6.0	0.0
(77.1)	(80.6)	(84.0)	(85.0)	(84.6)	(87.8)	(91.0)	(60.6)	(47.8)	(11.7)	0.0
-	-	-	-	-	-	-	-	-	-	-
(77.0)	**(80.4)**	**(83.9)**	**(84.8)**	**(84.5)**	**(87.7)**	**(90.9)**	**(60.6)**	**(47.8)**	**(11.7)**	**0.0**
(75.5)	**(79.0)**	**(82.4)**	**(85.5)**	**(83.6)**	**(86.4)**	**(89.6)**	**(81.9)**	**(50.8)**	**(17.8)**	**(2.1)**
(75.4)	**(78.8)**	**(82.3)**	**(85.4)**	**(83.7)**	**(86.2)**	**(89.4)**	**(83.2)**	**(51.3)**	**(19.3)**	**(2.6)**