Application No: A.15-09-013
Exhibit No.: SDGE-8-R
Witness: N. Kohls

In The Matter of the Application of San Diego Gas & Electric Company (U 902 G) and Southern California Gas Company (U 904 G) for a Certificate of Public Convenience and Necessity for the Pipeline Safety & Reliability Project	Application 15-09-013 (Filed September 30, 2015)

UPDATED

PREPARED DIRECT TESTIMONY OF

NORM G. KOHLS

ON BEHALF OF

SAN DIEGO GAS & ELECTRIC COMPANY

AND

SOUTHERN CALIFORNIA GAS COMPANY

BEFORE THE PUBLIC UTILITIES COMMISSION
OF THE STATE OF CALIFORNIA

March 21, 2016, updated February 21, 2017

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I. PURPOSE AND OVERVIEW

The purpose of my prepared direct testimony[1] on behalf of San Diego Gas & Electric Company (SDG&E) and Southern California Gas Company (SoCalGas) (collectively, the Utilities) is to: 1) present the scope, cost, and schedule of the Pipeline Safety & Reliability Project (PSRP or Proposed Project), 2) present the scope, cost, and schedule of the alternative that would hydrotest existing Line 1600 (Hydrotest Alternative), and 3) provide a brief overview of data inputs I provided for the costs analysis portion of the Utilities' cost-effectiveness analysis performed for certain of the alternatives (Alternatives) outlined in the Joint Assigned Commissioner and Administrative Law Judge's Ruling Requiring an Amended Application and Seeking Protests, Responses and Replies issued January 22, 2016 (Ruling).[2,3]

The Proposed Project consists of the construction of a new approximately 47-mile long, 36-inch diameter natural gas transmission pipeline (Line 3602) and associated facilities between the proposed Rainbow Pressure Limiting Station at the San Diego – Riverside County line south to Line 2010 located within Marine Corps Air Station (MCAS) Miramar in San Diego. After completion of the construction of Line 3602, the existing transmission Line 1600 from Rainbow

[1] I assume the witnessing role and responsibility for the Prepared Direct Testimony of Neil Navin, served in this proceeding on March 21, 2016, as Mr. Navin has taken on different job responsibilities. Aside from reflecting this witness change and the few updates detailed in the change log appended hereto, the contents of this testimony have not changed from the version tendered on March 21, 2016.

[2] The Ruling (at 11-14) directed the Utilities to file and serve an Amended Application by March 21, 2016 that includes, among other things, a "cost analysis" that compares the relative costs and benefits of the Proposed Project and the Alternatives outlined in the Ruling.

[3] To comply with the Ruling, the Utilities retained PricewaterhouseCoopers (PwC) to perform a cost-effectiveness analysis (Cost-Effectiveness Analysis) of the Proposed Project and the Alternatives identified in the Ruling. *See* Amended Application, Volume III – Cost-Effectiveness Analysis. The Cost-Effectiveness Analysis and underlying methodology were performed by PwC with input and data from the Utilities. I have provided data input to the Cost-Effectiveness Analysis for each Alternative, specifically the cost estimation for known and anticipated project scope and ongoing operation and maintenance costs, as applicable, for each Alternative.

Pressure Limiting Station (PLS) to Kearny Villa PLS would be de-rated to distribution-level service.

My testimony presents the proposed pipeline route, project schedule, and the associated cost estimate for engineering, planning, permitting, and construction. Table 1 below summarizes the annual capital expenditures for the Proposed Project including the cost for de-rating Line 1600 to distribution service.

TABLE 1
Estimated PSRP Project Annual Direct Capital Expenditures
(*In Millions of Dollars*)

	2014	2015	2016	2017	2018	2019	2020	2021	2022	Total
Proposed Line 3602	$3.3	$6.8	$5.9	$14.7	$95.4	$108.3	$187.6	$4.8	$0.0	$426.8
Line 1600 De-rate	$0.0	$0.0	$0.0	$0.8	$2.9	$0.4	$8.6	$2.2	$0.1	$15.1
Total	$3.3	$6.8	$5.9	$15.6	$98.3	$108.8	$196.2	$7.0	$0.1	$441.9

All of the estimated project costs described in my testimony are stated in 2015 direct costs (*i.e.*, do not include loaders or escalation), and cover anticipated project elements, including engineering, environmental review, permitting, mitigation, land and right-of-way acquisition, equipment and materials, construction labor, construction management, consultant costs, other project execution activities, and internal company labor.

II. GENERAL OVERVIEW ON COST ESTIMATING AS APPLIED TO THE PROPOSED PROJECT AND THE ALTERNATIVES

Estimating the costs for constructing and operating the Proposed Project and the Alternatives is a complex process that must take into account much uncertainty. The level of scope definition of the Proposed Project and the Alternatives varies, which directly influences the level of accuracy. In addition to the degree of project definition, estimate accuracy is also driven by other systemic risks such as: the complexity of the project, quality of reference cost estimating data, quality of assumptions used in preparing the estimate, experience and skill level,

estimating techniques employed, and the time and level of effort budgeted to prepare the estimate.

The Utilities developed the cost estimate for the Proposed Project using common, industry standard estimating practices, generally aligned with Association for the Advancement of Cost Engineering (AACE) Recommended Practices. The estimates are based on a combination of market research, historical data, and semi-detailed unit costs and order-of-magnitude estimating based on experience and judgment. The level of scope definition and estimating accuracy has been defined by references to AACE Recommended Practice 56R-08 Classification System.

As discussed in my testimony, the Utilities were able to develop a Class 3 cost estimate for the Proposed Project based on a defined route, semi-detailed design and engineering, and an environmental assessment. By contrast, the maturity level of the scope for the Alternatives, is lower, in some cases much lower, due to the lack of detailed definition for key project cost drivers – such as scope definition, level of completed design and engineering, material and labor requirements, permitting needs, environmental requirements, schedule assumptions, and other execution planning. This lower level of maturity of the scope results in greater uncertainty in the cost estimates. The Utilities' project team evaluated each Alternative, the scope and other considerations against the AACE Recommended Practices and assigned the appropriate estimate class. Estimate accuracy is essentially the potential variation of actual cost from the cost estimate after application of contingency for a given scope. Given the maturity of the project scope, including engineering and design, environmental review, and other project planning the Proposed Project can be classified as a Class 3 estimate. For the Alternatives identified in the

Ruling, the Utilities were able to define Class 4 and Class 5 cost estimates. These estimates and assumptions are presented in greater detail in the Cost-Effectiveness Analysis.

Although the level of scope definition and corresponding accuracy may vary among the Alternatives for which I provided input, the Utilities believe that the cost estimates developed are suitable to allow reasonable analysis and comparison.

III. PROPOSED PIPELINE SAFETY & RELIABILITY PROJECT

The Utilities developed the SDG&E and SoCalGas Pipeline Safety & Reliability Project Report (PSRP Report), provided as Attachment A to my Prepared Direct Testimony. The PSRP Report provides greater detail on project scope, pipeline alignment, cost, schedule, and risks. Also included in the PSRP Report is a description of the estimated cost reduction from potential reduction in operation at the Moreno Compressor Station if the 36-inch diameter natural gas transmission pipeline is installed.[4] A reduction in operating costs could be realized through a reduction of the following: emission fees and permitting, operations and maintenance (O&M), fuel consumption, Nitrogen Oxide (NOx) emissions, greenhouse gas (GHG) combustion emissions, and capital spending.[5] These avoided costs are described in greater detail in the Cost-Effectiveness Analysis. My testimony represents key elements to the Proposed Project, as further described in the PSRP Report.

[4] *See* Attachment A to my Prepared Direct Testimony – San Diego Gas & Electric and Southern California Gas Co. Pipeline Safety & Reliability (PSRP) Report. Attachment XII to the PSRP Report, Moreno Compressor Station – Operation Analysis.

[5] As further explained in the Prepared Direct Testimony of Dave Bisi, dated March 21, 2016, "[w]hile analysis indicates that compression at Moreno would be greatly reduced with the installation of the new pipeline, compression operations would still be needed during times where system constraints related to third-party damages, pipeline outages, and other routine maintenance warrants it."

A. SCOPE

The Utilities evaluated several routes for the construction of a new transmission pipeline in addition to the route ultimately selected for the Proposed Project. These alternate routes were identified in Chapter 5 of the Utilities' Proponent's Environmental Assessment (PEA).[6] With the assistance of third-party firms that specialize in engineering services and construction management, the Utilities developed the project scope and cost estimates for the Proposed Project.[7] Based on the preliminary engineering and design work completed to-date and the project experience of the Utilities and third-party firms, the overall scope of work presented below is feasible and constructible.

This Proposed Project is anticipated to require an extensive environmental review and involve monitoring and mitigation activities throughout the construction phase as it will be subject to the requirements of the National Environmental Policy Act (NEPA) and the California Environmental Quality Act (CEQA) as well as discretionary permits from various federal, state, and local agencies. The Proposed Project consists of the following major components: construction of approximately 47-miles of 36-inch diameter natural gas transmission pipeline (Line 3602) including the installation of ten mainline valves spaced a maximum of 5-miles apart, a cathodic protection system, an intrusion detection system, and a leak monitoring system; two pressure limiting stations (Rainbow Pressure Limiting Station and Cross-Tie with Line 1600); installation of a smart-pig launcher and receiver; three cross-ties facilities with Lines 1601 at Escondido, Line 1600 at Lake Hodges, Line 2010 at Miramar; and the de-rate scope for Line 1600 after the new 36-inch line is in service.

[6] *See* A.15-09-013, Volume II – PEA, filed September 30, 2015.
[7] The Utilities retained SPEC Services, URS Corporation, ARB, and Insignia Environmental to assist in the development of the preliminary project scope and cost estimation of the Proposed Project.

i. **Transmission Pipeline**

The proposed Line 3602 will be a new transmission pipeline that originates at the proposed SDG&E Rainbow Pressure Limiting Station and traverses approximately 47 miles in a southerly direction, terminating at Line 2010 within MCAS Miramar. The transmission pipeline will be constructed of API 5LX-65 steel designed for a Maximum Allowable Operating Pressure (MAOP) of 800 pounds per square inch (psig).[8] The outside diameter of the pipeline will be 36 inches with a wall thickness of 0.625 inch.

The proposed pipeline and associated facilities described in the sections below will be designed, constructed, operated, and maintained in accordance with all applicable requirements included in the U.S. Department of Transportation regulations in Title 49, Part 192 of the Code of Federal Regulations, Transmission of Natural and Other Gas by Pipeline: Minimum Federal Safety Standards, as well as the California Public Utilities Commission (CPUC or Commission) standards embodied under General Order 112-F.

The pipeline will be installed approximately 42 inches below the ground surface using conventional trenching methods for urban and cross-country areas. The pipeline alignment will cross several major roads, including Interstate 15, as well as a number of water features, including the San Luis Rey River, Lake Hodges, and Escondido Creek. At these crossings, horizontal directional drilling (HDD) and horizontal boring methods will be implemented to minimize impacts to riparian habitat and water quality. The HDD method employs a surface launch drilling rig that is used to install a pipe in arc along a prescribed path with minimal surface impacts. The horizontal boring method requires establishing a bore pit on one side of the

[8] As further discussed in Section III.A.vi of my Prepared Direct Testimony, the proposed Line 3602 will connect with an existing pre-lay segment (36-inch, API 5L X-60 steel pipe with 0.500-inch wall thickness) located in Pomerado Road.

structure and a receiving pit on the other side at depths that allow for pushing a pipe or drilling a pipe casing straight between the two pits under the structure.

The Utilities' project management, environmental, land services, and operations personnel developed the proposed pipeline alignment that will traverse both undeveloped and urban locations in San Diego County, and will pass through private and public land. The Utilities provided this alignment to SPEC Services for their review and analysis and to aid in their support of the engineering, design, and cost estimation effort. SPEC Services obtained publicly available Geographic Information System data, topography, land ownership, and fault data to use in their review and analysis of the pipeline route.

As discussed in the Proponent's Environmental Assessment,[9] the Utilities developed the following set of guiding principles or "routing criteria" for the purpose of identifying a specific proposed route for the project:

- Implement new pipeline safety requirements for existing Line 1600 as expeditiously as possible;
- Follow generally accepted principles for siting infrastructure, such as the "Garamendi Principles" for electric transmission infrastructure siting;
- Avoid unnecessary impacts to the environment;
- Avoid unnecessary acquisition of private property;
- Avoid impacts to mission-critical operations at MCAS Miramar; and
- Meet current and near-term energy needs in a cost-effective and efficient manner.

Applying these criteria, the Utilities ultimately selected a "Proposed Route" over other alternatives because it is located predominately within developed areas and existing public rights-of-way (*i.e.*, streets and roadways); minimizes impacts to natural habitats, sensitive species, and other environmental resources; reflects preliminary input from MCAS Miramar on routing alternatives; and avoids additional costs and time delays associated with a larger scope,

[9] A.15-09-013, Volume II – PEA, Project Purpose and Need/Project Objectives, Chapter 2, at 2-8 through 2-9.

among other considerations. The proposed pipeline route utilizes Old Highway 395 for most of the route, which allows the Utilities to proceed under the existing franchise agreement between San Diego County and SDG&E, and lessens the impact to the public and environment. In addition to Old Highway 395, the proposed pipeline also utilizes existing right-of-ways in Champagne Boulevard, North Centre City Parkway, Felicita Avenue, Encino Drive, Bear Valley Parkway, and Pomerado Road. While this may be the proposed pipeline route, the Utilities acknowledge that the final route will ultimately be approved by the Commission based upon public input and a full evaluation of the potential environmental impacts, as well as other considerations. For this reason, the Utilities acknowledge that the proposed route is subject to change during the Commission's review process, and have identified Route Segment Alternatives, which can be characterized as minor deviations in the alignment between Rainbow PLS and the Line 2010 Cross-Tie.

The proposed alignment of the proposed Line 3602 is depicted in Figure 1 below:

FIGURE 1
Proposed Alignment of PSRP Pipeline

1. Mainline Valves

Ten new mainline valves (MLVs) will be installed along the pipeline to shut down the flow of gas during operation and maintenance activities or emergency situations. The valves will be designed for automatic shut-off without operator intervention in the event of a loss of pressure and remote operation by SDG&E and SoCalGas' Gas Control Department. Each valve will be installed within a permanent easement and will measure approximately 50 feet by 75 feet. The valves will be installed below ground, which includes the 36-inch diameter valve and a 10-inch or 12-inch diameter blow-off valves. Other components for supervisory control and data acquisition (SCADA) will be installed aboveground and may consist of actuators, control cabinets, antennae pole and solar panel. At a minimum, valves will be located every five miles along the proposed pipeline route.[10]

2. Cathodic Protection System

The cathodic protection system consists of cathodic protection rectifiers, buried anodes, and test stations that will be situated along the pipeline. An estimated three rectifiers and three deep-well anode beds will be installed at approximately three of the proposed MLVs. Typically, the anode bed is a deep well anode that is installed by drilling a hole and inserting the anodes into the hole. Each anode will have a coated wire lead that will be connected to the rectifier. The anode bed will be located in close proximity to the proposed pipeline and rectifier. The rectifier will be connected to the pipeline to establish protection.[11]

3. Intrusion Detection Monitoring System

The Proposed Project will be equipped with an advanced right-of-way intrusion detection and monitoring system to provide early warning when digging, drilling, boring, cutting,

[10] A.15-09-013, Volume II – PEA, Project Description, Chapter 3, at 3-23.
[11] *Id.* at 3-28 through 3-37.

compacting, or unplanned vehicle operations pose a threat to pipeline integrity. The system will also continuously monitor for ground movement and temperature gradients associated with an unplanned release of gas from the pipeline. In addition, a 48-inch wide warning mesh/tape will be installed along the length of the pipeline trench as a visual barrier and early warning device. The warning mesh/tape will be installed at least one foot below grade on top of the pipeline, except in areas where the pipeline has been installed with trenchless technology (*e.g.*, HDDs and horizontal bores).[12]

4. Leak Detection Monitoring System

To further support the early detection and management of unplanned gas releases, gas detection sensors will be employed at key locations along the pipeline route and will provide near-real-time alarm notification to operations personnel if gas concentration levels indicate a potential gas release.[13]

ii. **Rainbow Pressure Limiting Station**

The Proposed Project includes the construction of the Rainbow PLS. The pressure limiting station will be located approximately 50 feet south of the existing Rainbow Metering Station on a parcel of land owned by SDG&E. The gravel site will have an approximately 0.3-acre (100-foot by 130-foot) footprint. The site will be enclosed by a 6-foot to 8-foot-high concrete block wall, and will be accessible by two 20-foot-wide swing gates and two 4-foot-wide pedestrian gates. Pressure limiting valves that measure 16 inches in diameter will be installed underground, with valve controls installed above ground and enclosed by a cabinet. In addition to pressure limiting equipment, the proposed pressure limiting station will contain a launcher to accommodate in-line inspection (ILI) "smart pigs."

[12] *Id.* at 3-27.
[13] *Id.*

The PLS will also be equipped with SCADA equipment, as well as the ability to blow down the pipeline for rapid removal of natural gas in order to shut down the pipeline during planned maintenance activities or in the event of an emergency. SCADA service will be provided via land-line or satellite service. Communication equipment for the station will be installed within a cabinet and power service will be obtained from a nearby SDG&E distribution line.

iii. **Line 1601 Cross-Tie**

The Line 1601 Cross-Tie will tie-in the proposed Line 3602 with the existing 16-inch diameter Line 1601 near State Route 78 in the City of Escondido. The graveled site will have an approximately 0.2-acre footprint, and the majority of the site will be located on SDG&E property. The site will be enclosed by a 6-foot to 8-foot-high concrete block wall, accessible by an approximately 20-foot-wide swing gate and an approximately four-foot-wide pedestrian gate. The interconnect will be established via a 16-inch diameter pipeline that will tee from the proposed Line 3602, extend approximately 100 feet in a horizontal bore under the State Route 78 on-ramp, and tie into the existing Line 1601 with a 16-inch diameter ball valve. Automated valve controls will be installed above ground and enclosed in a cabinet. Communication equipment will also be installed at this site and enclosed in a cabinet. Power service will be obtained from a nearby SDG&E distribution line. Access will be via an existing paved driveway off of Lincoln Avenue.

iv. **Line 1600 Cross-Tie**

The Line 1600 Cross-Tie will involve the installation of mainline valve and a PLS to tie-in the existing 16-inch diameter Line 1600 and the proposed Line 3602. The approximately 0.1-acre graveled site is located approximately 300 feet south of Bear Valley Parkway along Mule Hill Trail

(an unpaved road). A 6-foot to 8-foot-high concrete block wall will be constructed around the site, with a 20-foot-wide swing gate and a 6-foot-wide pedestrian gate. Pressure limiting valves, measuring eight inches in diameter, as well as the mainline valve will be installed underground, with valve controls installed above ground and enclosed within cabinets. Communication equipment will be installed onsite and enclosed in a cabinet and powered by a solar panel. Access to the site will be via Mule Hill Trail.

v. **Line 2010 Cross-Tie**

The Line 2010 Cross-Tie will be constructed at the terminus of the proposed Line 3602 on MCAS Miramar land. Two 1,800-foot-long (0.34-mile), 20-inch-diameter pipelines will extend north from the proposed Line 3602 to the existing Line 2010 to establish the cross-tie. These cross-ties will be installed within the proposed Line 3602 easement. The approximately 0.3-acre (100-foot by 150-foot) graveled cross-tie site will include a 42-inch by 36-inch pig receiver, valve control equipment, communication equipment, and a solar panel for power. The facility will also be equipped with SCADA equipment and the ability to blow down the pipeline for rapid removal of natural gas in order to shut down the pipeline during planned maintenance activities or in the event of an emergency. The valve will allow the Utilities to meet or exceed its criteria for isolation and depressurization of designated sections of the pipeline in the event of a pipeline failure. An approximately 20-foot communication pole will be installed for SCADA service. The site will be surrounded by a concrete block wall measuring 6-feet to 8-feet in height and will include two 20-foot-wide swing gates and two 4-foot-wide pedestrian gates. A gravel driveway will provide access to the site from the existing unpaved aqueduct road.

vi. **Pre-Lay Pipeline Segment and Three New Regulator Stations**

The proposed Line 3602 will connect with an existing pre-lay segment located in Pomerado Road. The pre-lay segment was installed in 1994 in Pomerado Road, beginning at Oak Knoll Road and traversing in southerly direction for approximately one mile to its terminus at Scripps Poway Parkway. The pre-lay pipe consists of a 36-inch, API 5L X-60 steel pipe with 0.500-inch wall thickness, coated with fusion-bonded epoxy, cathodic protection, installed with a cement sand slurry backfill approximately 12 inches above the pipe, and hydrotested for an MAOP of 800 psig. A set of double caution tapes was installed approximately 18 inches below grade, and a second set of double caution tapes was installed approximately 18 inches below the first set. The pre-lay segment is currently operating at 400 psig and is maintained as part of a distribution loop system. This pre-lay pipe segment will be hydrotested again as part of the Proposed Project.

Three 8-inch distribution pipelines are currently connected to the pre-lay segment; two are located at either end of the pre-lay segment, and one is located at the segment's midway point at the intersection of Stowe Drive and Pomerado Road. The Utilities installed the 36-inch pre-lay pipeline in the new street alignment in anticipation of a new 36-inch transmission pipeline from Rainbow (*i.e.*, Line 3602). This pipeline segment was incorporated into the existing 400 psig system tying Rancho Bernardo to the Poway, Penasquitos, and Scripps Ranch high pressure systems. This segment of pipeline will be incorporated into the proposed Line 3602, and a new 8-inch distribution supply pipeline will be installed to maintain system continuity.

In order to utilize the pre-lay segment, three regulator stations will be installed on the distribution lines. Each regulator station will be located below grade inside two concrete vaults each measuring approximately 7 feet by 7 feet. The proposed regulator stations are anticipated

to be located within SDG&E's existing right-of-way. No permanent above ground facilities will be installed at the regulator stations, with the exception of the steel vault covers and a 2-inch diameter steel pole approximately 6-feet to 10-feet high with an Electronic Pressure Monitoring (EPM) box mounted on it. Near the top of the pole will be a small solar panel measuring approximately 2 feet by 2 feet.

vii. **De-Rate Line 1600 to Distribution Service**

The Proposed Project includes the installation of Line 3602, a new 36-inch transmission line, to replace the transmission function of the existing Line 1600 between Rainbow and Kearny Villa PLS, but the existing Line 1600 is still a valued asset that, instead, can serve as a distribution line for SDG&E. Details on the scope to de-rate Line 1600 are provided in the Line 1600 De-Rating Impact Analysis provided as Attachment XI in the PSRP Report.[14] Currently, Line 1600 has an MAOP of 640 psig. In order to repurpose and de-rate Line 1600 to a distribution line operating at a pressure level below 20% SMYS, SDG&E proposes to reduce the pressure in the pipeline between the new Rainbow PLS to Kearny Villa PLS to an MAOP of 320 psig.

Ten regulator stations would no longer be needed between Line 1600 and the distribution system downstream. To maintain operational flexibility in the event of scheduled or unscheduled maintenance of the proposed Line 3602, check valves will likely be installed in place of two of the removed regulator stations. In addition, one existing regulator station will be pushed beyond its design capacity with the reduced inlet pressure so it will be replaced with a new regulator station designed to operate at 320 psig. In order to maintain a 400 MAOP pressure

[14] The Utilities performed an analysis and developed the scope to de-rate Line 1600 between the new Rainbow PLS and Kearny Villa PLS. *See* Attachment A to my Prepared Direct Testimony – San Diego Gas & Electric and Southern California Gas Co. Pipeline Safety & Reliability (PSRP) Report. Attachment XI to the PSRP Report, Line 1600 De-Rating Impact Analysis.

in the most critical distribution supply line systems, three new regulator stations will be required to feed the distribution systems from the proposed Line 3602.

As mentioned earlier in my testimony, the Utilities installed a 36-inch pre-lay pipeline in the new street alignment in anticipation of a new 36-inch transmission pipeline from Rainbow (*i.e.*, Line 3602). As discussed, this pipeline segment was designed and tested to operate at 800 psig, however, the segment was incorporated into the existing 400 psig system tying Rancho Bernardo to the Poway, Penasquitos, and Scripps Ranch high pressure systems. This segment of pipeline will be incorporated into the proposed Line 3602, and a new 8-inch distribution supply pipeline will be installed to maintain system continuity. The final element required to de-rate Line 1600 will be the replacement or installation of approximately 3 miles of pipelines ranging from 6 inches to 8 inches in diameter.

B. PSRP COST ESTIMATES

The Utilities developed direct cost estimates to implement the Proposed Project scope of work based on the known and anticipated project scope at the time of the Application's filing (September 2015) and have updated the cost estimates for the Amended Application to include the de-rate of Line 1600 to distribution pressure between the new Rainbow Pressure Limiting Station and Kearny Villa PLS. These estimates, as presented in Table 2 below, include costs for material and equipment procurement, construction, engineering and design, environmental permitting and mitigation, other project execution-related activities, and company labor.[15] As a

[15] The anticipated project scope as of the date of the Application was based on a proposed proceeding schedule and sequence that has been superseded by the November 4, 2016 *Scoping Memo and Ruling of Assigned Commissioner* (Scoping Memo), as amended by the December 22, 2016 *Assigned Commissioner and Administrative Law Judge's Ruling Modifying Schedule and Adding Scoping Memo Questions* (Amended Scoping Memo). Depending upon the length and complexity of the proceeding and environmental review, the estimated permitting and development costs may increase. The Utilities will update such costs, if needed, in Phase 2 of this proceeding.

result the scope definition, degree of completion of deliverables, and execution plan development, the Utilities' estimate is within a Class 3 range of accuracy as defined by AACE.[16] A Class 3 estimate as applied for the Building and General Construction Industries, most relevant to pipeline construction, is defined as having:

- A maturity level of project definition deliverables between 10% and 40%;
- An end usage of design development, budget authorization, and feasibility;
- A methodology of semi-detailed unit costs with assembly level line items; and
- An expected accuracy range of -5% to -15% and +10% to +20%.

TABLE 2
Proposed Project - Estimated Direct Costs
(*In Millions of Dollars*)

Direct Capital Costs	Total
Materials	$ 90.3
Construction	$ 256.0
Engineering & Design	$ 10.1
Environmental	$ 26.5
Other Project Execution Activities	$ 25.8
Company Labor	$ 18.2
Subtotal for Line 3602 Scope[17]	**$ 426.8**
Line 1600 De-rate	$ 15.1
Total for Proposed Project	**$ 441.9**

i. **Materials**

The Utilities consulted with vendors to determine current material costs for pipe and valves to develop cost estimates for the proposed Line 3602 and associated project scope. The total direct costs for materials, presented in Table 3 below, are estimated to be approximately $90.3 million.

[16] AACE Recommended Practice, No. 56R-08, Cost Estimate Classification System – As Applied for the Building and General Construction Industries, TCM Framework: 7.3 – Cost Estimating and Budgeting, Rev. December 5, 2012.
[17] Values may differ slightly due to rounding.

TABLE 3
Materials – Estimated Direct Costs
(*In Millions of Dollars*)

Material Direct Capital Costs	Total
Pipe & Coating	$ 56.7
Elbows	$ 13.3
Valves	$ 3.8
Other Materials	$ 5.8
Freight & Tax	$ 10.7
Total	**$ 90.3**

ii. **Construction**

The construction estimates account for type of terrain traversed during construction and the effect of the terrain on such factors as type of construction methods employed and rate of construction progress. Construction cost estimates were reviewed by the Utilities' experienced project management and construction personnel and each was considered to be technically acceptable and complete with respect to scope and schedule.

The construction cost estimates include the addition of incremental safety measures that provide for a pipeline burial depth of 42 inches, automation of mainline valves, installation of fiber optic right-of-way monitoring, and methane detection devices along the pipeline route. The total direct costs for the construction of proposed Line 3602 and associated project scope, presented in Table 4 below, are estimated to be approximately $256.0 million.

TABLE 4

Construction – Estimated Direct Costs

(*In Millions of Dollars*)

Construction Direct Capital Costs	Total
Pipeline Installation	$ 216.6
Horizontal Directional Drill & Bores	$ 14.2
Hydrotesting & Drying	$ 3.3
Mainline Valves & Others Installation	$ 6.2
Cross Tie & Station	$ 7.7
Construction Management	$ 8.0
Total	**$ 256.0**

iii. **Engineering & Design**

The Utilities' combined analysis of aerial images, U.S. Geological Survey maps, and extensive site visits to refine the engineering cost estimates. The engineering cost estimate incorporates anticipated labor hours and estimated labor rates for activities related to site investigation, project coordination, design drawings and review, preparation of bid specifications and coordination with vendors, construction support, review of right-of-way documents, and project closeout. The total direct costs for engineering and design for the proposed Line 3602 and associated project scope are estimated to be approximately $10.1 million.

iv. **Environmental**

SDG&E's environmental staff provided anticipated labor hours and labor rates in order to develop estimated costs for environmental data collection surveys (including cultural resources, natural resources, water resources, soils, geology, and hazardous materials), geotechnical support, and permitting activities, as well as pre-construction surveys, mitigation compliance, and construction monitoring. Costs for mitigation are based on estimated acreage impacts and fees to available mitigation banks, as well as standard costs per acre for restoration of specific

habitat types. The total direct costs for environmental project elements for the proposed Line 3602 and associated project scope are estimated to be approximately $26.5 million.

v. **Other Project Execution Activities**

Costs for Land Services include acquisition of both temporary work space and access roads and permanent easements along the proposed pipeline route. After construction is completed, the scope and estimate basis is that the sections of the pipeline outside dedicated roads and highways will have a 50-foot right-of-way. Temporary work space during construction will require an additional 50 feet in areas where space is available.

Major pipeline infrastructure projects undoubtedly have an impact on the communities through which they pass. To reduce this impact and facilitate successful project completion, the scale of the Proposed Project requires a comprehensive project-specific public outreach and education program to support permitting activities as well as mitigate risks that could directly impact the project's progress and schedule and result in an increase in project costs and generate unnecessary public controversy over the project. The Proposed Project outreach and education program includes multiple touch points throughout each year, including but not limited to, community educational events, mass media, social media, and internal and external communications methods throughout the duration of the project.

Due to the complexity and magnitude of the regulatory requirements for the project, including filing of a Certificate of Public Convenience and Necessity (CPCN), CEQA, and NEPA, and other approvals required to construct the project, outside legal services specializing in environmental and regulatory law have been engaged. The outside legal services are specific to the project and supplemental to internal legal support for the Proposed Project.

Including a performance bond for the Proposed Project, the total direct costs for Other Project Execution activities for the proposed Line 3602 and associated project scope are estimated to be approximately $25.8 million.

vi. **Company Labor**

The Utilities will use company resources to perform various functions over the course of the project. In particular, the Utilities will be responsible for overall project and construction management and oversight, environmental management, project controls, and various other support functions. All third-party contractor and consultant activity, including but not limited to, environmental surveys and monitoring, procurement, engineering/design, land and right-of-way acquisition, construction management, and legal services will be overseen by company resources. The total direct costs for company labor for the proposed Line 3602 and associated project scope are estimated to be approximately $18.2 million.

vii. **De-Rate Line 1600**

The Proposed Project scope includes the de-rating of Line 1600 for continued operation as a distribution asset. The costs for de-rating Line 1600, a presented in Table 5 below, were developed based on a combination of historical data, semi-detailed unit costs, and engineering experience and judgment. The total direct costs to de-rate Line 1600 are estimated to be approximately $15.1 million.[18] The estimate to de-rate Line 1600 was applied to each Alternative identified in the Ruling, except for the Hydrotest Alternative and the Replace Line

[18] The direct cost estimate for de-rating Line 1600 includes $2.3 million associated with removing existing assets. As explained in the Prepared Direct Testimony of Michael Woodruff, dated March 21, 2016, these costs are excluded from the revenue requirement requested for recovery in this application as the costs associated with removing existing assets is recovered through the revenue requirement associated with the original asset.

1600 in Place with a New 16-inch Transmission Pipeline Alternative, where the de-rate was not applicable.

TABLE 5
De-Rate Line 1600 - Estimated Direct Costs
(*In Millions of Dollars*)

Direct Capital Costs	Total
Material	$ 2.5
Construction	$ 8.0
Engineering & Design	$ 1.1
Environmental	$ 0.9
Other Project Execution Activities	$ 1.2
Company Labor	$ 1.4
Total	**$ 15.1**

viii. **Contingency**

Contingency is a direct cost to the project and will be spent over the course of engineering, design, procurement, and construction. Per the AACE, contingency is defined as "a cost element of the estimate used to cover the uncertainty and variability associated with a cost estimate, and unforeseeable elements of cost within the defined project scope."[19] The risks of these unknown elements within the defined scope, and their associated costs materializing, are always present on construction projects like the Proposed Project. Including a contingency allows for these costs to be budgeted, even though the exact contingency-related expenditures and unforeseen events are unknown at the current level of project definition. To calculate contingency, the Utilities analyzed each cost component, considered the risks related to the component that fall within the defined project scope, and established a contingency percentage.[20] This is a common process for calculating contingency. Consistent with good estimating practice

[19] AACE Recommended Practice, No. 34-R-05, TCM Framework: 7.3 - Cost Estimating and Budgeting, 2007, at 4.
[20] Project Management Institute's Project Management Body of Knowledge (PMBOK) in Section 7.2.2.6 Reserve Analysis states, "contingency reserves can provide for a specific activity, for the whole project, or both."

and prior Commission precedent, the Utilities have taken the approach of contemplating the risks specific to the Proposed Project costs when determining a reasonable contingency to include in the cost estimate.[21]

At the project component level, we included contingency amounts that range from 0% to 30% of the direct cost. Those project components where fewer issues are expected to arise and the scope and cost estimates are more fully developed will have contingencies towards the lower end of this range. Those project components that have the potential for greater cost impacts should an issue arise, and where the scope and costs estimates are not as fully developed will have a higher contingency applied. For example, environmental permit conditions may require additional mitigation measures that have not been included in the cost estimate. Additional mitigation may be required as a result of the final CEQA and NEPA analysis and due to discovery of onsite cultural resources, nesting birds, or vernal pools during construction. Regarding construction, changed permitting conditions or unknown conditions resulting from the discovery of contaminated soil or unknown substructures that may require additional mitigation measures and associated incremental costs have not been included in our current cost estimate. These issues will often cause a delay in project schedule and an increase in construction scope that ultimately impact project costs. Having a reasonable contingency will often avoid an impact to the final project cost.

[21] *See, e.g.*, D.09-03-026, which authorized Pacific Gas and Electric Company's (PG&E) Smart Meter Program Upgrade. The approved cost of that project included a risk-based allowance *(i.e.*, contingency) of 12.9%. The Commission authorized a 15% contingency amount in connection with Southern California Edison's (SCE) Tehachapi Renewable Transmission Project and further stated that "a contingency of 15% is consistent with Commission precedent." In support of this determination, the Commission cited several examples of utility infrastructure projects for which contingency levels above 11.4% were adopted by the Commission: "For example, D.08-12-058 adopted a contingency of 18.35% for SDG&E's Sunrise Powerlink Project, D.07-01-040 adopted a contingency of 'almost 15%' for SCE's Devers-Palo Verde No. 2 Project, and D.01-12-017 adopted a contingency of 14.6% for PG&E's Northeast San Jose Project." D.09-12-044, at 72.

Even after accounting for the contingency in the direct cost estimate, there still may be variability in the overall cost of the project. The amount of expected variability is related to external, uncontrollable factors that impact skilled labor costs, material costs, etc. For example, the best quality estimate would be a firm quote from a vendor to perform a specific task. While many cost estimates for this project are based on input from vendors and contractors, no firm quotations were obtained, as many of the project activities estimated will not be occurring for several years.

It should be noted that there are risks outside of the defined project scope that are excluded from the cost estimate and contingency.[22] In aggregate, the contingency for the Proposed Line 3602 is approximately $44 million, presented in Table 6 below. The overall contingency amount of 11.6% for the Proposed Line 3602 is consistent with prior Commission precedent and appropriate for the project scope.

The contingency for Line 1600 De-Rate is approximately $2.4 million, presented in Table 7 below. The contingency for the pipeline additions for the Line 1600 De-Rate is 20% and the contingency for the abandonment is 15%, resulting in an overall contingency for Line 1600 De-Rate of 19.3%.

[22] Examples of such risks include: (1) significant increases in costs for skilled labor and qualified resources (*e.g.*, engineers, contractors, construction workers, and specialty consultants), materials, or other commodities over the project duration, beyond the escalation included in the revenue requirement; (2) significant changes to the project scope as a result of the environmental and/or regulatory review of the project; (3) significant delays in the project schedule as a result of the environmental and/or regulatory review, local community intervention, natural disaster, labor strike, and changes to laws or regulations that would significantly affect project cost and/or schedule; and (4) earthquakes, fires, natural disasters, strikes, or other force majeure type events.

TABLE 6
Proposed Line 3602 Contingency
Estimated Direct Cost
(*In Millions of Dollars*)

Contingency Costs	Percent	Total
Materials	9.1%	$ 7.6
Construction	11.1%	$ 25.6
Engineering & Design	10.1%	$ 0.9
Environmental	30.0%	$ 6.1
Other Project Execution Activities	12.5%	$ 2.9
Company Labor	8.0%	$ 1.3
Total	11.6%	$ 44.4

TABLE 7
Line 1600 De-Rate Contingency
Estimated Direct Cost
(*In Millions of Dollars*)

Contingency Costs	Percent	Total
Materials	19.7%	$ 0.4
Construction	19.0%	$ 1.2
Engineering & Design	19.4%	$ 0.2
Environmental	19.9%	$ 0.2
Other Project Execution Activities	19.8%	$ 0.2
Company Labor	18.7%	$ 0.2
Total	19.3%	$ 2.4

C. POST-CONSTRUCTION OPERATION AND MAINTENANCE EXPENSE

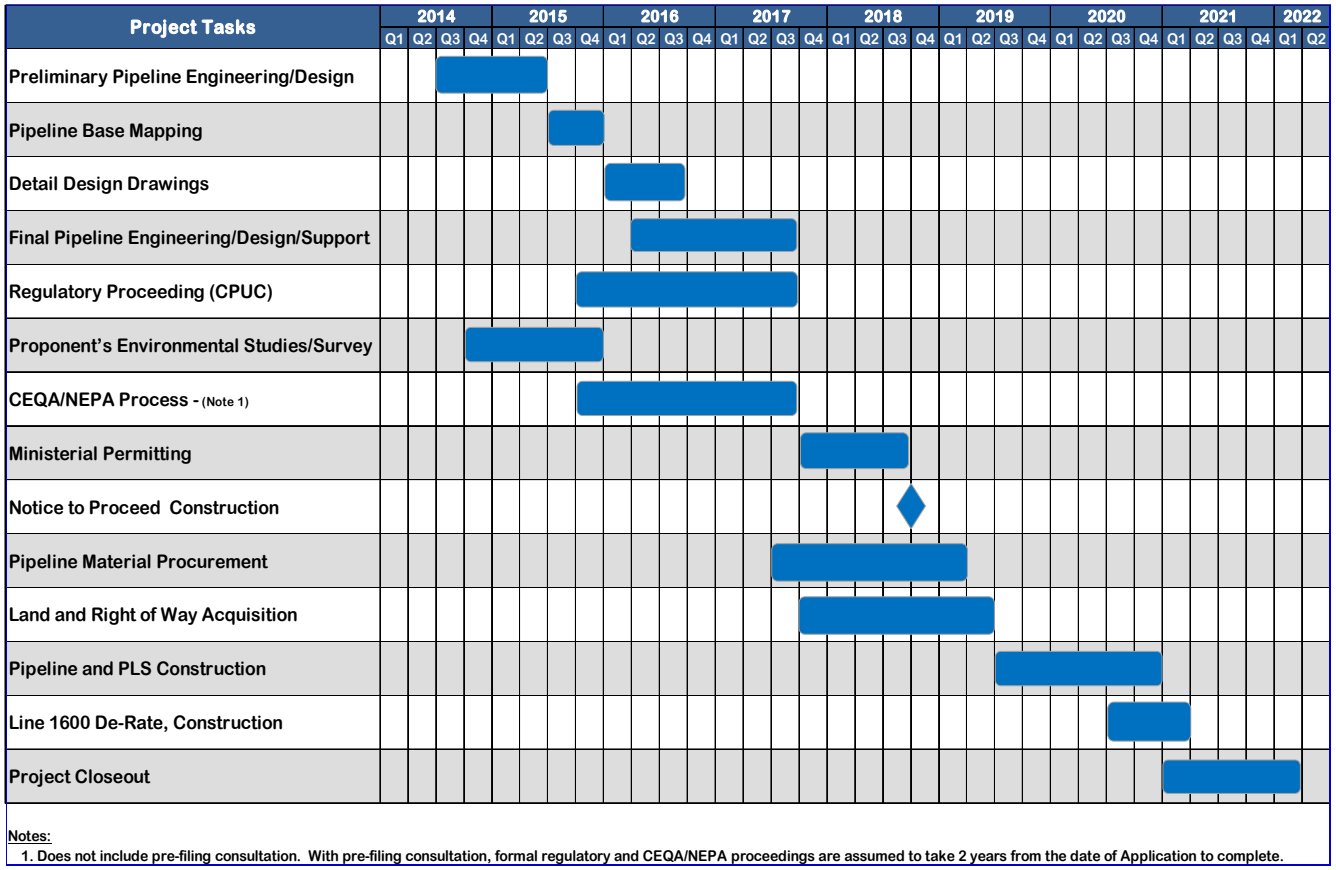
The Proposed Project will result in incremental ongoing O&M expense for the new pipeline after being placed into service. Pipeline operations and compliance activities, including valve maintenance and cathodic protection, will incur ongoing expense, estimated to be approximately $240,000 annually. As discussed in the Prepared Direct Testimony of John A. Roy, recovery of this ongoing O&M expense is not included in the proposed revenue

requirement for this Application; however, the post-construction O&M expense will be recorded in the requested PSRP Memorandum Account.[23]

D. SCHEDULE

The Utilities commenced the preliminary engineering design and environmental surveys for the Proposed Project beginning in Q3 2014. The Utilities estimate that it will take approximately seven years to permit, engineer, design, procure, construct, and place the new assets in service in Q4 2020. The Proposed Project's schedule, depicted in Figure 2 below, was used as the basis for developing the cost estimate and annual expenditures.[24]

Figure 2
Proposed Project Schedule, Pipeline Safety & Reliability Project



[23] *See* Prepared Direct Testimony of John A. Roy.
[24] The Utilities will update this schedule once the Commission sets a schedule for Phase 2 of this proceeding.

The initial years of the project focus primarily on the preliminary engineering and design work, as well as the environmental surveys and data collection that are necessary to develop and support the various permit applications. These activities include detailed reviews and mapping of the pipeline routes.

It is assumed that material procurement, including long lead time valves, land and right-of-way acquisition, and awarding of major construction contracts, will not occur until after the Utilities receive final environmental clearance and regulatory approval for the Proposed Project. It is estimated that detailed engineering and design, procurement, and construction for the Proposed Project will be completed within approximately three years of receiving final environmental clearances and regulatory approval.

Delays in the project schedule can increase costs, including: company labor costs to keep the project team together, cost escalation, Allowance for Funds Used During Construction (AFUDC), along with costs of maintaining third-party expertise. Key to meeting the project schedule is obtaining timely approvals from numerous regulatory and other agencies.

IV. HYDROTEST ALTERNATIVE

Although the Hydrotest Alternative (Alternative B in the Ruling) is referred to as the "No Project Alternative," this would in fact be a very expensive, lengthy, and complicated project. The portion of Line 1600 subject to hydrotesting for the purposes of this Alternative, is a 47-mile, 16-inch high-pressure natural gas transmission pipeline that starts at the Rainbow Metering Station south of Temecula, California and travels southbound to Kearney Villa PLS in San Diego, California.

The Utilities, with assistance from SPEC Services and other consultants, evaluated and developed the scope, cost, and schedule to hydrotest Line 1600 to allow continued transmission

level service at 640 psig.[25] The Line 1600 Hydrotest Study and Cost Estimate (Hydrotest Study), provided as Attachment B to my testimony, supports the technical aspects of the hydrotest, maintaining service to customers during the hydrotest, cost estimate development, and schedule basis.

A. Scope

As further described in the Hydrotest Study, hydrotesting Line 1600 is technically feasible, but it would be complicated, protracted, and fraught with risk. Line 1600 supplies approximately 152,000 distribution customers including core, noncore, and electric generation. These customers are supplied via 50 connections/regulator/meter stations, so provisions would be made during testing to maintain service and reliability to all current distribution customers for each test segment. There are no transmission lines within the vicinity of Line 1600, so alternate service would be provided through gas bottles, compressed natural gas trucks, installation of major bypasses, or from bypass connections at test breaks whereby supply would be backfed from the north or south through Line 3010 or the Otay Mesa receipt point. Delivery of gas supplies to the Otay Mesa receipt point during the planned outage for the hydrotest is further discussed in the Prepared Direct Testimony of Gwen Marelli.

In the event the hydrotest is not successful, significant cost increases and schedule delays could occur. As explained in the Prepared Direct Testimony of Travis Sera, "[a]voiding the need to pressure test Line 1600 would prevent the pitfalls associated with entering into an unpredictable cycle of pressure test failures."[26] Leaks resulting in sudden pressure loss (*e.g.*, rupture) are relatively easy to find. Once found, the repair can be made and the test repeated.

[25] The scope of this study is Rainbow Metering Station to Kearny Villa Pressure Limiting Station. The segment from Kearny Villa Pressure Limiting Station to Mission Station is currently being evaluated for testing or replacement.
[26] *See* Prepared Direct Testimony of Travis Sera, at 21.

This may add a few days to a couple of weeks to the test depending on where the release occurred and whether other leaks were found. A more difficult scenario occurs if the pipe were to have a very small leak that would result in a loss of a few psi per hour. There are several techniques to locate a small leak in underground pipelines. One way is to empty the water out of the line, segment it, and test each half to: a) get a good test on at least half of the segment, and b) reduce the length of the segment that contains the leak. This process is repeated on the "bad" half until the location of the leak becomes evident and can then be found via excavation and repaired. This method is time consuming and could result in delays of weeks or even months. Finally, there are pipeline locations where a leak would not be easily located and repaired and would require relocation of the pipeline. These locations include pipeline segments under Interstate 15, Lake Hodges, and other areas where limited work space would not allow for locating and repairing the pipeline.

B. Cost Estimate

The total direct costs to hydrotest Line 1600, as provided in Table 8 below, are $112.9 million, including contingency.

TABLE 8

Line 1600 Hydrotest - Estimated Direct Costs

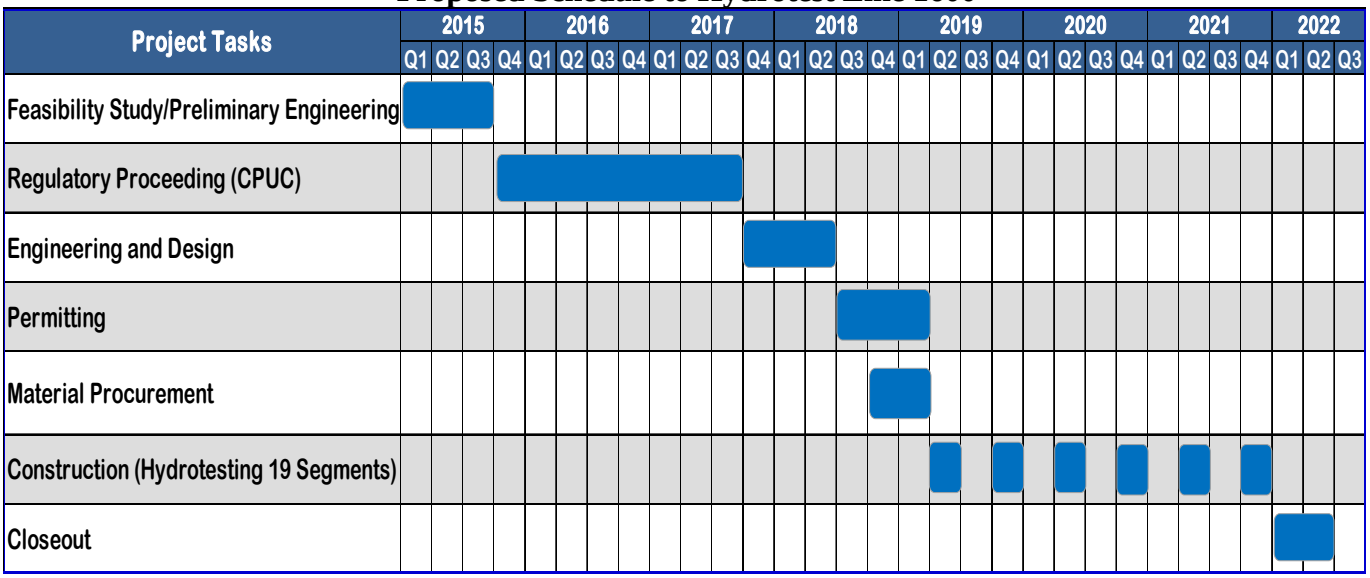
(*In Millions of Dollars*)

Direct Capital Cost	Total
Materials	$ 2.8
Construction	$ 54.8
Engineering & Design	$ 4.4
Environmental	$ 6.5
Company Labor	$ 2.8
Major Bypasses	$ 11.2
Gas Transportation to Otay Mesa	$ 20.3
Other Project Execution Activities	$ 10.1
Total	**$ 112.9**

C. Schedule for Hydrotesting Line 1600

Each test segment would take approximately four to six weeks to conduct. To minimize prolonged customer outages during testing, and to reasonably maintain supply to meet seasonal peak demand, the optimal time to test would be during the shoulder months from April 1 through June 15, and October 1 through December 15. The overall schedule for completing the hydrotesting, as depicted in Figure 3 below, would be approximately three years from regulatory approval and any subsequent approvals required by environmental review.

Figure 3
Proposed Schedule to Hydrotest Line 1600



V. ADDITIONAL ALTERNATIVES IN THE RULING

My testimony and attachments hereto provide detail on the Proposed Project and the Hydrotest Alternative. The Ruling identified several additional Alternatives, which are described and discussed in greater detail in the Cost-Effectiveness Analysis and in the Prepared Direct Testimonies of Gwen Marelli (Otay Mesa Alternatives)[27] and S. Ali Yari (Alternative

[27] *See* Prepared Direct Testimony of Gwen Marelli.

H).[28] Specifically, the Cost-Effectiveness Analysis provides additional detail on the cost estimates, schedule, and comparative benefits associated with each Alternative. In particular, I provided the cost estimates for the known and anticipated project scope and ongoing operation and maintenance costs, as applicable, for each Alternative.[29] I also provided the studies, referenced herein, supporting the avoided costs for reduced operations at the Moreno Compressor Station and the de-rate of Line 1600 that were included in the scope of certain Alternatives.[30]

[28] *See* Prepared Direct Testimony of S. Ali Yari.
[29] *See* Workpaper, Estimated Fixed and Operating Costs for Proposed Project and Alternatives.
[30] *See* Attachment A – San Diego Gas & Electric and Southern California Gas Co. Pipeline Safety & Reliability Project (PSRP) Report.

VI. QUALIFICATIONS

My name is Norm G. Kohls. I am employed by San Diego Gas & Electric Company (SDG&E) as the Manager of the Pipeline Safety & Reliability Project. My business address is 6875 Consolidated Way, San Diego, California 92121.

I joined SDG&E in 1992 as an Engineer and have worked in several diversified areas of the utility business with increasing leadership responsibility. While with SDG&E, I have held various positions in the functional areas of both Gas and Electric Operations and Engineering. These areas include Gas Transmission Major Projects, Gas System Planning, Gas Engineering, Gas Design, Gas Operations and Maintenance, Gas Mapping and Records, and Gas Geographic Information Systems. Other areas include Project Management, Construction Services, Electric Distributon System Capacity Planning, Electric System Reliability, Overhead to Underground Conversion Programs, New Business Extensions and Service Establishment, Distributed Generation Interconnections, Emergency Operations, Compliance as well as Asset Management and Information Management Support for Electric Distribution Operations. I transitioned to my current position in April 2016.

My current management responsibilities include the development of the scope, detailed design, cost, construction planning and scheduling of the Pipeline Safety & Reliability Project; the scope, cost and schedule of the alternative that would hydrotest Line 1600 (Hydrotest Alternative) and development of scope, cost and schedule of other alternatives considered in association with this Application as well as other administrative matters related to the proposed project.

In 1988, I earned a Bachelor of Science Degree in Mechanical Engineering with a Minor in Economics from San Diego State University. In 1992, I earned my California State

License as a Registered Professional Engineer in Mechanical Engineering. I have been a member of the American Society of Mechanical Engineers for approximately 30 years.

I have previously testified before the California Public Utilities Commission.

This concludes my prepared direct testimony.

A.15-09-013 Pipeline Safety & Reliability Project
SDG&E and SoCalGas Prepared Direct Testimony Change Log – February 2017
(Page and line references are to the original version of the prepared direct testimony served on March 21, 2016)

Witness	Page	Line(s)	Revision Detail
Neil Navin	Cover	N/A	Added "SDGE-8-R"
Neil Navin	Cover	N/A	Changed "Neil Navin" to "Norm G. Kohls"
Neil Navin	Cover	N/A	Added "Updated"
Neil Navin	Cover	N/A	Added "updated February 21, 2017"
Neil Navin	1	2	Added new footnote: "I assume the witnessing role and responsibility for the Prepared Direct Testimony of Neil Navin, served in this proceeding on March 21, 2016, as Mr. Navin has taken on different job responsibilities. Aside from reflecting this witness change and the few updates detailed in the change log appended hereto, the contents of this testimony have not changed from the version tendered on March 21, 2016."
Neil Navin	16	19	Added new footnote: "The anticipated project scope as of the date of the Application was based on a proposed proceeding schedule and sequence that has been superseded by the November 4, 2016 *Scoping Memo and Ruling of Assigned Commissioner* (Scoping Memo), as amended by the December 22, 2016 *Assigned Commissioner and Administrative Law Judge's Ruling Modifying Schedule and Adding Scoping Memo Questions* (Amended Scoping Memo). Depending upon the length and complexity of the proceeding and environmental review, the estimated permitting and development costs may increase. The Utilities will update such costs, if needed, in Phase 2 of this proceeding."
Neil Navin	26	8	Added new footnote: "The Utilities will update this schedule once the Commission sets a schedule for Phase 2 of this proceeding."
Neil Navin	30	6	Replace "four" with "three"
Neil Navin	32	2-23	Replaced witness qualifications of Neil Navin with that of Norm G. Kohls
	33	1-3	
Neil Navin	Attachment A, Sub-Attachment XII, Moreno Compressor Station PSRP Report page 2	Table 3 "Average" column and "Overall" row	Replaced "$2,613,907" with "$2,829,778"

Attachment A

San Diego Gas & Electric and Southern California Gas Co.

Pipeline Safety & Reliability Project (PSRP) Report.

SAN DIEGO GAS & ELECTRIC
AND SOUTHERN CALIFORNIA GAS CO.
PIPELINE SAFETY & RELIABILITY PROJECT
(PSRP) REPORT

March 2016

Prepared By:

Southern California Gas Company
555 W. Fifth Street
Los Angeles, CA 90013-1041

March 2016

TABLE OF CONTENTS

Attachments[1]

[1] Attachments IV, VI and X are workpapers and available upon request.

EXECUTIVE SUMMARY

Purpose of Report

San Diego Gas & Electric Company (SDG&E) and Southern California Gas Company (SoCalGas) are planning to construct, operate and maintain a new 36-inch diameter natural gas transmission pipeline (Proposed Line 3602), approximately 47 miles in length from Rainbow to Marine Corps Air Station (MCAS)-Miramar and de-rate the existing 16-inch diameter pipeline known as Line 1600 to distribution service (Proposed Project). The Proposed Project, which is described in more detail in the Proponent's Environmental Assessment (PEA), is referred to as the Pipeline Safety & Reliability Project (PSRP).[2]

The purpose of this report is to provide a detailed overview of scope, basis, and cost estimate for the Proposed Line 3602. This overview includes both a description of the engineering and analysis performed, as well as details on the execution approach assumptions. The Line 1600 de-rate scope is presented in Attachment XI.

The Proposed Project will also provide a cost reduction at the Moreno Compressor Station due to decreased operations identified in Attachment XII.

The scope and approach described in this report represents SDG&E and SoCalGas' current basis for the Proposed Project estimate. Further refinements to the engineering and design will occur as the project progresses through environmental reviews, permitting, procurement, and construction phases of the project. This report includes details regarding the scope, pipeline alignment, cost, schedule, and other factors that may affect project costs.

[2] The Application for a Certificate of Public Convenience and Necessity for the Pipeline Safety & Reliability Project was filed with the California Public Utilities Commission (CPUC) on September 30, 2015. The PEA is Volume II of the Application. A PEA Supplement, filed as Volume II of the Amended Application dated March 21, 2016, supplements the PEA to include additional information regarding the potential environmental impacts associated with de-rating Line 1600.

Project Overview

As more fully described in the PEA and PEA Supplement, the Proposed Project includes the construction, operation and maintenance of the following components:

1) Approximately 47 miles of 36-inch diameter natural gas transmission pipeline
2) Ten new mainline valves (MLV) spaced a maximum of 5 miles apart
3) Two pressure limiting stations (Rainbow Pressure Limiting Station [PLS] and Cross-Tie with Line 1600)
4) Three cross-ties facilities (*i.e.*, Line 1600, Line 1601 and Line 2010)
5) One launcher and one receiver for the proposed 36-in line
6) Cathodic protection system
7) An intrusion detection and leak monitoring system
8) De-rating of Line 1600 to distribution service

The Proposed Line 3602 alignment from the Rainbow PLS to MCAS-Miramar is depicted in Figure 1, below.

Figure 1: Proposed Line 3602 Alignment from Rainbow PLS to MCAS-Miramar

Cost Summary

The estimated cost for the Proposed Project is $442 million (direct cost),[1] including the pipeline, pressure limiting stations and the scope associated with de-rating of Line 1600 are summarized in Table 1. A more detailed cost estimate, with estimated costs by budget categories has been included in Attachment VI Pipeline Cost Estimate.

Environmental

The PEA was prepared by SDG&E's and SoCalGas' environmental consultant, Insignia Environmental and filed with the CPUC in September 2015. A PEA Supplement has been prepared to include updated information as of March 2016, including updated description and analysis of distribution system modifications for the Line 1600 de-rate. The cost analysis of the anticipated environmental permitting requirements (*e.g.*, cost for labor (external consultants), permit fees, monitoring and mitigation) is included in the overall project cost estimate. The environmental costs are shown in Attachment X Preliminary Environmental Cost Estimate.

TABLE 1

	Cost (Million)
Material	$90.3
Construction	$256.0
Engineering & Design/Project Mgmt.	$10.1
Environmental	$26.5
Company Labor	$18.2
Other (ROW/Insurance/Legal/Project Outreach)	$25.8
Line 1600 De-rate	$15.1
	$441.9

1.0 PROJECT COMPONENTS AND KEY ASSUMPTIONS

This section provides an overview of the Proposed Line 3602 components and key assumptions.

Rainbow Pressure Limiting Station (PLS)

- Install a new PLS at Rainbow, south of existing Rainbow Metering Station
- Design for connection of SoCalGas' existing lines to SDG&E's existing and Proposed Line 3602
- Provide pressure control at the Rainbow PLS

Line 1600 Cross-Tie

- Install a new PLS to connect the Proposed Line 3602 to existing Line 1600
- Design will also include a main line valve for the Proposed Line 3602
- Provide pressure control at the cross tie

Transmission Pipeline

- Approximately 47-mile section of 36-inch pipeline
- Install 10 mainline valves with blow-down and automatic/remote shut-in capability
- 36" pipeline design with Fusion Bonded Epoxy (FBE) coating and Abrasion Resistant Epoxy Coating – Powercrete where necessary
- Design Maximum Allowable Operating Pressure (MAOP) – 800 pounds per square inch gauge (psig)
- Pipeline will allow for the passage of commonly available internal inspection tools (*i.e.* piggable)
- Construction within unpaved corridor (right-of-way plus temporary area for construction activities) is assumed to be 100 feet wide. Construction within urban areas will be limited to road and road shoulder. Temporary staging areas along the construction corridor and special crossing locations will require wider widths at these specific locations
- Alignment traverses public and private lands within San Diego County

2.0 ROUTE DESCRIPTION

The Proposed Line 3602 includes construction of an approximately 47 mile-long, 36-inch diameter natural gas transmission pipeline that will carry natural gas from the proposed Rainbow Pressure Limiting Station to the terminus point on MCAS-Miramar. In addition to the pipeline, the Proposed Line 3602 will also include MLVs, pressure limiting stations, in-line inspection equipment, cathodic protection systems, and an intrusion and leak monitoring system. The pipeline will be constructed of API 5LX-65 steel designed for a MAOP of 800 pounds per square inch (psi). The outside diameter of the pipeline will be 36 inches with a wall thickness of 0.625 inch.

The proposed route for the new transmission line, Line 3602, begins at the proposed Rainbow PLS, which would be located approximately 50 feet south of the existing Rainbow Metering Station. From the Rainbow PLS, the proposed route travels southeast along Old Highway 395 for approximately 2.3 miles before turning west at Rainbow Glenn Road and crosses under Interstate (I-15) overpass. The proposed route then turns south along Rainbow Hills Road before veering southwest through an avocado orchard. South of the avocado orchard, the Proposed Line 3602 rejoins with Old Highway 395. The proposed route continues along Old Highway 395, crosses State Route 76, then the San Luis Rey River using horizontal directional drill (HDD). From the HDD exit point, the proposed route rejoins Old Hwy 395 and continues south until it reaches the I-15, where it crosses using HDD. From the HDD exit point, the proposed route continues southeast, then rejoins Old Hwy 395 and continues south until it becomes Champagne Boulevard, then North Centre City Parkway as it enters the City of Escondido. The proposed route continues along North Centre City Parkway for approximately 5 miles until it interconnects with Line-1601 and then under State Route 78. The proposed route continues through Escondido along North Centre City Parkway, Felicita Avenue, Encino Drive, and then Bear Valley Parkway until it enters a trail leading to Lake Hodges. The proposed route crosses Lake Hodges via HDD. At the HDD exit point, the Proposed Line 3602 heads west along Highland Valley Road, then turns south on Pomerado Road.

The Proposed Line 3602 will connect with an existing previously installed (pre-lay) segment located in Pomerado Road. The pre-lay segment was installed in 1994 at Pomerado Road, beginning at Oak Knoll Road and traversing in southerly direction for approximately one mile to its terminus at Scripps Poway Parkway. The pre-lay pipe consists of a 36-inch, API 5L X-60 steel pipe with 0.500-inch wall thickness. It was installed with a cement sand slurry backfill approximately 12 inches above the pipe. The pre-lay pipe was coated with fusion-bonded epoxy, cathodically protected, and hydrostatically tested for a MAOP of 800 psi. The proposed route continues southeast along Pomerado Road, until it reaches Willow Creek Road/Avenue of Nations. Just past Avenue of Nations, the proposed route turns southeast then east along an unpaved road, before entering MCAS Miramar land. The proposed route travels south through

MCAS Miramar, parallel to an unpaved aqueduct patrol road for approximately 2.6 miles, until it terminates north of State Route 52 and connects to existing Line 2010.

At above-ground facilities (PLS, mainline valves and cross-ties) a six to eight foot high block wall will be installed for security purposes. Each site will also be equipped with a vehicle and pedestrian gate access.

Rainbow Pressure Limiting Station

The Proposed Line 3602 will include construction of the new Rainbow PLS. The proposed Rainbow PLS will prevent the over-pressurization of interconnected pipelines that operate at different MAOP, and will be located approximately 50 feet south of the existing Rainbow Metering Station on a parcel of land owned by SDG&E. Pressure limiting equipment will consist of pressure limiting valves installed underground with valve controls installed aboveground and enclosed in a cabinet. The pressure limiting station will also contain a launcher for future in-line inspection work. The PLS will also be equipped with a Supervisory Control and Data Acquisition (SCADA).

Transmission Pipeline

The Proposed Line 3602 will consist of approximately 47 miles of steel API 5LX-65 pipe designed for a MAOP of 800 psi. The outside diameter of the pipe will be 36 inches with a wall thickness of 0.625 inch. The pipeline will be designed, constructed, operated, and maintained to meet or exceed applicable requirements included in United States Department of Transportation (DOT) regulations Title 49, Part 192 of the Code of Federal Regulations (CFR) Transportation of Natural and Other Gas by Pipeline, as well as CPUC standards under General Order (GO) 112-E. The proposed pipeline will be installed approximately 42 inches below ground surface using conventional trenching methods for urban and cross-country areas. The pipeline will cross several major roads, including the I-15, as well as a number of water features, including the San Luis Rey River and Lake Hodges (*see* Attachment VII – List of Major Crossings). At these crossings, HDD and horizontal boring methods will be implemented to minimize impacts to riparian habitat and water quality.

Mainline Valves

Approximately ten new MLV will be installed along the pipeline to shut down the flow of gas during operation and maintenance activities or emergency situations. The valves will be designed for automatic shut-off without operator intervention in the event of a rapid loss of pressure and remote operation by SDG&E and SoCalGas' Gas Control Department (Gas Control). Each valve will be installed within a permanent easement and will measure approximately 50 feet by 75 feet. The valves will be installed below ground, which includes the

36-inch diameter valve and a 10-inch or 12-inch diameter blow-off valves. Other components for SCADA controls will be installed aboveground and may consist of actuators, control cabinets, antennae pole and solar panel. At a minimum, valves will be located every five miles along the proposed pipeline route.

Line 1601 Cross-Tie

The Line 1601 Cross-Tie will interconnect the proposed pipeline with the existing 16-in diameter Line 1601 near the intersection of State Route 78 and Centre City Pkwy in the City of Escondido. The majority of the site will be located on SDG&E property. The proposed Line 1601 interconnection will be equipped with SCADA.

Line 1600 Cross-Tie

The Line 1600 Cross-Tie will include an interconnection between the existing 16-inch diameter Line 1600 and the Proposed Line 3602. This cross-tie will include a PLS and a mainline valve for the proposed Line 3602. The proposed site is located south of Bear Valley Parkway along Mule Hill Trail. Pressure limiting valves, blow-off valves and the mainline valve will be installed underground. The proposed Line 1600 interconnection will be equipped with SCADA.

Line 2010 Cross-Tie

The Line 2010 Cross-Tie will be constructed at the Proposed Line 3602 terminus on MCAS Miramar land. The proposed termination point will include a pig receiver as well as SCADA and will be situated in an area measuring approximately 100 feet by 150 feet.

3.0 RIGHT OF WAY

Detailed breakdowns of the cost estimate for Right-Of-Way (ROW) can be found in Attachment VI- Cost Estimate.

Permanent and temporary land requirements will be necessary to construct, operate and maintain the Proposed Line 3602. Approximately 87 percent of the Proposed Line 3602 will be in franchise utilizing existing roadways and road shoulders. The remaining approximately 13 percent of the proposed route will be installed in federal land or privately owned land. The Proposed Line 3602 will require an approximately 50-foot permanent linear easement along the entire alignment for operation and maintenance of the pipeline. With the exception of the Line 1601, Line 1600 and Line 2010 cross-ties, all aboveground facilities will be located within the approximately 50-foot permanent easement or on SDG&E-owned property.

Temporary work space required for construction will be limited to the road and road shoulder in urban areas, and will be up to 100 feet wide in cross-country areas. Additional temporary workspace will also be required at HDD and horizontal bore locations.

Pipe is anticipated to be shipped by rail and stored at an existing rail yard in the City of Fontana. The pipe will be transported by truck from the Fontana rail yard to one of the proposed staging areas or directly to the ROW. Approximately six staging/laydown yards have been preliminarily identified to facilitate construction activities and provide locations for the construction contractor to meet, carpool, store equipment, house office trailers and park and maintain equipment. Each staging area is located in a disturbed area that is accessible from an existing road. Site preparation will include installation of erosion and sediment control devices as well as fencing and grading, if necessary.

The Proposed Line 3602 will be accessed by existing public roadways and unpaved roadways that intersect paved roadways adjacent to the route. One unpaved access road, the Aqueduct Road, will be used during construction of the Proposed Line 3602 at MCAS Miramar. No improvements will be required along this road. No new permanent access roads will be constructed as part of the Proposed Line 3602.

4.0 ENGINEERING

Detailed breakdowns of the cost estimate for the pipelines, pressure limiting stations and mainline valves can be found in Attachment VI - Cost Estimate.

Engineering and Design

Rainbow Pressure Limiting Station

The Engineering Feasibility analysis for the proposed Rainbow PLS began with an evaluation of the station and the tie-ins required for the proposed transmission pipeline, the configuration of equipment and the ability to accommodate the requested capabilities into the station.

A preliminary design was developed and evaluated to allow the proposed pipeline to tie into a common header, to allow flow into the new pipeline and to allow reduced pressure flows into the existing Lines 1027, 1028, and 6900.

The Rainbow PLS uses a dual run "worker/monitor" design to provide pressure control and overpressure protection. Actuated ball valve regulators provide pressure control. Measurement at strategic locations will provide information on the flow rate between connected facilities. Communications with Gas Control are included to provide sufficient information to monitor the operating condition and performance of the station.

Location of Station

The Rainbow PLS is located approximately 50 feet south of the existing Rainbow Metering Station at the intersection of Old Hwy 395 and Rainbow Valley Blvd. The Rainbow Metering Station receives gas from SoCalGas from the north by three transmission pipelines:

- 16-inch diameter Line 1027
- 24-inch diameter Line 1028, and
- 30-inch/36-inch diameter Line 6900.

The Rainbow Metering Station serves as the custody transfer point between SoCalGas and SDG&E. The SDG&E system is serviced by two transmission pipelines:

- 16-inch Line 1600
- 30-inch Line 3010

Proposed Tie-Ins

The new pressure limiting station will be tied to SDG&E's transmission pipelines Line 1600 and Line 3010 downstream of the existing meters and will be designed for an 800 MAOP.

Pipeline

The analysis for the Proposed Line 3602 includes an evaluation of the possible pipeline routes by studying aerial images, United States Geological Survey (USGS) maps, and existing utility corridors parallel to or in the vicinity of the routes. The analysis was followed by multiple site visits along each of the possible route alternatives. Each identified alternative was reviewed in detail by multiple site visits along the proposed alignments, engineering review of difficult and challenging areas (*e.g.*, narrow two-lane road with detour access) and comprehensive evaluations of selected crossings such as freeways, rivers, and bridges. The drawings in Attachment I show the proposed route of the pipeline.

Pipeline Design - The pipeline will be designed in accordance with 49 CFR 192 - Transportation of Natural Gas and other Gas by Pipeline: Minimum Federal Safety Standards. The proposed pipeline is 36 inches in diameter and will be designed to operate at a MAOP of 800 psig. The pipe selected is 36" API 5L X65 with 0.625 inch wall thickness. This pipe will meet the design pressure requirements for Class 3 locations as defined in 49 CFR 192. The pipeline and its fittings will be coated with FBE to a thickness of approximately 15 mils. The weld joints will be sprayed with FBE Abrasion Resistant Coating (ARC) that will be used for Horizontal Directional Drills or bores without the use of casing and in areas of extremely abrasive soils (rock areas). Weld joints in abrasive soils will also be coated with ARC and inspected before backfill.

The pipeline will be designed to accommodate modern internal inspection tools to allow the ability to clean and inspect the pipeline. In order to accommodate the tools, the pipeline will be equipped with a launcher/receiver at each end of the line. All bends along the pipeline will be designed for a minimum of 9 foot radius (r = 3R). Valves at each end of the pipeline on the launchers/receivers and along the pipeline will be full port valves to allow for the internal inspection tools to traverse the pipeline. Barred tees will be installed to keep the tools from entering tee connections.

Mainline valve spacing will be every 5 miles meeting design requirements for Location Class 4, which exceeds the requirement of the proposed pipeline, since the Proposed Line 3602 is located in Class 1, 2 and 3. The exact location of mainline block valves will be determined during final design based on available open land, substructures, surface structures and access. Valve stations will be located in open areas where possible. Valves will be buried but the valve operators will

be extended above grade in the open area and security block-wall installed around the valve station. Valves that must be installed within the public ROW, where open above-ground areas are not available will have the valve operators housed within concrete vaults. The vaults will be installed out of the travelled roadway. The valves will be pilot-operated to activate a line shutdown in case of a sudden loss in pressure on the pipeline.

The engineering design was broken into ten categories, which include site investigation design development, project coordination, survey design drawings, design review, job showing, procurement, construction support, ROW documents, project closeout, and non-labor costs.

1. Site investigation includes activity required to develop design, site/archive investigations, job walks, code investigations, and interpretation and familiarization with client standards, as well as iterative investigation of alternatives both prior to and after filing the Application.

2. Project coordination includes project meetings both internal and external parties, project paperwork, coordination with project management and other disciplines and drawing reviews.

3. Design drawings include physical drawings, plans, sections and details, orthographic and isometric, plotting, blueprinting, checking, and project review.

4. Design reviews includes coordination for project and project meetings, project paper work, coordination with governmental agencies, utilities, other firms, encroachment permit and traffic plan submittal and acquisition etc.

5. Job showing includes preparation of bid specifications and support, coordination with client, contractors, agencies, and bid evaluations and recommendations.

6. Procurement includes preparation of requests for qualifications, coordination with vendors, bid summary, bid conditioning meetings, purchase order preparation, and vendor drawing review.

7. Construction support includes office and/or field support, construction bid meetings, drawing sets for permits, status reports, survey alignment, work strip and as-built of the pipeline.

8. ROW documents includes coordination with project management and other disciplines, interdisciplinary specifications and drawing review, review of ROW documents, preparation of new and temporary construction easement documents, survey and legal description support.

9. Project closeout includes collection of construction records such as material records, survey as-built records of the pipeline and easements, development of pipeline completion drawings, reconciliation of materials and equipment and recordation of easements.

10. Non-labor costs includes outside reproduction services, travel, word processing equipment, special materials and photo copies.

Station Detail Design

Each of the Pressure Limiting Stations uses a "worker/monitor" design to provide pressure control and overpressure protection. Actuated ball valve regulators provide pressure control. Measurement at strategic locations will provide information on the flow rate between connected facilities. Communications with SoCalGas' Gas Control are included to provide sufficient information to monitor the operating condition and performance of the station.

The stations are of similar design, providing the same pressure control capabilities. The locations and detailed design of the station will require research of existing records and drawings and excavation of the existing facilities at each of stations to determine available space for both the new buried and above grade facilities.

Geotechnical Investigation and Utility Potholing

A critical part of completing the project engineering design is the gathering of sound baseline data from geotechnical investigations (soil boring) and utility potholing. Geotechnical investigation includes soil borings to determine subsurface conditions for pipeline installation including horizontal directional drilling and jack and bore locations. Specific information on the number and depth of borings is included for each location. Along with the proposed route map, the geological map in Attachment II shows the various geological regions and potential fault crossings that have been evaluated during the design phase of the Proposed Line 3602. Potholing is the practice of digging a test hole to expose underground utilities to ascertain the horizontal and vertical location of the facility. The locations will be provided to the CPUC Energy Division prior to commencement of any work. A ROW reconnaissance and underground service alert (USA) field survey will be required to mark each soil boring location to ensure that the drilling equipment can access each soil boring location, to clear the area for other substructures and for the preparation of traffic control plans, as required. If a soil boring location is not accessible it will be relocated nearby to a suitable drilling location. In urban areas, where the proposed pipeline ROW is under paved roadways, the soil boring locations will be adjusted to minimize or eliminate the requirement for a traffic control plan.

In urban roadways, the soil borings will require vacuum soil extraction/hand auger borehole clearance. It is anticipated that encroachment permits will be required from various government agencies since the ROW trends parallel to roadways, and crosses numerous roadways, creeks, streams and rivers, flood control channels, city and other government lands. Physical soil property testing will be performed on samples retained from the drilling activity and will include: Moisture Content, Dry Density, Sieve Analysis, Atterberg Limits, and Corrosion (Resistivity, pH, Chloride and Sulfide). This estimate includes labor and other costs for: preliminary planning and scheduling, preparation of work permits, subcontractor oversight, and acquisition of encroachment permits from government agencies, health and safety coordination, and preparation of a summary report upon completion of field activities.

Work activities or services to be provided by other contractors as part of this work scope include the following: utility and borehole clearance, drilling, traffic control services, and laboratory testing. The costs for drilling methods are for hollow-stem auger method. Geotechnical reports will include a site plan, boring logs, laboratory test data, site conditions, summary of the surface, subsurface, and groundwater conditions and the engineering properties of the soils encountered during the site investigation.

Rainbow Pressure Limiting Station

No significant geotechnical investigation for soils is required for the small, self-contained facility. A geologic hazard assessment has been performed to identify any hazards, design recommendations or mitigation measures. No mitigation measures were identified for this site.

Transmission Pipeline

Geotechnical borings are estimated to be:

- Forty Six (46) 8-10-foot below ground surface (bgs) geotechnical soil borings (one boring per mile) along the pipeline ROW.
- Six 6) 120 foot bgs geotechnical soil borings (two each for the San Luis Rey river crossing, the I-15 crossing and Lake Hodges crossing).

It is estimated that three (3) days of field reconnaissance will be required to complete ROW and Underground Surveying and Analysis (USA) surveys prior to the start of geotechnical borings.

It is further estimated that twenty (20) days of hollow-stem auger drilling will be required and that eleven (11) days of borehole clearance may be required. This estimate includes eleven (11) days of field work by a certified traffic control subcontractor for soil borings located within paved urban roadways or highways.

Line 1601 Cross-Tie

No significant geotechnical investigation for soils is required for this small, self-contained facility located near the intersection of Centre City Parkway and Highway 78. A geologic hazard review has been performed to identify any hazards, design recommendations or mitigation measures. No mitigation measures were identified for this site.

Line 1600 Cross-Tie

No significant geotechnical investigation for soils is required for this small, self-contained facility located just south of Bear Valley Parkway and Beethoven Drive. Because this station is located within relatively small areas potholing of the buried facilities will be necessary to obtain the exact location and elevations of the existing piping for plan sections and details.

5.0 CONSTRUCTION

Detailed breakdowns of the cost estimate for the construction can be found in Attachment VI Cost Estimate.

Rainbow and Line 1600 Cross-Tie and Pressure Limiting Stations

Construction of the two pressure limiting stations at Rainbow and Line 1600 Cross-Tie will require excavation and connections installed between the existing pipelines. A short shutdown on each pipeline will be required to install tees and valves into the existing lines connecting them together. The valves will be buried with above grade actuators and controls. SCADA equipment will be installed to the new facilities for remote operations and pressure monitoring. Methane detection and intrusion monitoring would also be installed. Existing access roads will be utilized for access. Additional temporary construction easement will be required for staging, laydown and parking. Construction of each station is anticipated to require two (2) months.

Transmission Pipeline

Due to the diversity of the pipeline route, the pipeline is anticipated to be constructed utilizing four (4) construction crews over three (3) segments to be able to complete pipeline construction in approximately 12 to 18 months. Crew production rates were estimated for the various crews and shown on the table below.

Table 2: Rainbow to MCAS-Miramar Pipeline Construction Crews and Production

Crew No.	Segment	Total Footage	Average Lineal ft. per Day	Total number of Days
Crew 1	1	69,120	275	251
Crew 2	2	51,700	206	251
Crew 3	2	51,700	206	251
Crew 4	3	21,000	350	60
Crew 4	1	49,380	197	251
Totals		**242,900**	**247**	***251**

*Includes testing, cleaning, drying and tie-in.

Assumptions

1. It was assumed that approximately 25% of the trench will be excavated and/or blasted in very hard rock.
2. Excavated rock will have to be hauled off-site and clean fill imported into the trench.
3. Tree removal will be minimal in most areas of construction. The areas traversed are mostly covered with small shrubs.
4. All roadway and wetland crossings will need extra work space for laydown, staging soil stockpile and parking.
5. Paved roadway crossings will be open cut or bore depending on substructures.
6. State Highway crossings will be done by open cut or bore method.
7. The significant waterway will be crossed using a directional bore.
8. Small waterway crossings will be bore or open cut.
9. Pipe joints are assumed to be 80 feet in length for the rural, open areas and in urban and lightly populated areas.
10. The welds on the pipeline will be coated with Fusion Bond Epoxy.
11. The pipeline will have approximately 10 mainline block valves and one for each launcher/receiver at each end for smart pigging. The block valves will be spaced no more than 5 miles apart.
12. Test leads for cathodic protection will be installed at approximately 2,000 foot intervals.
13. Estimate includes 100% x-ray.
14. Top soil segregation is included in the construction estimate but replanting or crop replacement is included in the environmental cost estimate.
15. Estimate assumes use of union labor.
16. Estimate is based on working five (5) days a week, nine (9) hours each day in urban areas and six (6) days per week, ten (10) hours each day in rural areas. For areas under encroachment permit, work hours will be in accordance with the permit.
17. Once the ROW is cleared, the centerline of the pipeline will be established and construction can begin.
18. Small crews will progress at critical crossing points such as streams, rivers, paved streets and highways and these crossings will be completed ahead of the mainline crew.
19. Once there are enough crossings completed the mainline crew will begin construction. Open trench will be determined by the construction contractor depending on access to the ROW and room to string pipe along the trench.

Project Construction Management

In order to assure that the Proposed Line 3602 is completed according to plans and specifications identified, a construction management team including construction managers will be assigned to review construction progress, ensure that construction tasks are completed, inspection is current and documented, and reporting and documentation of records is current and complete.

The project construction manager will track the project schedule, oversee the project inspectors, coordinate with the construction contractor's project management and oversee progress billings, and contract administration.

Construction Inspection

Chief Inspector

The duties and responsibilities of the chief inspector require being knowledgeable and experienced in all phases of inspection. The chief inspector will supervise all phases of the field quality control and technical staff assigned to the project to observe adherence to client company's construction contract drawings and specifications. The chief inspector will delegate responsibilities and define limits of authority to each subordinate inspector and assure that members of the quality control team know their respective duties.

Piping/Welding Inspection

The duties and responsibilities of the piping/welding inspector require that he or she oversee welder qualifications, piping fabrication and installation, welding work, welding facilities, welding conditions, weld records and non-destructive examination (NDE) personnel qualifications, compliance to procedures and NDE documentation. The pipe/weld inspector monitors the compliance of company's quality control standards, project specifications, codes, safety and environmental policies and will maintain a daily log of activities and incidents and prepare appropriate report(s) for assigned activities.

Utility Inspector

The duties and responsibilities of the Utility inspector require that he perform all inspection and quality control duties relating to the installation of the pipe such as trenching, lowering pipe into the trench, bending, coating and backfill as well as any other inspection duties as assigned by the Chief Inspector. The Utility Inspector monitors the compliance of company's quality control standards, project specifications, codes, safety and environmental policies, and will keep a daily log of activities and incidents and prepare appropriate report(s) for assigned activities.

Electrical Inspection

The duties and responsibilities of the electrical inspector require that he oversee the installation of cable tray and conduit, installation of cable and wire, installation of equipment, grounding systems, lightning protection systems, cathodic protection systems, etc. The electrical inspector monitors the compliance of company's quality control standards, project specifications, codes, safety and environmental policies and will keep a daily log of activities and incidents and prepare appropriate report(s) for assigned activities.

Materials Management

The duties and responsibilities of the materials manager require that he or she oversee and manage the inventory, issuing and documentation of materials used during construction. Once material is delivered to the site, its physical control, preservation, security and damage control is his responsibility. As part of material control responsibilities, the materials manager will validate material type, quantities and specification for all project materials using the Bill of Materials, Material Test Reports, Purchase Orders and other purchasing information. The materials manager will maintain accurate records of installed quantities, coordinating with inspectors to assure that quantities are correct and that remaining quantities of material are adequate for the remainder of the project. The materials manager will assure that excess materials are identified and returned for credit or otherwise disposed of as directed by SDG&E and SoCalGas. For material quality concerns and issues, Materials Management is also responsible for arranging material inspection, including company, contractor and material supplier representatives, as needed. The materials manager will track disposition of material inspection items.

Instrumentation and Control

The duties and responsibilities of the Instrumentation and Control inspector require oversight of the installation and connection of instrumentation and control equipment, such as transmitters, transducers, controllers, SCADA panels and level gauges. The individual will also monitor compliance with the company's quality control standards, project specifications, codes, safety and environmental policies. A daily log of activities and incidents will be maintained and appropriate report(s) prepared for assigned activities.

6.0 ENVIRONMENTAL ANALYSIS

The cost estimate details for environmental are provided in Attachment VI - Cost Estimate and Attachment X – Preliminary Environmental Cost Estimate. The environmental cost estimates were prepared by Insignia Environmental.

As noted above, the PEA was filed with the CPUC on September 30, 2015. SDG&E and SoCalGas are planning to file a PEA Supplement on March 21, 2016. The Proposed Line 3602 triggers formal environmental analysis under the California Environmental Quality Act (CEQA) and the National Environmental Policy Act (NEPA). In addition, multiple federal and state environmental laws and regulations apply to the Proposed Line 3602. A full analysis of multiple environmental resource areas and close examination of project alternatives is required under both federal and state law.

Task I: Data Collection and Permitting Support

This task assumes that certain preliminary project activities, such as geotechnical testing and utility potholing, need to occur to provide critical information to prepare engineering plans and support grading and building plans. Certain activities such as soil borings and utility potholing may require encroachment and environmental permits for locations along the pipeline alignment. SDG&E will prepare and submit the required permit applications to respective agencies.

Task II: Environmental Data Collection

Environmental data collection includes the various resource-focused studies needed for the CPUC and MCAS Miramar to prepare an Environmental Impact Report (EIR) and Environmental Impact Statement (EIS). Insignia Environmental was retained to support in-house Environmental Services staff with the environmental assessment needs of the project. Certain data collection activities occurred as part of PEA preparation and are noted below. Additional data collection activities occurring after submittal of the PEA can be found in, Chapter 3 of the PEA Supplement.

Cultural and Paleontological Resources

Insignia Environmental conducted a desktop and field-level study to identify and delineate potential cultural and paleontological resources within the Proposed Line 3602 area. A record search at the South Coastal Information Center (SCIC) of the California Historical Resources Information System (CHRIS) located at San Diego State University was performed within a one mile radius of the Proposed Line 3602's temporary and permanent impact footprint. The field investigation conducted by archaeologists and Native American Monitors included an

approximately 150-foot survey corridor along the Proposed Line 3602 route in both urban and cross-country areas.

Information on the geologic setting and the potential presence of paleontological resources was derived from published and unpublished geologic and paleontological reports. Field investigation was conducted in October and November 2014, which included pedestrian and vehicular surveys along select areas of the Proposed Line 3602 to field-verify the results of the literature and records search and to determine the paleontological potential of the existing geologic units.

The results from environmental consultant's literature review, records search and field survey can be found in the PEA Section 4.5.

Biological Surveys

Insignia Environmental conducted a desktop-level review of biological literature and databases, a general habitat assessment survey, and several focused biological surveys within the biological resources survey area, which included all the Proposed Line 3602 components plus an approximately 150-foot buffer on each side of these components. Preliminary investigations include a review of aerial photographs, USGS topographic maps, San Diego Association of Governments (SANDAG) 2012 vegetation mapping, and National Hydrology Dataset data. Other sources were queried for potentially occurring speciaLine status species and other sensitive resources. Biological surveys were conducted within the proposed biological resources survey area to determine the potential for the area to support speciaLine status plant and wildlife species, as well as to determine the distribution and abundance of potential wetlands and water resources.

The results from environmental consultant's literature review, records search and field survey can be found in the PEA Section 4.4.

Air Quality

The Proposed Line 3602 is located entirely within the jurisdiction of the San Diego County Air Pollution Control District (SDAPCD). Therefore, existing air quality within San Diego County was researched using data obtained from the district's network of air quality monitoring stations. Recent regulations and guidance documents from the California Air Resources Board (CARB), CPUC, California Energy Commission (CEC), and the SDAPCD were also reviewed.

The Proposed Line 3602 air emissions were assessed by estimating emission rates from construction and operation and maintenance activities, and then compared to established significance criteria under federal and state law. Air pollutant emission rates were estimated using the publicly available software California Emissions Estimator Model (CalEEMod) Version 2013.2.2. This computer model allows users to generate estimates of construction and operational emissions of various pollutants, including inhalable particulate matter (PM_{10}), fine particulate matter ($PM_{2.5}$), carbon monoxide (CO), oxides of nitrogen (NO_x), sulfur oxides (SO_x), reactive organic gases (ROGs), and carbon dioxide.

The results from environmental consultant's air emission calculations can be found in the PEA Section 4.3.

Geology, Soils and Seismicity

The existing conditions and potential impacts associated with geologic hazards were primarily obtained from the Geologic Hazard Assessment prepared by URS Corporation (URS) for the Proposed Line 3602, which is included in the Proponent Environmental Assessment as Attachment 4.6–A: Geologic Hazard Assessment. To obtain geologic information in the vicinity of the Proposed Line 3602, URS (1) reviewed and compiled previous geotechnical and geological information for the Proposed Line3602 routes and general area, (2) performed a terrain analysis using digital imagery and terrain modeling software, and a stereoscopic analysis of historic aerial photography in areas of suspected hazardous terrain; and (3) performed a preliminary reconnaissance-level survey to identify geologic hazards. In addition to the research and analyses provided in Attachment 4.6–A: Geologic Hazard Assessment, a thorough review of available geologic resource literature that is relevant to the Proposed Line 3602 area was conducted to supplement or confirm the research performed by URS. The materials reviewed include publications and/or data from the USGS, the California Geological Survey (CGS), and other publicly available technical reports and resources.

The results from environmental consultant's literature review, records search and field survey can be found in the PEA Section 4.6.

Hazards and Hazardous Materials

Analysis of existing hazards and hazardous materials involved a review of applicable documents, including the following:

- the Phase I Environmental Site Assessment (ESA) conducted by Haley & Aldrich for the Proposed Line 3602, which is included as Attachment 4.8-A: Phase I Environmental Site Assessment in the PEA;

- the County of San Diego General Plan;
- the City of San Diego General Plan;
- the City of Escondido General Plan;
- the City of Poway General Plan;
- emergency evacuation and response plans and Office of Emergency Services (OES) websites for the County of San Diego, City of San Diego, City of Escondido, and City of Poway.

The results from environmental consultant's literature review, records search and field survey can be found in the PEA Section 4.8.

Other Resource Areas (Noise, Visual, Traffic, Land Use, GHG and Public Housing)

Insignia Environmental prepared a detailed analysis regarding other potential environmental issues, such as noise, aesthetics, traffic, land use, Greenhouse Gas, public housing and transportation, as further described in Chapter 4 of the PEA.

Technical Reports

A series of technical reports were prepared in support of the PEA. These technical reports are included as appendices to the PEA. Confidential record search and analysis for cultural and paleontological resources prepared were also prepared as part of the PEA Supplement.[3]

Task III: Environmental Permitting Process

SDG&E and SoCalGas will prepare and file applications with the appropriate regulatory permitting agencies. Those agencies are anticipated to include:

- Federal Agency Permits/Grants/Certification
  - Clean Water Act (CWA) 404 Permit (Nationwide Permit 12)
  - Department of Navy (DON), Marine Corps Air Station - Miramar ROW Grant, DON, MCAS Miramar National Environmental Policy Act (NEPA) Compliance. MCAS Miramar Committee for Land and Air Management Policy Tier 1 Application (draft filed on April 30, 2015 and final filed November 24, 2015)

[3] Confidential record search and analysis for cultural and paleontological resources will be provided to the CPUC Energy Division under Section 583 of Public Utilities Code and General Order 66-C.

- Federal Consultations
  - U.S. Fish and Wildlife Service (USFWS): Endangered Species Act (ESA) Section 7/10 Consultation (informal/formal)
  - State Historic Preservation Office (SHPO): National Historic Preservation Act (NHPA) Section 106 Consultation

- State Agency Permits and Agreements
  - Regional Water Quality Control Board (RWQCB): Clean Water Act (CWA) 401 Water Quality Certification
  - State Water Resources Control Board (SWRCB): CWA 402 National Pollutant Discharge Elimination System (NPDES) Permit
  - California Department of Fish and Wildlife (CDFW) California Endangered Species Act (CESA) 2081 (Incidental Take Permit)
  - California Department of Fish and Wildlife (CDFW): Fish &Wildlife Code 1602 (Streambed Alteration Agreement)
  - California Department of Transportation (Caltrans): Encroachment permit
  - CPUC Certificate of Public Convenience and Necessity (CPCN), CPUC California Environmental Quality Act (CEQA) Compliance PEA filed on September 30, 2015 and the PEA Supplement filed with this Application, as applicable.

- Local Agency Permits
  - Cities of Escondido, San Diego, and Poway Encroachment Permits
  - County of San Diego Encroachment Permits

In addition to the time needed to prepare and process the applications noted above, the following steps have been or would be required by the applicant and/or lead agencies:

1. Issue a request for proposals for third-party environmental review
2. Review consultant proposals and contract negotiation
3. Issue Notice to Proceed (NTP)
4. Synthesize data collected under Task II into an environmental review document EIR/EIS
5. Review by SDG&E and SoCalGas
6. Incorporate comments and prepare document public noticing and comment
7. Support public process including participating in a scoping meeting

8. Respond to public comments
9. Incorporate comments and prepare final document
10. Prepare notices identifying how document will support permitting
11. Participate in permitting activities.

Task IV: Preconstruction Surveys and Mitigation Compliance

SDG&E and SoCalGas will conduct preconstruction clearance surveys for special-status species within 90 days of the start of construction. These surveys will be conducted in accordance with regulatory agency requirements, including seasonal restrictions. The intent of the surveys is to avoid unanticipated impacts to listed species. The implementation of mitigation measures required to address construction impacts will also occur under this task.

Task V: Construction Monitoring

SDG&E and SoCalGas will ensure proper construction monitoring occurs in accordance with agency approvals and best construction management practices. Additionally, required mitigation will be implemented. The estimate includes construction restoration and revegetation costs given the length of the line and the number of streams crossed. Additionally, this task would include implementation of a Storm Water Pollution Prevention Plan (SWPPP).

Task VI: Post-Construction Monitoring and Ongoing Mitigation

Ensuring compliance with operation and maintenance requirements will require an ongoing level of effort for the life of the Project and to meet restoration success criteria established by the resource agencies.

Land Ownership/Land Use

The Proposed Line 3602 is located in San Diego County, California, and crosses the cities of Escondido, Poway, and San Diego, unincorporated communities, and federal land. Approximately 87 percent (approximately 41 miles) of the pipeline will be installed in urban areas within existing roadways and road shoulders, and the remaining approximately 13 percent (approximately six miles) of the pipeline will be installed cross-country. Construction of the Proposed Line3602 will not result in significant impacts to existing or proposed land uses, nor will it physically divide an established community. Based on a review of existing local plans and policies, the Proposed Line 3602 will be compatible with applicable land use plans and policies. Therefore, there will be a less-than-significant impact to land use and planning as a result of the Proposed Line 3602 project.

For the state of California, Geological data was obtained from the USGS and the CGS. Earthquake fault data was obtained and a report prepared by URS Corporation.

Environmental Review Methods

This land use analysis involves a review of various regional, county, and city land use plans, policies, and regulations that are applicable within the Proposed Line3602 area. A review of applicable general plans and specific plans for the County of San Diego and the cities of San Diego, Escondido, and Poway was conducted.

Plans that were developed and are currently implemented by SDG&E and SoCalGas (e.g., the Subregional Natural Community Conservation Plan [NCCP] and the Low-Effect Habitat Conservation Plan [HCP] for the Quino Checkerspot Butterfly [QCB]) were also reviewed, as were the County and City of San Diego's Multiple Species Conservation Programs (MSCPs) and the local plans that implement them.

Other regional plans considered in the analysis include the San Diego Association of Governments' (SANDAG's) Regional Comprehensive Plan and the MCAS Miramar Integrated Natural Resources Management Plan (INRMP).

Land use-related Geographic Information System (GIS) data was obtained from the County of San Diego, as well as the cities of San Diego, Escondido, and Poway. The relevant policies from these local land use plans, policies, and regulations were analyzed for consistency with the Proposed Line 3602, and summarized in Attachment 4.10-A: Local Land Use Plans and Policies Consistency Analysis in the PEA. The analysis includes only plans and regulations that contain policies applicable to the Proposed Line 3602. Policies were chosen for inclusion based on their relative applicability to the design, siting, construction, and operation of the Proposed Line 3602. Attachment 4.10-A: Local Land Use Plans and Policies Consistency Analysis in the PEA was referenced for the evaluation of potential impacts to land use.

The results from the environmental consultant's literature review and records search can be found in the PEA Section 4.10.

7.0 CONTINGENCY

Detailed breakdowns of the contingency can be found in Attachment VI- Cost Estimate.

The contingency estimate for the proposed project was developed based on expert judgment. Expert judgment is defined by the Association for the Advancement of Cost Engineering (AACE) in their Recommended Practice NO. 40R-08 as judgment that has a strong basis in experience and competency in risk management and analysis.

The Project Management Institute (PMI) Project Management Body of Knowledge (PMBOK) also provides guidance on assigning contingency including in section 7.2.2.6 Reserve Analysis where is states that, "contingency reserves can provide for a specific activity, for the whole project, or both." The PMBOK includes additional guidance allowing both project- and activity-level contingency reserves in sections 7.2.3.1 Activity Cost Estimates and 7.3.3.1 Cost Baseline.

Contingencies were assigned to account for uncertainty and variability associated with the cost estimate and un-foreseeable elements of cost within the defined project scope. Risks specific to the Pipeline Safety & Reliability Project costs were contemplated when determining a reasonable contingency to include in the cost estimate. The tables in this section document some of these risks.

SDG&E and SoCalGas assigned contingency to each detailed line-item component in the pipeline cost estimate. To calculate the contingency, SDG&E and SoCalGas analyzed each cost component, considered the risks related to the component that fall within the defined project scope, and established a contingency percentage. The contingency established is based on the project team and other subject matter expert's judgment.

Contingencies were assigned based on the general criteria below.

Contingency Range	General Basis
0 – 5%	There is relatively less uncertainty associated with this component. Fewer issues are expected to arise. Scope and costs estimates are more fully developed.
5 – 15%	There is moderate uncertainty associated with this component.
15 – 30%	There is significant uncertainty associated with this component. These line items have specific descriptions explaining the contingency percentage.

Below are rationales for pipeline components with contingencies greater than 15%. See specific sections of this report for additional detail.

Cost Element	Line Items with Greater than 15% Contingency Applied	Rationale
Construction Labor & Engineering	• Two Lane Paved (10%) • Primary Paved Road (10%) • PLS & Cross Ties (20%) • X-Ray/NDE (20%) • Mat'l Handling (20%) • Contaminated Soil (20%) • Engineering (15%)	• Uncertainty of paving thickness and paving restoration requirements and quantity, depth and location of substructures until detailed design and permitting. Unknown ground water and sub -surface roadway (old roadways covered over) cost impacts. • Uncertainty of the number of welds due to maturity of design • Uncertainty on timing of tie-ins and substructures for PLS and cross-ties • Unknown soil conditions • Uncertainty of transportation requirement for material handling
Right of Way	• Land Acquisition (15%) • Permanent Easements (20%) • Temporary Easements (15%)	• Uncertainty due to negotiated settlements. • Uncertainty due to future real estate market and economic climate.
Environmental/ Permitting	• Soils, Geology and Hazardous Materials (30%) • Environmental Clearance/Permit Process (30%) • Mitigation Compliance (30%)	• Uncertainty due to unknown level of inter-agency coordination efforts • Uncertainty due to results of mitigation requirements for impacts to socio and natural resources analyzed through the CEQA and NEPA permitting processes. • Unknown costs associated with payment in-lieu of fees for undefined mitigation ratios based on impacts.

It should be noted that there are certain project risks outside of the defined project scope that are excluded from the cost estimate and contingency for the following categories:

- Financial/ Escalation
- Regulatory/ Environmental/ Permitting/ Public Relations
- Land Acquisition
- Engineering and Design
- Construction

Financial/Escalation

If costs for skilled labor and qualified resources (e.g., engineers, contractors, construction workers, and specialty consultants), materials, or other commodities increase significantly over the project duration.

Regulatory/ Environmental/ Permitting/ Outreach

- Significant changes to the project scope, including mitigation measures, as a result of the environmental and/or regulatory review of the project.
- Significant delays in the project schedule as a result of the environmental and/or regulatory review, local community intervention, natural disaster, labor strike, etc.
- Significant work stoppages due to local agency/concerned citizen's actions (e.g. work impacting road that's been designated as a fire escape route).
- Changes to laws or regulations that would significantly impact project scope or schedule.
- Regulatory restrictions and other issues related to water demands and usage.

Land Acquisition

- Difficulty in acquiring property.

Engineering and Design

- Significant review of alternatives and level of detail.

Construction

- Unavailability of skilled labor and equipment.
- Unfavorable working conditions due to severe weather conditions.
- Extraordinary permitting restrictions that impact productivity.
- Earthquakes, fires, natural disasters, strikes or other force majeure type events.
- Significant site environmental issues. Examples could include agency ratios varying from assumptions, groundwater, and the identification of significant hazardous materials.

Geotechnical issues varying significantly from that assumed in this report.

8.0 PRELIMINARY INTEGRATED PROJECT PLAN

The purpose of the preliminary integrated project plan is to document the project team's approach to executing the proposed project. The project team intends that the project plan will become an independent document and will be updated as-needed throughout the project.

Scope and Objectives

The project scope and objectives are documented throughout this PSRP Report.

Project Team/Stakeholders, Roles and Responsibilities, and Governance

Detailed roles and responsibilities will be further defined as the project progresses.

Project Education and Outreach

A preliminary Communications / Outreach plan will be updated as the project progresses.

Delivery Strategy

The delivery strategy for the pipeline is to complete the design and engineering using internal resources and consultants. The project team will then bid the construction of the pipeline. The project team has selected this delivery strategy as opposed to other strategies (*e.g.*, owner as general contractor) to:

- Leverage in-house subject matter expertise in this area
- Easier to competitively bid the pipelines

Cost

The current project estimate is documented in Attachment VI- Cost Estimate. The estimate will be updated throughout the project to update project stakeholders and determine any mitigation steps needed. The project team will use normal SDG&E and SoCalGas forecasting and reporting practices and adhere to applicable SDG&E and SoCalGas policies and procedures.

Schedule

A preliminary project schedule is included in Attachment VIII. The schedule will be further defined as the project progresses in accordance with SDG&E and SoCalGas policies, procedures, and practices.

Procurement and Contracting

The project team contracted with a designer/engineer for the pipeline. Once design and engineering is complete for the pipeline the project team intends to competitively bid the construction to qualified bidders.

The project team will continue to further define the procurement and contracting strategy as the project progresses. This will include a strategy and plan for material, equipment, consultants, and construction contractors.

Risk Management

The project team will continue to monitor and manage risk which may include the development of a detailed risk register. The project team will also regularly report on contingency and continually assess whether or not it is reasonable to either draw down or increase the contingency funds as the project progresses and risk profile changes.

Change Management

The project team will work to mitigate the risk of significant scope changes and monitor any that do occur throughout the project. Changes will be reviewed and approved through a formal change order process and tracked using a change order log. Through the change order process, the change orders will be routed for approval in accordance with SDG&E and SoCalGas' approval thresholds. Change orders proposed by vendors, including contractors, will be reviewed by appropriate project team members for justification, support, and reasonableness.

Environmental Health & Safety, Quality Assurance & Control, and Commissioning

As with SDG&E and SoCalGas' ongoing operations and projects, Environmental Health & Safety (EH&S) is the highest priority. EH&S, Quality Assurance / Quality Control (QA/QC), and Commissioning activities and responsibilities will be further defined during project planning and the procurement process while working with our design/engineering consultants and construction contractors. A Preliminary Job Specific Safety Plan (JSSP) is included in Attachment IX. The project team will adhere to applicable SoCalGas policies and procedures.

Document Control

The project documents will be maintained in accordance with the company document control policies and procedures.

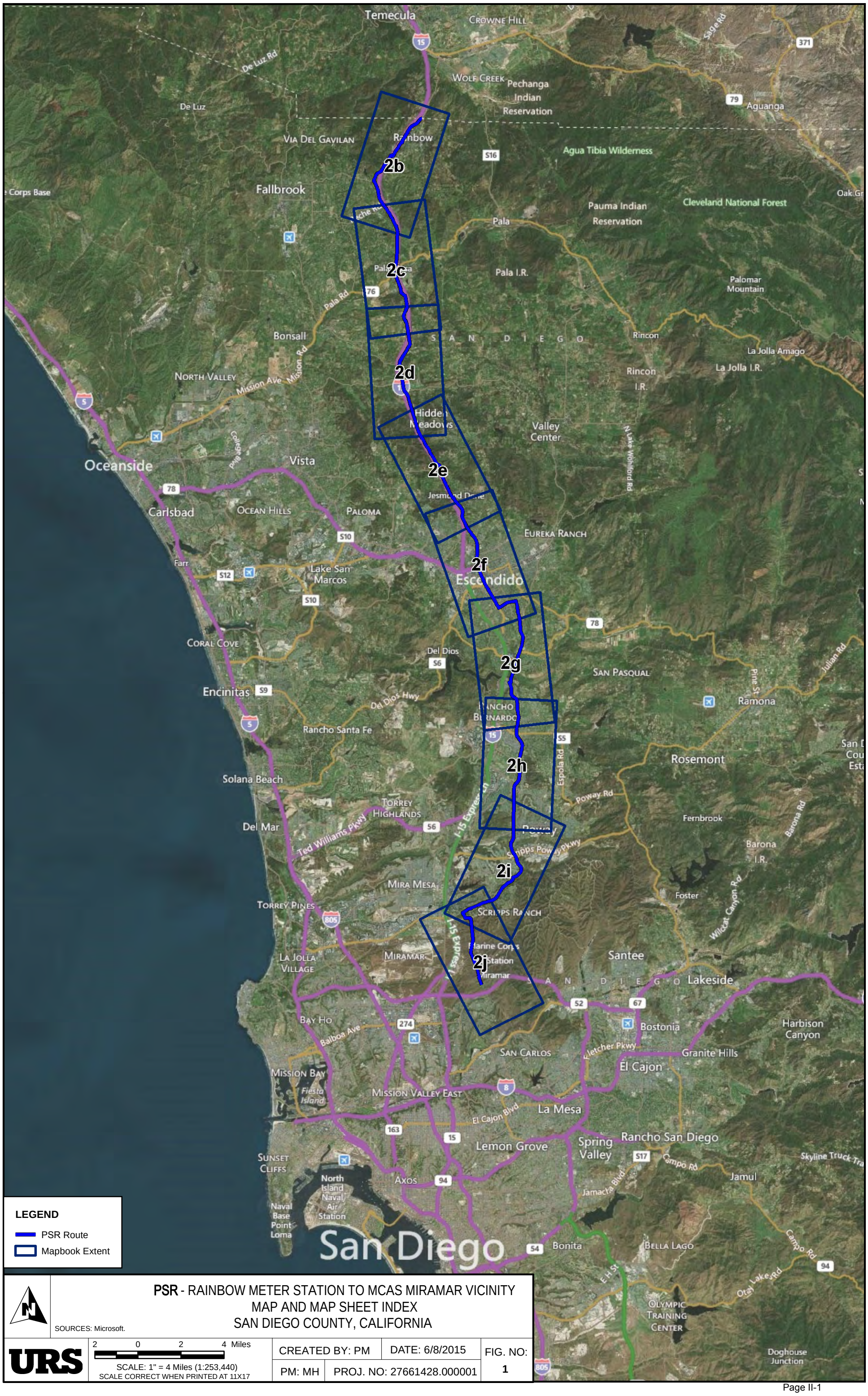
Attachment I

Route Maps

Proposed Line 3602 Alignment from Rainbow PLS to MCAS-Miramar

Attachment II

Geological Map



PSR - RAINBOW METER STATION TO MCAS MIRAMAR VICINITY
MAP AND MAP SHEET INDEX
SAN DIEGO COUNTY, CALIFORNIA

SOURCES: Microsoft.

URS

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SCALE: 1" = 4 Miles (1:253,440)
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- Qaf, Artificial fill
- Qls, Landslide deposits undivided
- Qls?, Landslide deposits undivided, query denotes possilbe landslide
- Qya, Young alluvial flood plain deposits
- Qyc, Young colluvial deposits
- Qoa, Old alluvial flood plain deposits undivided
- Qw, Wash deposits
- Qvop6, Very old paralic deposits, Unit 6
- Qvop5, Very old paralic deposits, Unit 5
- Qvop4, Very old paralic deposits, Unit 4
- Qvop3, Very old paralic deposits, Unit 3
- Qvop2, Very old paralic deposits, Unit 2
- Qvop1, Very old paralic deposits, Unit 1
- Tp, Pomerado Conglomerate
- Tmv, Mission Valley Formation
- Tst, Stadium Conglomerate
- Tt, Torrey Sandstone
- Tf, Friars Formation
- Mzu, Metasedimentary and metavolcanic rocks undivided
- Kqbd, Quartz-bearing diorite undivided
- Kis, Granite of Indian Springs
- Kmm, Monzogranite of Merriam Mountain
- Kgd, Granodiorite undivided
- Kwm, Granodiorite of Woodson Mountain
- Kjd, Granodiorite of Jesmond Dean
- Kr, Granodiorite of Rainbow
- Ki, Granodiorite of Indian Mountain
- Kt, Tonalite undivided
- Kgb, Gabbro undivided
- Water

Sources:

1) Modified from *Geologic Map of the San Diego 30x60 Quadrangle, California.* Michael P. Kennedy and Siang S. Tan. California Department of Conservation, California Geologic Survey. 2005.
2) Modified from *Preliminary Geologic Map of the El Cajon 30x60 Quadrangle, Southern, California.* V.R Todd. U.S Geologic Survey, OFR 2004-1361.
3) Alquist Priolo (EFZ) faults- Modified from California Geological Survey CD-ROM 2001-05 (2002), Official Map of Alquist-Priolo Earthquake Fault Zones. Various quads, various dates.
4) Quaternary/Pre-Quaternary Fault Data - *Digital Database of Fault from the Fault Activity Map of California and Adjacent Areas.* Charles W. Jennings. California Department of Conservation, California Geologic Survey. 2000.
5) Alignment – URS 2014.
6) Freeways/Interstates – ESRI.

PSR - RAINBOW METER STATION TO MCAS MIRAMAR GEOLOGIC LEGEND AND SOURCES
SAN DIEGO COUNTY, CALIFORNIA

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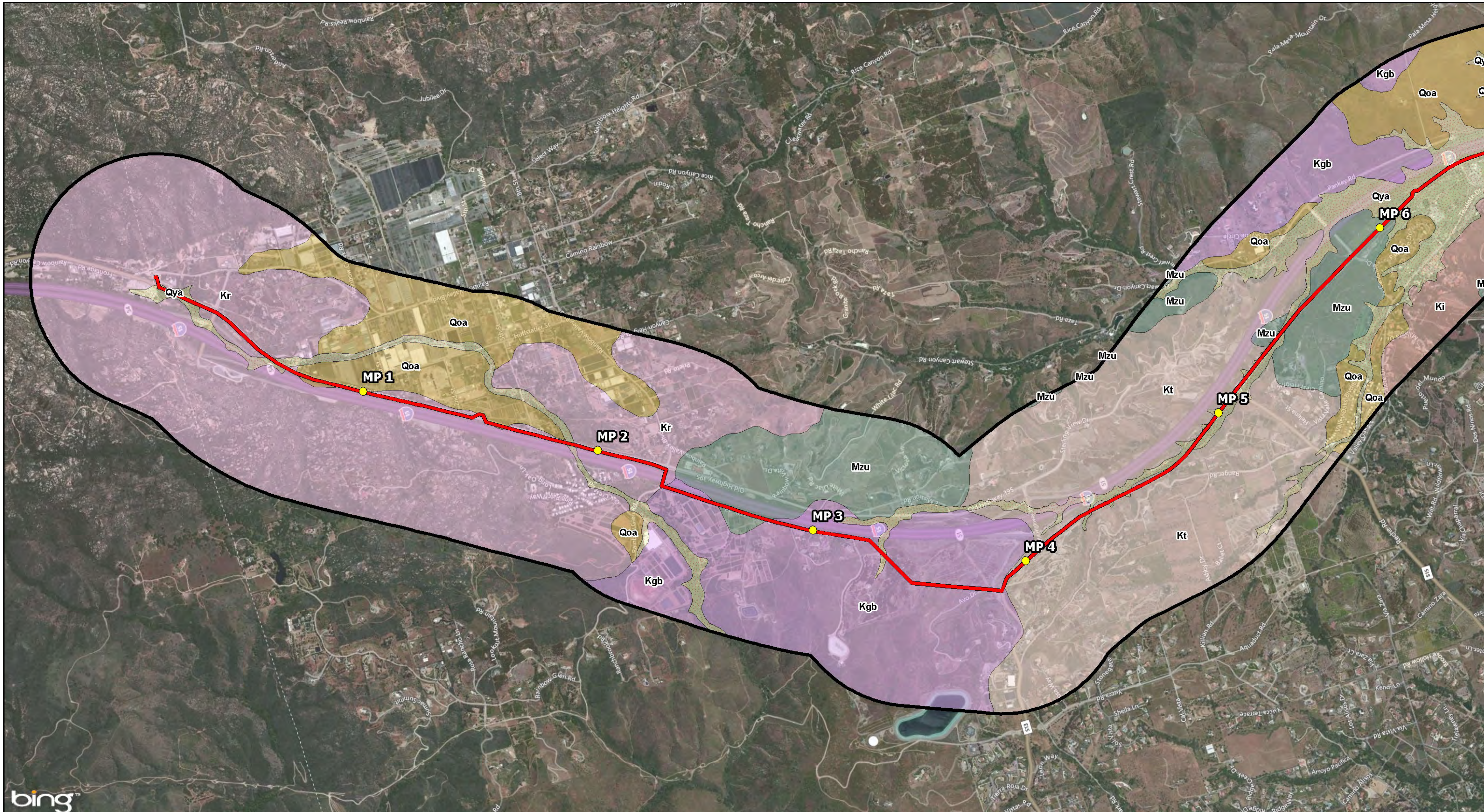

LEGEND

Milepost — PSR Route — Half-mile Buffer

See Figure 2a for Geology Legend

SOURCES:
SDG&E,
California Geological Survey,
Bing.

PSR - RAINBOW METER STATION TO MCAS MIRAMAR
SITE PLAN AND GENERALIZED GEOLOGIC MAP
SAN DIEGO COUNTY, CALIFORNIA

URS

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SCALE CORRECT WHEN PRINTED AT 11X17

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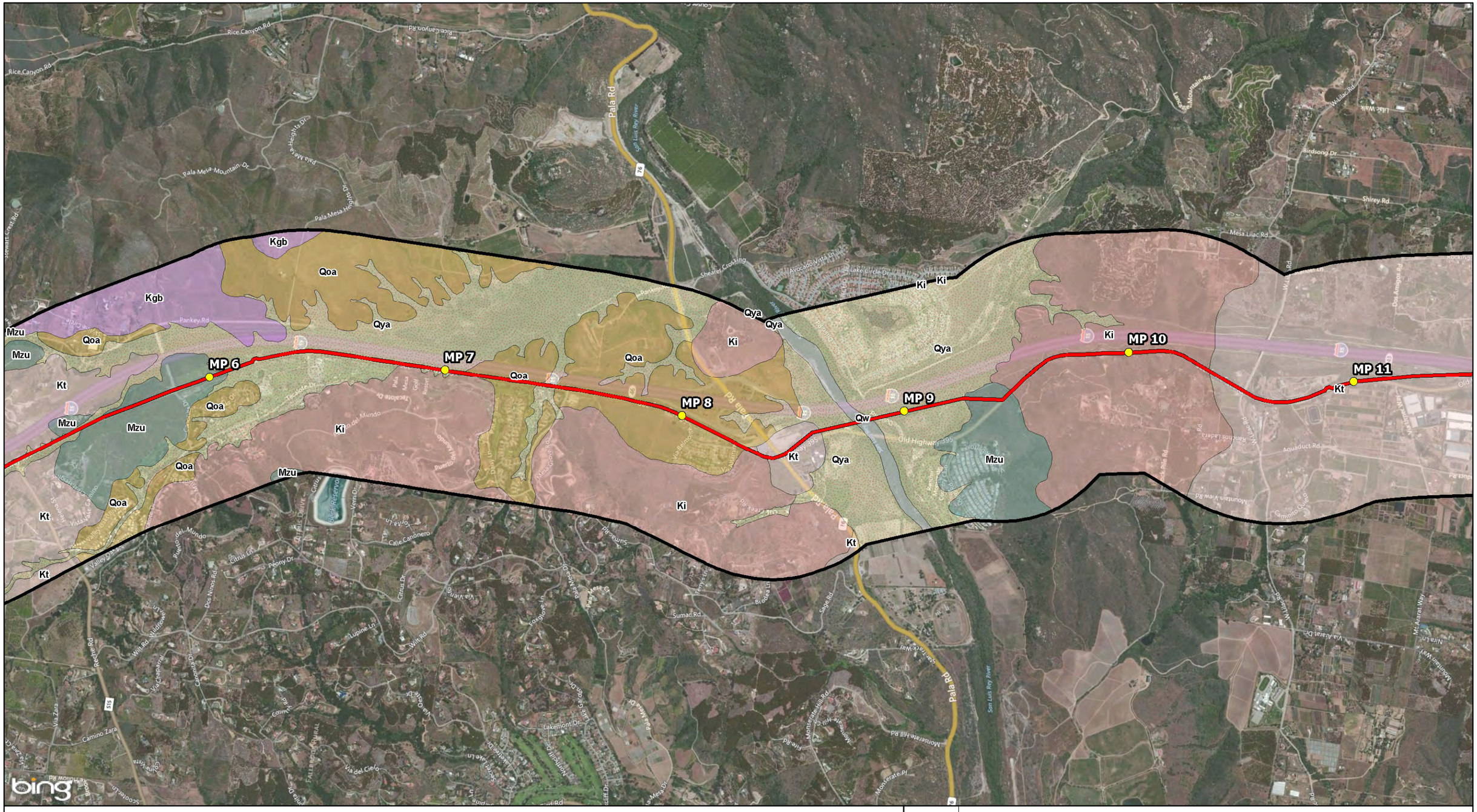

LEGEND

- Milepost
- PSR Route
- Half-mile Buffer

See Figure 2a for Geology Legend

SOURCES:
SDG&E,
California Geological Survey,
Bing.

PSR - RAINBOW METER STATION TO MCAS MIRAMAR
SITE PLAN AND GENERALIZED GEOLOGIC MAP
SAN DIEGO COUNTY, CALIFORNIA

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SCALE: 1" = 2000' (1:24,000)
SCALE CORRECT WHEN PRINTED AT 11X17

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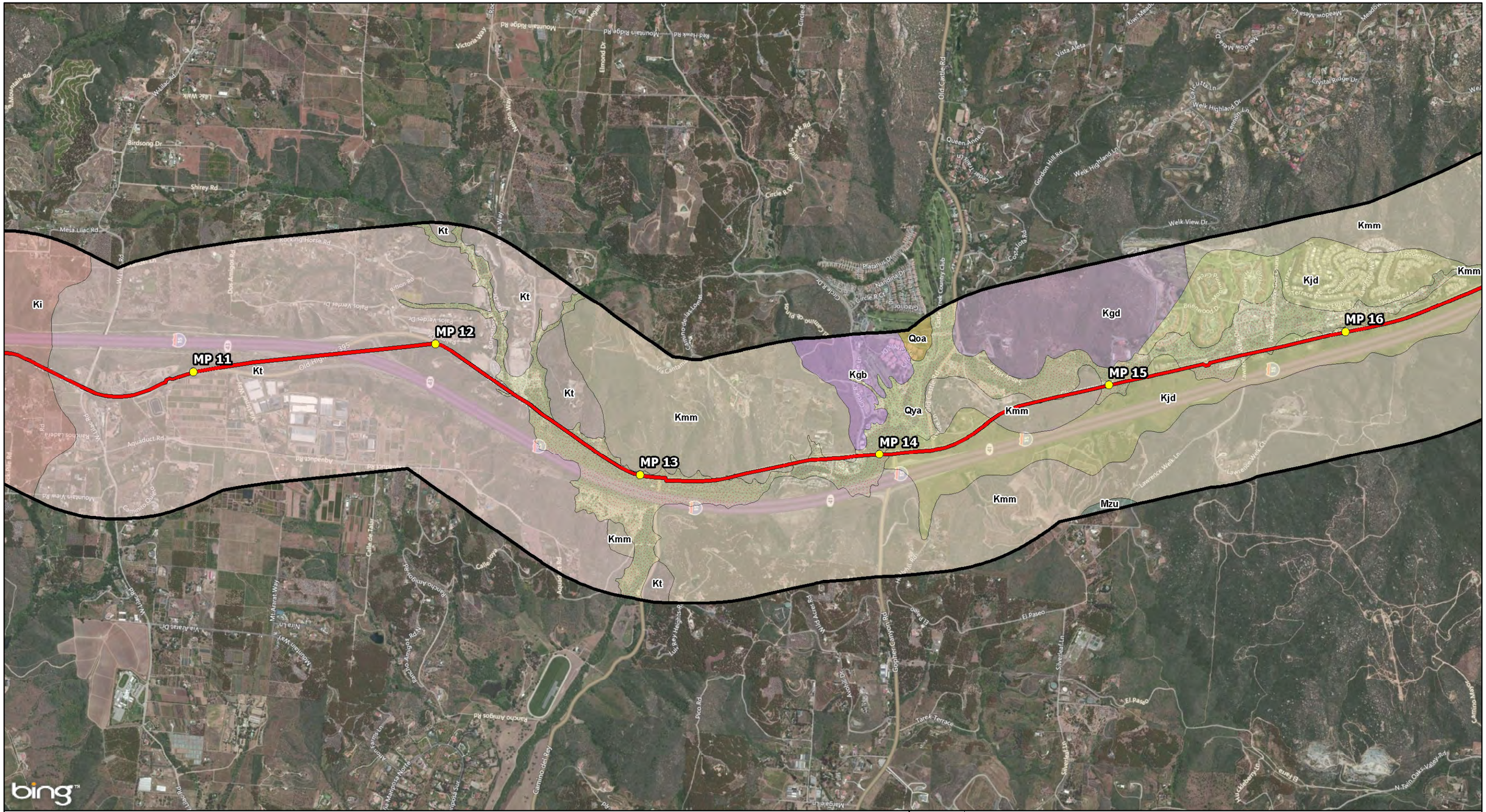

LEGEND

Milepost — PSR Route — Half-mile Buffer

See Figure 2a for Geology Legend

SOURCES:
SDG&E,
California Geological Survey,
Bing.

PSR - RAINBOW METER STATION TO MCAS MIRAMAR
SITE PLAN AND GENERALIZED GEOLOGIC MAP
SAN DIEGO COUNTY, CALIFORNIA

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SCALE: 1" = 2000' (1:24,000)
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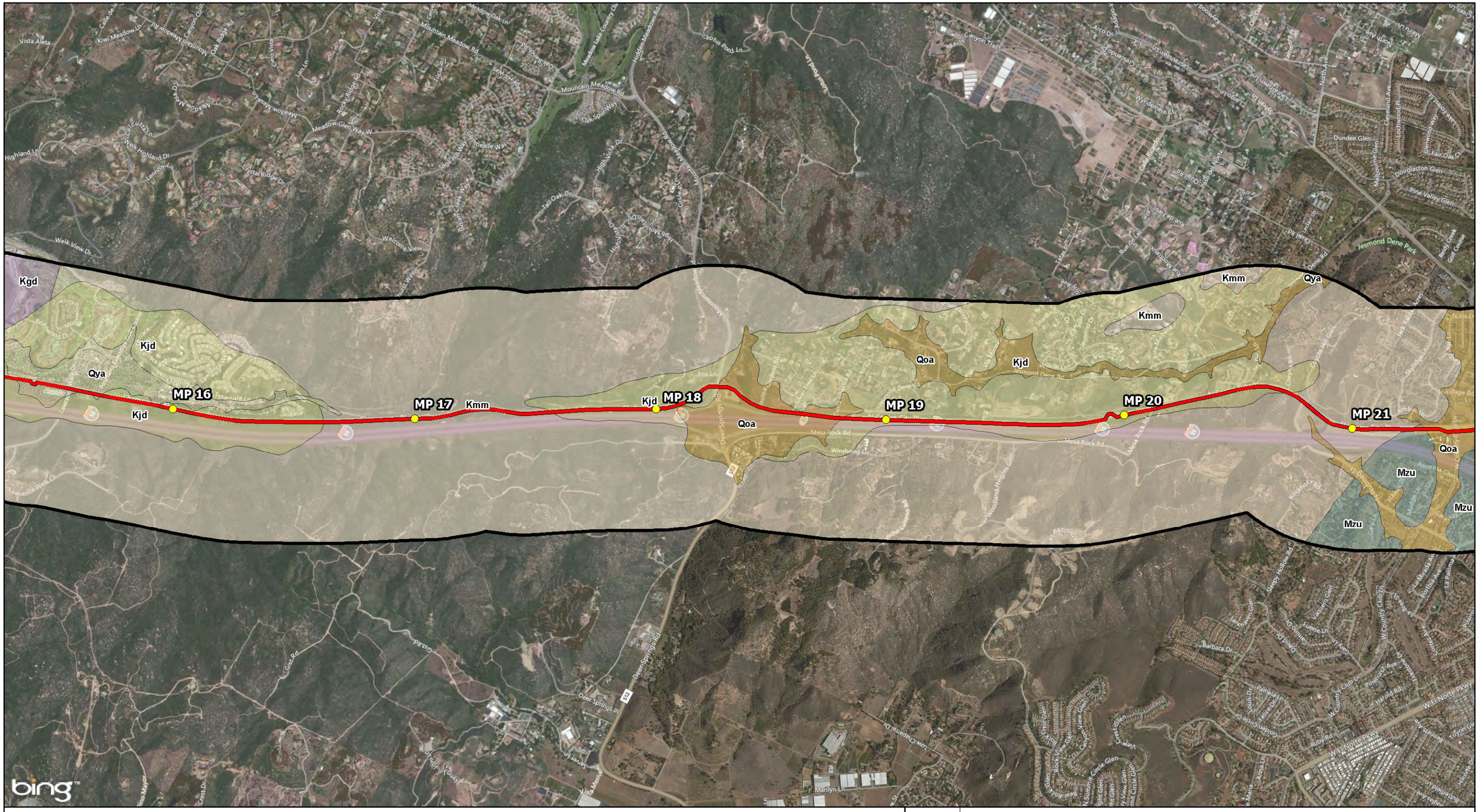

LEGEND

- Milepost
- PSR Route
- Half-mile Buffer

See Figure 2a for Geology Legend

SOURCES:
SDG&E,
California Geological Survey,
Bing.

PSR - RAINBOW METER STATION TO MCAS MIRAMAR
SITE PLAN AND GENERALIZED GEOLOGIC MAP
SAN DIEGO COUNTY, CALIFORNIA

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SCALE: 1" = 2000' (1:24,000)
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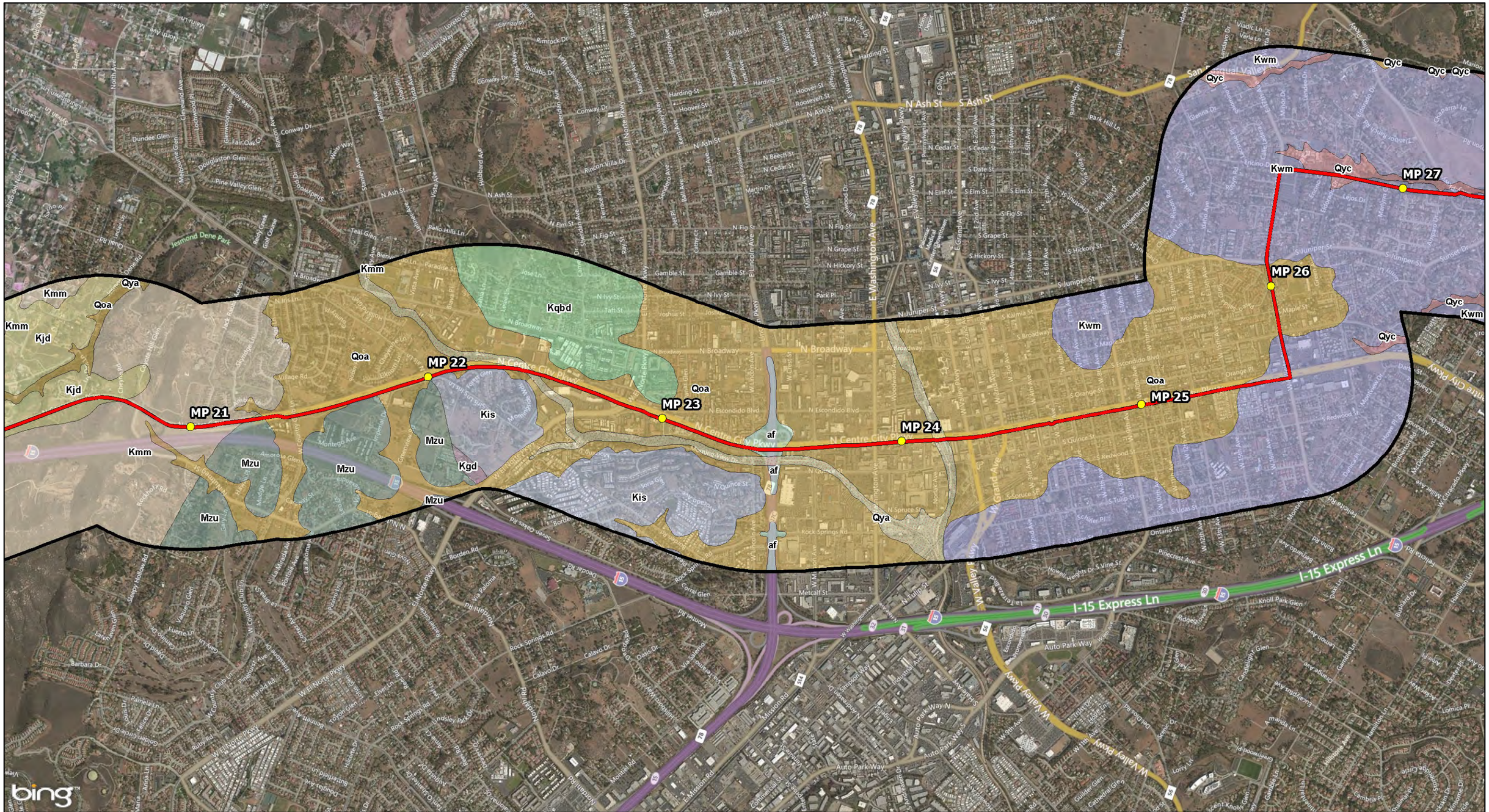

LEGEND

- Milepost
- PSR Route
- Half-mile Buffer

See Figure 2a for Geology Legend

SOURCES:
SDG&E,
California Geological Survey,
Bing.

PSR - RAINBOW METER STATION TO MCAS MIRAMAR
SITE PLAN AND GENERALIZED GEOLOGIC MAP
SAN DIEGO COUNTY, CALIFORNIA

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SCALE: 1" = 2000' (1:24,000)
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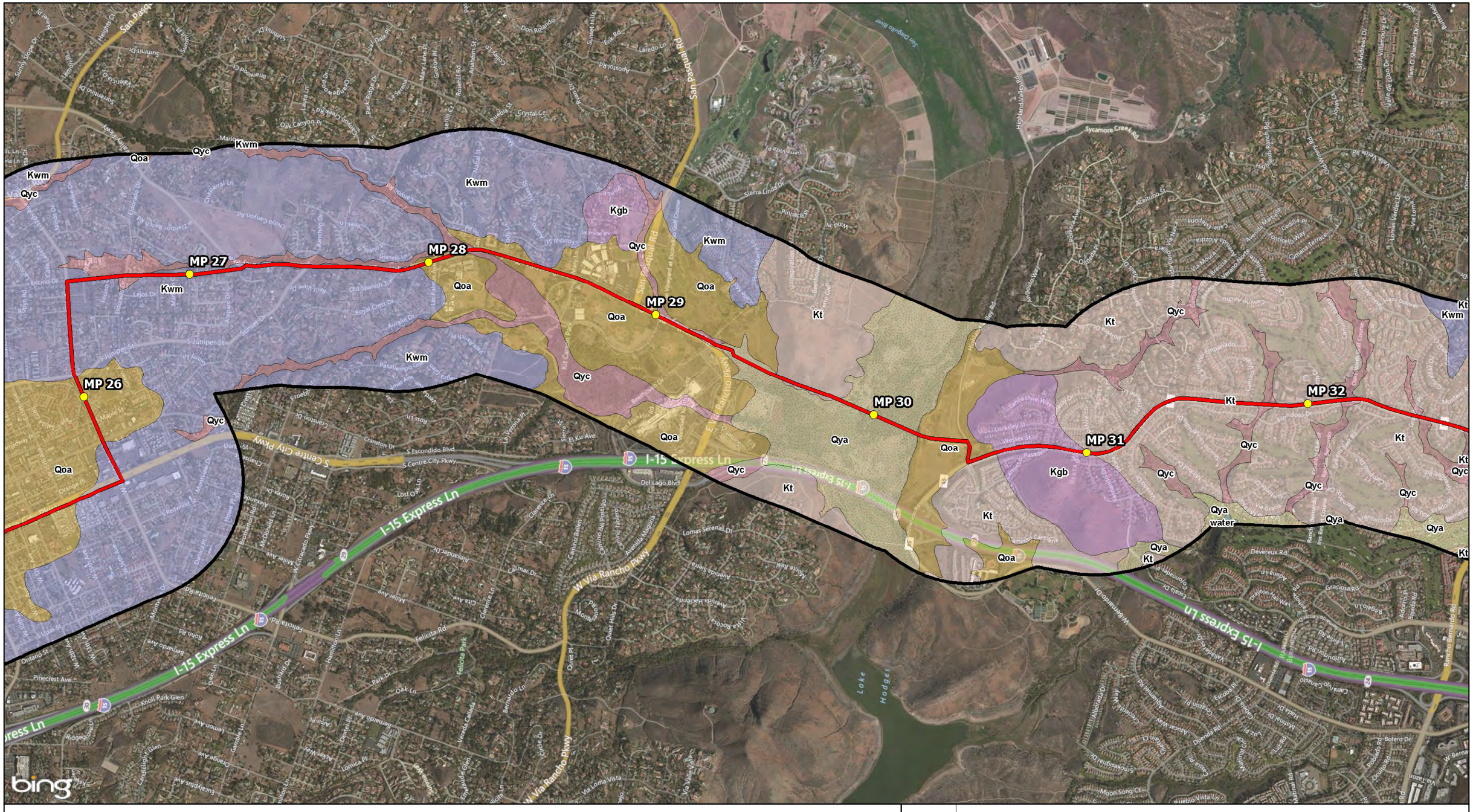

LEGEND

- Milepost
- PSR Route
- Half-mile Buffer

See Figure 2a for Geology Legend

SOURCES:
SDG&E,
California Geological Survey,
Bing.

PSR - RAINBOW METER STATION TO MCAS MIRAMAR
SITE PLAN AND GENERALIZED GEOLOGIC MAP
SAN DIEGO COUNTY, CALIFORNIA

URS

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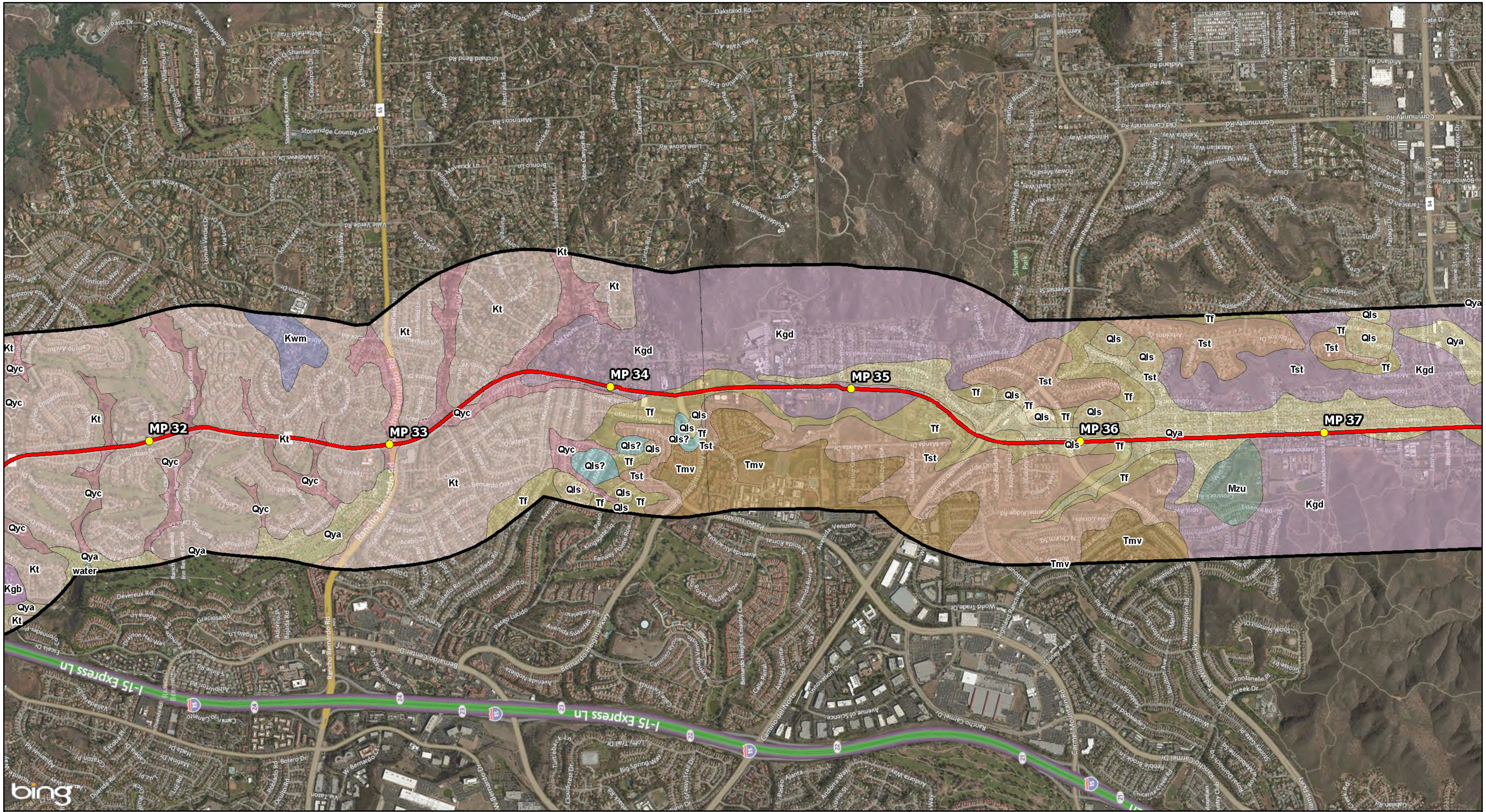

LEGEND

- Milepost
- PSR Route
- Half-mile Buffer

See Figure 2a for Geology Legend

SOURCES:
SDG&E,
California Geological Survey,
Bing.

PSR- RAINBOW METER STATION TO MCAS MIRAMAR
SITE PLAN AND GENERALIZED GEOLOGIC MAP
SAN DIEGO COUNTY, CALIFORNIA

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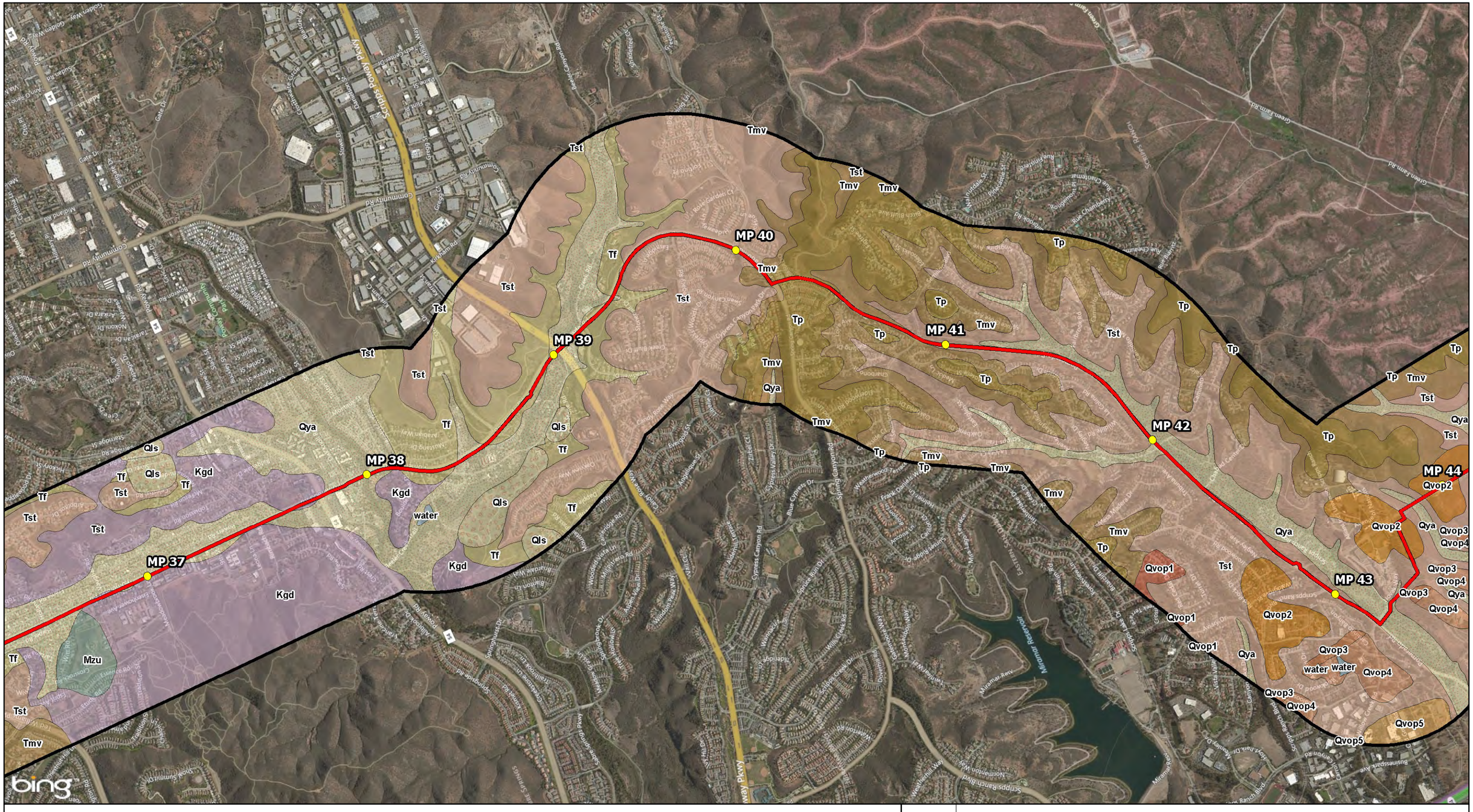

LEGEND

- Milepost
- PSR Route
- Half-mile Buffer

See Figure 2a for Geology Legend

SOURCES:
SDG&E,
California Geological Survey,
Bing.

PSR - RAINBOW METER STATION TO MCAS MIRAMAR
SITE PLAN AND GENERALIZED GEOLOGIC MAP
SAN DIEGO COUNTY, CALIFORNIA

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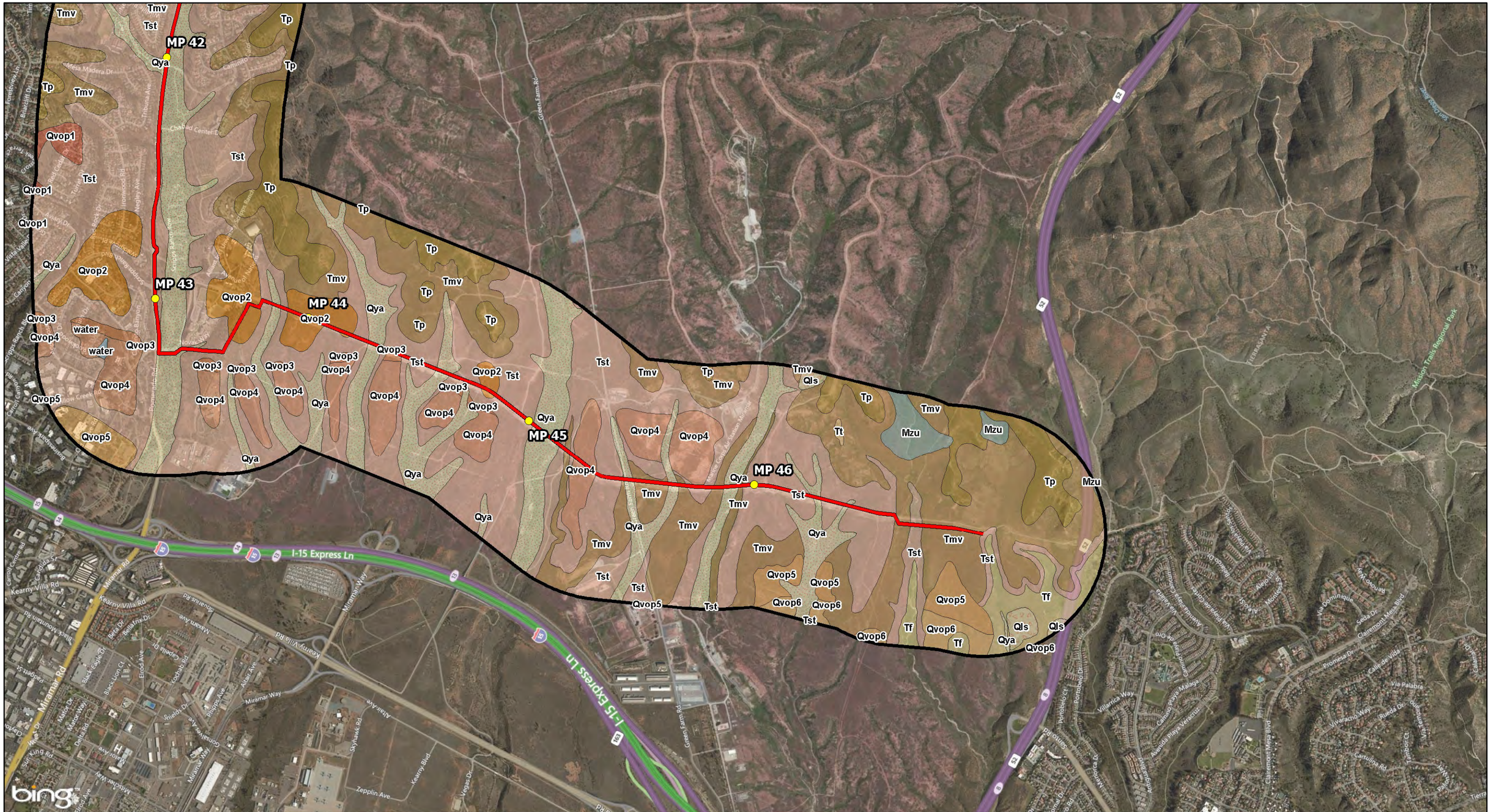

LEGEND

- Milepost
- PSR Route
- Half-mile Buffer

See Figure 2a for Geology Legend

SOURCES:
SDG&E,
California Geological Survey,
Bing.

PSR - RAINBOW METER STATION TO MCAS MIRAMAR
SITE PLAN AND GENERALIZED GEOLOGIC MAP
SAN DIEGO COUNTY, CALIFORNIA

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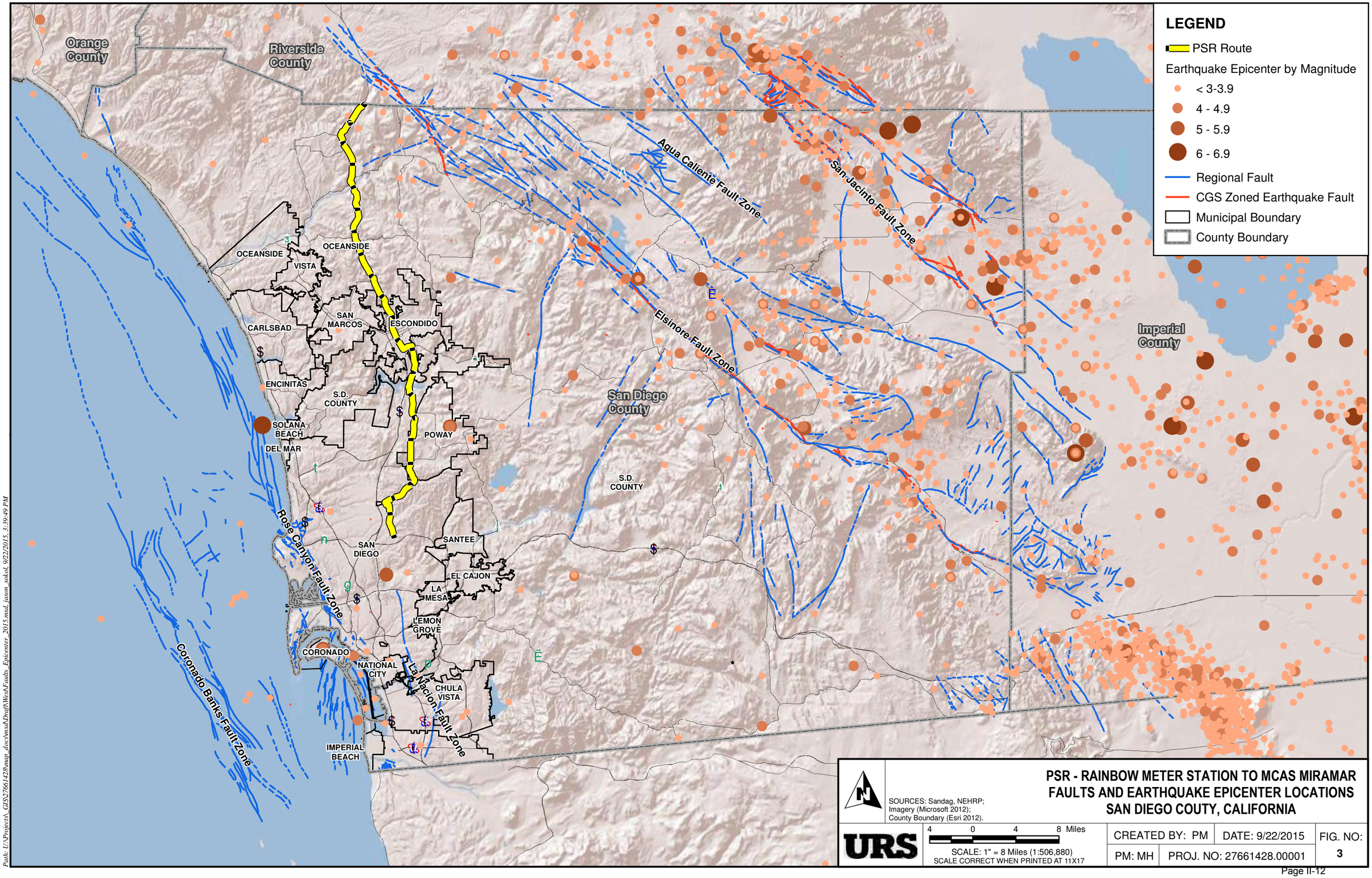

SOURCES: Sandag, NEHRP; Imagery (Microsoft 2012); County Boundary (Esri 2012).

PSR - RAINBOW METER STATION TO MCAS MIRAMAR FAULTS AND EARTHQUAKE EPICENTER LOCATIONS SAN DIEGO COUTY, CALIFORNIA

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SCALE: 1" = 8 Miles (1:506,880)
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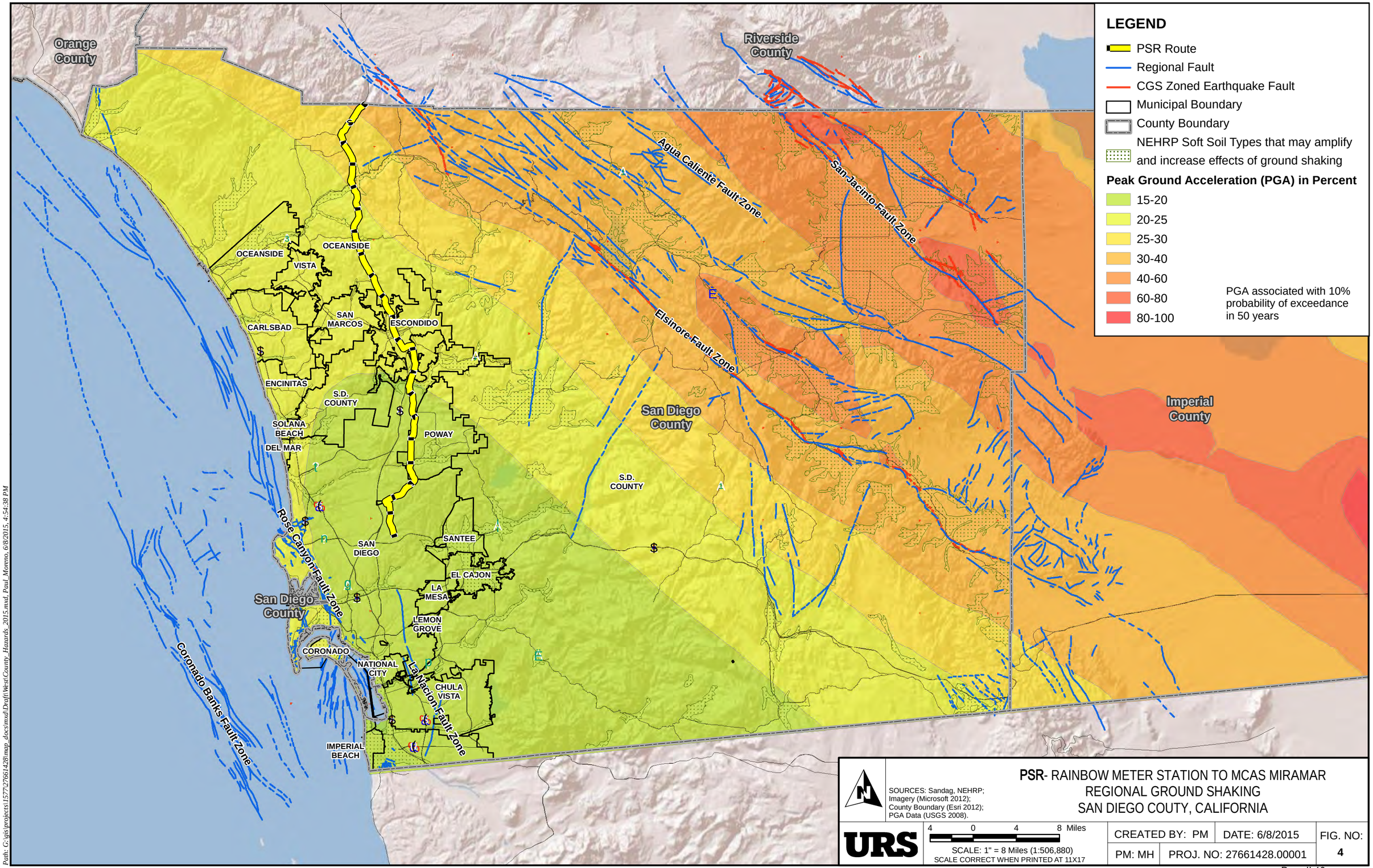

SOURCES: Sandag, NEHRP; Imagery (Microsoft 2012); County Boundary (Esri 2012); PGA Data (USGS 2008).

PSR- RAINBOW METER STATION TO MCAS MIRAMAR
REGIONAL GROUND SHAKING
SAN DIEGO COUTY, CALIFORNIA

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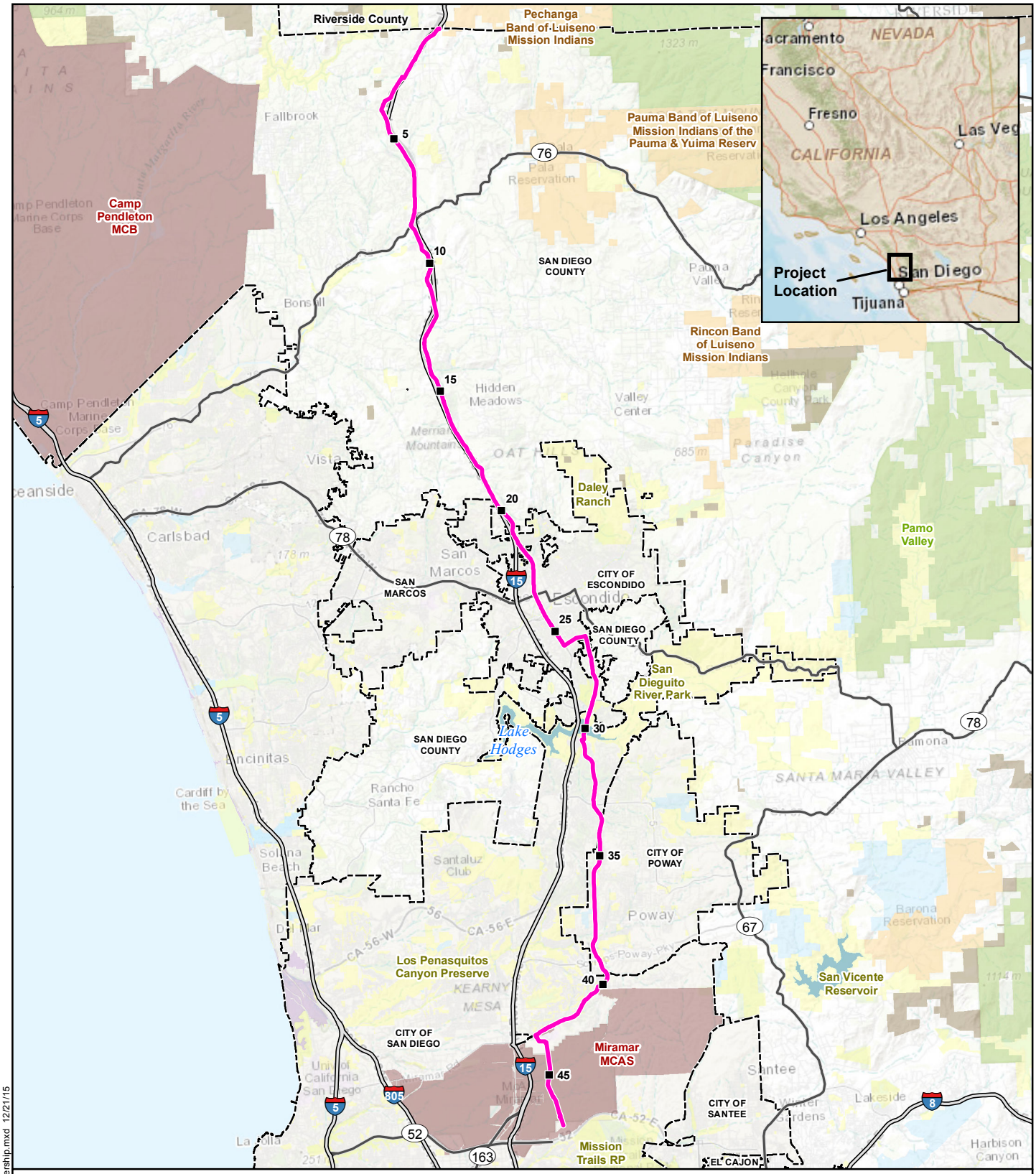
Attachment III

Land Ownership



Land Ownership Map

Pipeline Safety & Reliability Project

- Milepost
- Proposed Project Route
- Interstate
- Major Road/State Highway
- City/County Boundary
- Bureau of Indian Affairs
- California Department of Fish and Wildlife
- California Department of Parks and Recreation
- Other Parks
- US Military
- National Park Service
- US Bureau of Land Management
- US Forest Service

1:320,000

0 2 4 Miles

SoCalGas A Sempra Energy utility | SDGE A Sempra Energy utility | INSIGNIA ENVIRONMENTAL

\MXDs\AdHocLand_Ownership.mxd 12/21/15

Attachment IV

Pressure Limiting Station Drawings

Workpaper - Available Upon Request

Attachment V

Cultural Resources Summary

Table 4.5-1: Cultural Resources within the APE

Site Number	Site Type	Site Description	Relocated/Newly Recorded?[3]	Impacted by the Proposed Project?	NRHP, CRHR, or Local Register Eligibility
P-37-014275	Historic	Military property	Yes (MCAS Miramar)	Unknown	Recommended Not Eligible
P-37-019199	Historic	Structures/walls	No	No (Avoidance Possible)	Recommended Not Eligible
P-37-030889	Historic	Vista Irrigation District Bench Flumes	Yes	No (Avoidance Possible)	Recommended Eligible
P-37-033557	Historic	Roadbed	Yes	Unknown[4]	Not Evaluated
CA-SDI-4634	Multicomponent	Lithic scatter/Military feature	Not Resurveyed (MCAS Miramar)	Yes	Not Evaluated
CA-SDI-5072	Prehistoric	Bedrock milling site, artifact scatter, and village site	No	Yes	Eligible
CA-SDI-6001	Prehistoric	Bedrock milling site	No	Unknown	Not Evaluated
CA-SDI-6083	Prehistoric	Bedrock milling site and lithic scatter	No	Unknown	Not Evaluated
CA-SDI-6722	Prehistoric	Bedrock milling site	No	Unknown	Not Evaluated
CA-SDI-7313	Prehistoric	Lithic scatter and bedrock milling site	No	Unknown	Not Evaluated
CA-SDI-7315	Prehistoric	Lithic scatter	No	Unknown	Not Evaluated

[3] Relocated indicates that a previously recorded site was located during the April 2015 field investigation.
[4] The Proposed Project's impact on previously recorded resources that were not identified during the April 2015 field investigation are unknown because either the resources were either destroyed since their initial recordation; removed from the surface, and possibly still present subsurface; obscured by dense vegetation or pavement; and/or incorrectly mapped, and are actually located outside of the survey corridor.

Site Number	Site Type	Site Description	Relocated/Newly Recorded?[3]	Impacted by the Proposed Project?	NRHP, CRHR, or Local Register Eligibility
CA-SDI-9124	Historic	Landscaping, trash scatter, and cistern	Not Resurveyed (MCAS Miramar)	No	Recommended Not Eligible
CA-SDI-10917	Prehistoric	Lithic scatter and bedrock milling site; habitation debris	Yes	Unknown	Not Evaluated
CA-SDI-10918	Prehistoric	Lithic scatter and bedrock milling site	Yes	Unknown	Not Evaluated
CA-SDI-11466	Multicomponent	Bedrock milling site and historic road sign	Yes	No (Avoidance Possible)	Not Evaluated
CA-SDI-11467	Prehistoric	Lithic scatter	Yes	Unknown	Not Evaluated
CA-SDI-12919	Historic	Trash scatter; ranch complex	No	Unknown	Not Evaluated
CA-SDI-12920	Historic	trash scatter	No	Unknown	Not Evaluated
CA-SDI-15368	Prehistoric	bedrock milling site and lithic scatter	Yes	No (Avoidance Possible)	Not Evaluated
CA-SDI-15369	Historic	Mural	Yes	No (Avoidance Possible)	Not Evaluated
CA-TL1600-S-1	Historic	Engineering structure (Line 1600)	Yes	Unknown	Not Evaluated
3602-I-2	Prehistoric	Isolate	Yes	No	Ineligible
3602-S-1	Historic	Rock wall	Yes	Unknown	Not Evaluated
3602-S-4	Historic	Foundation	Yes	Unknown	Not Evaluated

Source: ASM 2015

Attachment VI

Cost Estimate

LINE NUMBER:	**Pipeline Safety & Reliability Project**	**PREPARED DATE:**	3/21/2016
LOCATION:	**San Diego County**	**PREPARED BY:**	Kelly Murillo (SCG)
ROUTE LENGTH (FT):	**248,050**	**VERSION:**	**1 (L1600 Derating Excluded)**

PROJECT SCOPE & COMMENTS

SCOPE: Budget estimate for a 36" pipeline beginning at Rainbow Station and terminating at the proposed Line 2010 connection in MCAS Miramar. The route takes advantage of an existing section of 36" pre-laid pipe along Pomerado Road.

	ESTIMATE	Contingency (%)	CONTINGENCY ($)	TOTAL
MATERIALS	$ 82,743,116	9.1%	$ 7,550,595	$ 90,293,711
CONSTRUCTION	$ 230,412,152	11.1%	$ 25,575,833	$ 255,987,985
ENGINEER/DESIGN/PROJ MGMT/SURVEY	$ 9,149,350	10.1%	$ 922,059	$ 10,071,409
ENVIRONMENTAL REVIEW & PERMITS	$ 20,369,741	30.0%	$ 6,110,922	$ 26,480,663
OTHER PROJECT EXECUTION ACTIVITIES	$ 22,909,251	12.5%	$ 2,859,638	$ 25,768,888
COMPANY LABOR	$ 16,816,033	8.0%	$ 1,345,283	$ 18,161,316
TOTAL	$ 382,399,642	11.6%	$ 44,364,330	$ 426,763,972

Note: Additional cost details are in workpapers and available upon request.

Attachment VII

Crossing List

Table 3-1: Major Road, Utility, and Sensitive Resources Crossings

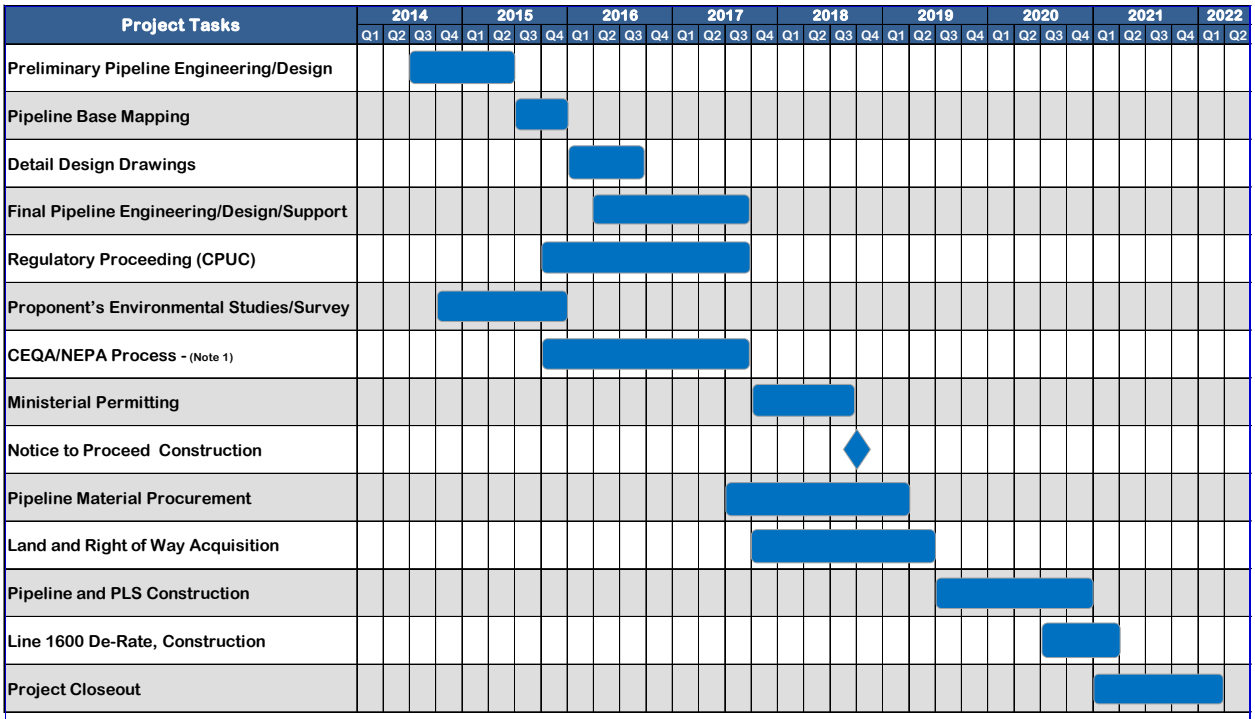
Feature	Approximate MP	Anticipated Crossing Method	
		HDD	Horizontal Bore
Major Road Crossings			
SR-76	8.4		●
I-15	11.2	●	
SR-78 On-Ramp	23.3		●
Major Utility Crossings			
San Diego Aqueduct	0.03		●
230 kV Overhead Powerline	0.2	--	--
30-inch-diameter Natural Gas Pipeline	3.8		●
San Diego Aqueduct	4.7		●
69 kV Overhead Powerline	7.2	--	--
Vista Canal	20.8		●
69 kV Overhead Powerline	21.6	--	--
230 kV Overhead Powerline	21.7	--	--
69 kV Overhead Powerline	21.7	--	--
69 kV Overhead Powerline	23.5	--	--
69 kV Underground Powerline	23.7	--	--
69 kV Overhead Powerline	25.3	--	--
69 kV Overhead Powerline	26.6	--	--
69 kV Overhead Powerline	27.3	--	--
69 kV Overhead Powerline	27.4	--	--
16-inch-diameter Natural Gas Pipeline	28.3		●
16-inch-diameter Natural Gas Pipeline	31.5		●
69 kV Overhead Powerline	35.6	--	--
69 kV Overhead Powerline	35.7	--	--
8-inch-diameter Natural Gas Pipeline	35.7	--	--
8-inch-diameter Natural Gas Pipeline	37.9	--	--

Feature	Approximate MP	Anticipated Crossing Method	
		HDD	Horizontal Bore
8-inch-diameter Natural Gas Pipeline	38.0	--	--
8-inch-diameter Natural Gas Pipeline	40.3	--	--
230 kV Overhead Powerline	39.8	--	--
138 kV Overhead Powerline	39.8	--	--
69 kV Overhead Powerline	39.8	--	--
69 kV Overhead Powerline	42.9	--	--
San Diego Aqueduct	42.9		●
San Diego Aqueduct	43.8		●
San Diego Aqueduct	46.6		●
Sensitive Resource Crossings			
San Luis Rey River	8.8	●	
Reidy Canyon Creek	22.4		●
Escondido Creek	24.1		●
Lake Hodges/San Dieguito River	29.6 – 30.2	●	

Attachment VIII

Project Schedule

Project Schedule



Notes:

1. Does not include pre-filing consultation. With pre-filing consultation, formal regulatory and CEQA/NEPA proceedings are assumed to take 2 years from the date of Application to complete.

Attachment IX

Preliminary Job Specific Safety Plan (JSSP)

Pipeline Safety & Reliability Project (PSRP)

CONTRACTOR/SUBCONTRACTOR JOB SPECIFIC SAFETY PLAN (JSSP)

Contractor/Subcontractor Superintendent - Please complete and return this Plan prior to commencement of work.

An accepted JSSP is required prior to mobilization.

CONTRACTOR/SUBCONTRACTOR NAME: _____

PROJECT NAME: _____

NUMBER OF INDIVIDUALWORK LOCATIONS: _____

DATE: _____

WELCOME!
It is SCG/SDG&E's intent and goal to establish and maintain the safest work-site possible. To help accomplish this task we are requiring our PSRP Construction Contractors to submit this Job Specific Safety Plan for each awarded contract. The JSSP will ensure that all hazards at the individual job locations have been identified and measures have been put in place to ensure the protection of all employees and the general public.

To be completed by Company Representative:
Date completed Job Site Specific Safety Plan (JSSP) received by PSRP Management team: _____

Date of Safety Meeting with Contractor/Subcontractor: _____

Section TABLE OF CONTENTS

GENERAL DESCRIPTION

A. SCOPE OF WORK:

Maximum number of worker personnel on site: _____

B. PROJECT TEAM

Project Manager: _____
Project Superintendent: _____
Safety Representative: _____

C. POINTS OF CONTACT IN THE EVENT OF AN EMERGENCY:

Please utilize Attachment A:

EMERGENCY NOTIFICATION & RESPONSE PLAN

D. SUBSTANCE ABUSE PREVENTION AND DETECTION

The Contractor/Subcontractor understands and has informed their employees and tier subcontractors that an active substance abuse program will be implemented on this project and includes: post incident, reasonable suspicion, and random. Please document the testing location in Attachment A.

E. FACILITIES FOR THE TREATMENT OF ON-THE-JOB INJURIES

We have identified that personnel requiring professional medical treatment for a presumed work-related injury will be transported to the following medical clinic or hospital.

Medical Clinic: _____

Hospital: _____

F. SUB-TIER CONTRACTORS

Please list all sub-tier contractors you anticipate hiring:

Subcontractor Name	Supervisor Name

GUIDANCE FOR COMPLETING THE JOB SPECIFIC SAFETY PLAN (JSSP)

The JSSP is a project-driven pre-planning document used to ensure every project location receives proper safety assessment and planning**. Multiple copies of selections below may be required to address hazards that may be present at each project location**. Only one copy of each JSSP section is required for projects with one location.

A Job Specific Safety plan is required to be submitted by each Construction Contractor at a job location, this includes the Pipeline Contractor, Civil Contractor, Non-Destructive Testing Contractor, LNG/CNG Contractor or other contractors having a direct contract with SDG&E/SCG.

Example: The same Personal Protective Equipment may be required on all project locations, therefore only one section "O. Personal Protective Equipment" would need to be submitted. However if the project has multiple Traffic Control/Work Zone locations, you would need to submit section "U. Traffic Control/ Work Zone Safety" for each location.

The preferred method for JSSP submittal is an electronic copy. This electronic version is the least labor intensive method of completing the JSSP.

Prior to filling out the JSSP please identify all of the individual work locations associated with the project. Making note of the individual jobsite locations during the initial job walk will be beneficial when completing the JSSP.

Things to consider when completing the JSSP:

- Are there any hazards that are unique to each project location?
- Have you determined the appropriate training for each project location?
- Have you determined the required PPE for each project location?
- Have you included safe work practices for each project location?

Site Procedures/Job Hazard Analysis

Project Number: **Project Location Identifier:**

A. AERIAL LIFTS

Will your employees be operating aerial/scissor lifts? Yes ☐ No ☐
If yes, How will you provide the proper training?

How will you provide verification of daily inspections for all aerial/scissor lifts?

Will your employees wear fall protection when operating aerial/scissor lifts?
Yes ☐ No ☐

If yes, What form of fall protection will be used?

Project Number: **Project Location Identifier:**

B. ASBESTOS/LEAD

Will you be handling, disturbing, abating or working around any Asbestos/Lead or Asbestos/Lead containing material? Yes ☐ No ☐

If yes, please describe:

What level of training have your employee completed in regard to Asbestos and Lead?

Who is confirming if Asbestos or Lead Containing Materials are present?

Who will be performing the abatement of any Asbestos or Lead Containing Materials?

What personal protective equipment will be worn when handling Asbestos or Lead Containing Materials?

Note: Any identification of possible and/or confirmed Asbestos or Lead Containing Material must be reported to the PSRP management team.

Project Number: **Project Location Identifier:**

C. CONCRETE/SLURRY

Will you be doing any concrete work? Yes ☐ No ☐

If yes, what type of form-work will you be using?

What type of shoring will you be using?

All form-work/shoring shall be designed by a P.E. Please provide name:

What type of fall protection will be used on form-work (i.e., decks/walls)?

What personal protective equipment will be worn when working in concrete and slurry?

Project Number: **Project Location Identifier:**

D. CRANES

Note: * **Be advised that cranes will not be allowed to operate on this job-site without a current inspection.**
* **Crane operator qualifications must be provided to PSRP management team.**

Will you be using a crane?	Yes ☐	No ☐
If yes, will you be hiring your own crane?	Yes ☐	No ☐
Will you be submitting a lift plan?	Yes ☐	No ☐

If no, please inform the PSRP management team.

What will you be lifting?

(If your crane requirements are more extensive than can be described here, please provide a separate, complete and detailed description of your requirements).

Where will the pick start and end?

Do you anticipate any picks being Critical lifts? Yes ☐ No ☐

Please note: Anyone signaling/rigging loads must complete training for signaling/rigging. Please be prepared to provide the PSRP management team with documentation of the completed training when requested.

Project Number: **Project Location Identifier:**

E. DEMOLITION

Will your work require any demolition? Yes ☐ No ☐
If yes, please describe:

What precautions will be necessary to protect workers and other personnel?

What will you do restrict unauthorized personnel from entering demo area?

How will you barricade or demarcate the area to be demolished?

Will your work require concrete demolition or cutting? Yes ☐ No ☐

If yes, How will you protect site personnel and the public from Silica Dust?

Project Name: **Project Location Identifier:**

F. ELECTRICAL

Will you be doing any electrical work? Yes ☐ No ☐
If yes, What are the voltages you will be working with?

Will employees be handling energized electrical parts and/or lines? Yes ☐ No ☐
If yes, Describe: (This work must be confirmed and authorized by the PSRP management team):

Will you be responsible for providing temporary power for your personnel and/or the project? Yes ☐ No ☐
If yes, describe daily maintenance procedures:

Do you have an Energy Isolation Program? Yes ☐ No ☐
If yes, please provide a copy to the PSRP management team.
If no, one will be required for this project and before work can commence.

Project Name: **Project Location Identifier:**

G. EXCAVATION/TRENCHING

Will you be moving any dirt? Yes ☐ No ☐
If yes, Who is your Competent Person for excavations?

Will you be using any heavy equipment? Yes ☐ No ☐
If yes, What type?

What is the depth of the deepest excavation?

What type of protective shoring systems will be used?

Will you be moving any dirt off-site? Yes ☐ No ☐
If yes, What special procedures will be necessary for hauling dirt on public streets?

Where will you be using Flaggers? Yes ☐ No ☐

Will you be excavating in proximity to live utilities? Yes ☐ No ☐
If yes, what procedures will you use to prevent damage?

Will you need to apply for a Cal/OSHA permit? Yes ☐ No ☐
If yes, proof of permit may be required during an audit.

Project Name: **Project Location Identifier:**

H. FALL PROTECTION

Will your employees be exposed to any fall hazards? Yes ☐ No ☐
If yes, Describe:

What fall protection measures will you use?

Will your work expose your employees to floor openings, wall openings or leading edge work? Yes ☐ No ☐
If yes: Please Describe:

What procedures will you use to ensure your employees and other project personnel are not exposed to fall hazards?

Where will the inspection records for Fall Protection Equipment be stored?

Project Name: **Project Location Identifier:**

I. FORKLIFTS

Will you be operating forklifts? Yes ☐ No ☐

If yes, How will you provide the proper training?

How will the hazards associated with operating forklifts around blind spots be mitigated?

Where will the forklift daily/pre use inspection logs be kept?

What material will you be moving with forklifts?

Project Name: **Project Location Identifier:**

J. HOT WORK

Will you be performing any activities that generate heat or sparks? Yes ☐ No ☐
If yes, how will the following control measures be implemented to eliminate or reduce the possibility of a fire or explosion?

- Smoking in designated smoking areas only
- A "Hot Work" Permit is to be completed
- A "FireWatch" is to be present when hot work is being performed
- Combustible air monitoring is to be performed if there is a potential of a combustible atmosphere.
- Combustibles within at least a 35 foot radius of the hot work are to be removed or protected.

Will you be performing Hot Work activities during potential "Red Flag" warning periods? Yes ☐ No ☐
If yes what control measures will you implement?

Project Name: **Project Location Identifier:**

K. HOUSEKEEPING

What will be your procedures for housekeeping and cleanup?

How will exits and access be kept unobstructed?

How will work areas be kept clean and free of debris?

How will trash and debris be removed from the site for disposal?

Project Name: **Project Location Identifier:**

L. LADDERS

Will your work require the use of ladders? Yes ☐ No ☐

If yes, Describe the procedure for the pre use inspection of ladders.

How often are documented ladder inspections performed?

Where are documented ladder inspections kept?

What precautions will be necessary to ensure workers maintain 3-points of contact while ascending and descending ladders (2-feet and 1- hand or 1-foot and 2-hands)?

What precautions are taken when a defective ladder is discovered on the job site?

What precautions are taken to ensure ladders do not exceed the designated weight capacity (worker and materials)?

Project Name: **Project Location Identifier:**

M. MASONRY

Will you be doing any masonry work? Yes ☐ No ☐

If yes, how will you protect impalement hazards?

What precautions will you take while cutting concrete bricks and blocks?

What personal protective equipment will be worn when cutting bricks and blocks?

What precautions will you take to protect your employees and other site workers below and around your work?

Project Name: **Project Location Identifier:**

N. MATERIAL STORAGE

Where will construction material be stored/staged?

Will you be using any flammable/combustible liquids? Yes ☐ No ☐
If yes, Where will these be stored?

What fire prevention/protection precautions will be taken?

What spill prevention precautions will be taken?

Project Name: **Project Location Identifier:**

O. PERSONAL PROTECTIVE EQUIPMENT (PPE)

Will your operations generate dust, fumes or potentially harmful gases? Yes ☐ No ☐
If yes, Please Describe:

What respirator precautions will you take?

What precautions will you take to protect other project personnel from dust, fumes or potentially harmful gases?

Will your employees be exposed to specific eye hazards? Yes ☐ No ☐
If yes, Please Describe:

What additional eye protection measures will you take, besides safety glasses with side shields?

Will your employees be exposed to any potentially harmful chemicals? Yes ☐ No ☐
If yes, Please Describe:

What PPE requirements will be necessary to handle potentially harmful chemicals?

What precautions will you take to protect other personnel on the project from potentially harmful chemicals?

Will you have work that requires any special PPE? Yes ☐ No ☐
If yes, Please Describe:

Project Number: **Project Location Identifier:**

P. PIPING/PLUMBING

Will you be working with piping or plumbing? Yes ☐ No ☐
If yes, Will this piping or plumbing contain pressurized fluids and/or gas?
Yes ☐ No ☐
If yes, what precautions will be taken?

Will hot taping be performed on energized gas lines? Yes ☐ No ☐
(If yes, the PSRP management team must confirm and authorize)

If yes, Do you have a hot taping procedure for energized gas lines? Yes ☐ No ☐

What other potential hazards and precautions have you identified associated with this task?

Project Number: **Project Location Identifier:**

Q. PUBLIC PROTECTION

Will any of your work be in close proximity to the public or employees of an existing facility? Yes ☐ No ☐

If yes, what precautions will be necessary to protect non-construction personnel?

What precautions will be necessary to protect the public from slip, trip and fall or other hazards?

WhatWarning/Danger signs will be posted at the project entrance?

How will you control dust or other hazardous substances?

Project Number: **Project Location Identifier:**

R. SCAFFOLD

Will you be using scaffolds? Yes ☐ No ☐
If yes, Who is your Competent Person for scaffolding?

What type of scaffolding?

Location?

Who will erect it?

Who will inspect it daily?

Will the nature of the scaffold require it be designed by a Registered Professional Engineer? Yes ☐ No ☐
If yes, the stamped drawings shall be provided to the North Project Management team

Will you be using scaffolding to shore formwork or for re-shoring? Yes ☐ No ☐
If yes, the stamped drawings shall be provided to PSRP management team.

Project Number: **Project Location Identifier:**

S. SITE OREINTATION/PRE TASK PLANNING

Where will the Site Specific Orientations be conducted?

Where will the Pre Task planning meetings be conducted?

Please list your Heat Related Illness precautions.

Project Number: **Project Location Identifier:**

T. TOOLS

Will you be using powder-actuated tools? Yes ☐ No ☐
If yes, How will you provide the proper training?

How will the unused shots be stored?

How will the used shots be disposed?

Will you be operating lasers? Yes ☐ No ☐
If yes, How will they be provided the proper training?

Will you be operating table saws? Yes ☐ No ☐
If yes, How will you ensure guards remain in place?

Will you be using other power tools? Yes ☐ No ☐
If yes, List tool with safety precautions/guards/training necessary for operation:

Project Number: **Project Location Identifier:**

U. TRAFFIC CONTROL /WORK ZONE SAFETY

Is the work on or adjacent to a roadway? Yes ☐ No ☐

Is a Traffic Control Plan necessary or required? Yes ☐ No ☐

Is a Traffic Control Permit required? Yes ☐ No ☐

Who will be providing traffic control?

Will paving be required after the work is completed? Yes ☐ No ☐

Is the paving work included in your traffic control plan? Yes ☐ No ☐

Will work be performed at night? Yes ☐ No ☐

What other precautions will be taken to address construction and non-construction personnel?

What personal protective equipment will be required when working on or adjacent to a roadway?

Project Number: **Project Location Identifier:**

V. OTHER SAFETY ISSUES/CONCERNS THAT NEED TO ADDRESSED?

Project Number: **Project Location Identifier:**

W. PLEASE LIST ALL QUALIFIED OR COMPETENT PERSONNEL AND THEIR CRAFT. PROOF OF DOCUMENTED TRAINING WILL BE REQUIRED.

Name	Craft

This Job Specific Safety Plan has been prepared for:

_____

Project Name/Number

By a representative of:

_____

Company Name

I, as a member of the Project Team, have read and am fully aware of the contents of this Plan. Additionally, my company is aware of and understands the safety requirements governing this job-site and will, in good faith, attempt to perform all tasks in accordance with same.

_____

Signature of Project/Construction Manager

_____

Date

ATTACHMENT A

EMERGENCY NOTIFICATION & RESPONSE PLAN

This plan outlines who is to be notified in the event of an incident, including motor vehicle incidents. An incident is defined as an "unplanned event that disrupts work activity".

Media
Media interaction is done by the PSRP Customer Communications Manager. Please do not address the media. All inquiries are to be forwarded to SDG&E/SCG.

Incident Notification
Incidents to anyone on or adjacent to the project site or in SDG&E/SCG are to be reported immediately to the employee's supervisor and the PSRP management team.

Any incident or injury is to be reported to the employee's supervisor and the PSRP management team.

Name	Company	Position	Phone Number

The seriousness of the injury will determine the level of reporting through the management structure. Depending on how serious the incident is will determine how far up the management structure the reporting will go. Reporting will be determined by PSRP management and safety personnel.

Medical Information
The following is a list of those trained on the job site in First Aid and CPR.

Name	Phone Number

Drug & Alcohol Screening

Personnel assigned to the project are required to complete a post-incident Drug & Alcohol Screening. This screening will be conducted at the following location:

Medical Clinic (Name, Location, & Phone Number)	
Hospital (Name, Location, & Phone Number)	

Outline the actions that will be taken in the event of the emergencies listed below:

- Gas Leak
- Severe weather (thunderstorm, lightning, high winds, tornado, flash flood)
- Earthquake
- Explosion/Fire
- Civil Unrest (violence, robbery)
- Terrorist Threat (bomb threat)
- Workplace violence

How To Turn In Alarm
How will all personnel on the job be informed of the emergency and be evacuated?

Evacuation Meeting Point
Where is the evacuation point?
How will you confirm that all personnel are accounted for?

"All Clear Signal
What will be the "all clear" signal?

Assembly Points / Responsible Person
Where are personnel to assemble in the event of an emergency?
Who will report to that location and be responsible for keep the evacuees informed?

Attachment X

Preliminary Environmental

Cost Estimate

Workpaper - Available Upon Request

Attachment XI

L-1600 De-rating Impacting Analysis

SAN DIEGO GAS & ELECTRIC COMPANY AND SOUTHERN CALIFORNIA GAS COMPANY

LINE 1600 DE-RATING IMPACT ANALYSIS

Prepared for:

SDGE

A Sempra Energy utility

Gas Technical Services Miramar

Prepared by:
Thomas Saunders, PE
Jani Kikuts, PE
Gas Distribution – San Diego Region
Engineering

Executive Summary

Line 1600 is a 16" transmission pipeline that extends from San Diego Gas & Electric Company's (SDG&E) Rainbow Metering Station to Mission Control in Mission Valley. Line 1600 supplies approximately 10% of the natural gas demand in San Diego County and serves as the sole supply of natural gas for customers in the inland valley communities north of Escondido. Currently, Line 1600 has a maximum allowable operating pressure (MAOP) of 640 pounds per square inch, gauge (psig) along its entire length. In order to reduce the operating stress in Line 1600 to a level below 20% specified minimum yield strength (SMYS), it has been proposed to reduce the pressure in the pipeline to an operating pressure of 300 psig with an MAOP of 320 psig between Rainbow pressure limiting station and Kearny Villa pressure limiting station.

Distribution systems supplied by Line 1600 operate at an MAOP of 400 psig or 60 psig. The distribution supply line systems (greater than 60 psig) depend on Line 1600 for a steady supply of high pressure natural gas to support the current and anticipated demands downstream. Each of the Distribution Supply systems has been designed, sized, and planned based on forecasted and anticipated system growth in the areas they serve at the time they were installed.

The anticipated impacts of de-rating Line 1600 are:

- Insufficient regulator station capacity
- Non-Uniform distribution of pressure along Line 1600

Analysis Summary

The de-rating analysis results contained herein were developed under SDG&E's 1-in-35 year planning conditions with no presumed pressure gradient in Line 1600. Weather conditions were simulated as a 24 heating degree day, the pressure in Line 1600 at Rainbow was set to 300 psig, and the proposed Line 3602 pipeline[1] was set to 780 psig. The proposed Line 3602 would be installed along the Old Highway 395 route with a pressure limiting station at the intersection of Lines 1600 and proposed Line-3602 near Lake Hodges.

[1] The PSRP pipeline is a proposed approximately 47-mile long, 36-inch diameter natural gas transmission pipeline that will carry natural gas from SDG&E's existing Rainbow Metering Station to the pipeline's terminus and cross-tie with the existing Line 2010 on Marine Corps Air Station (MCAS) Miramar.

Regulator Station Abandonment

Ten 640 psig to 400 psig regulator stations listed in the table below would no longer be needed between Line 1600 and the distribution systems downstream.

Stations to Abandon
Reg 1316
Reg 1101
Reg 1516
Reg 141
Reg 1500
Reg 1248
Reg 1494
Reg 1051
Reg 1335
Reg 982

In order to maintain operational flexibility in the event of scheduled or unscheduled maintenance of the proposed Line 3602 pipeline, SDG&E and SoCalGas recommends to install closed valves/check valves in the following to-be-abandoned regulator station locations.

New Check Valve Locations
Abandoned Reg 1516
Abandoned Reg 1500

New Regulator Stations

In order to maintain a 400 MAOP pressure in the distribution supply line systems in this vicinity, the following three new regulator stations would be required to feed the distribution systems from the proposed Line 3602 pipeline.

New Regulator Station Location
Regulator Station A - Pomerado Road and Camino Del Norte
Regulator Station B - Pomerado Road and Poway Road
Regulator Station C - Pomerado Road and Willow Creek Road

Under-Capacity Regulator Stations

One regulator station would not have sufficient design capacity with the reduced inlet pressure and therefore need to be replaced with a new regulator station.. This station would have to be replaced by a new station designed to operate at the new Line 1600 MAOP of 320 psig.

Replace Under-Capacity Regulator Stations
Regulator Station 939

System Ties

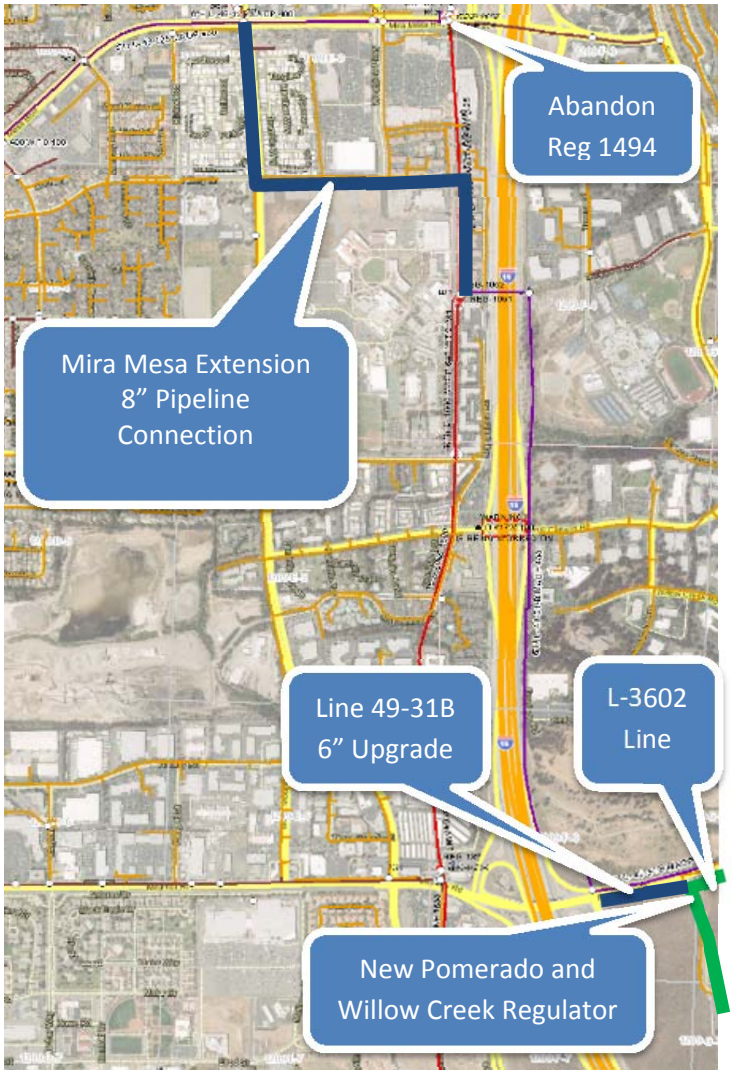
Line 49-31C

In 1994, Pomerado Road was re-aligned between Poway Road and Scripps Poway Parkway. SDG&E installed a 36" pipeline in the new street alignment in anticipation of a new 36" transmission pipeline from Rainbow. This pipeline segment was designed and tested to operate at 800 psig, however the segment was incorporated into the existing 400 psig system tying Rancho Bernardo to the Poway, Penasquitos, and Scripps Ranch high pressure systems. If this segment of pipeline, designated as 49-31C, is incorporated into the proposed PSRP pipeline, a new 1.08 mile long, 8" distribution supply pipeline (Pre-lay Segment Replacement) must be installed in its place, parallel to the existing 36" pipeline to maintain system continuity.

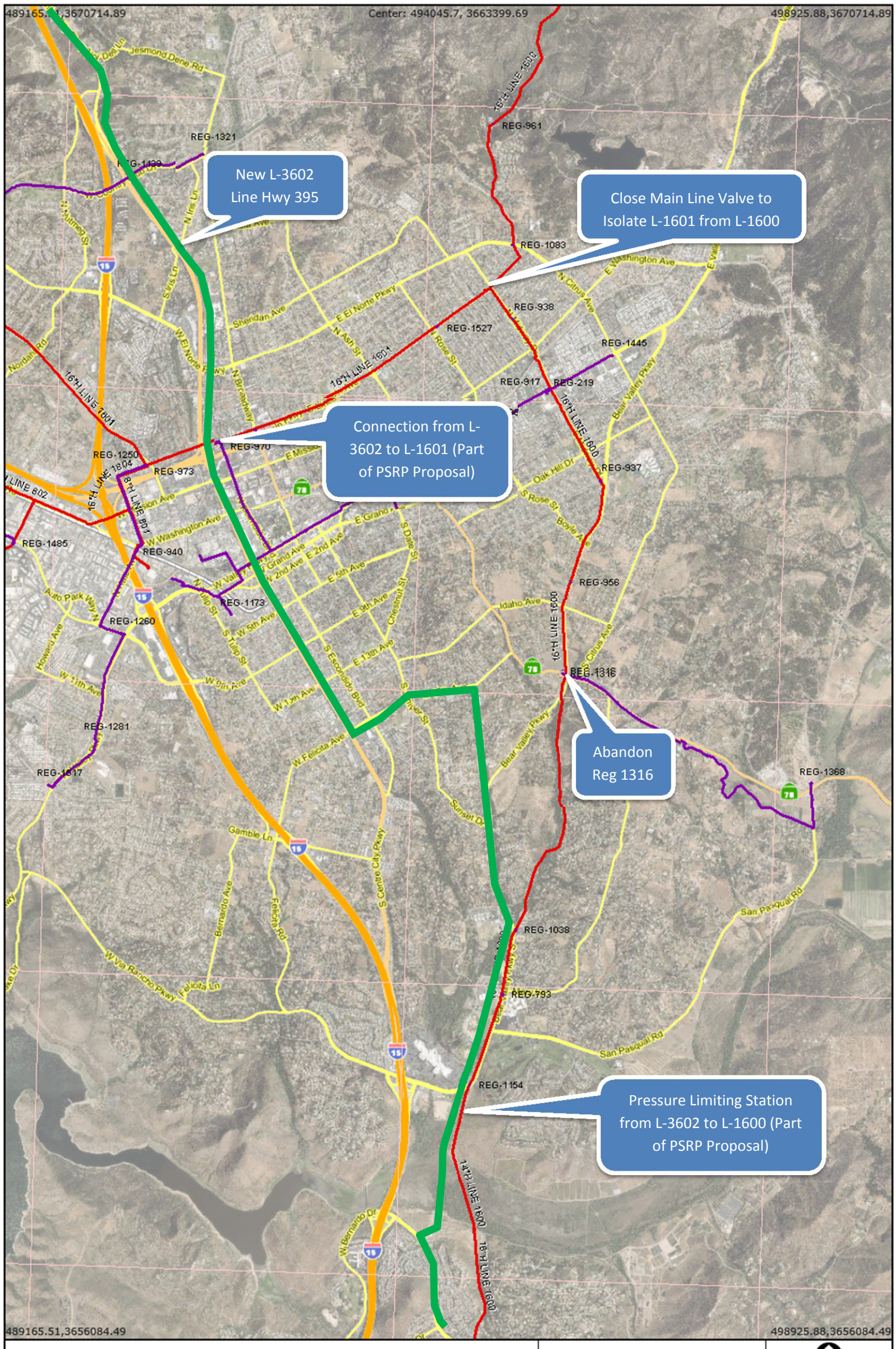

Pre-lay Segment
Replacement
(8”,1.08 Miles)
REG-1438
Scripps Poway Pkwy

Mira Mesa Extension

In 2010, SDG&E uprated an existing distribution pipe at Mira Mesa Blvd. This pipe, now Line 49-125, provides a feed into a gas system, which was at capacity prior to the pressure betterment project. Line 49-125 has an MAOP of 400 psig and is currently fed from the west by regulator station 1322 attached to Line 3010, and from the east by the newer station 1494 attached to Line 1600. In order to maintain the existing capacity of the Mira Mesa high pressure system, which serves not only Qualcomm but also San Diego's high tech Sorrento Valley area, a new 400 PSIG source is needed if Line 1600 is de-rated to an MAOP of 320 psig. A new 0.88 mile long, 8" inch high pressure connection would be installed between the west end of Line 49-31B and Line 49-125 in Mira Mesa Blvd. Additionally a 0.7 mile section of Line 49-31B in Pomerado Rd. would be upgraded to 6" inch diameter, and a new regulator station (Regulator Station C - Pomerado and Willow Creek Regulator) from the proposed Line 3602 pipeline to Line 49-31B would be installed.


Abandon
Reg 1494
Mira Mesa Extension
8” Pipeline
Connection
Line 49-31B
6” Upgrade
L-3602
Line
New Pomerado and
Willow Creek Regulator

Appendix A – De-rating Maps



Map Title:

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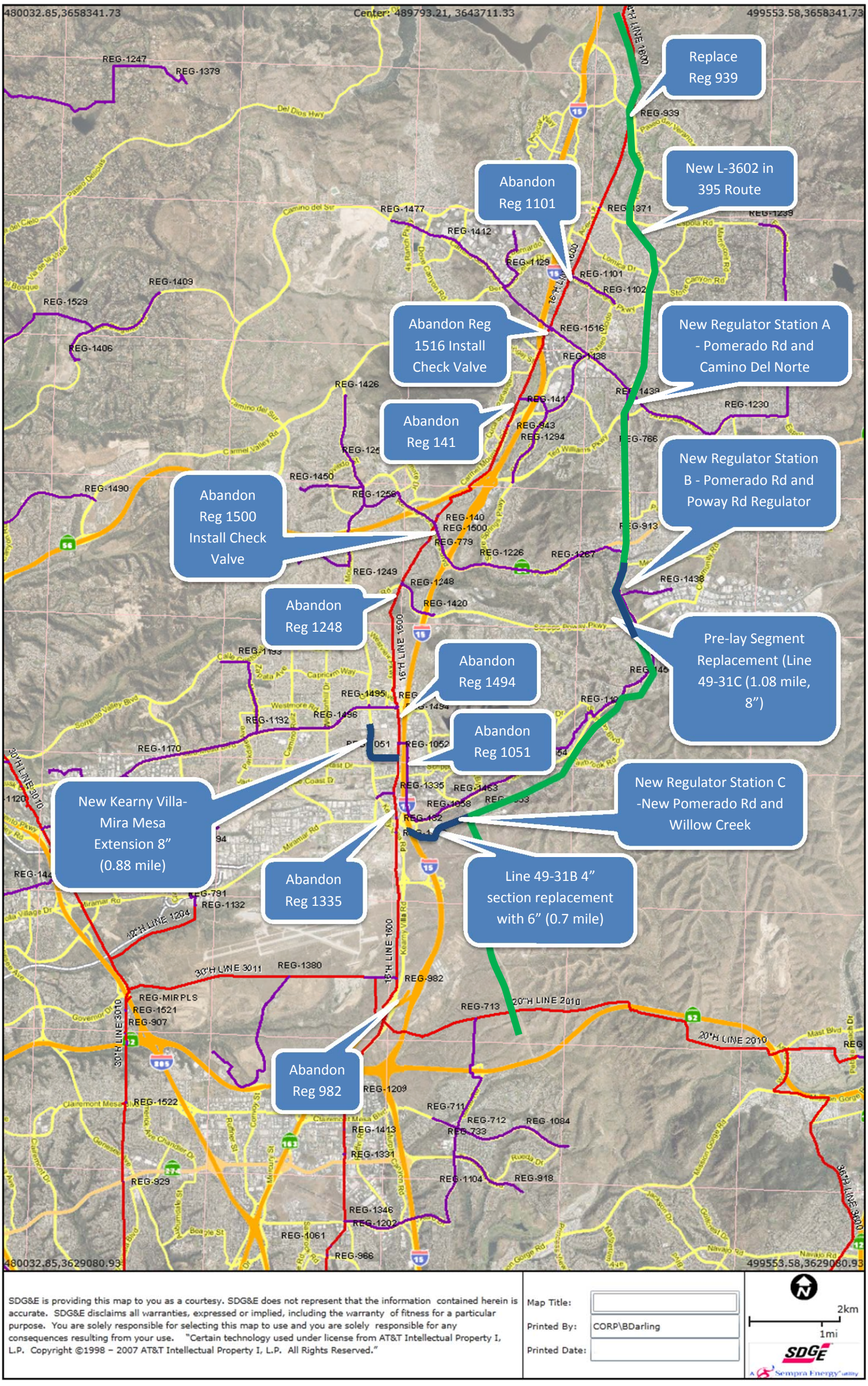

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Attachment XII

Moreno Compressor Station

PSRP Report

SAN DIEGO GAS & ELECTRIC

AND

SOUTHERN CALIFORNIA GAS COMPANY

MORENO COMPRESSOR STATION – OPERATION ANALYSIS

Pipeline Safety & Reliability Project

March 21, 2016

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SUMMARY

SDG&E and Southern California Gas (Utilities) have proposed a 36” line to replace the existing Line 1600, a 16” line, and then de-rate Line 1600 to distribution service (Proposed Project). A number of alternative projects have been identified for evaluation, including:

- Hydrotest the existing 16” line and retain it in transmission service, with no new pipeline (no project alternative)
- Construct and operate a new 36” line, and de-rate existing Line 1600 to distribution service (Proposed Project)

For the 36” line scenario, it is assumed that the Moreno Valley Compressor Station (Moreno) would only require reduced operations to function minimally as a safe guard during extreme or unplanned capacity interruption scenarios. However, the 16” line scenario (hydrotest) would still require Moreno to fully operate to provide gas to San Diego. The analysis is based on historic operations and costs at Moreno from 2012 through 2015.

OBJECTIVE

The objective of this estimate is to determine the annual avoided costs at Moreno with the Utilities’ Proposed Project (replacing a 16” line with a 36” line) when compared to the current 16” line (whether hydrotested or replaced). A matrix is shown below to summarize the different scenarios of operating the compressor station and the respective initial Total Installed Project Cost of each proposed line:

Table 1

		Moreno Full Operations	**Moreno Reduced Operations**
Base	36" Line		X
Alternate	16" Line Hydrotest	X	

This cost estimate analysis will compare the reduced operations assumed with the installation of a new 36” Line versus the full operation (status quo) with the existing 16” Line. The analysis provides estimated annual savings resulting from reduced operations of Moreno as a result of the installation of a 36” pipeline.

ANNUAL COSTS OF FULL OPERATIONS OF THE COMPRESSOR STATION

To determine annual costs, there were a number of costs considered that affect the cost of operating Moreno Compressor Station. They are as follows:

- Emission Fees and Permitting
- Operations and Maintenance
- Fuel
- Nitrogen Oxide (NOx) emissions
- Greenhouse Gas (GHG) combustion emissions
- Capital Spending

EMISSION FEES AND PERMITTING

Emission and water fees and permitting were developed based on annual reports from 2012 to 2015. These reports detailed annual emissions, emissions subjected to fee, and the fee rates applied. The table below summarizes the data for emission and water fees and permitting. The data is averaged to get an annual cost for emission fees of approximately $81K.

Table 2

	2012	2013	2014	2015	Average
Total Fees	$74,896	$125,897	$74,773	$48,304	$80,968

OPERATIONS AND MAINTENANCE

Actuals were obtained for both labor and non-labor costs for the operations and maintenance of Moreno from 2012 to 2015. These costs were averaged to get an annual cost for operations and maintenance.

Table 3

	Last 4 Years Actuals				
	2012	**2013**	**2014**	**2015**	**Average**
Labor	$1,315,975	$1,328,529	$1,379,170	$1,393,898	$1,354,393
Non-Labor	$1,440,528	$1,540,551	$1,553,125	$1,367,334	$1,475,385
Overall	$2,756,503	$2,869,080	$2,932,295	$2,761,232	$2,829,778

The annual average cost for labor was $1.35M and the annual average cost for non-labor was $1.48M.

FUEL

Fuel usage at the compressor station for years 2012-2015 was provided to determine an annual fuel cost. Fuel usage was given in MMSCF (Million Standard Cubic Feet) and then converted to dekatherms. Based on the CMEGroup Globex Futures, the average price per dekatherm for the California border in 2021 will be $3.23.

Table 4

	2012	2013	2014	2015	Average
MMSCF	643	505	246	325	
Decatherms	664,860	522,234	254,395	336,091	444,395

Based on this price applied to the average annual fuel usage, an annual fuel cost of $1.4M was developed.

NITROGEN OXIDE (NOX) EMISSIONS

NOx Regional Clean Air Incentives Market (RECLAIM) emissions balances per year from 2012 to current were obtained. A beginning allocation is applied to Moreno for each future compliance year (fiscal year, July 1st to June 30th). Based on the yearly emissions, SDG&E needs to either buy more credits of NOx emissions to meet reported usage, or sell the excess holdings at current market prices.

Over the next 6 years Moreno's available NOx RECLAIM holdings/allocations will decline by 41.7%, due to recent changes in the South Coast Air Quality Management District (SCAQMD) RECLAIM rules. SDG&E's 2015/2016 initial allocation of 96,626 lbs. will decline, year by year, to 56,333 lbs. by 2022. The large reduction in the total supply of credits will impact trading markets and the price for future credits will rise significantly from past levels.

Based on the average yearly NOx emissions from 2012 to 2015, an annual NOx emissions usage of 139,338 lbs. was determined.

Table 5

	2012/13	2013/14	2014/15	2015/16	Average
Total NOx Emissions	226,437	125,610	85,305	120,000	139,338

By 2022, SDG&E's beginning allocation will be 56,333 lbs., requiring about 83,000 lbs. of NOx emissions credits to be purchased to meet estimated annual usage. Based on recent sales for future NOx emissions credits, an average cost of $14 per lb. is forecasted (See reference 1 under section References for source information).

This results in an annual cost of $1.16M for NOx RECLAIM credit purchases.

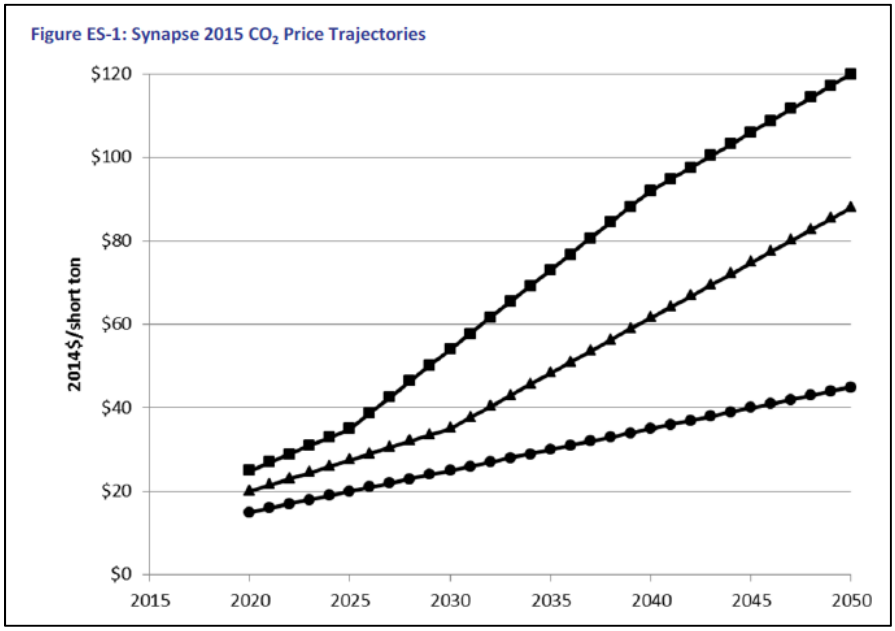
GREENHOUSE GAS (GHG) COMBUSTION EMISSIONS

GHG combustion emissions were obtained for 2012-2014. An average annual metric tonnage (MT) was determined at 25,159 MT.

Table 6

	2012	2013	2014	Average
GHG combustion emissions (MT CO2e)	34,635	27,362	13,479	25,159

The cost per metric ton is based on a CO_2 price trajectory from a 2015 Synapse paper, as shown below:



The "2015 Carbon Dioxide Price Forecast" paper details the pricing level as follows:

> "The **Low case** forecasts a CO_2 price that begins in 2020 at $15 per ton, and increases to $25 in 2030 and $45 in 2050, representing a $26 per ton levelized price over the 2020-2050 period. This forecast represents a scenario in which the final version of the Clean Power Plan is relatively more readily achieved, and a similar level of stringency is assumed after 2030.
>
> The **Mid case** forecasts a CO2 price that begins in 2020 at $20 per ton, and increases to $35 in 2030 and $88 in 2050, representing a $42 per ton levelized price over the 2020-2050 period. This forecast represents a scenario in which federal policies are implemented with significant but reasonably achievable goals. Clean Power Plan compliance is achieved and science-based climate targets are enacted mandating at least an 80 percent reduction in electric section emissions from 2005 levels by 2050. The pricing used to determine annual costs for GHG emissions depends on the number of years considered for the life of asset.

The **High case** forecasts a CO2 price that begins in 2020 at $25 per ton, and increases to approximately $54 in 2030 and $120 in 2050, representing a $59 per ton levelized price over the period 2020-2050. This forecast is consistent with a stringent level of Clean Power Plan targets, recognizing that achieving science-based emissions goals by 2050 will be relatively difficult. In recognition of these more stringent targets, implementation of standards that are more aggressive than the Clean Power Plan may begin as early as 2025. New regulations may mandate that electric-sector emissions are reduced to 90 percent or more below 2005 levels by 2050, in recognition of lower-cost emission reduction measures expected to be available in this sector. Other factors that may increase the cost of achieving emissions goals include: greater restrictions on the use of offsets; restricted availability or high cost of technology alternatives such as nuclear, biomass, and carbon capture and sequestration; and more aggressive international actions (thereby resulting in fewer inexpensive international offsets available for purchase by U.S. emitters).

The pricing used to determine annual costs for GHG emissions depends on the number of years considered for life of asset. For the purpose of this estimate, the following was used:

- 20 years, the levelized price per ton of $26 from the low range was used
- 30 years, the levelized price per ton of $41 from the mid-range was used
- 31+ years, the levelized price per ton of $52 from the high range was used

Using an annual average of 25,159 metric tons, the respective yearly costs for each timeline is as follows:

- 20 years – $654,125
- 30 years – $1,031,505
- 31+ years – $1,320,830

See reference 2 under section References for source information.

CAPITAL SPEND

Capital spending was based on annual reports from 2011 to 2015. The table below summarizes the data for annual capital spend.

Table 7

Annual Capital Spend - Moreno	
Year	Spend
2011	$ 1,354,842
2012	$ 1,406,702
2013	$ 1,770,251
2014	$ 2,892,646
2015	$ 2,287,017
(2011 - 2015) 5yr avg	**$ 1,942,292**

COST SAVINGS OF REDUCED OPERATIONS OF THE COMPRESSOR STATION

To determine annual cost savings for reduced operations of the compressor station, there were several assumptions made to each segment of the annual costs.

OPERATING ASSUMPTIONS AND COST SAVINGS ASSUMPTIONS

The following analysis is based on the determination that the Proposed Project will allow a reduction in Moreno operations by either 80%, the “low case” or 95%, the “high case.” Under the Proposed Project, the Moreno Station would then function minimally as a safe guard to serve SDG&E’s service territory during extreme or unplanned capacity interruption scenarios.

Table 8

	% of Compressor Station Operations Reduction	
	Low Case	High Case
36” Line	80%	95%

It is assumed that the following cost segments have a direct relationship to the level (by percentage) of compressor station operations:

- Fuel
- NOx Purchases & Sales
- GHG Cap & Trade Costs

For example, if the compressor station will need to run at 20% of its typical usage due to an unplanned capacity interruption, the annual costs for the above 3 cost segments will be reduced by 80%.

The other costs either remain unchanged or have been reduced based on recommendations made by Operations' engineering judgment:

- Emissions Fees
- O&M Labor
- O&M Non-Labor
- Capital Spending

The estimates for each cost segment used in this analysis are detailed in the following sections.

EMISSION FEES AND PERMITTING

It is assumed that the annual costs for emission fees and permitting will remain unchanged due to the need of maintaining permitting for the Compressor Station.

OPERATIONS AND MAINTENANCE

It is expected that labor costs will remain unchanged due to the need for the station to be maintained as required to meet permitting and compliance requirements independent of hours of operation per year. The station must be in a constant state of readiness and immediately operable.

Non-labor costs will be reduced by $300,000 (or 20% of annual cost average) due to expected reduction in RECLAIM credits, oil, water usage, and these types of consumables.

For the purpose of the avoided cost analysis, annual operations and maintenance costs are estimated as follows:

- Labor: $1,354,393
- Non-labor: $1,180,308

FUEL

It is expected that fuel use and costs will have a direct relationship to the percentage of reduction in operations.

For 95% reduction in operations, fuel will have an annual cost of $72K (or 5% of annual average cost)

For 80% reduction in operations, fuel will have an annual cost of $287K (or 20% of annual average cost)

NITROGEN OXIDE (NOX) EMISSIONS

It is assumed that there will be no requirement to purchase NOx credits emissions and in addition, the Utilities can sell the current holdings annually (the yearly beginning allocation of 56,333 lbs.). Therefore, there is a cost savings in emissions purchases as well as an opportunity in sales of future holdings.

NOX PURCHASES

Based on the annual average, the compressor station will have a total of 139,338 lbs. of NOx emissions per year. By 2021, the Utilities' beginning allocation will be 56,333 lbs. A remainder of about 83,000 lbs. would need to be purchased to meet annual usage. The annual average cost of emissions purchases for a fully operational compressor station is $1,162,000 (See section Nitrogen Oxide (NOx) Emissions under Annual Costs of Full Operations of the Compressor Station). With no need to purchase emissions holdings for reduced operations, there will be an annual cost savings of $1.16M.

NOX SALES

In addition, the remaining NOx emissions can be sold (assuming an average future price of $14/lb.).

For 95% reduction in operations, approximately 7,000 lbs of NOx emissions will be used. That leaves a remainder of about 49,000 lbs of NOx emissions that can be sold (based on a beginning allocation of 56,333 lbs). This results in approximately $691K per year of NOx emissions sales.

For 80% reduction in operations, approximately 28,000 lbs of NOx emissions will be used. That leaves a remainder of about 28,000 lbs of NOx emissions that can be sold (based on a beginning allocation of 56,333 lbs). This results in approximately $399K per year of NOx emissions sales.

GREENHOUSE GAS (GHG) EMISSIONS

There is a varied cost savings depending on the length of payback (see section Greenhouse Gas (GHG) Combustion Emissions under Annual Costs of Full Operations of the Compressor Station) for GHG Emissions. Equipment is assumed to have a direct relationship to the percentage of reduced operations and will reduce at the same rate.

CAPITAL SPEND

Based on historical capital spending, it is estimated that there will be an annual cost avoidance of $1.1M, based on a 55% reduction of 5 year annual average of $1.9M.

OVERALL ANALYSIS

The following shows the overall annual cost avoidance, based on low and high cases, for a proposed 36" line vs. hydrotesting the current 16" line.

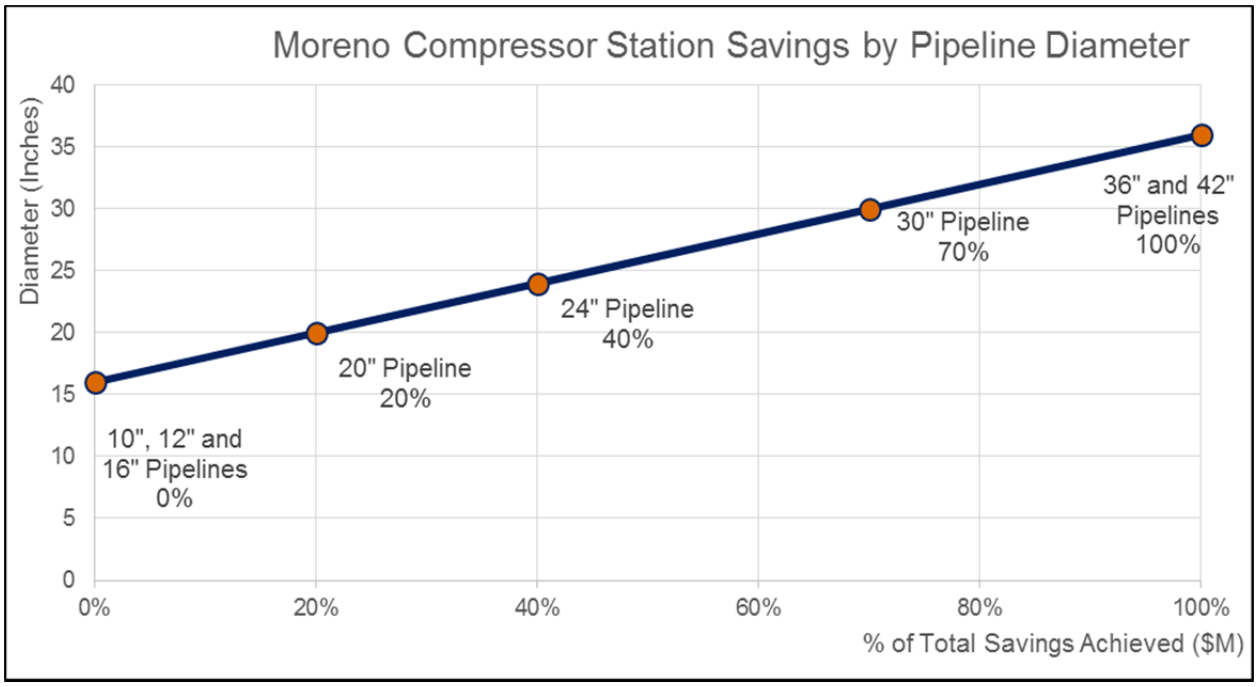
36" VS. 16" HYDROTEST

Table 9

	Annual Costs				
	2021 Current	2021 Projected (Reduced Ops)		Annual Savings	
	Current	95%	80%	95%	80%
Emissions fees	$80,968	$80,968	$80,968	$0	$0
O&M Labor	$1,354,393	$1,354,393	$1,354,393	$0	$0
O&M Non-Labor	$1,475,385	$1,180,308	$1,180,308	($295,077)	($295,077)
Fuel	$1,435,396	$71,770	$287,079	($1,363,626)	($1,148,317)
NOx Purchases	$1,162,000	$0	$0	($1,162,000)	($1,162,000)
NOx Sales	$0	($691,125)	($398,516)	($691,125)	($398,516)
GHG Cap & Trade Cost	$1,320,830	$66,042	$264,166	($1,254,789)	($1,056,664)
Capital Spending	N/A	$1,100,000	$1,100,000	($1,100,000)	($1,100,000)
Annual Sum	$6,828,971	$3,162,354	$3,868,398	($5,866,617)	($5,160,573)

FACTORED COST SAVINGS ESTIMATES FOR ALTERNATIVE PIPELINE SIZE 10” TO 42”

Figure 1



Assumptions:

1. Savings are based on the "best case" (95%) savings identified in this report.
2. Savings are based on the level of compression required from Moreno Valley Compressor Station.
3. Savings for pipelines between 16" and 36" are allocated on a straight-line basis, as shown in the above graph.
4. Additional savings are assumed not to accrue for pipeline diameters greater than 36”.
5. It is assumed that operations at Moreno Valley Compressor Station will be identical for pipelines with a diameter of 16” and less.

REFERENCES

1) *Reclaim Trading Credits (RTC) Trade Information (http://www.aqmd.gov/home/programs/business/about-reclaim/reclaim-trading-credits)*
2) *2015 Carbon Dioxide Price Forecast, March 3, 2015 (http://www.synapse-energy.com/sites/default/files/2015%20Carbon%20Dioxide%20Price%20Report.pdf)*
3) *All other costs are based on SoCalGas' historical actual costs*

Attachment B

Line 1600 Hydrotest Study and Cost Estimate

SAN DIEGO GAS & ELECTRIC
AND
SOUTHERN CALIFORNIA GAS COMPANY

LINE 1600 HYDROTEST STUDY AND COST ESTIMATE

March 21, 2016

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LIST OF ATTACHMENTS[1]

[1] Attachments III and VI are attached hereto, the remaining attachments are workpapers and are available upon request.

1.0 INTRODUCTION AND SCOPE

Line 1600 is a 50.2-mile, 16 inch high pressure natural gas transmission pipeline owned and operated by San Diego Gas & Electric Company. Line 1600 is a main gas delivery pipeline for San Diego County that currently supplies approximately 10% of that market's demand. The line starts at the Rainbow Metering Station south of Temecula, CA and travels southbound along Freeway I-15 to Mission Station in San Diego, CA. Line 1600 is one of two sources of natural gas serving the San Diego area, the other being the 30 inch Line 3010. SPEC Services, Inc. (SPEC) performed a preliminary engineering study. SDG&E and SCG developed cost estimates and alternative schedules to hydrotest Line 1600, from Rainbow Metering Station to Kearny Villa Pressure Limiting Station, for consideration as one of the project alternatives in the SDG&E and SCG Pipeline Safety and Reliability Project (PSRP).

Data Gathering and Data Assumptions:

This study evaluates the costs and schedule impacts to hydrotest Line 1600 under the following scenarios:

1.) Testing from April 1st through June 15th and October 1st through December 15th to avoid peak gas usage during winter and summer months.
2.) Testing from April 1st through October 15th to avoid peak gas usage during winter months.
3.) Testing continuously during all months to leverage synergies between adjacent tests and reduce costs and schedule time.

Testing during the shoulder months (Option 1) is preferred since it minimizes customer impact during the summer months and winter months for fairly similar costs.

Several sources of information were supplied by SDG&E and SCG including drawings, Geographic Information System (GIS) shapefile of the pipeline, preliminary feature study, and list of connections. Any components with unknown properties within the preliminary feature study assume verification digs would be performed prior to the hydrotest.

The stationing used in the exhibits measure horizontal distance of the pipeline route from Rainbow to Kearny Villa Pressure Limiting Station and does not employ the equations used in the data supplied by SCG. Therefore, the stationing for features or lengths of pipeline segments may not agree with SDG&E drawings and maps.

2.0 EXECUTIVE SUMMARY

This study evaluates the requirements to maintain line 1600 at Transmission level service[1] at a Maximum Allowable Operating Pressure (MAOP) of 640 psi. Strength-testing by hydrotest would need to be conducted to validate the MAOP of 640 psi. A minimum test pressure of 960 psi would be held continuously for at least 8 hours to verify the 640 psi MAOP. A spike test would also be included with each test raising the pressure approximately 5% for one-half hour. The maximum test pressure may be higher in some cases to accommodate elevation differences but is based on a premise to not exceed 90% Specified Minimum Yield Strength (SMYS) or 1,462 psi.

The study describes the technical aspects of how Line 1600 could be hydrotested. The study also addresses gas supply to local distribution customers during testing of individual pipeline segments of Line 1600, which consists of Compressed Natural Gas (CNG) trailers/pods and alternative gas sources backfeeding L1600 from Otay Mesa and Line 3010.

Private land ownership and land use complicates the siting of test breaks. Further, there are 50 significant connections on the line that currently provide service to customers via regulator stations. Ten connections would require a 160MSCF tube trailer to maintain service, and those trailers would have to be re-filled approximately every three days. Three connections could be served by a smaller 12 MSCF tube trailer. Two connections could be served by a 7MSCF pod. Eight taps are either currently inactive or can be back-fed from another distribution source.

A total of 27 taps would require pipeline bypasses with lengths ranging from 20 feet to 3,800 feet to maintain service to high flow customers. Fourteen of these bypasses are designated as temporary or permanent pipe that are typically installed underground and used to eliminate additional test breaks at major service taps. The other 13 bypasses are shorter (typically 100 feet in length) and situated aboveground within the main work area to feed service taps at a test break. The majority of the large diameter and high flow taps are located within the southern portion of the line.

Test segments were selected according to elevation restrictions, valve sites, large taps, and accessibility/workspace. The tests range from 2,000 feet to 7.5 miles in length with the average being approximately 2 miles. The pipeline would be cut at each large tap or valve using either stopples or the main line block valve and installing temporary bypass lines to serve the large customers.

Since there must always be a flow path from either the north or the south, only one test can be conducted at a time. It is assumed all test water would be filtered and properly disposed of at the end of each test.

Each test segment would take approximately four to six weeks to conduct and assumes a separate construction crew would install bypasses concurrently with the hydrotest effort. Total direct costs and schedules for each scenario evaluated are summarized in the Table 1.

---

[1] Per 49 CFR Part 192.3 – Transmission line is defined as pipeline operating greater than 20% SMYS

Option 1 is the preferred option to minimize customer impacts. Curtailment due to winter and summer maximum loads would be avoided as well as over reliance on a single pipeline (e.g. Line 3010) to feed the system.

Table 1

Direct Cost estimates for hydrotest scenarios

2015 dollars

Testing Scenario	Total Direct Cost ($M)	Project Schedule
Option 1: Testing 4/1 - 6/15 & 10/1 - 12/15	$ 112.9	Q4 2017 – Q2 2022
Option 2: Testing 4/1-10/15	$ 112.7	Q4 2017 –Q4 2021
Option 3: Testing All Months	$ 111.5	Q4 2017 – Q1 2021

Assumes PSRP application (A.15-09-013) decision in Q3 2017. See Appendix VI for hydrotest schedules with major tasks.

3.0 HYDROTEST OF LINE 1600

Hydrotesting Line 1600 has been identified as a project alternative in Chapter 5 of the Proponents Environmental Assessment (PEA) that is part of SDG&E and SCG's application (A.15-09-013). Line 1600 would be tested from Rainbow Metering Station to Kearny Villa Pressure Limiting Station.

The pipeline supplies 152,000 distribution customers, including core/non-core and electric generation supplied via 50 connections/regulator/meter stations. Provisions would need to occur during testing to maintain service and reliability to all current distribution customers for each test segment. However, there are generally no transmission lines within the vicinity of Line 1600, so alternate service would be provided by the following four methods:

A) Gas bottles;
B) CNG trucks;
C) Backfeeding from another distribution source;
D) Bypass connections at test breaks and back feeding from the north or south

The target MAOP of Line 1600 is 640 psi post-test. The pipe is generally 16 inch Outside Diameter (OD), 0.250-in wall thickness made to American Petroleum Institute (API) 5LX-52 specifications. The minimum test pressure of the 8-hour test to comply with 49 Code of Federal Regulations (CFR) Part 192.505 and 192.619 would be 960 psi (1.5 X MAOP). Before the 8-hour test, a short-duration spike test at a pressure that is approximately 5% greater than the target maximum low point pressure. The maximum allowable test pressure, as specified by SCG, is 90% of yield, or 1462 psi. The pressure calculations performed for this study (Attachment VIII) applies a range of 30 psi to the minimum 8-hour test pressure plus an additional 20 psi to the minimum spike test pressure. Applying this pressure range is a conservative approach to account for pressure fluctuations and helps ensure a successful test.

There are numerous regulator station taps (50) along the pipeline and the plan requires that service be maintained to each station and customer. The regulator stations vary in demand ranging from 14 Standard Cubic Feet per Hour (SCFH) to over 1.2MM SCFH with an average demand of 98M SCFH[2]. Most of the large demand is located in the southerly segments near San Diego.

A CNG trailer can carry up to 160,000 SCFH and can deliver approximately 80% of that volume at 60 psi. There is generally little workspace near the regulator stations and there are not many large compressed gas trailers, so it is assumed that a CNG trailer would have to last at least three days to allow time to re-fill another trailer, send to the site, and connect it.

With that limit, 15 regulator stations could be served by compressed gas bottles or compressed gas trailers. The remaining taps would have to be served by a separate bypass pipeline or piped to an adequately sized distribution line that would not be impacted by the test.

[2] Based on 24 HDD (heating-degree day)

Hydrotest Breaks:

Test breaks have been determined based on the following criteria:

- Elevation (pressure) limitation
- Main line valve location
- Large tap site
- Workspace accessibility
- Environmental impact

A typical test break would occur at a valve or regulator station. All customer taps would be identified and arrangements made for natural gas supplement. A bypass line would be built from a new connection at the block valve to serve the large taps. One segment would be blown down between valves, the pipe cut and test heads welded on. The line would be filled with water using a temporary pig launcher, tested, and then de-pressured. The test water would either be treated and disposed on-site or re-used for the proceeding test segment. Water disposed on-site would be pumped through a filtration bank into new Baker tanks and the water would be sampled, tested and released to a sanitary sewer if it meets water quality specifications. The pipeline would be re-connected using pre-tested pipe and the process repeated on the other side of the valve. In this case, gas would have to be back-fed from Line 3010 or Otay Mesa to maintain the large customers' service. Note that only one test can be performed at a time since a flow path must be maintained either from the south or the north.

Some test breaks occur at large taps rather than at valves, and in that case a stopple (Pressure Control Fitting) would be used. The stopple takes the place of the block valve in the above scenario. The hydrotest plan is intended to minimize the use of stopples wherever possible. Refer to Attachment VII for a typical test break detail using stopples.

Potential leaks resulting in sudden pressure loss are relatively easy to find. Once found, the repair can be made and the test repeated. This may add a few days to 2 weeks to the test depending on where the release occurred and whether other leaks were found. It is reasonable to assume that such a scenario would require a 13 man crew and an additional 10 working days to make repairs.

A more difficult scenario occurs if the pipe had a very small leak, losing a few psi per hour, also known as a pinhole leak. There are several techniques to locate a small leak in underground pipelines. One way is to empty the water out of the line, segment it, and test each half to: a) get a successful test on at least half of the segment, and, b) reduce the length of the segment that contains the leak. This process is repeated until the location of the leak becomes evident and can then be found via excavation and repaired. This method is often tedious and time consuming since each cut and re-test can take two to three long workdays each. Cumulative delays can amount to weeks if not months of work. It is reasonable to assume that such a scenario would require an 18 man crew and 2-3 weeks of work to segment the line four times before being able to locate and repair the leak. One pinhole leak repair was included in the estimate as previously described.

The worst case scenario occurs if a repair is required in an area where the pipeline is inaccessible, for instance, underneath a freeway. In this case, new replacement pipe would either be installed by conventional boring methods or re-routed around the freeway. The crew size and schedule impact for this type of scenario could range drastically depending on the circumstances.

Repair costs were estimated to range from $300,000 for simple repairs to $18 million for pipeline relocations. The project cost estimate does include an allowance for locating leaks and making repairs as outlined by the three scenarios discussed above.

Hydrotest Scope and Cost Basis:

By-pass Lines vs. Stopples for Large Customer Tap Gas Supply:

The decision on test breaks was driven largely by the need to maintain gas supply to large customers. Where practical, test breaks were located at existing mainline valves where customer supply could be achieved with temporary bypass lines. Where bypass lines were not feasible due to length or cost, perceived permitting issues, or construction difficulties, test breaks were located directly at large customer taps. Isolation and gas supply would be accomplished using stopples. Costly permanent bypass lines were proposed in some instances when there was an opportunity to improve the connectivity of the existing distribution network. This decision was made at the recommendation of SDG&E Distribution Region Engineering.

A summary table of all bypass lines and stopple requirements for each test segment has been included in Attachment I.

Temporary Gas Supply for Small Customer Taps:

Attachment II: Tap List & CNG Supply Summary Table summarizes the 50 taps identified by SDG&E Distribution Region Engineering that would require isolation and an alternate gas supply during the hydrotest. The type of alternate gas supply would vary depending on volume requirements. The project estimate includes costs for a generic hook-up at each site and a temporary alternative gas supply based on the type required.

Hydrotest Water Supply and Disposal:

Although the cost for water is not typically significant, identifying a water source and disposal location and assessing how it would get transported can increase the cost dramatically. Each work site was evaluated by desktop study or field reconnaissance to assess water supply and disposal options. In most cases it appears that water can be supplied by nearby fire hydrants. Water disposal after on-site treatment would be discharged directly into nearby sewer manhole, sprayed onto adjacent vacant land via sprinklers, or discharged to a storm drain. Refer to Attachment V: Test Break Work Area Exhibits for details on water sources and disposal locations at the beginning or end of each test segment.

It is assumed for each test segment a single Baker tank would be used at the inlet side to act as a breakout tank for pump suction to fill the pipeline section with water. At the end of the testing, water

would be discharged through an on-site filtration system and into a battery of Baker tanks where it can be sampled prior to discharge into an adjacent sewer or storm drain (see Attachment IX: Typical Hydrotest Water Treatment Diagram).

The estimates assume that hydrotest testing would be limited to one segment at a time and the water would be discharged on site after each tested section. Cost estimates for Baker tanks, pumps, and an on-site water filtration system have been included.

It is recognized that the use of reclaimed water has been required in past SDG&E projects. Significant jurisdictional details need to be assessed and resolved in order to use reclaimed water to test the entirety of Line 1600. Detailed examination of reclaimed water use will be performed in future studies.

Contingency:

The estimate has been prepared with a contingency of 25% applied to the base estimate. The level of contingency was determined using expert engineering judgement, and to account for addressing various unforeseen events, that may occur with the hydrotest of a vintage pipeline in high consequence areas (HCAs) with limited rights of way.

The recommended 25% contingency reflects that additional information can only be obtained through further planning, engineering and design, performing site visits, project outreach, and engaging with permitting agencies. The likelihood of unforeseen events increase with the length of time until the work will commence. Unanticipated issues associated with land acquisition, permitting, and environmental constraints may affect major cost components such as the number of test segments.

There are other factors that may affect costs. For purposes of this analysis those factors are outside of the defined project scope and excluded from the cost estimate and contingency costs. Examples of these unknown factors that may impact costs include:

- Labor, materials, or other commodities increasing significantly over the project duration, beyond the escalation included in the revenue requirement.
- Significant changes to the project scope as a result of environmental and/or regulatory review process.
- Significant delays in the project schedule as a result of the environmental and/or regulatory review process, local community intervention, natural disaster, or labor strike.
- Changes to laws or regulations that would significantly affect project cost and/or schedule.
- Earthquakes, fires, natural disasters, strikes or other force majeure type events.

Environmental Impacts & Costs:

Environmental costs for mitigation, permitting, and construction support during the construction seasons has been included. Off-season, the time in between hydrotest seasons based on the option, environmental costs for Storm Water Pollution Prevention Plan (SWPPP) maintenance for disturbed

work areas has been included in the estimate. The example pinhole leak described above in the Hydrotest Breaks section was included in the estimate and assumed to occur in an area that is not environmentally sensitive with minimal environmental impact.

Hydrotest Cost Estimate:

A standard template has been developed for hydrotest cost estimating through SPEC's involvement with PSEP. The estimates include assumptions and costs relative to mobilization, crew sizes, materials, inspection, support personnel, etc. Additional cost input specific to this project were obtained from construction contractors, ROW consultants, environmental consultants, and SPEC Services engineering and design staff to ensure the cost estimate is reflective of the specific conditions associated with the preliminary design of Line 1600 project. Refer to Attachment III for additional information on inclusion/exclusions in the estimate.

Hydrotest Schedules:

A Gantt project schedule is included in Attachment VI to show the individual steps involved in a typical hydrotest and the time required for each option. The schedule assumes that each hydrotest segment would require approximately 4-6 weeks to complete. If testing only from April 1st to October 15th the construction duration would be approximately 28 months. If testing the pipeline occurs only during shoulder months from April 1st through June 15th and October 1st through December 15th, the construction duration would be approximately 33 months. If testing each segment consecutively during all months, the construction duration would be approximately 18 months. The schedules assume major bypasses would be installed by a separate crew, concurrent with the hydrotest effort of segments that require only short, aboveground bypasses within the hydrotest work area.

Attachment I

Test Break Summary Table

Workpaper – Available Upon Request

Attachment II

Tap List & CNG Supply Summary Table

Workpaper – Available Upon Request

Attachment III

Project Cost Estimate

HYDROTEST & REPLACEMENT COST ESTIMATE SUMMARY

INPUTS (ORANGE CELLS)

LINE NUMBER:	**L1600**	**HYDROTEST LENGTH (FT):**	**236720**
LOCATION (CITY):		**REPLACEMENT LENGTH (FT):**	**24008**
SCG PROJECT #:		**EX. PIPE DIAMETER (IN):**	**16**
SCG REGION:		**PREPARED DATE:**	**3/2/2016**
PSEP PHASE:		**PREPARED BY:**	

PROJECT SCOPE & COMMENTS

SCOPE: Project estimate to hydrotest L1600 from Rainbow to Kearny Villa PLS (19 segments).

Option 1: Testing 4/1 - 5/15 & 10/1 - 12/15

COMMENTS:

	Subtotal	Contingency	Total
Materials	$ 2,299,142	25%	$ 2,873,928
Construction	$ 43,685,747	25%	$ 54,607,184
Engineering & Design	$ 3,558,050	25%	$ 4,447,562
Environmental	$ 5,175,003	25%	$ 6,468,753
SCG Labor	$ 2,359,517	25%	$ 2,949,396
Bypasses	$ 8,932,379	25%	$ 11,165,474
Gas Transportation to Otay Mesa	$ 16,200,000	25%	$ 20,250,000
Other Project Execution Activities	$ 8,098,257	25%	$ 10,122,821
TOTAL	$ 90,308,095	25%	$ 112,885,118

Notes/Overall Assumptions: $ 22,577,024

The estimates include direct project costs such as Sempra Energy Utilities (SEU) labor, construction, purchased services, paving, purchased materials, and permit fees.

Loaders, OHAP, and AFUDC costs are not incorporated into these comparative estimates.

TVR COST ESTIMATE TOOL REVISION 4.0

Note: Additional cost details are included in workpapers and available upon request.

HYDROTEST & REPLACEMENT COST ESTIMATE SUMMARY

INPUTS (ORANGE CELLS)

LINE NUMBER:	**L1600**	**HYDROTEST LENGTH (FT):**	**236720**
LOCATION (CITY):		**REPLACEMENT LENGTH (FT):**	**24008**
SCG PROJECT #:		**EX. PIPE DIAMETER (IN):**	**16**
SCG REGION:		**PREPARED DATE:**	**3/2/2016**
PSEP PHASE:		**PREPARED BY:**	

PROJECT SCOPE & COMMENTS

SCOPE: Project estimate to hydrotest L1600 from Rainbow to Kearny Villa PLS (19 segments).

Option 2: Testing 4/1 - 10/15

COMMENTS:

	Subtotal	Contingency	Total
Materials	$ 2,299,142	25%	$ 2,873,928
Construction	$ 43,685,747	25%	$ 54,607,184
Engineering & Design	$ 3,558,050	25%	$ 4,447,562
Environmental	$ 5,122,004	25%	$ 6,402,504
SCG Labor	$ 2,359,517	25%	$ 2,949,396
Bypasses	$ 8,932,379	25%	$ 11,165,474
Gas Transportation to Otay Mesa	$ 16,200,000	25%	$ 20,250,000
Other Project Execution Activities	$ 8,038,257	25%	$ 10,047,821
TOTAL	$ 90,195,096	25%	$ 112,743,870

Notes/Overall Assumptions: $ 22,548,774

Stage 2, Test Vs Replace estimates are intended to be a comparative cost estimate for a given pipeline. The estimates include direct project costs such as Sempra Energy Utilities (SEU) labor, construction, purchased services, paving, purchased materials, and permit fees.

Loaders, OHAP, and AFUDC costs are not incorporated into these comparative estimates.

TVR COST ESTIMATE TOOL REVISION 4.0

Note: Additional cost details are included in workpapers and available upon request.

HYDROTEST & REPLACEMENT COST ESTIMATE SUMMARY

INPUTS (ORANGE CELLS)

LINE NUMBE	**L1600**	**HYDROTEST LENGTH (FT):**	**236720**
LOCATION (CITY):		**REPLACEMENT LENGTH (FT):**	**24008**
SCG PROJECT #:		**EX. PIPE DIAMETER (IN):**	**16**
SCG REGION:		**PREPARED DATE:**	**3/2/2016**
PSEP PHASE:		**PREPARED BY:**	

PROJECT SCOPE & COMMENTS

SCOPE: Project estimate to hydrotest L1600 from Rainbow to Kearny Villa PLS (19 segments).

Option 3: Testing all months

COMMENTS:

	Subtotal	Contingency	Total
Materials	$ 2,299,142	25%	$ 2,873,928
Construction	$ 43,685,747	25%	$ 54,607,184
Engineering	$ 3,558,050	25%	$ 4,447,562
Environment	$ 5,054,975	25%	$ 6,318,718
SCG Labor	$ 2,359,516	25%	$ 2,949,395
Bypasses	$ 8,932,379	25%	$ 11,165,474
Gas Transpo	$ 16,200,000	25%	$ 20,250,000
Other Projec	$ 7,118,744	25%	$ 8,898,431
TOTAL	$ 89,208,554	25%	$ 111,510,692

Notes/Overall Assumptions: $ 22,302,138

Stage 2, Test Vs Replace estimates are intended to be a comparative cost estimate for a given pipeline. The estimates include direct project costs such as Sempra Energy Utilities (SEU) labor, construction, purchased services, paving, purchased materials, and permit fees.

Loaders, OHAP, and AFUDC costs are not incorporated into these comparative estimates.

TVR COST ESTIMATE TOOL REVISION 4.0

Note: Additional cost details are included in workpapers and available upon request.

Attachment IV

Test Break Schematic

Workpaper – Available Upon Request

Attachment V

Test Break Work Area Exhibits

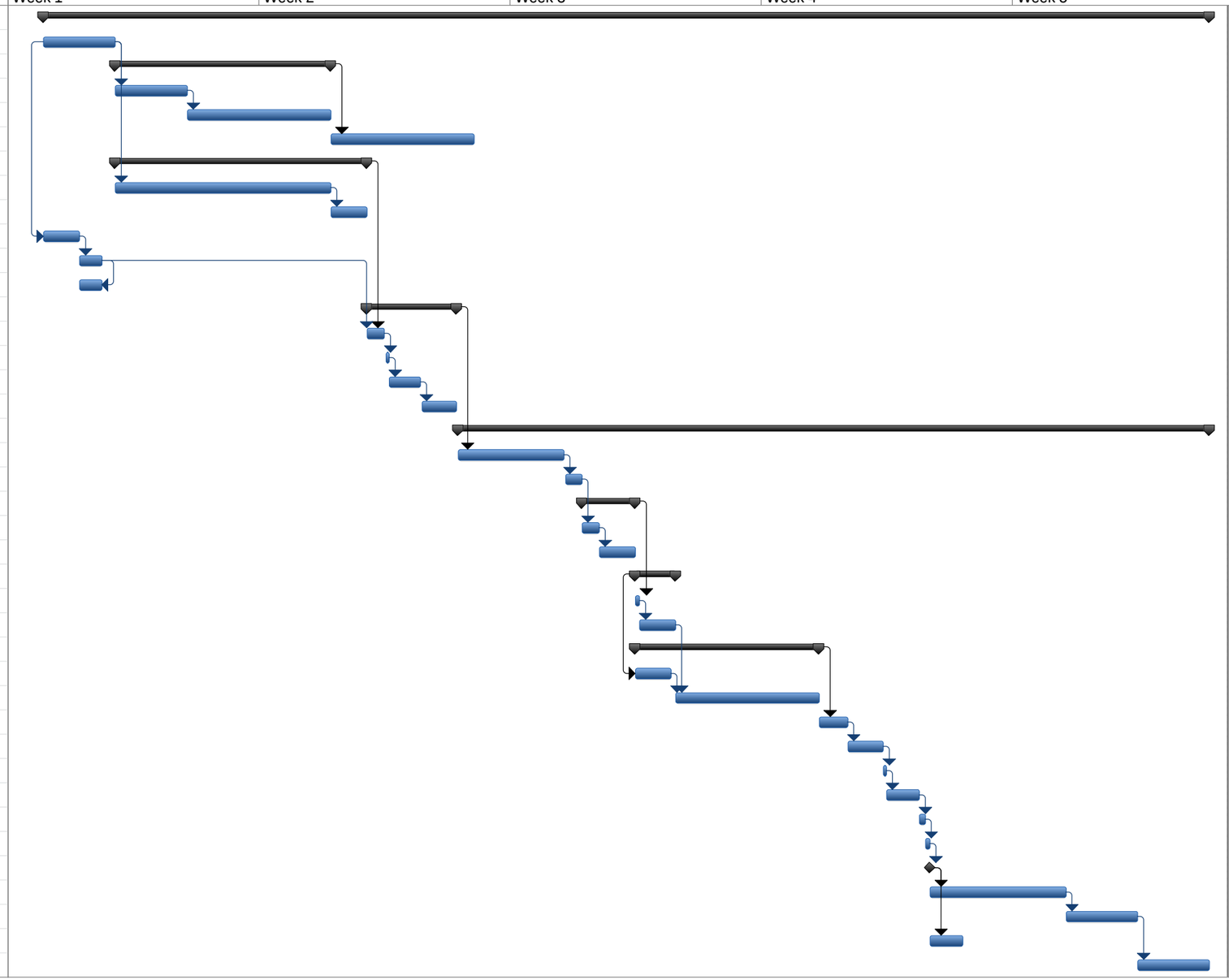
Workpaper – Available Upon Request

Attachment VI

Hydrotest Schedule

Typical Hydrotest Schedule For One Test Segment

ID	Task	Task Name	Duration
1		Hydrotest Construction	24.44 days
2		Mobilization	2 days
3		Excavation	4 days
4		Launcher	2 days
5		Receiver	2 days
6		Install 4 " bypass line (60')	4 days
7		Pre-fabrication	5 days
8		Prefab launcher/receiver	4 days
9		Weld caps onto pipe joint	1 day
10		Hot-tap 4 " bypass connections	1 day
11		Hot-tap customer line	6 hrs
12		Connect alternate gas source	6 hrs
13		Shutdown/blowdown pipeline	2.5 days
14		Close main line valves	4 hrs
15		Open bypass lines to feed customer	2 hrs
16		Cold-cut pipelines (4 places)	6 hrs
17		Install launcher/receiver	1 day
18		Fill line with hydrotest water	14.94 days
19		Set up baker tanks at test site and fill with water	1 day
20		Set up water pump	4 hrs
21		Insert pig, begin filling with water	1.44 days
22		100,000 gal at 500 gpm	3.5 hrs
23		Allow test medium to stabilize	1 day
24		Perform pressure test	1.25 days
25		Initial pressure-up	2 hrs
26		Hold test	8 hrs
27		De-pressure, de-water	3.25 days
28		Set-up Baker tanks & charcoal filters	1 day
29		De-water/Dry pipeline	2 days
30		Remove test head, pig launcher	4 hrs
31		Cut & install tested pipe	8 hrs
32		X-ray welds	2 hrs
33		Wrap pipe at weld joints	6 hrs
34		Close bypasses	3 hrs
35		Open main line valves	3 hrs
36		Return to service	0 days
37		Backfill/compact	12 hrs
38		Asphalt repairs	2 days
39		Disconnect alternate gas source	6 hrs
40		Demobilization	2 days



Date: Mon 3/21/16

Task	Project Summary	Inactive Milestone	Manual Summary Rollup	Deadline	
Split	External Tasks	Inactive Summary	Manual Summary	Progress	
Milestone	External Milestone	Manual Task	Start-only		
Summary	Inactive Task	Duration-only	Finish-only		

Hydrotest Schedule

Line 1600 Pipeline Hydrotest Schedule

OPTION 1: Testing 4/1-6/15 10/1-12/15

Project Tasks	2015				2016				2017				2018				2019				2020				2021				2022			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Feasibility Study/Preliminary Engineering																																
Regulatory Proceeding (CPUC)																																
Engineering and Design																																
Permitting																																
Material Procurement																																
Construction (Hydrotesting 19 Segments)																																
Closeout																																

Hydrotest Schedule

Line 1600 Pipeline Hydrotest Schedule

OPTION 2: Testing 4/1-10/15

Project Tasks	2015				2016				2017				2018				2019				2020				2021			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Feasibility Study/Preliminary Engineering																												
Regulatory Proceeding (CPUC)																												
Engineering and Design																												
Permitting																												
Material Procurement																												
Construction (Hydrotesting 19 Segments)																												
Closeout																												

Line 1600 Pipeline Hydrotest Schedule

OPTION 3: Testing All Months

Hydrotest Schedule

Project Tasks	2015				2016				2017				2018				2019				2020				2021			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Feasibility Study/Preliminary Engineering																												
Regulatory Proceeding (CPUC)																												
Engineering and Design																												
Permitting																												
Material Procurement																												
Construction (Hydrotesting 19 Segments)																												
Closeout																												

Attachment VII

Typical Test Break Detail

Workpaper – Available Upon Request

Attachment VIII

Pressure Calculations Summary Table

Workpaper – Available Upon Request

Attachment IX

Typical Hydrotest Water Treatment Diagram

Workpaper – Available Upon Request