Appendix A

Workpapers Supporting N. Kohls Direct Testimony

WORKPAPERS SUPPORTING THE PREPARED DIRECT TESTIMONY OF NORM KOHLS

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I. INTRODUCTION:

On September 26, 2018, in compliance with California Public Utilities Commission (CPUC) Decision (D.) 18-06-028, San Diego Gas and Electric Company (SDG&E) and Southern California Gas Company (SoCalGas) submitted a proposed Line 1600 Test or Replacement Plan which presented and evaluated four potential design alternatives for the pressure test or replacement of 49.7 miles of existing Line 1600.[1] The CPUC's Safety and Enforcement Division (SED) formally reviewed and approved Design Alternative 1 (i.e. Replace in High Consequence Areas (HCA)/Test in Non-HCA alternative) on January 15, 2019. Subsequently, in D.20-02-024, Ordering Paragraph 4, the CPUC directed SDG&E and SoCalGas to file detailed Class Three cost forecasts for the 19 independent projects in the approved Line 1600 Design Alternative 1.[2] The workpapers that follow provide background and reference information and represent the planned activities and cost estimates for the projects that comprise the approved Design Alternative 1, which include 14 projects to replace pipeline primarily[3] located in HCAs and 5 projects to pressure test pipeline in non-HCA areas.

These workpapers are presented in three sections:

- Section II contains a **Summary of Standard Pipeline and Construction Practices for Replacement and Hydrotest Projects**. It provides an overview of typical pre-construction and construction activities that will occur during SDG&E and SoCalGas's PSEP Line 1600 pipeline replacement and hydrotest projects.
- Section III contains the **PSEP Glossary** that will assist in defining specific construction and financial terminology used throughout the workpapers.
- Section IV comprises the **SDG&E's Pipeline Safety Enhancement Plan (PSEP) Line 1600 Project Workpapers**, which describe the anticipated project scope, activities and underlying assumptions used in estimating the costs for each of the nineteen Line 1600 PSEP projects.

[1] 1) replacing 37 miles of Line 1600 pipeline in HCAs and secured federal lands and hydrotesting 13 miles of Line 1600 pipeline in non-HCAs (Replace in HCA/Test in Non-HCA alternative); 2) hydrostatic strength testing the entire length of L 1600 (Full Hydrotest alternative); 3) full replacement of Line 1600, routing in nearby streets in the north (Full Replacement in Nearby Streets alternative); and 4) full replacement of Line 1600, routing along Highway 395 in the north (Full Replacement Along Highway 395 alternative).

[2] D.20-02-024 ,Ordering Paragraph (OP) 4, at pp. 59-60, "Within six months of the issuance of the Decision Approving Limited Modifications To Decision 18-06-028, to supplement the above, Applicants shall file cost information that includes, but is not limited to: the Class Three cost forecast for all Line 1600 segments, cost estimating methodology, proposed accounting treatment, contingency factor assumptions, cost containment strategies, and proposed schedule for applications for reasonableness review and cost recovery, supported by direct testimony and workpapers, of the work to implement the SED-approved hydrostatic test or replacement plan to the Commission for review, with service to the parties in the proceeding.

[3] Approximately 2.1 miles of vintage Line 1600 located within a non-HCA area within the Marine Corp Air Station (MCAS) Miramar is planned to be replaced to address airfield security, access and environmental concerns raised by MCAS Miramar.

II. SUMMARY OF STANDARD PIPELINE AND CONSTRUCTION PRACTICES FOR REPLACEMENT AND HYDROTEST PROJECTS

SDG&E's high pressure transmission pipeline Line 1600 spans approximately 50 miles. The sections designated for PSEP replacement projects are situated for the most part in high density urban areas, considered high consequence areas (HCAs), which greatly increases the complexity of the construction work performed. HCA areas are also designated as Class 3 and 4.

Figure 1: Construction Area in HCA

Roughly one fourth of the Line 1600 mileage is in more rural and undeveloped areas, which are designated Class 1 and 2, and also known as non-HCA.

The following information provides an overview of the typical construction activities that occur during SDG&E and SoCalGas's 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 project.

LAND SERVICES AND PERMITTING - Stages 2 and 3

One of the planning activities that affects project design decisions and project scheduling for both replacement and hydrotest projects is the acquisition of any necessary land rights and securing of any necessary permits. The PSEP Land Services and Permitting teams develop strategies to support project site access for construction through the acquisition of any necessary temporary rights of entry (TREs) and permanent easements, and the securing of any necessary permits from agencies (e.g. Caltrans). For PSEP construction projects, there can be significant differences between projects that are on private land

and those that are on public rights of way (ROW). In the latter, certain permits and rights may be required from local municipalities for construction to occur. PSEP pipeline projects are primarily linear projects located in franchised rights of way (streets) but may also be located on private and federal land.

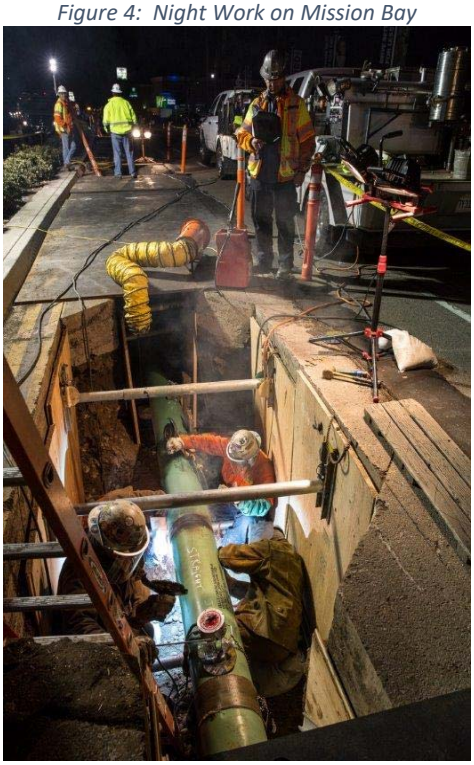
The design of some pipeline projects may require the acquisition of permanent pipeline easements from private landowners. Most PSEP projects require TREs for the storage of equipment, material, fabrication, water storage for hydrotests, work and office trailers, etc. for several weeks or months. Ideally, the size of the yard will be commensurate with the size of the project. Temporary and permanent land rights are typically acquired from private land owners. Permanent easements and/or temporary use agreements can take a long time to negotiate and may impact the project schedule. Some property owners may seek to impose their own work restrictions or requirements.

Figure 2: Typical Laydown Yard

Each construction site will present unique requirements that are necessary for safe and successful construction which also must follow any specific permitting requirements. Examples of permitting requirements would be requiring traffic controls or lighting requirements for night work. Permitting requirements will vary from site to site. Permits may take many months to secure and the requirements of the permit may not be known until construction is about to begin. Additionally, once construction has begun, agency inspectors may modify a permit once the construction site has been observed or based on input received from the community.

Figure 3: Traffic Control Along Camino del Rio South

Figure 4: Night Work on Mission Bay



ENVIRONMENTAL - Stages 2 and 3

As stated above, PSEP projects traverse through a variety of geographic locations: congested urban areas, highways/freeways, commercial centers, and natural areas including coastal zones, mountains, and deserts, and, as such, there may be permits required for a project. The permits may be issued by local, state, or federal agencies and they typically address protection of environmental resources, i.e.

land, air, water, natural and cultural resources, as well as the interests of the general public such as noise and traffic. Some of the most common agencies involved in PSEP projects are: U.S. Fish and Wildlife Service, U.S. Army Corps of Engineers, Bureau of Land Management, California Department of Fish and Wildlife, State Water Quality Control Board, and Air Quality Management Districts. Environmental permits can have long lead times and may impact project schedules. When feasible at reasonable cost, projects may be adjusted to avoid or minimize environmental impacts.

SURVEYING AND LOCATING – Stages 2 and 3

Surveying and locating activities typically take place during Stages 2 and 3, and identify and map ROW's, existing and proposed pipeline locations, as well as locations of other utilities and substructures. For a replacement project, this activity will span the entire length of the pipeline segment and/or the rerouted alignment. For a hydrotest project, the surveying and locating will take place at the locations selected for the test heads and bore pits and at other locations where features that impact piggability or the integrity of the line are planned to be removed.

Surveying and locating activities help to determine what will be needed for any permanent and/or 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. This is accomplished by extensive research including the review and analysis of city, county and other utilities' official records, site visits, and through confirmation via potholing prior to construction. Construction locations are typically crowded with other utility substructures which can result in the redesign of projects due to unidentified substructures that are discovered during construction.

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.

Potholing involves excavating a small hole over an existing substructure to validate the location including depth and size. Since it is critical that the exact pipeline location and substructures are known prior to the start of construction, potholing is typically completed during Stages 2 and 3, but there are circumstances when this activity occurs during Stage 4 (Construction).

CUSTOMER COMMUNICATION AND OUTREACH – Stages 2 and 3

During Stages 2 and 3, customers and other important community stakeholders such as schools that may be potentially affected by PSEP construction activities 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 early enough in the process to allow for customer input and changes to construction as needed and is done for both replacement and hydrotest projects. Customer

communication and outreach continues throughout Stage 4 (Construction) so that any customer complaints can be addressed in a timely and effective manner.

CONSTRUCTION CLEARING, GRADING, AND LAY-DOWN YARDS - beginning Stage 4

At the beginning of Stage 4 (Construction) clearing and grading activities typically take place for projects in non-paved locations or to prep laydown yards. Some projects require extensive clearing/grading 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 is required of the laydown yard and the pipeline construction area. Silt fencing, sand bags, straw wattels, etc. (collectively referred to as Best Management Practices or BMPs) are installed in specific project work areas to minimize the potential for water runoff, soil/silt migration, unauthorized discharge to storm drains, and protection of animals.

TRENCHING AND EXCAVATING REPLACEMENT PROJECTS – Stage 4

Trenching and excavating activity takes place in Stage 4 (Construction). The trenching operation in pavement begins with a saw-cutting crew which cuts the pavement for excavation.

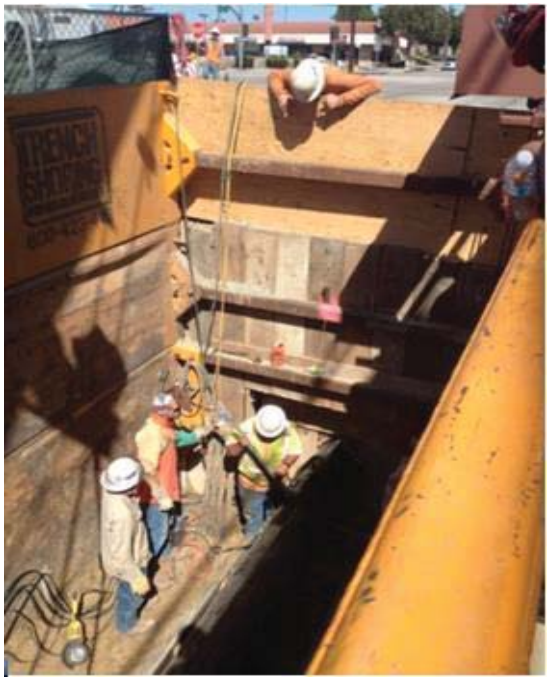
Figure 5: Saw Cutting Operations

Once the pavement is removed from the area, the trenching can begin. The trenching crew typically uses a backhoe to dig the pipeline trench. The trench is excavated to a depth that provides sufficient cover over the pipeline after backfilling. Typically, for Line 1600, the trench is about 30 to 36 inches wide and at least five-feet deep (depends on soil conditions, the pipeline's diameter, and DOT Class location to actual depth). This depth allows for the minimum 42 inches of cover specified for Line 1600.

Figure 6: Excavation with Backhoe

Many pipelines are located at a depth which requires shoring systems to be installed for construction. The shoring is necessary for safety reasons when the excavation is more than five feet deep or is in sandy soil conditions.

Figure 7: Shoring



The shoring can limit the work area due to beams and other structures that obstruct the construction process which can slow down production. An example of why greater pipeline depth is needed is a railroad crossing or conflict with existing sub-structures.

Figure 8: Shoring in an Urban Location

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 and temporary paving are often required 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.

Often, existing pipelines have 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 five feet by eight feet and takes a crew approximately one 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 placed in service. Then these tap connections to the new pipeline can be completed and backfilled.

In some instances the existing pipeline cannot be abandoned in place. There are some municipalities that require the existing pipeline to be removed and the new pipeline to be installed in the same location.

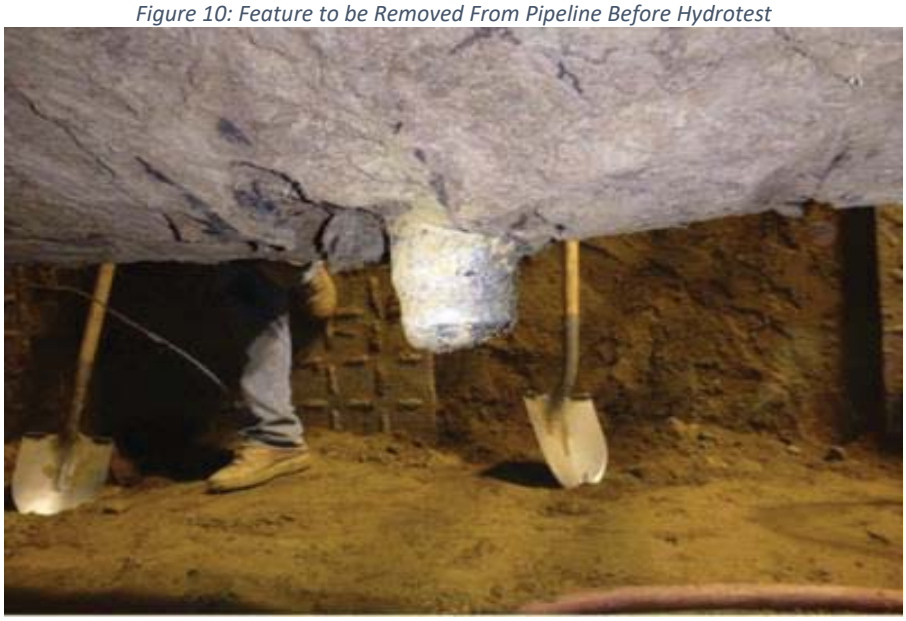
This also might be necessary if the pipeline right of way is not large enough for the replacement pipeline. This removal step can greatly add to the complexity and time for the project.

TRENCHING AND EXCAVATING HYDROTEST PROJECTS – Stage 4

The trenching/excavating activity for a hydrotest project will involve exposing the ends of the pipeline to be tested, exposing and removing all non-piggable pipeline features, and removing/replacing any pipeline features that cannot be pressure tested. The removal process in general will also involve welding and Non-Destructive Examination (NDE) of pipeline welds. In addition, all tap locations (customer lines, regulator station taps, etc.) that are off the main line will be excavated so they can be isolated before a hydrotest. Finally, test heads will be installed on either end of the pipeline. This will require a minimum of a 10 foot x 20 foot bell hole.

Figure 9: Bell hole inspection of Line 1600

Figure 10: Feature to be Removed From Pipeline Before Hydrotest



TRENCHLESS CONSTRUCTION – Stage 4

Some pipeline projects require trenchless installations using a bore operation (e.g. jack and bore, slick bore, horizontal directional drill) when the pipeline needs to go under a structure or geographic feature and an open trench cannot be dug, for example for crossing a freeway/highway or railroad, to avoid disrupting traffic across a busy intersection, or to avoid a stream or river channel. In this case, there is only an excavation at the entry and exit 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.

Figure 10: Highway 163 Horizontal Directional Drill (HDD) Crossing

Figure 11: Jack and Bore Pit

Figure 12: Jack and Bore Operations

PIPELINE LAYING, BENDING, WELDING - Stage 4

For a replacement project, 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.

Figure 13: Pipe with Field Bend

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.

NON-DESTRUCTIVE EXAMINATION (NDE) - Stage 4

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 per code requirements.

LOWERING PIPE INTO THE TRENCH - Stage 4

Depending on the length of pipe to replace, lowering the welded pipe into the trench demands close coordination and skilled operators. 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 six inches of sand to protect the pipe and coating from damage. Lastly, cathodic protection test stations may be installed on the pipeline before backfilling.

Figure 14: Lowering Section of Pipe into the Trench

FIELD COATING - Stage 4

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.

Figure 15: Coating Crew Preparing to Abrasive Blast

Figure 16: Holiday Testing of a Coated Weld

BACKFILLING AND PAVING - Stage 4

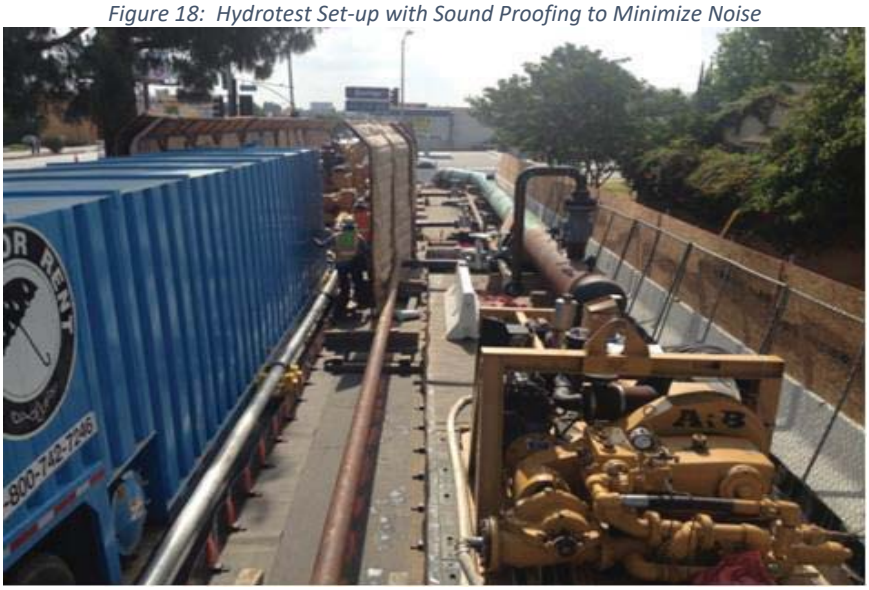
After all welds have passed NDE, coating is completed and passes inspection, and survey crews record the location of the pipe and various valves/fittings, crews begin the backfilling process. As with previous construction crews, the backfilling crew takes care to protect the pipeline and coating by using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

HYDROSTATIC TESTING - Stage 4

All new replacement pipe undergoes a post completion hydrotest. Depending on the varying elevation of the terrain along the pipeline and the location of available water sources, the pipeline may be divided into two or more test sections. 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.

Figure 17: Hydrotest Equipment

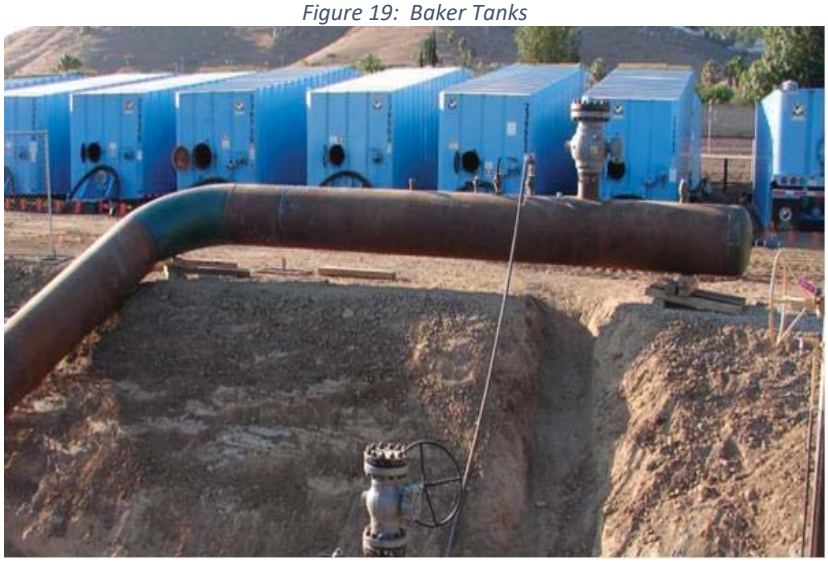
Figure 18: Hydrotest Set-up with Sound Proofing to Minimize Noise



Once a section successfully passes the hydrostatic test, water is emptied from the pipeline into large water tanks (Baker tanks) and the pipeline is dried to ensure that no water is present when natural gas begins to flow. The drying of the pipeline is completed using large compressors and foam tools also known as pigs. A pig launcher and receiver are installed at the ends to facilitate this process. The team will continue to pass the pigs 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 three 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.

Figure 19: Baker Tanks



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. Permit requirements typically dictate how the used hydrotest water is disposed.

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 removal of the small section of pipe at each end. The non-tested side of the pipeline must be welded with a cap that will be cut out after testing is completed.

FINAL TIE-IN AND COMMISSIONING - Stage 4

Following successful hydrostatic testing and drying, the final pipeline tie-ins are made and inspected. The line is then odorized for safety reasons which is a process that will take up to two 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 Compressed Natural Gas/Liquified Natural Gas 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 typically takes a few days to complete.

Figure 20: Final Tie-in

CLEANUP AND RESTORATION - Stage 4

The final step in the construction process is to restore the street, right-of-way, TREs, easements, and laydown yards as closely as possible to their original condition. This step involves removing all equipment, materials, trailers, etc. and cleaning up the lay-down yard, completing the paving repairs or land restoration as required by the applicable permit or land owner agreements. Careful attention is paid to unpaved areas so that future erosion and water runoff issues are addressed after construction is complete.

III. PIPELINE SAFETY ENHANCEMENT PLAN (PSEP) GLOSSARY OF TERMS AND ACRONYMS

The following list of acronyms, terms and high level definitions are intended to accompany the PSEP Line 1600 Replacement and Hydrotest Projects' workpapers that support the testimony of Norm Kohls (Chapter 1). 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
	Bell Hole (Weld Hole)	An excavation that minimizes surface disturbance and provides sufficient room for examination or repair of buried facilities.
BMP	Best Management Practices	Activities, maintenance procedures, and other management practices to prevent or reduce the pollution of waters of the United States. BMPs are also operating procedures and practices to control facility site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage.
	Blowdown	A controlled activity to release gas from an active pipe section to isolate the pipe section for maintenance or construction activities.
	Bollards	Short vertical post structures to control or direct road traffic.
	Bore Pit	An excavation that allows for the boring equipment to either send or receive pipe which has been bored through earth.
	Boring	The act or process of making or enlarging a hole.
	Bypass	Delivery of gas through alternate piping that allows for a section of pipeline to be isolated from the system.
	Capital	Costs of new additions of plant, property and equipment that have a useful life of more than one year. New additions include any costs incurred to construct, install and/or prepare plant, property, and equipment for its intended use. Capital-related costs include depreciation, taxes and return associated with the cost of the assets.
	Category 1	Pipeline segments that have documentation of hydrostatic pressure testing to at least 1.25 times the MAOP.
	Category 2	Pipeline segments that have documentation of pressure testing to at least 1.25 times MAOP using a medium other than water.
	Category 3	Pipeline segments for which documentation validates that the highest in-service operating pressure is at least 1.25 times the current MAOP.
	Class location or Class	Class locations are a method of differentiating risk along gas pipelines. Regulations for gas transmission pipelines establish pipe strength requirements based on population density near the pipeline. Locations along gas pipelines are divided into

		classes from 1 (rural) to 4 (densely populated) and are based on the number of buildings or dwellings for human occupancy.
	Class 1	An offshore area; or any class location unit that has ten or fewer buildings intended for human occupancy. 49 C.F.R. § 192.5.
	Class 2	Any class location unit that has more than ten but fewer than 46 buildings intended for human occupancy. 49 C.F.R. § 192.5.
	Class 3	A Class Location unit that has 46 or more buildings intended for human occupancy; or an area where the pipeline lies within 100 yards (91 meters) of either a building or a small, well-defined outside area (such as a playground, recreation area, outdoor theatre, or other place of public assembly) that is occupied by 20 or more persons on at least five days a week for ten weeks in any 12-month period. (The days and weeks need not be consecutive.) 49 C.F.R. § 192.5.
	Class 4	A class location unit where buildings with four or more stories above ground are prevalent. 49 C.F.R. § 192.5.
	Coal Tar	A water-resistant coal based material that is used as a coating to protect the pipelines against underground corrosion.
	Coal Tar Wrap	A thermoplastic polymeric coating produced from the plasticization of coal tar pitch, coal and distillates, followed by the addition of inert filler.
	Cold Tie-In	The method of connecting new pipe to existing pipe that is shut-down and not pressurized during the tie-in procedure.
	Criteria	Class 3 & 4 locations and Class 1 & 2 High Consequence Areas (HCA).
	Dewater	The removal of the test water from a pipeline.
	De-rate	Lowering the Maximum Allowable Operating Pressure (MAOP).
	Direct Costs	Direct costs are for those activities and services that support execution of a specific project, such as labor costs, which include salaries of Company employees, and non-labor costs, which include costs for contract labor, purchased services, and materials required to complete a specific project.
	Disbonded	Any loss of bond between the protective coating and steel pipe as a result of coating adhesion failure, chemical reaction, mechanical damage, or hydrogen concentrations.
	Drain	A capped off section of a gas pipeline installed in a manner designed to capture debris or moisture in the gas pipeline, where it can be cleaned out.
	Drip Leg	An additional section of gas pipeline installed in a manner designed to capture debris or moisture in the gas pipeline, where it can be cleaned out.
	Drip Pot	A drain installed on the bottom of a pipeline to capture and remove liquid and solid debris pushed along the pipeline.
	Elbow	A fitting that is designed and manufactured in a manner designed to produce a 90 degree change in the direction of flow in the pipe.

ERW	Electric Resistance Welding	A group of welding processes that produce coalescence of faying surfaces where heat to form the weld is generated by the electrical resistance of material combined with the time and the force used to hold the materials together during welding.
	Encroachment	An "encroachment" is any tower, pole, pole line, pipe, pipeline, fence, billboard, stand or building, or any structure, which is in, under, or over any portion of the street or highway rights of way.
ECDA	External Corrosion Direct Assessment	A four-step process that includes pre-assessment, indirect inspection, direct examination, and post assessment to evaluate the threat of external corrosion to the integrity of a pipeline.
	Feature Study	A study that provides the physical components of a pipeline and the attributes associated with those components.
GPR	Ground Penetrating Radar	A geophysical assessment method that uses radar pulses to image the subsurface. This nondestructive method uses electromagnetic radiation in the microwave band (UHF/VHF frequencies) of the radio spectrum, and detects the reflected signals from subsurface structures.
HCA	High Consequence Area	An area where a pipeline release could have greater consequences to health and safety or the environment. More specifically defined in 49 C.F.R. § 192.903.
	High Pressure	Pressure greater than 60 psig.
HDD	Horizontal Directional Drilling	A minimal impact, trenchless method of installing underground pipe in a relatively shallow arc or radius along a prescribed underground bore path.
	Holiday Testing (jeeping)	The act of assessing a pipeline using a holiday detector or “jeep.” Holiday detectors are employed in the non-destructive detection and location of pinholes, holidays, bare spots or thin points in protective coatings applied for corrosion protection over metal or concrete (conductive) surfaces. A holiday detector is also known as a porosity detector, pinhole tester, spark tester, jeep tester or jeeper.
	Hot Tap	A 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	The method of connecting new pipe to existing pipe that is not shut-down and is pressurized during the tie-in procedure.
	Indirects	Costs for activities and services that are associated with direct costs—such as payroll taxes, property taxes and pension and benefits —and benefit a project but are not directly charged to a project.
	Jack-and-Bore	Method of horizontal boring construction. Construction crews drill a hole underground horizontally between two points without disturbing the surface between sending and receiving pits.

	Lateral	A segment of a pipeline that branches off a main or transmission line to transport gas to a termination point.
	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.
	Midden Soil	A midden is an old dump for domestic waste which may consist of animal bone, human excrement, botanical material, mollusk shells, sherds, lithics (especially debitage), and other artifacts and ecofacts associated with past human occupation. Midden soils are formed from composted material accumulated via incidental human activity (often in middens).
	Miter bend	A joint made by beveling each of two parts to be joined, usually at a 45° angle, to form a corner, usually a 90° angle.
NDE or NDT	Nondestructive Examination or Nondestructive Testing	Evaluation of a pipeline using a number of inspection methods that are typically performed manually on exposed pipeline surfaces without causing damage, such as radiography, ultrasonic inspection, or magnetic particle testing.
NOP	Notice of Operation	Notification from a project team to the Accounting department that an asset has been placed in service. In some instances, NOP may also refer to the date an asset is placed in service.
O&M	Operations and Maintenance	Costs for activities related to the operation or maintenance of an asset.
PIG	Pipeline Inspection Gauge or "Smart Pig"	A device that is sent through a pipeline internally to detect signals caused by pipeline flaws.
	Pig	A tool that is sent down a pipeline and propelled by the pressure of the product flow in the pipeline itself. Used to perform various maintenance operations.
	Piggable	A pipeline that is capable of being evaluated using currently-available in-line inspection technology.
	Potholing	An excavation used to locate known subsurface structures. Potholing is most often used when a contractor needs to verify the depth, size or type of underground utility.
PCF	Pressure Control Fittings	Fittings used to stop or redirect flow in an active pipeline system.
	Regulator Station	Equipment installed on a pipeline for the purpose of automatically reducing and regulating the gas pressure in the downstream pipeline.
RER	Request for Engineering Review	Process by which the Engineering department within SDG&E and SoCalGas 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.
	Segment	A length of pipe with the same attributes.
	Slurry	A slurry is a thin wet mud or cement or, in extended use, any fluid mixture of a pulverized solid with a liquid (usually water).
SMYS	Specified Minimum Yield Strength	The minimum yield strength prescribed by the specification under which pipe is purchased from the manufacturer.
	Spool	Piece of pipe flanged on both ends that can be removed and re-installed.
	Stopple (Pressure Control Fitting)	A plug that can stop the flow of gas.
SWPPP	Stormwater Pollution Prevention Plan	A fundamental requirement of stormwater permits that identifies potential sources of pollution that may reasonably be expected to affect the quality of storm water discharges from the construction site, describes the practices to be used to reduce pollutants in storm water discharges from the construction site, and helps assure compliance with the terms and conditions of the permit (when the plan is designed for the individual site, and is fully implemented).
	Subpart J	Subpart J refers to 49 CFR 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.
	T-Cuts	Cuts made to asphalt after the backfill is completed for structural strength and sealing against water intrusion.
	Tee	A pipe fitting that is T-shaped having two outlets, at 90° to the connection to the main line. It is used for connecting pipes of different diameters or for changing the direction of pipe runs.
TRE	Temporary Right of Entry	Temporary permission to enter and perform various activities on private property which include but are not limited to land and environmental surveys to support planning and design and contractor laydown yards and work space in support of construction.
	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 project's direct costs.
	Two -sack Slurry	A slurry is a thin wet mud or cement or, in extended use, any fluid mixture of a pulverized solid with a liquid (usually water). The sack designation indicates the amount of aggregated/cement added to the sand.
	Type C Soil	The least stable type of soil, which includes granular soils in which particles do not stick together and cohesive soils with a low unconfined compressive strength; 0.5 tons per square foot or less. Examples of Type C soil include gravel and sand.

	Wedding bands	A welded sleeve on a pipeline that can be used to repair gas transmission pipelines. It allows for full encirclement repair over damage/defects.
	Wrinkle Bend	A pipe bend produced by a field machine or controlled process which may result in abrupt contour discontinuities on the inner radius.

IV. SDG&E'S PIPELINE SAFETY ENHANCEMENT PLAN (PSEP) LINE 1600 PROJECT WORKPAPERS

This Pipeline Projects workpaper section provides the workpapers for the fourteen replacement projects and five pressure test projects depicted in Figure 1. Each PSEP workpaper provides a project summary and describes the activities and assumptions used to develop a forecasted scope of work that addresses the unique aspects of each PSEP project and forms the basis for the Total Installed Cost "TIC" estimated project costs that result from those activities. The TIC estimate includes direct costs associated with project management, engineering and design, environmental review and permitting, land acquisition, material and equipment procurement, and construction. The TIC is presented in constant dollars (unescalated) and does not include Indirect Costs. Indirect Costs are determined separately and represent costs for activities and services that are associated with direct costs—such as payroll taxes, property taxes and pension costs that benefit a project but are not directly charged to a project. The summation of Direct and Indirect Costs is Total Costs, also sometimes referred to as Loaded Costs. The direct costs in the Workpapers reflect escalation, but do not include Allowance for Funds Used During Construction (AFUDC) or capitalized property tax.

Workpaper Structure

Each of the workpapers that follow is organized to capture the key elements of the forecasted direct cost estimate:

Total Project Cost Table(s) – *provides an overview of direct and indirect project costs incurred through 2019 and five years of forecasted Capital costs (2020-2024). In Replacement Project workpapers, only one table is provided that represents forecasted Capital costs. For Hydrotest Project workpapers, two additional tables are provided that represent forecasted O&M and Total Project Costs (Capital plus O&M).* Cost tables *separate costs into Direct Labor, Direct Non-Labor, Total Direct Costs and Indirect Costs. Direct Labor represents salaries of Company (SDG&E and SoCalGas) management and represented employees. Direct Non-Labor represents costs for activities and services that support execution of a specific project, which include costs for contract labor, purchased services, and materials required to complete a project. Total Direct Costs represents the summation of Direct Labor and Direct Non-Labor. The direct costs in the Workpapers reflect escalation, but do not include AFUDC or capitalized property tax. Total Indirect Costs represent charges incurred for* activities *and services that are associated with direct costs as detailed above.*

Project Description – *describes the project location and an overview of the project scope.*

Alternatives Considered – On September 26, 2018, SDG&E and SoCal Gas submitted to SED the proposed Line 1600 Test or Replacement Plan which evaluated four design alternatives:

Design Alternative 1: replace Line 1600 pipeline in High Consequence Areas (HCAs) and hydrotest Line 1600 pipeline in non-HCAs (Replace in HCA/Test in Non-HCA alternative);
Design Alternative 2: hydrotest the entire length of Line 1600 (Full Hydrotest alternative);
Design Alternative 3: full replacement of Line 1600, routing in nearby streets in the north (Full Replacement in Nearby Streets alternative); and
Design Alternative 4: full replacement of Line 1600, routing along Highway 395 in the north (Full Replacement Along Highway 395 alternative).

The SED evaluated the proposal and approved Design Alternative 1: replace pipeline sections that are primarily routed through High Consequence Areas (HCAs) and test pipeline sections in non-HCAs.

Shut-In Analysis – *states whether the project section can be temporarily taken out of service and the means, if any, by which service to customers will be maintained.*

Forecast Methodology – *the Workpapers note that the forecast methodology briefly describes the categories of costs considered in developing the project's Total Installed Cost (TIC) estimate.*

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

Project Overview (Topographic) and Satellite Maps – *the first of the two maps provides a conventional map and the general location of the project and color codes the pipeline segments as New, Cat 4 Criteria (i.e. pipelines segments that lack sufficient documentation of a post-construction strength test to at least 1.25 times the MAOP in HCA areas); Cat 4 (i.e. pipelines segments that lack sufficient documentation of a post-construction strength test to at least 1.25 times the MAOP in non-HCA areas); and Incidental mileage (i.e. pipeline miles that do not fall within the scope of the Commission's directives in D.11-06-017 or California Public Utilities Code section 958, but are addressed as part of the PSEP project, where their inclusion is determined to improve cost and program efficiency, address constructability, or facilitate continuity of testing.). The second, a satellite map, shows the type of terrain (urban, rural, river crossings, highways, etc.) the project traverses and color codes the pipeline segments as Test, Replace, Abandon or New. All New pipeline is tested following installation and therefore is designated as New rather than Test.*

Mileage Table – *distinguishes between Category 4 Criteria (i.e. pipelines segments that lack sufficient documentation of a post-construction strength test to at least 1.25 times the MAOP in HCA areas); Category 4 (i.e. pipelines segments that lack sufficient documentation of a post-construction strength test to at least 1.25 times the MAOP in non-HCA areas); and Incidental mileage (i.e. pipeline miles that do not fall within the scope of the Commission's directives in D.11-*

06-017 or California Public Utilities Code section 958, but are addressed as part of the PSEP project, where their inclusion is determined to improve cost and program efficiency, address constructability, or facilitate continuity of testing.)

Material Costs – *are the estimated non-labor costs that are based on the assumptions made regarding the type and quantities of material considered to be required for the project based on the known conditions.*

Construction Costs – *are the estimated non-labor* costs that are based *upon assumptions made in the development of the construction component of the project. General assumptions consist of:*

- *the type of geography where the pipeline construction activity is located,*
- *estimated construction schedule duration,*
- *working days and hours and any working hour restrictions,*
- *type of pipe installation method (i.e. open trench, jack and bore, Horizontal Directional Drilling (HDD,*

Other pertinent construction assumptions based on the unique aspects and challenges of each project location could include estimated direct costs associated with:

- *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 Survey/Permitting/Monitoring Costs – *are the estimated non-labor costs that are based upon evaluation of the project site by PSEP Environmental Services, and the assumptions regarding anticipated permitting, surveys, and monitoring, hazardous/non-hazardous waste containment/disposal, permit fees, and mitigation fees. Listed also are site specific environmental issues that are unique to the project.*

Land & Right of Way Acquisition Costs – *are the estimated non-labor costs based on evaluation of the project site. Assumptions will vary by site and could include the cost for new easements,*

construction yards for the storage of material and construction trailers and associated permits and legal services.

Company Labor Costs – *are the estimated direct labor costs of SDG&E and SoCalGas management, engineering, and union personnel in support of the project's anticipated activity and level of effort for Project Management, Project Field Management, Construction Management and union Labor.*

Other Costs – *are the estimated non-labor costs,* estimated costs of contracted Project Management and Engineering services*. Engineering services are contracted resources to augment Company engineering labor. Other costs also include non-labor expenses related to business related mileage, travel, meals and lodging.*

The Five Stage Review Process

As described in the testimony of Norm Kohls, the Line 1600 PSEP Projects will be managed according to the **Five Stage Review Process**[4] which sequences and schedules project workflow deliverables. The process promotes, among other things, that planning and engineering design are properly executed, accurate cost estimates are developed, and records are included in the final project packages. The Five Stage Review Process consists of five 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. Key design, management and execution actions and activities occur within and across the various stages as described below. Through the Stage Gate process, leadership is informed and takes action when there is a material variance to a project's assumptions regarding cost, schedule or scope. Below is a description of the common activities that occur within the PSEP Five Stage Review Process:

Stage 1: Project Initiation[5] The Project Team develops a preliminary project scope, cost estimate and baseline schedule. The initial funding (Phase 1 WOA) is authorized to support the analysis and design of preliminary options. The Project Team assesses and validates the Category 4 Criteria mileage. The mileage originally included for remediation[6] may be modified due to scope validation efforts, due to

[4] A Seven Stage PSEP review process was implemented by the PSEP Organization in 2013. The process was updated and revised in 2018 into the Five Stage Process that incorporates the same activities as the seven stage process.
[5] For PSEP Line 1600 Replacement and Hydrotest Projects, Stage 1 has been completed.
[6] Mileage identified as Category 4 Criteria in the Amended PSEP of SoCalGas and SDG&E, submitted December 2, 2011, in R.11-02-019 and subsequently transferred to A.11-11-002.

reduction in Maximum Allowable Operating Pressure (MAOP), or abandonment of lines that are no longer required from a gas operating system perspective.

Stage 2: Preliminary Design and Option Selection[7] The Project Team analyzes the proposed options (replace, test, abandon or de-rate) and makes the selection based on scope, cost, schedule and risk. The preliminary design is initiated, and secondary funding (Phase 2 WOA) is submitted and authorized. The project scope, cost, and schedule are baselined. Procurement and permitting activities are initiated.

Stage 3: Project Development The Project Team refines and finalizes the project design, secures the necessary permits and completes procurement activities. The Project Team initiates the Construction Contractor selection process. The design and construction documents are completed, and the cost estimate and schedule are refined as needed.

Stage 4: Construction The Project Team selects a Construction Contractor and initiates construction mobilization. Throughout the construction process, the Project Team monitors the scope, cost and schedule and ensures safety requirements are followed. Upon completion and once all inspections are complete, the pipeline is commissioned and placed back into service. The construction site is demobilized and the site is restored.

Stage 5: Closeout The Project Team performs regulatory, contractual, archival activities to close the project in an orderly manner and issue acceptance certificates.

[7] For PSEP Line 1600 Replacement and Hydrotest Proejcts, Stage 2 has been completed.

Figure 1: Map of PSEP Plan to Replace in HCAs, Hydrotest in Non-HCAs

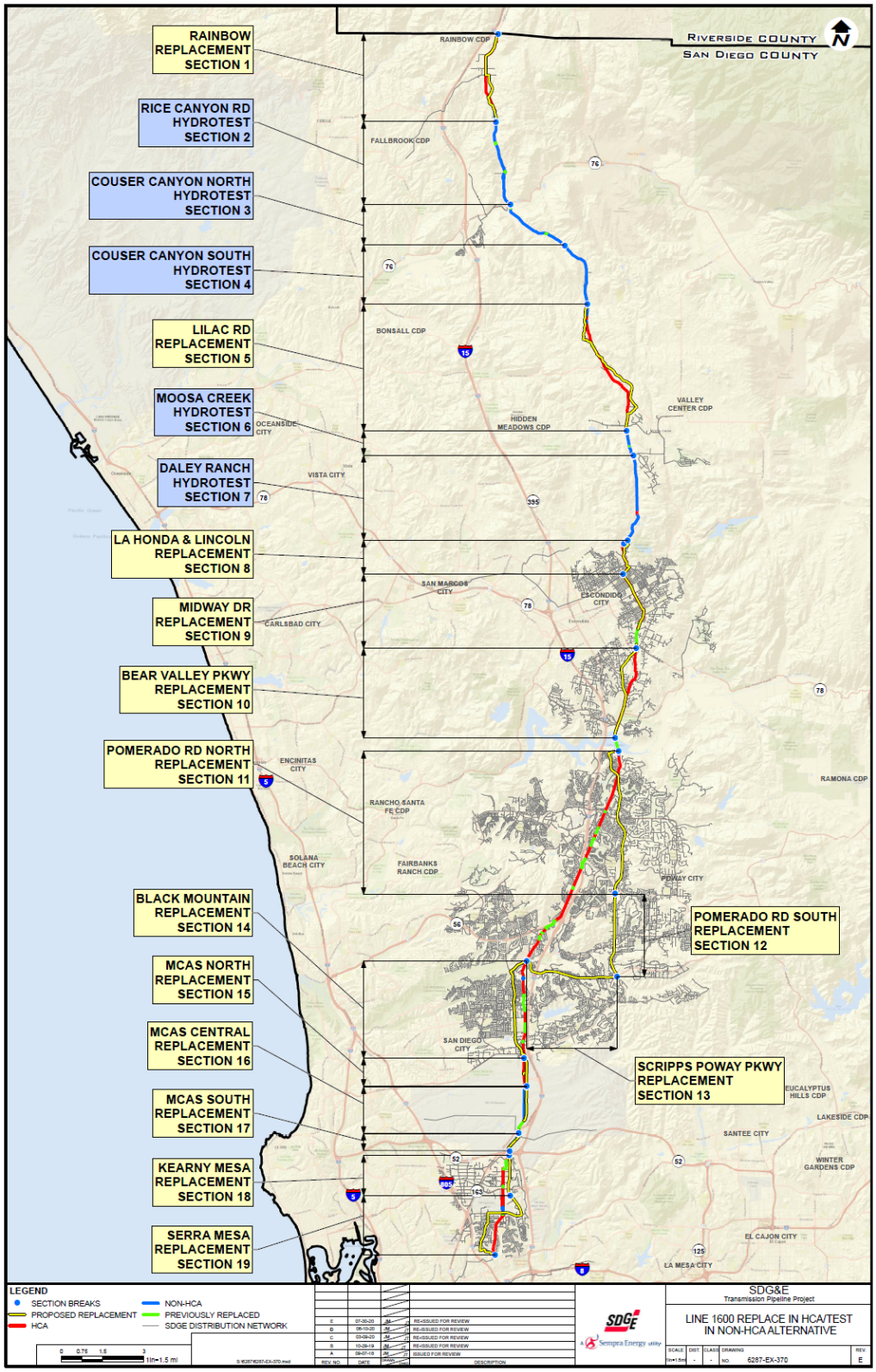


Table 1: Total Project Cost ($000's)

PROJECT COST	2019 & Prior[1]	2020	2021	2022	2023	Total[2]
DIRECT LABOR	$400	$14	$266	$884	$0	$1,563
DIRECT NON-LABOR	$1,927	$100	$5,247	$26,244	$1,364	$34,882
TOTAL DIRECT COSTS[3]	$2,326	$114	$5,512	$27,128	$1,364	$36,445
COMPANY OVERHEADS[4]	$439	$20	$1,130	$2,333	$70	$3,993
Total Capital Costs	$2,766	$134	$6,643	$29,461	$1,434	$40,438

Project Description

Line 1600 is a 16-inch diameter transmission line that runs approximately 49.7 miles from Rainbow to Mission Valley, San Diego. Per the CPUC Safety and Enforcement Division (SED) approved *Line 1600 Test or Replacement Plan*, the Line 1600 testing and replacement work is comprised of 19 independent projects. This workpaper describes the Line 1600 Rainbow Replacement project. The Line 1600 Rainbow Replacement project is located in the County of San Diego. The project will replace approximately 3.453 miles of existing 16-inch pipeline with 3.686 miles of new 16-inch pipeline along Rainbow Valley Boulevard to Rice Canyon Road, ending north of the intersection of Rice Canyon Road and Moon Ridge Road. Due to the offset of the new alignment, additional distribution work will be required as part of the project scope to allow for existing customers to be served from the rerouted alignment. The project will also install approximately 3.686 miles of fiber optic cable with one fiber optic monitoring station. Fiber optic cable will be installed along the new 16-inch pipeline to assist in leak detection, ground movement, and vibration analysis.

Considerations unique to the project are as follows:

- The new pipeline will be installed within County of San Diego street right of way (ROW) with a portion of the route being within a paving moratorium. This will require additional street repair requirements set by the County.
- This project will install a fiber optic monitoring station. The monitoring station will require a minimum of a 10 foot by 10 foot space for above ground communication equipment.
- A high level hazard analysis identified a historic flood plain near the intersection of Rainbow Valley Boulevard and Rainbow Creek Road. Additional geotechnical analysis will be performed to determine what mitigation efforts may be necessary. The information will be utilized by engineering to provide the design recommendation for this location.
- Geological formations identified within the area indicates that rock is likely to be encountered along Rice Canyon Road. This will require specialized equipment to break the rock and may impact construction productivity.

[1] Actual costs incurred associated with planning and engineering design work are included in the project cost estimates.
[2] Values may not add to total due to rounding.
[3] Direct Costs reflect escalation.
[4] Excludes AFUDC and tax.

Alternatives Considered

D.18-06-028, Ordering Paragraph 7, required SDG&E and SoCalGas to "submit to Safety and Enforcement Division a hydrostatic test or replacement plan pertaining to the existing 49.7 miles of Line 1600 in its present corridor." The Decision further required such plan to discuss two options: "1. Hydrotest the entire 49.7 miles of line and replace those segments that fail the test; and 2. Replace all pipeline segments in High Consequence Areas (HCAs) along Line 1600, thus ensuring a new pipeline without vintage pipeline characteristics that are perceived to increase the risk of Line 1600. Hydrotest in solely non-HCA segments would ensure less impact if there was a failure during hydrotesting." SDG&E's and SoCalGas' September 26, 2018 *Line 1600 Test or Replacement Plan* discussed D.18-06-028's two options as Design Alternative 1 (Replace in HCA/Test in Non-HCA alternative) and Design Alternative 2 (Full Hydrotest alternative), and also discussed Design Alternative 3 (Full Replacement in Nearby Streets alternative) and Design Alternative 4 (Full Replacement Along Highway 395 alternative). SDG&E and SoCalGas proposed to implement, and the CPUC SED approved, Design Alternative 1, which will replace existing Line 1600 primarily in HCAs and hydrotest the remaining sections in non-HCAs. D.18-06-028 at 92 also required the Utilities to "identify proposed rerouting of the line in specific segments." As discussed in the *Line 1600 Test or Replacement Plan*, "SDG&E and SoCalGas concluded it is not feasible, prudent nor reasonable to build a new replacement pipeline entirely within the existing Line 1600 rights-of-way." Due to construction difficulty, private property and community impacts, environmental impacts, and costs and delays of efforts to expand the existing rights of way (ROW), the *Line 1600 Test or Replacement Plan* proposed to re-route the majority of replacement segments, usually in nearby streets. In developing the Plan, SDG&E and SoCalGas reviewed these proposed re-routes with SED, which "conducted a joint field inspection of the identified sites with SDG&E personnel and its contractor to evaluate the existing safety conditions, constructability and serviceability of Line 1600. After the field inspections, SED agreed with SDG&E's and SoCalGas' proposed reroute of many segments of Line 1600 due to safety and serviceability reasons."

D.20-02-024 requires "a cost forecast for the approved Design Alternative 1 (Replace in HCAs and Hydrotest in Non-HCAs) that SED approved on January 15, 2019."[2] D.20-02-024 at 31-32 held that issues "out of scope" for Phase 2 include "revisiting Design Alternatives 2 (Full Hydrotest Alternative), 3 (Full Replacement), 4 (Full Replacement but different street routing) or alternative recommendations. Nor are we revisiting the substance of the PSEP engineering and implementation that falls within the authority of SED."

Shut-In Analysis

The Line 1600 Rainbow Replacement project can be temporarily taken out of service however, transmission capacity issues will need to be mitigated through partial curtailment of non-core customers or by bringing supply into the San Diego system through alternate receipt points, if available. The shut-in plan includes phasing the tie-in to mitigate the impacts to the local distribution system. The new section will be placed into service while at the same time allowing the old section to remain in service for a short period of time. Once the new section of line is in service, the distribution feeds will be tied over to the new section of line.

Forecast Methodology

The Utilities methodology for forecasting PSEP costs is discussed in the Direct Testimony of Ronn Gonzalez. The Utilities developed a Total Installed Cost (TIC) estimate to implement the above scope of work. The TIC Estimate includes direct costs associated with project management, engineering and design, environmental permitting, land acquisition, material and equipment procurement, and construction.

Following the approval of the Plan by SED in January 2019, the Utilities have undertaken the detailed design and planning of the 19 individual projects in the Plan. Generally, projects that are earliest in the overall schedule are the most developed, while those later in the overall schedule are less developed. At the time of cost estimate preparation, this project was at an approximately 30% design level. Further development of this project could reveal new information requiring some adjustments to the project plan in areas such as engineering, materials, construction, permitting, environmental and land, all of which could impact actual costs compared this cost estimate.

Schedule

Implementation of this project is proposed to be completed consistent with the overall prioritization and timing described in Section IV. D. of the *Line 1600 Test or Replacement Plan.* The schedule was developed based on the five-stage project life cycle as defined by PSEP. The key project deliverables were identified and incorporated into a work breakdown structure. This work breakdown structure was then sequenced, and predecessor and successor tasks were linked to each task. Durations were added to each task to provide a total project duration.

The preliminary Stage 2 Construction Schedule received additional planning and stakeholder input considering that typically 50% of the project costs are expended during the construction phase. The construction schedule is assumed to be 138 working days.

Figure 1: Overview Map for Line 1600 Rainbow Replacement

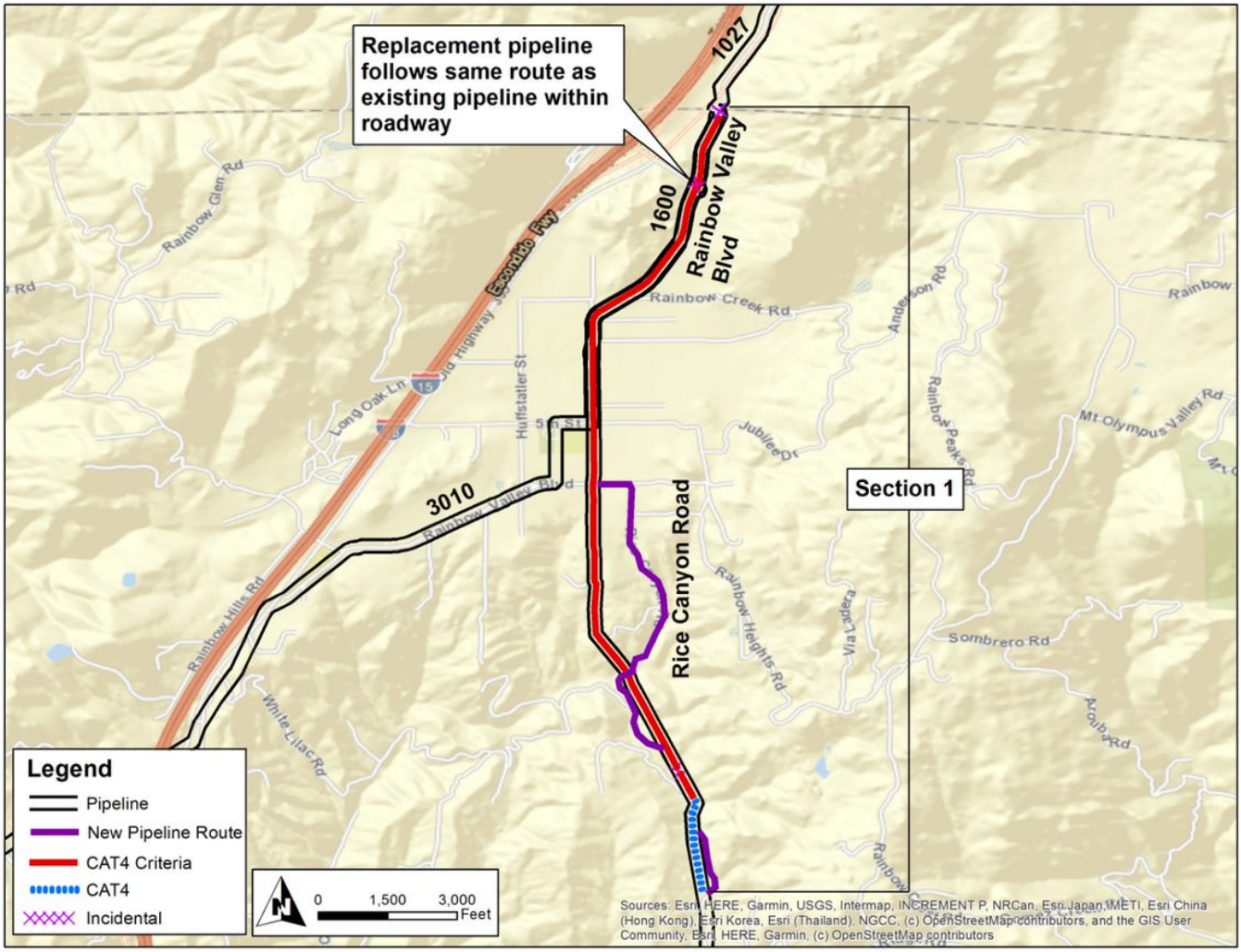


Figure 2: Satellite Map for Line 1600 Rainbow Replacement

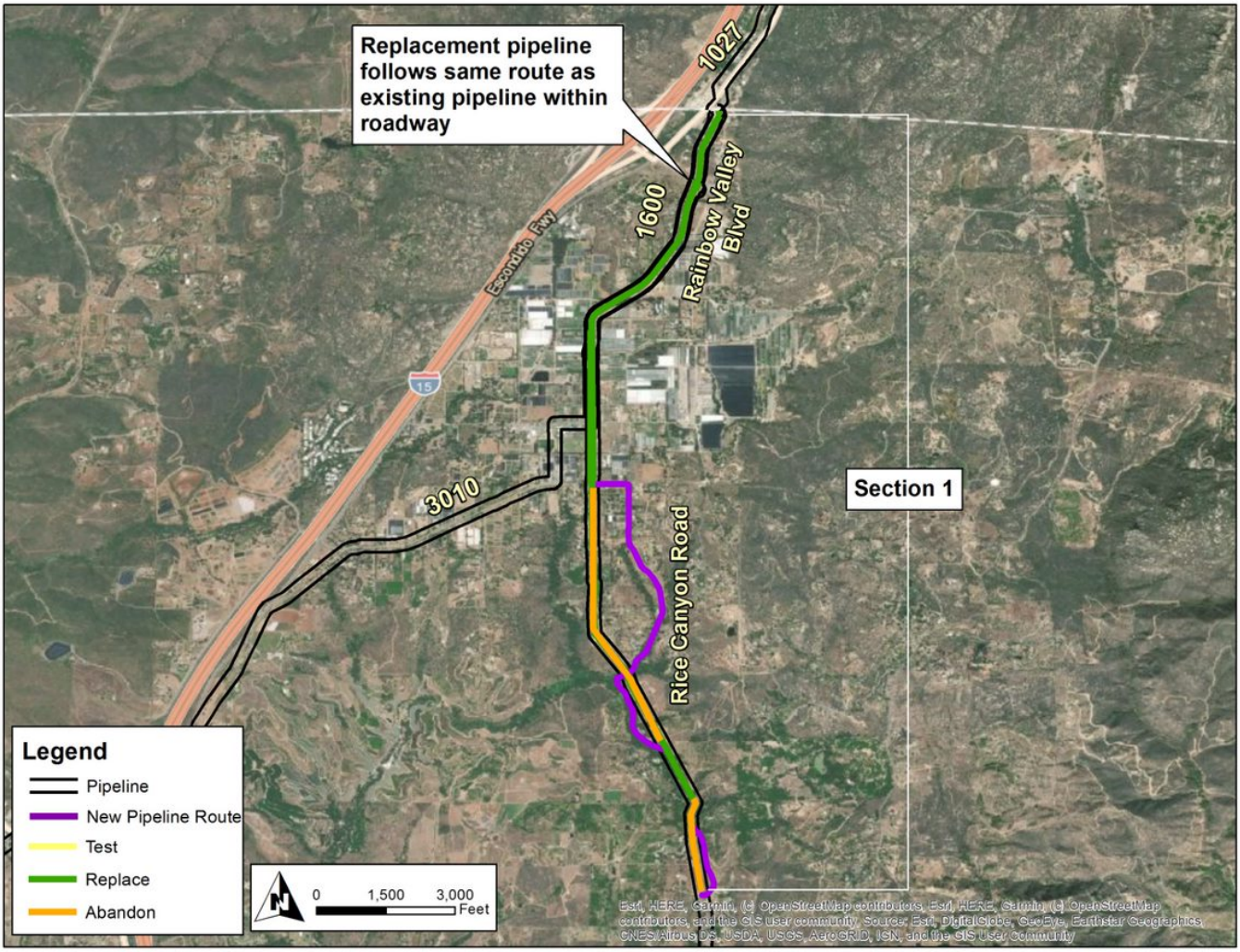


Table 2: Project Mileage

PHASE	MILEAGE
CATEGORY 4 CRITERIA[5]	3.019
CATEGORY 4[6]	0.400
INCIDENTAL	0.034
REPLACEMENT OFFSET	0.233
TOTAL MILEAGE[7]	3.686

The direct costs for each area are summarized below.

Table 3: Material ($000's)

PROJECT COST	2019 & Prior	2020	2021	2022	2023	Total[8]
TOTAL DIRECT COSTS (NON-LABOR)[9]	$0	$0	$2,483	$960	$0	$3,443

Assumptions

Materials for this project will be purchased following final internal authorization 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. Primary components include:

- 19,460 feet of 16-inch pipe meeting SDG&E specifications.
- Three 16-inch valves for odorization bridle meeting SDG&E specifications.
- 42 16-inch fittings meeting SDG&E specifications.

Table 4: Construction ($000's)

PROJECT COST	2019 & Prior	2020	2021	2022	2023	Total[10]
TOTAL DIRECT COSTS (NON-LABOR)[11]	$4	$3	$0	$21,617	$0	$21,623

Assumptions

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

- One mobilization and one demobilization.
- Contractor work is estimated using a 10 hour per day, five day work week.
- Fiber optic lines will be installed above the new pipeline.

[5] Lacks documentation of a post-construction strength test in a Class 3 or 4 HCA.
[6] Lacks documentation of a post-construction strength test in a Class 1 or 2 non-HCA.
[7] Values may not add to total due to rounding.
[8] Values may not add to total due to rounding.
[9] Direct Costs reflect escalation.
[10] Values may not add to total due to rounding.
[11] Direct Costs reflect escalation.

- Excess spoils will be hauled off and disposed.
- Tie-ins will be completed during a 24 hour continuous shift.
- Laydown yards will be restored to original condition at the end of the project.
- Restoration of grade along right of way (ROW) will be completed once pipeline is installed and tied-in.

Additional Construction Information

- **Site Mobilization / Site Facilities**
  - One mobilization and one demobilization.
  - Two office trailers have been included for management and inspection personnel at the primary laydown yard.
  - Six and a half months of site duration is anticipated.
  - Track out plates will be utilized at street access points to minimize soil being tracked onto the street by construction vehicles.

- **Site Management / Best Management Practices (BMPs)**
  - BMP materials for spoils piles, laydown yard, and work site.

- **Material Handling**
  - 31 loads of material will be unloaded by the contractor at laydown yards and transported as needed.

- **Traffic Control**

  Traffic control support for the duration of the project at all intersections, during hydrotesting, isolations, tie-ins, and restoration. This includes all traffic control devices and equipment necessary to complete the project.

- **Site Right of Way (ROW) Clearing**
  - Removal of three trees.
  - 10 days of arborist support.
  - Trimming of 400 trees.

- **Utility Locates**
  - 124 utility locates to verify locations prior to excavations.

- **Pipeline Installation**
  - Installation includes the following:
    - Approximately 19,460 linear feet (LF) of 16-inch pipe.
  - Site demo, excavation and pad trench / bellholes, string and bends pipe, coating joints.
  - Installation of fiber optic line and pipeline warning mesh.

- **Isolate Existing Pipeline**
  - One 24 hour shift is included for the mainline isolation of Line 1600.
  - The pipeline will be isolated in conjunction with tie-in activities.
  - The pipeline will not be separately isolated until the new pipeline has been installed and tested.

- **Pressure Test Pipeline**
  - Preparatory work for the setup of 12 20,000 gallon water tanks.
  - Installation of hard piping from the test head to the tank pump.
  - Following the dewatering of the pipeline, it will be intermittently dried until ready to be tied-in.

- **Tie-In Pipeline**
  - One 24 hour continuous shift for tie-in.

- **Retire / Abandon Existing Pipeline**
  - Three existing pipeline spans will be removed.
  - Approximately 10,190 LF of abandoned pipe will be of slurry filled. All other abandoned pipeline segments will be abandoned using nitrogen.

- **Site Restoration**
  - 486,615 square feet (SF) of unimproved ROW will be restored with hydroseed.
  - 401,288 SF of improved ROW will be restored with paving.
  - 401,288 SF of 2-inch grind and cap for paved areas.
  - 20,025 LF of 4-inch wide striping.

- **Site Demobilization**
  - One load of excess piping will be hauled to SDG&E designated yard.

- **Field Overhead**
  - Full time Project Manager
  - Full time Superintendent
  - Full time Safety Supervisor

Table 5: Environmental Survey/Permitting/Monitoring ($000's)

PROJECT COST	2019 & Prior	2020	2021	2022	2023	Total[12]
TOTAL DIRECT COSTS (NON-LABOR)[13]	$606	$4	$422	$832	$149	$2,012

Assumptions

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

- Asbestos abatement of Asbestos Containing Material (ACM).
- Non-hazardous waste containment/disposal.
- Water source will be a hydrant located near the new alignment.
- Water will be treated and disposed within municipal sewer for hydrotest. Any water encountered during trenching would be stored in water tanks and discharged to land.
- Water treatment and disposal of approximately 185,000 gallons of hydrostatic test water.
- Permit costs.

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

[13] Direct Costs reflect escalation.

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

- Environmental Consultants for pre-construction assessments, construction monitoring, and environmental close-out support.
- Abatement Support is based upon Subject Matter Expert (SME) recommendations.
- Storm Water Pollution Prevention Plan (SWPPP) development and monitoring.
- Compensatory Mitigation for jurisdictional impacts during excavation within/or near waterways.
- CDFW (Streambed Alteration Agreement).
- Regional Water Quality Control Board (401 Permit).
- US Army Corps (404 Permit).

Table 6: Land & Right of Way Acquisition ($000's)

PROJECT COST	2019 & Prior	2020	2021	2022	2023	Total[14]
TOTAL DIRECT COSTS (NON-LABOR)[15]	$0	$0	$218	$150	$0	$368

Assumptions

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

- Encroachment permit and traffic control plan costs.
- New easement costs.
- Temporary Right of Entry (TRE) – Construction yards and workspace required for construction activities.

Factors such as location, zoning, current market price and square footage are considered to determine a final estimated value specific to easements and TRE permits.

Table 7: Company Labor ($000's)

PROJECT COST	2019 & Prior	2020	2021	2022	2023	Total[16]
TOTAL DIRECT COSTS (LABOR)[17]	$400	$14	$266	$884	$0	$1,563

Assumptions

SDG&E and SoCalGas Labor - Management, Engineering, and Non-Union Labor

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

- Project Management (11,730 hours)
- Project Field Management (4,039 hours)

[14] Values may not add to total due to rounding.
[15] Direct Costs reflect escalation.
[16] Values may not add to total due to rounding.
[17] Direct Costs reflect escalation.

- Construction Management (1,460 hours)
- Environmental Services (3,055 hours)
- Land Services (1,125 hours)

Company employees provide extensive oversight with respect to safety; environmental protection; site management; construction, engineering and design services contract management and administration; project engineering and management; planning; scheduling; progress control; cost estimating, tracking and control; inspection; job site material and logistics management as well as job site customer interface management and community outreach.

SDG&E Labor - Union Labor

SDG&E Union Labor costs were developed with the guidance of SDG&E Construction Management and those costs are duration dependent and activity specific.

Critical operational activities such as operating valves, bringing the cathodic protection system online, bringing instrumentation online, gas handling and removing old assets from service as well as loading gas into new assets and placing them into service are all completed by Company Union personnel.

Table 8: Other Costs ($000's)

PROJECT COST	2019 & Prior	2020	2021	2022	2023	Total[18]
TOTAL DIRECT COSTS (NON-LABOR)[19]	$1,317	$94	$2,124	$2,685	$1,216	$7,435

Assumptions

In addition to costs previously described above, there are other costs incurred as part of completing the project that are primarily associated with contracts that are established with specialized service providers that either perform a unique service or supplement the core Company project team. It is typical that services are contracted to complete activities related to planning, engineering, design, estimating, project and construction management, scheduling, survey, construction inspection, x-ray and non-destructive examination of welds, hot tapping and/or stopple services, temporary gas supplies, gas capture services, safety services, as well as as-built and project documentation and records management services. Other costs also include non-labor expenses related to business related mileage, travel, meals and lodging.

Engineering and Project Management

- Developed upon specified scope of work, planned deliverables, and activity levels of effort reflecting anticipated manpower requirements over the planned timeframe of the project schedule.
- Contracted engineering assistance to identify and evaluate potential options to bring Line 1600 into compliance with D.11-06-017 and Public Utilities Code § 958.
- Non-labor costs included in this estimate address travel, meals, expenses, and lodging incurred for SDG&E and SoCalGas Labor.

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

[19] Direct Costs reflect escalation.

Construction Support Services

The high-level assumptions and specific level of effort to provide construction management support for this project are described in more detail below.

- Full time X-Ray / NDE support with each pipeline lay crew.
- No CNG to support existing taps during pipeline isolation.
- 15 hours for gas capture services to reduce the amount of natural gas vented to atmosphere.
- Gas service for core customers will be maintained through combination of purchase of additional gas through an alternative receipt point and curtailments to non-core customers where as appropriate.

Inspection Services

- Full time Chief Inspector
- Four full time Welding Inspectors

Survey and Design Services

- The survey and design service estimate includes survey support staff for project and site facility layout and as-builts. The estimate also includes engineering team material support in the development of as-built close-out packages.

Table 9: Indirect Costs ($000's)

PROJECT COST	2019 & Prior	2020	2021	2022	2023	Total[20]
COMPANY OVERHEADS	$439	$20	$1,130	$2,333	$70	$3,993

Assumptions

- Indirect costs are for Administrative and General, purchasing, warehousing, pension and benefits, payroll tax, and other costs that are overhead in nature.
- Indirect costs do not include AFUDC or Property Tax.

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

Table 1: Total O&M Cost ($000's)

PROJECT COST – O&M	2019 & Prior[1]	2020	2021	2022	2023	2024	Total[2]
DIRECT LABOR	$103	$3	$0	$40	$507	$364	$1,017
DIRECT NON-LABOR	$550	$88	$0	$498	$6,082	$4,152	$11,371
TOTAL DIRECT COSTS[3]	$653	$91	$0	$538	$6,589	$4,516	$12,387
COMPANY OVERHEADS[4]	$114	$4	$0	$50	$504	$307	$980
Total O&M Costs	$768	$95	$0	$588	$7,093	$4,823	$13,367

Table 2: Total Capital Cost ($000's)

PROJECT COST – CAPITAL	2019 & Prior[5]	2020	2021	2022	2023	2024	Total[6]
DIRECT LABOR	$24	$1	$0	$16	$197	$142	$380
DIRECT NON-LABOR	$167	$22	$0	$194	$2,365	$1,615	$4,362
TOTAL DIRECT COSTS[7]	$191	$23	$0	$209	$2,562	$1,756	$4,742
COMPANY OVERHEADS[8]	$25	$2	$0	$29	$313	$200	$570
Total Capital Costs	$216	$26	$0	$238	$2,876	$1,956	$5,312

[1] Actual costs incurred associated with planning and engineering design work are included in the project cost estimates.
[2] Values may not add to total due to rounding.
[3] Direct Costs reflect escalation.
[4] Excludes AFUDC and tax.
[5] Actual costs incurred associated with planning and engineering design work are included in the project cost estimates.
[6] Values may not add to total due to rounding.
[7] Direct Costs reflect escalation.
[8] Excludes AFUDC and tax.

Table 3: Total Project Cost ($000's)

PROJECT COST	2019 & Prior[9]	2020	2021	2022	2023	2024	Total[10]
DIRECT LABOR	$127	$5	$0	$55	$704	$505	$1,397
DIRECT NON-LABOR	$717	$109	$0	$692	$8,448	$5,767	$15,733
TOTAL DIRECT COSTS[11]	$844	$114	$0	$747	$9,152	$6,272	$17,130
COMPANY OVERHEADS[12]	$139	$6	$0	$79	$817	$507	$1,550
Total Costs	$984	$120	$0	$827	$9,969	$6,780	$18,679

Project Description

Line 1600 is a 16-inch diameter transmission line that runs approximately 49.7 miles from Rainbow to Mission Valley, San Diego. Per the CPUC Safety and Enforcement Division (SED) approved *Line 1600 Test or Replacement Plan*, the Line 1600 testing and replacement work is comprised of 19 independent projects. This workpaper describes the Line 1600 Rice Canyon Hydrotest project. The Line 1600 Rice Canyon Hydrotest project is located in the County of San Diego. The project will hydrotest approximately 3.223 miles of existing 16-inch pipeline along Rice Canyon Road through agricultural land from Rancho Bavaria Road to Couser Canyon Road near Highway 76. Prior to the hydrotest, the Project will install a 10-inch automated valve bridle across an existing mainline valve (MLV) and tie-in to an existing 10-inch peaker plant feed to provide uninterrupted gas supply. The 10-inch pipe installation includes a 30-inch cased jack and bore crossing of Caltrans Highway 76. Prior to the hydrotest, to improve piggability and the integrity of the line, the project will replace 26 features, which include wrinkle bends, short radius elbows, and existing pressure control fittings (PCFs).

Considerations unique to the project are as follows:

- The Rice Canyon Hydrotest project will require the installation of two temporary piping connections to an adjacent pipeline to support customers served by an adjacent pipeline. The temporary piping connection supporting the adjacent pipeline will require crossing Caltrans Highway 76 and the project will utilize a jack and bore to complete the crossing to reduce traffic impacts.
- Extensive right of way (ROW) clearing is necessary for the removal of 26 features prior to hydrotesting. All sites will be restored after features are removed.
- Two existing pipeline spans, approximately 47 feet and 73 feet in length, will require support during the hydrotest due to the weight of the water within the pipeline for the hydrotest. The support of these pipeline spans will require additional engineering analysis to provide a method of support.

[9] Actual costs incurred associated with planning and engineering design work are included in the project cost estimates.
[10] Values may not add to total due to rounding.
[11] Direct Costs reflect escalation.
[12] Excludes AFUDC and tax.

Alternatives Considered

D.18-06-028, Ordering Paragraph 7, required SDG&E and SoCalGas to "submit to Safety and Enforcement Division a hydrostatic test or replacement plan pertaining to the existing 49.7 miles of Line 1600 in its present corridor." The Decision further required such plan to discuss two options: "1. Hydrotest the entire 49.7 miles of line and replace those segments that fail the test; and 2. Replace all pipeline segments in High Consequence Areas (HCAs) along Line 1600, thus ensuring a new pipeline without vintage pipeline characteristics that are perceived to increase the risk of Line 1600. Hydrotest in solely non-HCA segments would ensure less impact if there was a failure during hydrotesting." SDG&E's and SoCalGas' September 26, 2018 *Line 1600 Test or Replacement Plan* discussed D.18-06-028's two options as Design Alternative 1 (Replace in HCA/Test in Non-HCA alternative) and Design Alternative 2 (Full Hydrotest alternative), and also discussed Design Alternative 3 (Full Replacement in Nearby Streets alternative) and Design Alternative 4 (Full Replacement Along Highway 395 alternative). SDG&E and SoCalGas proposed to implement the Design Alternative 1, to replace existing Line 1600 primarily in HCAs and hydrotest the remaining sections in non-HCAs and the CPUC SED approved the Plan in January 2019. D.20-02-024 at 31-32 held that issues "out of scope," for Phase 2 include, "revisiting Design Alternatives 2 (Full Hydrotest Alternative), 3 (Full Replacement), 4 (Full Replacement but different street routing) or alternative recommendations. Nor are we revisiting the substance of the PSEP engineering and implementation that falls within the authority of SED."

D.20-02-024 requires, "a cost forecast for the approved Design Alternative 1 (Replace in HCAs and Hydrotest in Non-HCAs) that SED approved on January 15, 2019." Line 1600 Rice Canyon Hydrotest project hydrotests a segment of Line 1600 not located in an HCA.

Shut-In Analysis

The Line 1600 Rice Canyon Hydrotest project can be temporarily taken out of service during any seasonal conditions provided appropriate actions are taken to mitigate loss of transmission capacity and steps are taken to ensure supply to core customers fed directly from this section is maintained. Transmission capacity issues can be mitigated through partial curtailment of non-core customers or by providing supply through alternate receipt points, if available. Three existing regulator stations will require CNG support, while one tap will require temporary bypass piping connections to an adjacent pipeline to maintain service.

Forecast Methodology

The Utilities methodology for forecasting PSEP costs is discussed in the Direct Testimony of Ronn Gonzalez. The Utilities developed a Total Installed Cost (TIC) estimate to implement the above scope of work. The TIC Estimate includes direct costs associated with project management, engineering and design, environmental permitting, land acquisition, material and equipment procurement, and construction.

Following the approval of the Plan by SED in January 2019, the Utilities have undertaken the detailed design and planning of the 19 individual projects in the Plan. Generally, projects that are earliest in the overall schedule are the most developed, while those later in the overall schedule are less developed. At the time of cost estimate preparation, this project was at an approximately 30% design level. Further development of this project could reveal new information requiring some adjustments to the project plan in areas such as engineering, materials, construction, permitting, environmental and land, all of which could impact actual costs compared this cost estimate.

Schedule

Implementation of this project is proposed to be completed consistent with the overall prioritization and timing described in Section IV. D. of the *Line 1600 Test or Replacement Plan*. The schedule was developed based on the five-stage project life cycle as defined by PSEP. The key project deliverables were identified and incorporated into a work breakdown structure. This work breakdown structure was then sequenced, and predecessor and successor tasks were linked to each task. Durations were added to each task to provide a total project duration.

The preliminary Stage 4 Construction Schedule received additional planning and stakeholder input considering that typically 50% of the project costs are expended during the construction phase. The construction schedule is assumed to be 73 working days. The schedule does not include any hydrotest failures.

Figure 1: Overview Map for Line 1600 Rice Canyon Hydrotest

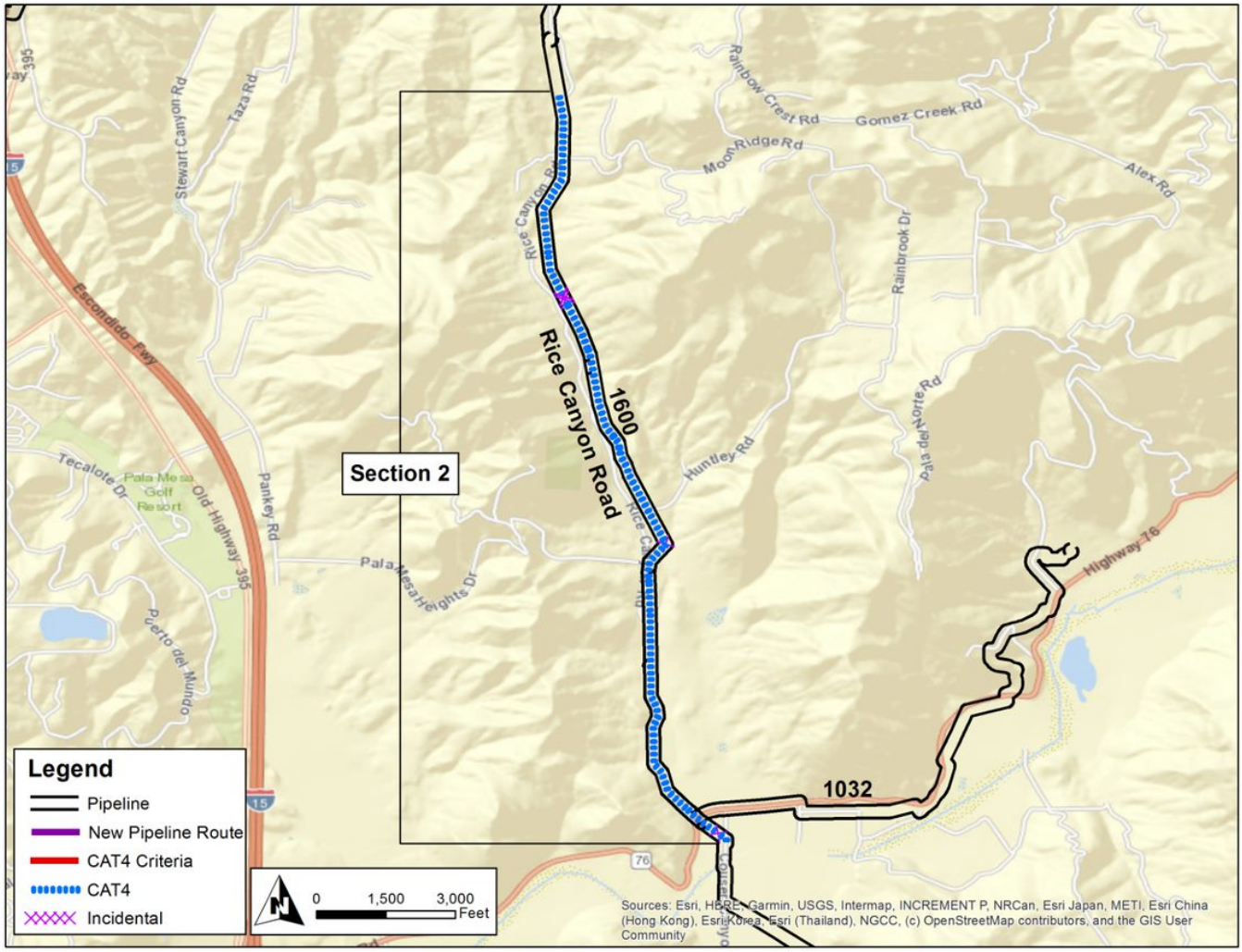


Figure 2: Satellite Map for Line 1600 Rice Canyon Hydrotest

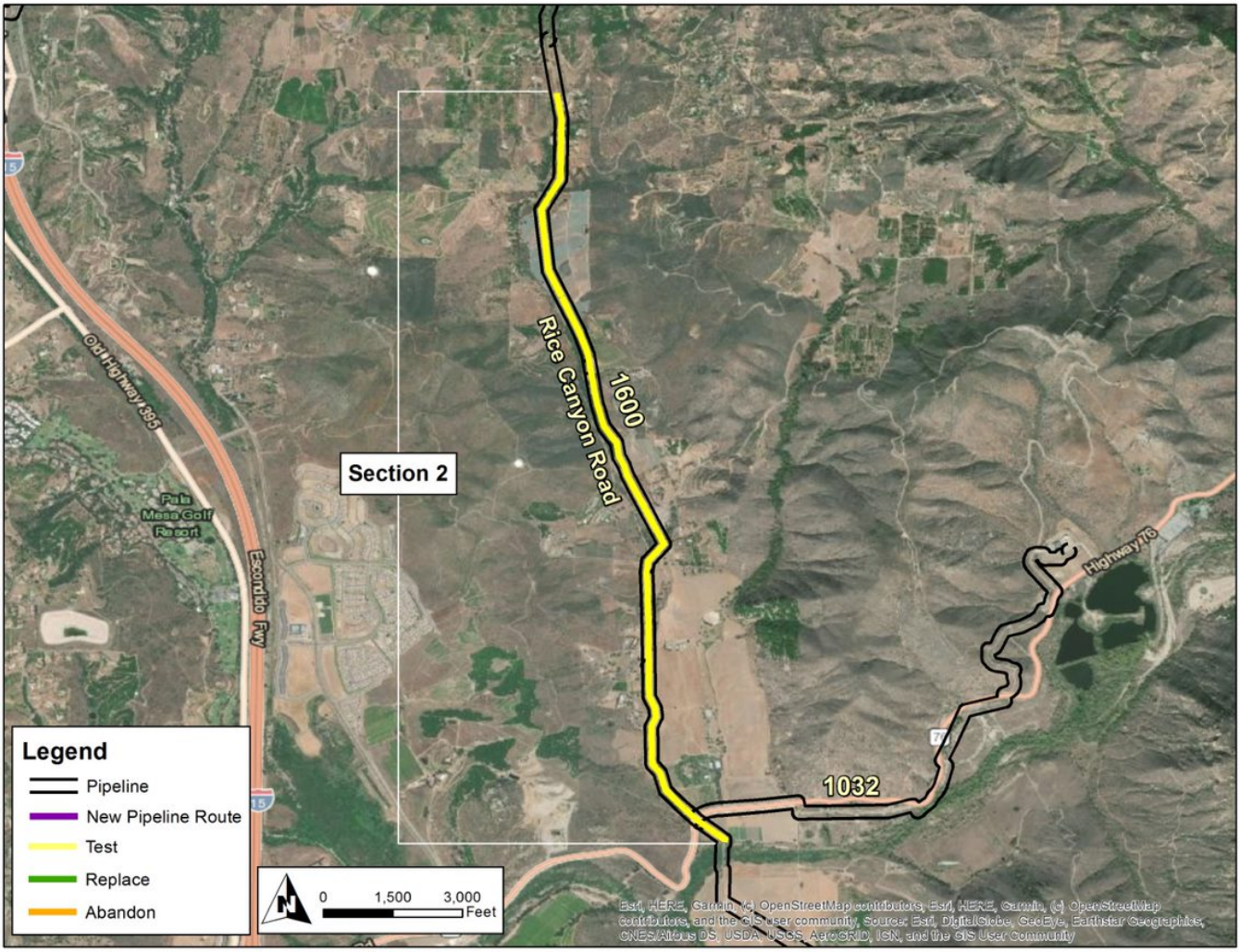


Table 4: Project Mileage

PHASE	MILEAGE
CATEGORY 4 CRITERIA[13]	0.000
CATEGORY 4[14]	3.200
INCIDENTAL	0.023
TOTAL MILEAGE[15]	3.223

The direct costs for each area are summarized below.

Table 5: Material ($000's)

PROJECT COST	2019 & Prior	2020	2021	2022	2023	2024	Total[16]
TOTAL DIRECT COSTS (NON-LABOR)[17]	$0	$0	$0	$81	$374	$0	$455

Assumptions

Materials for this project will be purchased following final internal authorization 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. Materials are necessary to complete hydrotest activities and the replacement of features affecting pipeline integrity and piggability. Primary components include:

- 620 feet of 16-inch pipe meeting SDG&E specifications.
- 600 feet of 10-inch pipe meeting SDG&E specifications.
- 31 16-inch fittings meeting SDG&E specifications.

Table 6: Construction ($000's)

PROJECT COST	2019 & Prior	2020	2021	2022	2023	2024	Total[18]
TOTAL DIRECT COSTS (NON-LABOR)[19]	$1	$1	$0	$0	$3,926	$3,209	$7,137

[13] Lacks documentation of a post-construction strength test in a Class 3 or 4 HCA.
[14] Lacks documentation of a post-construction strength test in a Class 1 or 2 non-HCA.
[15] Values may not add to total due to rounding.
[16] Values may not add to total due to rounding.
[17] Direct Costs reflect escalation.
[18] Values may not add to total due to rounding.
[19] Direct Costs reflect escalation.

Assumptions

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

- One mobilization and one demobilization
- Work has been scheduled using a 10 hour per day, five day work week.
- Contractor will assist with the preparatory work prior to the set-up of 10 20,000 gallon water tanks for hydrotesting activities.
- Mechanical excavation will be authorized up to two feet of the existing pipeline. Hand excavation will be required within the remaining two-foot zone.
- Four taps will be isolated prior to hydrotesting. Three taps will be supported using CNG and two taps will use a bypass.
- 26 features affecting piggability and/or integrity of the line have been identified and will be replaced prior to hydrotesting.
- Installation of approximately 620 feet of 10-inch pipe and a bridled bypass for an existing mainline valve (MLV).
- Installation of supports for two existing pipeline spans.
- Installation of one new impressed current cathodic protection deep well anode.
- The 16-inch pipeline will be tested in one test segment.
- Isolation and final tie-ins have been assumed for a 24 hour continuous duration.
- All excavation sites and cleared sites will be hydroseeded.
- No allowance for hydrotest failure(s) and the associated repairs and retest has been included in this estimate due to the uncertainty as to whether a failure (or multiple failures) will happen, the location and scope of the failure, and the effort required to complete a repair. The cost for any failure, repair and retest would be incremental to the costs provided in this estimate.

Additional Construction Information

- **Site Mobilization / Site Facilities**
  - One mobilization and one demobilization.
  - Two office trailers have been included for management and inspection personnel at the primary laydown yard.
  - Four months of site duration is anticipated.
  - Placement of crushed rock for the laydown yards.
  - Installation of 300 linear feet (LF) of temporary fill piping from the water tanks to the first test head.
  - Temporary fencing for the laydown yard.
  - Temporary fencing for feature excavations.

- **Site Management / Best Management Practices (BMPs)**
  - BMP materials for spoils piles, laydown yard, and work site.

- **Site Right of Way (ROW) Clearing**
  - 19 sites for light vegetation clearing at 2 hours per site.
  - Four sites for heavy vegetation clearing at 5 hours per site.

- **Material Handling**
  - Four loads of material will be unloaded by the contractor at laydown yards and transported as needed.

- **Traffic Control**

  56 days of traffic control support during the project at all intersections, during hydrotesting, isolations, tie-ins, and restoration. This includes all traffic control devices and equipment necessary to complete the project.

- **Utility Locates**
  - 37 utility locates have been included to verify pipe location at cutouts and tap excavations.

- **Site Excavations**
  - Two test breaks sites will be excavated for test head manifold installation.
  - Replacement of one creek crossing.
  - There will be a total of 21 excavations for the cutout and replacement of 26 features in the pipeline.

- **Remove Existing / Install New Features**
  - 40 hours for fabricating isolation caps using 4 welders.
  - One nitrogen test for isolation caps and taps.
  - 12 shifts for fabricating replacement spools.
  - 34 shifts with a backfill crew to backfill all excavations.
  - Seven shifts for coating and welding bypass fabrication.
  - 90 LF of fence demo is included for existing MLV site.

- **10-inch Bypass and 16-inch Mainline Valve**
  - Installation of one 40 foot jack and bore with 30-inch casing.
  - Installation of one remote control valve (RCV) panel.
  - 10 shifts for backfilling all excavations associated with bypass and mainline valve.

- **Isolate Existing Pipeline**
  - Three days for stopple tapping support.
  - One nitrogen truck for pipeline purging.
  - One 16 hour shift included for cut and cap of pipeline.
  - One 16 hour shift for 10-inch bypass isolation and tie-over.
  - Eight shifts for removing cut outs are included.

- **Hydrotest / Pressure Test Pipeline**
  - Preparatory work for the setup of 10 20,000 gallon water tanks.
  - Two test breaks sites will be excavated for test head manifold installation.
  - One shift for installing test heads.
  - One shift for installing hard fill piping to test heads.
  - Two tests are included, one for Line 1600 and one for the 10-inch bypass.
  - Two 10 hour shifts for filling the pipeline for the hydrotest.
  - One 12 hour shift for testing Line 1600 and one 10 hour shift for testing the bypass line.
  - Three shifts for dewatering and drying each line.

- **Tie-In Pipeline**
  - Two shifts for removing test heads and hard fill piping.
  - One shift for tie-in preparation.
  - Tie-in will be completed during a 16 hour continuous shift.

- **Backfill Excavations**
  - 34 shifts for backfilling all cutout and test break excavations.

- **Site Restoration**
  - All work site locations will be restored to original condition.
  - 115,000 SF of hydroseeding.
  - 785 SF of asphalt restoration at 8-inches thick.
  - 1,000 SF of grind and overlay.
  - 125 LF of striping repair.
  - 30 LF of new residential fence.
  - One shift for removing temp fencing.
  - Two shifts for removing BMPs.
  - One shift for final cleanup of the worksites.

- **Site Demobilization**
  - One load of excess piping will be hauled to SDG&E designated yard.

- **Field Overhead**
  - Full time Project Manager
  - Full time Superintendent
  - Full time Safety Supervisor

Table 7: Environmental Survey/Permitting/Monitoring ($000's)

PROJECT COST	2019 & Prior	2020	2021	2022	2023	2024	Total[20]
TOTAL DIRECT COSTS (NON-LABOR)[21]	$200	$3	$0	$121	$866	$720	$1,909

Assumptions

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

- Asbestos abatement of Asbestos Containing Material (ACM).
- Non-hazardous waste containment/disposal.
- Assumes water source will be a hydrant located the pipeline.
- Assumes water will be treated and disposed within municipal sewer for hydrotest. Any water encountered during trenching would be stored in water tanks and discharged to land.
- Water treatment and disposal of approximately 179,000 gallons of hydrostatic test water.
- Permit costs.

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

- Environmental Consultants for pre-construction assessments, construction monitoring, and environmental close-out support.
- Abatement Support is based upon Subject Matter Expert (SME) recommendations
- Aquatic features jurisdictional delineations.
- Stormwater Pollution Prevention Plan (SWPPP) development and monitoring.
- Compensatory Mitigation for jurisdictional impacts during excavation within/or near waterways.
- CDFW (Streambed Alteration Agreement).
- Regional Water Quality Control Board (401 Certification).
- US Army Corps (404 Permit).

Table 8: Land & Right-of-Way Acquisition ($000's)

PROJECT COST	2019 & Prior	2020	2021	2022	2023	2024	Total[22]
TOTAL DIRECT COSTS (NON-LABOR)[23]	$0	$0	$0	$91	$684	$0	$775

[20] Values may not add to total due to rounding.
[21] Direct Costs reflect escalation.
[22] Values may not add to total due to rounding.
[23] Direct Costs reflect escalation.

Assumptions

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

- Encroachment permit and traffic control plan costs.
- New easement costs for replacement sections.
- Temporary Right of Entry (TRE) – Construction yards and workspace required for construction activities.

Factors such as location, zoning, current market price and square footage are considered to determine a final estimated value specific to easements and TRE permits.

Table 9: Company Labor ($000's)

PROJECT COST	2019 & Prior	2020	2021	2022	2023	2024	Total[24]
TOTAL DIRECT COSTS (LABOR)[25]	$127	$5	$0	$55	$704	$505	$1,397

Assumptions

SDG&E and SoCalGas Labor - Management, Engineering, and Non-Union Labor

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

- Project Management (8,092 hours)
- Project Field Management (6,039 hours)
- Construction Management (810 hours)
- Environmental Services (3,009 hours)
- Land Services (224 hours)

Company employees provide extensive oversight with respect to safety; environmental protection; site management; construction, engineering and design services contract management and administration; project engineering and management; planning; scheduling; progress control; cost estimating, tracking and control; inspection; job site material and logistics management as well as job site customer interface management and community outreach.

SDG&E Labor - Union Labor

SDG&E Union Labor costs were developed with the guidance of SDG&E Construction Management and those costs are duration dependent and activity specific.

Critical operational activities such as operating valves, bringing the cathodic protection system online, bringing instrumentation online, gas handling and removing old assets from service as well as loading gas into new assets and

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

[25] Direct Costs reflect escalation.

placing them into service are all completed by Company Union personnel.

Table 10: Other Costs ($000's)

PROJECT COST	2019 & Prior	2020	2021	2022	2023	2024	Total[26]
TOTAL DIRECT COSTS (NON-LABOR)[27]	$516	$106	$0	$400	$2,598	$1,838	$5,457

Assumptions

In addition to costs previously described above, there are other costs incurred as part of completing the project that are primarily associated with contracts that are established with specialized service providers that either perform a unique service or supplement the core Company project team. It is typical that services are contracted to complete activities related to planning, engineering, design, estimating, project and construction management, scheduling, survey, construction inspection, x-ray and non-destructive examination of welds, hot tapping and/or stopple services, temporary gas supplies, gas capture services, safety services, as well as as-built and project documentation and records management services. Other costs also include non-labor expenses related to business related mileage, travel, meals and lodging.

Engineering and Project Management

- Developed upon specified scope of work, planned deliverables, and activity levels of effort reflecting anticipated manpower requirements over the planned timeframe of the project schedule.
- Contracted engineering assistance to identify and evaluate potential options to bring Line 1600 into compliance with D.11-06-017 and Public Utilities Code § 958.
- Non-labor costs included in this estimate address travel, meals, expenses, and lodging incurred for SDG&E and SoCalGas Labor.

Construction Support Services

The high-level assumptions and specific level of effort to provide construction support for this project are described in more detail below.

- X-Ray / NDE support is based upon the take-off quantities of welds for all newly installed pipe.
- 30 days of CNG to support for existing taps during pipeline isolation.
- Gas service for core customers will be maintained through combination of purchase of additional gas through an alternative receipt point and curtailments to non-core customers where as appropriate.
- Gas capture services for the mainline isolation.

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

[27] Direct Costs reflect escalation.

Inspection Services

- Full time Chief Inspector
- Two full time Welding Inspectors

Survey and Design Services

- The survey and design service estimate includes survey support staff for project and site facility layout and as-builts. The estimate also includes engineering team material support in the development of as-built close-out packages.

Table 11: Indirect Costs ($000's)

PROJECT COST	2019 & Prior	2020	2021	2022	2023	2024	Total[28]
COMPANY OVERHEADS	$139	$6	$0	$79	$817	$507	$1,550

Assumptions

- Indirect costs are for Administrative and General, purchasing, warehousing, pension and benefits, payroll tax, and other costs that are overhead in nature.
- Indirect costs do not include AFUDC or Property Tax.

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

Table 1: Total O&M Cost ($000's)

PROJECT COST – O&M	2019 & Prior[1]	2020	2021	2022	2023	2024	Total[2]
DIRECT LABOR	$101	$8	$0	$0	$364	$634	$1,107
DIRECT NON-LABOR	$499	$115	$0	$0	$3,498	$5,368	$9,479
TOTAL DIRECT COSTS[3]	$600	$123	$0	$0	$3,862	$6,002	$10,587
COMPANY OVERHEADS[4]	$98	$12	$0	$0	$336	$532	$977
Total O&M Costs	$698	$135	$0	$0	$4,198	$6,533	$11,564

Table 2: Total Capital Cost ($000's)

PROJECT COST – CAPITAL	2019 & Prior[5]	2020	2021	2022	2023	2024	Total[6]
DIRECT LABOR	$24	$1	$0	$0	$142	$246	$412
DIRECT NON-LABOR	$162	$36	$0	$0	$1,360	$2,087	$3,646
TOTAL DIRECT COSTS[7]	$186	$37	$0	$0	$1,502	$2,334	$4,059
COMPANY OVERHEADS[8]	$24	$2	$0	$0	$199	$314	$539
Total Capital Costs	$210	$39	$0	$0	$1,701	$2,648	$4,598

[1] Actual costs incurred associated with planning and engineering design work are included in the project cost estimates.
[2] Values may not add to total due to rounding.
[3] Direct Costs reflect escalation.
[4] Excludes AFUDC and tax.
[5] Actual costs incurred associated with planning and engineering design work are included in the project cost estimates.
[6] Values may not add to total due to rounding.
[7] Direct Costs reflect escalation.
[8] Excludes AFUDC and tax.

Table 3: Total Project Cost ($000's)

PROJECT COST	2019 & Prior[9]	2020	2021	2022	2023	2024	Total[10]
DIRECT LABOR	$125	$9	$0	$0	$506	$880	$1,520
DIRECT NON-LABOR	$661	$151	$0	$0	$4,858	$7,455	$13,125
TOTAL DIRECT COSTS[11]	$786	$160	$0	$0	$5,364	$8,336	$14,645
COMPANY OVERHEADS[12]	$122	$15	$0	$0	$535	$845	$1,517
Total Costs	$908	$175	$0	$0	$5,899	$9,181	$16,162

Project Description

Line 1600 is a 16-inch diameter transmission line that runs approximately 49.7 miles from Rainbow to Mission Valley, San Diego. Per the CPUC Safety and Enforcement Division (SED) approved *Line 1600 Test or Replacement Plan*, the Line 1600 testing and replacement work is comprised of 19 independent projects. This workpaper describes the Line 1600 Couser Canyon North Hydrotest project. The Line 1600 Couser Canyon North Hydrotest project is located in the County of San Diego. The project will hydrotest approximately 2.600 miles of 16-inch pipeline through agricultural land from Highway 76 along Couser Canyon to Pala Loma Drive. Prior to the hydrotest, to improve piggability and the integrity of the line, the project will replace 23 features, which include wrinkle bends, short radius elbows, and existing pressure control fittings (PCFs).

Considerations unique to the project are as follows:

- Southern test break location was coordinated with the Line 1600 Couser Canyon South Hydrotest to accommodate construction spacing and access to test break location.
- Extensive right of way (ROW) clearing is necessary for the removal of 23 features prior to hydrotesting. All sites will be restored after features are removed.
- Approximately 142 feet of existing Line 1600 along with three feature removals will be abandoned in place in favor of a straight pipe replacement at the north end of the project. This replacement reduces potential impacts to Couser Canyon Road.

Alternatives Considered

D.18-06-028, Ordering Paragraph 7, required SDG&E and SoCalGas to "submit to Safety and Enforcement Division a hydrostatic test or replacement plan pertaining to the existing 49.7 miles of Line 1600 in its present corridor." The Decision further required such plan to discuss two options: "1. Hydrotest the entire 49.7 miles of line and replace those segments that fail the test; and 2. Replace all pipeline segments in High Consequence Areas (HCAs) along Line 1600, thus ensuring a new pipeline without vintage pipeline characteristics that are perceived to increase the risk of

[9] Actual costs incurred associated with planning and engineering design work are included in the project cost estimates.
[10] Values may not add to total due to rounding.
[11] Direct Costs reflect escalation.
[12] Excludes AFUDC and tax.

Line 1600. Hydrotest in solely non-HCA segments would ensure less impact if there was a failure during hydrotesting." SDG&E's and SoCalGas' September 26, 2018 Line 1600 Test or Replacement Plan discussed D.18-06-028's two options as Design Alternative 1 (Replace in HCA/Test in Non-HCA alternative) and Design Alternative 2 (Full Hydrotest alternative), and also discussed Design Alternative 3 (Full Replacement in Nearby Streets alternative) and Design Alternative 4 (Full Replacement Along Highway 395 alternative). SDG&E and SoCalGas proposed to implement the Design Alternative 1, to replace existing Line 1600 primarily in HCAs and hydrotest the remaining sections in non-HCAs and the CPUC SED approved the Plan in January 2019. D.20-02-024 at 31-32 held that issues "out of scope," for Phase 2 include, "revisiting Design Alternatives 2 (Full Hydrotest Alternative), 3 (Full Replacement), 4 (Full Replacement but different street routing) or alternative recommendations. Nor are we revisiting the substance of the PSEP engineering and implementation that falls within the authority of SED."

D.20-02-024 requires, "a cost forecast for the approved Design Alternative 1 (Replace in HCAs and Hydrotest in Non-HCAs) that SED approved on January 15, 2019." Line 1600 Section 3 Couser Canyon North Hydrotest Project hydrotests a segment of Line 1600 not located in an HCA.

Shut-In Analysis

The Line 1600 Couser Canyon North project can be temporarily taken out of service during any seasonal conditions provided appropriate actions are taken to mitigate loss of transmission capacity and steps are taken to ensure supply to core customers fed directly from this section is maintained. If necessary, transmission capacity issues can be mitigated through partial curtailment of non-core customers or by bringing supply into the San Diego system through alternate receipt points, if available. Four regulator stations will be supplied by CNG during the hydrotest activity. Gas service for core customers downstream of the hydrotest segment will be maintained through combination of purchase of additional gas through an alternative receipt point and curtailment of non-core customers.

Forecast Methodology

The Utilities methodology for forecasting PSEP costs is discussed in the Direct Testimony of Ronn Gonzalez. The Utilities developed a Total Installed Cost (TIC) estimate to implement the above scope of work. The TIC Estimate includes direct costs associated with project management, engineering and design, environmental permitting, land acquisition, material and equipment procurement, and construction.

Following the approval of the Plan by SED in January 2019, the Utilities have undertaken the detailed design and planning of the 19 individual projects in the Plan. Generally, projects that are earliest in the overall schedule are the most developed, while those later in the overall schedule are less developed. At the time of cost estimate preparation, this project was at an approximately 30% design level. Further development of this project could reveal new information requiring some adjustments to the project plan in areas such as engineering, materials, construction, permitting, environmental and land, all of which could impact actual costs compared this cost estimate.

Schedule

Implementation of this project is proposed to be completed consistent with the overall prioritization and timing described in Section IV. D. of the *Line 1600 Test or Replacement Plan*. The schedule was developed based on the five-stage project life cycle as defined by PSEP. The key project deliverables were identified and incorporated into a work breakdown structure. This work breakdown structure was then sequenced, and predecessor and successor tasks were linked to each task. Durations were added to each task to provide a total project duration.

The preliminary Stage 2 Construction Schedule received additional planning and stakeholder input considering that typically 50% of the project costs are expended during the construction phase. The construction schedule is assumed to be 73 working days. The schedule does not include any hydrotest failures.

Figure 1: Overview Map for Line 1600 Couser Canyon North Hydrotest

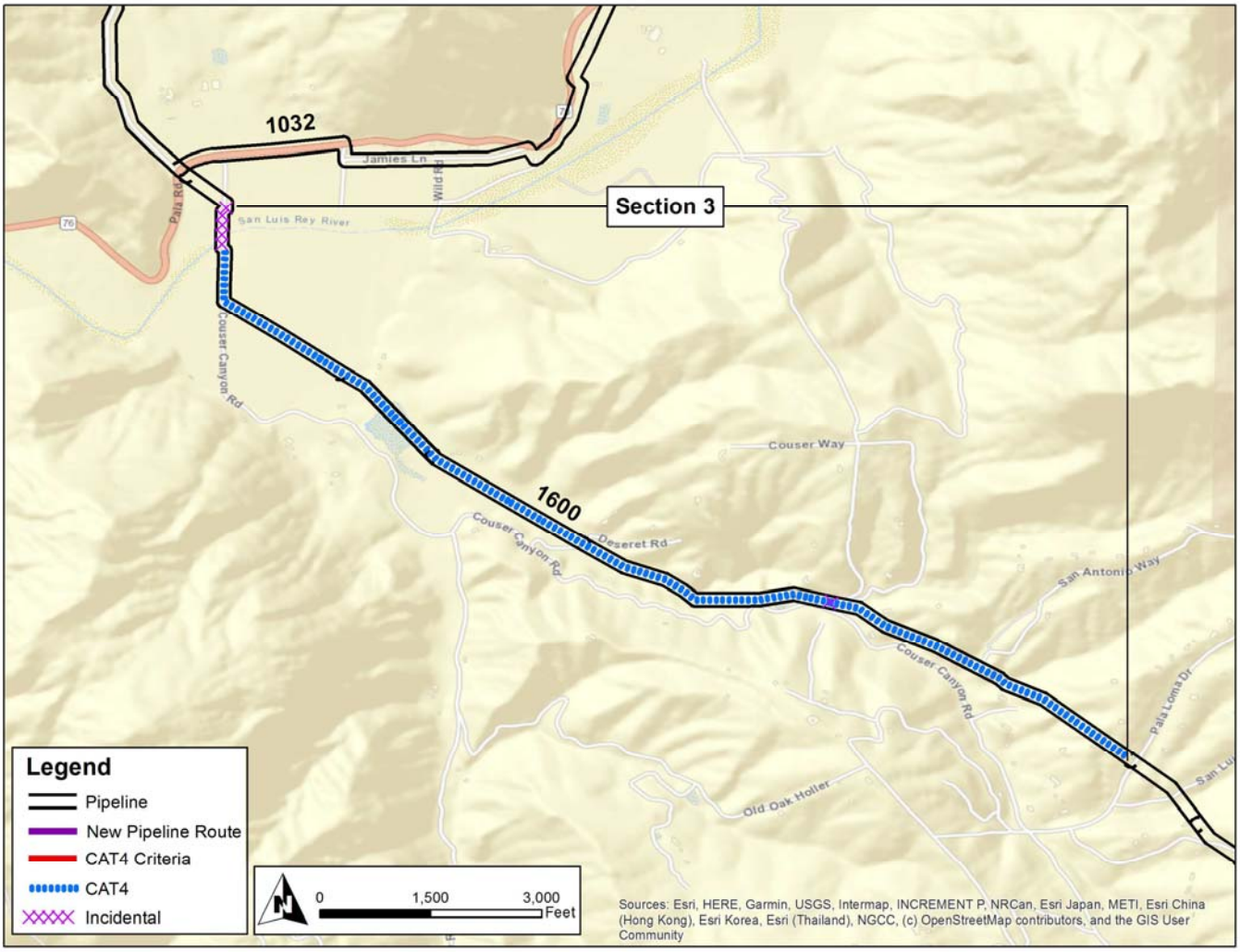


Figure 2: Satellite Map for Line 1600 Couser Canyon North Hydrotest

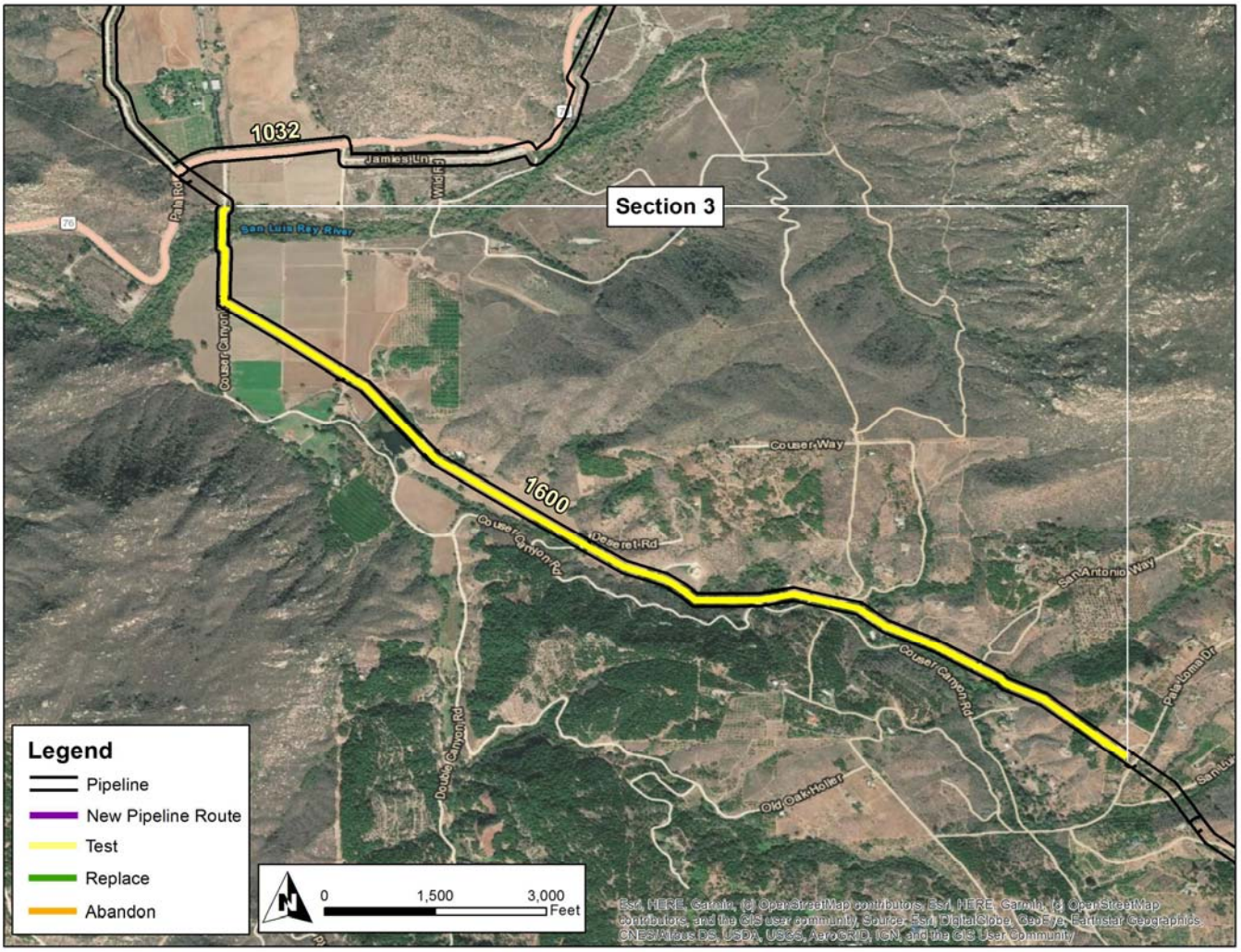


Table 4: Project Mileage

PHASE	MILEAGE
CATEGORY 4 CRITERIA[13]	0.000
CATEGORY 4[14]	2.551
INCIDENTAL	0.049
TOTAL MILEAGE[15]	2.600

The direct costs for each area are summarized below.

Table 5: Material ($000's)

PROJECT COST	2019 & Prior	2020	2021	2022	2023	2024	Total[16]
TOTAL DIRECT COSTS (NON-LABOR)[17]	$0	$0	$0	$0	$218	$0	$218

Assumptions

Materials for this project will be purchased following final internal authorization 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. Materials are necessary to complete hydrotest activities and the replacement of features affecting pipeline integrity and piggability. Primary components include:

- 500 feet of 16-inch pipe meeting SDG&E specifications.
- 13 16-inch fittings meeting SDG&E specifications.

Table 6: Construction ($000's)

PROJECT COST	2019 & Prior	2020	2021	2022	2023	2024	Total[18]
TOTAL DIRECT COSTS (NON-LABOR)[19]	$1	$1	$0	$0	$907	$4,641	$5,549

[13] Lacks documentation of a post-construction strength test in a Class 3 or 4 HCA.
[14] Lacks documentation of a post-construction strength test in a Class 1 or 2 non-HCA.
[15] Values may not add to total due to rounding.
[16] Values may not add to total due to rounding.
[17] Direct Costs reflect escalation.
[18] Values may not add to total due to rounding.
[19] Direct Costs reflect escalation.

Assumptions

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

- One mobilization and one demobilization.
- Work has been scheduled using a 10-hour per day, five-day work week.
- Nine 20,000 gallon water tanks for hydrotesting activities.
- Mechanical excavation will be authorized up to within two feet of the existing pipeline. Hand excavation will be required within the remaining two foot zone.
- Four taps will be isolated prior to hydrotesting.
- 23 features affecting piggability and/or integrity of the line have been identified and will be replaced prior to hydrotesting.
- Installation of approximately 142 feet of new 16-inch pipe along Couser Canyon Road.
- The pipeline will be tested in one test segment.
- A single final tie-in will be performed.
- Isolation has been assumed for a 16-hour continuous duration.
- All excavation sites and cleared sites will be hydroseeded.
- Hydrotest water will be disposed locally near the north end of the test segment.
- No allowance for hydrotest failure(s) and the associated repairs and retest has been included in this estimate due to the uncertainty as to whether a failure (or multiple failures) will happen, the location and scope of the failure, and the effort required to complete a repair. The cost for any failure, repair and retest would be incremental to the costs provided in this estimate.

Additional Construction Information

- **Site Mobilization / Site Facilities**
  - One mobilization and one demobilization.
  - Two office trailers have been included for management and inspection personnel at the primary laydown yard.
  - Five months of site duration is anticipated.
  - Placement of crushed rock for the laydown yards.
  - Installation of 300 linear feet (LF) of temporary fill piping from the water tanks to the first test head.
  - Temporary fencing for the laydown yard.
  - Temporary fencing for feature excavations.

- **Site Management / Best Management Practices (BMPs)**
  - BMP materials for spoils piles, laydown yard, and work site.

- **Site Right of Way (ROW) Clearing**
  - 30 hours for light vegetation clearing.
  - 60 hours for heavy vegetation clearing.

- **Material Handling**
  - Four loads of material will be unloaded by the contractor at laydown yards and transported as needed.

- **Traffic Control**
  - 24 days of traffic control support during the project at all intersections, during hydrotesting, isolations, tie-ins, and restoration. This includes all traffic control devices and equipment necessary to complete the project.

- **Utility Locates**
  - 26 utility locates have been included to verify pipe location at cutouts and tap excavations.

- **Isolate Existing Pipeline**
  - Four taps will be isolated prior to hydrotesting.
  - CNG support will be required on all taps.

- **Remove Existing /Install New Features**
  - 142 feet of new 16-inch pipe excavated, installed, and backfilled along Couser Canyon Road.
  - 23 features affecting piggability and/or integrity of the line have been identified and will be replaced prior to hydrotesting.

- **Pressure Test Pipeline**
  - Preparatory work for the setup of nine 20,000 gallon water tanks .
  - Installation of hard piping from the test head to the tank pump.
  - Following the dewatering of the pipeline, it will be intermittently dried until ready to be tied-in.
  - 60 hours for the installation of temporary span supports for six existing pipeline spans.
  - 60 hours for the removal of temporary span supports for six existing pipeline spans.
  - Pipeline will be tested in one test segment.
  - Two test breaks sites will be excavated.
  - Test heads will be installed below grade.

- **Tie-In Pipeline**
  - One 24 hour continuous shift for tie-in.

- **Retire / Abandon Existing Pipeline**
  - One section of existing pipe will be abandoned by plating ends.

- **Site Restoration**
  - All work site locations will be restored to original condition.
  - Hillsides will be restabilized using hydroseeding.

- **Site Demobilization**
  - One load of excess piping will be hauled to SDG&E designated yard.

- **Field Overhead**
  - Full time Project Manager
  - Full time Superintendent
  - Full time Safety Supervisor

Table 7: Environmental Survey/Permitting/Monitoring ($000's)

PROJECT COST	2019 & Prior	2020	2021	2022	2023	2024	Total[20]
TOTAL DIRECT COSTS (NON-LABOR)[21]	$199	$3	$0	$0	$657	$777	$1,636

Assumptions

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

- Asbestos abatement of Asbestos Containing Materials (ACM).
- Non-hazardous waste containment/disposal.
- Water source will be a hydrant located near the new alignment.
- Water will be treated and disposed within municipal sewer for hydrotest. Any water encountered during trenching would be stored in water tanks and discharged to land.
- Water treatment and disposal of approximately 135,000 gallons of hydrostatic test water.
- Permit costs.
- Mitigation costs.

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

- Environmental Consultants for pre-construction assessments, construction monitoring, and environmental close-out support.
- Abatement Support is based upon Subject Matter Expert (SME) recommendations.
- Compensatory Mitigation for jurisdictional impacts during excavation within/or near waterways.
- California Department of Fish and Wildlife (Streambed Alteration Agreement).
- Regional Water Quality Control Board (401 Certification).
- US Army Corps (404 Permit).

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

[21] Direct Costs reflect escalation.

Table 8: Land & Right-of-Way Acquisition ($000's)

PROJECT COST	2019 & Prior	2020	2021	2022	2023	2024	Total[22]
TOTAL DIRECT COSTS (NON-LABOR)[23]	$0	$0	$0	$0	$176	$0	$176

Assumptions

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

- Encroachment permit and traffic control plan costs.
- New easement costs for replacement sections.
- Temporary Right of Entry (TRE) – Construction yards and workspace required for construction activities.

Factors such as location, zoning, current market price and square footage are considered to determine a final estimated value specific to easements and TRE permits.

Table 9: Company Labor ($000's)

PROJECT COST	2019 & Prior	2020	2021	2022	2023	2024	Total[24]
TOTAL DIRECT COSTS (LABOR)[25]	$125	$9	$0	$0	$506	$880	$1,520

Assumptions

SDG&E and SoCalGas Labor - Management, Engineering, and Non-Union Labor

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

- Project Management (9,340 hours)
- Project Field Management (4,703 hours)
- Construction Management (810 hours)
- Environmental Services (2,509 hours)
- Land Services (159 hours)

Company employees provide extensive oversight with respect to safety; environmental protection; site management; construction, engineering and design services contract management and administration; project engineering and management; planning; scheduling; progress control; cost estimating, tracking and control; inspection; job site material and logistics management as well as job site customer interface management and community outreach.

[22] Values may not add to total due to rounding.
[23] Direct Costs reflect escalation.
[24] Values may not add to total due to rounding.
[25] Direct Costs reflect escalation.

SDG&E Labor - Union Labor

SDG&E Union Labor costs were developed with the guidance of SDG&E Construction Management and those costs are duration dependent and activity specific.

Critical operational activities such as operating valves, bringing the cathodic protection system online, bringing instrumentation online, gas handling and removing old assets from service as well as loading gas into new assets and placing them into service are all completed by Company Union personnel.

Table 10: Other Costs ($000's)

PROJECT COST	2019 & Prior	2020	2021	2022	2023	2024	Total[26]
TOTAL DIRECT COSTS (NON-LABOR)[27]	$461	$147	$0	$0	$2,900	$2,038	$5,546

Assumptions

In addition to costs previously described above, there are other costs incurred as part of completing the project that are primarily associated with contracts that are established with specialized service providers that either perform a unique service or supplement the core Company project team. It is typical that services are contracted to complete activities related to planning, engineering, design, estimating, project and construction management, scheduling, survey, construction inspection, x-ray and non-destructive examination of welds, hot tapping and/or stopple services, temporary gas supplies, gas capture services, safety services, as well as as-built and project documentation and records management services. Other costs also include non-labor expenses related to business related mileage, travel, meals and lodging.

Engineering and Project Management

- Developed upon specified scope of work, planned deliverables, and activity levels of effort reflecting anticipated manpower requirements over the planned timeframe of the project schedule.
- Contracted engineering assistance to identify and evaluate potential options to bring Line 1600 into compliance with D.11-06-017 and Public Utilities Code § 958.
- Non-labor costs included in this estimate address travel, meals, expenses, and lodging incurred for SDG&E and SoCalGas Labor.

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

[27] Direct Costs reflect escalation.

Construction Support Services

The high-level assumptions and specific level of effort to provide construction management support for this project are described in more detail below.

- X-Ray / NDE support is based upon the take-off quantities of welds for all newly installed pipe.
- CNG to support existing taps during pipeline isolation.
- Gas service for core customers will be maintained through combination of purchase of additional gas through an alternative receipt point and curtailments to non-core customers where as appropriate.

Inspection Services

- Full time Chief Inspector
- Full time Welding Inspector

Survey and Design Services

- The survey and design service estimate includes survey support staff for project and site facility layout and as-builts. The estimate also includes engineering team material support in the development of as-built close-out packages.

Table 11: Indirect Costs ($000's)

PROJECT COST	2019 & Prior	2020	2021	2022	2023	2024	Total[28]
COMPANY OVERHEADS	$122	$15	$0	$0	$535	$845	$1,517

Assumptions

- Indirect costs are for Administrative and General, purchasing, warehousing, pension and benefits, payroll tax, and other costs that are overhead in nature.
- Indirect costs do not include AFUDC or Property Tax.

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

Table 1: Total O&M Cost ($000's)

PROJECT COST – O&M	2019 & Prior[1]	2020	2021	2022	2023	2024	Total[2]
DIRECT LABOR	$94	$5	$0	$48	$192	$837	$1,176
DIRECT NON-LABOR	$465	$93	$0	$483	$2,032	$6,871	$9,944
TOTAL DIRECT COSTS[3]	$559	$98	$0	$531	$2,224	$7,708	$11,119
COMPANY OVERHEADS[4]	$106	$6	$0	$55	$224	$718	$1,109
Total O&M Costs	$665	$104	$0	$586	$2,448	$8,426	$12,228

Table 2: Total Capital Cost ($000's)

PROJECT COST – CAPITAL	2019 & Prior[5]	2020	2021	2022	2023	2024	Total[6]
DIRECT LABOR	$22	$1	$0	$19	$75	$325	$441
DIRECT NON-LABOR	$147	$21	$0	$188	$790	$2,672	$3,818
TOTAL DIRECT COSTS[7]	$169	$22	$0	$206	$865	$2,997	$4,259
COMPANY OVERHEADS[8]	$22	$2	$0	$31	$127	$417	$598
Total Capital Costs	$191	$24	$0	$238	$992	$3,414	$4,857

[1] Actual costs incurred associated with planning and engineering design work are included in the project cost estimates.
[2] Values may not add to total due to rounding.
[3] Direct Costs reflect escalation.
[4] Excludes AFUDC and tax.
[5] Actual costs incurred associated with planning and engineering design work are included in the project cost estimates.
[6] Values may not add to total due to rounding.
[7] Direct Costs reflect escalation.
[8] Excludes AFUDC and tax.

Table 3: Total Project Cost ($000's)

PROJECT COST	2019 & Prior[9]	2020	2021	2022	2023	2024	Total[10]
DIRECT LABOR	$116	$6	$0	$67	$266	$1,162	$1,617
DIRECT NON-LABOR	$612	$114	$0	$671	$2,823	$9,543	$13,762
TOTAL DIRECT COSTS[11]	$728	$120	$0	$737	$3,089	$10,705	$15,379
COMPANY OVERHEADS[12]	$128	$8	$0	$86	$350	$1,135	$1,707
Total Costs	$855	$127	$0	$824	$3,439	$11,840	$17,086

Project Description

Line 1600 is a 16-inch diameter transmission line that runs approximately 49.7 miles from Rainbow to Mission Valley, San Diego. Per the CPUC Safety and Enforcement Division (SED) approved *Line 1600 Test or Replacement Plan*, the Line 1600 testing and replacement work is comprised of 19 independent projects. This workpaper describes the Line 1600 Couser Canyon South Hydrotest project. The Line 1600 Couser Canyon South Hydrotest project is located in the County of San Diego. The project will hydrotest approximately 2.527 miles of existing 16-inch pipeline through agricultural land from Pala Loma Drive to Keys Creek Road. Prior to the hydrotest, to improve piggability and the integrity of the line, the project will replace 23 features, which include wrinkle bends, short radius elbows, and existing pressure control fittings (PCFs).

Considerations unique to the project are as follows:

- Due to this project's location within a rural area, some work sites will need to be accessed using dirt roads within private property that are not regularly maintained.
- Access roads along the southern end of the project have experienced erosion and additional grading activities will need to occur if road conditions worsen.
- Access to some work sites will require crossing through agricultural lands and large agricultural operations. This will require extensive coordination with landowners and business owners to minimize impacts.
- Portions of the project crosses water runoffs that are currently dry. Depending on weather conditions, more stringent Best Management Practices (BMP's) or additional permitting may be required if water is present during construction.
- The south end of the segment is near a State Mitigation Site and may require additional coordination with Caltrans to prevent impacts outside the pipeline easement.

[9] Actual costs incurred associated with planning and engineering design work are included in the project cost estimates.
[10] Values may not add to total due to rounding.
[11] Direct Costs reflect escalation.
[12] Excludes AFUDC and tax.

Alternatives Considered

D.18-06-028, Ordering Paragraph 7, required SDG&E and SoCalGas to "submit to Safety and Enforcement Division a hydrostatic test or replacement plan pertaining to the existing 49.7 miles of Line 1600 in its present corridor." The Decision further required such plan to discuss two options: "1. Hydrotest the entire 49.7 miles of line and replace those segments that fail the test; and 2. Replace all pipeline segments in High Consequence Areas (HCAs) along Line 1600, thus ensuring a new pipeline without vintage pipeline characteristics that are perceived to increase the risk of Line 1600. Hydrotest in solely non-HCA segments would ensure less impact if there was a failure during hydrotesting." SDG&E's and SoCalGas' September 26, 2018 *Line 1600 Test or Replacement Plan* discussed D.18-06-028's two options as Design Alternative 1 (Replace in HCA/Test in Non-HCA alternative) and Design Alternative 2 (Full Hydrotest alternative), and also discussed Design Alternative 3 (Full Replacement in Nearby Streets alternative) and Design Alternative 4 (Full Replacement Along Highway 395 alternative). SDG&E and SoCalGas proposed to implement the Design Alternative 1, to replace existing Line 1600 primarily in HCAs and hydrotest the remaining sections in non-HCAs and the CPUC SED approved the Plan in January 2019. D.20-02-024 at 31-32 held that issues "out of scope," for Phase 2 include, "revisiting Design Alternatives 2 (Full Hydrotest Alternative), 3 (Full Replacement), 4 (Full Replacement but different street routing) or alternative recommendations. Nor are we revisiting the substance of the PSEP engineering and implementation that falls within the authority of SED."

D.20-02-024 requires, "a cost forecast for the approved Design Alternative 1 (Replace in HCAs and Hydrotest in Non-HCAs) that SED approved on January 15, 2019." Line 1600 Couser Canyon South Hydrotest project hydrotests a segment of Line 1600 not located in an HCA.

Shut-In Analysis

The Line 1600 Couser Canyon South project can be temporarily taken out of service during any seasonal conditions provided appropriate actions are taken to mitigate loss of transmission capacity and steps are taken to ensure supply to core customers fed directly from this section is maintained. If necessary, transmission capacity issues can be mitigated through partial curtailment of non-core customers or by bringing supply into the San Diego system through alternate receipt points, if available. For core customers, service for four existing regulators will be maintained with the use of CNG and a temporary bypass piping connection to an adjacent pipeline.

Forecast Methodology

The Utilities methodology for forecasting PSEP costs is discussed in the Direct Testimony of Ronn Gonzalez. The Utilities developed a Total Installed Cost (TIC) estimate to implement the above scope of work. The TIC Estimate includes direct costs associated with project management, engineering and design, environmental permitting, land acquisition, material and equipment procurement, and construction.

Following the approval of the Plan by SED in January 2019, the Utilities have undertaken the detailed design and planning of the 19 individual projects in the Plan. Generally, projects that are earliest in the overall schedule are the most developed, while those later in the overall schedule are less developed. At the time of cost estimate preparation, this project was at an approximately 30% design level. Further development of this project could reveal new information requiring some adjustments to the project plan in areas such as engineering, materials, construction, permitting, environmental and land, all of which could impact actual costs compared this cost estimate.

Schedule

Implementation of this project is proposed to be completed consistent with the overall prioritization and timing described in Section IV. D. of the *Line 1600 Test or Replacement Plan*. The schedule was developed based on the five-stage project life cycle as defined by PSEP. The schedule was developed based on the five-stage project life cycle as defined by PSEP. The key project deliverables were identified and incorporated into a work breakdown structure. This work breakdown structure was then sequenced, and predecessor and successor tasks were linked to each task. Durations were added to each task to provide a total project duration.

The preliminary Stage 2 Construction Schedule received additional planning and stakeholder input considering that typically 50% of the project costs are expended during the construction phase. The construction schedule is assumed to be 71 working days. The schedule does not include any hydrotest failures.

Pipeline Safety Enhancement Plan Workpaper Supporting Chapter

Line 1600 Couser Canyon South Hydrotest Project

Figure 1: Overview Map for Line 1600 Couser Canyon South Hydrotest

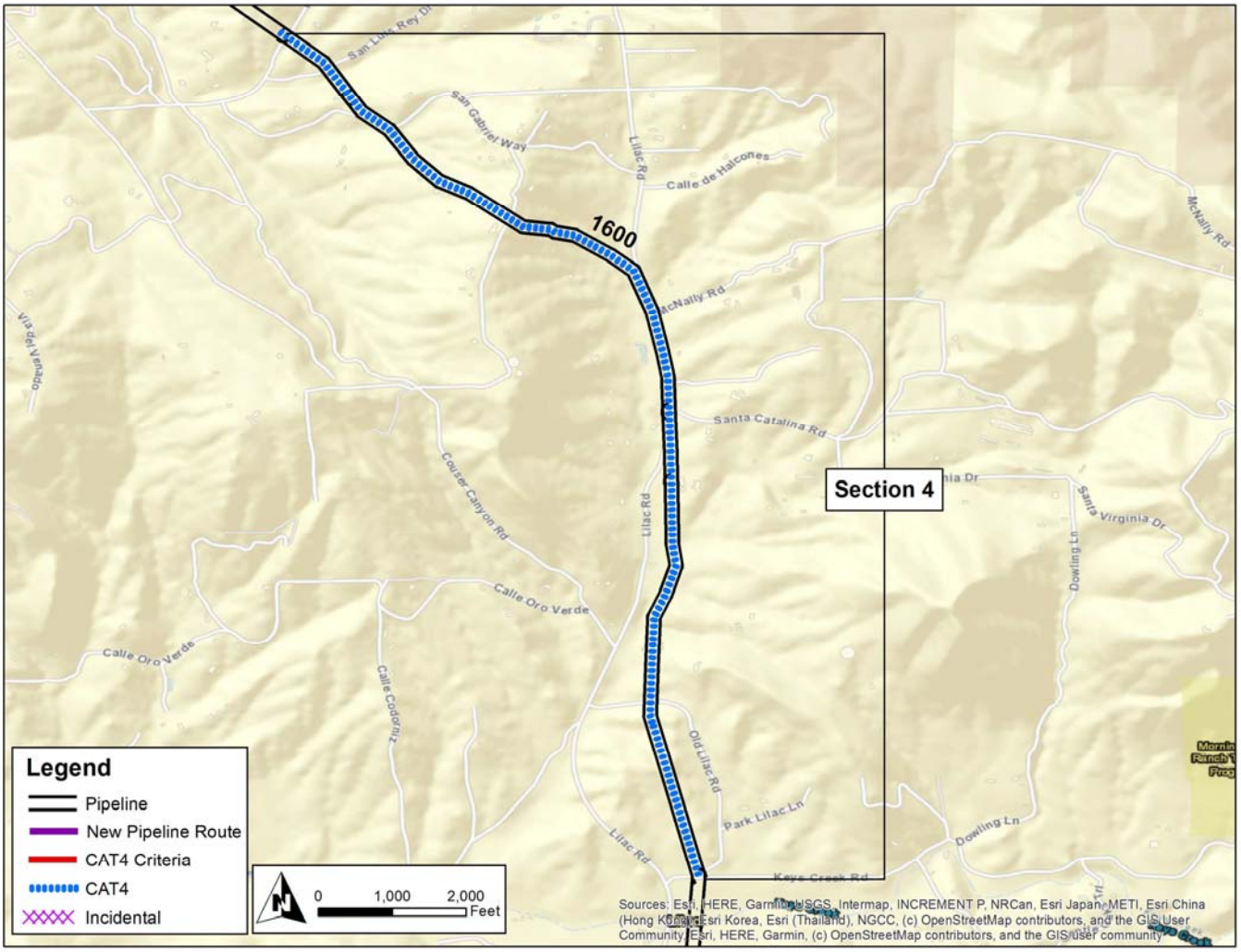


Figure 2: Satellite Map for Line 1600 Couser Canyon South Hydrotest

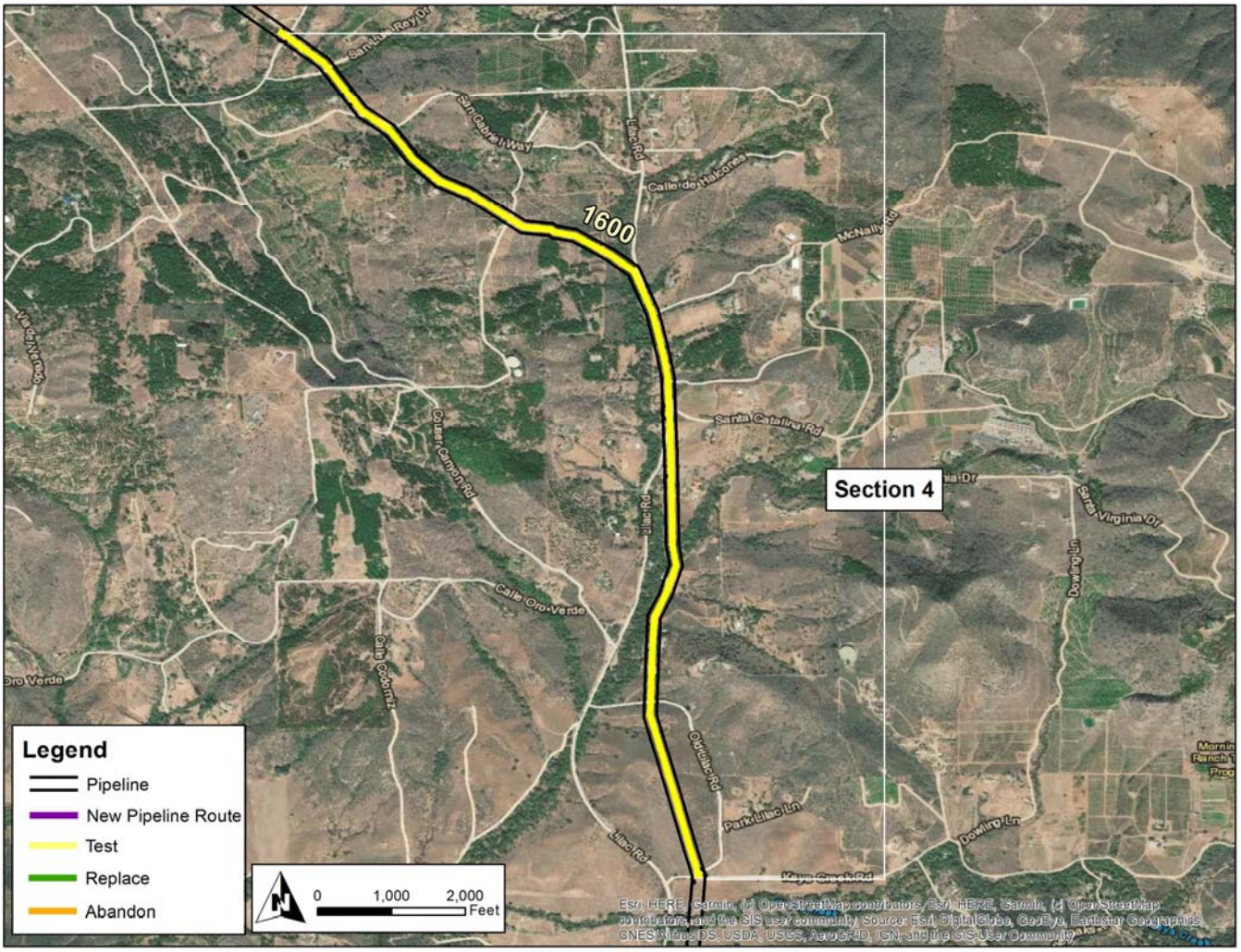


Table 4: Project Mileage

PHASE	MILEAGE
CATEGORY 4 CRITERIA[13]	0.000
CATEGORY 4[14]	2.527
INCIDENTAL	0.000
TOTAL MILEAGE[15]	2.527

The direct costs for each area are summarized below.

Table 5: Material ($000's)

PROJECT COST	2019 & Prior	2020	2021	2022	2023	2024	Total[16]
TOTAL DIRECT COSTS (NON-LABOR)[17]	$0	$0	$0	$73	$299	$51	$422

Assumptions

Materials for this project will be purchased following final internal authorization 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. Materials are necessary to complete hydrotest activities and the replacement of features affecting pipeline integrity and piggability. Primary components include:

- 1,240 feet of 16-inch pipe meeting SDG&E specifications.
- 38 16-inch fittings meeting SDG&E specifications.

Table 6: Construction ($000's)

PROJECT COST	2019 & Prior	2020	2021	2022	2023	2024	Total[18]
TOTAL DIRECT COSTS (NON-LABOR)[19]	$1	$1	$0	$0	$0	$6,162	$6,164

[13] Lacks documentation of a post-construction strength test in a Class 3 or 4 HCA.
[14] Lacks documentation of a post-construction strength test in a Class 1 or 2 non-HCA.
[15] Values may not add to total due to rounding.
[16] Values may not add to total due to rounding.
[17] Direct Costs reflect escalation.
[18] Values may not add to total due to rounding.
[19] Direct Costs reflect escalation.

Assumptions

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

- One mobilization and one demobilization.
- Work has been scheduled using a 10 hour per day, five day work week.
- Eight 20,000 gallon water tanks for hydrotesting activities.
- Mechanical excavation will be authorized up to two feet of the existing pipeline. Hand excavation will be required within the remaining two foot zone.
- Four taps will be isolated prior to hydrotesting and require CNG support.
- 23 features affecting piggability and/or integrity of the line have been identified and will be replaced prior to hydrotesting.
  - The replacement of 800 feet of 16-inch pipe at two sites affecting piggability. 650 feet at Blind Horse and 150 feet at McNally Creek.
- The pipeline will be tested in one test segment.
- Isolation and final tie-ins have been assumed for a 16-hour continuous duration.
- Two final tie-ins have been assumed.
- No allowance for hydrotest failure(s) and the associated repairs and retest has been included in this estimate due to the uncertainty as to whether a failure (or multiple failures) will happen, the location and scope of the failure, and the effort required to complete a repair. The cost for any failure, repair and retest would be incremental to the costs provided in this estimate.

Additional Construction Information

- **Site Mobilization / Site Facilities**
  - One mobilization and one demobilization.
  - Two office trailers have been included for management and inspection personnel.
  - Five months of site duration is anticipated.
  - Placement of crushed rock for the laydown yards.
  - Installation of 300 linear feet (LF) of temporary fill piping from the water tanks to the first test head.
  - Temporary fencing for the laydown yard.
  - Temporary fencing for feature excavations.

- **Site Preparation**
  - 13 days for preparation of access roads and site clearing.

- **Site Management / Best Management Practices (BMPs)**
  - BMP materials for spoils piles, laydown yard, and worksite.
  - Two water trucks for full project duration.

- **Material Handling**
  - Four loads of material will be unloaded by the contractor at laydown yards and transported as needed.

- **Traffic Control**
  - 14 days of traffic control is assumed.

- **Utility Locates**
  - 26 utility locates to verify pipe location at cutouts and tap excavations.

- **Site Excavations**
  - There will be a total of 19 excavations for the cutout and replacement of 23 features in the pipeline.
  - Two excavations for test heads.
  - 800 feet of excavation for the installation of new 16-inch pipe at two sites affecting piggability. 650 feet at Blind Horse and 150 feet at McNally Creek.
  - Four excavations for existing taps.

- **Pipeline Isolation**
  - Four taps will be isolated prior to hydrotesting and require CNG support.

- **Pressure Test Pipeline**
  - Two test breaks sites will be excavated for test head installation.
  - There will be one hydrotest section.

- **Tie-In Pipeline**
  - Two hot tie-ins will be completed.

- **Retire / Abandon Existing Pipeline**
  - Two existing pipeline sections will be abandoned by plating ends. Each abandonment is 284 feet and 150 feet.

- **Site Restoration**
  - Excavated areas will be re-stabilized using hydroseed.

- **Site Demobilization**
  - One load of excess piping will be hauled to SDG&E designated yard.

- **Field Overhead**
  - Full time Project Manager
  - Full time Superintendent
  - Full time Safety Supervisor

Table 7: Environmental Survey/Permitting/Monitoring ($000's)

PROJECT COST	2019 & Prior	2020	2021	2022	2023	2024	Total[20]
TOTAL DIRECT COSTS (NON-LABOR)[21]	$181	$3	$0	$77	$321	$738	$1,321

Assumptions

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

- Asbestos abatement of Asbestos Containing Material (ACM).
- Non-hazardous waste containment/disposal.
- Water source will be a hydrant located near the new alignment.
- Water will be treated and disposed within municipal sewer for hydrotest. Any water encountered during trenching would be stored in water tanks and discharged to land.
- Water treatment and disposal of approximately 143,000 gallons of hydrostatic test water.
- Permit costs.

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

- Environmental Consultants for pre-construction assessments, construction monitoring, and environmental close-out support.
- Aquatic features jurisdictional delineations, habitat assessments, and protocol surveys for listed species.
- Abatement Support is based upon Subject Matter Expert (SME) recommendations.
- Compensatory Mitigation for jurisdictional impacts during excavation within/or near waterways.
- Stormwater Pollution Prevention Plan (SWPPP) development and implementation.
- California Department Fish Wildlife (Streambed Alteration Agreement).
- Regional Water Quality Control Board (401 Certification).
- US Army Corps (404 Permit).

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

[21] Direct Costs reflect escalation.

Table 8: Land & Right-of-Way Acquisition ($000's)

PROJECT COST	2019 & Prior	2020	2021	2022	2023	2024	Total[22]
TOTAL DIRECT COSTS (NON-LABOR)[23]	$0	$0	$0	$65	$406	$129	$600

Assumptions

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

- Encroachment permit and traffic control plan costs.
- New easement costs for replacement sections.
- Temporary Right of Entry (TRE) - Construction yards and workspace required for construction activities.

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.

Table 9: Company Labor ($000's)

PROJECT COST	2019 & Prior	2020	2021	2022	2023	2024	Total[24]
TOTAL DIRECT COSTS (LABOR)[25]	$116	$6	$0	$67	$266	$1,162	$1,617

Assumptions

SDG&E and SoCalGas Labor - Management, Engineering, and Non-Union Labor

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

- Project Management (10,200 hours)
- Project Field Management (5,181 hours)
- Construction Management (790 hours)
- Environmental Services (2,492 hours)
- Land Services (159 hours)

[22] Values may not add to total due to rounding.
[23] Direct Costs reflect escalation.
[24] Values may not add to total due to rounding.
[25] Direct Costs reflect escalation.

Company employees provide extensive oversight with respect to safety; environmental protection; site management; construction, engineering and design services contract management and administration; project engineering and management; planning; scheduling; progress control; cost estimating, tracking and control; inspection; job site material and logistics management as well as job site customer interface management and community outreach.

SDG&E Labor - Union Labor

SDG&E Union Labor costs were developed with the guidance of SDG&E Construction Management and those costs are duration dependent and activity specific.

Critical operational activities such as operating valves, bringing the cathodic protection system online, bringing instrumentation online, gas handling and removing old assets from service as well as loading gas into new assets and placing them into service are all completed by Company Union personnel.

Table 10: Other Costs ($000's)

PROJECT COST	2019 & Prior	2020	2021	2022	2023	2024	Total[26]
TOTAL DIRECT COSTS (NON-LABOR)[27]	$429	$110	$0	$455	$1,797	$2,463	$5,256

Assumptions

In addition to costs previously described above, there are other costs incurred as part of completing the project that are primarily associated with contracts that are established with specialized service providers that either perform a unique service or supplement the core Company project team. It is typical that services are contracted to complete activities related to planning, engineering, design, estimating, project and construction management, scheduling, survey, construction inspection, x-ray and non-destructive examination of welds, hot tapping and/or stopple services, temporary gas supplies, gas capture services, safety services, as well as as-built and project documentation and records management services. Other costs also include non-labor expenses related to business related mileage, travel, meals and lodging.

Engineering and Project Management

- Developed upon specified scope of work, planned deliverables, and activity levels of effort reflecting anticipated manpower requirements over the planned timeframe of the project schedule.
- Contracted engineering assistance to identify and evaluate potential options to bring Line 1600 into compliance with D.11-06-017 and Public Utilities Code § 958.
- Non-labor costs included in this estimate address travel, meals, expenses, and lodging incurred for SDG&E Labor.

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

[27] Direct Costs reflect escalation.

Construction Support Services

The high-level assumptions and specific level of effort to provide construction management support for this project are described in more detail below.

- 39 Days of X-Ray / NDE support with full time X-Ray support with each pipeline lay crew.
- CNG to support existing taps during pipeline isolation.
- Gas service for core customers will be maintained through combination of purchase of additional gas through an alternative receipt point and curtailments to non-core customers where as appropriate.
- Two stopple fitting service.

Inspection Services

- Full time Chief Inspector
- Full time Welding Inspector

Survey and Design Services

- The survey and design service estimate includes survey support staff for project and site facility layout and as-builts. The estimate also includes engineering team material support in the development of as-built close-out packages.

Table 11: Indirect Costs ($000's)

PROJECT COST	2019 & Prior	2020	2021	2022	2023	2024	Total[28]
COMPANY OVERHEADS	$128	$8	$0	$86	$350	$1,350	$1,707

Assumptions

- Indirect costs are for Administrative and General, purchasing, warehousing, pension and benefits, payroll tax, and other costs that are overhead in nature.
- Indirect costs do not include AFUDC or Property Tax.

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

Table 1: Total Project Cost ($000's)

PROJECT COST	2019 & Prior[1]	2020	2021	2022	2023	Total[2]
DIRECT LABOR	$654	$15	$349	$1,538	$464	$3,020
DIRECT NON-LABOR	$3,131	$125	$5,181	$27,519	$17,093	$53,049
TOTAL DIRECT COSTS[3]	$3,784	$140	$5,530	$29,057	$17,556	$56,068
COMPANY OVERHEADS[4]	$772	$23	$1,076	$3,146	$1,243	$6,261
Total Capital Costs	$4,557	$163	$6,606	$32,203	$18,800	$62,329

Project Description

Line 1600 is a 16-inch diameter transmission line that runs approximately 49.7 miles from Rainbow to Mission Valley, San Diego. Per the CPUC Safety and Enforcement Division (SED) approved *Line 1600 Test or Replacement Plan*, the Line 1600 testing and replacement work is comprised of 19 independent projects. This workpaper describes the Line 1600 Lilac Road Replacement project. The Line 1600 Lilac Road Replacement project is located in the County of San Diego. The project will replace approximately 5.121 miles of existing 16-inch pipeline with 5.958 miles of new 16-inch pipeline along Lilac Road, Hideaway Lake Road, and Lamar Road ending south of Betsworth Road along Frace Lane. Due to the offset of the new alignment, additional distribution work will be required as part of the project scope to allow for existing customers to be served from the rerouted alignment. Associated distribution work includes installation of two new regulator stations. The project will utilize three jack and bores for creek crossings and remove 11 existing pipeline spans following the abandonment of the existing pipeline. The project will also install approximately 5.121 miles of fiber optic cable with one fiber optic monitoring station. Fiber optic cable will be installed along the new 16-inch pipeline to assist in leak detection, ground movement, and vibration analysis.

Considerations unique to the project are as follows:

- 11 existing pipeline spans will be removed in environmentally sensitive areas. To minimize the construction impacts within these areas, helicopter support is planned for the removal of the spans.
- The three jack and bores for creek crossings will require the use of 36-inch casing due to the presence of large rock.

[1] Actual costs incurred associated with planning and engineering design work are included in the project cost estimates.
[2] Values may not add to total due to rounding.
[3] Direct Costs reflect escalation.
[4] Excludes AFUDC and tax.

Alternatives Considered

D.18-06-028, Ordering Paragraph 7, required SDG&E and SoCalGas to "submit to Safety and Enforcement Division a hydrostatic test or replacement plan pertaining to the existing 49.7 miles of Line 1600 in its present corridor." The Decision further required such plan to discuss two options: "1. Hydrotest the entire 49.7 miles of line and replace those segments that fail the test; and 2. Replace all pipeline segments in High Consequence Areas (HCAs) along Line 1600, thus ensuring a new pipeline without vintage pipeline characteristics that are perceived to increase the risk of Line 1600. Hydrotest in solely non-HCA segments would ensure less impact if there was a failure during hydrotesting." SDG&E's and SoCalGas' September 26, 2018 *Line 1600 Test or Replacement Plan* discussed D.18-06-028's two options as Design Alternative 1 (Replace in HCA/Test in Non-HCA alternative) and Design Alternative 2 (Full Hydrotest alternative), and also discussed Design Alternative 3 (Full Replacement in Nearby Streets alternative) and Design Alternative 4 (Full Replacement Along Highway 395 alternative). SDG&E and SoCalGas proposed to implement, and the CPUC SED approved, Design Alternative 1, which will replace existing Line 1600 primarily in HCAs and hydrotest the remaining sections in non-HCAs. D.18-06-028 at 92 also required the Utilities to "identify proposed rerouting of the line in specific segments." As discussed in the *Line 1600 Test or Replacement Plan,* "SDG&E and SoCalGas concluded it is not feasible, prudent nor reasonable to build a new replacement pipeline entirely within the existing Line 1600 rights-of-way." Due to construction difficulty, private property and community impacts, environmental impacts, and costs and delays of efforts to expand the existing rights of way (ROW), the *Line 1600 Test or Replacement Plan* proposed to re-route the majority of replacement segments, usually in nearby streets. In developing the Plan, SDG&E and SoCalGas reviewed these proposed re-routes with SED, which "conducted a joint field inspection of the identified sites with SDG&E personnel and its contractor to evaluate the existing safety conditions, constructability and serviceability of Line 1600. After the field inspections, SED agreed with SDG&E's and SoCalGas' proposed reroute of many segments of Line 1600 due to safety and serviceability reasons."

D.20-02-024 requires "a cost forecast for the approved Design Alternative 1 (Replace in HCAs and Hydrotest in Non-HCAs) that SED approved on January 15, 2019."[2] D.20-02-024 at 31-32 held that issues "out of scope" for Phase 2 include "revisiting Design Alternatives 2 (Full Hydrotest Alternative), 3 (Full Replacement), 4 (Full Replacement but different street routing) or alternative recommendations. Nor are we revisiting the substance of the PSEP engineering and implementation that falls within the authority of SED."

Shut-In Analysis

The Line 1600 Lilac Road Replacement project can be temporarily taken out of service without any notable impacts to the transmission or distribution system. No CNG support is planned during the isolation of the pipeline. Two new pressure control fittings (PCFs) will be installed at the north and south end of the Project to facilitate the tie-in of the new pipeline to the existing Line 1600.

Forecast Methodology

The Utilities methodology for forecasting PSEP costs is discussed in the Direct Testimony of Ronn Gonzalez. The Utilities developed a Total Installed Cost (TIC) estimate to implement the above scope of work. The TIC Estimate includes direct costs associated with project management, engineering and design, environmental permitting, land acquisition, material and equipment procurement, and construction.

Following the approval of the Plan by SED in January 2019, the Utilities have undertaken the detailed design and planning of the 19 individual projects in the Plan. Generally, projects that are earliest in the overall schedule are the most developed, while those later in the overall schedule are less developed. At the time of cost estimate preparation, this project was at an approximately 30% design level. Further development of this project could reveal new information requiring some adjustments to the project plan in the areas such as engineering, materials, construction, permitting, environmental and land, all of which could impact actual costs compared this cost estimate.

Schedule

Implementation of this project is proposed to be completed consistent with the overall prioritization and timing described in Section IV. D. of the *Line 1600 Test or Replacement Plan.* The schedule was developed based on the five-stage project life cycle as defined by PSEP. The key project deliverables were identified and incorporated into a work breakdown structure. This work breakdown structure was then sequenced, and predecessor and successor tasks were linked to each task. Durations were added to each task to provide a total project duration.

The preliminary Stage 2 Construction Schedule received additional planning and stakeholder input considering that typically 50% of the project costs are expended during the construction phase. The construction schedule is assumed to be 169 working days.

Pipeline Safety Enhancement Plan Workpaper Supporting Chapter

Line 1600 Lilac Road Replacement Project

Figure 1: Overview Map for Line 1600 Lilac Replacement Project

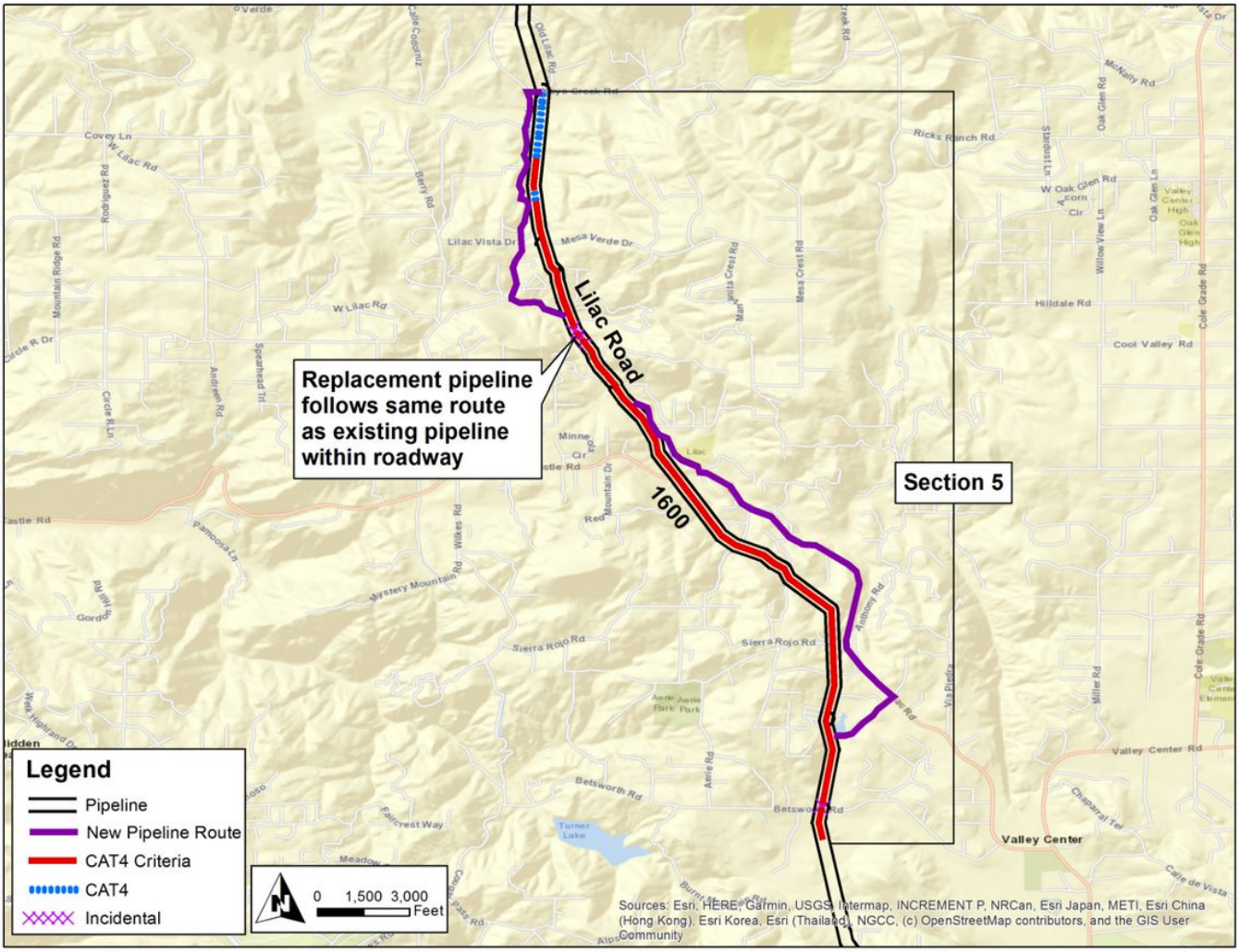


Figure 2: Satellite Map for Line 1600 Lilac Replacement

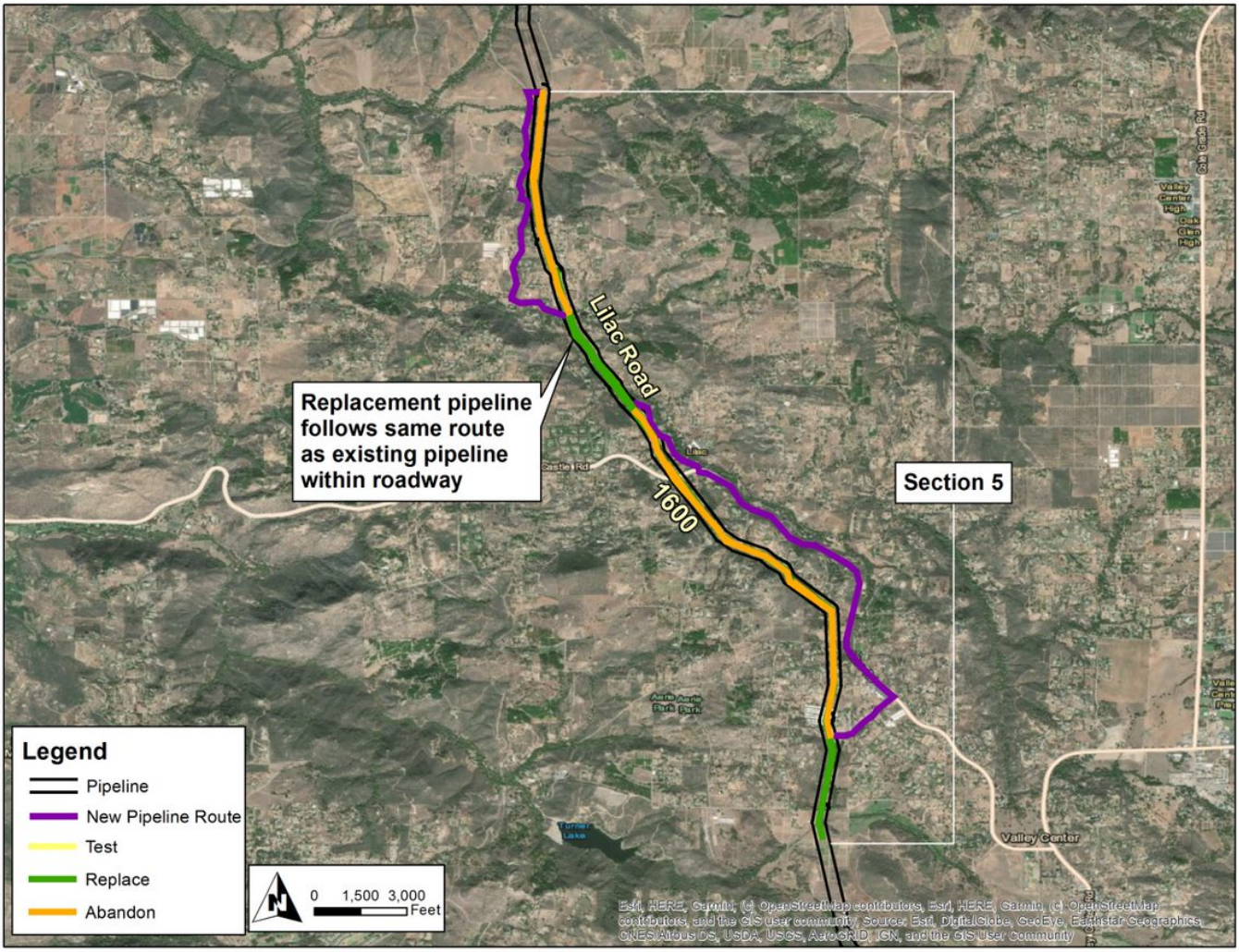


Table 2: Project Mileage

PHASE	MILEAGE
CATEGORY 4 CRITERIA[5]	4.629
CATEGORY 4[6]	0.480
INCIDENTAL	0.011
REPLACEMENT OFFSET	0.837
TOTAL MILEAGE[7]	5.958

The direct costs for each area are summarized below.

Table 3: Material ($000's)

PROJECT COST	2019 & Prior	2020	2021	2022	2023	Total[8]
TOTAL DIRECT COSTS (NON-LABOR)[9]	$0	$0	$1,995	$1,800	$0	$3,795

Assumptions

Materials for this project will be purchased following final internal authorization 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. Primary components include:

- 32,000 feet of 16-inch pipe meeting SDG&E specifications.
- 47 16-inch fittings meeting SDG&E specifications.

Table 4: Construction ($000's)

PROJECT COST	2019 & Prior	2020	2021	2022	2023	Total[10]
TOTAL DIRECT COSTS (NON-LABOR)[11]	$10	$4	$0	$21,635	$13,354	$35,003

[5] Lacks documentation of a post-construction strength test in a Class 3 or 4 HCA.
[6] Lacks documentation of a post-construction strength test in a Class 1 or 2 non-HCA.
[7] Values may not add to total due to rounding.
[8] Values may not add to total due to rounding.
[9] Direct Costs reflect escalation.
[10] Values may not add to total due to rounding.
[11] Direct Costs reflect escalation.

Assumptions

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

- One mobilization and one demobilization.
- Contractor work is estimated using a 10 hour per day, five day work week.
- Two mainline installation crews.
- One installation crew for three jack and bore crossings.
- Fiber optic lines will be installed above the new pipeline.
- Excess spoils will be hauled off and disposed.
- Tie-ins will be completed during a 24 hour continuous shift.
- The new pipeline will be hydrotested in one section.
- Laydown yards will be restored to original condition at the end of the project.
- Restoration of grade along right of way (ROW) will be completed at the end of the project.

Additional Construction Information

- **Site Mobilization / Site Facilities**
  - One mobilization and one demobilization.
  - Two office trailers have been included for management and inspection personnel at the primary laydown yard.
  - 10 months of site duration is anticipated
  - Temporary fencing for all laydown yards.
  - Track out plates will be utilized at street access points to minimize soil being tracked onto the street by construction vehicles.

- **Site Management / BMP's**
  - BMP materials for spoils piles, laydown yard, and work site.

- **SDG&E / Company Furnished Material Handling**
  - 50 loads of material will be unloaded by the contractor at laydown yards and transported as needed.

- **Traffic Control**
  - A three man crew will be used for traffic control during the project.

- **Utility Locates**
  - 76 utility locates to verify using potholing.

- **Pipeline Installation**
  - Installation includes the following:
    - Approximately 32,000 linear feet (LF) of 16-inch pipe.
  - Site demo, excavation and pad trench / bellholes, string and bends pipe, coating joints.
  - Installation of fiber optic line and pipeline warning mesh.

- **Isolate Existing Pipeline**
  - The existing pipeline will be isolated using two PCFs after the new pipeline has been installed and post-completion pressure tested.

- **Pressure Test Pipeline**
  - Contractor will assist with the preparatory work prior to the set-up of 17 20,000 gallon water tanks.
  - Hard piping will be installed from the test head to the water tank pumps.
  - Two test heads will be provided and installed.
  - The pipeline will be tested in one segment.
  - Following the dewatering of the new pipeline, the new pipeline will be intermittently dried and then filled with nitrogen as preparation for tie-in activities.

- **Tie-In Pipeline**
  - Tie-ins will be completed during a 24 hour continuous shift.
  - One existing gas service will be tied-in following the gas up of the new main.
  - Two new Regulator Stations will be installed.
  - Two existing mainline valves (MLVs) will be tied-in to the new pipeline.

- **Retire / Abandon Existing Pipeline**
  - 11 existing pipeline spans will be removed.
  - Approximately 1,485 linear feet (LF) of abandoned pipe will be of slurry filled at six locations. All other abandoned pipeline segments will be abandoned using nitrogen.

- **Site Restoration**
  - Base paving of trench width will be completed up to 8-inch thick where the pipeline is installed in paved areas.
  - Disturbed pavement in a moratorium area will receive a mill and overlay from edge of pavement to edge of pavement or approximately 30 feet wide and 1-inch thick.
  - All paved roads will receive new striping where disturbed.

- **Site Demobilization**
  - Three loads of excess piping will be hauled to SDG&E designated yard.

- **Field Overhead**
  - Full time Project Manager
  - Full time Superintendent
  - Full time Safety Supervisor

Table 5: Environmental Survey/Permitting/Monitoring ($000's)

PROJECT COST	2019 & Prior	2020	2021	2022	2023	Total[12]
TOTAL DIRECT COSTS (NON-LABOR)[13]	$1,002	$4	$435	$913	$738	$3,092

Assumptions

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

- Asbestos abatement of Asbestos Containing Material (ACM).
- Non-hazardous waste containment/ disposal.
- Water source will be a hydrant located near the new alignment.
- Water will be treated and disposed within municipal sewer for hydrotest. Any water encountered during trenching would be stored in water tanks and discharged to land.
- Water treatment and disposal of approximately 297,000 gallons of hydrostatic test water.
- Permit costs.

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

- Environmental Consultants for pre-construction assessments, construction monitoring, and environmental close-out support.
- Storm Water Pollution Prevention Plan (SWPPP) development and monitoring.
- Abatement Support is based upon Subject Matter Expert (SME) recommendations.
- Compensatory Mitigation for jurisdictional impacts during excavation within/or near waterways.
- California Department of Fish and Wildlife (Streambed Alteration Agreement).
- Regional Water Quality Control Board (401 Certification).
- US Army Corps (404 Permit).

Table 6: Land & Right of Way Acquisition ($000's)

PROJECT COST	2019 & Prior	2020	2021	2022	2023	Total[14]
TOTAL DIRECT COSTS (NON-LABOR)[15]	$0	$0	$200	$341	$0	$541

[12] Values may not add to total due to rounding.
[13] Direct Costs reflect escalation.
[14] Values may not add to total due to rounding.
[15] Direct Costs reflect escalation.

Assumptions

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

- Encroachment permit and traffic control plan costs.
- New easement costs.
- Temporary Right of Entry (TRE) - Construction yards and workspace required for construction activities.

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.

Table 7: Company Labor ($000's)

PROJECT COST	2019 & Prior	2020	2021	2022	2023	Total[16]
TOTAL DIRECT COSTS (LABOR)[17]	$654	$15	$349	$1,538	$464	$3,020

Assumptions

SDG&E and SoCalGas Labor - Management, Engineering, and Non-Union Labor

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

- Project Management (14,425 hours)
- Project Field Management (4,648 hours)
- Construction Management (1,770 hours)
- Environmental Services (3,752 hours)
- Land Services (1,265 hours)

Company employees provide extensive oversight with respect to safety; environmental protection; site management; construction, engineering and design services contract management and administration; project engineering and management; planning; scheduling; progress control; cost estimating, tracking and control; inspection; job site material and logistics management as well as job site customer interface management and community outreach.

SDG&E Labor - Union Labor

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

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

[17] Direct Costs reflect escalation.

Critical operational activities such as operating valves, bringing the cathodic protection system online, bringing instrumentation online, gas handling and removing old assets from service as well as loading gas into new assets and placing them into service are all completed by Company Union personnel.

Table 8: Other Costs ($000's)

PROJECT COST	2019 & Prior	2020	2021	2022	2023	Total[18]
TOTAL DIRECT COSTS (NON-LABOR)[19]	$2,119	$117	$2,551	$2,831	$3,001	$10,618

Assumptions

In addition to costs previously described above, there are other costs incurred as part of completing the project that are primarily associated with contracts that are established with specialized service providers that either perform a unique service or supplement the core Company project team. It is typical that services are contracted to complete activities related to planning, engineering, design, estimating, project and construction management, scheduling, survey, construction inspection, x-ray and non-destructive examination of welds, hot tapping and/or stopple services, temporary gas supplies, gas capture services, safety services, as well as as-built and project documentation and records management services. Other costs also include non-labor expenses related to business related mileage, travel, meals and lodging.

Engineering and Project Management

- Developed upon specified scope of work, planned deliverables, and activity levels of effort reflecting anticipated manpower requirements over the planned timeframe of the project schedule.
- Contracted engineering assistance to identify and evaluate potential options to bring Line 1600 into compliance with D.11-06-017 and Public Utilities Code § 958.
- Non-labor costs included in this estimate address travel, meals, expenses, and lodging incurred for SDG&E and SoCalGas Labor.

Construction Support Services

The high-level assumptions and specific level of effort to provide construction management support for this project are described in more detail below.

- Full time X-Ray / NDE support with each pipeline lay crew.
- Two stopple fitting service.
- No CNG to support existing taps during pipeline isolation.
- Gas capture services to reduce the amount of natural gas vented to atmosphere.

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

[19] Direct Costs reflect escalation.

Inspection Services

- Full time Chief Inspector
- Four full time Welding Inspectors

Survey and Design Services

- The survey and design service estimate includes survey support staff for project and site facility layout and as-builts. The estimate also includes engineering team material support in the development of as-built close-out packages.

Table 9: Indirect Costs ($000's)

PROJECT COST	2019 & Prior	2020	2021	2022	2023	Total[20]
COMPANY OVERHEADS	$772	$23	$1,076	$3,146	$1,243	$6,261

Assumptions

- Indirect costs are for Administrative and General, purchasing, warehousing, pension and benefits, payroll tax, and other costs that are overhead in nature.
- Indirect costs do not include AFUDC or Property Tax.

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

Pipeline Safety Enhancement Plan Workpaper Supporting Chapter

Line 1600 Moosa Creek Hydrotest Project

Table 1: Total O&M Cost ($000's)

PROJECT COST – O&M	2019 & Prior[1]	2020	2021	2022	2023	Total[2]
DIRECT LABOR	$74	($1)	$0	$256	$771	$1,101
DIRECT NON-LABOR	$315	$34	$0	$1,952	$4,601	$6,902
TOTAL DIRECT COSTS[3]	$389	$34	$0	$2,208	$5,373	$8,003
COMPANY OVERHEADS[4]	$86	($1)	$0	$259	$645	$988
Total O&M Costs	$475	$32	$0	$2,466	$6,018	$8,991

Table 2: Total Capital Cost ($000's)

PROJECT COST – CAPITAL	2019 & Prior[5]	2020	2021	2022	2023	Total[6]
DIRECT LABOR	$16	$0	$0	$100	$300	$415
DIRECT NON-LABOR	$104	$16	$0	$759	$1,789	$2,668
TOTAL DIRECT COSTS[7]	$120	$16	$0	$859	$2,089	$3,083
COMPANY OVERHEADS[8]	$16	$1	$0	$140	$347	$503
Total Capital Costs	$135	$17	$0	$998	$2,436	$3,587

[1] Actual costs incurred associated with planning and engineering design work are included in the project cost estimates.
[2] Values may not add to total due to rounding.
[3] Direct Costs reflect escalation.
[4] Excludes AFUDC and tax.
[5] Actual costs incurred associated with planning and engineering design work are included in the project cost estimates.
[6] Values may not add to total due to rounding.
[7] Direct Costs reflect escalation.
[8] Excludes AFUDC and tax.

Table 3: Total Project Cost ($000's)

PROJECT COST	2019 & Prior[9]	2020	2021	2022	2023	Total[10]
DIRECT LABOR	$90	($0)	$0	$356	$1,071	$1,516
DIRECT NON-LABOR	$419	$50	$0	$2,711	$6,391	$9,570
TOTAL DIRECT COSTS[11]	$508	$50	$0	$3,066	$7,462	$11,086
COMPANY OVERHEADS[12]	$102	($0)	$0	$399	$992	$1,492
Total Costs	$610	$49	$0	$3,465	$8,454	$12,578

Project Description

Line 1600 is a 16-inch diameter transmission line that runs approximately 49.7 miles from Rainbow to Mission Valley, San Diego. Per the CPUC Safety and Enforcement Division (SED) approved *Line 1600 Test or Replacement Plan*, the Line 1600 testing and replacement work is comprised of 19 independent projects. This workpaper describes the Line 1600 Moosa Creek Hydrotest project. The Line 1600 Moosa Creek Hydrotest project is located in the County of San Diego near the unincorporated community of Valley Center. The project will hydrotest approximately 0.980 miles of existing 16-inch pipeline through agricultural land from Betsworth Road to south of the intersection of Mirar De Valle Road and Frace Lane. Prior to the hydrotest, to improve piggability and the integrity of the line, the project will replace 12 features, which include wrinkle bends, short radius elbows, and existing pressure control fittings (PCFs).

Considerations unique to the project are as follows:

- Due to this Project's location within a rural area, some work sites will need to be accessed using dirt roads within private property that are not regularly maintained.
- Access roads along the southern end of the project have experienced erosion and additional grading activities will need to occur if road conditions worsen.
- Access to some work sites will require crossing through agricultural lands and large agricultural operations. This will require extensive coordination with landowners and business owners to minimize impacts.
- Portions of the project cross water runoffs that are typically dry but do become intermittently wet depending on the season and recent precipitation. Depending on weather conditions, more stringent best management practices (BMPs) or additional permitting may be required if water is present during construction.
- One creek crossing will be replaced to eliminate short radius elbows prior to the hydrotest.

[9] Actual costs incurred associated with planning and engineering design work are included in the project cost estimates.
[10] Values may not add to total due to rounding.
[11] Direct Costs reflect escalation.
[12] Excludes AFUDC and tax.

Alternatives Considered

D.18-06-028, Ordering Paragraph 7, required SDG&E and SoCalGas to "submit to Safety and Enforcement Division a hydrostatic test or replacement plan pertaining to the existing 49.7 miles of Line 1600 in its present corridor." The Decision further required such plan to discuss two options: "1. Hydrotest the entire 49.7 miles of line and replace those segments that fail the test; and 2. Replace all pipeline segments in High Consequence Areas (HCAs) along Line 1600, thus ensuring a new pipeline without vintage pipeline characteristics that are perceived to increase the risk of Line 1600. Hydrotest in solely non-HCA segments would ensure less impact if there was a failure during hydrotesting." SDG&E's and SoCalGas' September 26, 2018 *Line 1600 Test or Replacement Plan* discussed D.18-06-028's two options as Design Alternative 1 (Replace in HCA/Test in Non-HCA alternative) and Design Alternative 2 (Full Hydrotest alternative), and also discussed Design Alternative 3 (Full Replacement in Nearby Streets alternative) and Design Alternative 4 (Full Replacement Along Highway 395 alternative). SDG&E and SoCalGas proposed to implement the Design Alternative 1, to replace existing Line 1600 primarily in HCAs and hydrotest the remaining sections in non-HCAs and the CPUC SED approved the Plan in January 2019. D.20-02-024 at 31-32 held that issues, "out of scope," for Phase 2 include, "revisiting Design Alternatives 2 (Full Hydrotest Alternative), 3 (Full Replacement), 4 (Full Replacement but different street routing) or alternative recommendations. Nor are we revisiting the substance of the PSEP engineering and implementation that falls within the authority of SED."

D.20-02-024 requires, "a cost forecast for the approved Design Alternative 1 (Replace in HCAs and Hydrotest in Non-HCAs) that SED approved on January 15, 2019." Line 1600 Moosa Creek Hydrotest project hydrotests a segment of Line 1600 not located in an HCA.

Shut-In Analysis

The Line 1600 Moosa Creek Hydrotest project can be temporarily taken out of service during any seasonal conditions provided appropriate actions are taken to mitigate loss of transmission capacity and steps are taken to ensure supply to core customers fed directly from this section is maintained. If necessary, transmission capacity issues can be mitigated through partial curtailment of non-core customers or by bringing supply into the San Diego system through alternate receipt points, if available. For core customers served directly by this section of Line 1600, service will be maintained with the use of CNG, an existing bridle, and a temporary bypass piping connection to an adjacent pipeline.

Forecast Methodology

The Utilities methodology for forecasting PSEP costs is discussed in the Direct Testimony of Ronn Gonzalez. The Utilities developed a Total Installed Cost (TIC) estimate to implement the above scope of work. The TIC Estimate includes direct costs associated with project management, engineering and design, environmental permitting, land acquisition, material and equipment procurement, and construction.

Following the approval of the Plan by SED in January 2019, the Utilities have undertaken the detailed design and planning of the 19 individual projects in the Plan. Generally, projects that are earliest in the overall schedule are the most developed, while those later in the overall schedule are less developed. At the time of cost estimate preparation, this project was at an approximately 30% design level. Further development of this project could reveal new information requiring some adjustments to the project plan in areas such as engineering, materials, construction, permitting, environmental and land, all of which could impact actual costs compared this cost estimate.

Schedule

Implementation of this project is proposed to be completed consistent with the overall prioritization and timing described in Section IV. D. of the *Line 1600 Test or Replacement Plan*. The schedule was developed based on the five-stage project life cycle as defined by PSEP. The key project deliverables were identified and incorporated into a work breakdown structure. This work breakdown structure was then sequenced, and predecessor and successor tasks were linked to each task. Durations were added to each task to provide a total project duration.

The preliminary Stage 4 Construction Schedule received additional planning and stakeholder input considering that typically 50% of the project costs are expended during the construction phase. The construction schedule is assumed to be 51 working days. The schedule does not include any hydrotest failures.

Figure 1: Overview Map for Line 1600 Moosa Creek Hydrotest

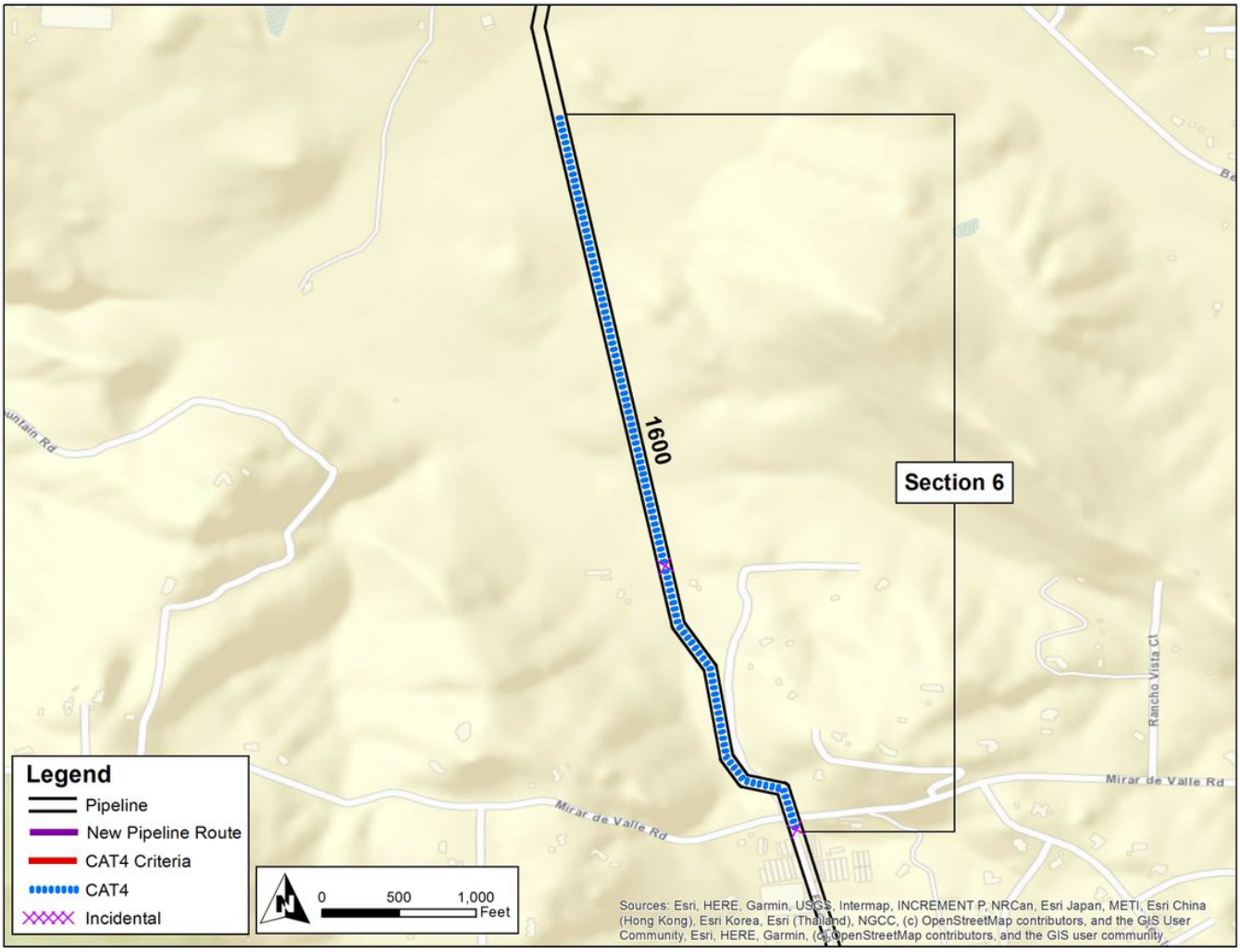


Figure 2: Project Satellite Map for Line 1600 Moosa Creek Hydrotest

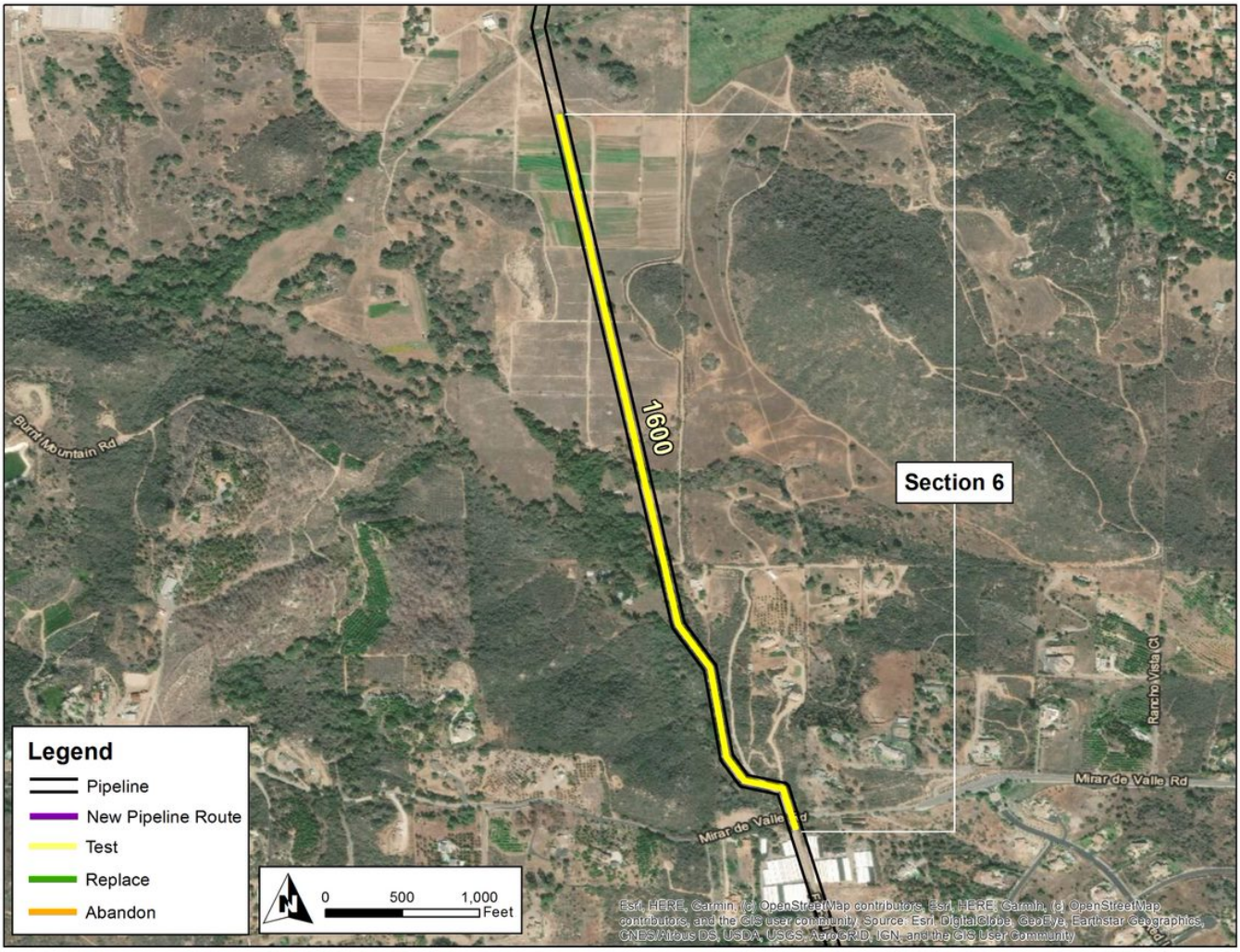


Table 4: Project Mileage

PHASE	MILEAGE
CATEGORY 4 CRITERIA[13]	0.000
CATEGORY 4[14]	0.976
INCIDENTAL	0.004
TOTAL MILEAGE[15]	0.980

The direct costs for each area are summarized below.

Table 5: Material ($000's)

PROJECT COST	2019 & Prior	2020	2021	2022	2023	Total[16]
TOTAL DIRECT COSTS (NON-LABOR)[17]	$0	$0	$0	$203	$0	$203

Assumptions

Materials for this project will be purchased following final internal authorization 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. Materials are necessary to complete hydrotest activities and the replacement of features affecting pipeline integrity and piggability. Primary components include:

- 380 feet of 16-inch pipe meeting SDG&E specifications.
- 26 16-inch fittings meeting SDG&E specifications.

Table 6: Construction ($000's)

PROJECT COST	2019 & Prior	2020	2021	2022	2023	Total[18]
TOTAL DIRECT COSTS (NON-LABOR)[19]	$1	$0	$0	$0	$3,559	$3,561

[13] Lacks documentation of a post-construction strength test in a Class 3 or 4 HCA.
[14] Lacks documentation of a post-construction strength test in a Class 1 or 2 non-HCA.
[15] Values may not add to total due to rounding.
[16] Values may not add to total due to rounding.
[17] Direct Costs reflect escalation.
[18] Values may not add to total due to rounding.
[19] Direct Costs reflect escalation.

Pipeline Safety Enhancement Plan Workpaper Supporting Chapter

Line 1600 Moosa Creek Hydrotest Project

Assumptions

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

- One mobilization and one demobilization.
- Work has been scheduled using a 10 hour per day, five day work week.
- Three 20,000 gallon water tanks for hydrotesting activities.
- Hydrotest water will be disposed at nearest treatment facility.
- Two test heads with the associated 16-inch piping will be fabricated and pretested.
- Mechanical excavation will be authorized up to two feet of the existing pipeline. Hand excavation will be required within the remaining two foot zone.
- Three taps will be isolated prior to hydrotesting.
- Line taps will be fabricated and then reconnected after line is back in service.
- 12 features affecting piggability and/or integrity of the line have been identified and will be replaced prior to hydrotesting.
- The pipeline will be tested in one test segment.
- No allowance for hydrotest failure(s) and the associated repairs and retest has been included in this estimate due to the uncertainty as to whether a failure (or multiple failures) will happen, the location and scope of the failure, and the effort required to complete a repair. The cost for any failure, repair and retest would be incremental to the costs provided in this estimate.
- Isolation and final tie-ins have been assumed for a 16 hour continuous duration.

Additional Construction Information

- **Site Mobilization / Site Facilities**
  - One mobilization and one demobilization.
  - Two office trailers have been included for management and inspection personnel.
  - Four and a half months of site duration is anticipated.
  - Placement of crushed rock for the laydown yards.
  - Installation of 300 linear feet (LF) of temporary fill piping from the water tanks to the first test head.
  - Temporary fencing for the laydown yard.
  - Temporary fencing for feature excavations.

- **Site Preparation**
  - Four days for preparation of access roads and site clearing.

- **Site Management / Best Management Practices (BMPs)**
  - Environmental protective fencing has been included at each of the hydrotest and other excavation locations associated with the described work activities.
  - BMP materials for spoils piles, laydown yard, and worksite.

- **Material Handling**
  - Two loads of material will be unloaded by the contractor at laydown yards and transported as needed.

- **Traffic Control**
  - Traffic control is not included on this project as it is assumed work activities will remain off dedicated roadways.

- **Utility Locates**
  - Two utility locates to verify coating and pipe integrity prior to installing testing manifolds.
  - 14 utility locates to verify pipe location at cutouts and tap excavations.

- **Isolate Existing Pipeline**
  - Three taps will be isolated prior to hydrotesting:
    - One tap can be supported using an existing MLV bridle feed once the line is capped north of the test break.
    - One tap will be isolated and supported with CNG.
    - One tap will require the installation of temporary piping to maintain service to customers.
- **Site Excavation**
  - A total of two test breaks sites will be excavated for test head manifold installation.
  - There will be a total of 11 excavations for the cutout and replacement of 12 features in the pipeline.

- **Remove Existing/Install New Features**
  - Two 16-inch Isolation caps will be fabricated and tested.
  - Two 2-inch isolation caps will be fabricated and tested.
  - 400 linear feet (LF) of 2-inch temporary piping will be installed to maintain service to customers.

- **Pressure Test Pipeline**
  - Pipeline will be tested in one test segment.
  - Two test heads with the associated 16-inch piping will be fabricated and pretested.

- **Mainline Valve (MLV)**
  - This project does not include a MLV.

- **Tie-In Pipeline**
  - One 10 hour day for tie-in preparation.
  - One 16 hour day for tie-in.
  - Five hours for reconnection of taps.

- **Site Restoration**
  - All work site locations will be restored to a state similar to original condition.
  - Excavated areas will be re-stabilized using hydroseed.

- **Site Demobilization**
  - One load of excess piping will be hauled to SDG&E designated yard.

- **Field Overhead**
  - Full time Project Manager
  - Full time Superintendent
  - Full time Safety Supervisor

Table 7: Environmental Survey/Permitting/Monitoring ($000's)

PROJECT COST	2019 & Prior	2020	2021	2022	2023	Total[20]
TOTAL DIRECT COSTS (NON-LABOR)[21]	$125	$3	$0	$422	$609	$1,159

Assumptions

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

- Asbestos abatement.
- Non-hazardous waste containment/disposal.
- Water treatment and disposal of approximately 55,000 gallons of hydrostatic test water.
- Water source will be a hydrant located near the pipeline.
- Water will be treated and disposed within municipal sewer for hydrotest. Any water encountered during trenching would be stored in water tanks and discharged to land.
- Permit costs.

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

- Environmental Consultants for pre-construction assessments, construction monitoring, and environmental close-out support.
- Aquatic features jurisdictional delineations, habitat assessments, and protocol surveys for listed bird species.
- Abatement support is based upon subject matter expert (SME) recommendations.
- Stormwater Pollution Prevention Plan (SWPPP) development and monitoring.
- Compensatory Mitigation for jurisdictional impacts during excavation within/or near waterways.

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

[21] Direct Costs reflect escalation.

- CDFW (Streambed Alteration Agreement).
- Regional Water Quality Control Board (401 Certification).
- US Army Corps (404 Permit).

Table 8: Land & Right of Way Acquisition ($000's)

PROJECT COST	2019 & Prior	2020	2021	2022	2023	Total[22]
TOTAL DIRECT COSTS (NON-LABOR)[23]	$0	$0	$0	$116	$13	$129

Assumptions

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

- Encroachment permit and traffic control plan costs.
- New easement costs for replacement sections.
- Temporary Right of Entry (TRE) – Construction yards and workspace required for construction activities.

Factors such as location, zoning, current market price and square footage are considered to determine a final estimated value specific to easements and TRE permits.

Table 9: Company Labor ($000's)

PROJECT COST	2019 & Prior	2020	2021	2022	2023	Total[24]
TOTAL DIRECT COSTS (LABOR)[25]	$90	($0)	$0	$356	$1,071	$1,516

Assumptions

SDG&E and SoCalGas Labor - Management, Engineering, and Non-Union Labor

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

- Project Management (10,221 hours)
- Project Field Management (4,559 hours)
- Construction Management (590 hours)
- Environmental Services (2,487 hours)
- Land Services (160 hours)

[22] Values may not add to total due to rounding.
[23] Direct Costs reflect escalation.
[24] Values may not add to total due to rounding.
[25] Direct Costs reflect escalation.

Company employees provide extensive oversight with respect to safety; environmental protection; site management; construction, engineering and design services contract management and administration; project engineering and management; planning; scheduling; progress control; cost estimating, tracking and control; inspection; job site material and logistics management as well as job site customer interface management and community outreach.

SDG&E Labor - Union Labor

SDG&E Union Labor costs were developed with the guidance of SDG&E Construction Management and those costs are duration dependent and activity specific.

Critical operational activities such as operating valves, bringing the cathodic protection system online, bringing instrumentation online, gas handling and removing old assets from service as well as loading gas into new assets and placing them into service are all completed by Company Union personnel.

Table 10: Other Costs ($000's)

PROJECT COST	2019 & Prior	2020	2021	2022	2023	Total[26]
TOTAL DIRECT COSTS (NON-LABOR)[27]	$293	$47	$0	$1,970	$2,209	$4,519

Assumptions

In addition to costs previously described above, there are other costs incurred as part of completing the project that are primarily associated with contracts that are established with specialized service providers that either perform a unique service or supplement the core Company project team. It is typical that services are contracted to complete activities related to planning, engineering, design, estimating, project and construction management, scheduling, survey, construction inspection, x-ray and non-destructive examination of welds, hot tapping and/or stopple services, temporary gas supplies, gas capture services, safety services, as well as as-built and project documentation and records management services. Other costs also include non-labor expenses related to business related mileage, travel, meals and lodging.

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

[27] Direct Costs reflect escalation.

Engineering and Project Management

- Developed upon specified scope of work, planned deliverables, and activity levels of effort reflecting anticipated manpower requirements over the planned timeframe of the project schedule.
- Contracted engineering assistance to identify and evaluate potential options to bring Line 1600 into compliance with D.11-06-017 and Public Utilities Code § 958.
- Non-labor costs included in this estimate address travel, meals, expenses, and lodging incurred for SDG&E and SoCalGas Labor.

Construction Support Services

The high-level assumptions and specific level of effort to provide construction management support for this project are described in more detail below.

- 36 Days of X-Ray / NDE support with full time X-Ray support with each pipeline lay crew.
- CNG to support existing tap during pipeline isolation.
- Gas service for core customers will be maintained through combination of purchase of additional gas through an alternative receipt point and curtailments to non-core customers where as appropriate.
- One stopple fitting service.

Inspection Services

- Full time Chief Inspector
- Full time Welding Inspector

Survey and Design Services

- The survey and design service estimate include survey support staff for project and site facility layout and as-builts. The estimate also includes engineering team material support in the development of as-built close-out packages.

Table 11: Indirect Costs ($000's)

PROJECT COST	2019 & Prior	2020	2021	2022	2023	Total[28]
COMPANY OVERHEADS	$102	($0)	$0	$399	$992	$1,492

Assumptions

- Indirect costs are for Administrative and General, purchasing, warehousing, pension and benefits, payroll tax, and other costs that are overhead in nature.
- Indirect costs do not include AFUDC or Property Tax.

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

Table 1: Total O&M Cost ($000's)

PROJECT COST – O&M	2019 & Prior[1]	2020	2021	2022	2023	Total[2]
DIRECT LABOR	$77	($0)	$0	$258	$865	$1,200
DIRECT NON-LABOR	$345	$34	$0	$1,730	$5,452	$7,560
TOTAL DIRECT COSTS[3]	$422	$33	$0	$1,988	$6,317	$8,760
COMPANY OVERHEADS[4]	$90	($1)	$0	$236	$731	$1,055
Total O&M Costs	$512	$32	$0	$2,224	$7,048	$9,816

Table 2: Total Capital Cost ($000's)

PROJECT COST – CAPITAL	2019 & Prior[5]	2020	2021	2022	2023	Total[6]
DIRECT LABOR	$16	$0	$0	$100	$336	$453
DIRECT NON-LABOR	$112	$12	$0	$673	$2,120	$2,917
TOTAL DIRECT COSTS[7]	$129	$12	$0	$773	$2,457	$3,370
COMPANY OVERHEADS[8]	$17	$1	$0	$127	$397	$542
Total Capital Costs	$145	$13	$0	$900	$2,853	$3,912

[1] Actual costs incurred associated with planning and engineering design work are included in the project cost estimates.
[2] Values may not add to total due to rounding.
[3] Direct Costs reflect escalation.
[4] Excludes AFUDC and tax.
[5] Actual costs incurred associated with planning and engineering design work are included in the project cost estimates.
[6] Values may not add to total due to rounding.
[7] Direct Costs reflect escalation.
[8] Excludes AFUDC and tax.

Table 3: Total Project Cost ($000's)

PROJECT COST	2019 & Prior[9]	2020	2021	2022	2023	Total[10]
DIRECT LABOR	$94	$0	$0	$358	$1,202	$1,653
DIRECT NON-LABOR	$457	$45	$0	$2,403	$7,572	$10,477
TOTAL DIRECT COSTS[11]	$551	$45	$0	$2,761	$8,773	$12,131
COMPANY OVERHEADS[12]	$106	($0)	$0	$363	$1,128	$1,597
Total Costs**	$657	$45	$0	$3,124	$9,901	$13,728

Project Description

Line 1600 is a 16-inch diameter transmission line that runs approximately 49.7 miles from Rainbow to Mission Valley, San Diego. Per the CPUC Safety and Enforcement Division (SED) approved *Line 1600 Test or Replacement Plan*, the Line 1600 testing and replacement work is comprised of 19 independent projects. This workpaper describes the Line 1600 Daley Ranch Hydrotest project. The Line 1600 Daley Ranch Hydrotest project is located in the City of Escondido the County of San Diego. The project will hydrotest approximately 3.250 miles of existing 16-inch pipeline from Mirar De Valle along Frace Lane to La Honda Drive. Prior to the hydrotest, to improve piggability and the integrity of the line, the project will replace 14 features, which include wrinkle bends, short radius elbows, and existing pressure control fittings (PCFs).

Considerations unique to the project are as follows:

- The project resides in Daley Ranch which is also a recreational use park. Construction considerations will be required when working on hiking trails within the park and ensure open excavations are adequately protected at the end of each shift. Additional signs and public outreach to notify the public will be required prior to construction start.
- Extensive right of way (ROW) clearing is necessary for the removal of 14 features prior to hydrotesting. All sites will be restored after features are removed.
- The project will extend the test segment approximately 220 feet south into public right of way (ROW) to prevent disturbance to avocado trees.
- The area near the ranch house is currently under review with respect to how it is being used by the public relative to its current classification as an HCA. The current estimate assumes it would be hydrotested but could change to replacement. If it is later determined that replacement is necessary due to confirmation of the HCA classification, this would be an incremental cost. (Ranch house is located near the CAT4 criteria section in Figure 1)

[9] Actual costs incurred associated with planning and engineering design work are included in the project cost estimates.
[10] Values may not add to total due to rounding.
[11] Direct Costs reflect escalation.
[12] Excludes AFUDC and tax.

Alternatives Considered

D.18-06-028, Ordering Paragraph 7, required SDG&E and SoCalGas to "submit to Safety and Enforcement Division a hydrostatic test or replacement plan pertaining to the existing 49.7 miles of Line 1600 in its present corridor." The Decision further required such plan to discuss two options: "1. Hydrotest the entire 49.7 miles of line and replace those segments that fail the test; and 2. Replace all pipeline segments in High Consequence Areas (HCAs) along Line 1600, thus ensuring a new pipeline without vintage pipeline characteristics that are perceived to increase the risk of Line 1600. Hydrotest in solely non-HCA segments would ensure less impact if there was a failure during hydrotesting." SDG&E's and SoCalGas' September 26, 2018 *Line 1600 Test or Replacement Plan* discussed D.18-06-028's two options as Design Alternative 1 (Replace in HCA/Test in Non-HCA alternative) and Design Alternative 2 (Full Hydrotest alternative), and also discussed Design Alternative 3 (Full Replacement in Nearby Streets alternative) and Design Alternative 4 (Full Replacement Along Highway 395 alternative). SDG&E and SoCalGas proposed to implement the Design Alternative 1, to replace existing Line 1600 primarily in HCAs and hydrotest the remaining sections in non-HCAs and the CPUC SED approved the Plan in January 2019. D.20-02-024 at 31-32 held that issues "out of scope," for Phase 2 include, "revisiting Design Alternatives 2 (Full Hydrotest Alternative), 3 (Full Replacement), 4 (Full Replacement but different street routing) or alternative recommendations. Nor are we revisiting the substance of the PSEP engineering and implementation that falls within the authority of SED."

D.20-02-024 requires, "a cost forecast for the approved Design Alternative 1 (Replace in HCAs and Hydrotest in Non-HCAs) that SED approved on January 15, 2019." Line 1600 Daley Ranch Hydrotest project hydrotests a segment of Line 1600 not located in an HCA (subject to clarification of the status of the area near the ranch house noted above).

Shut-In Analysis

The Line 1600 Daley Ranch Hydrotest project can be temporarily taken out of service during any seasonal conditions provided appropriate actions are taken to mitigate loss of transmission capacity and steps are taken to ensure supply to core customers fed directly from this section is maintained. If necessary, transmission capacity issues can be mitigated through partial curtailment of non-core customers or by bringing supply into the San Diego system through alternate receipt points, if available.

Forecast Methodology

The Utilities methodology for forecasting PSEP costs is discussed in the Direct Testimony of Ronn Gonzalez. The Utilities developed a Total Installed Cost (TIC) estimate to implement the above scope of work. The TIC Estimate includes direct costs associated with project management, engineering and design, environmental permitting, land acquisition, material and equipment procurement, and construction.

Following the approval of the Plan by SED in January 2019, the Utilities have undertaken the detailed design and planning of the 19 individual projects in the Plan. Generally, projects that are earliest in the overall schedule are the most developed, while those later in the overall schedule are less developed. At the time of cost estimate preparation, this project was at an approximately 30% design level. Further development of this project could reveal new information requiring some adjustments to the project plan in areas such as engineering, materials, construction, permitting, environmental and land, all of which could impact actual costs compared this cost estimate.

Schedule

Implementation of this project is proposed to be completed consistent with the overall prioritization and timing described in Section IV. D. of the *Line 1600 Test or Replacement Plan*. The schedule was developed based on the five-stage project life cycle as defined by PSEP. The key project deliverables were identified and incorporated into a work breakdown structure. This work breakdown structure was then sequenced, and predecessor and successor tasks were linked to each task. Durations were added to each task to provide a total project duration.

The preliminary Stage 4 Construction Schedule received additional planning and stakeholder input considering that typically 50% of the project costs are expended during the construction phase. The construction schedule is assumed to be 55 working days. The schedule does not include any hydrotest failures.

Figure 1: Overview Map for Line 1600 Daley Ranch Hydrotest

Figure 2: Satellite Map for Line 1600 Daley Ranch Hydrotest

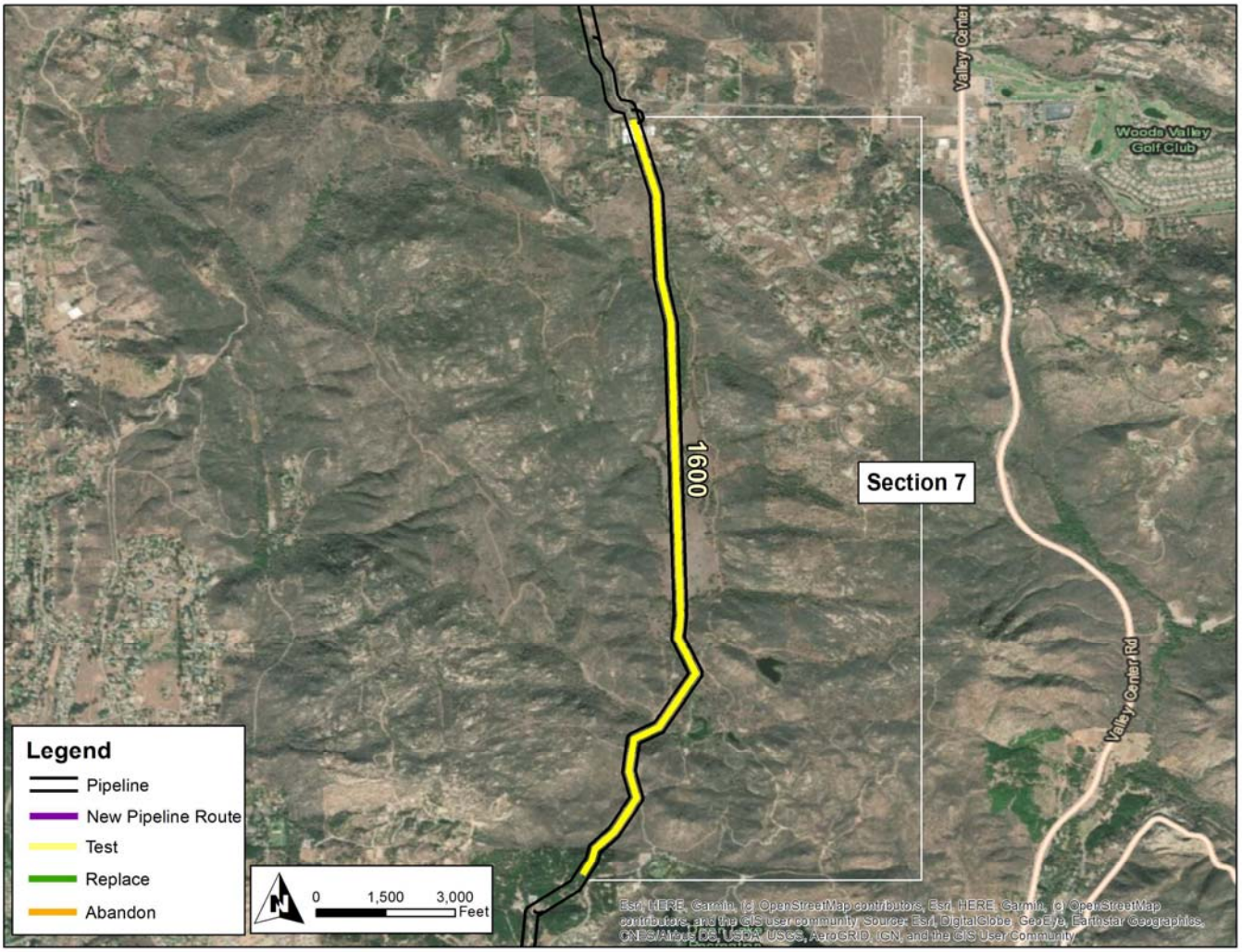


Table 4: Project Mileage

PHASE	MILEAGE
CATEGORY 4 CRITERIA[13]	0.192
CATEGORY 4[14]	3.058
INCIDENTAL	0.000
TOTAL MILEAGE[15]	3.250

The direct costs for each area are summarized below.

Table 5: Material ($000's)

PROJECT COST	2019 & Prior	2020	2021	2022	2023	Total[16]
TOTAL DIRECT COSTS (NON-LABOR)[17]	$0	$0	$0	$78	$8	$86

Assumptions

Materials for this project will be purchased following final internal authorization 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. Materials are necessary to complete hydrotest activities and the replacement of features affecting pipeline integrity and piggability. Primary components include:

- 280 feet of 16-inch pipe meeting SDG&E specifications.
- Three 16-inch fittings meeting SDG&E specifications.

Table 6: Construction ($000's)

PROJECT COST	2019 & Prior	2020	2021	2022	2023	Total[18]
TOTAL DIRECT COSTS (NON-LABOR)[19]	$1	$1	$0	$0	$4,480	$4,482

[13] Lacks documentation of a post-construction strength test in a Class 3 or 4 HCA.
[14] Lacks documentation of a post-construction strength test in a Class 1 or 2 non-HCA.
[15] Values may not add to total due to rounding.
[16] Values may not add to total due to rounding.
[17] Direct Costs reflect escalation.
[18] Values may not add to total due to rounding.
[19] Direct Costs reflect escalation.

Assumptions

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

- One mobilization and one demobilization.
- Work has been scheduled using a 10 hour per day, five day work.
- Contractor will assist with the preparatory work prior to the set-up of 11 20,000 gallon water tanks for hydrotesting activities.
- Two test heads with the associated 16-inch piping will be fabricated and pretested.
- Mechanical excavation will be authorized up to within two feet of the existing pipeline. Hand excavation will be required within the remaining two foot zone.
- 14 features affecting piggability and/or integrity of the line have been identified and will be replaced prior to hydrotesting.
- The pipeline will be tested in one test segment.
- Isolation and final tie-ins have been assumed for a 16 hour continuous duration.
- No allowance for hydrotest failure(s) and the associated repairs and retest has been included in this estimate due to the uncertainty as to whether a failure or (multiple failures) will happen, the location and scope of the failure, and the effort required to complete a repair. The cost for any failure, repair and retest would be incremental to the costs provided in this estimate.

Additional Construction Information

- **Site Mobilization / Site Facilities**
  - One mobilization and one demobilization.
  - Two office trailers have been included for management and inspection personnel
  - Four and a half months of site duration is anticipated
  - Placement of crushed rock for the laydown yards
  - Installation of 300 linear feet (LF) of temporary fill piping from the water tanks to the first test head.
  - Temporary fencing for the laydown yard.
  - Temporary fencing for feature excavations.

- **Site Management / Best Management Practices (BMPs)**
  - BMP materials for spoils piles, laydown yard, and work site.

- **Site Right of Way (ROW) Clearing**
  - Three days for preparation of access roads and site clearing.

- **Material Handling**
  - Two loads of material will be unloaded by the contractor at laydown yards and transported as needed.

- **Traffic Control**
  - 39 days of traffic control is included on this project to manage public access to the Daley Ranch recreational park and to safely move equipment. This includes all traffic control devices and equipment necessary to complete the project.

- **Utility Locates**
  - 20 utility locates have been included to verify pipe location at cutouts and tap excavations.

- **Site Excavations**
  - Two excavations for the installation of test head.
  - There will be a total of 12 excavations for the cutout and replacement of 14 features in the pipeline including two excavations for the removal of drop sections.

- **Remove Existing / Install New Features**
  - Two features that were identified as an integrity issue will be abandoned by installation of drop sections parallel to existing line prior to the hydrotest.
  - One existing pressure control fitting (PCF) will be removed.
  - 11 bends, consisting of wrinkle bends or elbows have been identified and will be replaced prior to hydrotesting.

- **Isolate Existing Pipeline**
  - No taps will be isolated prior to hydrotesting.

- **Pressure Test Pipeline**
  - Pipeline will be tested in one test segment.
  - Two test heads with the associated 16-inch piping will be fabricated and pre-tested.

- **Tie-In Pipeline**
  - Final tie-ins have been assumed for a 16-hour continuous duration.

- **Site Restoration**
  - All work site locations will be restored to original condition.
  - 4,433 square feet (SF) of base paving included in areas as needed.
  - Hillsides will be restabilized using jute matting and hydroseed.

- **Site Demobilization**
  - One load of excess piping will be hauled to SDG&E designated yard.

- **Field Overhead**
  - Full time Project Manager
  - Full time Superintendent
  - Full time Safety Supervisor

Table 7: Environmental Survey/Permitting/Monitoring ($000's)

PROJECT COST	2019 & Prior	2020	2021	2022	2023	Total[20]
TOTAL DIRECT COSTS (NON-LABOR)[21]	$139	$3	$-	$387	$683	$1,212

Assumptions

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

- Asbestos abatement of Asbestos Containing Materials (ACM).
- Non-hazardous waste containment/disposal.
- Water source will be a hydrant located near the pipeline.
- Water will be treated and disposed within municipal sewer for hydrotest. Any water encountered during trenching would be stored in water tanks and discharged to land.
- Water treatment and disposal of approximately 192,000 gallons of hydrostatic test water.
- Permit costs.

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

- Environmental Consultants for pre-construction assessments, construction monitoring, and environmental close-out support.
- Abatement Support is based upon Subject Matter Expert (SME) recommendations.
- Storm Water Pollution Prevention Plan (SWPPP) development and monitoring.
- Aquatic Features jurisdictional delineations. Compensatory Mitigation for jurisdictional impacts during excavation within/near waterways.
- CDFW (Streambed Alteration Agreement).
- Regional Water Quality Control Board (401 Certification).
- US Army Corps (404 Permit).

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

[21] Direct Costs reflect escalation.

Table 8: Land & Right-of-Way Acquisition ($000's)

PROJECT COST	2019 & Prior	2020	2021	2022	2023	Total[22]
TOTAL DIRECT COSTS (NON-LABOR)[23]	$0	$0	$0	$83	$21	$104

Assumptions

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

- Encroachment permit and traffic control plan costs.
- Temporary Right of Entry (TRE) – Construction yards and workspace required for construction activities.

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.

Table 9: Company Labor ($000's)

PROJECT COST	2019 & Prior	2020	2021	2022	2023	Total[24]
TOTAL DIRECT COSTS (LABOR)[25]	$94	$0	$0	$358	$1,202	$1,653

Assumptions

SDG&E and SoCalGas Labor - Management, Engineering, and Non-Union Labor

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

- Project Management (9,862 hours)
- Project Field Management (4,801 hours)
- Construction Management (630 hours)
- Environmental Services (2,107 hours)
- Land Services (234 hours)

Company employees provide extensive oversight with respect to safety; environmental protection; site management; construction, engineering and design services contract management and administration; project engineering and management; planning; scheduling; progress control; cost estimating, tracking and control; inspection; job site material and logistics management as well as job site customer interface management and community outreach.

[22] Values may not add to total due to rounding.
[23] Direct Costs reflect escalation.
[24] Values may not add to total due to rounding.
[25] Direct Costs reflect escalation.

SDG&E Labor – Union Labor

SDG&E Union Labor costs were developed with the guidance of SDG&E Construction Management and those costs are duration dependent and activity specific.

Critical operational activities such as operating valves, bringing the cathodic protection system online, bringing instrumentation online, gas handling and removing old assets from service as well as loading gas into new assets and placing them into service are all completed by Company Union personnel.

Table 10: Other Costs ($000's)

PROJECT COST	2019 & Prior	2020	2021	2022	2023	Total[26]
TOTAL DIRECT COSTS (NON-LABOR)[27]	$317	$42	$0	$1,856	$2,380	$4,595

Assumptions

In addition to costs previously described above, there are other costs incurred as part of completing the project that are primarily associated with contracts that are established with specialized service providers that either perform a unique service or supplement the core Company project team. It is typical that services are contracted to complete activities related to planning, engineering, design, estimating, project and construction management, scheduling, survey, construction inspection, x-ray and non-destructive examination of welds, hot tapping and/or stopple services, temporary gas supplies, gas capture services, safety services, as well as as-built and project documentation and records management services. Other costs also include non-labor expenses related to business related mileage, travel, meals and lodging.

Engineering and Project Management

- Developed upon specified scope of work, planned deliverables, and activity levels of effort reflecting anticipated manpower requirements over the planned timeframe of the project schedule.
- Contracted engineering assistance to identify and evaluate potential options to bring Line 1600 into compliance with D.11-06-017 and Public Utilities Code § 958.
- Non-labor costs included in this estimate address travel, meals, expenses, and lodging incurred for SDG&E and SoCalGas Labor.

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

[27] Direct Costs reflect escalation.

Construction Support Services

The high-level assumptions and specific level of effort to provide construction management support for this project are described in more detail below.

- 36 Days of X-Ray / NDE support with full-time X-Ray support with each pipeline lay crew .
- Gas service for core customers will be maintained through combination of purchase of additional gas through an alternative receipt point and curtailments to non-core customers where as appropriate.
- Gas capture services for the mainline isolation.

Inspection Services

- Full time Chief Inspector
- Full time Welding Inspector

Survey and Design Services

- The survey and design service estimate includes survey support staff for project and site facility layout and as-builts. The estimate also includes engineering team material support in the development of as-built close-out packages.

Table 11: Indirect Costs ($000's)

PROJECT COST	2019 & Prior	2020	2021	2022	2023	Total[28]
COMPANY OVERHEADS	$106	$0	$0	$363	$1,128	$1,597

Assumptions

- Indirect costs are for Administrative and General, purchasing, warehousing, pension and benefits, payroll tax, and other costs that are overhead in nature.
- Indirect costs do not include AFUDC or Property Tax.

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

Table 1: Total Project Cost ($000's)

PROJECT COST	2019 & Prior[1]	2020	2021	2022	Total[2]
DIRECT LABOR	$215	$27	$385	$1,030	$1,657
DIRECT NON-LABOR	$1,098	$200	$3,331	$16,351	$20,979
TOTAL DIRECT COSTS[3]	$1,313	$227	$3,716	$17,380	$22,636
COMPANY OVERHEADS[4]	$263	$43	$973	$1,706	$2,985
Total Capital Costs	$1,576	$270	$4,688	$19,086	$25,621

Project Description

Line 1600 is a 16-inch diameter transmission line that runs approximately 49.7 miles from Rainbow to Mission Valley, San Diego. Per the CPUC Safety and Enforcement Division (SED) approved *Line 1600 Test or Replacement Plan*, the Line 1600 testing and replacement work is comprised of 19 independent projects. This workpaper describes the Line 1600 La Honda-Lincoln Replacement project. The Line 1600 La Honda-Lincoln Replacement project is in the County of San Diego and the City of Escondido. The project will replace 1.486 miles of existing 16-inch pipeline with 1.560 miles of new 16-inch pipeline from Daley Ranch along La Honda Drive, El Norte Parkway, and end along Lincoln Avenue at Midway Drive. The project will install one new automated mainline valve (MLV). As part of the project scope some associated distribution work will be completed to maintain reliability of the system and reconnect gas supply to local customers. Associated distribution work includes the completion of a tie-over to an existing regulator station, abandonment of the regulator station, and the reconnection of an existing regulator station. The project will also install approximately 1.560 miles of fiber optic cable. Fiber optic cable will be installed along the new 16-inch pipeline to assist in leak detection, ground movement, and vibration analysis.

Considerations unique to the project are as follows:

- Approximately 220 feet of the existing Line 1600 will need to be rerouted from private property within an avocado farm in order to access the nearest public roadway. This will reroute will require the purchase of a new easement on this private property.
- The new automated MLV will be installed off the side of the roadway in a new above ground valve station. Due to the grade changes along the alignment, new backfill, drainage, fencing, and site preparation will be required to install the valve.
- The proposed plan for the fiber optic cable is to have a continuous run from the Line 1600 La Honda-Lincoln Replacement to Line 1600 Serra Mesa Replacement projects. The end result of the continuous run would reduce the number of required monitoring stations between these Projects to one which is located on the Line 1600 Pomerado South Replacement project.

[1] Actual costs incurred associated with planning and engineering design work are included in the project cost estimates.
[2] Values may not add to total due to rounding.
[3] Direct Costs reflect escalation.
[4] Excludes AFUDC and tax.

Alternatives Considered

D.18-06-028, Ordering Paragraph 7, required SDG&E and SoCalGas to "submit to Safety and Enforcement Division a hydrostatic test or replacement plan pertaining to the existing 49.7 miles of Line 1600 in its present corridor." The Decision further required such plan to discuss two options: "1. Hydrotest the entire 49.7 miles of line and replace those segments that fail the test; and 2. Replace all pipeline segments in High Consequence Areas (HCAs) along Line 1600, thus ensuring a new pipeline without vintage pipeline characteristics that are perceived to increase the risk of Line 1600. Hydrotest in solely non-HCA segments would ensure less impact if there was a failure during hydrotesting." SDG&E's and SoCalGas' September 26, 2018 *Line 1600 Test or Replacement Plan* discussed D.18-06-028's two options as Design Alternative 1 (Replace in HCA/Test in Non-HCA alternative) and Design Alternative 2 (Full Hydrotest alternative), and also discussed Design Alternative 3 (Full Replacement in Nearby Streets alternative) and Design Alternative 4 (Full Replacement Along Highway 395 alternative). SDG&E and SoCalGas proposed to implement, and the CPUC SED approved, Design Alternative 1, which will replace existing Line 1600 primarily in HCAs and hydrotest the remaining sections in non-HCAs. D.18-06-028 at 92 also required the Utilities to "identify proposed rerouting of the line in specific segments." As discussed in *the Line 1600 Test or Replacement Plan*, "SDG&E and SoCalGas concluded it is not feasible, prudent nor reasonable to build a new replacement pipeline entirely within the existing Line 1600 rights-of-way." Due to construction difficulty, private property and community impacts, environmental impacts, and costs and delays of efforts to expand the existing rights of way (ROW), the *Line 1600 Test or Replacement Plan* proposed to re-route the majority of replacement segments, usually in nearby streets. In developing the Plan, SDG&E and SoCalGas reviewed these proposed re-routes with SED, which "conducted a joint field inspection of the identified sites with SDG&E personnel and its contractor to evaluate the existing safety conditions, constructability and serviceability of Line 1600. After the field inspections, SED agreed with SDG&E's and SoCalGas' proposed reroute of many segments of Line 1600 due to safety and serviceability reasons."

D.20-02-024 requires "a cost forecast for the approved Design Alternative 1 (Replace in HCAs and Hydrotest in Non-HCAs) that SED approved on January 15, 2019."[2] D.20-02-024 at 31-32 held that issues "out of scope" for Phase 2 include "revisiting Design Alternatives 2 (Full Hydrotest Alternative), 3 (Full Replacement), 4 (Full Replacement but different street routing) or alternative recommendations. Nor are we revisiting the substance of the PSEP engineering and implementation that falls within the authority of SED."

Shut-In Analysis

The Line 1600 La Honda-Lincoln Replacement project can be temporarily taken out of service during any seasonal conditions provided appropriate actions are taken to mitigate loss of transmission capacity and steps are taken to ensure supply to core customers fed directly from this section is maintained. If necessary, transmission capacity issues can be mitigated through partial curtailment of non-core customers or by bringing supply into the San Diego system through alternate receipt points, if available. Winter condition isolation is recommended to avoid potential capacity risk. To avoid potential seasonal risk, it is recommended to isolate the pipeline during winter seasonal conditions. To avoid service disruption to distribution customers, associated distribution system modifications will be required to maintain continuous and reliable service.

Forecast Methodology

The Utilities methodology for forecasting PSEP costs is discussed in the Direct Testimony of Ronn Gonzalez. The

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

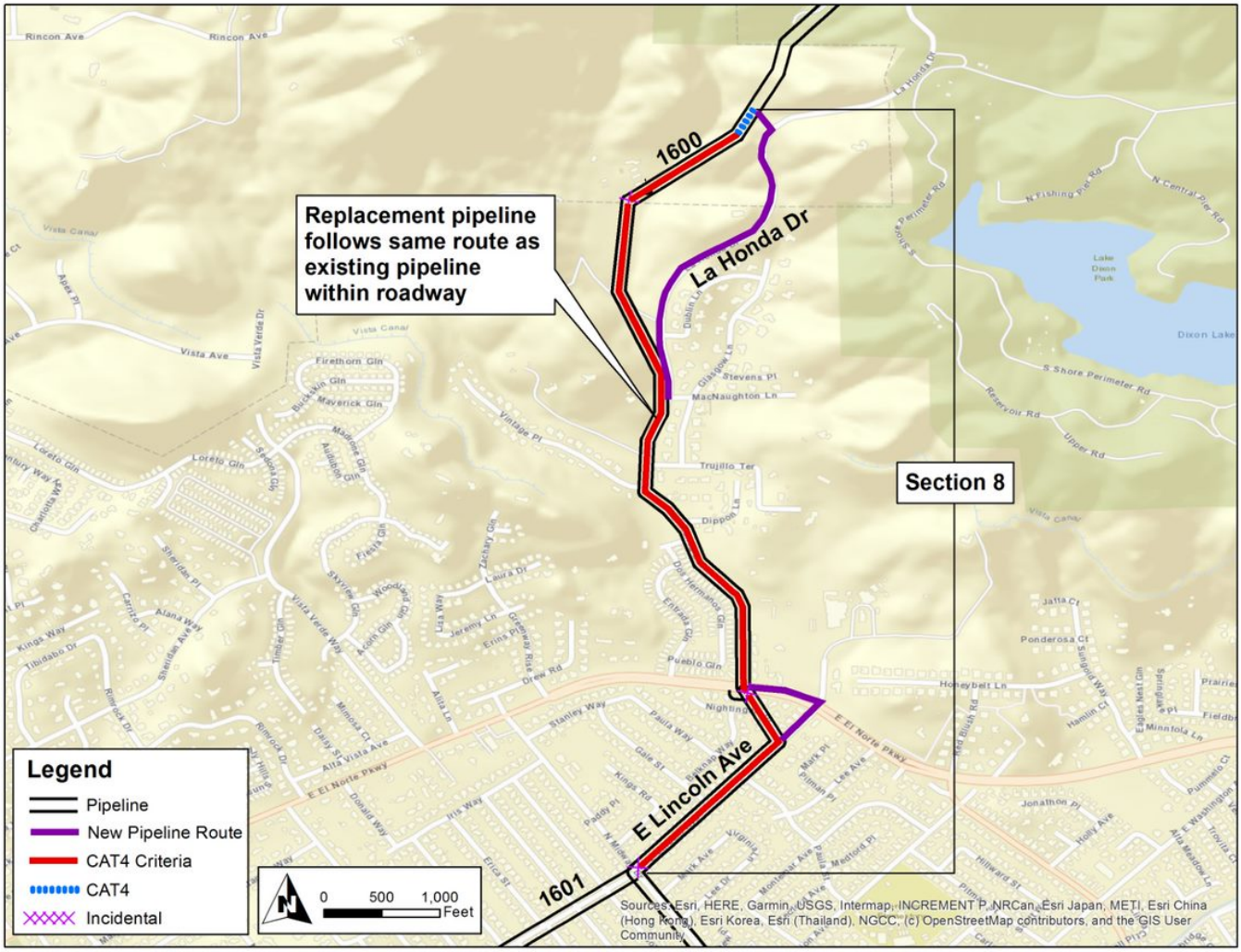
Following the approval of the Plan by SED in January 2019, the Utilities have undertaken the detailed design and planning of the 19 individual projects in the Plan. Generally, projects that are earliest in the overall schedule are the most developed, while those later in the overall schedule are less developed. At the time of cost estimate preparation, this project was at an approximately 30% design level. Further development of this project could reveal new information requiring some adjustments to the project plan in the areas such as engineering, materials, construction, permitting, environmental and land, all of which could impact actual costs compared this cost estimate.

Schedule

Implementation of this project is proposed to be completed consistent with the overall prioritization and timing described in Section IV. D. of the *Line 1600 Test or Replacement Plan.* The schedule was developed based on the five-stage project life cycle as defined by PSEP. The key project deliverables were identified and incorporated into a work breakdown structure. This work breakdown structure was then sequenced, and predecessor and successor tasks were linked to each task. Durations were added to each task to provide a total project duration.

The preliminary Stage 2 Construction Schedule received additional planning and stakeholder input considering that typically 50% of the project costs are expended during the construction phase. The construction schedule is assumed to be 97 working days.

Figure 1: Overview Map for Line 1600 La Honda and Lincoln Replacement



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Line 1600 La Honda-Lincoln Replacement Project

Figure 2: Satellite Map for Line 1600 La Honda and Lincoln Replacement

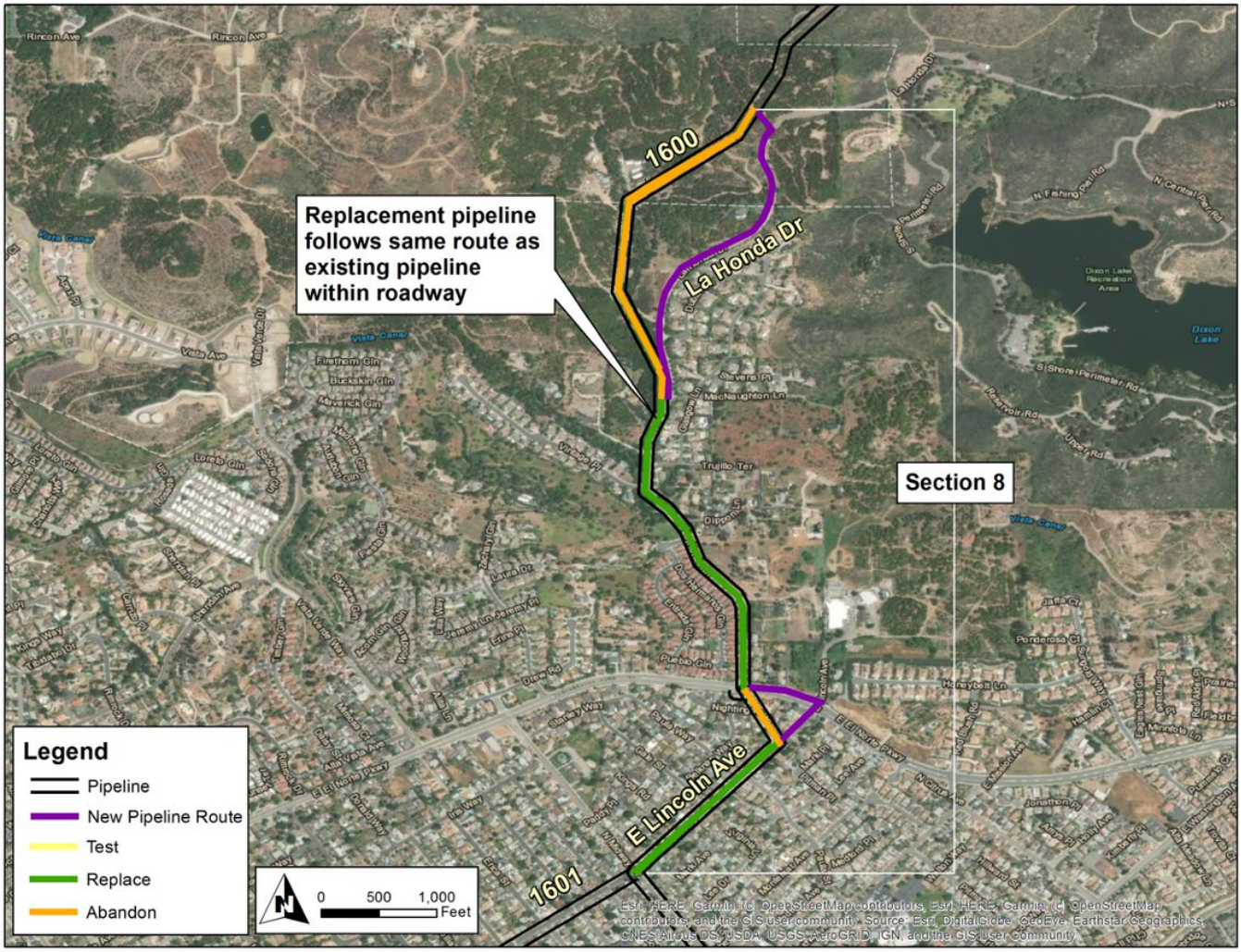

Table 2: Project Mileage

PHASE	MILEAGE
CATEGORY 4 CRITERIA[5]	1.418
CATEGORY 4[6]	0.048
INCIDENTAL	0.020
REPLACEMENT OFFSET	0.074
TOTAL MILEAGE[7]	1.560

The direct costs for each area are summarized below.

Table 3: Material ($000's)

PROJECT COST	2019 & Prior	2020	2021	2022	Total[8]
TOTAL DIRECT COSTS (NON-LABOR)[9]	$0	$8	$1,840	$0	$1,848

Assumptions

Materials for this project will be purchased following final internal authorization 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. Primary components include:

- 8,604 feet of 16-inch pipe meeting SDG&E specifications.
- 14 16-inch fittings meeting SDG&E specifications.
- One 16-inch valve meeting SDG&E specifications.

Table 4: Construction ($000's)

PROJECT COST	2019 & Prior	2020	2021	2022	Total[10]
TOTAL DIRECT COSTS (NON-LABOR)[11]	$2	$1	$0	$13,644	$13,648

[5] Lacks documentation of a post-construction strength test in a Class 3 or 4 HCA.
[6] Lacks documentation of a post-construction strength test in a Class 1 or 2 non-HCA.
[7] Values may not add to total due to rounding.
[8] Values may not add to total due to rounding.
[9] Direct Costs reflect escalation.
[10] Values may not add to total due to rounding.
[11] Direct Costs reflect escalation.

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Line 1600 La Honda-Lincoln Replacement Project

Assumptions

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

- One mobilization and one demobilization
- Contractor work is estimated using a 10 hour per day, five day work week.
- Fiber optic lines will be installed above the new pipeline.
- Excess spoils will be hauled off and disposed.
- Tie-ins will be completed during a 16 hour continuous shift.
- Laydown yards will be restored to original condition at the end of the project.
- Restoration of grade along right of way (ROW) will be completed once pipeline is installed and tied-in.

Additional Construction Information

- **Site Mobilization / Site Facilities**
  - One mobilization and one demobilization.
  - Two office trailers have been included for management and inspection personnel at the primary laydown yard.
  - Five months of site duration is anticipated.
  - Track out plates will be utilized at street access points to minimize soil being tracked onto the street by construction vehicles.

- **Site Management / Best Management Practices (BMPs)**
  - BMP materials for spoils piles, laydown yard, and work site.

- **Material Handling**
  - 12 loads of material will be unloaded by the contractor at laydown yards and transported as needed.

- **Traffic Control**
  - Two crews traffic control support during the project at all intersections, during hydrotesting, isolations, tie-ins, and restoration. This includes all traffic control devices and equipment necessary to complete the project.

- **Utility Locates**
  - 120 utility locates to verify locations prior to excavations.

- **Pipeline Installation**
  - Installation includes the following:
    - Approximately 8,604 linear feet (LF) of 16-inch pipe.
  - Site demo, excavation and pad trench / bellholes, string and bends pipe, coating joints.
  - Installation of fiber optic line and pipeline warning mesh.

- **Isolate Existing Pipeline**

- The pipeline will be isolated in conjunction with tie-in activities.
- The pipeline will not be separately isolated until the new pipeline has been installed and tested.
- Existing taps will be supported using CNG.

- **Pressure Test Pipeline**
  - The pipeline will be tested in one individual segment.
  - Preparatory work for the setup of five 20,000 gallon water tanks.
  - Installation of hard piping from the test head to the tank pump.
  - Following the dewatering of the pipeline, it will be intermittently dried until ready to be tied-in.
  - Pre-commissioning nitrogen testing for the installation of new valves.

- **Mainline Valve**
  - One new automated MLV will be installed.

- **Tie-in Pipeline**
  - One 16 hour continuous shift for tie-in.

- **Retire / Abandon Existing Pipeline**
  - Installation of four abandonment plates and two abandonment caps.
  - Six abandonment excavations are planned.
  - Grout fill of approximately 4,600 linear feet (LF) of existing 16-inch piping within City roadways. All other abandoned pipeline segments will be abandoned using nitrogen.
  - Excavate existing an MLV station to demolish and remove existing piping.
  - Demolish 140 LF of existing security fencing at MLV station.
  - Demolish existing 1,000 square feet (SF) of asphalt pavement located within the MLV station.

- **Site Restoration**
  - 350 SF of concrete sidewalk with ADA ramp included.
  - 7,622 SF of eight foot wide concrete gutter.
  - 98,266 SF of 2-inch asphalt grind and cap included.
  - 8,150 LF of new pavement markings and striping.

- **Site Demobilization**
  - One load of excess piping will be hauled to SDG&E designated yard.

- **Field Overhead**
  - Full time Project Manager
  - Full time Superintendent

Table 5: Environmental Survey/Permitting/Monitoring ($000's)

PROJECT COST	2019 & Prior	2020	2021	2022	Total[12]
TOTAL DIRECT COSTS (NON-LABOR)[13]	$346	$3	$336	$517	$1,201

Assumptions

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

- Asbestos abatement of Asbestos Containing Material (ACM).
- Non-hazardous waste containment/disposal.
- Water source will be a hydrant located near the new alignment.
- Water will be treated and disposed within municipal sewer for hydrotest. Any water encountered during trenching would be stored in water tanks and discharged to land.
- Water treatment and disposal of approximately 85,000 gallons of hydrostatic test water.

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

- Environmental Consultants for pre-construction assessments, construction monitoring, and environmental close-out support.
- Abatement Support is based upon Subject Matter Expert (SME) recommendations.
- Stormwater Pollution Prevention Plan (SWPPP) development and monitoring.

Table 6: Land & Right of Way Acquisition

PROJECT COST	2019 & Prior	2020	2021	2022	Total[14]
TOTAL DIRECT COSTS (NON-LABOR)[15]	$1	$2	$88	$12	$103

Assumptions

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

- Encroachment permit and traffic control plan costs.
- New easement costs.
- Temporary Right of Entry (TRE) – Construction yards and workspace required for construction activities.

Factors such as location, zoning, current market price and square footage are considered to determine a final estimated value specific to easements and TRE permits.

[12] Values may not add to total due to rounding.
[13] Direct Costs reflect escalation.
[14] Values may not add to total due to rounding.
[15] Direct Costs reflect escalation.

Table 7: Company Labor ($000's)

PROJECT COST	2019 & Prior	2020	2021	2022	Total[16]
TOTAL DIRECT COSTS (LABOR)[17]	$215	$27	$385	$1,030	$1,657

Assumptions

SDG&E and SoCalGas Labor - Management, Engineering, and Non-Union Labor

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

- Project Management (8,945 hours)
- Project Field Management (3,192 hours)
- Construction Management (1,050 hours)
- Environmental Services (2,543 hours)
- Land Services (621 hours)

Company employees provide extensive oversight with respect to safety; environmental protection; site management; construction, engineering and design services contract management and administration; project engineering and management; planning; scheduling; progress control; cost estimating, tracking and control; inspection; job site material and logistics management as well as job site customer interface management and community outreach.

SDG&E Labor - Union Labor

SDG&E Union Labor costs were developed with the guidance of SDG&E Construction Management and those costs are duration dependent and activity specific.

Critical operational activities such as operating valves, bringing the cathodic protection system online, bringing instrumentation online, gas handling and removing old assets from service as well as loading gas into new assets and placing them into service are all completed by Company Union personnel.

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

[17] Direct Costs reflect escalation.

Table 8: Other Costs ($000's)

PROJECT COST	2019 & Prior	2020	2021	2022	Total[18]
TOTAL DIRECT COSTS (NON-LABOR)[19]	$748	$186	$1,067	$2,178	$4,179

Assumptions

In addition to costs previously described above, there are other costs incurred as part of completing the project that are primarily associated with contracts that are established with specialized service providers that either perform a unique service or supplement the core Company project team. It is typical that services are contracted to complete activities related to planning, engineering, design, estimating, project and construction management, scheduling, survey, construction inspection, x-ray and non-destructive examination of welds, hot tapping and/or stopple services, temporary gas supplies, gas capture services, safety services, as well as as-built and project documentation and records management services. Other costs also include non-labor expenses related to business related mileage, travel, meals and lodging.

Engineering and Project Management

- Developed upon specified scope of work, planned deliverables, and activity levels of effort reflecting anticipated manpower requirements over the planned timeframe of the project schedule.
- Contracted engineering assistance to identify and evaluate potential options to bring Line 1600 into compliance with D.11-06-017 and Public Utilities Code § 958.
- Non-labor costs included in this estimate address travel, meals, expenses, and lodging incurred for SDG&E and SoCalGas Labor.

Construction Support Services

The high-level assumptions and specific level of effort to provide construction management support for this project are described in more detail below.

- Full time X-Ray / NDE support with each pipeline lay crew.
- CNG to support existing taps during pipeline isolation.
- Gas capture services to reduce the amount of natural gas vented to atmosphere.
- Gas service for core customers will be maintained through combination of purchase of additional gas through an alternative receipt point and curtailments to non-core customers where as appropriate.

Inspection Services

- Full time Chief Inspector
- Two full time Welding Inspectors

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

[19] Direct Costs reflect escalation.

Survey and Design Services

- The survey and design service estimate include survey support staff for project and site facility layout and as-builts. The estimate also includes engineering team material support in the development of as-built close-out packages.

Table 9: Indirect Costs ($000's)

PROJECT COST	2019 & Prior	2020	2021	2022	Total[20]
COMPANY OVERHEADS	$263	$43	$973	$1,706	$2,985

Assumptions

- Indirect costs are for Administrative and General, purchasing, warehousing, pension and benefits, payroll tax, and other costs that are overhead in nature.
- Indirect costs do not include AFUDC or Property Tax.

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

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Line 1600 Midway Drive Replacement Project

Table 1: Total Project Cost ($000's)

PROJECT COST	2019 & Prior[1]	2020	2021	2022	Total[2]
DIRECT LABOR	$816	$1,082	$387	$0	$2,284
DIRECT NON-LABOR	$4,117	$22,561	$1,106	$0	$27,784
TOTAL DIRECT COSTS[3]	$4,933	$23,642	$1,493	$0	$30,069
COMPANY OVERHEADS[4]	$1,399	$2,102	$393	$0	$3,894
Total Capital Costs	$6,332	$25,745	$1,886	$0	$33,963

Project Description

Line 1600 is a 16-inch diameter transmission line that runs approximately 49.7 miles from Rainbow to Mission Valley, San Diego. Per the CPUC Safety and Enforcement Division (SED) approved *Line 1600 Test or Replacement Plan*, the Line 1600 testing and replacement work is comprised of 19 independent projects. This workpaper describes the Line 1600 Midway Drive Replacement Project. The Line 1600 Midway Drive Replacement Project is located in the City of Escondido and San Diego County. The project will replace approximately 2.451 miles of existing 16-inch pipeline with 2.407 miles of new 16-inch pipeline. The project is planned in two separate segments with the northern segment starting at the intersection of Lincoln Avenue and Midway Drive, and continues along Bear Valley Parkway ending at Birch Avenue. The southern replacement segment is along Bear Valley Parkway ending south of Highway 78 at an existing mainline valve (MLV). Approximately 0.576 miles of existing pipe installed in 2015 will be hydrotested along with the replacement sections to facilitate the post-completion pressure testing process in order to reduce the need for multiple pressure tests and to minimize community impacts. During the isolation of Line 1600 a temporary bypass piping connection to an adjacent pipeline will be used to provide uninterrupted gas service to customers normally fed by this section of Line 1600. The project will also install approximately 2.451 miles of fiber optic cable with one fiber optic monitoring station. Fiber optic cable will be installed along the new 16-inch pipeline to assist in leak detection, ground movement, and vibration analysis. Construction of this project began on February 10, 2020 and is expected to be complete by Q4 2020.

Considerations unique to the project are as follows:

- To provide the appropriate horizontal clearance of the new pipeline from other existing utilities, the Project will be physically removing approximately 0.310 miles of the existing Line 1600 pipeline along Midway Drive starting south of Valley Parkway to north of Bear Valley Parkway. The removal of the existing pipeline is due to the limited space resulting from the heavy congestion of existing utilities along North Midway Drive and South Midway Drive.

[1] Actual costs incurred associated with planning and engineering design work are included in the project cost estimates.
[2] Values may not add to total due to rounding.
[3] Direct Costs reflect escalation.
[4] Excludes AFUDC and tax.

- The new pipeline will span across the concrete lined Escondido Creek channel as it was determined to be infeasible to use trenchless crossing methods due to the presence of 45 foot deep bridge pilings and limited workspace.
- A portion of the alignment crosses Caltrans Highway 78. In order to minimize community impacts, minimize traffic impacts, and reduce installation costs, the new pipeline will be installed using open trenching installation methods as opposed to using a trenchless method, which is a typical requirement of crossing Caltrans right of way (ROW).
- One post-completion hydrotest will be performed as part of this project from the intersection of East Lincoln Avenue and North Midway Drive to south of Highway 78 and Bear Valley Parkway. The single post-completion hydrotest will reduce construction costs and minimize the community impacts by only performing one mainline hydrotest instead of two by including the retesting of approximately 0.576 miles of existing 2015 vintage pipe.
- The proposed plan for the fiber optic cable is to have a continuous run from the Line 1600 La Honda-Lincoln Replacement to Line 1600 Serra Mesa Replacement projects. The end result of the continuous run would reduce the number of required monitoring stations between these Projects to one which is located on the Line 1600 Pomerado South Replacement project.

Alternatives Considered

D.18-06-028, Ordering Paragraph 7, required SDG&E and SoCalGas to "submit to Safety and Enforcement Division a hydrostatic test or replacement plan pertaining to the existing 49.7 miles of Line 1600 in its present corridor." The Decision further required such plan to discuss two options: "1. Hydrotest the entire 49.7 miles of line and replace those segments that fail the test; and 2. Replace all pipeline segments in High Consequence Areas (HCAs) along Line 1600, thus ensuring a new pipeline without vintage pipeline characteristics that are perceived to increase the risk of Line 1600. Hydrotest in solely non-HCA segments would ensure less impact if there was a failure during hydrotesting." SDG&E's and SoCalGas' September 26, 2018 *Line 1600 Test or Replacement Plan* discussed D.18-06-028's two options as Design Alternative 1 (Replace in HCA/Test in Non-HCA alternative) and Design Alternative 2 (Full Hydrotest alternative), and also discussed Design Alternative 3 (Full Replacement in Nearby Streets alternative) and Design Alternative 4 (Full Replacement Along Highway 395 alternative). SDG&E and SoCalGas proposed to implement, and the CPUC SED approved, Design Alternative 1, which will replace existing Line 1600 primarily in HCAs and hydrotest the remaining sections in non-HCAs. D.18-06-028 at 92 also required the Utilities to "identify proposed rerouting of the line in specific segments." As discussed in the *Line 1600 Test or Replacement Plan*, "SDG&E and SoCalGas concluded it is not feasible, prudent nor reasonable to build a new replacement pipeline entirely within the existing Line 1600 rights-of-way." Due to construction difficulty, private property and community impacts, environmental impacts, and costs and delays of efforts to expand the existing rights of way (ROW), the *Line 1600 Test or Replacement Plan* proposed to re-route the majority of replacement segments, usually in nearby streets. In developing the Plan, SDG&E and SoCalGas reviewed these proposed re-routes with SED, which "conducted a joint field inspection of the identified sites with SDG&E personnel and its contractor to evaluate the existing safety conditions, constructability and serviceability of Line 1600. After the field inspections, SED agreed with SDG&E's and SoCalGas' proposed reroute of many segments of Line 1600 due to safety and serviceability reasons."

D.20-02-024 requires "a cost forecast for the approved Design Alternative 1 (Replace in HCAs and Hydrotest in Non-HCAs) that SED approved on January 15, 2019."[2] D.20-02-024 at 31-32 held that issues "out of scope" for Phase 2 include "revisiting Design Alternatives 2 (Full Hydrotest Alternative), 3 (Full Replacement), 4 (Full Replacement but different street routing) or alternative recommendations. Nor are we revisiting the substance of the PSEP engineering and implementation that falls within the authority of SED."

Shut-In Analysis

The Line 1600 Midway Drive Replacement project can be temporarily taken out of service during summer conditions provided strategies are implemented as necessary to mitigate impacts. Depending on weather conditions as well as localized system demand, work related to the isolation of this section of Line 1600 may trigger partial power plant curtailments in the Escondido area for 2 to 3 days. In addition, during isolation of Line 1600, an area of the distribution system normally fed by a regulator station connected to this section of Line 1600 will require a temporary bypass piping connection to provide uninterrupted service to core customers.

Forecast Methodology

The Utilities methodology for forecasting PSEP costs is discussed in the Direct Testimony of Ronn Gonzalez. The Utilities developed a Total Installed Cost (TIC) estimate to implement the above scope of work. The TIC Estimate includes direct costs associated with project management, engineering and design, environmental permitting, land acquisition, material and equipment procurement, and construction.

Following the approval of the Plan by SED in January 2019, the Utilities have undertaken the detailed design and planning of the 19 individual projects in the Plan. Generally, projects that are earliest in the overall schedule are the most developed, while those later in the overall schedule are less developed. At the time of cost estimate preparation, this project was at an approximately 30% design level. Prior to the start of construction, costs related to construction activities were reevaluated at an approximately 90% design level. Further development of this project could reveal new information requiring some adjustments to the project plan in the areas such as engineering, materials, permitting, environmental and land, all of which could impact actual costs compared this cost estimate.

Schedule

Implementation of this project is proposed to be completed consistent with the overall prioritization and timing described in Section IV. D. of the *Line 1600 Test or Replacement Plan*. The schedule was developed based on the five-stage project life cycle as defined by PSEP. The key project deliverables were identified and incorporated into a work breakdown structure. This work breakdown structure was then sequenced, and predecessor and successor tasks were linked to each task. Durations were added to each task to provide a total project duration.

The preliminary Stage 4 Construction Schedule received additional planning and stakeholder input considering that typically 50% of the project costs are expended during the construction phase. The construction schedule is assumed to be 160 working days.

Pipeline Safety Enhancement Plan Workpaper Supporting Chapter

Line 1600 Midway Drive Replacement Project

Figure 1: Overview Map for Line 1600 Midway Drive Replacement

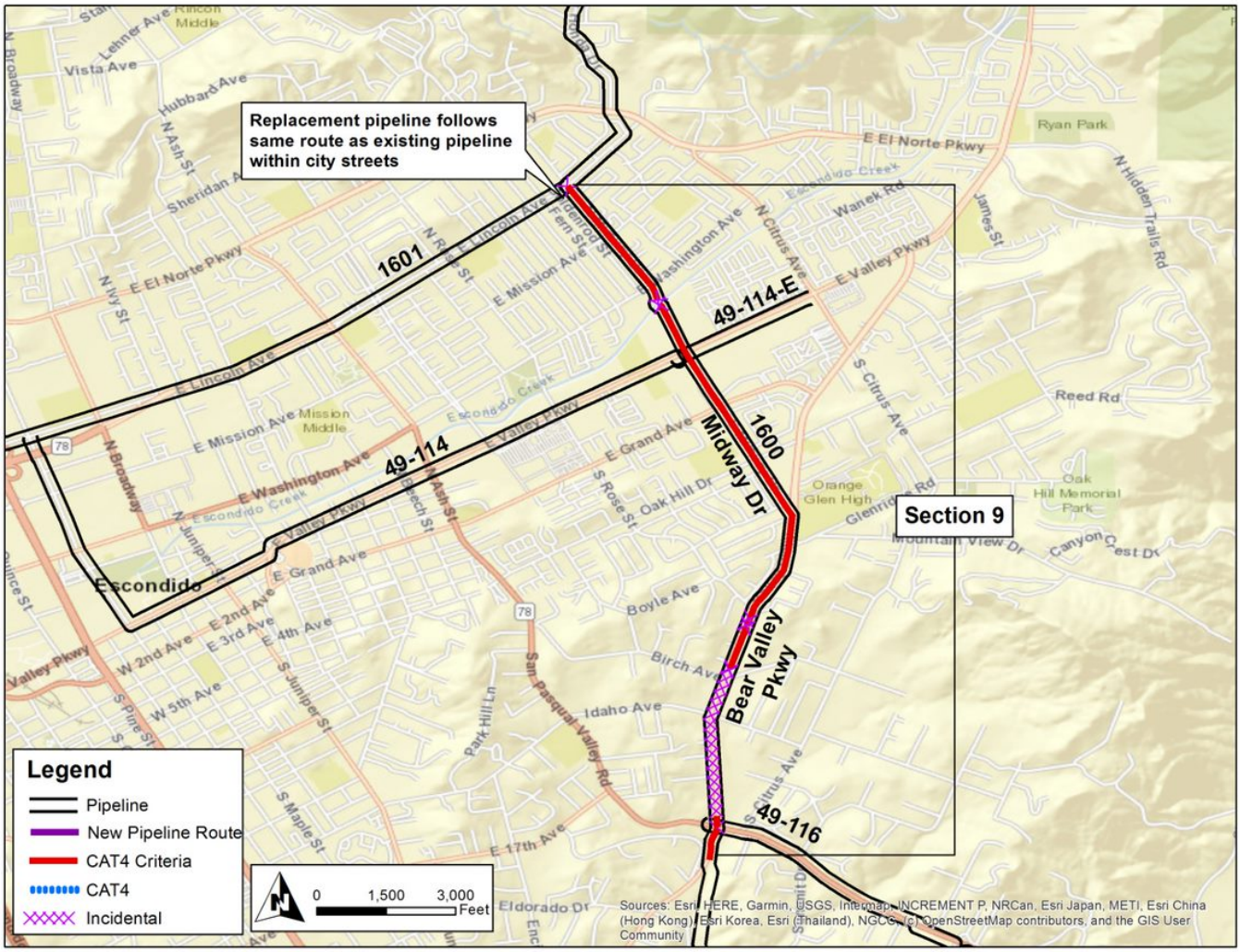

Figure 2: Satellite Map for Line 1600 Midway Drive Replacement

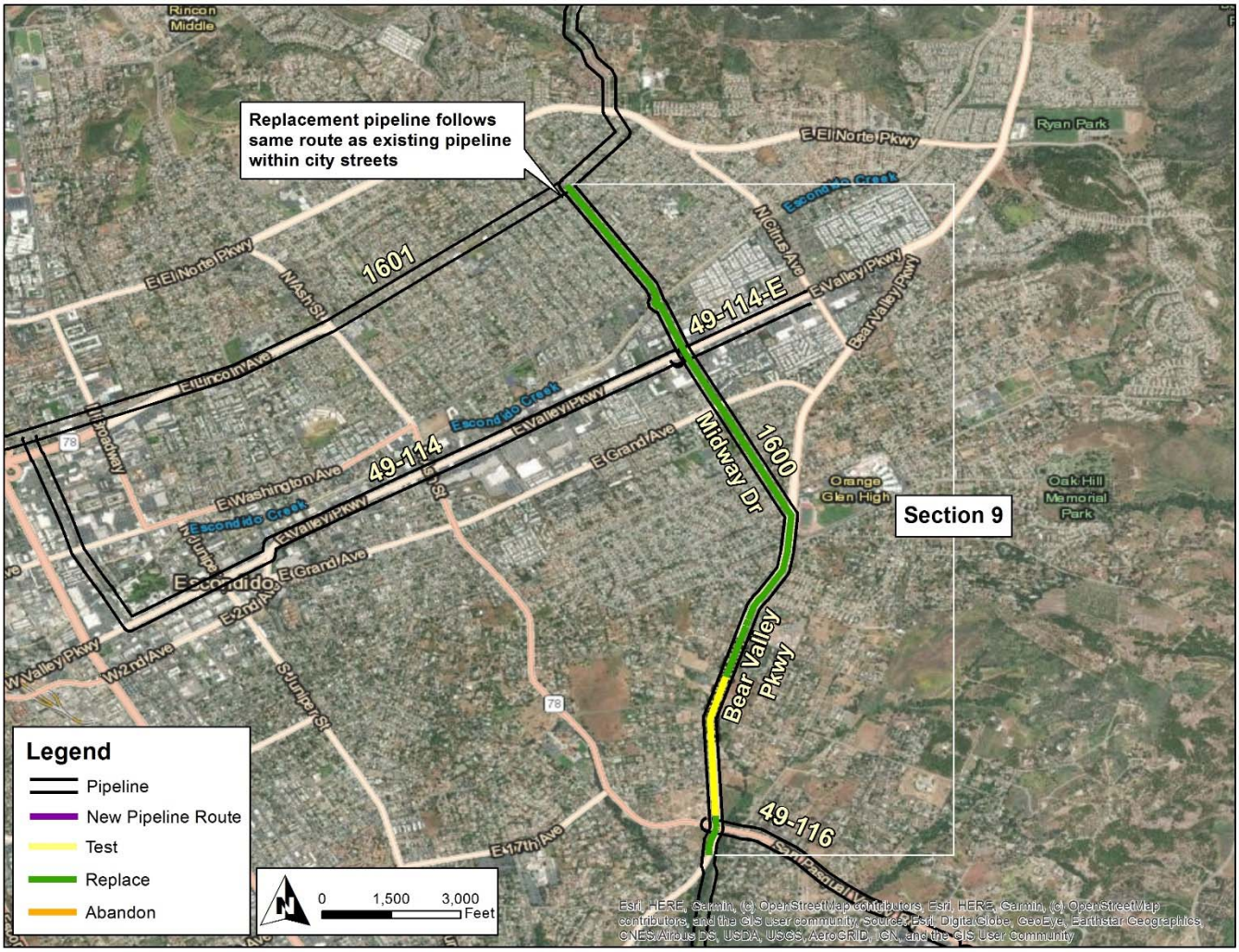

Table 2: Project Mileage

PHASE	MILEAGE
CATEGORY 4 CRITERIA[5]	2.333
CATEGORY 4[6]	0.028
INCIDENTAL	0.622
REPLACEMENT OFFSET	0.044
HYDROTEST[7]	0.576
TOTAL MILEAGE[8]	3.026

The direct costs for each area are summarized below.

Table 3: Material ($000's)

PROJECT COST	2019 & Prior	2020	2021	2022	Total[9]
DIRECT NON-LABOR (NON-LABOR)[10]	$916	$85	$0	$0	$1,001

Assumptions

Materials for this project were purchased after final internal authorization to purchase long lead time material. This allowed for material to be procured, inspected, and delivered to coincide with the anticipated construction start date. Primary components include:

- 13,000 feet of 16-inch pipe meeting SDG&E specifications.
- 26 16-inch fittings meeting SDG&E specifications.

[5] Lacks documentation of a post-construction strength test in a Class 3 or 4 HCA.

[6] Lacks documentation of a post-construction strength test in a Class 1 or 2 non-HCA.

[7] Approximately 0.576 miles of existing pipe installed in 2015 will be hydrotested along with the replacement sections to facilitate the post-completion pressure testing process in order to reduce the need for multiple pressure tests and to minimize community impacts. This length is included within the 0.622 "INCIDENTAL" length value.

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

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

[10] Direct Costs reflect escalation.

Table 4: Construction ($000's)

PROJECT COST	2019 & Prior	2020	2021	2022	Total[11]
TOTAL DIRECT COSTS (NON-LABOR)[12]	$4	$16,146	$77	$0	$16,227

Assumptions

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

- One mobilization and one demobilization.
- Contractor work is estimated using a 10 hour per day, five day work week.
- A full time utility locate crew will be utilized to account for unidentified utilities and existing pipeline crossings.
- Two mainline installation crews. One for Intersections and another for all other open trench installation.
- One pipe span installation has been included at Escondido Creek.
- Fiber optic lines will be installed above the new pipeline.
- Tie-ins will be completed during a 24 hour continuous shift. One 10 hour shift is included for intermediate tie-in.
- Laydown yards will be restored to the original condition at the end of the project.
- Restoration of streets, affected landscaping and grade along right of way (ROW) will be completed once the pipeline is installed and tied-in.

Additional Construction Information

- **Site Mobilization / Site Facilities**
  - One mobilization and one demobilization.
  - Two office trailers have been included for management and inspection personnel at laydown yards.
  - Eight months of site duration is anticipated.
  - Temporary fencing for all laydown yards.
  - Track out plates will be utilized at street access points to minimize soil being tracked onto the street by construction vehicles.

- **Site Management / Best Management Practices (BMPs)**
  - BMP materials for spoils piles, laydown yard, and worksite.

- **Material Handling**
  - 30 loads of material will be unloaded by the contractor at laydown yards and transported as needed.

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

[12] Direct Costs reflect escalation.

- **Traffic Control**
  - A three man crew will be used for each construction spread for traffic control for pipe installations at all intersections, during hydrotesting, isolations, tie-ins, and restoration. This includes all traffic control devices and equipment necessary to complete the project within the City of Escondido and San Diego County.
  - A two man crew will be used for traffic control for pipe installation in improved areas outside of intersections. This includes all traffic control devices and equipment necessary to complete the project within the City of Escondido and San Diego County.

- **Utility Locates**
  - A full time utility locate crew will be utilized to account for unidentified utilities and to field validate existing pipeline crossings.

- **Isolate Existing Pipeline**
  - One 10 hour shift is included in isolation preparation activities.
  - One 24 hour shift is included for the mainline isolation of Line 1600.
  - Installation of a temporary piping connection to an adjacent pipeline in order to facilitate the isolation of regulator station number 1316.
  - Isolation of six regulator stations.

- **Install New Pipeline**
  - Installation includes the following:
    - Approximately 13,000 linear feet (LF) of 16-inch pipe.
  - Site demo, excavation and pad trench / bellholes, string and bends pipe, coating joints.
  - Installation of fiber optic line and pipeline warning mesh.
  - One trenchless installation has been included for crossing Escondido Creek. This crossing is planned to be installed by spanning the creek.

- **Pressure Test Pipeline**
  - Preparatory work for the setup of nine 20,000 gallon water tanks.
  - Installation of hard piping from the test head to the tank pump.
  - Two test heads will be fabricated.
  - The pipeline will be tested in one segment.

- **Tie-In Pipeline**
  - One 10 hour shift for tie-in preparation.
  - The existing pre-tested section of the pipe will be tied-in during one 10 hour continuous shift.
  - The final tie-ins into Line 1600 will be tied in during one 24 hour continuous shift.
  - Three shifts of gas up and odorant seasoning support.

- **Retire / Abandon Existing Pipeline**
  - Removal of 26 existing pipeline markers.
  - The abandoned pipeline within improved areas will be abandoned using slurry fill. Length of slurry filled 16-inch pipe is estimated to be 12,260 linear feet (LF)
  - 15 abandonment excavations are planned.

- **Site Restoration**
  - Base paving of trench width will be completed up to 8-inch thick in the City of Escondido and San Diego County where the pipeline is installed in paved zones.
  - The disturbed area in the City of Escondido and San Diego County will receive a mill and overlay from centerline to curb-line, or approximately 12 feet wide.
  - All paved roads will receive new 4-inch striping where disturbed.
  - All disturbed traffic sensing devices (loops) at intersections will be replaced in kind or with equivalent functioning technology, assuming six per intersection.
  - 540 LF of curb and gutter repair is included.
  - 200 square feet (SF) of sidewalk repair is included.
  - Two 10 hour shifts are included for breaking down laydown yards and removing BMPs.

- **Site Demobilization**
  - One load of excess piping will be hauled to SDG&E designated yard.

- **Field Overhead**
  - Full time Project Manager
  - Full time Superintendent
  - Full time Safety Supervisor

Table 5: Environmental Survey/Permitting/Monitoring ($000's)

PROJECT COST	2019 & Prior	2020	2021	2022	Total[13]
TOTAL DIRECT COSTS (NON-LABOR)[14]	$617	$355	$613	$0	$1,586

Assumptions

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

- Asbestos abatement of Asbestos Containing Material (ACM).
- Non-hazardous waste containment/disposal.

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

[14] Direct Costs reflect escalation.

- Water source will be a hydrant located near the new alignment.
- Water will be treated and disposed within municipal sewer for hydrotest. Any water encountered during trenching would be stored in water tanks and discharged to land.
- Water treatment and disposal of approximately 165,000 gallons of hydrostatic test water.

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

- Environmental Consultants for pre-construction assessments, construction monitoring, and environmental close-out support.
- Abatement support is based upon Subject Matter Expert (SME) recommendations.
- Storm Water Pollution Prevention Plan (SWPPP) development and monitoring.

Table 6: Land & Right of Way Acquisition ($000's)

PROJECT COST	2019 & Prior	2020	2021	2022	Total[15]
TOTAL DIRECT COSTS (NON-LABOR)[16]	$8	$56	$243	$0	$307

Assumptions

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

- Encroachment permit and traffic control plan costs.
- New easement costs.
- Temporary Right of Entry (TRE) – Construction yards and workspace required for construction activities.

Factors such as location, zoning, current market price, and square footage are considered to determine a final estimated value specific to easements and TRE permits.

Table 7: Company Labor ($000's)

PROJECT COST	2019 & Prior	2020	2021	2022	Total[17]
TOTAL DIRECT COSTS (LABOR)[18]	$816	$1,082	$387	$0	$2,284

[15] Values may not add to total due to rounding.
[16] Direct Costs reflect escalation.
[17] Values may not add to total due to rounding.
[18] Direct Costs reflect escalation.

Assumptions

SDG&E and SoCalGas Labor - Management, Engineering, and Non-Union Labor

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

- Project Management (10,323 hours)
- Project Field Management (8,391 hours)
- Construction Management (1,680 hours)
- Environmental Services (3,350 hours)
- Land Services (648 hours)

Company employees provide extensive oversight with respect to safety; environmental protection; site management; construction, engineering and design services contract management and administration; project engineering and management; planning; scheduling; progress control; cost estimating, tracking and control; inspection; job site material and logistics management as well as job site customer interface management and community outreach.

Critical operational activities such as operating valves, bringing the cathodic protection system online, bringing instrumentation online, gas handling and removing old assets from service as well as loading gas into new assets and placing them into service are all completed by Company Union personnel.

SDG&E Labor - Union Labor ($000's)

SDG&E Union Labor costs were developed with the guidance of SDG&E Construction Management and those costs are duration dependent and activity-specific.

Table 8: Other Costs

PROJECT COST	2019 & Prior	2020	2021	2022	Total[19]
TOTAL DIRECT COSTS (NON-LABOR)[20]	$2,572	$5,918	$173	$0	$8,663

Assumptions

In addition to costs previously described above, there are other costs incurred as part of completing the project that are primarily associated with contracts that are established with specialized service providers that either perform a unique service or supplement the core Company project team. It is typical that services are contracted to complete activities related to planning, engineering, design, estimating, project and construction management, scheduling, survey, construction inspection, x-ray and non-destructive examination of welds, hot tapping and/or stopple services, temporary gas supplies, gas capture services, safety services, as well as as-built and project documentation

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

[20] Direct Costs reflect escalation.

and records management services. Other costs also include non-labor expenses related to business related mileage, travel, meals and lodging.

Engineering and Project Management

- Developed upon specified scope of work, planned deliverables, and activity levels of effort reflecting anticipated manpower requirements over the planned timeframe of the project schedule.
- Contracted engineering assistance to identify and evaluate potential options to bring Line 1600 into compliance with D.11-06-017 and Public Utilities Code § 958.
- Non-labor costs included in this estimate address travel, meals, expenses, and lodging incurred for SDG&E and SoCalGas Labor.

Construction Support Services

The high-level assumptions and specific level of effort to provide construction management support for this project are described in more detail below.

- X-Ray / NDE support is based upon the take-off quantities of welds for all newly installed pipe.
- No CNG to support existing taps during pipeline isolation.
- 17 hours for gas capture services to minimize the amount of natural gas vented to atmosphere.
- Gas service for core customers will be maintained through combination of purchase of additional gas through an alternative receipt point and curtailments to non-core customers where as appropriate.

Inspection Services

- Full time Chief Inspector
- Two full time Welding Inspectors

Survey and Design Service

- The survey and design service estimate include survey support staff for project and site facility layout and as-builts. The estimate also includes engineering team material support in the development of as-built close-out packages.

Table 9: Indirect Costs ($000's)

PROJECT COST	2019 & Prior	2020	2021	2022	Total[21]
COMPANY INDIRECTS	$1,399	$2,102	$393	$0	$3,894

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

Assumptions

- Indirect costs are for Administrative and General, purchasing, warehousing, pension and benefits, payroll tax, and other costs that are overhead in nature.
- Indirect costs do not include AFUDC or Property Tax.

Pipeline Safety Enhancement Plan Workpaper Supporting Chapter

Line 1600 Bear Valley Replacement Project

Table 1: Total Project Cost ($000's)

PROJECT COST	2019 & Prior[1]	2020	2021	2022	2023	Total[2]
DIRECT LABOR	$432	$267	$1,656	$0	$0	$2,355
DIRECT NON-LABOR	$2,427	$2,278	$24,768	$781	$0	$30,255
TOTAL DIRECT COSTS[3]	$2,859	$2,545	$26,425	$781	$0	$32,611
COMPANY OVERHEADS[4]	$577	$656	$2,708	$40	$0	$3,981
Total Capital Costs	$3,437	$3,201	$29,133	$821	$0	$36,592

Project Description

Line 1600 is a 16-inch diameter transmission line that runs approximately 49.7 miles from Rainbow to Mission Valley, San Diego. Per the CPUC Safety and Enforcement Division (SED) approved *Line 1600 Test or Replacement Plan*, the Line 1600 testing and replacement work is comprised of 19 independent projects. This workpaper describes the Line 1600 Bear Valley Replacement project. The Line 1600 Bear Valley Replacement project is located in the City of Escondido, City of San Diego, and San Diego County. The project will replace approximately 3.494 miles of existing 16-inch pipeline with 3.574 miles of new 16-inch pipeline along Bear Valley Parkway from the intersection of San Pasqual Valley Road and Bear Valley Parkway to the Lake Hodges area along Mule Hill Trail south of Bear Valley Parkway. Due to the offset of the new alignment, some distribution work will be required as part of the project scope to allow for existing customers to be served from the rerouted alignment. Associated distribution work includes the tie-over of three existing regulator stations. The Project will remove two pipeline spans along the existing route. The project will also install approximately 3.574 miles of fiber optic cable with one fiber optic monitoring station. Fiber optic cable will be installed along the new 16-inch pipeline to assist in leak detection, ground movement, and vibration analysis.

Considerations unique to the project are as follows:

- Two existing pipeline spans, approximately 35 feet and 67 feet in length, will be removed as part of the post-completion abandonment activities on the existing pipeline.
- The southernmost 0.568 miles of the project is within the San Dieguito River Park area where environmentally sensitive areas have been identified. Extensive pre-construction surveys have been performed and monitoring during construction will occur to minimize potential impacts.
- The proposed plan for the fiber optic cable is to have a continuous run from the Line 1600 La Honda-Lincoln Replacement to Line 1600 Serra Mesa Replacement projects. The end result of the continuous run would reduce the number of required monitoring stations between these Projects to one which is located on the Line 1600 Pomerado South Replacement project.

[1] Actual costs incurred associated with planning and engineering design work are included in the project cost estimates.
[2] Values may not add to total due to rounding.
[3] Direct Costs reflect escalation.
[4] Excludes AFUDC and tax.

- The Project is reviewing options to utilize existing conduit runs crossing the environmentally sensitive Lake Hodges for the installation of fiber optic cable. The installation of the fiber optic cable across Lake Hodges will provide a continuous connection to southern projects and remove the need for an additional monitoring station.

Alternatives Considered

D.18-06-028, Ordering Paragraph 7, required SDG&E and SoCalGas to "submit to Safety and Enforcement Division a hydrostatic test or replacement plan pertaining to the existing 49.7 miles of Line 1600 in its present corridor." The Decision further required such plan to discuss two options: "1. Hydrotest the entire 49.7 miles of line and replace those segments that fail the test; and 2. Replace all pipeline segments in High Consequence Areas (HCAs) along Line 1600, thus ensuring a new pipeline without vintage pipeline characteristics that are perceived to increase the risk of Line 1600. Hydrotest in solely non-HCA segments would ensure less impact if there was a failure during hydrotesting." SDG&E's and SoCalGas' September 26, 2018 *Line 1600 Test or Replacement Plan* discussed D.18-06-028's two options as Design Alternative 1 (Replace in HCA/Test in Non-HCA alternative) and Design Alternative 2 (Full Hydrotest alternative), and also discussed Design Alternative 3 (Full Replacement in Nearby Streets alternative) and Design Alternative 4 (Full Replacement Along Highway 395 alternative). SDG&E and SoCalGas proposed to implement, and the CPUC SED approved, Design Alternative 1, which will replace existing Line 1600 primarily in HCAs and hydrotest the remaining sections in non-HCAs. D.18-06-028 at 92 also required the Utilities to "identify proposed rerouting of the line in specific segments." As discussed in the *Line 1600 Test or Replacement Plan*, "SDG&E and SoCalGas concluded it is not feasible, prudent nor reasonable to build a new replacement pipeline entirely within the existing Line 1600 rights-of-way." Due to construction difficulty, private property and community impacts, environmental impacts, and costs and delays of efforts to expand the existing rights of way (ROW), the *Line 1600 Test or Replacement Plan* proposed to re-route the majority of replacement segments, usually in nearby streets. In developing the Plan, SDG&E and SoCalGas reviewed these proposed re-routes with SED, which "conducted a joint field inspection of the identified sites with SDG&E personnel and its contractor to evaluate the existing safety conditions, constructability and serviceability of Line 1600. After the field inspections, SED agreed with SDG&E's and SoCalGas' proposed reroute of many segments of Line 1600 due to safety and serviceability reasons."

D.20-02-024 requires "a cost forecast for the approved Design Alternative 1 (Replace in HCAs and Hydrotest in Non-HCAs) that SED approved on January 15, 2019."[2] D.20-02-024 at 31-32 held that issues "out of scope" for Phase 2 include "revisiting Design Alternatives 2 (Full Hydrotest Alternative), 3 (Full Replacement), 4 (Full Replacement but different street routing) or alternative recommendations. Nor are we revisiting the substance of the PSEP engineering and implementation that falls within the authority of SED."

Shut-In Analysis

The Line 1600 Bear Valley Replacement project can be temporarily taken out of service without significant impact to distribution customers, and therefore mitigation strategies must be employed. The shut-in plan includes phasing the tie-in to mitigate the impacts to the local distribution system. Some transmission system capacity impacts will occur for less than a week during the period when the new line is being fully connected and the old line removed from service. If necessary, based on gas demand and system operations during this period, mitigation strategies such as bringing additional gas supply from an alternate receipt point and/or curtailment of non-core customers can be implemented.

Forecast Methodology

The Utilities methodology for forecasting PSEP costs is discussed in the Direct Testimony of Ronn Gonzalez. The Utilities developed a Total Installed Cost (TIC) estimate to implement the above scope of work. The TIC Estimate includes direct costs associated with project management, engineering and design, environmental permitting, land acquisition, material and equipment procurement, and construction.

Following the approval of the Plan by SED in January 2019, the Utilities have undertaken the detailed design and planning of the 19 individual projects in the Plan. Generally, projects that are earliest in the overall schedule are the most developed, while those later in the overall schedule are less developed. At the time of cost estimate preparation, this project was at an approximately 30% design level. Further development of this project could reveal new information requiring some adjustments to the project plan in the areas such as engineering, materials, construction, permitting, environmental and land, all of which could impact actual costs compared this cost estimate.

Schedule

Implementation of this project is proposed to be completed consistent with the overall prioritization and timing described in Section IV. D. of the *Line 1600 Test or Replacement Plan.* The schedule was developed based on the five-stage project life cycle as defined by PSEP. The key project deliverables were identified and incorporated into a work breakdown structure. This work breakdown structure was then sequenced, and predecessor and successor tasks were linked to each task. Durations were added to each task to provide a total project duration.

The preliminary Stage 4 Construction Schedule received additional planning and stakeholder input considering that typically 50% of the project costs are expended during the construction phase. The construction schedule is assumed to be 133 working days.

Figure 1: Overview Map for Line 1600 Bear Valley Replacement

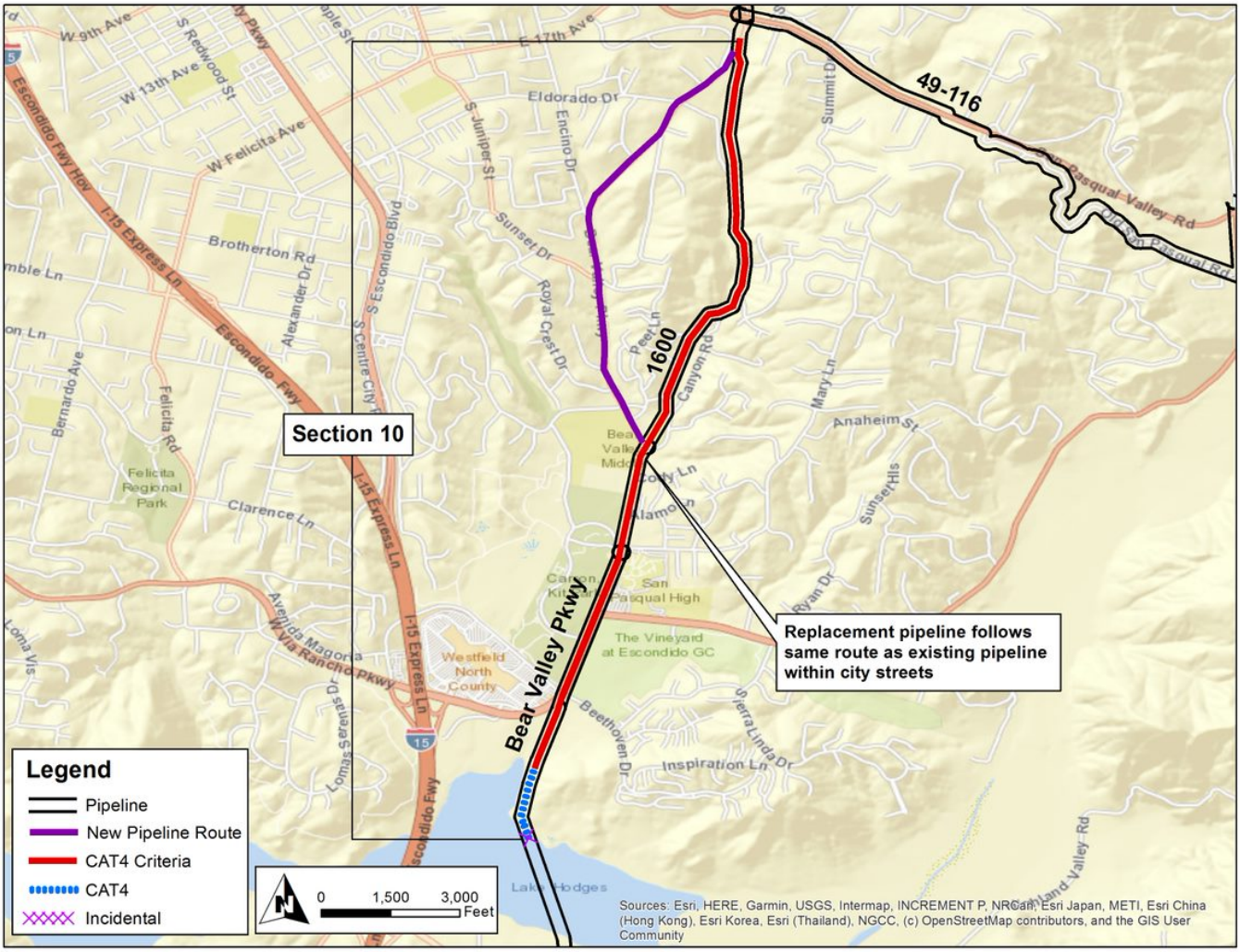

Figure 2: Satellite Map for Line 1600 Bear Valley Replacement

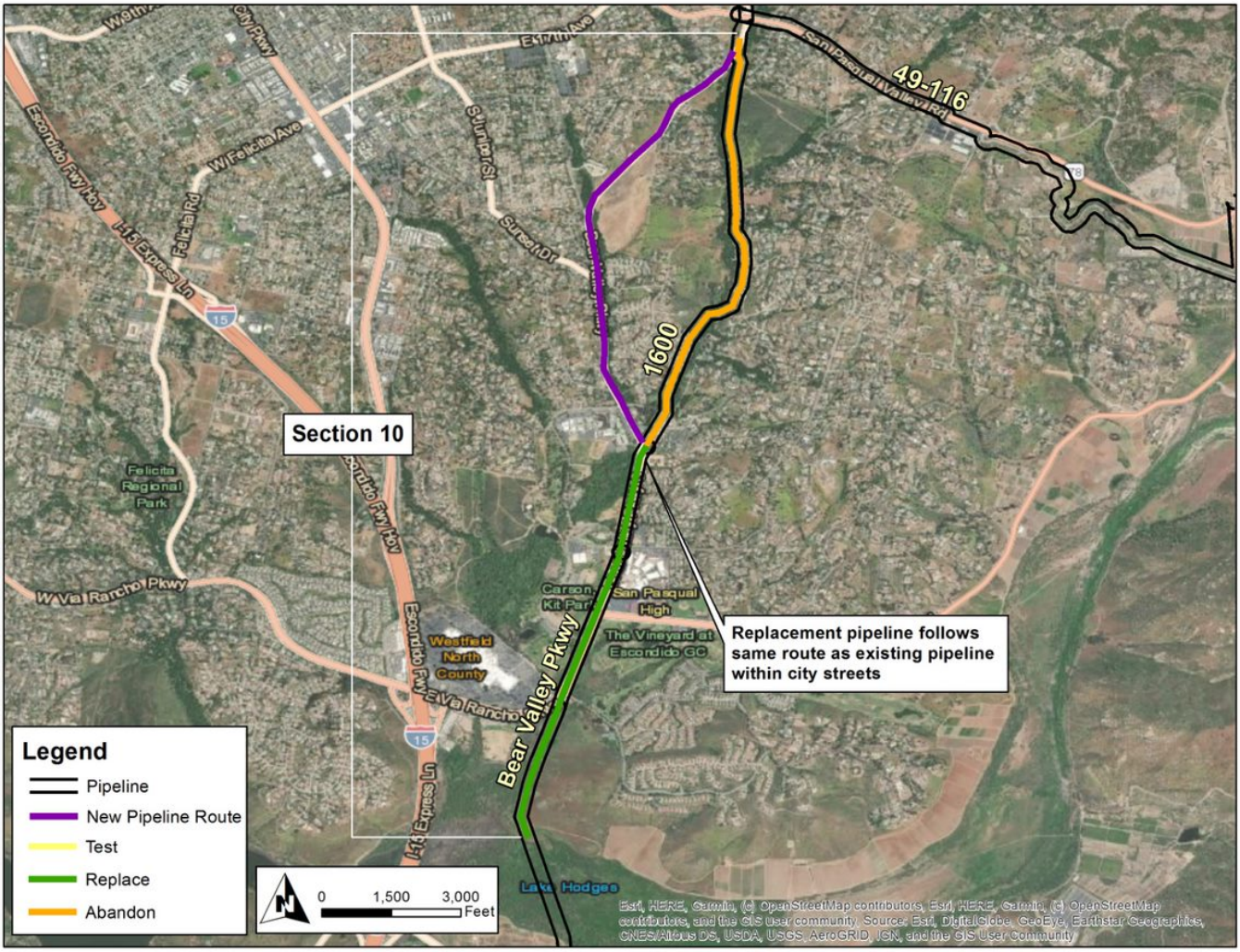

Table 2: Project Mileage

PHASE	MILEAGE
CATEGORY 4 CRITERIA[5]	3.193
CATEGORY 4[6]	0.302
INCIDENTAL	0.000
REPLACEMENT OFFSET	0.080
TOTAL MILEAGE[7]	3.574

The direct costs for each area are summarized below.

Table 3: Material ($000's)

PROJECT COST	2019 & Prior	2020	2021	2022	2023	Total[8]
TOTAL DIRECT COSTS (NON-LABOR)[9]	$274	$1,200	$32	$0	$0	$1,506

Assumptions

Materials for this project will be purchased following final internal authorization 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. Primary components include:

- 19,600 feet of 16-inch pipe meeting SDG&E specifications.
- 15 16-inch fittings meeting SDG&E specifications.

Table 4: Construction ($000's)

PROJECT COST	2019 & Prior	2020	2021	2022	2023	Total[10]
TOTAL DIRECT COSTS (NON-LABOR)[11]	$6	$6	$18,884	$0	$0	$18,896

[5] Lacks documentation of a post-construction strength test in a Class 3 or 4 HCA.
[6] Lacks documentation of a post-construction strength test in a Class 1 or 2 non-HCA.
[7] Values may not add to total due to rounding.
[8] Values may not add to total due to rounding.
[9] Direct Costs reflect escalation.
[10] Values may not add to total due to rounding.
[11] Direct Costs reflect escalation.

Assumptions

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

- One mobilization and one demobilization
- Work has been scheduled using a 10 hour per day, five day work week.
- Pipeline installation activities are based on an eight hour work window in the streets due to housing and schools along the new alignment.
- Night work has been included for all work.
- A full time utility locate crew will be utilized to account for unidentified utilities and existing pipeline crossings.
- Two mainline installation crews will be utilized. One for intersections and select open trench installations, and one for all other open trench installations.
- Fiber optic lines will be installed above the new pipeline.
- Excess spoils will be hauled off and disposed.
- Tie-ins will be completed during a 24 hour continuous shift. One 10 hour shift is included for intermediate tie-in.
- Laydown yards will be restored to original condition at the end of the project.
- Restoration of grade along right of way (ROW) will be completed once pipeline is installed and tied in.

Additional Construction Information

- **Site Mobilization / Site Facilities**
  - One mobilization and one demobilization.
  - Two office trailers have been included for management and inspection personnel at the primary laydown yard.
  - Six months of site duration is anticipated.
  - Temporary fencing for all laydown yards.
  - Track out plates will be utilized at street access points to minimize soil being tracked onto the street by construction vehicles.

- **Site Management / Best Management Practices (BMPs)**
  - BMP materials for spoils piles, laydown yard, and work site.

- **Material Handling**
  - 19 loads of material will be unloaded by the contractor at laydown yards and transported as needed.

- **Traffic Control**
  - A three person crew will be used each construction spread for traffic control for pipe installations at all intersections, during hydrotesting, isolations, and restoration. This includes all traffic control devices and equipment necessary to complete the project within the City of Escondido.
  - A two person crew will be used for each construction spread for traffic control for pipe installations at all intersections, during hydrotesting, isolations, and restoration. This includes all traffic control devices

and equipment necessary to complete the project within the scope of this Project.
- A three person crew will be used for tie-ins.

- **Utility Locates**
  - 100 utility locates are included in the estimate and are assumed to be carried out by a full time utility locate crew with a hydrovac truck.

- **Isolate Existing Pipeline**
  - One 10 hour shift is included in isolation preparation activities.
  - One 24 hour shift is included for the mainline isolation of Line 1600.
  - Isolation of three regulator stations.

- **Install New Pipeline**
  - Installation includes the following:
    - Approximately 19,600 linear feet (LF) of 16-inch pipe.
  - Site demo, excavation and pad trench / bellholes, string and bends pipe, coating joints.
  - Installation of fiber optic line and pipeline warning mesh.

- **Pressure Test Pipeline**
  - Installation of hard piping from the test head to the tank pump.
  - Two prefabricated test heads will be utilized.
  - The pipeline will be tested in one segment.

- **Tie-In Pipeline**
  - One 10 hour shift for tie-in preparation.
  - The existing pre-tested section of the pipe will be tied-in during one 10 hour continuous shift.
  - The final tie-ins into Line 1600 will be tied in during one 24 hour continuous shift.
  - Three shifts of gas up and odorant seasoning support.
  - Three shifts of support is included for tie-overs.

- **Retire / Abandon Existing Pipeline**
  - Removal of 80 pipeline markers is included.
  - Slurry abandonment of 11,395 LF of 16-inch pipeline is included.
  - Four abandonment excavations are planned.

- **Site Restoration**
  - Base paving of trench will be up to 8-inch thick where the pipeline is installed in paved zones.
  - Restoration of grade along ROW will be performed once pipeline is installed and tied in, the trench lines will receive a grind and overlay of asphalt at a thickness of 2-inch and a width of 12-inch.
  - Approximately 4,015 LF of alignment is assumed to be within moratoriums and receive grind and cap from curb to curb.
  - Approximately 254,200 SF of mill and overlay is included.
  - 24 traffic loop replacements with four traffic loops at each intersection is included.
  - Approximately 9,220 LF of 4-inch wide line repainting is included.
  - Approximately 21,555 LF of double 4-inch wide line repainting is included.
  - Approximately 45 LF of curb and gutter repair is included.
  - Approximately 330 SF of sidewalk repair is included.
  - Five 10 hour shifts are included for breaking down laydown yards and removing BMP's.

- **Site Demobilization**
  - One load of excess piping will be off hauled.
  - Two 10 hour shifts for final cleanup of work sites.

- **Field Overhead**
  - Full time Project Manager
  - Full time Superintendent
  - Full time Safety Supervisor

Table 5: Environmental Survey/Permitting/Monitoring ($000's)

PROJECT COST	2019 & Prior	2020	2021	2022	2023	Total[12]
TOTAL DIRECT COSTS (NON-LABOR)[13]	$610	$211	$458	$325	$0	$1,604

Assumptions

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

- Asbestos abatement of Asbestos Containing Material (ACM).
- Non-hazardous waste containment/disposal.
- Water source will be a hydrant located near the new alignment.
- Water will be treated and disposed within municipal sewer for hydrotest. Any water encountered during trenching would be stored in water tanks and discharged to land.
- Water treatment and disposal of approximately 186,000 gallons of hydrostatic test water.

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

[13] Direct Costs reflect escalation.

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

- Environmental Consultants for pre-construction assessments, construction monitoring, and environmental closeout support.
- Aquatic Features jurisdictional delineations.
- Abatement support is based upon Subject Matter Expert (SME) recommendations.
- Stormwater Pollution Prevention Plan development and monitoring.

Table 6: Land & Right-of-Way Acquisition ($000's)

PROJECT COST	2019 & Prior	2020	2021	2022	2023	Total[14]
TOTAL DIRECT COSTS (NON-LABOR)[15]	$0	$50	$649	$0	$0	$700

Assumptions

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

- Permitting costs.
- Temporary Right of Entry (TRE) - Construction yards and workspace required for construction activities.

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.

Table 7: Company Labor ($000's)

PROJECT COST	2019 & Prior	2020	2021	2022	2023	Total[16]
TOTAL DIRECT COSTS (LABOR)[17]	$432	$267	$1,656	$0	$0	$2,355

Assumptions

SDG&E and SoCalGas Labor - Management, Engineering, and Non-Union Labor

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

- Project Management (14,094 hours)
- Project Field Management (8,783 hours)
- Construction Management (1,410 hours)
- Environmental Services (4,224 hours)
- Land Services (933 hours)

[14] Values may not add to total due to rounding.
[15] Direct Costs reflect escalation.
[16] Values may not add to total due to rounding.
[17] Direct Costs reflect escalation.

Company employees provide extensive oversight with respect to safety; environmental protection; site management; construction, engineering and design services contract management and administration; project engineering and management; planning; scheduling; progress control; cost estimating, tracking and control; inspection; job site material and logistics management as well as job site customer interface management and community outreach.

SDG&E Labor - Union Labor

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

Critical operational activities such as operating valves, bringing the cathodic protection system online, bringing instrumentation online, gas handling and removing old assets from service as well as loading gas into new assets and placing them into service are all completed by Company Union personnel.

Table 8: Other Costs ($000's)

PROJECT COST	2019 & Prior	2020	2021	2022	2023	Total[18]
TOTAL DIRECT COSTS (NON-LABOR)[19]	$1,537	$811	$4,745	$456	$0	$7,550

Assumptions

In addition to costs previously described above, there are other costs incurred as part of completing the project that are primarily associated with contracts that are established with specialized service providers that either perform a unique service or supplement the core Company project team. It is typical that services are contracted to complete activities related to planning, engineering, design, estimating, project and construction management, scheduling, survey, construction inspection, x-ray and non-destructive examination of welds, hot tapping and/or stopple services, temporary gas supplies, gas capture services, safety services, as well as as-built and project documentation and records management services. Other costs also include non-labor expenses related to business related mileage, travel, meals and lodging.

Engineering and Project Management

- Developed upon specified scope of work, planned deliverables, and activity levels of effort reflecting anticipated manpower requirements over the planned timeframe of the project schedule.
- Contracted engineering assistance to identify and evaluate potential options to bring Line 1600 into compliance with D.11-06-017 and Public Utilities Code § 958.
- Non-labor costs included in this estimate address travel, meals, expenses, and lodging incurred for SDG&E and SoCalGas Labor.

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

[19] Direct Costs reflect escalation.

Construction Support Services

The high-level assumptions and specific level of effort to provide construction management support for this project are described in more detail below.

- Full time X-Ray / NDE support with each pipeline lay crew.
- No CNG to support existing taps during pipeline isolation.
- Gas capture services to reduce the amount of natural gas vented to atmosphere.

Inspection Services

- Part time Chief Inspector
- Two full time and one part time Welding Inspectors

Survey and Design Services

- The survey and design service estimate includes survey support staff for project and site facility layout and as-builts. The estimate also includes engineering team material support in the development of as-built close-out packages.

Table 9: Indirect Costs ($000's)

PROJECT COST	2019 & Prior	2020	2021	2022	2023	Total[20]
COMPANY OVERHEADS	$577	$656	$2,708	$40	$0	$3,981

Assumptions

- Indirect costs are for Administrative and General, purchasing, warehousing, pension and benefits, payroll tax, and other costs that are overhead in nature.
- Indirect costs do not include AFUDC or Property Tax.

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

Table 1: Total Project Cost ($000's)

PROJECT COST	2019 & Prior[1]	2020	2021	2022	Total[2]
DIRECT LABOR	$629	$749	$97	$0	$1,475
DIRECT NON-LABOR	$3,151	$6,171	$44,117	$1,103	$54,542
TOTAL DIRECT COSTS[3]	$3,780	$6,920	$44,214	$1,103	$56,017
COMPANY OVERHEADS[4]	$754	$1,894	$2,552	$57	$5,256
Total Capital Costs	$4,534	$8,814	$46,767	$1,159	$61,274

Project Description

Line 1600 is a 16-inch diameter transmission line that runs approximately 49.7 miles from Rainbow to Mission Valley, San Diego. Per the CPUC Safety and Enforcement Division (SED) approved *Line 1600 Test or Replacement Plan*, the Line 1600 testing and replacement work is comprised of 19 independent projects. This workpaper describes the Line 1600 Pomerado North Replacement project. The Line 1600 Pomerado North Replacement project is located in the City of San Diego and the City of Poway. The project will replace approximately 5.304 miles of 16-inch pipeline with 5.837 miles of new 16-inch pipe and one new mainline valve (MLV), along Pomerado Road from Highland Valley Road to Ted Williams Parkway. Due to the offset of the new alignment, additional distribution work will be required as part of the project scope to allow for existing customers to be served from the rerouted alignment. Associated distribution work includes tie-over of one existing regulator station, the installation of four new regulator stations to replace five existing regulator stations, and the installation of approximately 0.467 miles of distribution main to connect a new regulator station to the existing distribution system. The project will also install approximately 5.837 miles of fiber optic cable with one fiber optic monitoring station. Fiber optic cable will be installed along the new 16-inch pipeline to assist in leak detection, ground movement, and vibration analysis.

Considerations unique to the project are as follows:

- In order to maintain uninterrupted gas service to the community, the new pipeline and the existing pipeline will both remain in service by utilizing a temporary 16-inch tee, until construction of subsequent projects are completed. The abandonment of the existing pipeline in this segment will occur as part of the Line 1600 Section 13 Scripps-Poway Replacement Project.
- The proposed plan for the fiber optic cable is to have a continuous run from the Line 1600 La Honda-Lincoln Replacement to Line 1600 Serra Mesa Replacement projects. The end result of the continuous run would reduce the number of required monitoring stations between these Projects to one which is located on the Line 1600 Pomerado South Replacement project.

[1] Actual costs incurred associated with planning and engineering design work are included in the project cost estimates.
[2] Values may not add to total due to rounding.
[3] Direct Costs reflect escalation.
[4] Excludes AFUDC and tax.

Alternatives Considered

D.18-06-028, Ordering Paragraph 7, required SDG&E and SoCalGas to "submit to Safety and Enforcement Division a hydrostatic test or replacement plan pertaining to the existing 49.7 miles of Line 1600 in its present corridor." The Decision further required such plan to discuss two options: "1. Hydrotest the entire 49.7 miles of line and replace those segments that fail the test; and 2. Replace all pipeline segments in High Consequence Areas (HCAs) along Line 1600, thus ensuring a new pipeline without vintage pipeline characteristics that are perceived to increase the risk of Line 1600. Hydrotest in solely non-HCA segments would ensure less impact if there was a failure during hydrotesting." SDG&E's and SoCalGas' September 26, 2018 *Line 1600 Test or Replacement Plan* discussed D.18-06-028's two options as Design Alternative 1 (Replace in HCA/Test in Non-HCA alternative) and Design Alternative 2 (Full Hydrotest alternative), and also discussed Design Alternative 3 (Full Replacement in Nearby Streets alternative) and Design Alternative 4 (Full Replacement Along Highway 395 alternative). SDG&E and SoCalGas proposed to implement, and the CPUC SED approved, Design Alternative 1, which will replace existing Line 1600 primarily in HCAs and hydrotest the remaining sections in non-HCAs. D.18-06-028 at 92 also required the Utilities to "identify proposed rerouting of the line in specific segments." As discussed in the *Line 1600 Test or Replacement Plan*, "SDG&E and SoCalGas concluded it is not feasible, prudent nor reasonable to build a new replacement pipeline entirely within the existing Line 1600 rights-of-way." Due to construction difficulty, private property and community impacts, environmental impacts, and costs and delays of efforts to expand the existing rights of way (ROW), the *Line 1600 Test or Replacement Plan* proposed to re-route the majority of replacement segments, usually in nearby streets. In developing the Plan, SDG&E and SoCalGas reviewed these proposed re-routes with SED, which "conducted a joint field inspection of the identified sites with SDG&E personnel and its contractor to evaluate the existing safety conditions, constructability and serviceability of Line 1600. After the field inspections, SED agreed with SDG&E's and SoCalGas' proposed reroute of many segments of Line 1600 due to safety and serviceability reasons."

D.20-02-024 requires "a cost forecast for the approved Design Alternative 1 (Replace in HCAs and Hydrotest in Non-HCAs) that SED approved on January 15, 2019."[2] D.20-02-024 at 31-32 held that issues "out of scope" for Phase 2 include "revisiting Design Alternatives 2 (Full Hydrotest Alternative), 3 (Full Replacement), 4 (Full Replacement but different street routing) or alternative recommendations. Nor are we revisiting the substance of the PSEP engineering and implementation that falls within the authority of SED."

Shut-In Analysis

The existing section of Line 1600 at the tie-in points of the Line 1600 Pomerado North Replacement Project can be temporarily taken out of service to complete tie-in activities. With the careful and proper sequencing of work, the distribution system can be fed for this section while incorporating gas feed from the south or the use of temporary CNG. Four regulator stations will be isolated using existing tap valves once the new replacement regulator stations are installed, tied-over, and in service to avoid impacts to the distribution system.

Forecast Methodology

The Utilities methodology for forecasting PSEP costs is discussed in the Direct Testimony of Ronn Gonzalez. The Utilities developed a Total Installed Cost (TIC) estimate to implement the above scope of work. The TIC Estimate includes direct costs associated with project management, engineering and design, environmental permitting, land acquisition, material and equipment procurement, and construction.

Following the approval of the Plan by SED in January 2019, the Utilities have undertaken the detailed design and planning of the 19 individual projects in the Plan. Generally, projects that are earliest in the overall schedule are the most developed, while those later in the overall schedule are less developed. At the time of cost estimate preparation, this project was at an approximately 30% design level. Further development of this project could reveal new information requiring some adjustments to the project plan in the areas such as engineering, materials, construction, permitting, environmental and land, all of which could impact actual costs compared this cost estimate.

Schedule

Implementation of this project is proposed to be completed consistent with the overall prioritization and timing described in Section IV. D. of the *Line 1600 Test or Replacement Plan*. The schedule was developed based on the five-stage project life cycle as defined by PSEP. The key project deliverables were identified and incorporated into a work breakdown structure. This work breakdown structure was then sequenced, and predecessor and successor tasks were linked to each task. Durations were added to each task to provide a total project duration.

The preliminary Stage 4 Construction Schedule received additional planning and stakeholder input considering that typically 50% of the project costs are expended during the construction phase. The construction schedule is assumed to be 190 working days.

Figure 1: Overview Map for Line 1600 Pomerado North, Pomerado South, and Scripps-Poway Replacement Projects

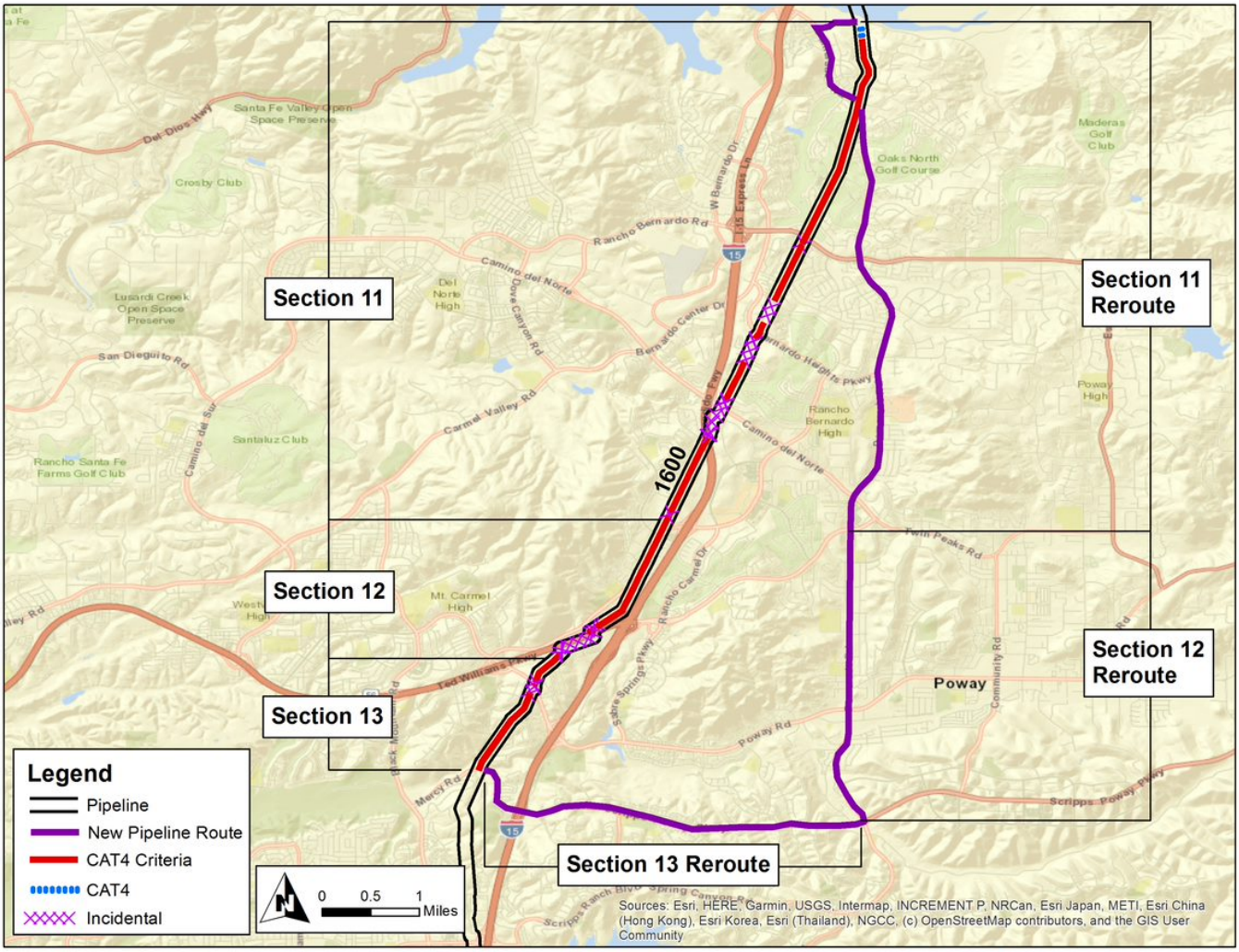

Figure 2: Overview Map for Line 1600 Pomerado North Replacement

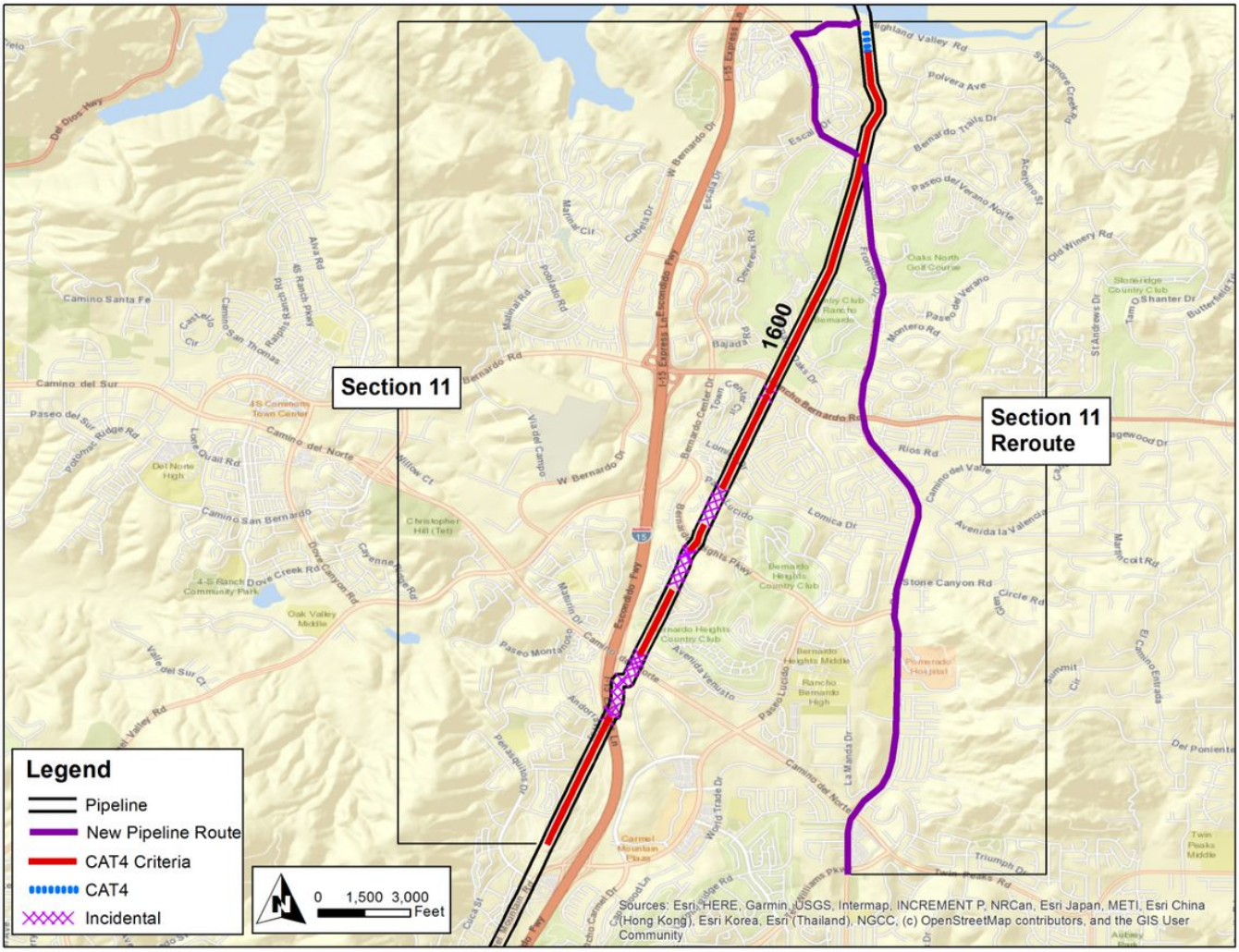

Figure 3: Satellite Map for Line 1600 Pomerado North Replacement

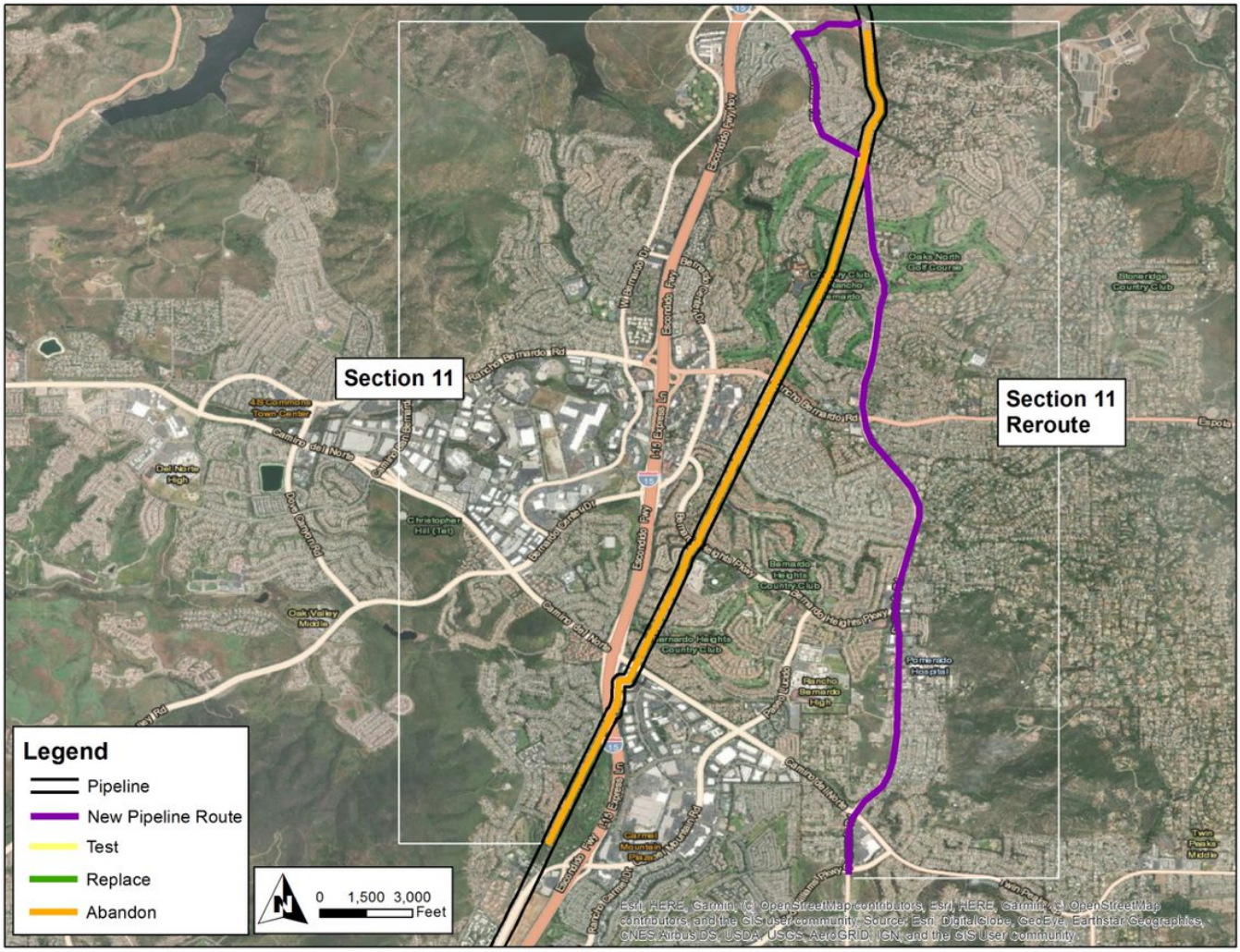

Table 2: Project Mileage

PHASE	MILEAGE
CATEGORY 4 CRITERIA[5]	4.313
CATEGORY 4[6]	0.129
INCIDENTAL	0.863
REPLACEMENT OFFSET	0.532
TOTAL MILEAGE[7]	5.837

The direct costs for each area are summarized below.

Table 3: Material ($000's)

PROJECT COST	2019 & Prior	2020	2021	2022	Total[8]
DIRECT NON-LABOR (NON-LABOR)[9]	$0	$2,731	$908	$0	$3,639

Assumptions

Materials for this project will be purchased following final internal authorization 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. Primary components include:

- 31,000 feet of 16-inch pipe meeting SDG&E specifications.
- 105 16-inch fittings meeting SDG&E specifications.

Table 4: Construction ($000's)

PROJECT COST	2019 & Prior	2020	2021	2022	Total[10]
DIRECT NON-LABOR (NON-LABOR)[11]	$7	$307	$38,618	$0	$38,932

Assumptions

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

- One mobilization and one demobilization.
- Contractor work has been scheduled using a 10 hour per day, five day work week.
- Two mainline install crews will be utilized.
- Fiber optic lines will be installed above the new pipeline.

[5] Lacks documentation of a post-construction strength test in a Class 3 or 4 HCA.
[6] Lacks documentation of a post-construction strength test in a Class 1 or 2 non-HCA.
[7] Values may not add to total due to rounding.
[8] Values may not add to total due to rounding.
[9] Direct Costs reflect escalation.
[10] Values may not add to total due to rounding.
[11] Direct Costs reflect escalation.

- Excess spoils will be hauled off and disposed.
- Tie-ins will be completed during a 24 hour continuous shift.
- Laydown yards will be restored to original condition at the end of the project.
- Restoration of grade along right of way (ROW) will be completed once pipeline is installed and tied in.

Additional Construction Information

- **Site Mobilization / Site Facilities**
  - One mobilization and one demobilization.
  - Two office trailers have been included for management and inspection personnel at the primary laydown yard.
  - 11 months of site duration is anticipated.
  - Temporary fencing for all laydown yards.
  - Track out plates will be utilized at street access points to minimize soil being tracked onto the street by construction vehicles.

- **Site Management / Best Management Practices (BMPs)**
  - BMP materials for spoils piles, laydown yard, and worksite.

- **Material Handling**
  - 40 loads of material will be unloaded by the contractor at laydown yards and transported as needed.

- **Traffic Control**

  Traffic control for the duration of construction for pipe installations at all intersections, during hydrotesting, isolations, and restoration.

- **Mainline Valve**
  - One 16-inch MLV.

- **Utility Locates**
  - 364 utility locates to verify pipe location at cutouts and tap excavations.

- **Pipeline Installation**
  - Installation includes the following:
    - Approximately 31,000 linear feet (LF) of 16-inch pipe.
  - Site demo, excavation and pad trench / bellholes, string and bends pipe, coating joints.
  - Installation of fiber optic line and pipeline warning mesh.

- **Isolate Existing Pipeline**
  - Installation of stopple fitting.
  - One nitrogen truck for purge support of the existing pipeline.

- **Pressure Test Pipeline**
  - Preparatory work for the setup of 15 20,000 gallon water tanks.
  - Installation of hard piping from the test head to the tank pump.
  - The pipeline will be tested in one post-completion hydrotest.
  - Following the dewatering of each section of pipe, it will be intermittently dried until ready to be tied-in.

- **Tie-In Pipeline**
  - One 24 hour continuous shift for pipeline tie-in.

- **Retire / Abandon Existing Pipeline**
  - Abandonment of four regulator stations[12].
  - All existing pipe will be abandoned during the Line 1600 Section 13 Scripps-Poway Replacement Project.

- **Site Restoration**
  - Paving of approximately 306,340 SF of ROW.
  - 45,000 linear feet (LF) of 4-inch wide striping.
  - Installation of 80 traffic loops.
  - Installation of 900 SF of concrete sidewalks.
  - Installation of 130 LF of concrete curb and gutter.
  - Landscape and irrigation repair.
  - Installation of 1,800 SF of landscaping sod.
  - 7 shifts for 490 manhours are included for the removal of temporary fencing, BMPs, and final cleanup.

- **Site Demobilization**
  - Two loads of excess piping will be hauled to SDG&E designated yard.

- **Field Overhead**
  - Full time Project Manager
  - Full time Superintendent
  - Full time Safety Supervisor

Table 5: Environmental Survey/Permitting/Monitoring ($000's)

PROJECT COST	2019 & Prior	2020	2021	2022	Total[13]
TOTAL DIRECT COSTS (NON-LABOR)[14]	$1,023	$75	$911	$810	$2,820

[12] Since the completion of the TIC estimate, the Project will now include the abandonment of a fifth regulator station.
[13] Values may not add to total due to rounding.
[14] Direct Costs reflect escalation.

Assumptions

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

- Asbestos abatement of Asbestos Containing Material (ACM).
- Non-hazardous Waste Containment/Disposal.
- Water source will be a hydrant located near the new alignment.
- Water will be treated and disposed within municipal sewer for hydrotest. Any water encountered during trenching would be stored in water tanks and discharged to land. Water treatment and disposal of approximately 265,000 gallons of hydrostatic test water.

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

- Environmental Consultants for pre-construction assessments, construction monitoring, and environmental close-out support.
- Abatement Support is based upon Subject Matter Expert (SME) recommendations.
- Stormwater Pollution Prevention Plan development and implementation.

Table 6: Land & Right-of-Way Acquisition ($000's)

PROJECT COST	2019 & Prior	2020	2021	2022	Total[15]
TOTAL DIRECT COSTS (NON-LABOR)[16]	$0	$267	$60	$0	$327

Assumptions

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

- Encroachment permit and traffic control plan costs.
- New easement costs.
- Temporary Right of Entry (TRE) – Construction yards and workspace required for construction activities.

Factors such as location, zoning, current market price and square footage are considered to determine a final estimated value specific to easements and TRE permits.

Table 7: Company Labor ($000's)

PROJECT COST	2019 & Prior	2020	2021	2022	Total[17]
TOTAL DIRECT COSTS (LABOR)[18]	$629	$749	$97	$0	$1,475

[15] Values may not add to total due to rounding.
[16] Direct Costs reflect escalation.
[17] Values may not add to total due to rounding.
[18] Direct Costs reflect escalation.

Assumptions

SDG&E Labor - Management, Engineering, and Non-Union Labor

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

- Project Management (7,915 hours)
- Project Field Management (3,327 hours)
- Construction Management (1,980 hours)
- Environmental Services (3,558 hours)
- Land Services (985 hours)

Company employees provide extensive oversight with respect to safety; environmental protection; site management; construction, engineering and design services contract management and administration; project engineering and management; planning; scheduling; progress control; cost estimating, tracking and control; inspection; job site material and logistics management as well as job site customer interface management and community outreach.

SDG&E Labor - Union Labor

SDG&E Union Labor costs were developed with the guidance of SDG&E Construction Management and those costs are duration dependent and activity specific.

Critical operational activities such as operating valves, bringing the cathodic protection system online, bringing instrumentation online, gas handling and removing old assets from service as well as loading gas into new assets and placing them into service are all completed by Company Union personnel.

Table 8: Other Costs ($000's)

PROJECT COST	2019 & Prior	2020	2021	2022	Total[19]
TOTAL DIRECT COSTS (NON-LABOR)[20]	$2,121	$2,790	$3,620	$293	$8,824

Assumptions

In addition to costs previously described above, there are other costs incurred as part of completing the project that are primarily associated with contracts that are established with specialized service providers that either perform a unique service or supplement the core Company project team. It is typical that services are contracted to complete activities related to planning, engineering, design, estimating, project and construction management, scheduling, survey, construction inspection, x-ray and non-destructive examination of welds, hot tapping and/or stopple services, temporary gas supplies, gas capture services, safety services, as well as as-built and project documentation and records management services. Other costs also include non-labor expenses related to business related mileage, travel, meals and lodging.

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

[20] Direct Costs reflect escalation.

Engineering and Project Management

- Developed upon specified scope of work, planned deliverables, and activity levels of effort reflecting anticipated manpower requirements over the planned timeframe of the project schedule.
- Contracted engineering assistance to identify and evaluate potential options to bring Line 1600 into compliance with D.11-06-017 and Public Utilities Code § 958.
- Non-labor costs included in this estimate address travel, meals, expenses, and lodging incurred for SDG&E Labor.

Construction Support Services

The high-level assumptions and specific level of effort to provide construction management support for this project are described in more detail below.

- Full time X-Ray / NDE support with each pipeline lay crew.
- CNG to support existing taps during system downtime.
- Gas capture services to reduce the amount of natural gas vented to atmosphere.
- Stopple fitting service.

Inspection Services

- Full time Chief Inspector
- Four full time Welding Inspectors

Survey and Design Services

- The survey and design service estimate includes survey support staff for project and site facility layout and as-builts. The estimate also includes engineering team material support in the development of as-built close-out packages.

Table 9: Indirect Costs ($000's)

PROJECT COST	2019 & Prior	2020	2021	2022	Total[21]
COMPANY INDIRECTS	$754	$1,894	$2,552	$57	$5,256

Assumptions

- Indirect costs are for Administrative and General, purchasing, warehousing, pension and benefits, payroll tax, and other costs that are overhead in nature.
- Indirect costs do not include AFUDC or Property Tax.

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

Pipeline Safety Enhancement Plan Workpaper Supporting Chapter

Line 1600 Pomerado South Replacement Project

Table 1: Total Project Cost ($000's)

PROJECT COST	2019 & Prior[1]	2020	2021	2022	Total[2]
DIRECT LABOR	$367	$200	$1,853	$297	$2,717
DIRECT NON-LABOR	$1,893	$1,938	$32,575	$5,024	$41,430
TOTAL DIRECT COSTS[3]	$2,260	$2,138	$34,428	$5,321	$44,147
COMPANY OVERHEADS[4]	$453	$512	$7,528	$911	$9,404
Total Capital Costs	$2,713	$2,650	$41,956	$6,232	$53,552

Project Description

Line 1600 is a 16-inch diameter transmission line that runs approximately 49.7 miles from Rainbow to Mission Valley, San Diego. Per the CPUC Safety and Enforcement Division (SED) approved *Line 1600 Test or Replacement Plan*, the Line 1600 testing and replacement work is comprised of 19 independent projects. This workpaper describes the Line 1600 Pomerado South Replacement project. The Line 1600 Pomerado South Replacement project is located in the City of Poway. The project will replace and reroute 1.893 miles of existing 16-in pipeline with approximately 3.136 miles of new 16-inch pipeline along Pomerado Road from Ted Williams Parkway to Scripps-Poway Parkway and two new 16-inch mainline valves (MLVs). Due to the offset of the new alignment, additional distribution work will be required as part of the project scope to allow for existing customers to be served from the rerouted alignment. Associated distribution work includes the installation of two new regulator stations to replace four existing regulator stations, and approximately 1.364 miles of 8-inch high pressure distribution main. The project will also install approximately 3.136 miles of fiber optic cable. Fiber optic cable will be installed along the new 16-inch pipeline to assist in leak detection, ground movement, and vibration analysis.

Considerations unique to the project are as follows:

- The Project will coordinate construction phasing with the Line 1600 Pomerado North Replacement and Line 1600 Scripps Poway Replacement projects to sequence the abandonment activities of the existing pipeline as well as to prevent disruption to the distribution system.
- Associated distribution work will provide uninterrupted gas service during the tie-in phasing for the project and restore the system to equal capabilities prior to the replacement work.
- The selection of the MLV location will be coordinated with Line 1600 Pomerado North Replacement and Line 1600 Scripps Poway Replacement projects to achieve proper MLV spacing.
- The proposed plan for the fiber optic cable is to have a continuous run from the Line 1600 La Honda-Lincoln Replacement to Line 1600 Serra Mesa Replacement projects. The end result of the continuous run would reduce the number of required monitoring stations between these Projects to one which is located on the Line 1600 Pomerado South Replacement project. Engineering determined the optimal location for the fiber optic monitoring station was on the Line 1600 Pomerado South Replacement project as it is centrally located between these projects.

[1] Actual costs incurred associated with planning and engineering design work are included in the project cost estimates.
[2] Values may not add to total due to rounding.
[3] Direct Costs reflect escalation.
[4] Excludes AFUDC and tax.

Alternatives Considered

D.18-06-028, Ordering Paragraph 7, required SDG&E and SoCalGas to "submit to Safety and Enforcement Division a hydrostatic test or replacement plan pertaining to the existing 49.7 miles of Line 1600 in its present corridor." The Decision further required such plan to discuss two options: "1. Hydrotest the entire 49.7 miles of line and replace those segments that fail the test; and 2. Replace all pipeline segments in High Consequence Areas (HCAs) along Line 1600, thus ensuring a new pipeline without vintage pipeline characteristics that are perceived to increase the risk of Line 1600. Hydrotest in solely non-HCA segments would ensure less impact if there was a failure during hydrotesting." SDG&E's and SoCalGas' September 26, 2018 *Line 1600 Test or Replacement Plan* discussed D.18-06-028's two options as Design Alternative 1 (Replace in HCA/Test in Non-HCA alternative) and Design Alternative 2 (Full Hydrotest alternative), and also discussed Design Alternative 3 (Full Replacement in Nearby Streets alternative) and Design Alternative 4 (Full Replacement Along Highway 395 alternative). SDG&E and SoCalGas proposed to implement, and the CPUC SED approved, Design Alternative 1, which will replace existing Line 1600 primarily in HCAs and hydrotest the remaining sections in non-HCAs. D.18-06-028 at 92 also required the Utilities to "identify proposed rerouting of the line in specific segments." As discussed in the *Line 1600 Test or Replacement Plan*, "SDG&E and SoCalGas concluded it is not feasible, prudent nor reasonable to build a new replacement pipeline entirely within the existing Line 1600 rights-of-way." Due to construction difficulty, private property and community impacts, environmental impacts, and costs and delays of efforts to expand the existing rights of way (ROW), the *Line 1600 Test or Replacement Plan* proposed to re-route the majority of replacement segments, usually in nearby streets. In developing the Plan, SDG&E and SoCalGas reviewed these proposed re-routes with SED, which "conducted a joint field inspection of the identified sites with SDG&E personnel and its contractor to evaluate the existing safety conditions, constructability and serviceability of Line 1600. After the field inspections, SED agreed with SDG&E's and SoCalGas' proposed reroute of many segments of Line 1600 due to safety and serviceability reasons."

D.20-02-024 requires "a cost forecast for the approved Design Alternative 1 (Replace in HCAs and Hydrotest in Non-HCAs) that SED approved on January 15, 2019."[2] D.20-02-024 at 31-32 held that issues "out of scope" for Phase 2 include "revisiting Design Alternatives 2 (Full Hydrotest Alternative), 3 (Full Replacement), 4 (Full Replacement but different street routing) or alternative recommendations. Nor are we revisiting the substance of the PSEP engineering and implementation that falls within the authority of SED."

Shut-In Analysis

The Line 1600 Pomerado South Replacement project is located between the Pomerado North, and Scripps Poway Replacement Projects. The existing section of Line 1600 will remain in service, until the completion of these three projects. Transmission system capacity impacts during construction and tie-in operations of this project are not expected. Due to the nature and the way in which the project will be phased, no impacts to the distribution costumers are anticipated. Transmission system capacity impacts during construction and tie-in operations of this project are not expected. To avoid impacts to customers, two new regulator stations, and the 8-inch high pressure distribution main on Sabre Springs will be placed into service prior to decommissioning any of the four existing regulator stations in scope for abandonment.

Forecast Methodology

The Utilities methodology for forecasting PSEP costs is discussed in the Direct Testimony of Ronn Gonzalez. The Utilities developed a Total Installed Cost (TIC) estimate to implement the above scope of work. The TIC Estimate includes direct costs associated with project management, engineering and design, environmental permitting, land acquisition, material and equipment procurement, and construction.

Following the approval of the Plan by SED in January 2019, the Utilities have undertaken the detailed design and planning of the 19 individual projects in the Plan. Generally, projects that are earliest in the overall schedule are the most developed, while those later in the overall schedule are less developed. At the time of cost estimate preparation, this project was at an approximately 30% design level. Further development of this project could reveal new information requiring some adjustments to the project plan in the areas such as engineering, materials, construction, permitting, environmental and land, all of which could impact actual costs compared this cost estimate.

Schedule

Implementation of this project is proposed to be completed consistent with the overall prioritization and timing described in Section IV. D. of the *Line 1600 Test or Replacement Plan*. The schedule was developed based on the five-stage project life cycle as defined by PSEP. The key project deliverables were identified and incorporated into a work breakdown structure. This work breakdown structure was then sequenced, and predecessor and successor tasks were linked to each task. Durations were added to each task to provide a total project duration.

The preliminary Stage 4 Construction Schedule received additional planning and stakeholder input considering that typically 50% of the project costs are expended during the construction phase. The construction schedule is assumed to be 112 working days.

Figure 1: Overview Map for Line 1600 Pomerado North, Pomerado South, and Scripps-Poway Replacement Projects

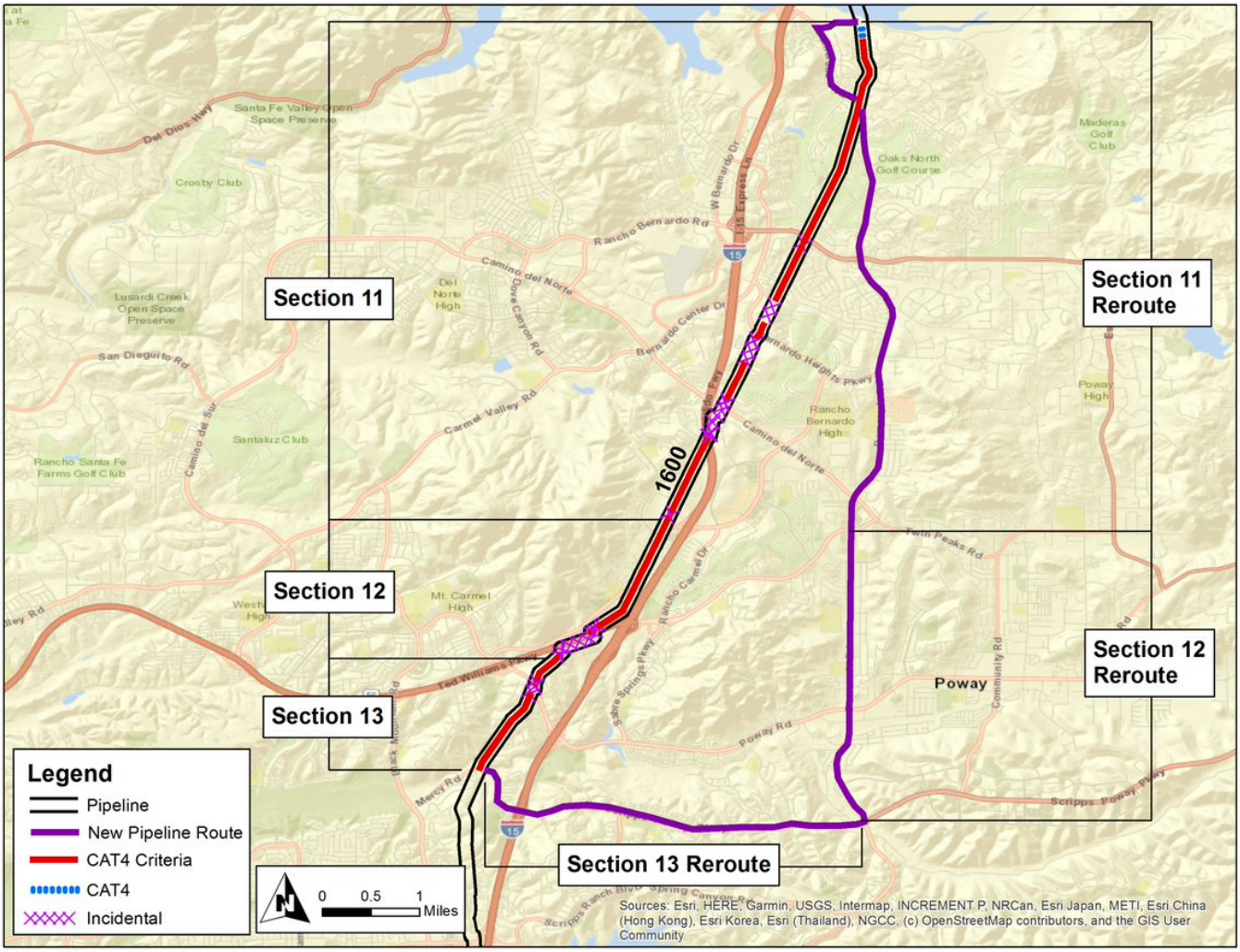

Figure 2: Overview Map for Line 1600 Pomerado South Replacement

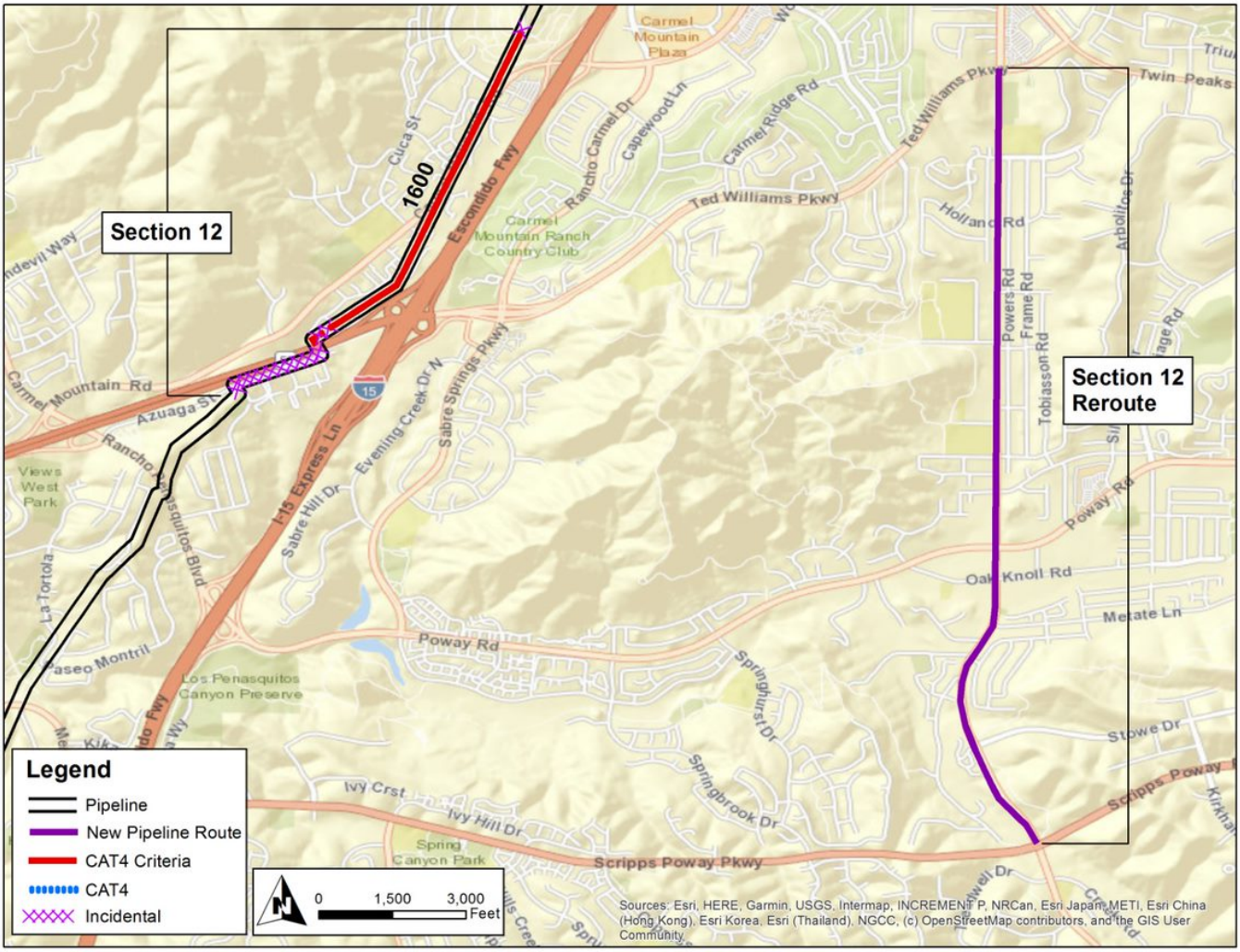

Figure 3: Satellite Map for Line 1600 Pomerado South Replacement

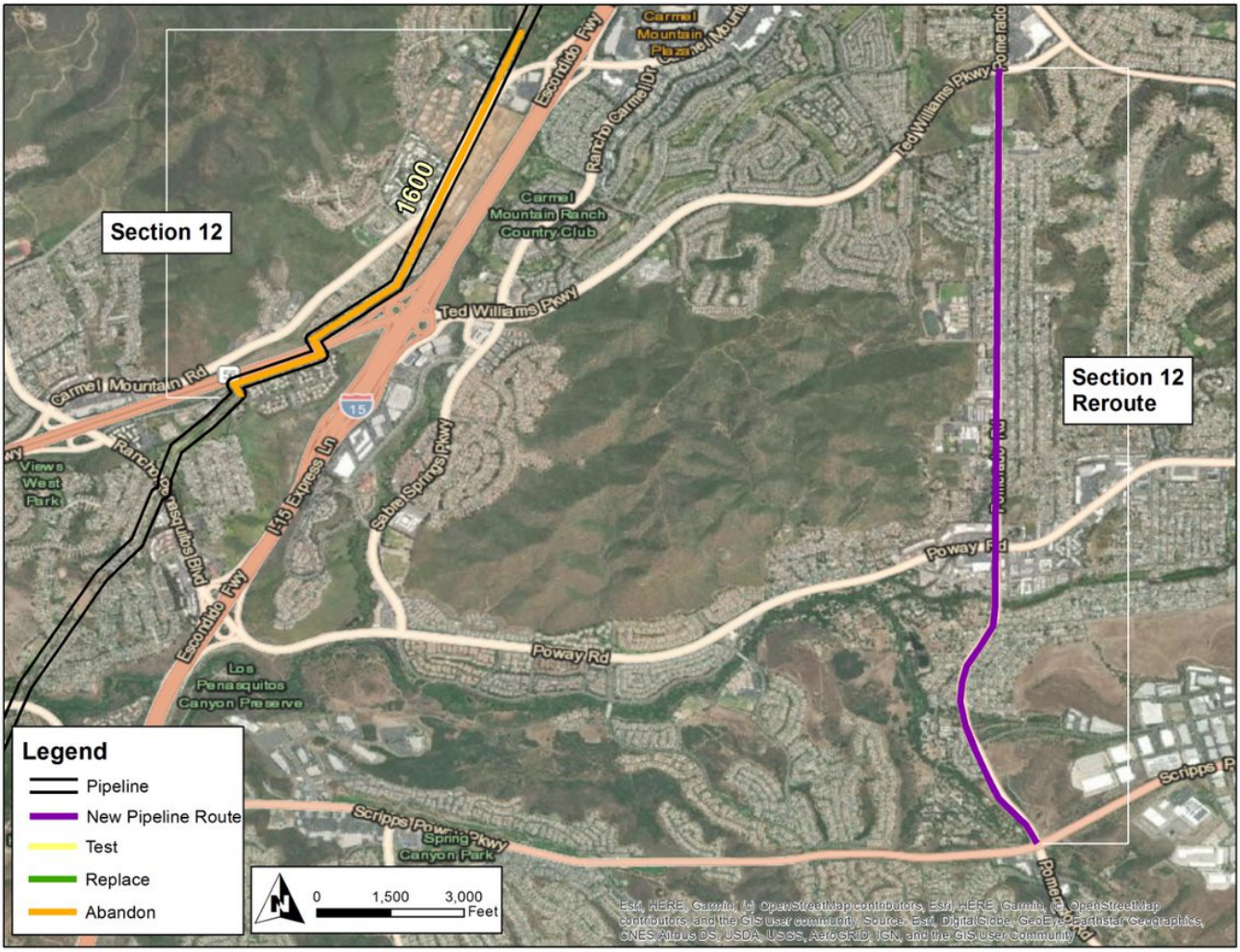

Table 2: Project Mileage

PHASE	MILEAGE
CATEGORY 4 CRITERIA[5]	1.462
CATEGORY 4[6]	0.000
INCIDENTAL	0.432
REPLACEMENT OFFSET	1.242
TOTAL MILEAGE[7]	3.136

The direct costs for each area are summarized below.

Table 3: Material ($000's)

PROJECT COST	2019 & Prior	2020	2021	2022	Total[8]
TOTAL DIRECT COSTS (NON-LABOR)[9]	$0	$931	$3,045	$0	$3,977

Assumptions

Materials for this project will be purchased following final internal authorization 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. Primary components include:

- 16,700 feet of 16-inch pipe meeting SDG&E specifications.
- 7,200 feet of 8-inch pipe meeting SDG&E specifications
- 55 16-inch fittings meeting SDG&E specifications.
- Two stopple fittings meeting SDG&E specifications.
- One 16-inch MLV meeting SDG&E specifications.
- One fiber optic monitoring station meeting SDG&E specifications.

Table 4: Construction ($000's)

PROJECT COST	2019 & Prior	2020	2021	2022	Total[10]
TOTAL DIRECT COSTS (NON-LABOR)[11]	$4	$3	$25,811	$2,183	$28,000

[5] Lacks documentation of a post-construction strength test in a Class 3 or 4 HCA.
[6] Lacks documentation of a post-construction strength test in a Class 1 or 2 non-HCA.
[7] Values may not add to total due to rounding.
[8] Values may not add to total due to rounding.
[9] Direct Costs reflect escalation.
[10] Values may not add to total due to rounding.
[11] Direct Costs reflect escalation.

Assumptions

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

- One mobilization and one demobilization for the 16-inch pipeline installation and 8-inch pipeline installation.
- Contractor work has been scheduled using an eight hour per day, five-day work week.
- Hours assumed to be 9:00 AM to 3:00 PM Monday through Friday for work in the City of San Diego and City of Poway.
- Two mainline install crews will be utilized. One crew for the 16-inch pipeline installation and one crew for the 8-inch pipeline installation.
- Fiber optic will be installed above the new pipeline.
- Tie-in of the 16-inch pipeline will be completed during a 24 hour continuous shift.
- Tie-ins of the 8-inch pipeline will be completed during a 12 hour continuous shift.
- The new 16-inch and 8-inch pipelines will be hydrotested independently with two post-completion hydrotests.
- Laydown yards will be restored to the original condition at the end of the project.
- Restoration of grade along right of way (ROW) will be completed once the pipeline is installed and tied-in.

Additional Construction Information

- **Site Mobilization / Site Facilities**
  - Two office trailers have been included for management and inspection personnel at laydown yards.
  - Seven months of site duration is anticipated.
  - Temporary fencing for all laydown yards.
  - Track out plates will be utilized at street access points.

- **Site Management / Best Management Practices (BMPs)**
  - BMP materials for spoils piles, laydown yard, and worksite.

- **Material Handling**
  - 35 loads of material will be unloaded by the contractor at laydown yards and transported as needed for the 16-inch transmission pipeline
  - 6 loads of material will be unloaded by the contractor at laydown yards and transported as needed for the 8-inch distribution pipeline.

- **Traffic Control**
  - A full time traffic control crew will provide support during the project at all intersections, during hydrotesting, isolations, tie-ins, and restoration. This includes all traffic control devices and equipment necessary to complete the project.

- **Utility Locates**
  - 193 utility locates to verify known utilities by potholing for the 16-inch pipeline.
  - 66 utility locates to verify known utilities by potholing for the 8-inch distribution pipeline.

- **Pipeline Installation**
  - Installation includes the following:
    - Approximately 16,700 linear feet (LF) of 16-inch pipe.
    - Approximately 7,200 LF of 8-inch pipe.
  - Site demo, excavation and pad trench / bellholes, string and bends pipe, coating joints.
  - Installation of fiber optic line and pipeline warning mesh.

- **Isolate Existing Pipeline**
  - Pipeline will be isolated and cross-compressed in conjunction with tie-in activities.
  - Pipeline will be cross-compressed and isolated using a 16-inch MLV.

- **Pressure Test Pipeline**
  - Preparatory work for the setup of 10 20,000 gallon water tanks.
  - Installation of hard piping from the test head to the tank pump.
  - The pipeline will be tested in one post-completion hydrotest.
  - Following the dewatering of each section of pipe, it will be intermittently dried until ready to be tied-in.
  - Pre-commissioning nitrogen testing for the installation of new valves.

- **Mainline Valve**
  - Two 16-inch valves (one automated MLV and one non-automated valve).

- **Tie-In Pipeline**
  - One 24 hour continuous shift for pipeline tie-in for the 16-inch pipeline.
  - One 12 hour continuous shift for pipeline tie-in for the 8-inch pipeline.
  - One existing service will be tied-over following the gas up of the new main.
  - Two new Regulator Stations will be installed on the 16-inch transmission line.
  - Four existing valve stations will be tied-over to the new 8-inch distribution pipeline.

- **Retire / Abandon Existing Pipeline**
  - Abandonment of four regulator stations on the 8-inch distribution pipeline.
  - All existing pipe will be abandoned during the Line 1600 Section 13 Scripps-Poway Replacement Project.

- **Site Restoration**
  - Base paving of trench width will be 8-inches thick in sections where the pipeline is installed in paved areas.
  - Eight foot wide grind and cap for approximately 132,632 SF for the 16-inch pipe installation.
  - Eight foot wide grind and cap for approximately 57,600 SF for the 8-inch pipe installation.
  - Installation of 200 SF of concrete sidewalk.
  - Installation of 40 LF of concrete curb and gutter.
  - Approximately 23,779 LF of new lane striping where disturbed.

- **Site Demobilization**
  - One load of excess piping will be hauled to SDG&E designated yard.

- **Field Overhead**
  - Full time Project Manager
  - Full time Superintendent
  - Full time Safety Supervisor

Table 5: Environmental Survey/Permitting/Monitoring ($000's)

PROJECT COST	2019 & Prior	2020	2021	2022	Total[12]
TOTAL DIRECT COSTS (NON-LABOR)[13]	$560	$18	$663	$444	$1,685

Assumptions

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

- Asbestos abatement of Asbestos Containing Material (ACM).
- Non-hazardous Waste Containment/Disposal.
- Water source will be a hydrant located near the new alignment.
- Water will be treated and disposed within municipal sewer for hydrotest. Any water encountered during trenching would be stored in water tanks and discharged to land.
- Water treatment and disposal of approximately 153,000 gallons of hydrostatic test water.

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

- Environmental Consultants for pre-construction assessments, construction monitoring, and environmental close-out support.
- Abatement Support is based upon Subject Matter Expert (SME) recommendations.
- Stormwater Pollution Prevention Plan development and monitoring.

Table 6: Land & Right of Way Acquisition ($000's)

PROJECT COST	2019 & Prior	2020	2021	2022	Total[14]
TOTAL DIRECT COSTS (NON-LABOR)[15]	$0	$54	$218	$0	$272

[12] Values may not add to total due to rounding.
[13] Direct Costs reflect escalation.
[14] Values may not add to total due to rounding.
[15] Direct Costs reflect escalation.

Assumptions

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

- Encroachment permit and traffic control plan costs.
- New easement costs.
- Temporary Right of Entry (TRE) – Construction yards and workspace required for construction activities.

Factors such as location, zoning, current market price and square footage are considered to determine a final estimated value specific to easements and TRE permits.

Table 7: Company Labor ($000's)

PROJECT COST	2019 & Prior	2020	2021	2022	Total[16]
TOTAL DIRECT COSTS (LABOR)[17]	$367	$200	$1,853	$297	$2,717

Assumptions

SDG&E Labor - Management, Engineering, and Non-Union Labor

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

- Project Management (16,438 hours)
- Project Field Management (6,359 hours)
- Construction Management (976 hours)
- Environmental Services (1,339 hours)
- Land Services (995 hours)

Company employees provide extensive oversight with respect to safety; environmental protection; site management; construction, engineering and design services contract management and administration; project engineering and management; planning; scheduling; progress control; cost estimating, tracking and control; inspection; job site material and logistics management as well as job site customer interface management and community outreach.

SDG&E Labor - Union Labor

SDG&E Union Labor costs were developed with the guidance of SDG&E Construction Management and those costs are duration dependent and activity specific.

Critical operational activities such as operating valves, bringing the cathodic protection system online, bringing instrumentation online, gas handling and removing old assets from service as well as loading gas into new assets and placing them into service are all completed by Company Union personnel.

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

[17] Direct Costs reflect escalation.

Table 8: Other Costs ($000's)

PROJECT COST	2019 & Prior	2020	2021	2022	Total[18]
TOTAL DIRECT COSTS (NON-LABOR)[19]	$1,329	$933	$2,838	$2,396	$7,496

Assumptions

In addition to costs previously described above, there are other costs incurred as part of completing the project that are primarily associated with contracts that are established with specialized service providers that either perform a unique service or supplement the core Company project team. It is typical that services are contracted to complete activities related to planning, engineering, design, estimating, project and construction management, scheduling, survey, construction inspection, x-ray and non-destructive examination of welds, hot tapping and/or stopple services, temporary gas supplies, gas capture services, safety services, as well as as-built and project documentation and records management services. Other costs also include non-labor expenses related to business related mileage, travel, meals and lodging.

Engineering and Project Management

- Developed upon specified scope of work, planned deliverables, and activity levels of effort reflecting anticipated manpower requirements over the planned timeframe of the project schedule.
- Contracted engineering assistance to identify and evaluate potential options to bring Line 1600 into compliance with D.11-06-017 and Public Utilities Code § 958.
- Non-labor costs included in this estimate address travel, meals, expenses, and lodging incurred for SDG&E Labor.

Construction Support Services

The high-level assumptions and specific level of effort to provide construction management support for this project are described in more detail below.

- Full time X-Ray / NDE support with the 16-inch pipeline lay crew.
- Full time X-Ray / NDE support with the the 8-inch pipeline lay crew.
- No CNG to support existing taps during pipeline isolation.
- Gas capture services to reduce the amount of natural gas vented to atmosphere.

Inspection Services

- One full time and one part time Chief Inspector
- Five full time Welding Inspectors

Survey and Design Services

- The survey and design service estimate includes survey support staff for project and site facility layout and as-builts. The estimate also includes engineering team material support in the development of as-built close-out packages.

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

[19] Direct Costs reflect escalation.

Table 9: Indirect Costs ($000's)

PROJECT COST	2019 & Prior	2020	2021	2022	Total[20]
COMPANY INDIRECTS	$453	$512	$7,528	$911	$9,404

Assumptions

- Indirect costs are for Administrative and General, purchasing, warehousing, pension and benefits, payroll tax, and other costs that are overhead in nature.
- Indirect costs do not include AFUDC or Property Tax.

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

Pipeline Safety Enhancement Plan Workpaper Supporting Chapter

Line 1600 Scripps-Poway Replacement Project

Table 1: Total Project Cost ($000's)

PROJECT COST	2019 & Prior[1]	2020	2021	2022	Total[2]
DIRECT LABOR	$264	$278	$1,087	$910	$2,538
DIRECT NON-LABOR	$1,290	$1,585	$14,353	$17,355	$34,584
TOTAL DIRECT COSTS[3]	$1,554	$1,864	$15,440	$18,265	$37,122
COMPANY OVERHEADS[4]	$289	$601	$1,945	$1,633	$4,468
Total Capital Costs	$1,843	$2,464	$17,384	$19,898	$41,590

Project Description

Line 1600 is a 16-inch diameter transmission line that runs approximately 49.7 miles from Rainbow to Mission Valley, San Diego. Per the CPUC Safety and Enforcement Division (SED) approved *Line 1600 Test or Replacement Plan*, the Line 1600 testing and replacement work is comprised of 19 independent projects. This workpaper describes the Line 1600 Scripps-Poway Replacement project. The Line 1600 Scripps-Poway Replacement project is located in the City of San Diego and the City of Poway. The project will replace approximately 1.473 miles of existing 16-inch pipeline with 3.643 miles of new 16-inch pipeline along Scripps-Poway Parkway and Mercy Road. The project will also install one new mainline valve (MLV). Due to the offset of the new alignment, additional distribution work will be required as part of the project scope to allow for existing customers to be served from the rerouted alignment. Associated distribution work includes the tie-over of one existing regulator station and approximately 200 feet of 4-inch distribution pipeline. The project will also install approximately 3.643 miles of fiber optic cable. Fiber optic cable will be installed along the new 16-inch pipeline to assist in leak detection, ground movement, and vibration analysis.

Considerations unique to the project are as follows:

- A portion of the alignment crosses Interstate 15 and the new pipeline will be installed by open cut trenching instead of a trenchless method.
- One automated mainline valve (MLV) is required as part of this project.
- The proposed plan for the fiber optic cable is to have a continuous run from the Line 1600 La Honda-Lincoln Replacement to Line 1600 Serra Mesa Replacement projects. The end result of the continuous run would reduce the number of required monitoring stations between these Projects to one which is located on the Line 1600 Pomerado South Replacement project.

Alternatives Considered

D.18-06-028, Ordering Paragraph 7, required SDG&E and SoCalGas to "submit to Safety and Enforcement Division a hydrostatic test or replacement plan pertaining to the existing 49.7 miles of Line 1600 in its present corridor." The Decision further required such plan to discuss two options: "1. Hydrotest the entire 49.7 miles of line and replace those segments that fail the test; and 2. Replace all pipeline segments in High Consequence Areas (HCAs) along Line 1600, thus ensuring a new pipeline without vintage pipeline characteristics that are perceived to increase the risk of

[1] Actual costs incurred associated with planning and engineering design work are included in the project cost estimates.
[2] Values may not add to total due to rounding.
[3] Direct Costs reflect escalation.
[4] Excludes AFUDC and tax.

Line 1600. Hydrotest in solely non-HCA segments would ensure less impact if there was a failure during hydrotesting." SDG&E's and SoCalGas' September 26, 2018 *Line 1600 Test or Replacement Plan* discussed D.18-06-028's two options as Design Alternative 1 (Replace in HCA/Test in Non-HCA alternative) and Design Alternative 2 (Full Hydrotest alternative), and also discussed Design Alternative 3 (Full Replacement in Nearby Streets alternative) and Design Alternative 4 (Full Replacement Along Highway 395 alternative). SDG&E and SoCalGas proposed to implement, and the CPUC SED approved, Design Alternative 1, which will replace existing Line 1600 primarily in HCAs and hydrotest the remaining sections in non-HCAs. D.18-06-028 at 92 also required the Utilities to "identify proposed rerouting of the line in specific segments." As discussed in the *Line 1600 Test or Replacement Plan*, "SDG&E and SoCalGas concluded it is not feasible, prudent nor reasonable to build a new replacement pipeline entirely within the existing Line 1600 rights-of-way." Due to construction difficulty, private property and community impacts, environmental impacts, and costs and delays of efforts to expand the existing rights of way (ROW), the *Line 1600 Test or Replacement Plan* proposed to re-route the majority of replacement segments, usually in nearby streets. In developing the Plan, SDG&E and SoCalGas reviewed these proposed re-routes with SED, which "conducted a joint field inspection of the identified sites with SDG&E personnel and its contractor to evaluate the existing safety conditions, constructability and serviceability of Line 1600. After the field inspections, SED agreed with SDG&E's and SoCalGas' proposed reroute of many segments of Line 1600 due to safety and serviceability reasons."

D.20-02-024 requires "a cost forecast for the approved Design Alternative 1 (Replace in HCAs and Hydrotest in Non-HCAs) that SED approved on January 15, 2019."[2] D.20-02-024 at 31-32 held that issues "out of scope" for Phase 2 include "revisiting Design Alternatives 2 (Full Hydrotest Alternative), 3 (Full Replacement), 4 (Full Replacement but different street routing) or alternative recommendations. Nor are we revisiting the substance of the PSEP engineering and implementation that falls within the authority of SED."

Shut-In Analysis

The Line 1600 Scripps-Poway Replacement project can be completed with no transmission impacts and minimal distribution impacts. No shut-ins will occur for the transmission or distribution systems.

Forecast Methodology

The Utilities methodology for forecasting PSEP costs is discussed in the Direct Testimony of Ronn Gonzalez. The Utilities developed a Total Installed Cost (TIC) estimate to implement the above scope of work. The TIC Estimate includes direct costs associated with project management, engineering and design, environmental permitting, land acquisition, material and equipment procurement, and construction.

Following the approval of the Plan by SED in January 2019, the Utilities have undertaken the detailed design and planning of the 19 individual projects in the Plan. Generally, projects that are earliest in the overall schedule are the most developed, while those later in the overall schedule are less developed. At the time of cost estimate preparation, this project was at an approximately 30% design level. Further development of this project could reveal new information requiring some adjustments to the project plan in the areas such as engineering, materials, construction, permitting, environmental and land, all of which could impact actual costs compared this cost estimate.

Schedule

Implementation of this project is proposed to be completed consistent with the overall prioritization and timing described in Section IV. D. of the *Line 1600 Test or Replacement Plan*. The schedule was developed based on the five-stage project life cycle as defined by PSEP. The key project deliverables were identified and incorporated into a work breakdown structure. This work breakdown structure was then sequenced, and predecessor and successor tasks were linked to each task. Durations were added to each task to provide a total project duration.

The preliminary Stage 4 Construction Schedule received additional planning and stakeholder input considering that typically 50% of the project costs are expended during the construction phase. The construction schedule is assumed to be 150 working days.

Figure 1: Overview Map for Line 1600 Pomerado North, Pomerado South, and Scripps-Poway Replacement Projects

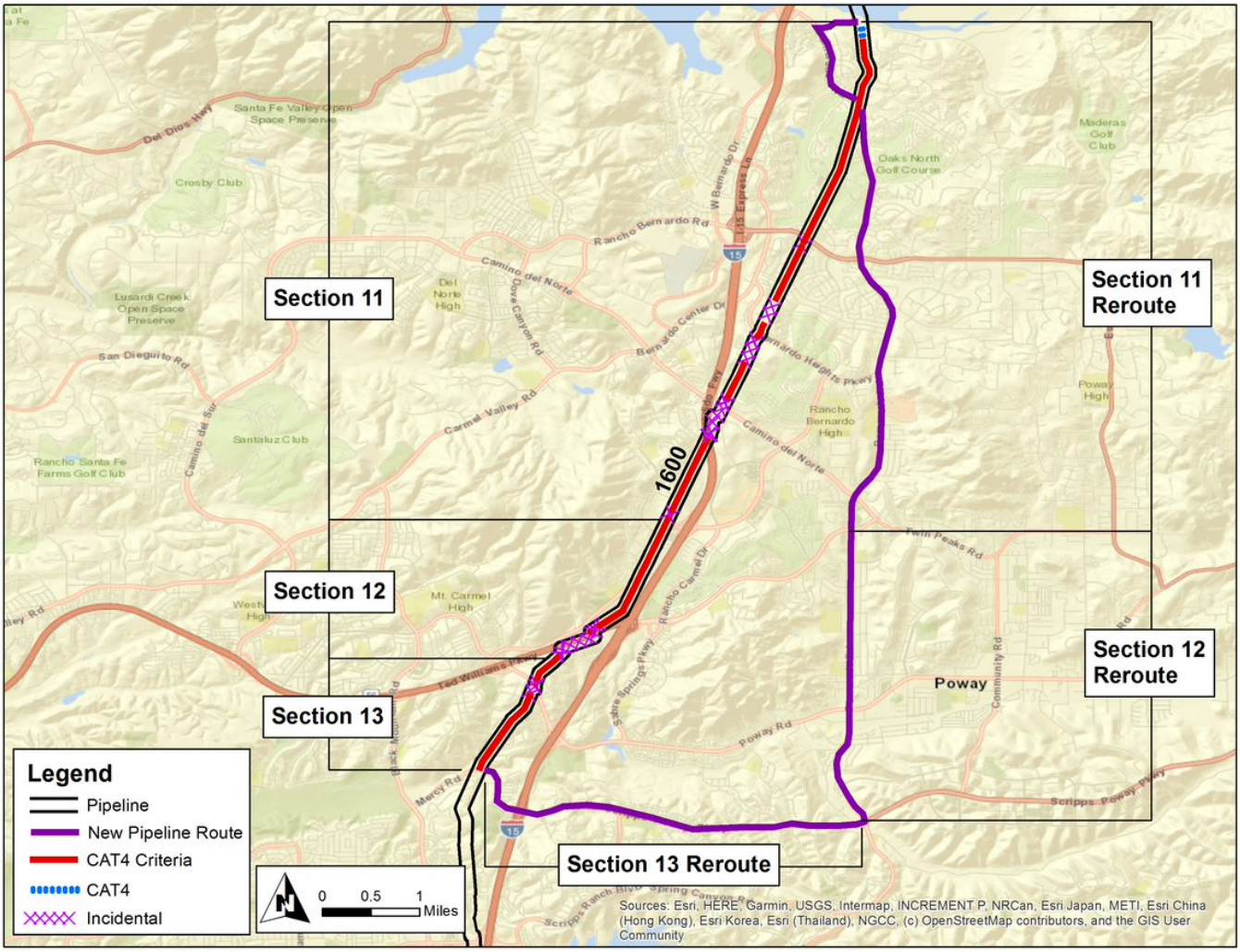

Figure 2: Overview Map for Line 1600 Scripps-Poway Replacement Project

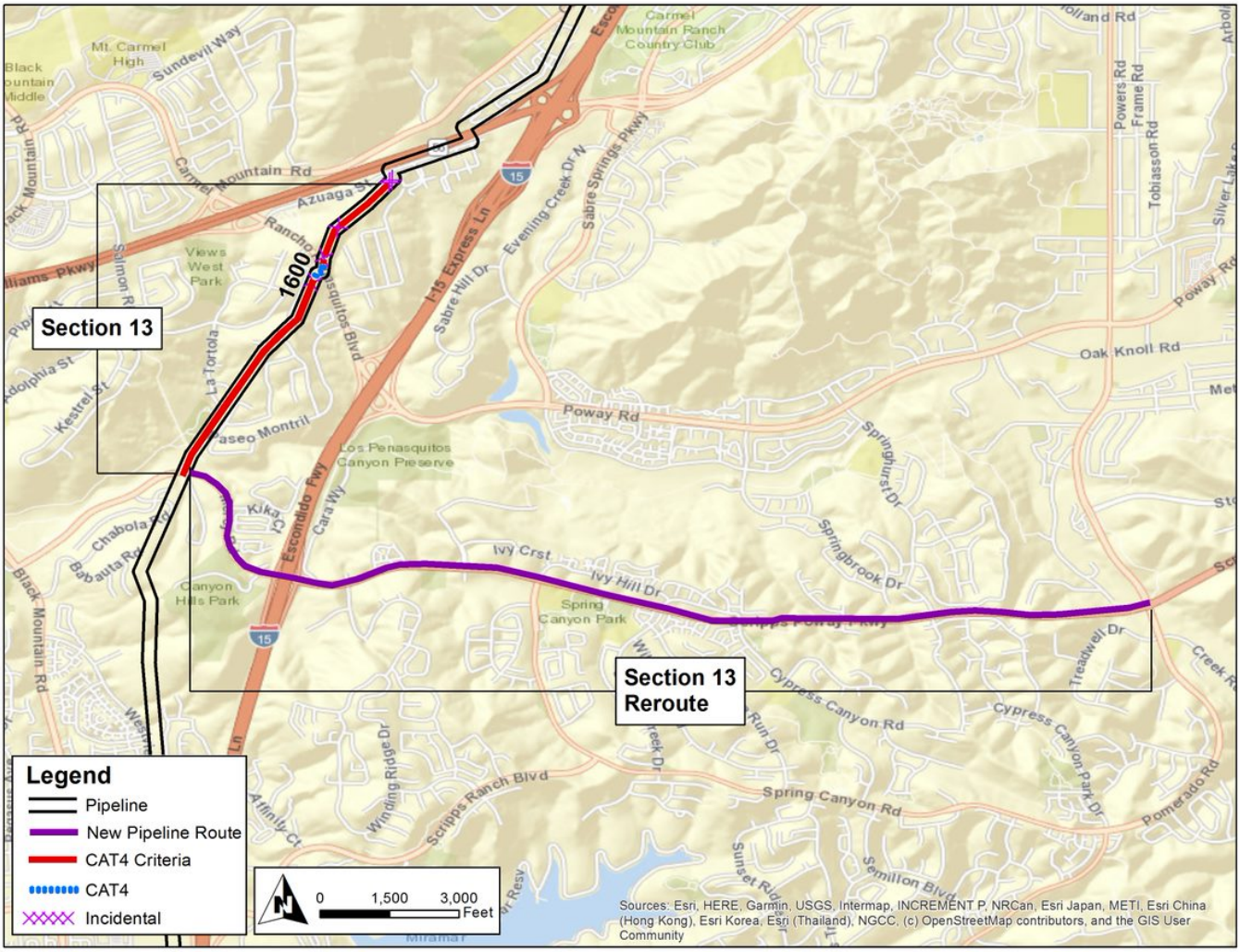

Figure 3: Satellite Map for Line 1600 Scripps-Poway Replacement Project

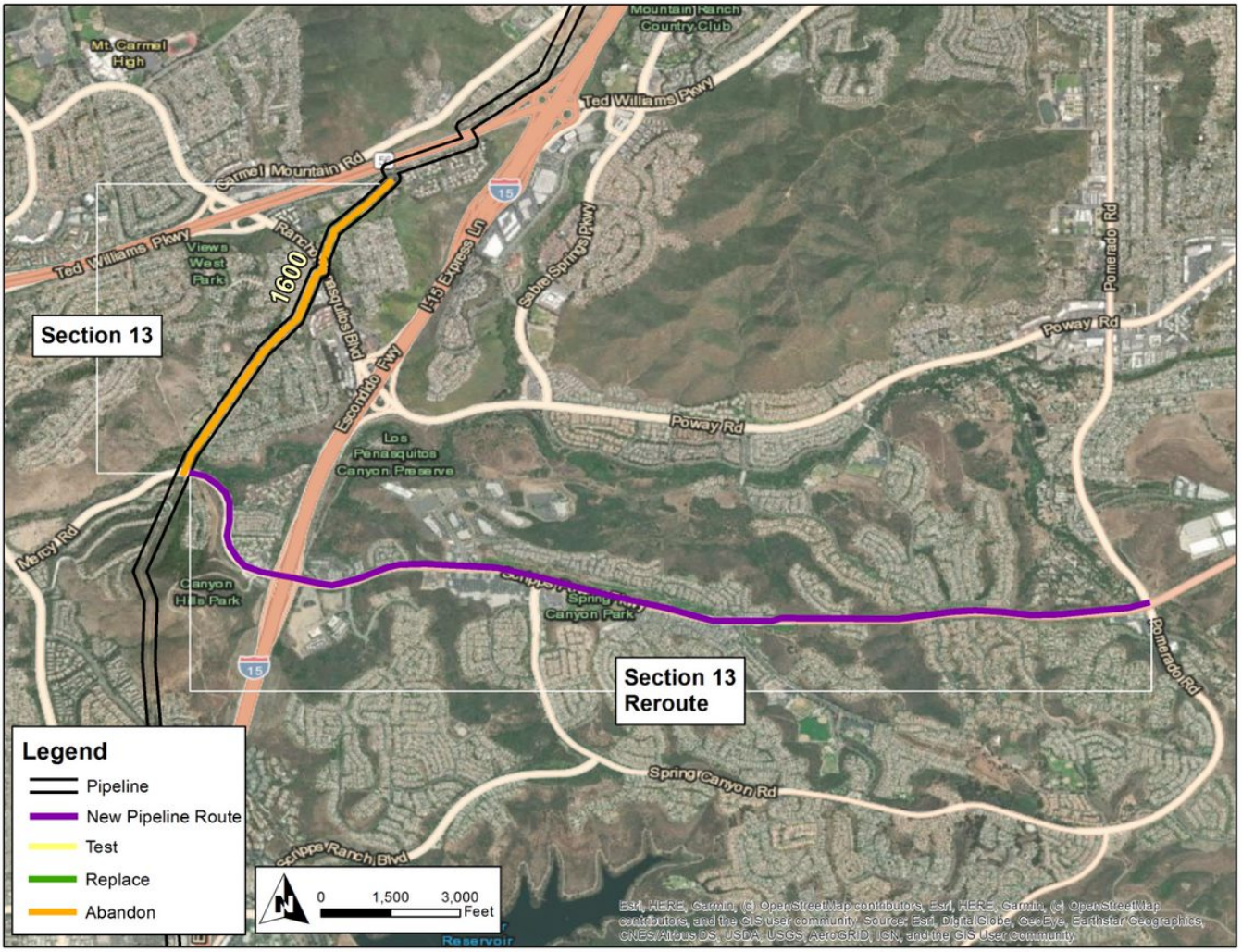

Table 2: Project Mileage

PHASE	MILEAGE
CATEGORY 4 CRITERIA[5]	1.360
CATEGORY 4[6]	0.079
INCIDENTAL	0.034
REPLACEMENT OFFSET	2.170
TOTAL MILEAGE[7]	3.643

The direct costs for each area are summarized below.

Table 3: Material ($000's)

PROJECT COST	2019 & Prior	2020	2021	2022	Total[8]
TOTAL DIRECT COSTS (NON-LABOR)[9]	$0	$1,085	$1,163	$0	$2,248

Assumptions

Materials for this project will be purchased following final internal authorization 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. Primary components include:

- 19,800 feet of 16-inch pipe meeting SDG&E specifications.
- 200 feet of 4-inch pipe meeting SDG&E specifications.
- One 16-inch MLV meeting SDG&E specifications.
- 85 16-inch fittings meeting SDG&E specifications.

Table 4: Construction ($000's)

PROJECT COST	2019 & Prior	2020	2021	2022	Total[10]
TOTAL DIRECT COSTS (NON-LABOR)[11]	$3	$79	$9,673	$14,266	$24,020

Assumptions

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

- One mobilization and one demobilization.
- Contractor work has been scheduled using an eight hour per day, five-day work week.

[5] Lacks documentation of a post-construction strength test in a Class 3 or 4 HCA.
[6] Lacks documentation of a post-construction strength test in a Class 1 or 2 non-HCA.
[7] Values may not add to total due to rounding.
[8] Values may not add to total due to rounding.
[9] Direct costs are escalated.
[10] Values may not add to total due to rounding.
[11] Direct costs are escalated.

- Work hours assumed to be 8:30 AM to 3:30 PM Monday through Friday for work within the City of San Diego and City of Poway.
- Work hours assumed to be 9:00 PM to 5:00 AM Sunday through Thursday for work within the Caltrans jurisdiction.
- Night work is assumed at the western end of Scripps Poway Parkway at Caltrans ROW.
- Two mainline install crews will be utilized.
- Fiber optic lines will be installed above the new pipeline.
- Excess spoils will be hauled off and disposed.
- Tie-ins will be completed during a 24 hour continuous shift.
- Laydown yards will be restored to original condition at the end of the project.
- Restoration of grade along right of way (ROW) will be completed once pipeline is installed and tied in.

Additional Construction Information

- **Site Mobilization / Site Facilities**
  - One mobilization and one demobilization.
  - Two office trailers have been included for management and inspection personnel at the primary laydown yard.
  - Eight months of site duration is anticipated.
  - Temporary fencing for all laydown yards.
  - Track out plates will be utilized at street access points to minimize soil being tracked onto the street by construction vehicles.

- **Site Management / Best Management Practices (BMPs)**
  - BMP materials for spoils piles, laydown yard, and worksite.

- **Material Handling**
  - 32 loads of material will be unloaded by the contractor at laydown yards and transported as needed.

- **Traffic Control**
  - A three person crew will be used each construction spread for traffic control for pipe installations at all intersections, during hydrotesting, isolations, and restoration.

- **Utility Locates**
  - 179 utility locates to verify pipe location at cutouts and tap excavations.

- **Pipeline Installation**
  - Installation includes the following:
    - Approximately 19,800 linear feet (LF) of 16-inch pipe.
    - Approximately 200 LF of 4-inch pipe.
  - Site demo, excavation and pad trench / bellholes, string and bends pipe, coating joints.
  - Installation of fiber optic line and pipeline warning mesh.

- **Isolate Existing Pipeline**
  - The existing pipeline will be isolated and existing gas cross compressed in conjunction with tie-in activities.
  - The existing pipeline will be isolated using existing MLVs at time of new pipeline installation and testing.

- **Pressure Test Pipeline**
  - Preparatory work for the setup of 11 20,000 gallon water tanks.
  - Installation of hard piping from the test head to the tank pump.
  - The pipeline will be tested in one post-completion hydrotest.
  - Following the dewatering of each section of pipe, it will be intermittently dried until ready to be tied-in.

- **Mainline Valve**
  - One 16-inch MLV.

- **Tie-In Pipeline**
  - One 16 hour continuous shift for pipeline tie-in.
  - One eight hour continuous shift for MLV tie-in.
  - One existing service will be tied-over following the gas up of the new main.
  - One existing regulator station will be tied-over.

- **Retire / Abandon Existing Pipeline**
  - The abandoned pipeline will be abandoned using slurry fill.
  - 42 existing pipeline spans will be removed.
  - 42 abandonment holes for the 16-inch pipeline will be excavated.
  - Excavation and demolition of two vaults.
  - Two MLVs will be removed from the existing pipeline.

- **Site Restoration**
  - Base paving of trench width will be completed up to 8-inch thick where the pipeline is installed in paved zones.
  - The disturbed area will receive a mill and overlay from centerline to curb-line, or approximately eight feet wide at 153,888 square feet (SF).
  - 149,252 SF of slurry seal has been included for a moratorium area.
  - All paved roads will receive new striping estimated at 65,900 linear feet (LF) where disturbed.

- **Site Demobilization**
  - One load of excess piping will be hauled to SDG&E designated yard.

- **Field Overhead**
  - Full time Project Manager
  - Full time Superintendent
  - Full time Safety Supervisor

Table 5: Environmental Survey/Permitting/Monitoring ($000's)

PROJECT COST	2019 & Prior	2020	2021	2022	Total[12]
TOTAL DIRECT COSTS (NON-LABOR)[13]	$428	$7	$625	$525	$1,585

Assumptions

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

- Asbestos abatement of Asbestos Containing Material (ACM).
- Non-hazardous Waste Containment/Disposal.
- Assumes water source will be a hydrant located near the new alignment.
- Assumes water will be treated and disposed within municipal sewer for hydrotest. Any water encountered during trenching would be stored in water tanks and discharged to land.
- Water treatment and disposal of approximately 182,000 gallons of hydrostatic test water.

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

- Environmental Consultants for pre-construction assessments, construction monitoring, and environmental close-out support.
- Abatement support is based upon Subject Matter Expert (SME) recommendations.
- Stormwater Pollution Prevention Plan development and monitoring.

Table 6: Land & Right of Way Acquisition ($000's)

PROJECT COST	2019 & Prior	2020	2021	2022	Total[14]
TOTAL DIRECT COSTS (NON-LABOR)[15]	$0	$20	$425	$0	$445

Assumptions

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

- Permitting costs.
- New easement costs.
- Temporary Right of Entry (TRE) – Construction yards and workspace required for construction activities.

Factors such as location, zoning, current market price and square footage are considered to determine a final estimated value specific to easements and TRE permits.

[12] Values may not add to total due to rounding.
[13] Direct costs are escalated.
[14] Values may not add to total due to rounding.
[15] Direct costs are escalated.

Table 7: Company Labor ($000's)

PROJECT COST	2019 & Prior	2020	2021	2022	Total[16]
TOTAL DIRECT COSTS (LABOR)[17]	$264	$278	$1,087	$910	$2,538

Assumptions

SDG&E and SoCalGas Labor - Management, Engineering, and Non-Union Labor

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

- Project Management (13,238 hours)
- Project Field Management (4,357 hours)
- Construction Management (1,280 hours)
- Environmental Services (3,729 hours)
- Land Services (1,087 hours)

Company employees provide extensive oversight with respect to safety; environmental protection; site management; construction, engineering and design services contract management and administration; project engineering and management; planning; scheduling; progress control; cost estimating, tracking and control; inspection; job site material and logistics management as well as job site customer interface management and community outreach.

SDG&E Labor - Union Labor

SDG&E Union Labor costs were developed with the guidance of SDG&E Construction Management and those costs are duration dependent and activity specific.

Critical operational activities such as operating valves, bringing the cathodic protection system online, bringing instrumentation online, gas handling and removing old assets from service as well as loading gas into new assets and placing them into service are all completed by Company Union personnel.

Table 8: Other Costs ($000's)

PROJECT COST	2019 & Prior	2020	2021	2022	Total[18]
TOTAL DIRECT COSTS (NON-LABOR)[19]	$859	$394	$2,468	$2,565	$6,285

Assumptions

In addition to costs previously described above, there are other costs incurred as part of completing the project that are primarily associated with contracts that are established with specialized service providers that either perform a

[16] Values may not add to total due to rounding.
[17] Direct costs are escalated.
[18] Values may not add to total due to rounding.
[19] Direct costs are escalated.

unique service or supplement the core Company project team. It is typical that services are contracted to complete activities related to planning, engineering, design, estimating, project and construction management, scheduling, survey, construction inspection, x-ray and non-destructive examination of welds, hot tapping and/or stopple services, temporary gas supplies, gas capture services, safety services, as well as as-built and project documentation and records management services. Other costs also include non-labor expenses related to business related mileage, travel, meals and lodging.

Engineering and Project Management

- Developed upon specified scope of work, planned deliverables, and activity levels of effort reflecting anticipated manpower requirements over the planned timeframe of the project schedule.
- Contracted engineering assistance to identify and evaluate potential options to bring Line 1600 into compliance with D.11-06-017 and Public Utilities Code § 958.
- Non-labor costs included in this estimate address travel, meals, expenses, and lodging incurred for SDG&E and SoCalGas Labor.

Construction Support Services

The high-level assumptions and specific level of effort to provide construction management support for this project are described in more detail below.

- Full time X-Ray / NDE support with each pipeline lay crew.
- No CNG to support existing taps during pipeline isolation.
- Gas capture services to reduce the amount of natural gas vented to atmosphere.

Inspection Services

- Full time Chief Inspector
- Four full time Welding Inspectors

Survey and Design Services

- The survey and design service estimate includes survey support staff for project and site facility layout and as-builts. The estimate also includes engineering team material support in the development of as-built close-out packages.

Table 9: Indirect Costs ($000's)

PROJECT COST	2019 & Prior	2020	2021	2022	Total[20]
COMPANY OVERHEADS	$289	$601	$1,945	$1,633	$4,468

Assumptions

- Indirect costs are for Administrative and General, purchasing, warehousing, pension and benefits, payroll tax, and other costs that are overhead in nature.
- Indirect costs do not include AFUDC or Property Tax.

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

Pipeline Safety Enhancement Plan Workpaper Supporting Chapter

Line 1600 Black Mountain Replacement Project

Table 1: Total Project Cost ($000's)

PROJECT COST	2019 & Prior[1]	2020	2021	2022	Total[2]
DIRECT LABOR	$936	$1,355	$45	$0	$2,336
DIRECT NON-LABOR	$4,698	$30,363	$1,820	$0	$36,880
TOTAL DIRECT COSTS[3]	$5,634	$31,718	$1,865	$0	$39,216
COMPANY OVERHEADS[4]	$1,478	$2,855	$302	$0	$4,635
Total Capital Costs	$7,112	$34,572	$2,166	$0	$43,851

Project Description

Line 1600 is a 16-inch diameter transmission line that runs approximately 49.7 miles from Rainbow to Mission Valley, San Diego. Per the CPUC Safety and Enforcement Division (SED) approved *Line 1600 Test or Replacement Plan*, the Line 1600 testing and replacement work is comprised of 19 independent projects. This workpaper describes the Line 1600 Black Mountain Replacement project. The project is located in the City of San Diego. The project will replace and reroute approximately 3.692 miles of existing 16-inch pipeline with 4.129 miles of new pipeline primarily along Black Mountain and Mercy Roads from the intersection of Mercy Road and Branicole Lane to the intersection of Kearny Villa Road and Kearny Mesa Road. This route was selected for constructability reasons and to remain inside the Mira Mesa and Miramar neighborhoods to interconnect gas supply to the existing distribution system, and to relocate pipe away from close proximity to existing commercial and residential structures. The Black Mountain Replacement project will include the installation of three mainline valves (MLVs). Due to the offset of the new alignment, some distribution work will be required as part of the project scope to allow for existing customers to be served from the rerouted alignment. Associated distribution work includes the installation of two new regulator stations and approximately 0.9 miles of distribution main replacing 0.87 miles of existing distribution main. The project will also install approximately 4.129 miles of fiber optic cable. Fiber optic cable will be installed along the new 16-inch pipeline to assist in leak detection, ground movement, and vibration analysis. Construction of this project began on April 6, 2020 and is expected to be complete by Q1 2021.

Considerations unique to the project:

- The reroute will support the distribution system in a manner that system reliability is not compromised and maintain the existing reliability of service that customers currently receive from the existing pipeline.
- The project will be within 500 feet of onramps and offramps to Interstate 15, at the intersection of Miramar Road and Kearny Mesa Road. Night work is anticipated for all work along Miramar Road.
- Black Mountain Road is a heavily traveled thoughfare and restrictive work hours are anticipated by the City of San Diego to minimize traffic impacts during construction.

[1] Actual costs incurred associated with planning and engineering design work are included in the project cost estimates.
[2] Values may not add to total due to rounding.
[3] Direct Costs reflect escalation.
[4] Excludes AFUDC and tax.

- A portion of the project must traverse a 500 year flood plain. To mitigate this risk, it is assumed that the project will install this segment of the new pipe at a greater depth than what is typically standard.
- The proposed plan for the fiber optic cable is to have a continuous run from the Line 1600 La Honda-Lincoln Replacement to Line 1600 Serra Mesa Replacement projects. The end result of the continuous run would reduce the number of required monitoring stations between these Projects to one which is located on the Line 1600 Pomerado South Replacement project.

Alternatives Considered

D.18-06-028, Ordering Paragraph 7, required SDG&E and SoCalGas to "submit to Safety and Enforcement Division a hydrostatic test or replacement plan pertaining to the existing 49.7 miles of Line 1600 in its present corridor." The Decision further required such plan to discuss two options: "1. Hydrotest the entire 49.7 miles of line and replace those segments that fail the test; and 2. Replace all pipeline segments in High Consequence Areas (HCAs) along Line 1600, thus ensuring a new pipeline without vintage pipeline characteristics that are perceived to increase the risk of Line 1600. Hydrotest in solely non-HCA segments would ensure less impact if there was a failure during hydrotesting." SDG&E's and SoCalGas' September 26, 2018 *Line 1600 Test or Replacement Plan* discussed D.18-06-028's two options as Design Alternative 1 (Replace in HCA/Test in Non-HCA alternative) and Design Alternative 2 (Full Hydrotest alternative), and also discussed Design Alternative 3 (Full Replacement in Nearby Streets alternative) and Design Alternative 4 (Full Replacement Along Highway 395 alternative). SDG&E and SoCalGas proposed to implement, and the CPUC SED approved, Design Alternative 1, which will replace existing Line 1600 primarily in HCAs and hydrotest the remaining sections in non-HCAs. D.18-06-028 at 92 also required the Utilities to "identify proposed rerouting of the line in specific segments." As discussed in the *Line 1600 Test or Replacement Plan,* "SDG&E and SoCalGas concluded it is not feasible, prudent nor reasonable to build a new replacement pipeline entirely within the existing Line 1600 rights-of-way." Due to construction difficulty, private property and community impacts, environmental impacts, and costs and delays of efforts to expand the existing rights of way (ROW), the *Line 1600 Test or Replacement Plan* proposed to re-route the majority of replacement segments, usually in nearby streets. In developing the Plan, SDG&E and SoCalGas reviewed these proposed re-routes with SED, which "conducted a joint field inspection of the identified sites with SDG&E personnel and its contractor to evaluate the existing safety conditions, constructability and serviceability of Line 1600. After the field inspections, SED agreed with SDG&E's and SoCalGas' proposed reroute of many segments of Line 1600 due to safety and serviceability reasons."

D.20-02-024 requires "a cost forecast for the approved Design Alternative 1 (Replace in HCAs and Hydrotest in Non-HCAs) that SED approved on January 15, 2019."[2] D.20-02-024 at 31-32 held that issues "out of scope" for Phase 2 include "revisiting Design Alternatives 2 (Full Hydrotest Alternative), 3 (Full Replacement), 4 (Full Replacement but different street routing) or alternative recommendations. Nor are we revisiting the substance of the PSEP engineering and implementation that falls within the authority of SED."

Shut-In Analysis

The Line 1600 Black Mountain Replacement project cannot be temporarily taken out of service without significant impact to distribution customers, and therefore mitigation strategies must be employed. The shut-in plan includes phasing the tie-in to mitigate the impacts to the local distribution system. Some transmission system capacity impacts will occur for less than a week during the period when the new line is being fully connected and the old line

removed from service. If necessary, based on gas demand and system operations during this period, mitigation strategies such as bringing additional gas supply from an alternate receipt point and/or curtailment of non-core customers can be implemented.

Forecast Methodology

The Utilities methodology for forecasting PSEP costs is discussed in the Direct Testimony of Ronn Gonzalez. The Utilities developed a Total Installed Cost (TIC) estimate to implement the above scope of work. The TIC Estimate includes direct costs associated with project management, engineering and design, environmental permitting, land acquisition, material and equipment procurement, and construction.

Following the approval of the Plan by SED in January 2019, the Utilities have undertaken the detailed design and planning of the 19 individual projects in the Plan. Generally, projects that are earliest in the overall schedule are the most developed, while those later in the overall schedule are less developed. At the time of cost estimate preparation, this project was at an approximately 30% design level. Further development of this project could reveal new information requiring some adjustments to the project plan in the areas such as engineering, materials, permitting, environmental and land, all of which could impact actual costs compared this cost estimate.

Schedule

Implementation of this project is proposed to be completed consistent with the overall prioritization and timing described in Section IV. D. of the *Line 1600 Test or Replacement Plan.* The schedule was developed based on the five-stage project life cycle as defined by PSEP. The key project deliverables were identified and incorporated into a work breakdown structure. This work breakdown structure was then sequenced, and predecessor and successor tasks were linked to each task. Durations were added to each task to provide a total project duration.

The preliminary Stage 4 Construction Schedule received additional planning and stakeholder input considering that typically 50% of the project costs are expended during the construction phase. The construction schedule is assumed to be 180 working days.

Pipeline Safety Enhancement Plan Workpaper Supporting Chapter

Line 1600 Black Mountain Replacement Project

Figure 1: Overview Map for Line 1600 Black Mountain Replacement

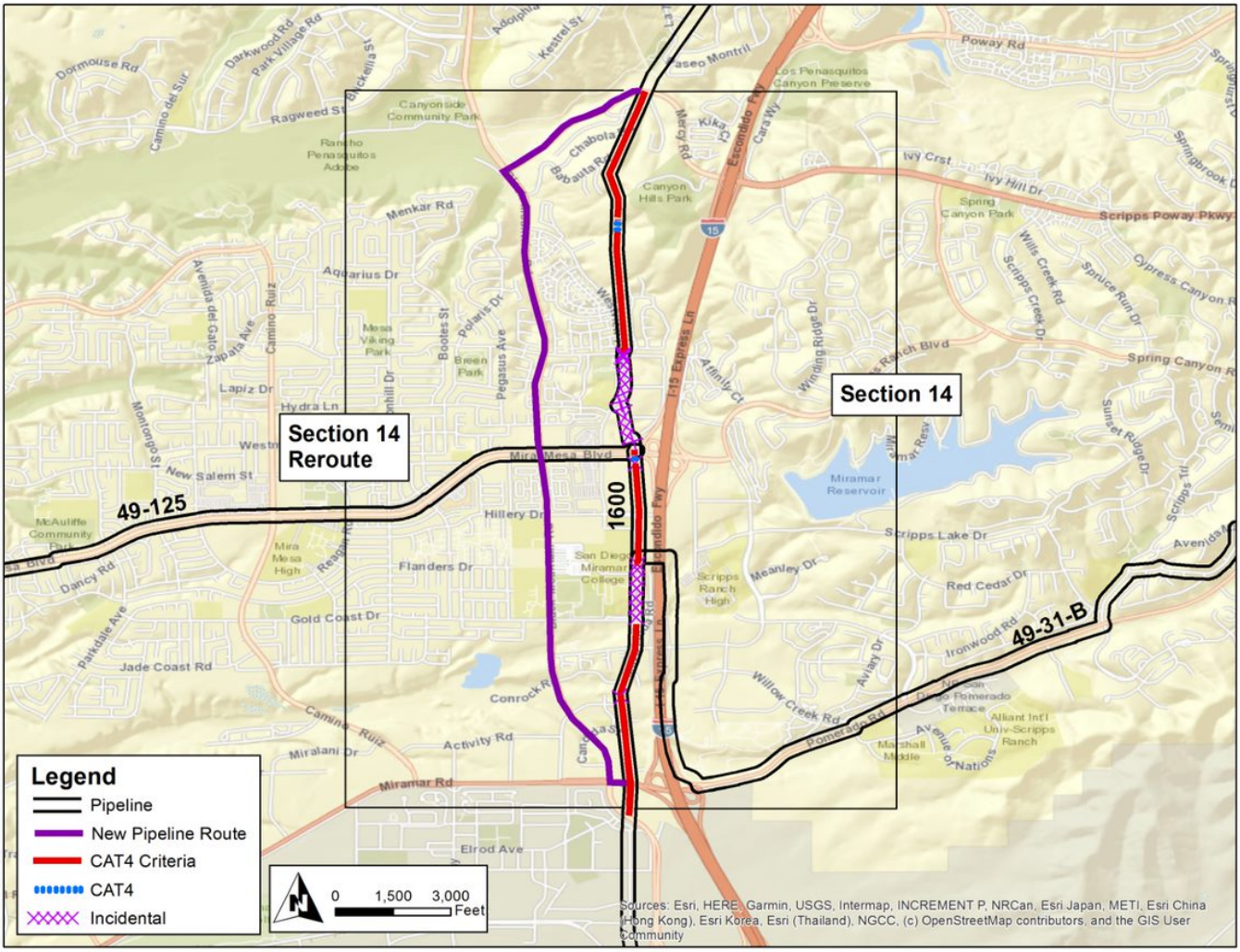

Figure 2: Satellite Map for Line 1600 Black Mountain Replacement

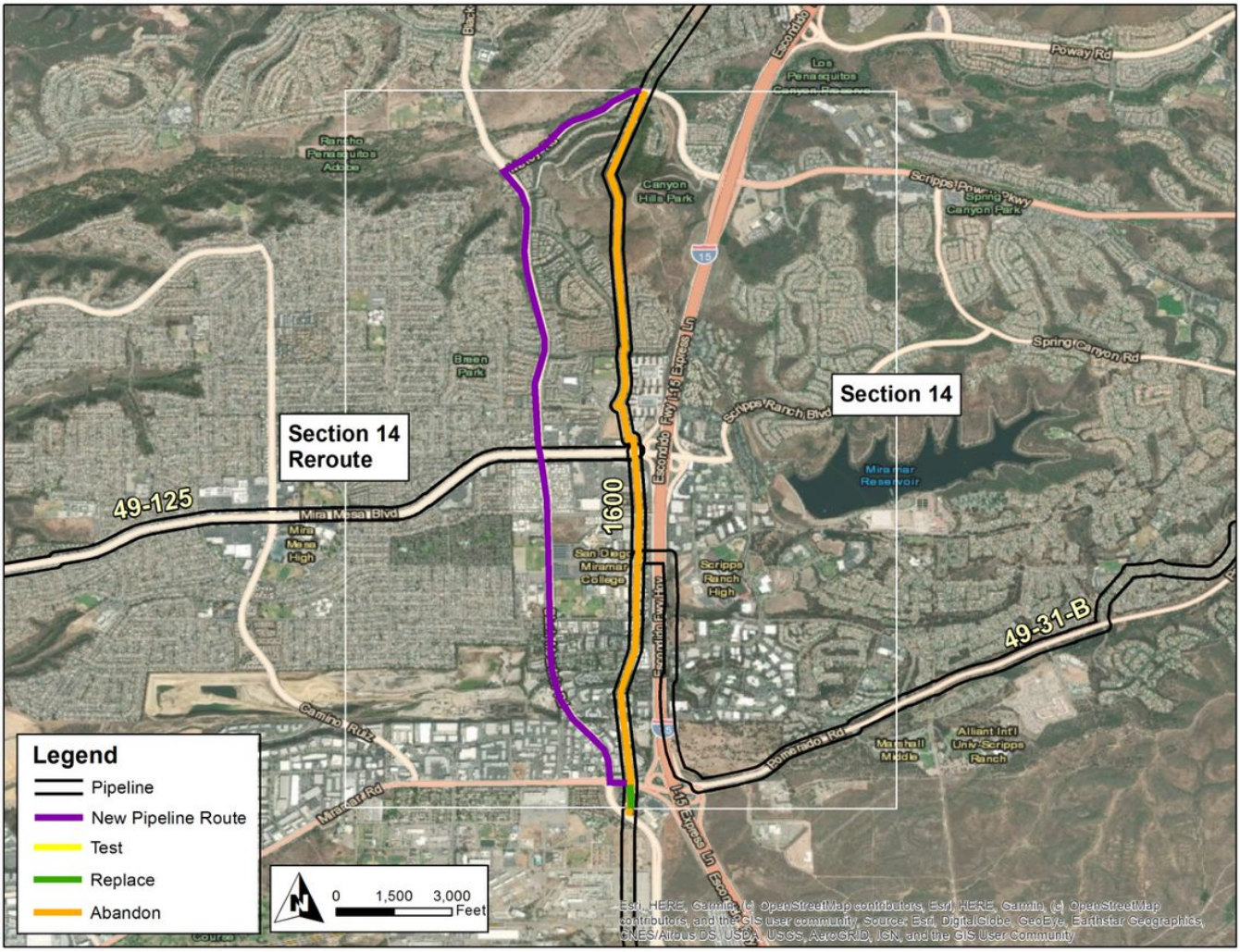

Table 2: Project Mileage

PHASE	MILEAGE
CATEGORY 4 CRITERIA[5]	2.841
CATEGORY 4[6]	0.074
INCIDENTAL	0.777
REPLACEMENT OFFSET	0.437
TOTAL MILEAGE[7]	4.129

The direct costs for each area are summarized below.

Table 3: Material ($000's)

PROJECT COST	2019 & Prior	2020	2021	2022	Total[8]
TOTAL DIRECT COSTS (NON-LABOR)[9]	$1,388	$253	$667	$0	$2,309

Assumptions

Materials for this project were purchased after final internal authorization to purchase long lead time material. This allowed for material to be procured, inspected, and delivered to coincide with the anticipated construction start date. Primary components include:

- 22,000 feet of 16-inch pipe meeting SDG&E specifications.
- 5,300 feet of 6-inch pipe meeting SDG&E specifications.[10]
- 3,820 feet of 4-inch pipe meeting SDG&E specifications.
- 22 16-inch fittings meeting SDG&E specifications.
- Three 16-inch MLVs (one automated valve and two non-automated valves) meeting SDG&E specifications.

[5] Lacks documentation of a post-construction strength test in a Class 3 or 4 HCA.
[6] Lacks documentation of a post-construction strength test in a Class 1 or 2 non-HCA.
[7] Values may not add to total due to rounding.
[8] Values may not add to total due to rounding.
[9] Direct Costs reflect escalation.
[10] Actual footage may vary upon completion of Project.

Table 4: Construction ($000's)

PROJECT COST	2019 & Prior	2020	2021	2022	Total[11]
TOTAL DIRECT COSTS (NON-LABOR)[12]	$6	$24,877	$0	$0	$24,884

Assumptions

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

- One mobilization and one demobilization.
- Work has been scheduled using a 10 hour per day, five day work week.
- Two mainline install crews will be utilized. One for intersections and select open trench installations, and one for all other open trench installation.
- Fiber optic lines will be installed above the new pipeline.
- Excess spoils will be hauled off and disposed.
- Tie-ins will be completed during a 24 hour continuous shift. One 10 hour shift is included for intermediate tie-in.
- Laydown yards will be restored to original condition at the end of the project.
- Restoration of grade along right of way (ROW) will be completed once pipeline is installed and tied in.

Additional Construction Information

- **Site Mobilization / Site Facilities**
  - One mobilization and one demobilization.
  - Two office trailers have been included for management and inspection personnel at laydown yards.
  - Eight months of site duration is anticipated.
  - Temporary fencing for all laydown yards.
  - Track out plates will be utilized at street access points to minimize soil being tracked onto the street by construction vehicles.

- **Site Management / Best Management Practices (BMPs)**
  - BMP materials for spoils piles, laydown yard, and work site.

- **Material Handling**
  - 35 loads of material will be unloaded by the contractor at laydown yards and transported as needed.

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

[12] Direct Costs reflect escalation.

- **Traffic Control**
  - A three man crew will be used for each construction spread for traffic control at all intersections, during hydrotesting, isolations, tie-ins, and restoration. This includes all traffic control devices and equipment necessary to complete the project within the City of San Diego.

- **Utility Locates**
  - Utility locates have been included to verify pipe location at cutouts and tap excavations.
  - 191 utility crossings.

- **Isolate Existing Pipeline**
  - Installation of two stopple fittings.
  - Isolation of two regulator stations.
  - Two 24 hour shifts for the mainline isolation of Line 1600.

- **Pipeline Installation**
  - Installation includes the following:
    - Approximately 21,829 linear feet (LF) of 16-inch pipe
    - Approximately 2,700 LF of 6-inch pipe[13]
    - Approximately 1,900 LF of 4-inch pipe
  - Site demo, excavation and pad trench / bellholes, string and bends pipe, coating joints.
  - Installation of fiber optic line and pipeline warning mesh.
  - Base paving of approximately 80,485 square feet (SF) of roadway.

- **Pressure Test Pipeline**
  - Preparatory work for the setup of 11 20,000 gallon water tanks.
  - Installation of hard piping from the test head to the tank pump.
  - Two 16-inch test heads will be fabricated.
  - Two 6-inch test heads will be fabricated.
  - Two 4-inch test heads will be fabricated.
  - The pipeline will be tested in two individual segments, one for the new transmission pipe and one for the distribution pipe.
  - Following the dewatering of each section of pipe, it will be intermittently dried until ready to be tied-in.

- **Mainline Valve**
  - Three 16-inch MLVs (one automated valve and two non-automated valves).

[13] BOE inadvertently included 5,300 feet of 6-inch pipe and 3,820 feet of 4-inch pipe in Material Assumptions.

- **Tie-In Pipeline**
  - One eight hour day for tie-in preparation.
  - One 24 hour continuous shift for tie-in.

- **Retire / Abandon Existing Pipeline**
  - 15 abandonment excavations are planned.
  - The abandoned pipeline within improved areas will be abandoned using slurry fill.
  - Removal of four vaults and regulator stations.

- **Site Restoration**
  - Base paving of trench will be up to 8-inch thick in the City of San Diego.
  - Roadways will be restored to the width of one lane. In areas that cross fog and lane lines, two lanes will be restored.
  - All paved roads will receive new 4-inch striping where disturbed.
  - 140 traffic loops will be replaced at intersections.
  - 100 square feet (SF) of median repair.
  - One eight hour shift is included for breaking down laydown yards and removing BMPs.
  - 80 LF of curb and gutter repair.

- **Site Demobilization**
  - One load of excess piping will be off hauled.

- **Field Overhead**
  - Full time Project Manager
  - Full time Superintendent
  - Full time Safety Supervisor

Table 5: Environmental Survey/Permitting/Monitoring ($000's)

PROJECT COST	2019 & Prior	2020	2021	2022	Total[14]
TOTAL DIRECT COSTS (NON-LABOR)[15]	$688	$541	$112	$0	$1,340

Assumptions

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

- Asbestos abatement of Asbestos Containing Materials (ACM).
- Non-hazardous Waste Containment/Disposal.

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

[15] Direct Costs reflect escalation.

- Water source will be a hydrant located near the new alignment.
- Water will be treated and disposed within municipal sewer for hydrotest. Any water encountered during trenching would be stored in water tanks and discharged to land.
- Water treatment and disposal of approximately 227,000 gallons of hydrostatic test water.

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

- Environmental Consultants for pre-construction assessments, construction monitoring, and environmental closeout support.
- Aquatic Features jurisdictional delineations.
- Abatement Support is based upon Subject Matter Expert (SME) recommendations.
- Stormwater Pollution Prevention Plan development and monitoring.

Table 6: Land & Right of Way Acquisition ($000's)

PROJECT COST	2019 & Prior	2020	2021	2022	Total[16]
TOTAL DIRECT COSTS (NON-LABOR)[17]	$87	$240	$281	$0	$608

Assumptions

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

- Encroachment permit and traffic control plan costs.
- Temporary Right of Entry (TRE) - Construction yards and workspace required for construction activities.

Factors such as location, zoning, current market price and square footage are included to determine a final estimated value specific to easements and TRE permits.

Table 7: Company Labor ($000's)

PROJECT COST	2019 & Prior	2020	2021	2022	Total[18]
TOTAL DIRECT COSTS (LABOR)[19]	$936	$1,355	$45	$0	$2,336

[16] Values may not add to total due to rounding.
[17] Direct Costs reflect escalation.
[18] Values may not add to total due to rounding.
[19] Direct Costs reflect escalation.

Assumptions

SDG&E and SoCalGas Labor - Management, Engineering, and Non-Union Labor

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

- Project Management (8,100 hours)
- Project Field Management (5,380 hours)
- Construction Management (1,880 hours)
- Environmental Services (2,788 hours)
- Land Services (802 hours)

Company employees provide extensive oversight with respect to safety; environmental protection; site management; construction, engineering and design services contract management and administration; project engineering and management; planning; scheduling; progress control; cost estimating, tracking and control; inspection; job site material and logistics management as well as job site customer interface management and community outreach.

SDG&E Labor - Union Labor

SDG&E Union Labor costs were developed with the guidance of SDG&E Construction Management and those costs are duration dependent and activity specific.

Critical operational activities such as operating valves, bringing the cathodic protection system online, bringing instrumentation online, gas handling and removing old assets from service as well as loading gas into new assets and placing them into service are all completed by Company Union personnel.

Table 8: Other Costs ($000's)

PROJECT COST	2019 & Prior	2020	2021	2022	Total[20]
TOTAL DIRECT COSTS (NON-LABOR)[21]	$2,528	$4,452	$759	$0	$7,739

Assumptions

In addition to costs previously described above, there are other costs incurred as part of completing the project that are primarily associated with contracts that are established with specialized service providers that either perform a unique service or supplement the core Company project team. It is typical that services are contracted to complete activities related to planning, engineering, design, estimating, project and construction management, scheduling, survey, construction inspection, x-ray and non-destructive examination of welds, hot tapping and/or stopple services, temporary gas supplies, gas capture services, safety services, as well as as-built and project documentation and records management services. Other costs also include non-labor expenses related to business related mileage, travel, meals and lodging.

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

[21] Direct Costs reflect escalation.

Engineering and Project Management

- Developed upon specified scope of work, planned deliverables, and activity levels of effort reflecting anticipated manpower requirements over the planned timeframe of the project schedule.
- Contracted engineering assistance to identify and evaluate potential options to bring Line 1600 into compliance with D.11-06-017 and Public Utilities Code § 958.
- Non-labor costs included in this estimate address travel, meals, expenses, and lodging incurred for SDG&E and SoCalGas Labor.

Construction Support Services

The high-level assumptions and specific level of effort to provide construction management support for this project are described in more detail below.

- Full time X-Ray / NDE support with each pipeline lay crew.
- No CNG to support existing taps during pipeline isolation.
- 17 hours for gas capture services to reduce the amount of natural gas vented to atmosphere.
- Gas service for core customers will be maintained through combination of purchase of additional gas through an alternative receipt point and curtailments to non-core customers where as appropriate.

Inspection Services

- Full time Chief Inspector
- Two full time Welding Inspectors

Survey and Design Service

- The survey and design service estimate include survey support staff for project and site facility layout and as-builts. The estimate also includes engineering team material support in the development of as-built close-out packages.

Table 9: Indirect Costs ($000's)

PROJECT COST	2019 & Prior	2020	2021	2022	Total[22]
COMPANY OVERHEADS	$1,478	$2,855	$302	$0	$4,635

Assumptions

- Indirect costs are for Administrative and General, purchasing, warehousing, pension and benefits, payroll tax, and other costs that are overhead in nature.
- Indirect costs do not include AFUDC or Property Tax.

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

Disallowance

In D.14-06-007, the Commission approved implementation of SoCalGas and SDG&E's PSEP, and disallowed recovery of specified costs associated with pressure testing or replacing pipeline segments installed after July 1, 1961. This decision was later modified by D.15-12-020 to include pipe installed from January 1, 1956 to July 1, 1961. The Line 1600 Black Mountain Replacement project includes 26 feet of Category 4 pipe installed in 1965 that does not have test records to demonstrate compliance with the then-applicable industry or regulatory strength testing and record keeping standards. This resulted in an anticipated cost disallowance of $8,739. The final value of the Black Mountain Replacement project cost disallowance will be adjusted once the project is placed is service.

Pipeline Safety Enhancement Plan Workpaper Supporting Chapter

Line 1600 MCAS North Replacement Project

Table 1: Total Project Cost ($000's)

PROJECT COST	2019 & Prior[1]	2020	2021	2022	2023	Total[2]
DIRECT LABOR	$131	$83	$204	$204	$2,059	$2,682
DIRECT NON-LABOR	$676	$488	$509	$544	$12,228	$14,445
TOTAL DIRECT COSTS[3]	$807	$571	$713	$748	$14,287	$17,127
COMPANY OVERHEADS[4]	$146	$107	$265	$268	$2,490	$3,276
Total Capital Costs	$953	$679	$978	$1,016	$16,777	$20,403

Project Description

Line 1600 is a 16-inch diameter transmission line that runs approximately 49.7 miles from Rainbow to Mission Valley, San Diego. Per the CPUC Safety and Enforcement Division (SED) approved *Line 1600 Test or Replacement Plan*, the Line 1600 testing and replacement work is comprised of 19 independent projects. This workpaper describes the Line 1600 MCAS North Replacement Project. The project is located in the City of San Diego, primarily within MCAS (Marine Corps Air Station) Miramar property. The project will replace and reroute approximately 1.038 miles of existing 16-inch pipeline with 1.067 miles of new pipeline along Kearny Mesa Road and Kearny Villa Road south of Miramar Road to south of Miramar Way. This will enable the reroute of Line 1600 from within the MCAS military base's high security area and avoid environmentally sensitive areas along the existing right of way (ROW) by placing the replacement line within a new easement to be granted by MCAS Miramar. Due to the offset of the new alignment, additional distribution work will be required as part of the project scope to allow for existing customers to be served from the rerouted alignment. Associated distribution work includes the installation of a new 4-inch parallel line for regulator station tie-overs. The project will also install approximately 1.067 miles of fiber optic cable. Fiber optic cable will be installed along the new 16-inch pipeline to assist in leak detection, ground movement, and vibration analysis.

Considerations unique to the project are as follows:

- The existing and new pipeline are located within the MCAS federal property. This will require a new easement be granted by MCAS Miramar as well as a federal environmental review via the NEPA (National Environmental Policy Act) process. The timeline for review may range from 18 months to four years.
- The MCAS North Replacement project and MCAS Central Replacement project will have one combined single post-completion hydrotest operation to reduce overall costs and minimize community impacts.

[1] Actual costs incurred associated with planning and engineering design work are included in the project cost estimates.
[2] Values may not add to total due to rounding.
[3] Direct Costs reflect escalation.
[4] Excludes AFUDC and tax.

- Proposed laydown yard locations, traffic control planning, encroachment permitting, construction scheduling, and the CLAMP (Committee for Land and Airspace Management Policy) Tier I application development process for MCAS North, MCAS Central, and MCAS South projects utilized a combined effort approach. This approach provides for streamlined use of resources and increased efficiency across all MCAS North, MCAS Central, and MCAS South projects.
- The proposed plan for the fiber optic cable is to have a continuous run from the Line 1600 La Honda-Lincoln Replacement to Line 1600 Serra Mesa Replacement projects. The end result of the continuous run would reduce the number of required monitoring stations between these Projects to one which is located on the Line 1600 Pomerado South Replacement project.

Alternatives Considered

D.18-06-028, Ordering Paragraph 7, required SDG&E and SoCalGas to "submit to Safety and Enforcement Division a hydrostatic test or replacement plan pertaining to the existing 49.7 miles of Line 1600 in its present corridor." The Decision further required such plan to discuss two options: "1. Hydrotest the entire 49.7 miles of line and replace those segments that fail the test; and 2. Replace all pipeline segments in High Consequence Areas (HCAs) along Line 1600, thus ensuring a new pipeline without vintage pipeline characteristics that are perceived to increase the risk of Line 1600. Hydrotest in solely non-HCA segments would ensure less impact if there was a failure during hydrotesting." SDG&E's and SoCalGas' September 26, 2018 *Line 1600 Test or Replacement Plan* discussed D.18-06-028's two options as Design Alternative 1 (Replace in HCA/Test in Non-HCA alternative) and Design Alternative 2 (Full Hydrotest alternative), and also discussed Design Alternative 3 (Full Replacement in Nearby Streets alternative) and Design Alternative 4 (Full Replacement Along Highway 395 alternative). SDG&E and SoCalGas proposed to implement, and the CPUC SED approved, Design Alternative 1, which will replace existing Line 1600 primarily in HCAs and hydrotest the remaining sections in non-HCAs. D.18-06-028 at 92 also required the Utilities to "identify proposed rerouting of the line in specific segments." As discussed in the *Line 1600 Test or Replacement Plan*, "SDG&E and SoCalGas concluded it is not feasible, prudent nor reasonable to build a new replacement pipeline entirely within the existing Line 1600 rights-of-way." Due to construction difficulty, private property and community impacts, environmental impacts, and costs and delays of efforts to expand the existing rights of way (ROW), the *Line 1600 Test or Replacement Plan* proposed to re-route the majority of replacement segments, usually in nearby streets. In developing the Plan, SDG&E and SoCalGas reviewed these proposed re-routes with SED, which "conducted a joint field inspection of the identified sites with SDG&E personnel and its contractor to evaluate the existing safety conditions, constructability and serviceability of Line 1600. After the field inspections, SED agreed with SDG&E's and SoCalGas' proposed reroute of many segments of Line 1600 due to safety and serviceability reasons."

D.20-02-024 requires "a cost forecast for the approved Design Alternative 1 (Replace in HCAs and Hydrotest in Non-HCAs) that SED approved on January 15, 2019."[2] D.20-02-024 at 31-32 held that issues "out of scope" for Phase 2 include "revisiting Design Alternatives 2 (Full Hydrotest Alternative), 3 (Full Replacement), 4 (Full Replacement but different street routing) or alternative recommendations. Nor are we revisiting the substance of the PSEP engineering and implementation that falls within the authority of SED."

Shut-In Analysis

The Line 1600 MCAS North Replacement project can be temporarily taken out of service with minimal impact to the transmission system. Distribution system impacts will require non-core customer coordination and the use of a temporary bypass or a pressure control fitting (PCF) for shut-in. Distribution system impacts will be mitigated by installing a permanent 4-inch bridle and with the use of a bottom out pressure control fitting (PCF) for tie-ins to the existing distribution regulator stations.

Forecast Methodology

The Utilities methodology for forecasting PSEP costs is discussed in the Direct Testimony of Ronn Gonzalez. The Utilities developed a Total Installed Cost (TIC) estimate to implement the above scope of work. The TIC Estimate includes direct costs associated with project management, engineering and design, environmental permitting, land acquisition, material and equipment procurement, and construction.

Following the approval of the Plan by SED in January 2019, the Utilities have undertaken the detailed design and planning of the 19 individual projects in the Plan. Generally, projects that are earliest in the overall schedule are the most developed, while those later in the overall schedule are less developed. At the time of cost estimate preparation, this project was at an approximately 30% design level. Further development of this project could reveal new information requiring some adjustments to the project plan in the areas such as engineering, materials, construction, permitting, environmental and land, all of which could impact actual costs compared this cost estimate.

Schedule

Implementation of this project is proposed to be completed consistent with the overall prioritization and timing described in Section IV. D. of the *Line 1600 Test or Replacement Plan*. The schedule was developed based on the five-stage project life cycle as defined by PSEP. The key project deliverables were identified and incorporated into a work breakdown structure. This work breakdown structure was then sequenced, and predecessor and successor tasks were linked to each task. Durations were added to each task to provide a total project duration.

The preliminary Stage 4 Construction Schedule received additional planning and stakeholder input considering that typically 50% of the project costs are expended during the construction phase. The construction schedule is assumed to be 88 working days.

Figure 1: Overview Map for Line 1600 MCAS North Replacement

Figure 2: Satellite Map for Line 1600 MCAS North Replacement

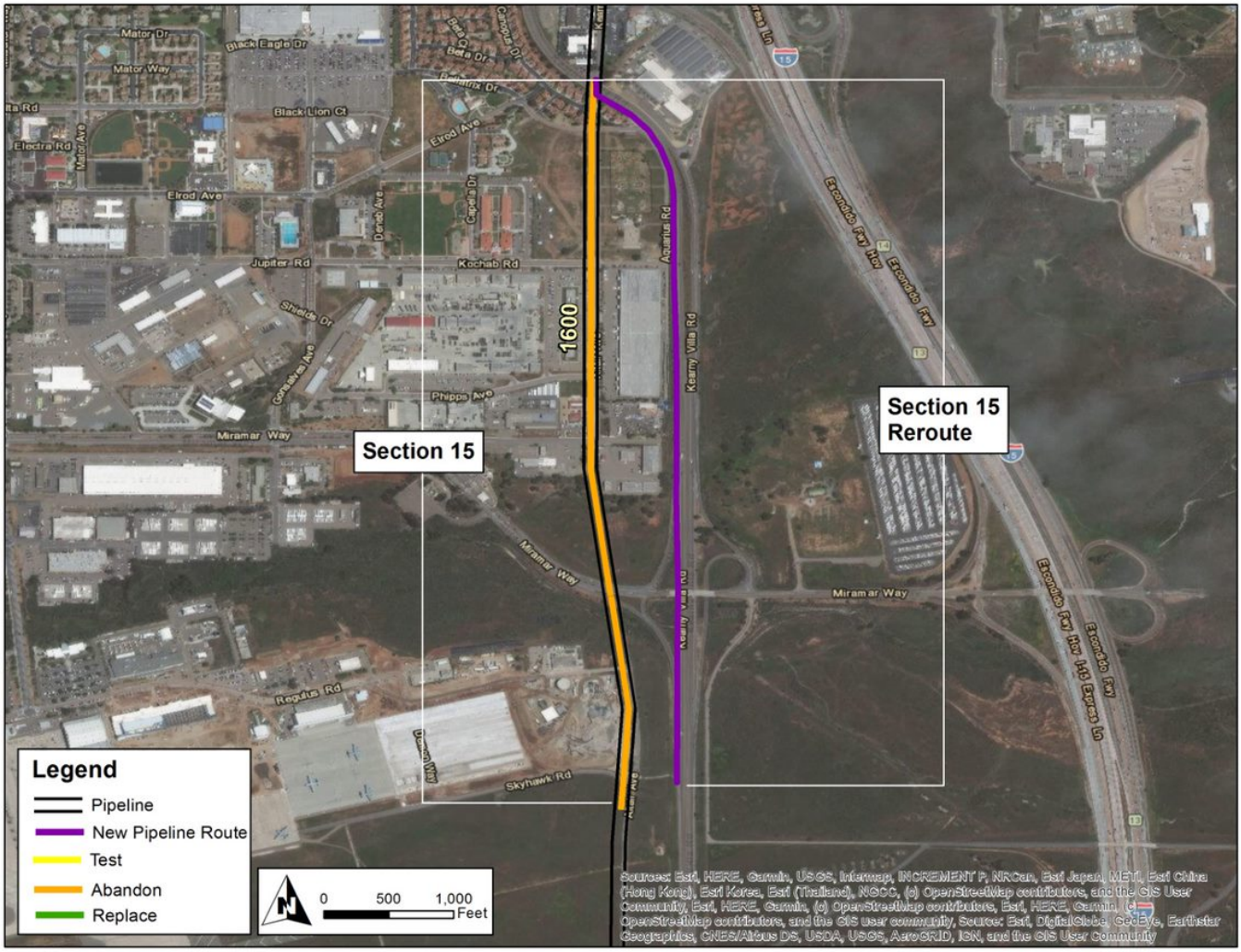

Table 2: Project Mileage

PHASE	MILEAGE
CATEGORY 4 CRITERIA[5]	0.737
CATEGORY 4[6]	0.301
INCIDENTAL	0.000
REPLACEMENT OFFSET	0.029
TOTAL MILEAGE[7]	1.067

The direct costs for each area are summarized below.

Table 3: Material ($000's)

PROJECT COST	2019 & Prior	2020	2021	2022	2023	Total[8]
TOTAL DIRECT COSTS (NON-LABOR)[9]	$0	$0	$240	$247	$303	$790

Assumptions

Materials for this project will be purchased following final internal authorization 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. Primary components include:

- 5,680 feet of 16-inch pipe meeting SDG&E specifications.
- 6,000 feet of 4-inch pipe meeting SDG&E specifications.
- Five 16-inch fittings meeting SDG&E specifications.

Table 4: Construction ($000's)

PROJECT COST	2019 & Prior	2020	2021	2022	2023	Total[10]
TOTAL DIRECT COSTS (NON-LABOR)[11]	$1	$1	$0	$0	$8,387	$8,389

[5] Lacks documentation of a post-construction strength test in a Class 3 or 4 HCA.
[6] Lacks documentation of a post-construction strength test in a Class 1 or 2 non-HCA.
[7] Values may not add to total due to rounding.
[8] Values may not add to total due to rounding.
[9] Direct Costs reflect escalation.
[10] Values may not add to total due to rounding.
[11] Direct Costs reflect escalation.

Assumptions

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

- One mobilization and one demobilization.
- Contractor work is estimated using a eight hour per day, five day work week.
- Working hours are based on a six hour production window between from 9:00 AM to 3:00 PM.
- Fiber optic lines will be installed above the new pipeline.
- Excess spoils will be hauled off and disposed.
- Tie-ins will be completed during a 16 hour continuous shift.
- Laydown yards will be restored to the original condition at the end of the project.
- Restoration of asphalt pavement and striping along ROW will be performed the end of the project.

Additional Construction Information

- **Site Mobilization / Site Facilities**
  - One mobilization and one demobilization.
  - Two office trailers have been included for management and inspection personnel at the primary laydown yard.
  - Four months of site duration is anticipated.
  - Track out plates will be utilized at street access points to minimize soil being tracked onto the street by construction vehicles.

- **Site Management / Best Management Practices (BMPs)**
  - BMP materials for spoils piles, laydown yard, and work site.

- **Material Handling**
  - 14 loads of material will be unloaded by the contractor at laydown yards and transported as needed.

- **Traffic Control**
  - Three man crew traffic control support during the project at all intersections, during hydrotesting, isolations, tie-ins, and restoration. This includes all traffic control devices and equipment necessary to complete the project.

- **Utility Locates**
  - A part time locate crew will be utilized to verify identified utilities and existing pipeline crossings.
  - Estimate includes two days for ground penetrating radar (GPR) to verify identified utilities and existing pipeline crossings.

- **Pipeline Installation**
  - Installation includes the following:
    - Approximately 5,680 linear feet (LF) of 16-inch pipe.
    - Approximately 6,000 linear feet (LF) of 4-inch pipe.

- Site demo, excavation and pad trench / bellholes, string and bends pipe, coating joints.
- Installation of fiber optic line and pipeline warning mesh.

- **Isolate Existing Pipeline**
  - The pipeline will be isolated in conjunction with tie-in activities.
  - The pipeline will not be separately isolated until the new pipeline has been installed and tested.

- **Pressure Test Pipeline**
  - Preparatory work for the setup of water tanks.
  - Installation of hard piping from the test head to the tank pump.
  - The pipeline will be tested in one post-completion hydrotest.
  - Following the dewatering of each section of pipe, it will be intermittently dried until ready to be tied-in.

- **Tie-in Pipeline**
  - One 16 hour continuous shift for tie-in.

- **Retire / Abandon Existing Pipeline**
  - Five abandonment excavations are planned.
  - The abandon pipeline will be grout filled.

- **Site Restoration**
  - Base paving of trench will be up to 8-inch thick.
  - Approximately 103,338 SF of disturbed asphalt pavement area will receive a mill and overlay approximately 18 feet wide and 2-inch thick.
  - All paved roads will receive new striping and pavement markings where disturbed with approximately 17,223 LF of 4-inch white solid fog lane and bike lane, including 4-inch broken white vehicle lane.

- **Site Demobilization**
  - One load of excess piping will be hauled to SDG&E designated yard.

- **Field Overhead**
  - Full time Project Manager
  - Full time Superintendent
  - Full time Safety Supervisor

Table 5: Environmental Survey/Permitting/Monitoring ($000's)

PROJECT COST	2019 & Prior	2020	2021	2022	2023	Total[12]
TOTAL DIRECT COSTS (NON-LABOR)[13]	$217	$120	$119	$127	$627	$1,210

Assumptions

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

- Asbestos abatement of Asbestos Containing Material (ACM).
- Non-hazardous waste containment/disposal.
- Water source will be a hydrant located near the new alignment.
- Water will be treated and disposed within municipal sewer for hydrotest. Any water encountered during trenching would be stored in water tanks and discharged to land.
- Water treatment and disposal of approximately 67,000 gallons of hydrostatic test water.

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

- Environmental Consultants for pre-construction assessments, construction monitoring, and environmental close-out support.
- Abatement support is based upon Subject Matter Expert (SME) recommendations.
- Stormwater Pollution Prevention Plan (SWPPP) development and monitoring.
- Committee for Land and Airspace Management Policy (CLAMP) and TIER 1 Application and associated National Environmental Policy Act (NEPA) compliance support.

Table 6: Land & Right of Way Acquisition ($000's)

PROJECT COST	2019 & Prior	2020	2021	2022	2023	Total[14]
TOTAL DIRECT COSTS (NON-LABOR)[15]	$0	$20	$78	$116	$73	$287

Assumptions

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

- Encroachment permit and traffic control plan costs.
- New easement costs.
- Temporary Right of Entry (TRE) - Construction yards and workspace required for construction activities.

[12] Values may not add to total due to rounding.
[13] Direct Costs reflect escalation.
[14] Values may not add to total due to rounding.
[15] Direct Costs reflect escalation.

Factors such as location, zoning, current market price and square footage are considered to determine a final estimated value specific to easements and TRE permits.

Table 7: Company Labor ($000's)

PROJECT COST	2019 & Prior	2020	2021	2022	2023	Total[16]
TOTAL DIRECT COSTS (LABOR)[17]	$131	$83	$204	$204	$2,059	$2,682

Assumptions

SDG&E and SoCalGas Labor - Management, Engineering, and Non-Union Labor

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

- Project Management (16,510 hours)
- Project Field Management (5,626 hours)
- Construction Management (784 hours)
- Environmental Services (3,912 hours)
- Land Services (969 hours)

Company employees provide extensive oversight with respect to safety; environmental protection; site management; construction, engineering and design services contract management and administration; project engineering and management; planning; scheduling; progress control; cost estimating, tracking and control; inspection; job site material and logistics management as well as job site customer interface management and community outreach.

SDG&E Labor - Union Labor

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

Critical operational activities such as operating valves, bringing the cathodic protection system online, bringing instrumentation online, gas handling and removing old assets from service as well as loading gas into new assets and placing them into service are all completed by Company Union personnel.

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

[17] Direct Costs reflect escalation.

Table 8: Other Costs ($000's)

PROJECT COST	2019 & Prior	2020	2021	2022	2023	Total[18]
TOTAL DIRECT COSTS (NON-LABOR)[19]	$458	$347	$72	$54	$2,839	$3,771

Assumptions

In addition to costs previously described above, there are other costs incurred as part of completing the project that are primarily associated with contracts that are established with specialized service providers that either perform a unique service or supplement the core Company project team. It is typical that services are contracted to complete activities related to planning, engineering, design, estimating, project and construction management, scheduling, survey, construction inspection, x-ray and non-destructive examination of welds, hot tapping and/or stopple services, temporary gas supplies, gas capture services, safety services, as well as as-built and project documentation and records management services. Other costs also include non-labor expenses related to business related mileage, travel, meals and lodging.

Engineering and Project Management

- Developed upon specified scope of work, planned deliverables, and activity levels of effort reflecting anticipated manpower requirements over the planned timeframe of the project schedule.
- Contracted engineering assistance to identify and evaluate potential options to bring Line 1600 into compliance with D.11-06-017 and Public Utilities Code § 958.
- Non-labor costs included in this estimate address travel, meals, expenses, and lodging incurred for SDG&E Labor.

Construction Support Services

The high-level assumptions and specific level of effort to provide construction management support for this project are described in more detail below.

- 63 days of X-Ray / NDE support with full time X-Ray support with each pipeline lay crew.
- No CNG to support existing taps during pipeline isolation.
- Gas capture services to reduce the amount of natural gas vented to atmosphere.

Inspection Services

- Full time Chief Inspector
- Full time Trenching Inspector
- Two full time Welding Inspectors

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

[19] Direct Costs reflect escalation.

Survey and Design Services

- The survey and design service estimate include survey support staff for project and site facility layout and as-builts. The estimate also includes engineering team material support in the development of as-built close-out packages.

Table 9: Indirect Costs ($000's)

PROJECT COST	2019 & Prior	2020	2021	2022	2023	Total[20]
COMPANY OVERHEADS	$146	$107	$265	$268	$2,490	$3,276

Assumptions

- Indirect costs are for Administrative and General, purchasing, warehousing, pension and benefits, payroll tax, and other costs that are overhead in nature.
- Indirect costs do not include AFUDC or Property Tax.

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

Pipeline Safety Enhancement Plan Workpaper Supporting Chapter

Line 1600 MCAS Central Replacement Project

Table 1: Total Project Cost ($000's)

PROJECT COST	2019 & Prior[1]	2020	2021	2022	2023	2024	Total[2]
DIRECT LABOR	$166	$89	$198	$198	$1,882	$65	$2,597
DIRECT NON-LABOR	$843	$493	$780	$642	$11,146	$887	$14,792
TOTAL DIRECT COSTS[3]	$1,009	$582	$978	$840	$13,028	$952	$17,389
COMPANY OVERHEADS[4]	$184	$106	$267	$262	$2,228	$148	$3,196
Total Capital Costs	$1,194	$688	$1,246	$1,102	$15,256	$1,100	$20,585

Project Description

Line 1600 is a 16-inch diameter transmission line that runs approximately 49.7 miles from Rainbow to Mission Valley, San Diego. Per the CPUC Safety and Enforcement Division (SED) approved *Line 1600 Test or Replacement Plan*, the Line 1600 testing and replacement work is comprised of 19 independent projects. This workpaper describes the Line 1600 MCAS Central Replacement project. The Project is located in the City of San Diego, primarily within MCAS (Marine Corps Air Station) Miramar property. The project will replace and reroute approximately 1.212 miles of existing 16-inch pipeline along Kearny Villa Road south of Miramar Way to south of Harris Plant Road. This segment was rerouted from within the MCAS military base's high security area and avoids environmentally sensitive areas along the existing ROW by placing the replacement line within a new easement to be granted by MCAS Miramar. Due to the offset of the new alignment, additional distribution work will be required as part of the project scope to allow for existing customers to be served from the rerouted alignment. Associated distribution work includes the installation a section of new 4-inch pipeline to reconnect to a regulator station. The project will also install approximately 1.212 miles of fiber optic cable. Fiber optic cable will be installed along the new 16-inch pipeline to assist in leak detection, ground movement, and vibration analysis.

Considerations unique to the project are as follows:

- The new pipeline alignment crosses Johnson Creek, a natural waterway. To eliminate environmental impacts to the natural waterway, the new pipeline will be installed using a jack and bore.
- The new alignment passes near several environmentally sensitive areas such as vernal pools. Extensive environmental reviews have been performed to detail the location, size, and makeup of these environmental features. This has resulted in an environmentally optimized pipeline alignment and associated new access roadways near the Kearny Villa Pressure Limiting Station (KVPLS).

[1] Actual costs incurred associated with planning and engineering design work are included in the project cost estimates.
[2] Values may not add to total due to rounding.
[3] Direct Costs reflect escalation.
[4] Excludes AFUDC and tax.

- The existing and new pipeline are located within the MCAS federal property. This will require a new easement be granted by MCAS Miramar as well as a federal environmental review via the NEPA (National Environmental Policy Act) process. The timeline for review may range from 18 months to four years.
- The MCAS North Replacement Project and MCAS Central Replacement project will have one combined single post-completion hydrotest operation to reduce overall costs and minimize community impacts.
- Proposed laydown yard locations, traffic control planning, encroachment permitting, construction scheduling, and the CLAMP (Committee for Land and Airspace Management Policy) Tier I application development process for MCAS North, MCAS Central, and MCAS South projects utilized a combined effort approach. This approach provides for streamlined use of resources and increased efficiency across all MCAS North, MCAS Central, and MCAS South projects.
- The proposed plan for the fiber optic cable is to have a continuous run from the Line 1600 La Honda-Lincoln Replacement to Line 1600 Serra Mesa Replacement projects. The end result of the continuous run would reduce the number of required monitoring stations between these projects to one which is located on the Line 1600 Pomerado South Replacement project.

Alternatives Considered

D.18-06-028, Ordering Paragraph 7, required SDG&E and SoCalGas to "submit to Safety and Enforcement Division a hydrostatic test or replacement plan pertaining to the existing 49.7 miles of Line 1600 in its present corridor." The Decision further required such plan to discuss two options: "1. Hydrotest the entire 49.7 miles of line and replace those segments that fail the test; and 2. Replace all pipeline segments in High Consequence Areas (HCAs) along Line 1600, thus ensuring a new pipeline without vintage pipeline characteristics that are perceived to increase the risk of Line 1600. Hydrotest in solely non-HCA segments would ensure less impact if there was a failure during hydrotesting." SDG&E's and SoCalGas' September 26, 2018 *Line 1600 Test or Replacement Plan* discussed D.18-06-028's two options as Design Alternative 1 (Replace in HCA/Test in Non-HCA alternative) and Design Alternative 2 (Full Hydrotest alternative), and also discussed Design Alternative 3 (Full Replacement in Nearby Streets alternative) and Design Alternative 4 (Full Replacement Along Highway 395 alternative). SDG&E and SoCalGas proposed to implement, and the CPUC SED approved, Design Alternative 1, which will replace existing Line 1600 primarily in HCAs and hydrotest the remaining sections in non-HCAs. D.18-06-028 at 92 also required the Utilities to "identify proposed rerouting of the line in specific segments." As discussed in the *Line 1600 Test or Replacement Plan*, "SDG&E and SoCalGas concluded it is not feasible, prudent nor reasonable to build a new replacement pipeline entirely within the existing Line 1600 rights-of-way." Due to construction difficulty, private property and community impacts, environmental impacts, and costs and delays of efforts to expand the existing rights of way (ROW), the *Line 1600 Test or Replacement Plan* proposed to re-route the majority of replacement segments, usually in nearby streets. In developing the Plan, SDG&E and SoCalGas reviewed these proposed re-routes with SED, which "conducted a joint field inspection of the identified sites with SDG&E personnel and its contractor to evaluate the existing safety conditions, constructability and serviceability of Line 1600. After the field inspections, SED agreed with SDG&E's and SoCalGas' proposed reroute of many segments of Line 1600 due to safety and serviceability reasons."

D.20-02-024 requires "a cost forecast for the approved Design Alternative 1 (Replace in HCAs and Hydrotest in Non-HCAs) that SED approved on January 15, 2019."[2] D.20-02-024 at 31-32 held that issues "out of scope" for Phase 2 include "revisiting Design Alternatives 2 (Full Hydrotest Alternative), 3 (Full Replacement), 4 (Full Replacement but different street routing) or alternative recommendations. Nor are we revisiting the substance of the PSEP engineering and implementation that falls within the authority of SED."

Shut-In Analysis

The Line 1600 MCAS Central Replacement project can be temporarily taken out of service with minimal impact to the transmission system. Distribution system impacts will require non-core customer coordination and the use of a temporary bypass or a pressure control fitting (PCF) for shut-in. Distribution system impacts will be mitigated by installing a permanent 4-inch bridle and with the use of a bottom out pressure control fitting (PCF) for tie-ins to the existing distribution regulator stations.

Forecast Methodology

The Utilities methodology for forecasting PSEP costs is discussed in the Direct Testimony of Ronn Gonzalez. The Utilities developed a Total Installed Cost (TIC) estimate to implement the above scope of work. The TIC Estimate includes direct costs associated with project management, engineering and design, environmental permitting, land acquisition, material and equipment procurement, and construction.

Following the approval of the Plan by SED in January 2019, the Utilities have undertaken the detailed design and planning of the 19 individual projects in the Plan. Generally, projects that are earliest in the overall schedule are the most developed, while those later in the overall schedule are less developed. At the time of cost estimate preparation, this project was at an approximately 30% design level. Further development of this project could reveal new information requiring some adjustments to the project plan in the areas such as engineering, materials, construction, permitting, environmental and land, all of which could impact actual costs compared this cost estimate.

Schedule

Implementation of this project is proposed to be completed consistent with the overall prioritization and timing described in Section IV. D. of the *Line 1600 Test or Replacement Plan*. The schedule was developed based on the five-stage project life cycle as defined by PSEP. The key project deliverables were identified and incorporated into a work breakdown structure. This work breakdown structure was then sequenced, and predecessor and successor tasks were linked to each task. Durations were added to each task to provide a total project duration.

The preliminary Stage 4 Construction Schedule received additional planning and stakeholder input considering that typically 50% of the project costs are expended during the construction phase. The construction schedule is assumed to be 78 working days.

Figure 1: Overview Map for Line 1600 MCAS Central Replacement

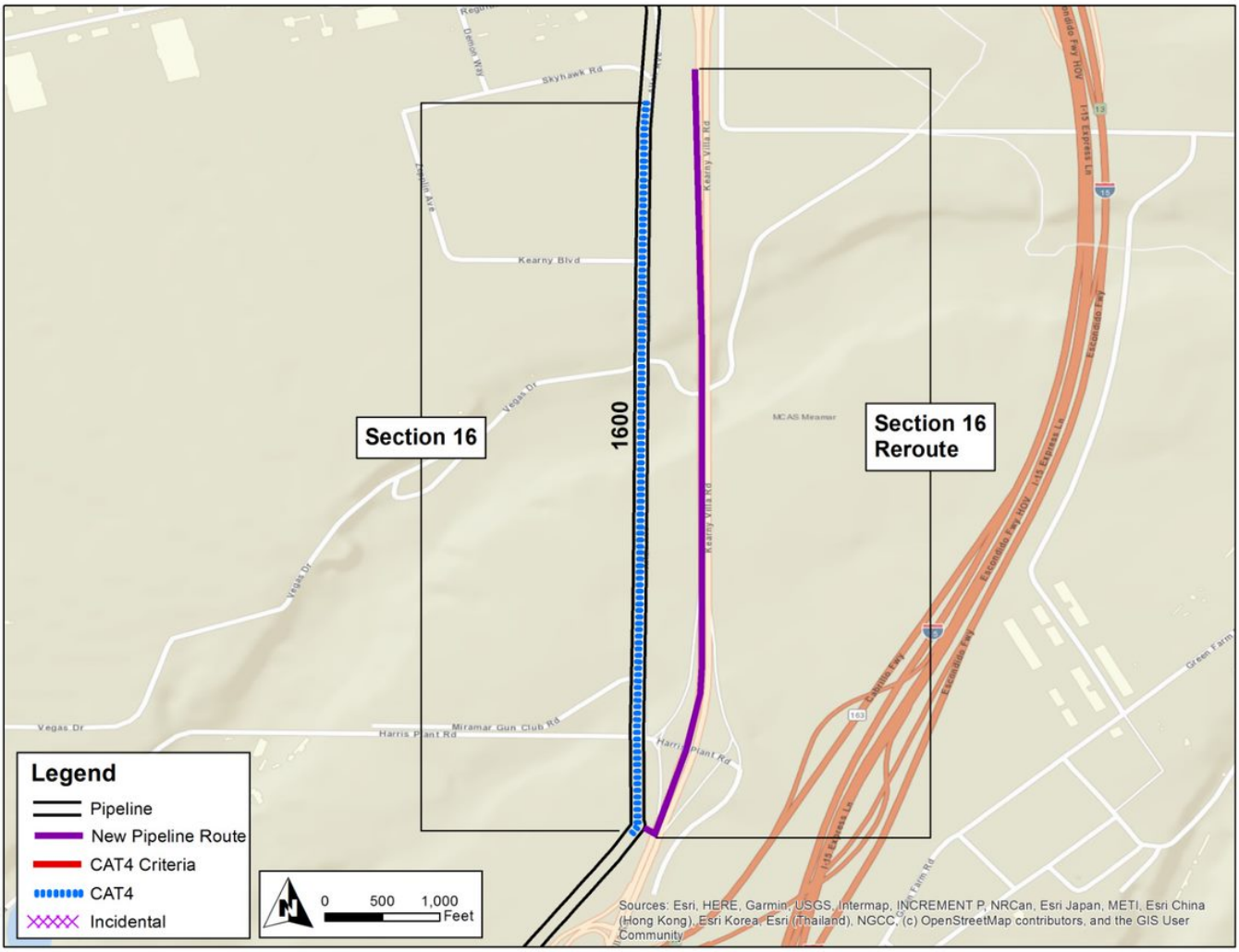

Figure 2: Satellite Map for Line 1600 MCAS Central Replacement

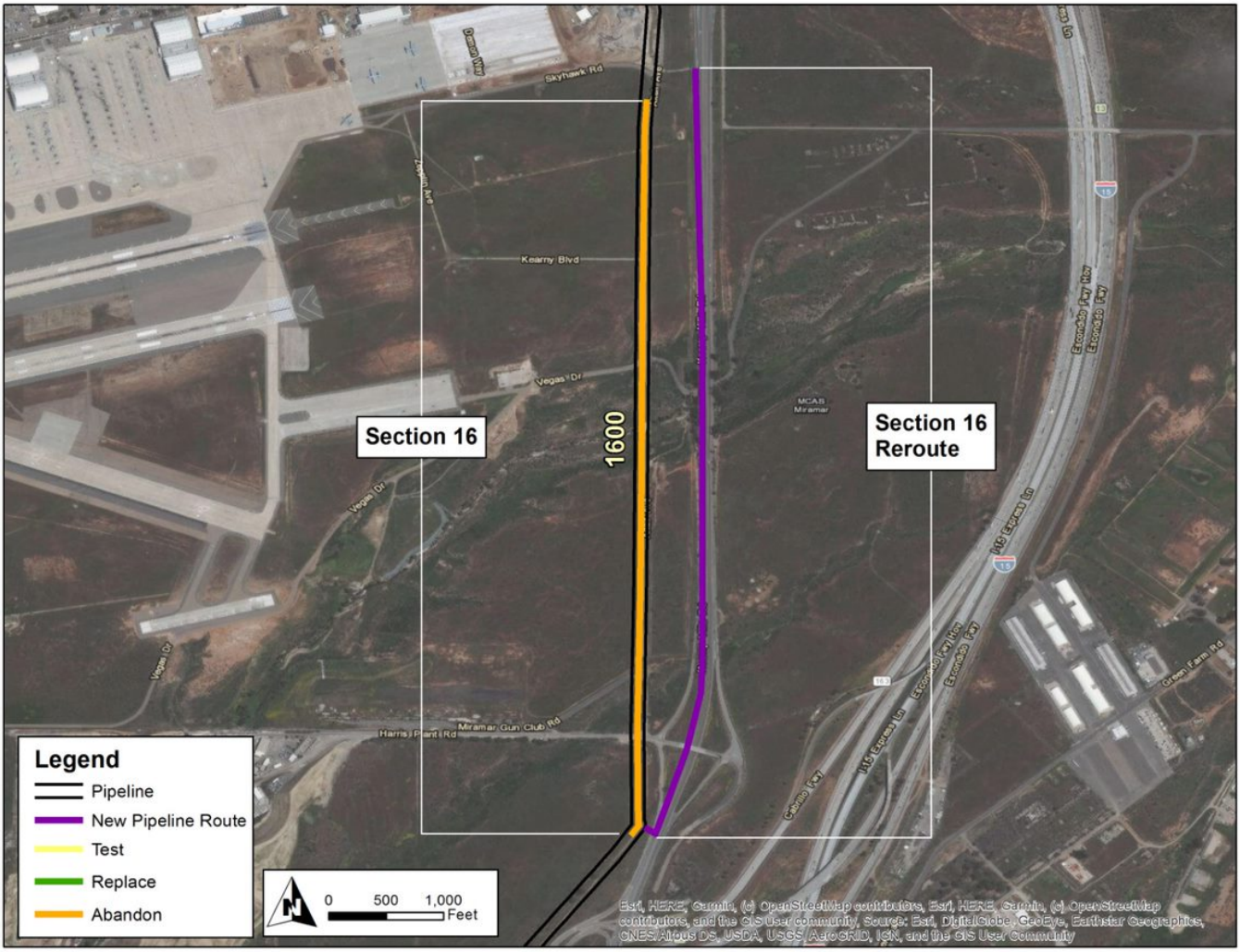

Table 2: Project Mileage

PHASE	MILEAGE
CATEGORY 4 CRITERIA[5]	0.000
CATEGORY 4[6]	1.212
INCIDENTAL	0.000
REPLACEMENT OFFSET	0.000
TOTAL MILEAGE[7]	1.212

The direct costs for each area are summarized below.

Table 3: Material ($000's)

PROJECT COST	2019 & Prior	2020	2021	2022	2023	2024	Total[8]
TOTAL DIRECT COSTS (NON-LABOR)[9]	$0	$0	$217	$224	$96	$181	$717

Assumptions

Materials for this project will be purchased following final internal authorization 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. Primary components include:

- 6,660 feet of 16-inch pipe meeting SDG&E specifications.
- 1,800 feet of 4-inch pipe meeting SDG&E specifications.
- Three 16-inch fittings meeting SDG&E specifications.

Table 4: Construction ($000's)

PROJECT COST	2019 & Prior	2020	2021	2022	2023	2024	Total[10]
TOTAL DIRECT COSTS (NON-LABOR)[11]	$2	$1	$0	$0	$8,168	$0	$8,171

[5] Lacks documentation of a post-construction strength test in a Class 3 or 4 HCA.
[6] Lacks documentation of a post-construction strength test in a Class 1 or 2 non-HCA.
[7] Values may not add to total due to rounding.
[8] Values may not add to total due to rounding.
[9] Direct Costs reflect escalation.
[10] Values may not add to total due to rounding.
[11] Direct Costs reflect escalation.

Pipeline Safety Enhancement Plan Workpaper Supporting Chapter

Line 1600 MCAS Central Replacement Project

Assumptions

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

- One mobilization and one demobilization.
- Contractor work is estimated using a eight hour per day, five day work week.
- Working hours are based on a six hour production window between from 9:00 AM to 3:00 PM.
- Fiber optic lines will be installed above the new pipeline.
- Excess spoils will be hauled off and disposed.
- Tie-ins will be completed during a 16 hour continuous shift.
- Laydown yards will be restored to the original condition at the end of the project.
- Restoration of asphalt pavement and striping along ROW will be performed the end of the project.

Additional Construction Information

- **Site Mobilization / Site Facilities**
  - One mobilization and one demobilization.
  - Two office trailers have been included for management and inspection personnel at the primary laydown yard.
  - Four months of site duration is anticipated.
  - Track out plates will be utilized at street access points to minimize soil being tracked onto the street by construction vehicles.

- **Site Management / Best Management Practices (BMPs)**
  - BMP materials for spoils piles, laydown yard, and work site.

- **Material Handling**
  - 14 loads of material will be unloaded by the contractor at laydown yards and transported as needed.

- **Traffic Control**
  - Three man crew traffic control support during the project at all intersections, during hydrotesting, isolations, tie-ins, and restoration. This includes all traffic control devices and equipment necessary to complete the project.

- **Utility Locates**
  - A part time locate crew will be utilized to verify identified utilities and existing pipeline crossings.

- **Pipeline Installation**
  - Installation includes the following:
    - Approximately 6,600 linear feet (LF) of 16-inch pipe.
    - Approximately 1,800 linear feet (LF) of 4-inch pipe.
  - Site demo, excavation and pad trench / bellholes, string and bends pipe, coating joints.
  - Installation of fiber optic line and pipeline warning mesh.

- **Isolate Existing Pipeline**
  - The pipeline will be isolated in conjunction with tie-in activities.
  - The pipeline will not be separately isolated until the new pipeline has been installed and tested.

- **Pressure Test Pipeline**
  - Preparatory work for the setup of water tanks.
  - Installation of hard piping from the test head to the tank pump.
  - The pipeline will be tested in one post-completion hydrotest.
  - Following the dewatering of each section of pipe, it will be intermittently dried until ready to be tied-in.

- **Tie-in Pipeline**
  - One 16 hour continuous shift for tie-in.

- **Retire / Abandon Existing Pipeline**
  - Five abandonment excavations are planned.
  - The abandon pipeline will be grout filled.

- **Retire / Abandon Existing Pipeline**
  - 5 abandonment excavations are planned.
  - The abandon pipeline will be grout filled.

- **Site Restoration**
  - Base paving of trench will be up to 8-inch thick.
  - Approximately 107,280 SF of disturbed asphalt pavement area will receive a mill and overlay approximately 18 feet wide and 2-inch thick.
  - All paved roads will receive new striping and pavement markings where disturbed with approximately 17,223 LF of 4-inch white solid fog lane and bike lane, including 4-inch broken white vehicle lane.

- **Site Demobilization**
  - One load of excess piping will be hauled to SDG&E designated yard.

- **Field Overhead**
  - Full time Project Manager
  - Full time Superintendent
  - Full time Safety Supervisor

Table 5: Environmental Survey/Permitting/Monitoring ($000's)

PROJECT COST	2019 & Prior	2020	2021	2022	2023	2024	Total[12]
TOTAL DIRECT COSTS (NON-LABOR)[13]	$270	$164	$167	$179	$794	$105	$1,680

Assumptions

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

- Asbestos abatement of Asbestos Containing Material (ACM).
- Non-hazardous waste containment/disposal.
- Water source will be a hydrant located near the new alignment.
- Water will be treated and disposed within municipal sewer for hydrotest. Any water encountered during trenching would be stored in water tanks and discharged to land.
- Water treatment and disposal of approximately 65,000 gallons of hydrostatic test water.
- Permit costs.

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

- Environmental Consultants for pre-construction assessments, construction monitoring, and environmental close-out support.
- Abatement support is based upon Subject Matter Expert (SME) recommendations.
- Aquatic Features jurisdictional delineations.
- Stormwater Pollution Prevention Plan (SWPPP) development and monitoring.
- Committee for Land and Airspace Management Policy (CLAMP) and TIER 1 Application and associated National Environmental Policy Act (NEPA) compliance support. California Department of Fish and Wildlife (Streambed Alteration Agreement).
- Regional Water Quality Control Board (401 Certification).
- US Army Corps (404 Permit).

Table 6: Land & Right of Way Acquisition ($000's)

PROJECT COST	2019& Prior	2020	2021	2022	2023	2024	Total[14]
TOTAL DIRECT COSTS (NON-LABOR)[15]	$0	$38	$52	$51	$0	$80	$220

[12] Values may not add to total due to rounding.
[13] Direct Costs reflect escalation.
[14] Values may not add to total due to rounding.
[15] Direct Costs reflect escalation.

Assumptions

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

- Encroachment permit and traffic control plan costs.
- New easement costs.
- Temporary Right of Entry (TRE) - Construction yards and workspace required for construction activities.

Factors such as location, zoning, current market price and square footage are considered to determine a final estimated value specific to easements and TRE permits.

Table 7: Company Labor ($000's)

PROJECT COST	2019 & Prior	2020	2021	2022	2023	2024	Total[16]
TOTAL DIRECT COSTS (LABOR)	$166	$89	$198	$198	$1,882	$65	$2,597

Assumptions

SDG&E and SoCalGas Labor - Management, Engineering, and Non-Union Labor

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

- Project Management (17,030 hours)
- Project Field Management (5,725 hours)
- Construction Management (704 hours)
- Environmental Services (3,868 hours)
- Land Services (969 hours)

Company employees provide extensive oversight with respect to safety; environmental protection; site management; construction, engineering and design services contract management and administration; project engineering and management; planning; scheduling; progress control; cost estimating, tracking and control; inspection; job site material and logistics management as well as job site customer interface management and community outreach.

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

Critical operational activities such as operating valves, bringing the cathodic protection system online, bringing instrumentation online, gas handling and removing old assets from service as well as loading gas into new assets and placing them into service are all completed by Company Union personnel.

SDG&E Labor - Union Labor

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

Table 8: Other Costs ($000's

PROJECT COST	2019 & Prior	2020	2021	2022	2023	2024	Total[17]
TOTAL DIRECT COSTS (NON-LABOR)[18]	$570	$291	$344	$188	$2,089	$522	$4,004

Assumptions

In addition to costs previously described above, there are other costs incurred as part of completing the project that are primarily associated with contracts that are established with specialized service providers that either perform a unique service or supplement the core Company project team. It is typical that services are contracted to complete activities related to planning, engineering, design, estimating, project and construction management, scheduling, survey, construction inspection, x-ray and non-destructive examination of welds, hot tapping and/or stopple services, temporary gas supplies, gas capture services, safety services, as well as as-built and project documentation and records management services. Other costs also include non-labor expenses related to business related mileage, travel, meals and lodging.

Engineering and Project Management

- Developed upon specified scope of work, planned deliverables, and activity levels of effort reflecting anticipated manpower requirements over the planned timeframe of the project schedule.
- Non-labor costs included in this estimate address travel, meals, expenses, and lodging incurred for SDG&E Labor.

Construction Support Services

The high-level assumptions and specific level of effort to provide construction management support for this project are described in more detail below.

- 56 days of X-Ray / NDE support with full time X-Ray support with each pipeline lay crew.
- Gas capture services to reduce the amount of natural gas vented to atmosphere.

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

[18] Direct Costs reflect escalation.

Inspection Services

- Full time Chief Inspector
- Full time Trenching Inspector
- Two full time Welding Inspectors

Survey and Design Services

- The survey and design service estimate includes survey support staff for project and site facility layout and as-builts. The estimate also includes engineering team material support in the development of as-built close-out packages.

Table 9: Indirect Costs ($000's)

PROJECT COST	2019 & Prior	2020	2021	2022	2023	2024	Total[19]
COMPANY OVERHEADS	$184	$106	$267	$262	$2,228	$148	$3,196

Assumptions

- Indirect costs are for Administrative and General, purchasing, warehousing, pension and benefits, payroll tax, and other costs that are overhead in nature.
- Indirect costs do not include AFUDC or Property Tax.

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

Pipeline Safety Enhancement Plan Workpaper Supporting Chapter

Line 1600 MCAS South Replacement Project

Table 1: Total Project Cost ($000's)

PROJECT COST	2019 & Prior[1]	2020	2021	2022	2023	2024	Total[2]
DIRECT LABOR	$95	$53	$191	$191	$1,843	$203	$2,577
DIRECT NON-LABOR	$525	$405	$730	$663	$10,620	$911	$13,854
TOTAL DIRECT COSTS[3]	$619	$459	$921	$854	$12,462	$1,115	$16,431
COMPANY OVERHEADS[4]	$108	$73	$253	$251	$2,157	$257	$3,099
Total Capital Costs	$727	$532	$1,174	$1,105	$14,620	$1,371	$19,530

Project Description

Line 1600 is a 16-inch diameter transmission line that runs approximately 49.7 miles from Rainbow to Mission Valley, San Diego. Per the CPUC Safety and Enforcement Division (SED) approved *Line 1600 Test or Replacement Plan*, the Line 1600 testing and replacement work is comprised of 19 independent projects. This workpaper describes the Line 1600 MCAS South Replacement project. The project is located in the City of San Diego, primarily within MCAS (Marine Corps Air Station) Miramar property. The project will replace and reroute approximately 0.912 miles of existing 16-inch pipeline with 0.913 miles of new pipeline along Kearny Villa Road from the Kearny Villa Pressure Limiting Station (KVPLS) to Highway 52. This segment was rerouted from within the MCAS military base's high security area and avoids environmentally sensitive areas along the existing right of way (ROW) by placing the replacement line within a new easement to be granted by MCAS Miramar. The project will also install approximately 0.913 miles of fiber optic cable. Fiber optic cable will be installed along the new 16-inch pipeline to assist in leak detection, ground movement, and vibration analysis.

Considerations unique to the project are as follows:

- At the southern end of the project, a section of 1987 vintage pipe crosses Caltrans Highway 52, the Project will not replace this section of pipe. The Project Team identified existing conduit running through the Kearny Villa Road Bridge over Highway 52 which provides a continuous run of fiber optic monitoring. The proposed plan for the fiber optic cable is to have a continuous run from the Line 1600 La Honda-Lincoln Replacement to Line 1600 Serra Mesa Replacement projects. The end result of the continuous run would reduce the number of required monitoring stations between these Projects to one which is located on the Line 1600 Pomerado South Replacement project.
- The new alignment passes near several environmentally sensitive areas such as vernal pools. Extensive environmental reviews have been performed to detail the location, size, and makeup of these environmental features. This has resulted in an environmentally optimized pipeline alignment and associated new access roadways near the Kearny Villa Pressure Limiting Station (KVPLS).

[1] Actual costs incurred associated with planning and engineering design work are included in the project cost estimates.
[2] Values may not add to total due to rounding.
[3] Direct Costs reflect escalation.
[4] Excludes AFUDC and tax.

- The existing and new pipeline are located within the MCAS federal property. This will require a new easement be granted by MCAS Miramar as well as a federal environmental review via the NEPA (National Environmental Policy Act) process. The timeline for review may range from 18 months to four years.
- Proposed laydown yard locations, traffic control planning, encroachment permitting, construction scheduling, and the CLAMP (Committee for Land and Airspace Management Policy) Tier I application development process for MCAS North, MCAS Central, and MCAS South Projects utilized a combined effort approach. This approach provides for streamlined use of resources and increased efficiency across all MCAS North, MCAS Central, and MCAS South projects.

Alternatives Considered

D.18-06-028, Ordering Paragraph 7, required SDG&E and SoCalGas to "submit to Safety and Enforcement Division a hydrostatic test or replacement plan pertaining to the existing 49.7 miles of Line 1600 in its present corridor." The Decision further required such plan to discuss two options: "1. Hydrotest the entire 49.7 miles of line and replace those segments that fail the test; and 2. Replace all pipeline segments in High Consequence Areas (HCAs) along Line 1600, thus ensuring a new pipeline without vintage pipeline characteristics that are perceived to increase the risk of Line 1600. Hydrotest in solely non-HCA segments would ensure less impact if there was a failure during hydrotesting." SDG&E's and SoCalGas' September 26, 2018 *Line 1600 Test or Replacement Plan* discussed D.18-06-028's two options as Design Alternative 1 (Replace in HCA/Test in Non-HCA alternative) and Design Alternative 2 (Full Hydrotest alternative), and also discussed Design Alternative 3 (Full Replacement in Nearby Streets alternative) and Design Alternative 4 (Full Replacement Along Highway 395 alternative). SDG&E and SoCalGas proposed to implement, and the CPUC SED approved, Design Alternative 1, which will replace existing Line 1600 primarily in HCAs and hydrotest the remaining sections in non-HCAs. D.18-06-028 at 92 also required the Utilities to "identify proposed rerouting of the line in specific segments." As discussed in the *Line 1600 Test or Replacement Plan*, "SDG&E and SoCalGas concluded it is not feasible, prudent nor reasonable to build a new replacement pipeline entirely within the existing Line 1600 rights-of-way." Due to construction difficulty, private property and community impacts, environmental impacts, and costs and delays of efforts to expand the existing rights of way (ROW), the *Line 1600 Test or Replacement Plan* proposed to re-route the majority of replacement segments, usually in nearby streets. In developing the Plan, SDG&E and SoCalGas reviewed these proposed re-routes with SED, which "conducted a joint field inspection of the identified sites with SDG&E personnel and its contractor to evaluate the existing safety conditions, constructability and serviceability of Line 1600. After the field inspections, SED agreed with SDG&E's and SoCalGas' proposed reroute of many segments of Line 1600 due to safety and serviceability reasons."

D.20-02-024 requires "a cost forecast for the approved Design Alternative 1 (Replace in HCAs and Hydrotest in Non-HCAs) that SED approved on January 15, 2019."[2] D.20-02-024 at 31-32 held that issues "out of scope" for Phase 2 include "revisiting Design Alternatives 2 (Full Hydrotest Alternative), 3 (Full Replacement), 4 (Full Replacement but different street routing) or alternative recommendations. Nor are we revisiting the substance of the PSEP engineering and implementation that falls within the authority of SED."

Shut-In Analysis

The Line 1600 MCAS South Replacement project can be temporarily taken out of service by utilizing two double stopple bypasses to limit impacts to the transmission system. Distribution system impacts will require noncore customer coordination and the use of a temporary bypass or pressure control fitting (PCF) to allow for shut-in.

Forecast Methodology

The Utilities methodology for forecasting PSEP costs is discussed in the Direct Testimony of Ronn Gonzalez. The Utilities developed a Total Installed Cost (TIC) estimate to implement the above scope of work. The TIC Estimate includes direct costs associated with project management, engineering and design, environmental permitting, land acquisition, material and equipment procurement, and construction.

Following the approval of the Plan by SED in January 2019, the Utilities have undertaken the detailed design and planning of the 19 individual projects in the Plan. Generally, projects that are earliest in the overall schedule are the most developed, while those later in the overall schedule are less developed. At the time of cost estimate preparation, this project was at an approximately 30% design level. Further development of this project could reveal new information requiring some adjustments to the project plan in the areas such as engineering, materials, construction, permitting, environmental and land, all of which could impact actual costs compared this cost estimate.

Schedule

Implementation of this project is proposed to be completed consistent with the overall prioritization and timing described in Section IV. D. of the *Line 1600 Test or Replacement Plan*. The schedule was developed based on the five-stage project life cycle as defined by PSEP. The key project deliverables were identified and incorporated into a work breakdown structure. This work breakdown structure was then sequenced, and predecessor and successor tasks were linked to each task. Durations were added to each task to provide a total project duration.

The preliminary Stage 4 Construction Schedule received additional planning and stakeholder input considering that typically 50% of the project costs are expended during the construction phase. The construction schedule is assumed to be 90 working days.

Figure 1: Overview Map for Line 1600 MCAS South Replacement

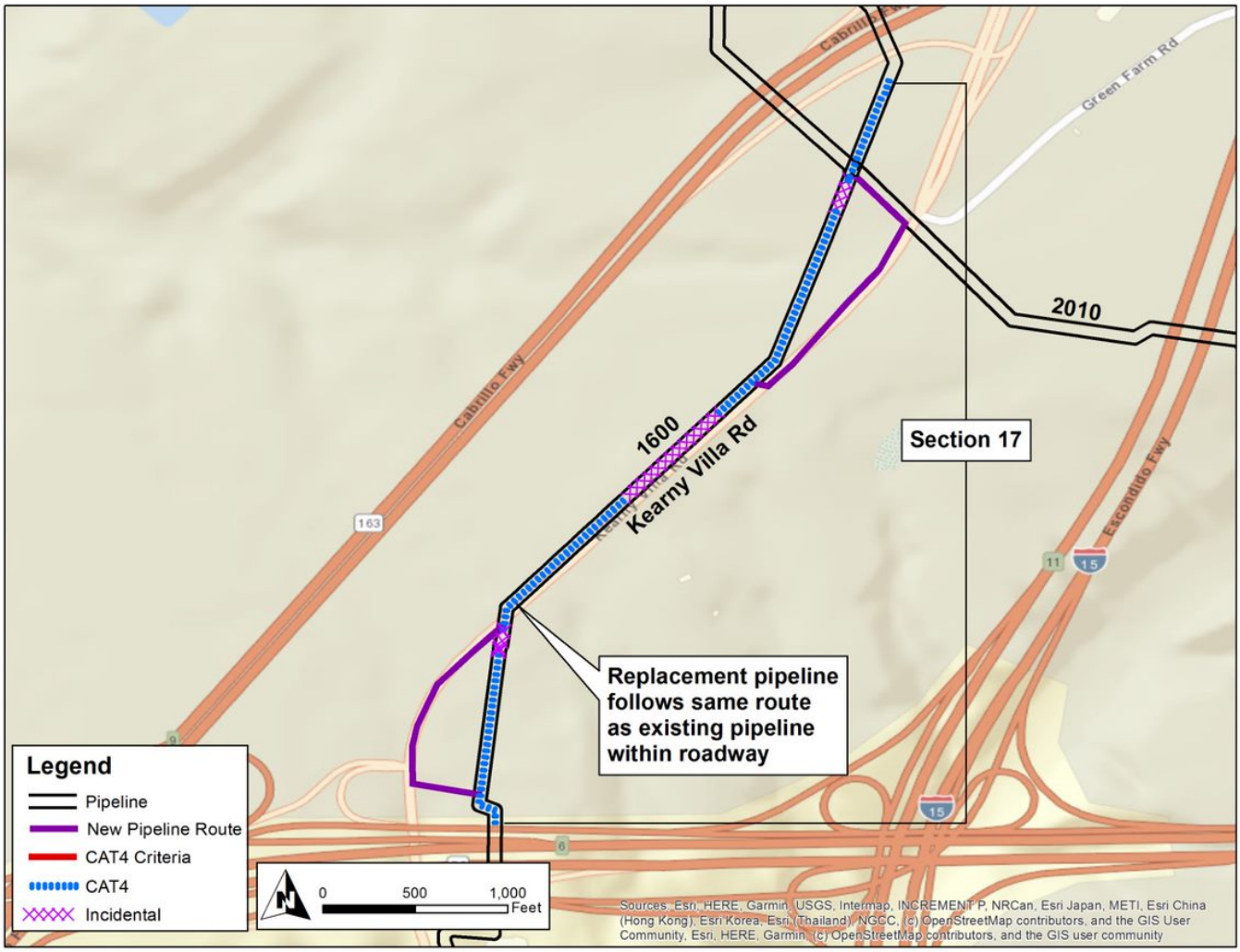

Figure 2: Satellite Map for Line 1600 MCAS South Replacement

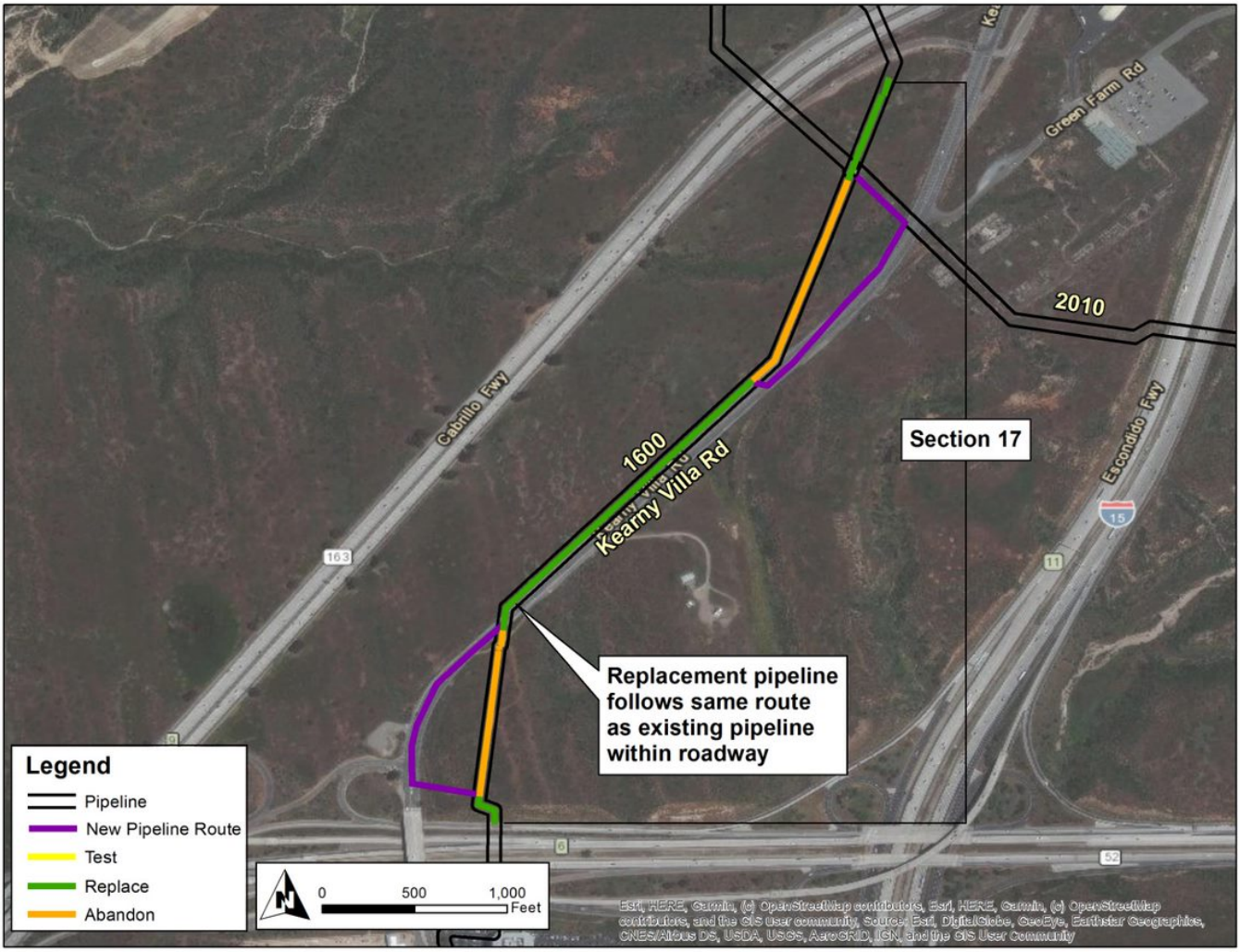

Table 2: Project Mileage

PHASE	MILEAGE
CATEGORY 4 CRITERIA[5]	0.000
CATEGORY 4[6]	0.882
INCIDENTAL	0.030
REPLACEMENT OFFSET	0.000
TOTAL MILEAGE[7]	0.913

The direct costs for each area are summarized below.

Table 3: Material ($000's)

PROJECT COST	2019 & Prior	2020	2021	2022	2023	2024	Total[8]
TOTAL DIRECT COSTS (NON-LABOR)[9]	$0	$0	$194	$200	$120	$129	$643

Assumptions

Materials for this project will be purchased following final internal authorization 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. Primary components include:

- 5,160 feet of 16-inch pipe meeting SDG&E specifications.
- 10 16-inch fittings meeting SDG&E specifications.

Table 4: Construction ($000's)

PROJECT COST	2019 & Prior	2020	2021	2022	2023	2024	Total[10]
TOTAL DIRECT COSTS (NON-LABOR)[11]	$20	$1	$0	$0	$7,473	$0	$7,494

Assumptions

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

[5] Lacks documentation of a post-construction strength test in a Class 3 or 4 HCA.
[6] Lacks documentation of a post-construction strength test in a Class 1 or 2 non-HCA.
[7] Values may not add to total due to rounding.
[8] Values may not add to total due to rounding.
[9] Direct Costs reflect escalation.
[10] Values may not add to total due to rounding.
[11] Direct Costs reflect escalation.

- One mobilization and one demobilization.
- Contractor work is estimated using a eight hour per day, five day work week.
- Working hours are based on a six hour production window between from 9:00 AM to 3:00 PM.
- Fiber optic lines will be installed above the new pipeline.
- Excess spoils will be hauled off and disposed.
- Tie-ins will be completed during a 16 hour continuous shift.
- Laydown yards will be restored to the original condition at the end of the project.
- Restoration of asphalt pavement and striping along ROW will be performed the end of the project.

Additional Construction Information

- **Site Mobilization / Site Facilities**
  - One mobilization and one demobilization.
  - Two office trailers have been included for management and inspection personnel at the primary laydown yard.
  - Five months of site duration is anticipated.
  - Track out plates will be utilized at street access points to minimize soil being tracked onto the street by construction vehicles.

- **Site Management / Best Management Practices (BMPs)**
  - BMP materials for spoils piles, laydown yard, and work site.

- **Material Handling**
  - 11 loads of material will be unloaded by the contractor at laydown yards and transported as needed.

- **Traffic Control**
  - Three man crew traffic control support during the project at all intersections, during hydrotesting, isolations, tie-ins, and restoration. This includes all traffic control devices and equipment necessary to complete the project.

- **Utility Locates**
  - A utility locates crew will be utilized to verify identified utilities and existing pipeline.

- **Pipeline Installation**
  - Installation includes the following:
    - Approximately 5,160 linear feet (LF) of 16-inch pipe.
    - Approximately 1,800 linear feet (LF) of 4-inch pipe.
  - Site demo, excavation and pad trench / bellholes, string and bends pipe, coating joints.
  - Installation of fiber optic line and pipeline warning mesh.

- **Isolate Existing Pipeline**
  - The pipeline will be isolated in conjunction with tie-in activities.
  - The pipeline will not be separately isolated until the new pipeline has been installed and tested.

- **Pressure Test Pipeline**
  - Preparatory work for the setup of water tanks.
  - Installation of hard piping from the test head to the tank pump.
  - The pipeline will be tested in one post-completion hydrotest.
  - Following the dewatering of each section of pipe, it will be intermittently dried until ready to be tied-in.

- **Tie-In Pipeline**
  - One 16 hour continuous shift for tie-in.

- **Retire / Abandon Existing Pipeline**
  - The abandon pipeline will be grout filled.

- **Site Restoration**
  - Base paving of trench will be up to 8-inch thick in the City of San Diego where the pipeline is installed in paved zones.
  - Approximately 44,290 SF of disturbed asphalt pavement area will receive a mill and overlay.
  - All paved roads will receive new striping where disturbed.

- **Site Demobilization**
  - One load of excess piping will be hauled to SDG&E designated yard.

- **Field Overhead**
  - Full time Project Manager
  - Full time Superintendent
  - Full time Safety Supervisor

Table 5: Environmental Survey/Permitting/Monitoring ($000's)

PROJECT COST	2019 & Prior	2020	2021	2022	2023	2024	Total[12]
TOTAL DIRECT COSTS (NON-LABOR)[13]	$152	$122	$176	$188	$739	$279	$1,656

[12] Values may not add to total due to rounding.
[13] Direct Costs reflect escalation.

Assumptions

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

- Asbestos abatement of Asbestos Containing Material (ACM).
- Non-hazardous waste containment/disposal.
- Water source will be a hydrant located near the new alignment.
- Water will be treated and disposed within municipal sewer for hydrotest. Any water encountered during trenching would be stored in water tanks and discharged to land.
- Water treatment and disposal of approximately 48,000 gallons of hydrostatic test water.

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

- Environmental Consultants for pre-construction assessments, construction monitoring, and environmental close-out support.
- Abatement support is based upon Subject Matter Expert (SME) recommendations.
- Storm Water Pollution Prevention Plan (SWPPP) development and monitoring.
- Committee for Land and Airspace Management Policy (CLAMP) and TIER 1 Application and associated National Environmental Policy Act (NEPA) compliance support.

Table 6: Land & Right of Way Acquisition ($000's)

PROJECT COST	2019 & Prior	2020	2021	2022	2023	2024	Total[14]
TOTAL DIRECT COSTS (NON-LABOR)[15]	$2	$16	$33	$68	$46	$0	$166

Assumptions

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

- Encroachment permit and traffic control plan costs.
- New easement costs.
- Temporary Right of Entry (TRE) - Construction yards and workspace required for construction activities.

Factors such as location, zoning, current market price and square footage are considered to determine a final estimated value specific to easements and TRE permits.

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

[15] Direct Costs reflect escalation.

Table 7: Company Labor ($000's)

PROJECT COST	2019 & Prior	2020	2021	2022	2023	2024	Total[16]
TOTAL DIRECT COSTS (LABOR)[17]	$95	$53	$191	$191	$1,843	$203	$2,577

Assumptions

SDG&E and SoCalGas Labor - Management, Engineering, and Non-Union Labor

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

- Project Management (16,354 hours)
- Project Field Management (5,825 hours)
- Construction Management (800 hours)
- Environmental Services (4,100 hours)
- Land Services (969 hours)

Company employees provide extensive oversight with respect to safety; environmental protection; site management; construction, engineering and design services contract management and administration; project engineering and management; planning; scheduling; progress control; cost estimating, tracking and control; inspection; job site material and logistics management as well as job site customer interface management and community outreach.

SDG&E Labor - Union Labor

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

Critical operational activities such as operating valves, bringing the cathodic protection system online, bringing instrumentation online, gas handling and removing old assets from service as well as loading gas into new assets and placing them into service are all completed by Company Union personnel.

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

[17] Direct Costs reflect escalation.

Table 8: Other Costs ($000's)

PROJECT COST	2019 & Prior	2020	2021	2022	2023	2024	Total[18]
TOTAL DIRECT COSTS (NON-LABOR)[19]	$350	$267	$327	$206	$2,243	$503	$3,896

Assumptions

In addition to costs previously described above, there are other costs incurred as part of completing the project that are primarily associated with contracts that are established with specialized service providers that either perform a unique service or supplement the core Company project team. It is typical that services are contracted to complete activities related to planning, engineering, design, estimating, project and construction management, scheduling, survey, construction inspection, x-ray and non-destructive examination of welds, hot tapping and/or stopple services, temporary gas supplies, gas capture services, safety services, as well as as-built and project documentation and records management services. Other costs also include non-labor expenses related to business related mileage, travel, meals and lodging.

Engineering and Project Management

- Developed upon specified scope of work, planned deliverables, and activity levels of effort reflecting anticipated manpower requirements over the planned timeframe of the project schedule.
- Contracted engineering assistance to identify and evaluate potential options to bring Line 1600 into compliance with D.11-06-017 and Public Utilities Code § 958.
- Non-labor costs included in this estimate address travel, meals, expenses, and lodging incurred for SDG&E Labor.

Construction Support Services

The high-level assumptions and specific level of effort to provide construction management support for this project are described in more detail below.

- 63 days of X-Ray / NDE support with full time X-Ray support with each pipeline lay crew.
- No CNG to support existing taps during system downtime is planned.
- Gas capture services to reduce the amount of natural gas vented to atmosphere.
- Four stopple fitting services.

Inspection Services

- Full time Chief Inspector
- Two full time Welding Inspectors

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

[19] Direct Costs reflect escalation.

Survey and Design Services

The survey and design service estimate includes survey support staff for project and site facility layout and as-builts. The estimate also includes engineering team material support in the development of as-built close-out packages.

Table 9: Indirect Costs ($000's)

PROJECT COST	2019 & Prior	2020	2021	2022	2023	2024	Total[20]
COMPANY OVERHEADS	$108	$73	$253	$251	$2,157	$257	$3,099

Assumptions

- Indirect costs are for Administrative and General, purchasing, warehousing, pension and benefits, payroll tax, and other costs that are overhead in nature.
- Indirect costs do not include AFUDC or Property Tax.

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

Pipeline Safety Enhancement Plan Workpaper Supporting Chapter

Line 1600 Kearny Mesa Replacement Project

Table 1: Total Project Cost ($000's)

PROJECT COST	2019 & Prior[1]	2020	2021	2022	Total[2]
DIRECT LABOR	$407	$749	$744	$0	$1,901
DIRECT NON-LABOR	$2,473	$21,441	$4,850	$0	$28,764
TOTAL DIRECT COSTS[3]	$2,880	$22,190	$5,594	$0	$30,665
COMPANY OVERHEADS[4]	$728	$2,010	$1,141	$0	$3,879
Total Capital Costs	$3,608	$24,201	$6,735	$0	$34,544

Project Description

Line 1600 is a 16-inch diameter transmission line that runs approximately 49.7 miles from Rainbow to Mission Valley. Per the CPUC Safety and Enforcement Division (SED) approved *Line 1600 Test or Replacement Plan*, the Line 1600 testing and replacement work is comprised of 19 independent projects. This workpaper describes the Line 1600 Kearny Mesa Replacement project. The Line 1600 Kearny Mesa Replacement project is located in the City of San Diego and will replace approximately 2.020 miles of existing 16-inch pipeline with 1.501 miles of new 16-inch pipeline along Ruffin Road from Waxie Way to Ridegehaven Court. Due to the offset of the new alignment, some distribution work will be required as part of the project scope to allow for existing customers to be served from the rerouted alignment. Associated distribution work includes the installation of approximately 0.606 miles new 8-inch pipe to allow for continuity of service to a large industrial customer who is located farther away from the new pipeline alignment, the installation of two new regulator stations, the tie-over of one existing regulator station, and the replacement of approximately 0.417 miles of 6-inch distribution main. The project will also install approximately 1.501 miles of fiber optic cable. Fiber optic cable will be installed along the new 16-inch pipeline to assist in leak detection, ground movement, and vibration analysis. Construction of this project began on June 15, 2020 and is expected to be complete by Q4 2020.

Considerations unique to the project are as follows:

- The location of the new easement for the new 8-inch pipeline avoids environmentally sensitive land crossing Montgomery Airport.
- In order to reduce costs and to avoid curtailment of the large industrial customer, the Project Team utilized a bypass piping that is designed to provide uninterrupted service in a manner that would still allow for a cold tie-in to the customers regulator inlets.

[1] Actual costs incurred associated with planning and engineering design work are included in the project cost estimates.
[2] Values may not add to total due to rounding.
[3] Direct Costs reflect escalation.
[4] Excludes AFUDC and tax.

- The proposed plan for the fiber optic cable is to have a continuous run from the Line 1600 La Honda-Lincoln Replacement to Line 1600 Serra Mesa Replacement projects. The end result of the continuous run would reduce the number of required monitoring stations between these Projects to one which is located on the Line 1600 Pomerado South Replacement project.

Alternatives Considered

D.18-06-028, Ordering Paragraph 7, required SDG&E and SoCalGas to "submit to Safety and Enforcement Division a hydrostatic test or replacement plan pertaining to the existing 49.7 miles of Line 1600 in its present corridor." The Decision further required such plan to discuss two options: "1. Hydrotest the entire 49.7 miles of line and replace those segments that fail the test; and 2. Replace all pipeline segments in High Consequence Areas (HCAs) along Line 1600, thus ensuring a new pipeline without vintage pipeline characteristics that are perceived to increase the risk of Line 1600. Hydrotest in solely non-HCA segments would ensure less impact if there was a failure during hydrotesting." SDG&E's and SoCalGas' September 26, 2018 Line *1600 Test or Replacement Plan* discussed D.18-06-028's two options as Design Alternative 1 (Replace in HCA/Test in Non-HCA alternative) and Design Alternative 2 (Full Hydrotest alternative), and also discussed Design Alternative 3 (Full Replacement in Nearby Streets alternative) and Design Alternative 4 (Full Replacement Along Highway 395 alternative). SDG&E and SoCalGas proposed to implement, and the CPUC SED approved, Design Alternative 1, which will replace existing Line 1600 primarily in HCAs and hydrotest the remaining sections in non-HCAs. D.18-06-028 at 92 also required the Utilities to "identify proposed rerouting of the line in specific segments." As discussed in *the Line 1600 Test or Replacement Plan,* "SDG&E and SoCalGas concluded it is not feasible, prudent nor reasonable to build a new replacement pipeline entirely within the existing Line 1600 rights-of-way." Due to construction difficulty, private property and community impacts, environmental impacts, and costs and delays of efforts to expand the existing rights of way (ROW), the *Line 1600 Test or Replacement Plan* proposed to re-route the majority of replacement segments, usually in nearby streets. In developing the Plan, SDG&E and SoCalGas reviewed these proposed re-routes with SED, which "conducted a joint field inspection of the identified sites with SDG&E personnel and its contractor to evaluate the existing safety conditions, constructability and serviceability of Line 1600. After the field inspections, SED agreed with SDG&E's and SoCalGas' proposed reroute of many segments of Line 1600 due to safety and serviceability reasons."

D.20-02-024 requires "a cost forecast for the approved Design Alternative 1 (Replace in HCAs and Hydrotest in Non-HCAs) that SED approved on January 15, 2019."[2] D.20-02-024 at 31-32 held that issues "out of scope" for Phase 2 include "revisiting Design Alternatives 2 (Full Hydrotest Alternative), 3 (Full Replacement), 4 (Full Replacement but different street routing) or alternative recommendations. Nor are we revisiting the substance of the PSEP engineering and implementation that falls within the authority of SED."

Shut-In Analysis

The Line 1600 Kearny Mesa Replacement project can be temporarily taken out of service under any seasonal condition but will require coordination with non-core customers to reduce service impacts.

Forecast Methodology

The Utilities methodology for forecasting PSEP costs is discussed in the Direct Testimony of Ronn Gonzalez. The Utilities developed a Total Installed Cost (TIC) estimate to implement the above scope of work. The TIC Estimate includes direct costs associated with project management, engineering and design, environmental permitting, land acquisition, material and equipment procurement, and construction.

Following the approval of the Plan by SED in January 2019, the Utilities have undertaken the detailed design and planning of the 19 individual projects in the Plan. Generally, projects that are earliest in the overall schedule are the most developed, while those later in the overall schedule are less developed. At the time of cost estimate preparation, this project was at an approximately 30% design level. Further development of this project could reveal new information requiring some adjustments to the project plan in the areas such as engineering, materials, construction, permitting, environmental and land, all of which could impact actual costs compared this cost estimate.

Schedule

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

The preliminary Stage 4 Construction Schedule received additional planning and stakeholder input considering that typically 50% of the project costs are expended during the construction phase. The construction schedule is assumed to be 135 days.

Figure 1: Overview Map for Line 1600 Kearny Mesa Replacement

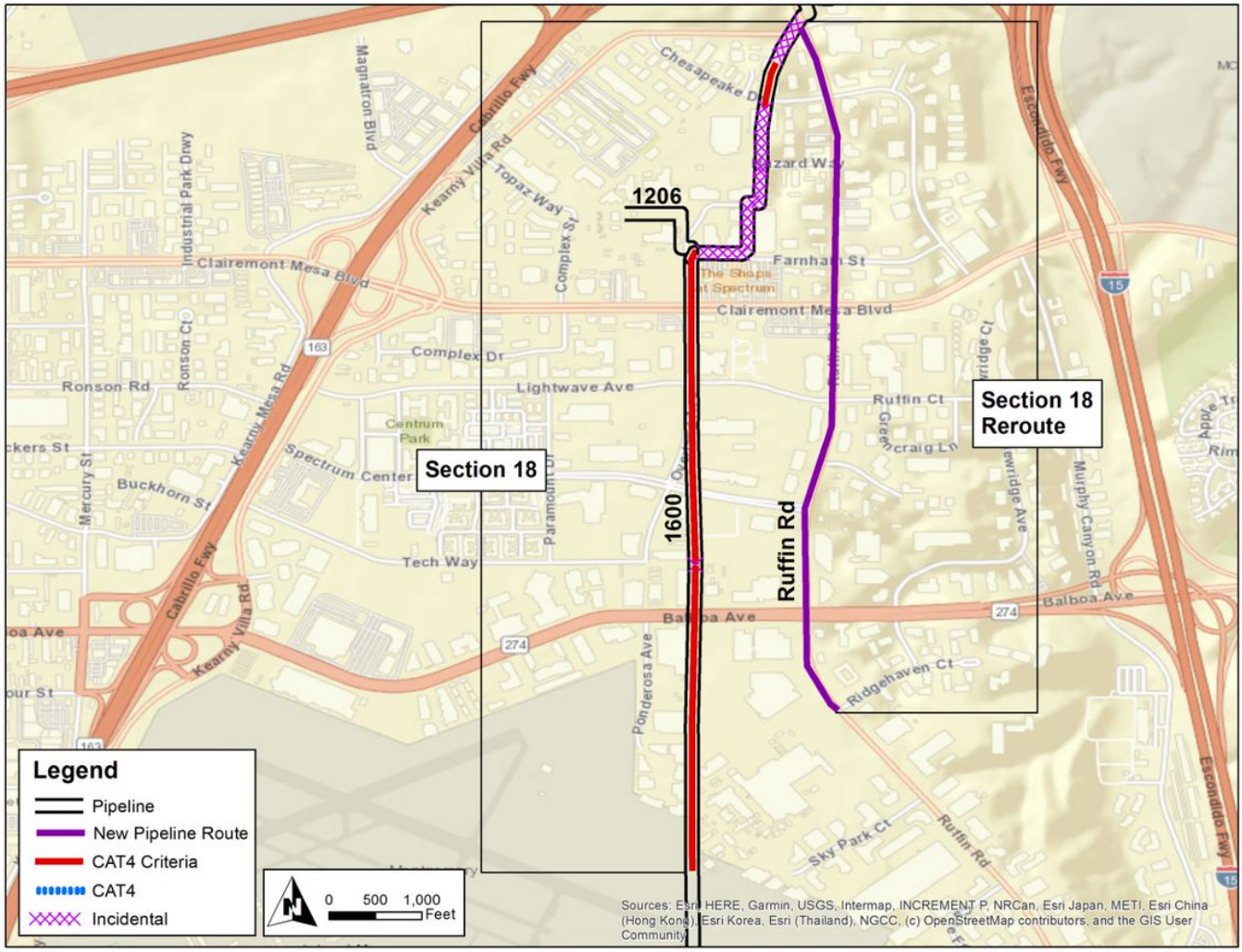

Figure 2: Satellite Map for Line 1600 Kearny Mesa Replacement

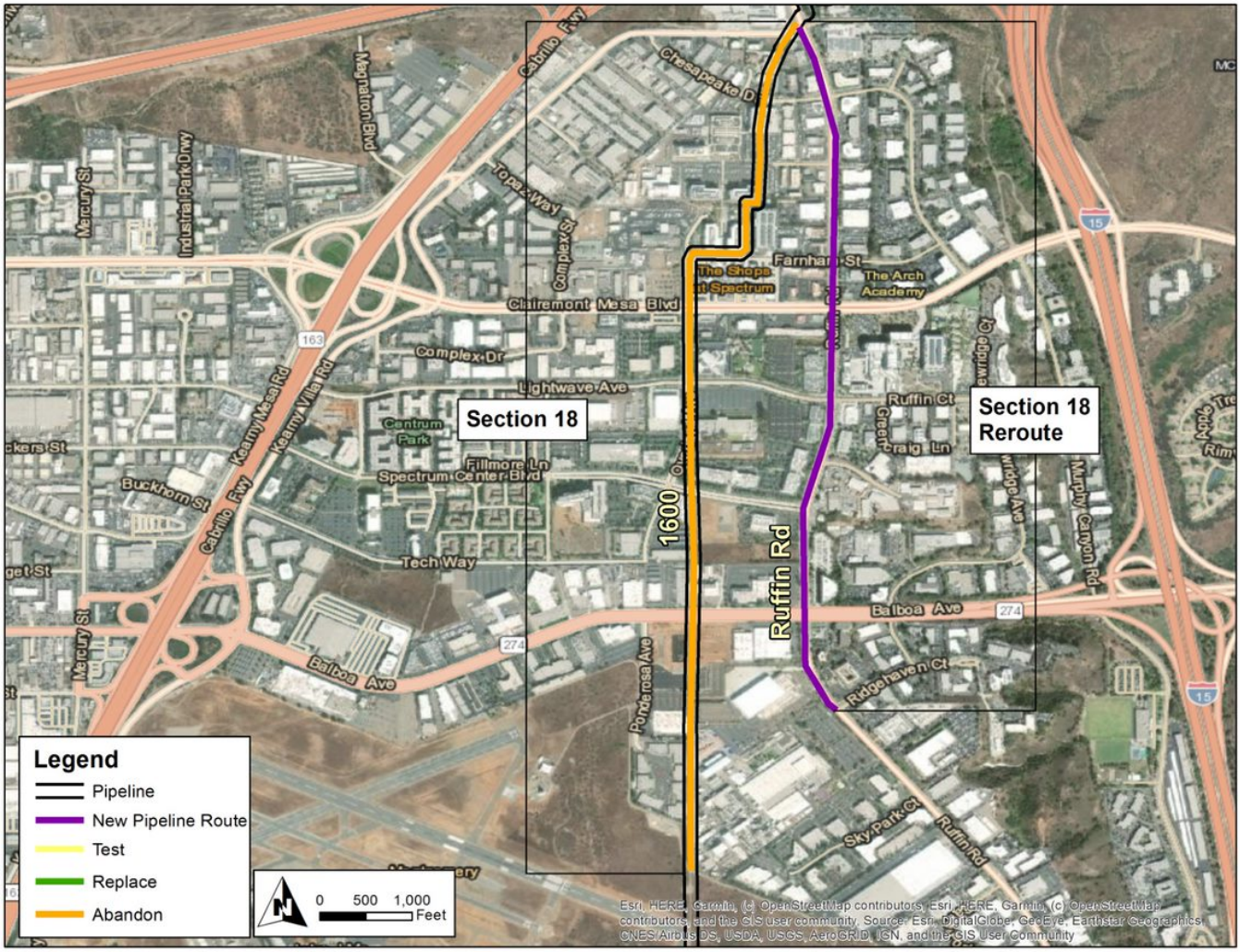

Table 2: Project Mileage

PHASE	MILEAGE
CAT 4 CRITERIA	1.413
CAT 4	0.084
INCIDENTAL	0.523
REPLACEMENT OFFSET	0.000
TOTAL MILEAGE[5][6]	1.501

The direct costs for each area are summarized below.

Table 3: Material ($000's)

PROJECT COST	2019 & Prior	2020	2021	2022	Total[7]
DIRECT NON-LABOR (NON-LABOR)[8]	$439	$108	$963	$0	$1,511

Assumptions

Materials for this project were purchased after final internal authorization to purchase long lead time material. This allowed for material to be procured, inspected, and delivered to coincide with the anticipated construction start date. Primary components include:

- 8,900 feet of 16-inch pipe meeting SDG&E specifications.
- 3,360 feet of 8-inch pipe meeting SDG&E specifications.
- 2,860 feet of 6-inch pipe meeting SDG&E specifications.
- 15 16-inch fittings meeting SDG&E specifications.

[5] Values may not add to total due to rounding.
[6] Total mileage of the completed project differs from the mileage of the pipe addressed due to realignment of the pipeline route.
[7] Values may not add to total due to rounding.
[8] Direct Costs reflect escalation.

Table 4: Construction ($000's)

PROJECT COST	2019 & Prior	2020	2021	2022	Total[9]
DIRECT NON-LABOR (NON-LABOR)[10]	$37	$18,636	$0	$0	$18,673

Assumptions

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

- One mobilization and one demobilization.
- Contractor work has been scheduled using an eight hour per day, five-day work week.
- Night work is included for installation of the new pipeline installation.
- Fiber optic lines will be installed above the new pipeline.
- Tie-in of the new 16-inch pipeline will be completed during a 24 hour continuous shift.
- Two mainline install crews will be utilized. One for intersections and select open trench installations, and one for all other open trench installation.
- Laydown yards will be restored to original condition at the end of the project.
- Restoration of grade along right of way (ROW) will be completed once pipeline is installed and tied in.

Additional Construction Information

- **Site Mobilization / Site Facilities**
  - One mobilization and one demobilization.
  - Two office trailers have been included for management and inspection personnel at the primary laydown yard.
  - Track out plates will be utilized at street access points to minimize soil being tracked onto the street by construction vehicles.

- **Site Management / Best Management Practices (BMPs)**
  - BMP materials for spoils piles, laydown yard, and work site.

- **Material Handling**
  - 32 loads of material will be unloaded by the contractor at laydown yards and transported as needed.

- **Traffic Control**
  - Traffic control support during the project at all intersections, during hydrotesting, isolations, tie-ins, and restoration. This includes all traffic control devices and equipment necessary to complete the project.

[9] Values may not add to total due to rounding.
[10] Direct Costs reflect escalation.

- **Utility Locates**
  - 224 utility locates utility locates to verify locations prior to excavations.

- **Pipeline Installation**
  - Installation includes the following:
    - Approximately 19,460 linear feet (LF) of 16-inch pipe.
    - Approximately 3,360 linear feet (LF) of 8-inch pipe[11].
    - Approximately 2,860 linear feet (LF) of 6-inch pipe.
  - Site demo, excavation and pad trench / bellholes, string and bends pipe, coating joints.
  - Installation of fiber optic line and pipeline warning mesh.

- **Isolate Existing Pipeline**
  - Pipeline will not be separately isolated until new pipeline has been installed and strength tested.

- **Pressure Test Pipeline**
  - Preparatory work for the setup of water tanks.
  - Installation of hard piping from the test head to the tank pump.
  - Post completion strength tests will be performed for each new pipeline segment.
  - Following the dewatering of each section of pipe, it will be intermittently dried until ready to be tied-in.

- **Tie-In Pipeline**
  - One eight hour shift is included for tie-in preparation for each tie-in.
  - The final tie-ins into Line 1600 will be tied in during one 24 hour continuous shift.
  - Tie-ins for 8-inch pipeline with be completed will be during one 24 hour continuous shift.
  - Tie-ins for 6-inch will be completed during one 16 hour continuous shift.

- **Retire / Abandon Existing Pipeline**
  - Slurry abandonment of approximately 7,680 LF of existing 16-inch pipeline.

- **Site Restoration**
  - Base paving of trench width will be completed up to 8-inch thick in the City of San Diego where the pipeline is installed in paved zones.
  - Disturbed area in City of San Diego streets will receive a mill and overlay from centerline to curb.
  - All paved roads will receive new 4-inch striping where disturbed.
  - 80 traffic loop replacements.

[11] Since the completion of the TIC estimate, the Project will now include the installation of 10-pipe instead of 8-inch pipe.

- **Site Demobilization**
  - One load of excess piping will be hauled to SDG&E designated yard.

- **Field Overhead**
  - Full time Project Manager
  - Full time Superintendent
  - Full time Safety Supervisor

Table 5: Environmental Survey/Permitting/Monitoring ($000's)

PROJECT COST	2019 & Prior	2020	2021	2022	Total[12]
TOTAL DIRECT COSTS (NON-LABOR)[13]	$290	$272	$297	$0	$859

Assumptions

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

- Asbestos abatement of Asbestos Containing Materials (ACM).
- Non-hazardous waste containment/disposal.
- Water source will be a hydrant located near the new alignment.
- Water will be treated and disposed within municipal sewer for hydrotest. Any water encountered during trenching would be stored in water tanks and discharged to land.
- Water treatment and disposal of approximately 69,000 gallons of hydrostatic test water.

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

- Environmental Consultants for pre-construction assessments, construction monitoring, and environmental close-out support.
- Abatement support is based upon Subject Matter Expert (SME) recommendations.
- Stormwater Pollution Prevention Plan (SWPPP) development and monitoring.

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

[13] Direct Costs reflect escalation.

Table 6: Land & Right-of-Way Acquisition ($000's)

PROJECT COST	2019 & Prior	2020	2021	2022	Total[14]
TOTAL DIRECT COSTS (NON-LABOR)[15]	$90	$78	$1,563	$0	$1,731

Assumptions

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

- Encroachment permit and traffic control plan costs.
- New easement costs.
- Temporary Right of Entry (TRE) – Construction yards and workspace required for construction activities.

Factors such as location, zoning, current market price and square footage are considered to determine a final estimated value specific to easements and TRE permits.

Table 7: Company Labor ($000's)

PROJECT COST	2019 & Prior	2020	2021	2022	Total[16]
TOTAL DIRECT COSTS (LABOR)[17]	$407	$749	$744	$0	$1,901

Assumptions

SDG&E and SoCalGas Labor - Management, Engineering, and Non-Union Labor

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

- Project Management (12,031 hours)
- Project Field Management (6,870 hours)
- Construction Management (1,136 hours)
- Environmental Services (2,545 hours)
- Land Services (861 hours)

[14] Values may not add to total due to rounding.
[15] Direct Costs reflect escalation.
[16] Values may not add to total due to rounding.
[17] Direct Costs reflect escalation.

Company employees provide extensive oversight with respect to safety; environmental protection; site management; construction, engineering and design services contract management and administration; project engineering and management; planning; scheduling; progress control; cost estimating, tracking and control; inspection; job site material and logistics management as well as job site customer interface management and community outreach.

SDG&E Labor - Union Labor

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

Critical operational activities such as operating valves, bringing the cathodic protection system online, bringing instrumentation online, gas handling and removing old assets from service as well as loading gas into new assets and placing them into service are all completed by Company Union personnel.

Table 8: Other Costs ($000's)

PROJECT COST	2019 & Prior	2020	2021	2022	Total[18]
TOTAL DIRECT COSTS (NON-LABOR)[19]	$1,616	$2,347	$2,027	$0	$5,990

Assumptions

In addition to costs previously described above, there are other costs incurred as part of completing the project that are primarily associated with contracts that are established with specialized service providers that either perform a unique service or supplement the core Company project team. It is typical that services are contracted to complete activities related to planning, engineering, design, estimating, project and construction management, scheduling, survey, construction inspection, x-ray and non-destructive examination of welds, hot tapping and/or stopple services, temporary gas supplies, gas capture services, safety services, as well as as-built and project documentation and records management services. Other costs also include non-labor expenses related to business related mileage, travel, meals and lodging.

Engineering and Project Management

- Developed upon specified scope of work, planned deliverables, and activity levels of effort reflecting anticipated manpower requirements over the planned timeframe of the project schedule.
- Contracted engineering assistance to identify and evaluate potential options to bring Line 1600 into compliance with D.11-06-017 and Public Utilities Code § 958.
- Non-labor costs included in this estimate address travel, meals, expenses, and lodging incurred for SDG&E and SoCalGas Labor.

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

[19] Direct Costs reflect escalation.

Construction Support Services

The high-level assumptions and specific level of effort to provide construction management support for this project are described in more detail below.

- X-Ray / NDE support is based upon the take-off quantities of welds for all newly installed pipe.
- CNG to support existing taps during system downtime.
- Gas capture services to reduce the amount of natural gas vented to atmosphere.
- Two stopple fitting services.

Inspection Services

- One full time Chief Inspector
- Two full time Welding Inspectors

Survey and Design Service

- The survey and design service estimate includes survey support staff for project and site facility layout and as-builts. The estimate also includes engineering team material support in the development of as-built close-out packages.

Table 9: Indirect Costs ($000's)

PROJECT COST	2019 & Prior	2020	2021	2022	Total[20]
COMPANY INDIRECTS	$728	$2,010	$1,141	$0	$3,879

Assumptions

- Indirect costs are for Administrative and General, purchasing, warehousing, pension and benefits, payroll tax, and other costs that are overhead in nature.
- Indirect costs do not include AFUDC or Property Tax.

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

Pipeline Safety Enhancement Plan Workpaper Supporting Chapter

Line 1600 Serra Mesa Replacement Project

Table 1: Total Project Cost ($000's)

PROJECT COST	2019 & Prior[1]	2020	2021	2022	Total[2]
DIRECT LABOR	$847	$861	$387	$0	$2,095
DIRECT NON-LABOR	$4,966	$28,681	$6,245	$0	$39,891
TOTAL DIRECT COSTS[3]	$5,813	$29,541	$6,632	$0	$41,986
COMPANY OVERHEADS[4]	$1,411	$2,252	$1,070	$0	$4,733
Total Capital Costs	$7,224	$31,794	$7,702	$0	$46,719

Project Description

Line 1600 is a 16-inch diameter transmission line that runs approximately 49.7 miles from Rainbow to Mission Valley, San Diego. Per the CPUC Safety and Enforcement Division (SED) approved *Line 1600 Test or Replacement Plan*, the Line 1600 testing and replacement work is comprised of 19 independent projects. This workpaper describes the Line 1600 Serra Mesa Replacement project. The Line 1600 Serra Mesa Replacement project is located in the City of San Diego. The project will replace and reroute approximately 1.978 miles of existing 16-inch pipeline with 4.228 miles of new 16-inch pipeline along Ruffin Road and Ridgehaven Court to Mission Station. Due to the offset of the new alignment, additional distribution work will be required as part of the project scope to allow for existing customers to be served from the rerouted alignment. Associated distribution work includes the installation of two new regulator stations. The project will also include the installation of a new 16-inch mainline valve (MLV). The project will also install approximately 4.228 miles of fiber optic cable. Fiber optic cable will be installed along the new 16-inch pipeline to assist in leak detection, ground movement, and vibration analysis. Construction of this project began on June 1, 2020 and is expected to be complete by Q1 2021.

Considerations unique to the project are as follows:

- The reroute will support the distribution system in a manner that system reliability is not compromised and maintain the existing reliability of service that customers currently receive from the existing pipeline.
- The proposed plan for the fiber optic cable is to have a continuous run from the Line 1600 La Honda-Lincoln Replacement to Line 1600 Serra Mesa Replacement projects. The end result of the continuous run would reduce the number of required monitoring stations between these Projects to one which is located on the Line 1600 Pomerado South Replacement project.

Alternatives Considered

D.18-06-028, Ordering Paragraph 7, required SDG&E and SoCalGas to "submit to Safety and Enforcement Division a hydrostatic test or replacement plan pertaining to the existing 49.7 miles of Line 1600 in its present corridor." The

[1] Actual costs incurred associated with planning and engineering design work are included in the project cost estimates.
[2] Values may not add to total due to rounding.
[3] Direct Costs reflect escalation.
[4] Excludes AFUDC and tax.

Decision further required such plan to discuss two options: "1. Hydrotest the entire 49.7 miles of line and replace those segments that fail the test; and 2. Replace all pipeline segments in High Consequence Areas (HCAs) along Line 1600, thus ensuring a new pipeline without vintage pipeline characteristics that are perceived to increase the risk of Line 1600. Hydrotest in solely non-HCA segments would ensure less impact if there was a failure during hydrotesting." SDG&E's and SoCalGas' September 26, 2018 *Line 1600 Test or Replacement Plan* discussed D.18-06-028's two options as Design Alternative 1 (Replace in HCA/Test in Non-HCA alternative) and Design Alternative 2 (Full Hydrotest alternative), and also discussed Design Alternative 3 (Full Replacement in Nearby Streets alternative) and Design Alternative 4 (Full Replacement Along Highway 395 alternative). SDG&E and SoCalGas proposed to implement, and the CPUC SED approved, Design Alternative 1, which will replace existing Line 1600 primarily in HCAs and hydrotest the remaining sections in non-HCAs. D.18-06-028 at 92 also required the Utilities to "identify proposed rerouting of the line in specific segments." As discussed in the *Line 1600 Test or Replacement Plan*, "SDG&E and SoCalGas concluded it is not feasible, prudent nor reasonable to build a new replacement pipeline entirely within the existing Line 1600 rights-of-way." Due to construction difficulty, private property and community impacts, environmental impacts, and costs and delays of efforts to expand the existing rights of way (ROW), the *Line 1600 Test or Replacement Plan* proposed to re-route the majority of replacement segments, usually in nearby streets. In developing the Plan, SDG&E and SoCalGas reviewed these proposed re-routes with SED, which "conducted a joint field inspection of the identified sites with SDG&E personnel and its contractor to evaluate the existing safety conditions, constructability and serviceability of Line 1600. After the field inspections, SED agreed with SDG&E's and SoCalGas' proposed reroute of many segments of Line 1600 due to safety and serviceability reasons."

D.20-02-024 requires "a cost forecast for the approved Design Alternative 1 (Replace in HCAs and Hydrotest in Non-HCAs) that SED approved on January 15, 2019."[2] D.20-02-024 at 31-32 held that issues "out of scope" for Phase 2 include "revisiting Design Alternatives 2 (Full Hydrotest Alternative), 3 (Full Replacement), 4 (Full Replacement but different street routing) or alternative recommendations. Nor are we revisiting the substance of the PSEP engineering and implementation that falls within the authority of SED."

Shut-In Analysis

A segment of the Line 1600 Serra Mesa project will be temporarily taken out of service provided strategies are implemented as necessary to mitigate impacts. The existing pipeline will not be abandoned until the installation of the Line 1600 Kearny Mesa Replacement project is completed. The segment that can be taken out of service will require coordination with Transmission operations.

Forecast Methodology

The Utilities methodology for forecasting PSEP costs is discussed in the Direct Testimony of Ronn Gonzalez. The Utilities developed a Total Installed Cost (TIC) estimate to implement the above scope of work. The TIC Estimate includes direct costs associated with project management, engineering and design, environmental permitting, land acquisition, material and equipment procurement, and construction.

Following the approval of the Plan by SED in January 2019, the Utilities have undertaken the detailed design and planning of the 19 individual projects in the Plan. Generally, projects that are earliest in the overall schedule are the most developed, while those later in the overall schedule are less developed. At the time of cost estimate

preparation, this project was at an approximately 30% design level. Prior to the start of construction, costs related to construction activities were reevaluated at an approximately 90% design level. Further development of this project could reveal new information requiring some adjustments to the project plan in the areas such as engineering, materials, permitting, environmental and land, all of which could impact actual costs compared this cost estimate.

Schedule

Implementation of this project is proposed to be completed consistent with the overall prioritization and timing described in Section IV. D. of the *Line 1600 Test or Replacement Plan*. The schedule was developed based on the five-stage project life cycle as defined by PSEP. The key project deliverables were identified and incorporated into a work breakdown structure. This work breakdown structure was then sequenced, and predecessor and successor tasks were linked to each task. Durations were added to each task to provide a total project duration.

The preliminary Stage 4 Construction Schedule received additional planning and stakeholder input considering that typically 50% of the project costs are expended during the construction phase. The construction schedule is assumed to be 158 working days.

Pipeline Safety Enhancement Plan Workpaper Supporting Chapter

Line 1600 Serra Mesa Replacement Project

Figure 1: Overview Map for Line 1600 Serra Mesa Replacement

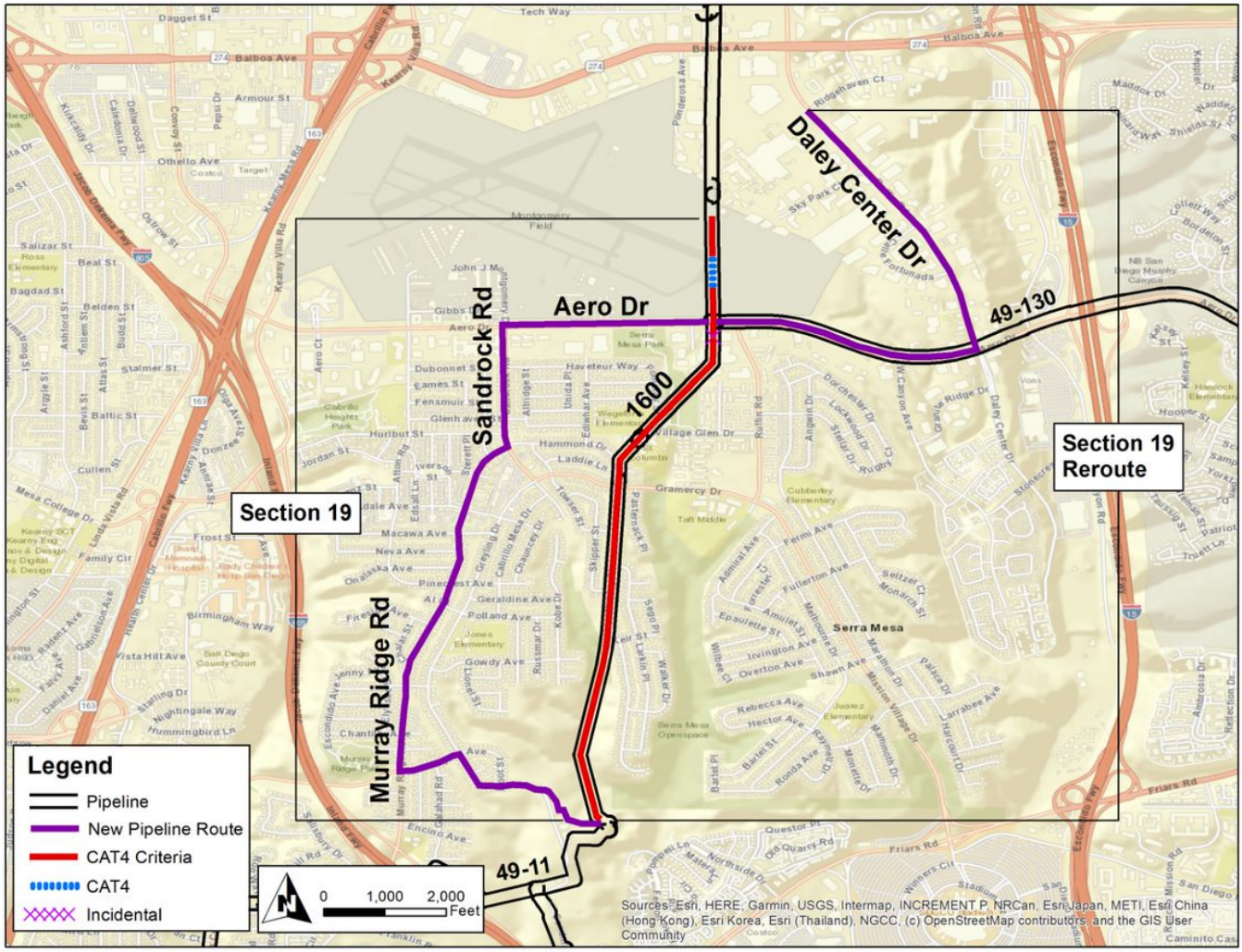

Figure 2: Satellite Map for Line 1600 Serra Mesa Replacement

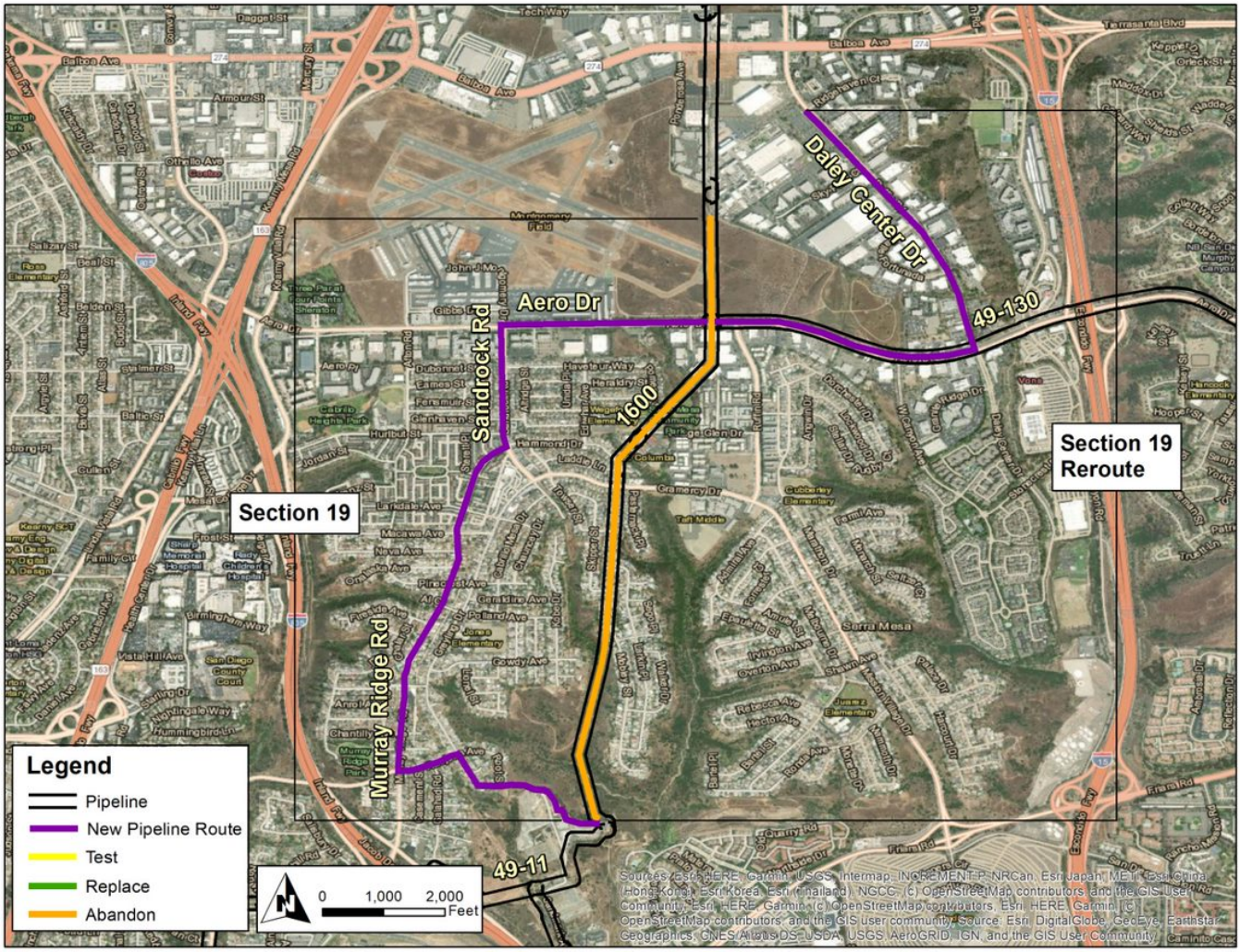

Table 2: Project Mileage

PHASE	MILEAGE
CATEGORY 4 CRITERIA[5]	1.824
CATEGORY 4[6]	0.153
INCIDENTAL	0.001
REPLACEMENT OFFSET	2.250
TOTAL MILEAGE[7]	4.228

The direct costs for each area are summarized below.

Table 3: Material ($000's)

PROJECT COST	2019 & Prior	2020	2021	2022	Total[8]
DIRECT NON-LABOR (NON-LABOR)[9]	$1,302	$64	$1,650	$0	$3,016

Assumptions

Materials for this project were purchased after final internal authorization to purchase long lead time material. This allowed for material to be procured, inspected, and delivered to coincide with the anticipated construction start date. Primary components include:

- 23,040 feet of 16-inch pipe meeting SDG&E specifications.
- 37 16-inch fittings meeting SDG&E specifications.
- Two 16-inch valves (one automated MLV and one non-automated valve) meeting SDG&E specifications.

Table 4: Construction ($000's)

PROJECT COST	2019 & Prior	2020	2021	2022	Total[10]
DIRECT NON-LABOR (NON-LABOR)[11]	$102	$25,205	$162	$0	$25,469

[5] Lacks documentation of a post-construction strength test in a Class 3 or 4 HCA.
[6] Lacks documentation of a post-construction strength test in a Class 1 or 2 non-HCA.
[7] Values may not add to total due to rounding.
[8] Values may not add to total due to rounding.
[9] Direct Costs reflect escalation.
[10] Values may not add to total due to rounding.
[11] Direct Costs reflect escalation.

Assumptions

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

- One mobilization and one demobilization
- Contractor work is estimated using a 10-hour per day, five-day work week.
- Night work is estimated for approximately 2.083 miles of new pipeline installation including the mainline valve work.
- Fiber optic lines will be installed above the new pipeline.
- Tie-ins will be completed during a 24 hour continuous shift.
- Two mainline install crews will be utilized. One for intersections and select open trench installations, and one for all other open trench installation.
- Laydown yards will be restored to original condition at the end of the project.
- Restoration of grade along ROW will be performed once pipeline is installed and tied in, the trench lines will receive a grind and overlay of asphalt at a thickness of 2-inches and a width of 12 feet.
- Streets within moratoriums will receive grind and cap from curb to curb.

Additional Construction Information

- **Site Mobilization / Site Facilities**
  - One mobilization and one demobilization.
  - Two office trailers have been included for management and inspection personnel at the primary laydown yard.
  - Eight months of site duration is anticipated.
  - Track out plates will be utilized at street access points to minimize soil being tracked onto the street by construction vehicles.

- **Site Management / Best Management Practices (BMPs)**
  - BMP materials for spoils piles, laydown yard, and work site.

- **Material Handling**
  - 38 loads of material will be unloaded by the contractor at laydown yards and transported as needed.

- **Traffic Control**
  - A full time traffic control crew will provide support during the project at all intersections, during hydrotesting, isolations, tie-ins, and restoration. This includes all traffic control devices and equipment necessary to complete the project.

- **Utility Locates**
  - 257 utility locates to verify locations prior to excavations.

- **Pipeline Installation**
  - Installation includes the following:
    - Approximately 23,040 linear feet (LF) of 16-inch pipe.
  - Site demo, excavation and pad trench / bellholes, string and bends pipe, coating joints.
  - Installation of fiber optic line and pipeline warning mesh.

- **Isolate Existing Pipeline**
  - The pipeline will be isolated in conjunction with tie-in activities.
  - The pipeline will not be separately isolated until the new pipeline has been installed and tested.

- **Pressure Test Pipeline**
  - The pipeline will be tested in one individual segment.
  - Preparatory work for the setup of water tanks.
  - Installation of hard piping from the test head to the tank pump.
  - Following the dewatering of the pipeline, it will be intermittently dried until ready to be tied-in.
  - Pre-commissioning nitrogen testing for the installation of new valves.

- **Mainline Valve**
  - Two 16-inch valves (one automated MLV and one non-automated valve).

- **Tie-In Pipeline**
  - One 10 hour day for tie-in preparation.
  - One 24 hour continuous shift for tie-in.

- **Retire / Abandon Existing Pipeline**
  - Removal of 45 pipeline markers.
  - Slurry abandonment of approximately 2,962 LF of existing 16-inch pipeline.
  - Four abandonment excavations are planned.

- **Site Restoration**
  - Base paving of trench width will be completed up to 8-inch thick.
  - Approximately 490,000 SF of mill and overlay.
  - Four traffic loops at the intersections will be replaced for a total of 44 traffic loop repairs.
  - Approximately 66,000 LF of 4-inch wide line repainting.
  - Approximately 22,062 LF of double 4-inch wide line repainting.
  - Approximately 200 SF of sidewalk repair.
  - Approximately 50 LF of block wall installation.
  - Approximately 540 LF of curb and gutter repair.

- **Site Demobilization**
  - One load of excess piping will be hauled to SDG&E designated yard.

- **Field Overhead**
  - Full time Project Manager
  - Full time Superintendent
  - Full time Safety Supervisor

Table 5: Environmental Survey/Permitting/Monitoring ($000's)

PROJECT COST	2019 & Prior	2020	2021	2022	Total[12]
TOTAL DIRECT COSTS (NON-LABOR)[13]	$780	$503	$278	$0	$1,561

Assumptions

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

- Asbestos abatement of Asbestos Containing Material (ACM).
- Non-hazardous Waste Containment/Disposal.
- Assumes water source will be a hydrant located near the new alignment.
- Assumes water will be treated and disposed within municipal sewer for hydrotest. Any water encountered during trenching would be stored in water tanks and discharged to land. Water treatment and disposal of approximately 225,000 gallons of hydrostatic test water.
- Permit costs.

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

- Environmental Consultants for pre-construction assessments, construction monitoring, and environmental close-out support.
- Abatement Support is based upon subject matter expert (SME) recommendations
- Aquatic Features jurisdictional delineations.
- Stormwater Pollution Prevention Plan development and monitoring.
- Compensatory Mitigation for jurisdictional impacts during excavation within/or near waterways.
- CDFW (Streambed Alteration Agreement).
- Regional Water Quality Control Board (401 Certification).
- US Army Corps (404 Permit).

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

[13] Direct Costs reflect escalation.

Table 6: Land & Right of Way Acquisition ($000's)

PROJECT COST	2019 & Prior	2020	2021	2022	Total[14]
TOTAL DIRECT COSTS (NON-LABOR)[15]	$72	$357	$481	$0	$910

Assumptions

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

- Encroachment permit and traffic control plan costs.
- New easement costs.
- Temporary Right of Entry (TRE) – Construction yards and workspace required for construction activities.

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.

Table 7: Company Labor ($000's)

PROJECT COST	2019 & Prior	2020	2021	2022	Total[16]
TOTAL DIRECT COSTS (LABOR)[17]	$847	$861	$387	$0	$2,095

Assumptions

SDG&E and SoCalGas Labor - Management, Engineering, and Non-Union Labor

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

- Project Management (8,447 hours)
- Project Field Management (4,699 hours)
- Construction Management (1,660 hours)
- Environmental Services (3,574 hours)
- Land Services (0 hours)

Company employees provide extensive oversight with respect to safety; environmental protection; site management; construction, engineering and design services contract management and administration; project engineering and management; planning; scheduling; progress control; cost estimating, tracking and control;

[14] Values may not add to total due to rounding.
[15] Direct Costs reflect escalation.
[16] Values may not add to total due to rounding.
[17] Direct Costs reflect escalation.

inspection; job site material and logistics management as well as job site customer interface management and community outreach.

SDG&E Labor - Union Labor

SDG&E Union Labor costs were developed with the guidance of SDG&E Construction Management and those costs are duration dependent and activity specific.

Critical operational activities such as operating valves, bringing the cathodic protection system online, bringing instrumentation online, gas handling and removing old assets from service as well as loading gas into new assets and placing them into service are all completed by Company Union personnel.

Table 8: Other Costs ($000's)

PROJECT COST	2019 & Prior	2020	2021	2022	Total[18]
TOTAL DIRECT COSTS (NON-LABOR)[19]	$2,709	$2,553	$3,673	$0	$8,935

Assumptions

In addition to costs previously described above, there are other costs incurred as part of completing the project that are primarily associated with contracts that are established with specialized service providers that either perform a unique service or supplement the core Company project team. It is typical that services are contracted to complete activities related to planning, engineering, design, estimating, project and construction management, scheduling, survey, construction inspection, x-ray and non-destructive examination of welds, hot tapping and/or stopple services, temporary gas supplies, gas capture services, safety services, as well as as-built and project documentation and records management services. Other costs also include non-labor expenses related to business related mileage, travel, meals and lodging.

Engineering and Project Management

- Developed upon specified scope of work, planned deliverables, and activity levels of effort reflecting anticipated manpower requirements over the planned timeframe of the project schedule.
- Contracted engineering assistance to identify and evaluate potential options to bring Line 1600 into compliance with D.11-06-017 and Public Utilities Code § 958.
- Non-labor costs included in this estimate address travel, meals, expenses, and lodging incurred for SDG&E and SoCalGas Labor.

Construction Support Services

The high-level assumptions and specific level of effort to provide construction management support for this project are described in more detail below.

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

[19] Direct Costs reflect escalation.

- X Full time X-Ray / NDE support with each pipeline lay crew.
- No CNG to support existing taps during pipeline isolation.
- Gas capture services to reduce the amount of natural gas vented to atmosphere.
- Gas service for core customers will be maintained through combination of purchase of additional gas through an alternative receipt point and curtailments to non-core customers where as appropriate.

Inspection Services

- Full time Chief Inspector
- Two full time Welding Inspectors

Survey and Design Services

- The survey and design service estimate include survey support staff for project and site facility layout and as-builts. The estimate also includes engineering team material support in the development of as-built close-out packages.

Table 9: Indirect Costs ($000's)

PROJECT COST	2019 & Prior	2020	2021	2022	Total[20]
COMPANY INDIRECTS	$1,411	$2,252	$1,070	$0	$4,733

Assumptions

- Indirect costs are for Administrative and General, purchasing, warehousing, pension and benefits, payroll tax, and other costs that are overhead in nature.
- Indirect costs do not include AFUDC or Property Tax.

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