



Pacific Gas and
Electric Company

EDGEWOOD PRESERVE ROUTING ANALYSIS:

L-109 MP 23.30 to MP 24.00

PIPE REPLACEMENT PLAN

November 13, 2013



TRANSCON
environmental

Privileged and Confidential, Draft, Attorney Work Product

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EXECUTIVE SUMMARY

Undertaken in conjunction with the Pacific Gas and Electric Company (PG&E) Pipeline Safety Enhancement Plan: Gas Line 109, this analysis of a portion of Gas Line 109 evaluated issues relevant to the replacement of a pipeline segment referred to as the Edgewood Preserve segment, located partially in incorporated areas of the town of Woodside and Redwood City, California, and largely in the Edgewood Park and Natural Preserve, San Mateo County, California. This analysis recommends a replacement segment that is approximately 0.86 miles long, deviates slightly from a parallel position to the existing pipeline, and connects at mile point (MP) 23.30 and MP 24.00 of the original pipeline.

Selection of the recommended route for the pipeline replacement was based on evaluation and comparison of four possible routes. This report describes how suitable segments were identified, how relevant sensitivities were analyzed for each segment, how segments were combined to form routes, and how one recommended route was identified among the four routes considered.

GLOSSARY OF TERMS

Analysis Area The area within which pipeline replacement would occur and within which all analysis is performed.

Backbone Transmission (Natural Gas) System used to transport gas from interstate pipelines, other local distribution companies, or California gas fields to a local transmission and distribution system.

California Public Utilities Commission (CPUC) State governmental body that regulates utilities within California.

Centerline Center of an existing or proposed linear facility that defines the location of the gas line for planning, engineering, legal, and maintenance purposes.

Commercial Development Two or more commercial, educational, or governmental enterprises located on a single parcel of land or contiguous parcels.

Constraint A sensitive physical, biological, or cultural attribute of an area. Constraints do not necessarily translate into areas or routes that should be dropped from consideration but indicate that additional planning, analysis, permitting, or mitigation may be required.

Cubic Foot (cf) The most common unit of measurement of natural gas volume.

Distribution Main Underground pipelines (operating at pressures lower than 100 pounds per square inch [psi]) that carry natural gas from utility high pressure pipelines (usually operating at pressures higher than 100 psi) to homes and businesses.

Distribution Main Extension The length of main and related facilities required to transport gas from existing distribution facilities to the point of connection with the service pipe.

Distribution Trench Footage Total trench footage used to calculate costs of cabling and pipe. Equal to the total length of all trench needed to install underground electric distribution lines and gas distribution mains.

Easement Area of entitlement for construction, operation, and maintenance of a gas line. Easements may be land owned in fee, a right-of-way (ROW), or other agreement. The utility company compensates the land owner for easements acquired.

Excavation Trenching, backfilling, and other digging required to install gas and electric underground facilities.

Franchise A location—usually along a city or county road or other linear facility—where the underlying land ownership is city or county property. The utility company compensates the fee owner for use of the position within the roadway.

Gas Combustible gas or vapor, or a combustible mixture of gaseous constituents, burned to produce heat (see Natural Gas).

Gas Distribution System Includes mains, service connections, and equipment that carries or controls the supply of natural gas from point of local supply to the meter.

Gas Houseline Small pipes ($\frac{3}{4}$ to 1 inch in diameter) that carry natural gas from the meter onto the customer's property to home appliances.

Industrial Development Two or more enterprises that create products or change materials into different forms located on a single parcel of land or on contiguous parcels.

Joint Trench Excavation that provides for more than one service (gas, electricity, cable television, telephone, etc.).

Main Line Extension (MLX) Extension of electric or gas service from the main energy supply line to the customer's facility.

Mile Post (MP) Location on a gas transmission pipeline, expressed as miles from the starting point of the pipeline to the designated location.

Multifamily Accommodation Apartment building, duplex, court group, residential hotel, or other group of residential units located on a single premise (assuming that the residential units meet requirements for a residential dwelling unit). Temporary or transient accommodations (such as motels and dormitories) are excluded from the definition.

Natural Gas Flammable gas found naturally underground that is used as fuel and is composed of methane, ethane, butane, propane, nitrogen, carbon dioxide, hexane, heptanes, and pentane.

Natural Gas Distribution Delivery of natural gas to customers. Natural gas distribution lines normally operate at pressures of 100 pounds per square inch, or less.

Node Geographical point of reference that defines the end of a linear feature or a point of convergence between linear features (for example, segments of a route).

Pipeline Safety Enhancement Plan (PSEP) Program instituted by PG&E to safeguard the public by ensuring that PG&E transmission pipelines utilize defined and qualified materials and operate within appropriate parameters. The PSEP team warrants PG&E pipelines with several procedures including record review and verification, pipeline replacement, pipeline testing, pipeline inspection, and pipeline shutdown measures.

Potential Impact Radius (PIR) Radius of the circle that defines the perimeter of an area within which potential pipeline failure could have significant impacts on people and/or property. Determined by the formula, $r = 0.69 \sqrt{p \cdot d^2}$, where r is the radius (in feet) of a circular area surrounding the point of failure, p is the maximum allowable operating pressure (in pounds per square inch) in the pipeline segment, and d is the diameter of the pipeline (in inches).

Premises Real property, buildings, structures, and apparatus engaged in a single enterprise on a single parcel of land. Exceptions include commercial or industrial facilities divided by a public thoroughway, or a commercial or industrial facility separated by an alley from its parking lot.

Residential Development Five or more residential dwelling units in two or more buildings located on a single parcel of land.

Residential Dwelling Unit A group of rooms—such as a house, a flat, or an apartment—where people live, cook meals, eat, sleep, and carry on a domestic life.

Residential Subdivision Group of residential dwellings, typically of similar design, usually built and sold by a single builder or by coordinated building companies.

Rights-of-Way (ROW) Easements that may be required to install utility facilities on private or public property.

Route A combination of suitable segments that forms a continuous route between designated starting and ending points.

Routing Analysis Process by which the PG&E PSEP Pipeline Replacement Team analyzes options for installation of utility/pipeline routes. The process reviews and evaluates factors such as land use, environmental concerns, current and future operating impacts, engineering and constructability, and cost. Routing analysis helps provide a recommended route for the replacement work.

Segment A portion of a route, a discrete linear feature being considered for a route, or an area under consideration for a route. Segments are typically referred to as “alignments.”

Sensitivity Measurement of the ability of a particular environmental resource to absorb impacts of the proposed facility. Sensitivity considers the resource's fragility (potential for damage or destruction), scarcity (rarity), and importance (significance).

Service Extensions Overhead and underground facilities, either primary or secondary, extending from the point of connection with a distribution line to the service delivery point.

Service Line Pipeline, valves, and fittings that carry natural gas from a distribution main to the customer's gas meter.

Special Status Species Plants and animals listed, proposed, or candidates for listing as threatened or endangered by the U.S. Fish and Wildlife Service under the Endangered Species Act; plants and animals listed or proposed for listing as threatened or endangered by the California Department of Fish and Game under the California Endangered Species Act; or plants listed by the California Native Plant Society Inventory of Rare and Endangered Plants. Also includes species managed or protected by federal agencies on federal public lands (such as the Bureau of Land Management, U.S. Forest Service, etc.).

Tract or Subdivision Area containing a number of residential dwellings, typically built at the same time and by the same builder or coordinated groups of builders working together.

Transmission Pipes Network of large steel pipes carrying natural gas from processing plants to utilities, normally operating above 100 psi.

Urban Cluster A statistical entity designated by the U.S. Census Bureau that consists of a central core and adjacent densely settled territory that together contain 2,500–49,000 people. Typically, overall population density of an urban cluster is greater than 1,000 people per square mile. Urban clusters are based on the density of census blocks and block group density, and do not align with municipal boundaries.

Utility Supplier that provides a basic service to a community, such as delivering electricity, natural gas, and/or water.

1.0 INTRODUCTION

In response to the Pacific Gas and Electric Company (PG&E) Pipeline Safety Enhancement Plan (PSEP), a section of Gas Line 109 (L-109) in San Mateo County, California, has been identified for replacement (Figure 1). L-109 is one of three gas transmission lines serving San Francisco. Located partially in incorporated areas of Woodside and Redwood City, California, and largely in the Edgewood Park and Natural Preserve, the section of gas pipeline has been designated the Edgewood Preserve segment. The proposed replacement segment is approximately 0.86 mile long (mile point [MP] 23.30 and MP 24.00 are the existing line tie-in points), and is planned for replacement by 2014 as part of Phase 1 of the 2012–2014 Pipeline Safety Enhancement Plan.

Following extensive investigation and analysis by PG&E gas transmission staff and subject matter experts, it was determined that replacement of the line in a portion of its current position or alignment may be disproportionately rigorous, and may create unacceptable system operating conditions. For these reasons, PG&E looked to realigning all or a portion of the existing route. Engineers began by identifying possible replacement locations; subsequently, those initial investigations were folded into a systematic, three-phased approach to siting and route analysis. Both the three-phased analysis and the findings are documented in this report, which has been prepared in collaboration with PG&E's engineering, construction, and environmental teams.

The purposes of this analysis are to:

- Examine the existing alignment to identify areas where construction, maintenance, and/or operations will impede the commitments made as part of the 2012–2014 PG&E PSEP Phase 1.
- Identify and compare routes that address constrained areas of the existing alignment.
- Identify routes that allow for safe and reliable long-term maintenance and operation.
- Consider construction timing and cost as part of the comparison of the routes.
- Minimize impacts to sensitive land uses, biological resources, historic resources, and other environmental resources.

- Provide a recommended route.

1.1 PURPOSE AND NEED

The PG&E PSEP has identified this segment of L-109 for replacement by the end of 2014. The California Public Utilities Commission (CPUC) has jurisdiction over the design, operation and maintenance of gas pipelines. The existing pipeline is considered to be safe; however, the existing 22-inch diameter pipe impedes the use of modern in-line inspection (ILI) technology. The existing 22-inch pipe in this segment will be replaced by 24-inch pipe to enable future integrity testing by automated, in-line internal inspection of the pipeline.

Constraints on the project include the requirement for completion by the end of 2014, anticipated construction complexities, and local challenges. Preliminary analyses by PG&E gas transmission staff and subject matter experts determined that replacement of L-109 within the current alignment may be disproportionately rigorous because construction, operations, and maintenance are atypically constrained in the areas on the northern end of the Edgewood Preserve segment where L-109 parallels L-132. PG&E's easements pre-date creation of the Edgewood Park and Natural Preserve and specifically authorize the reconstruction of the pipeline. The Edgewood Park and Natural Preserve Master Plan delineates PG&E's utility easements for construction, operation, and maintenance of its facilities; the San Mateo General Plan allows underground utilities in public recreation zones. However, advocates of the Edgewood Park and Natural Preserve may resist construction activities within the Park.

Because of construction constraints posed by replacing L-109 within the current location, PG&E team members established criteria to guide consideration of locations that could present less difficult construction conditions and provide better long-term maintenance, operation, and environmental solutions. These considerations include the ability to:

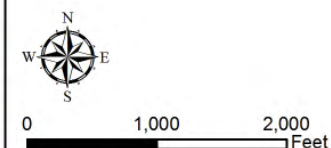
- Maximize use of the existing alignment and associated land rights.
- Identify areas where conventional construction methods can be utilized, when possible.
- Acquire 25 to 50-foot-wide rights-of-way where possible.



Figure 1



- L-109 Replacement
- - - Existing L-109
- Jurisdictional Boundary



Replacement Segment Edgewood Preserve

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1.2 ROUTING OBJECTIVES

The following primary objectives guided this analysis of replacement/realignment opportunities for the Edgewood Preserve segment:

- Construct a safe and reliable gas transmission system protected from dig-ins and third-party interference.
- Simplify the permitting process.
- Identify routes in areas compatible with existing land uses.
- Minimize impacts to existing land uses.
- Minimize impacts to sensitive resources and environmental effects.
- Minimize length and cost of the gas transmission line.
- Minimize construction challenges and keep system flowing.
- Minimize system flexibility impacts.
- Maximize use of the existing land rights when feasible.
- Maximize the confidence of successful replacement/realignment by the end of 2014.

1.3 ANALYSIS AREA

Located on the San Francisco Peninsula in San Mateo County, California, the analysis area encompasses an incorporated suburban residential area in the towns of Woodside and Redwood City, California, and an unincorporated open area in the Edgewood Park and Natural Preserve (Figure 2).

The analysis area extends only a short distance to the north and east of the existing alignment. The hilly, non-mountainous terrain contains developed residential areas and the preliminary analysis determined that these geographies present few opportunities for suitable pipeline routes. The analysis area extends further to the south and west into open areas encompassing both sides of Interstate 280 (I-280).

Outside of suburban development, the analysis area includes wetland, riparian, grassland, oak woodland, and chaparral plant communities. Water features in the analysis area include two small drainages, a wet swale, and a seasonal seep. Much of the grassland community is on serpentine substrate, a rock that supports a unique group of plant species. Eleven special status plant species have been identified in the serpentine grasslands and oak woodlands in the analysis area. The analysis area contains habitat suitable to support two special status animal species: bay checkerspot butterfly (*Euphydryas editha bayensis*) and California red-legged frog (*Rana draytonii*).

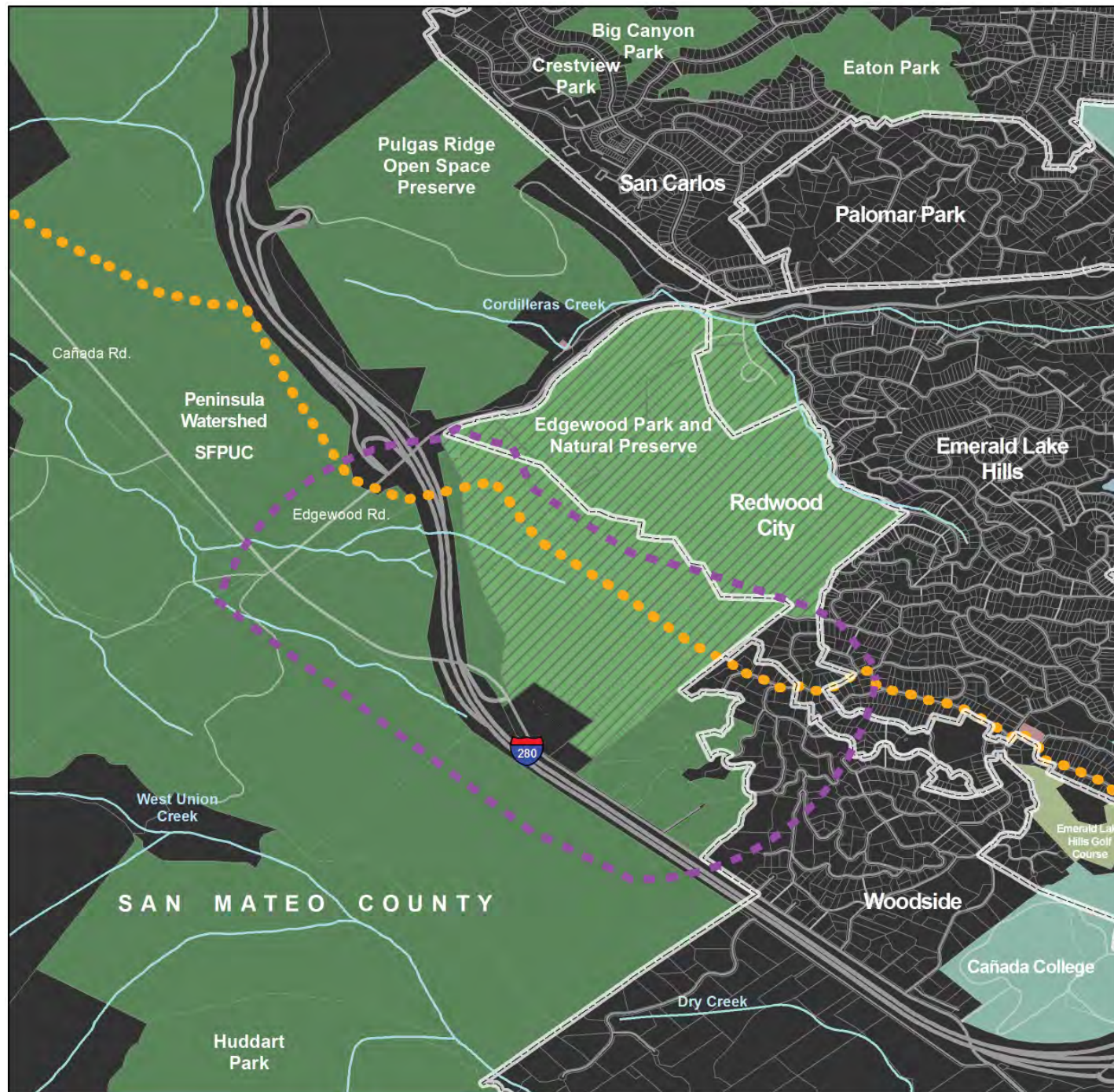


Figure 2



- Gas Line 109
- Analysis Area
- Jurisdictional Boundary
- Park/Open Space
- Edgewood Preserve
- Golf Course
- Educational Facility
- Fire House
- Stream or Creek
- Lake



Analysis Area

Edgewood Preserve

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2.0 ANALYTICAL APPROACH

This routing analysis of the Edgewood Preserve segment of L-109 utilized a three-phased analytical approach (Figure 3).

2.1 PHASE 1: SUITABILITY ANALYSIS

During the first phase of analysis, the analysis area is defined, suitable segments are identified within the analysis area, and data is collected about each segment. The process of identifying suitable segments includes routing objectives outlined by PG&E engineering, construction, and operations staff. In essence, a “suitable” segment is defined as one which contains reasonably compatible land uses; presents uncomplicated construction, maintenance, and operation; and promises to avoid, to the greatest degree possible, constraints encountered on the existing alignment.

Phase 1: Suitability Analysis is limited to the selection of suitable segments; it does not evaluate the resource sensitivities of those segments or identify complete routes. Evaluation of resource sensitivities occurs in Phase 2, and identification of routes occurs in Phase 3.

In the *Phase 1: Suitability Analysis* of the Edgewood Preserve segment of L-109, twenty-nine suitable segments were identified in the Analysis Area (Figure 4). The first twenty-six segments were labeled alphabetically from A to Z; three additional segments were labeled A1, C-O and D-O in which the O indicates “offset” from the existing L-109.

2.2 PHASE 2: SENSITIVITY ANALYSIS

In the second phase of analysis, each suitable segment is evaluated for its sensitivity to project-specific factors and resources. “Factors” include engineering, safety, system redundancy, and maintenance concerns. “Resources” encompass biological, cultural, and visual resources. Incorporating on-site examination with the best available data, sensitivity evaluations are qualitative and are described as “high,” “medium,” or “low.”

Resource sensitivity is a measurement of the ability of a particular environmental resource to absorb anticipated project impacts. It is worth mentioning that segments that will affect protected resources (e.g., endangered species) or displace community economic engines (e.g., a town’s business core) warrant high sensitivity ratings because of their fragility, scarcity, and importance.



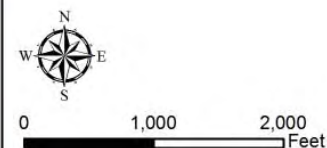
Figure 3 Analytical Approach



Figure 4



- Segments
- Segment Nodes
- Tie-in Existing L-109
- - - Existing L-109
- Jurisdictional Boundary



Segments

Edgewood Preserve

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After analyzing each segment for its sensitivity to a multitude of factors and resources, the conclusions are combined using an overlay approach (Figure 5). The result is a single composite map that displays qualitative information in a form that can be methodically analyzed. In creating the composite map, higher sensitivities take precedence over lower sensitivities. On each segment, the composite map reveals the highest sensitivity rating for each segment and highlights the segments more likely to have lower composite sensitivity.

In the *Phase 2: Sensitivity Analysis* of the Edgewood Preserve segment of L-109, each of the 29 suitable segments was examined for its sensitivity to 9 factors and resources (including 21 sub-criteria); a composite map was created using the overlay approach. The 9 factors and resources were:

- Engineering
- Constructability
- Long-term Operations and Maintenance and Safety
- Land Use
- Land Rights
- Biological Resources–Plants
- Biological Resources–Animals
- Restoration
- Cultural and Visual Resources

Results of the sensitivity analysis are tabulated in Table 1 and displayed on individual maps (Figures 6 through 14). The composite map summarizing the sensitivity analysis is included as Figure 15.

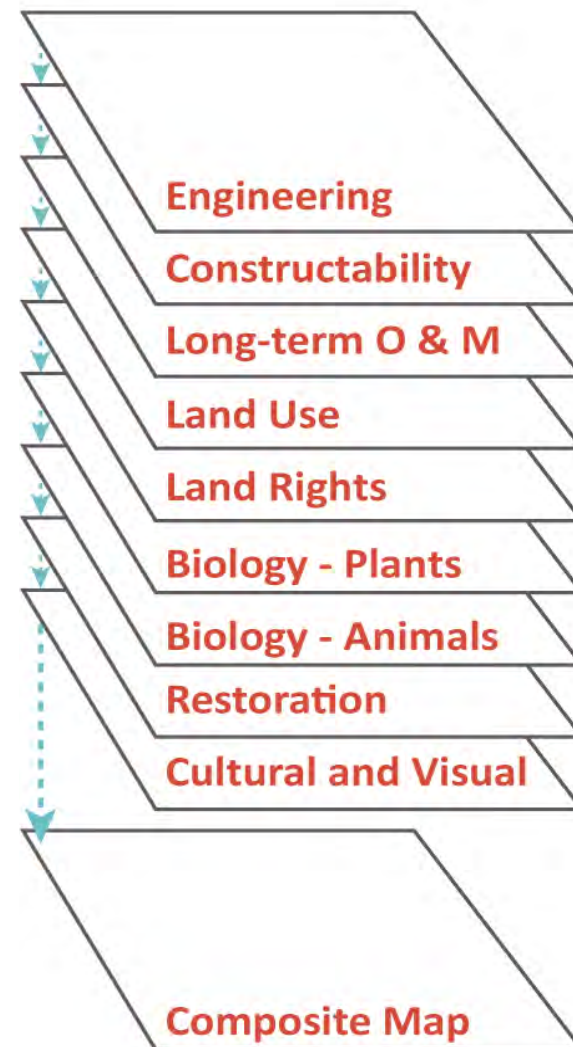


Figure 5 Sensitivity Overlay Approach

TABLE 1 – SENSITIVITY SUMMARY

MEASURED SENSITIVITY	SEGMENTS																												
	A	B	C	C-O	D	D-O	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	A1
ENGINEERING																													
Design Complexity	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>
In-Ground Utilities	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>
CONSTRUCTABILITY																													
Construction complexity, disproportional delays, or time to complete construction	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>
In-Ground Utilities	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>
LONG-TERM OPERATIONS, MAINTENANCE, AND SAFETY																													
Complexity with access, monitoring, and maintenance; complexity in system operation and function	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>
LAND USE																													
Traffic Disruption	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>
Residential	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>
Church / School / Day Care	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>
Commercial	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>
Parks and Open Spaces	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>
Public / Quasi-public Spaces	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>
Land Use Displacement	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>
																High=	<div></div>	Moderate=	<div></div>	Low=	<div></div>	Not Applicable=	<div></div>						

High= Moderate= Low= Not Applicable=

TABLE 1 – SENSITIVITY SUMMARY (CONTINUED)

MEASURED SENSITIVITY	SEGMENTS																													
	A	B	C	C-O	D	D-O	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	A1	
LAND RIGHTS																														
Level of expected effort involved with securing necessary land rights.	High	Moderate	Low	Moderate	Low	Moderate	High	High	High	Low	High	Moderate	High	Low	High	High	High	Moderate	Low	Moderate	Moderate	High	High	High	High	Moderate	High	Low	Low	
BIOLOGICAL RESOURCES - PLANTS																														
Species considered are endangered and/or threatened on a federal and/or state level. CNPS rare plants in categories 1B.1, 1B.2, and 2 are also noted.	High	Low	Low	Low	High	High	High	Moderate	Low	Low	Low	Low	Low	Low	Moderate	High	High	High	High	High	High	High	High	High	High	Low	High	Low	Low	
Tree Removal (biological effect)	Low	Low	Low	Low	Moderate	Moderate	Moderate	Moderate	Low	Low	Moderate	Low	Low	Low	Low	Low	Low	Low	Moderate	Moderate	Low	Moderate	Low	Low	Low	Low	Moderate	Low	Low	
BIOLOGICAL RESOURCES - ANIMALS																														
Species considered are endangered and/or threatened on a federal and/or state level. CDFW species of special concern are also noted.	High	Low	Low	Low	High	High	High	Moderate	Moderate	Low	Moderate	Low	High	Low	Moderate	High	High	High	High	High	High	High	High	High	High	Low	High	Low	Low	
RESTORATION																														
Level of expected effort for site restoration	High	High	Moderate	Moderate	High	High	High	High	Moderate	Low	Moderate	Low	Moderate	Low	Moderate	High	High	High	High	High	High	High	High	High	High	Moderate	High	Low	Low	
Wetlands / Streams / Ponds	Low	Low	Low	Low	Moderate	Moderate	Moderate	Low	Moderate	Low	Low	Low	Moderate	Low	Low	Low	Low	Low	Moderate	Moderate	Low	Moderate	Low	Low	Low	Low	Low	Moderate	Low	Low
CULTURAL AND VISUAL RESOURCES																														
Cultural Resources	Low	Low	Low	Low	Low	Low	Moderate	Moderate	Low	Low	Moderate	Low	Low	Low	Moderate	Moderate	Low	Low	Low	Moderate	Moderate	Low	Low	Moderate	Moderate	Low	Moderate	Low	Low	
Visual Resources	Moderate	High	Low	Low	Moderate	Moderate	High	High	Moderate	Low	Moderate	Low	Moderate	Low	Moderate	Moderate	Moderate	Low	Moderate	Low	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	High	Low	Low	
Tree Removal (visual effect)	Low	Moderate	Low	Low	Moderate	Moderate	High	High	Low	Low	Moderate	Low	Low	Low	Low	Low	Low	Low	Moderate	Moderate	Low	Moderate	Low	Low	Low	Low	High	Low	Low	
High= Moderate= Low= Not Applicable=																														
15 Pacific Gas and Electric Company																														
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Edgewood Preserve Routing Analysis																														

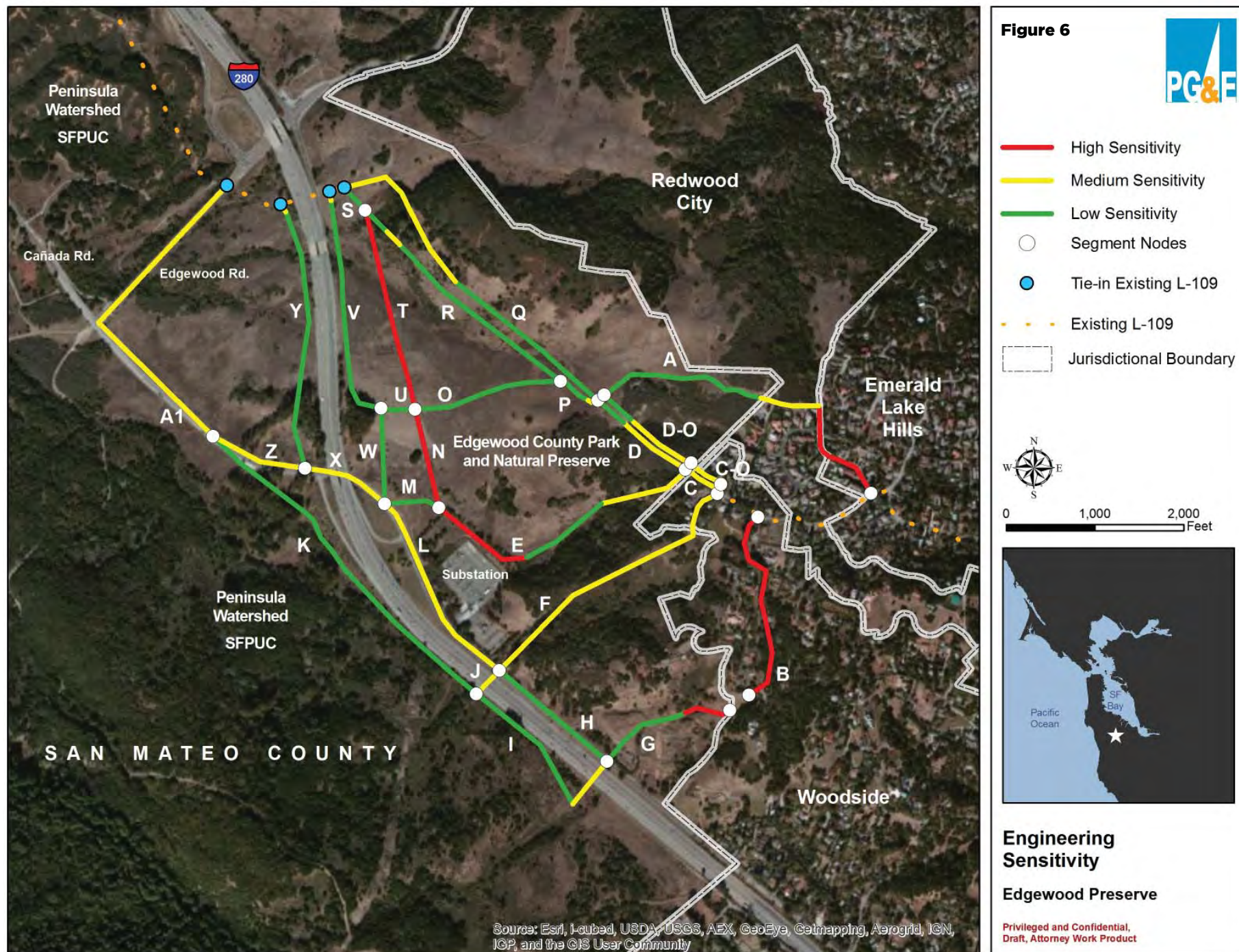




Figure 7



- High Sensitivity
- Medium Sensitivity
- Low Sensitivity
- Segment Nodes
- Tie-in Existing L-109
- Existing L-109
- Jurisdictional Boundary



0 1,000 2,000 Feet



Constructability Sensitivity

Edgewood Preserve

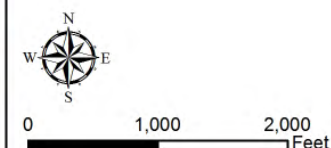
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Figure 8



- High Sensitivity
- Medium Sensitivity
- Low Sensitivity
- Segment Nodes
- Tie-in Existing L-109
- Existing L-109
- Jurisdictional Boundary



**Long Term O&M
and Safety
Sensitivity
Edgewood Preserve**

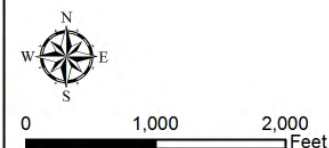
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Figure 9



- High Sensitivity
- Medium Sensitivity
- Low Sensitivity
- Segment Nodes
- Tie-in Existing L-109
- - - Existing L-109
- Jurisdictional Boundary



Land Use Sensitivity

Edgewood Preserve

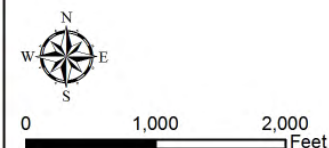
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Figure 10



- High Sensitivity
- Medium Sensitivity
- Low Sensitivity
- Segment Nodes
- Tie-in Existing L-109
- - - Existing L-109
- Jurisdictional Boundary



Land Rights Sensitivity

Edgewood Preserve

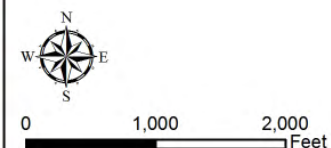
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Figure 11



- High Sensitivity
- Medium Sensitivity
- Low Sensitivity
- Segment Nodes
- Tie-in Existing L-109
- - - Existing L-109
- Jurisdictional Boundary



**Biological Resources -
Plants
Sensitivity
Edgewood Preserve**

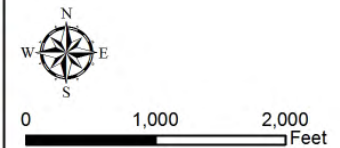
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Figure 12



- High Sensitivity
- Medium Sensitivity
- Low Sensitivity
- Segment Nodes
- Tie-in Existing L-109
- - - Existing L-109
- Jurisdictional Boundary



**Biological Resources -
Animals
Sensitivity
Edgewood Preserve**

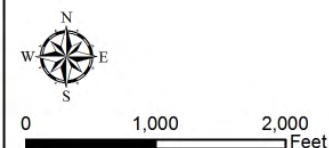
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Figure 13



- High Sensitivity
- Medium Sensitivity
- Low Sensitivity
- Segment Nodes
- Tie-in Existing L-109
- - - Existing L-109
- Jurisdictional Boundary



Restoration Sensitivity

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Source: Esri, i-labeled, USDA, USGS, AEX, GeoEye, Getmapping, Aerogrid, IGN, IGP, and the GIS User Community

Figure 14



- High Sensitivity
- Medium Sensitivity
- Low Sensitivity
- Segment Nodes
- Tie-in Existing L-109
- Existing L-109
- Jurisdictional Boundary



0 1,000 2,000 Feet



Cultural and Visual Resources Sensitivity Edgewood Preserve

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Figure 15



- High Sensitivity
- Medium Sensitivity
- Low Sensitivity
- Segment Nodes
- Tie-in Existing L-109
- - - Existing L-109
- Jurisdictional Boundary



0 1,000 2,000 Feet



Sensitivity Composite

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2.3 PHASE 3: ROUTES CONSIDERED

In the third phase of analysis, information from the sensitivity composite map—along with program-specific criteria and input from interested parties at PG&E—is used to combine segments into routes connecting the replacement start with the replacement end. The objective is to create routes that maximize the use of segments with lower composite sensitivity and minimize use of segments with higher composite sensitivity.

In the *Phase 3: Routes Considered* analysis of the Edgewood Preserve segment of L-109, four routes were derived from the Phase 2 results (Figure 16). One of the four routes follows the existing L-109 alignment, and three are in different locations.

- **Existing L-109 Route.** This route incorporates segments C, D, and Q, and parallels the existing L-109 alignment for its entire length. The route begins at Rocky Way in the northern section of the Emerald Hills residential area of Woodside, and runs approximately 300 feet to the southwestern edge of Edgewood Park. After entering the park boundary and spanning a drainage, it continues northwest across the park, crossing 2-3 additional drainages. At the junction of C/Q, the route transitions to the north side of the gas line corridor. At the northwest end of the park, the route turns west and ties into the existing alignment.
- **Service Corridor Route.** This route incorporates segments C–O, D–O, P, R, and S. It is the shortest of the four routes, and parallels the existing L-109 alignment for approximately eighty percent of its length. On the southern end of the replacement, the route begins near Rocky Way, enters Edgewood Park, spans a drainage, and continues northwest across the park. At the service road, the route follows the service road through an open area. Continuing northwest, the route crosses two drainages and passes through a non-native grove of olive trees before tying into the existing L-109 alignment.
- **Substation Route.** This route incorporates segments C–O, E, M, X, Z, and A1. It parallels the existing L-109 alignment from Rocky Way to Edgewood Park. After crossing the park boundary, the route turns southwest and parallels

a wood pole electric transmission line for a short distance. The route then heads west, crosses a drainage and follows slope contours to the substation boundary where it turns northwest following the substation boundary. It exits the park to Cañada Road and continues northwest within the Cañada Road alignment to Edgewood Road where it turns northeast to tie into the existing L-109 alignment. It is the second longest of the four routes.

- **Ridgeline Route.** This route incorporates segments F, L, X, Z, and A1. At its beginning, the route follows Rocky Way south to the road's end. At that point, the route enters San Francisco Public Utilities Commission (SFPUC) land and follows a ridgeline southwest to Cañada Road. It continues northwest within the Cañada Road alignment to Edgewood Road. At Edgewood Road, the route turns northeast to tie into the existing L-109 alignment. It is the longest of the four routes.

3.0 RECOMMENDED ROUTE

The four routes under consideration were assessed using a detailed side-by-side comparison guided by the specific routing objectives detailed in Section 1.2. The side-by-side comparison encompassed relevant qualitative and quantitative factors and is summarized in Table 2; relevant factors included construction and permitting issues, land uses, and sensitive biological resources.

The assessment determined that the Service Corridor Route had the most advantages and the fewest constraints. The Service Corridor Route was selected as the recommended route for the Edgewood Preserve section of L-109 replacement (Figure 17) because the route:

- Substantially uses the existing utility corridor, which is a permitted use within the park.
- Provides the most direct and shortest route (approximately 1/2 the length of the longest route).
- Provides the best opportunity for uncomplicated construction.
- Provides the best opportunity for long-term operations and maintenance, and safety.
- Provides an alternative that does not jeopardize system integrity.
- Complies with the Edgewood Park Master Plan.

- Requires the least amount of permanent benching (300 linear feet).
- Decreases the amount of serpentine soil disturbance in comparison to the existing alignment by approximately 200 linear feet.
- Will have the shortest construction duration.
- Requires the least linear feet of tree removal (1,300 feet, similar to the Ridgeline Route).
- Provides the lowest degree of impact to environmental resources.
- Provides safety from the risk of third-party dig-ins.

The Service Corridor Route will require some new land acquisition, and restoration for sensitive habitats. Land acquisition would occur adjacent to the existing pipelines. Restoration activities are relatively similar in level of effort to two other routes considered; an exception is the Ridgeline Route, which would involve removal of a hilltop and cannot be similarly reclaimed.



Source: Esri, DeLorme, USDA, USGS, AEX, GeoEye, Getmapping, Aerogrid, IGN, IGP, and the GIS User Community

Figure 16



- Replacement Start
- Replacement End(s)
- Existing Alignment
- Service Corridor
- Substation
- Ridgeline
- Existing L109
- Jurisdictional Boundary



0 1,000 2,000 Feet



Routes Considered

Edgewood Preserve

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TABLE 2 – ROUTES CONSIDERED

ROUTES CONSIDERED	EXISTING ALIGNMENT	SERVICE CORRIDOR	SUBSTATION	RIDGELINE
ANALYSIS FACTORS				
Segments	C, D, Q	C-O, D-O, P, R, S	C-O, E, M, X, Z, A1	F, L, X, Z, A1
Description	Route follows existing L-109 alignment (replace-in-place). The route begins near Rocky Way and enters Edgewood Park. It spans a drainage and continues northwest across the park, crossing 2-3 drainages. At the northwest end of the park the route turns west and ties into existing L-109 line.	Route parallels existing L-109 alignment for approximately 80 percent of its length. It begins near Rocky Way, enters Edgewood Park, spans a drainage, and continues northwest to the service road. It aligns with portions of the service road trail for approximately 1,500 feet. The route crosses 2-3 drainages and at the northwest end it passes through a non-native grove of olive trees before tying into existing L-109.	Route begins near Rocky Way and enters Edgewood Park where it heads southwest, initially paralleling a power line. The route then heads west to cross a drainage and follow contours of the base of the slope toward the substation. It follows the substation boundary northwest and exits the park toward Cañada Road. It continues northwest within the Cañada Road alignment to Edgewood Road where it turns northeast to tie into existing L-109.	Route follows Rocky Way to its western terminus. It then enters San Francisco Public Utilities Commission (SFPUC) land and follows a ridgeline southwest until reaching Cañada Road. It continues northwest within the Cañada Road alignment to Edgewood Road where it turns northeast to tie into existing L-109.
Replacement Length (feet)*	4,554 ft.	4,385 ft.	8,352 ft.	9,282 ft.
Existing Gas Transmission Easement Length (feet)*	4,554 ft.	80 ft.	None	None
Existing Easement Width (where available) (feet)	10 ft.	10 ft.	None	None
New Easement Length – including Franchise (feet)*	None	4,305 ft.	7,122 ft.	8,782 ft.
New Easement Acreage – including Franchise (width varies) (acres)*	None	2.0 acres	3.3 acres	4.0 acres
Franchise Length (feet)*	None	None	4,351 ft.	6,575 ft.
Caltrans Encroachment Permit Length (feet)*	None	None	500 ft.	500 ft.
Route in PG&E Property (feet)*	None	None	700 ft.	None

TABLE 2 – ROUTES CONSIDERED (CONTINUED)

ROUTES CONSIDERED	EXISTING ALIGNMENT		SERVICE CORRIDOR		SUBSTATION		RIDGELINE	
ANALYSIS FACTORS								
Caltrans Bore	None		None		Yes		Yes	
Tree Removal (linear feet)*^	1,900 ft.		1,300 ft.		3,900 ft.		1,300 ft.	
Permanent Benching (linear feet)*^	600 ft.		300 ft.		800 ft.		2,200 ft.	
Potential Riparian/Wetland/Seeps Construction Disturbance (linear feet)*	60 ft.		60 ft.		700 ft.		None	
Disturbance	<u>Permanent Easement</u>	<u>Total Construction Easement</u>	<u>Permanent Easement</u>	<u>Total Construction Easement</u>	<u>Permanent Easement</u>	<u>Total Construction Easement</u>	<u>Permanent Easement</u>	<u>Total Construction Easement</u>
Total Disturbance of Unpaved Surfaces (square feet)*^	91,100 sq. ft.	387,100 sq. ft.	87,700 sq. ft.	372,700 sq. ft.	70,000 sq. ft.	297,600 sq. ft.	44,100 sq. ft.	187,600 sq. ft.
Total Disturbance of Paved Surfaces (square feet)*^	2,400 sq. ft.	2,400 sq. ft.	2,400 sq. ft.	2,400 sq. ft.	37,200 sq. ft.	37,200 sq. ft.	58,400 sq. ft.	58,400 sq. ft.
Serpentine Grassland / Bay Checkerspot Butterfly (BCB) Habitat (square feet)*^	34,000 sq. ft.	144,500 sq. ft.	30,000 sq. ft.	127,500 sq. ft.	5,500 sq. ft.	23,400 sq. ft.	None	None
Serpentine Chaparral (square feet)*^	14,000 sq. ft.	59,500 sq. ft.	14,000 sq. ft.	59,500 sq. ft.	None	None	None	None
Riparian/Wetland/Seeps (square feet)*^	None	6,400 sq. ft.	None	3,800 sq. ft.	13,000 sq. ft.	55,300 sq. ft.	None	None
Red-legged Frog Habitat Fencing (linear feet)*^	None	None	None	None	None	8,000 ft.	None	8,000 ft.
San Francisco Garter Snake Habitat Fencing (linear feet)*^	None	None	None	None	None	8,000 ft.	None	8,000 ft.
Benching (square feet)*^	18,000 sq. ft.	51,000 sq. ft.	9,000 sq. ft.	25,500 sq. ft.	24,600 sq. ft.	69,700 sq. ft.	66,200 sq. ft.	187,600 sq. ft.
Cut/Fill (cubic yards)*^	3,300 cu. yd.	9,400 cu. yd.	1,700 cu.yd.	4,700 cu. yd.	4,600 cu. yd.	12,900 cu. yd.	24,500 cu. yd.	69,500 cu. yd.

TABLE 2 – ROUTES CONSIDERED (CONTINUED)

ROUTES CONSIDERED	EXISTING ALIGNMENT	SERVICE CORRIDOR	SUBSTATION	RIDGELINE
ANALYSIS FACTORS				
Third-party Dig-in Potential	Low Risk	Low Risk	Risk	Risk
Business Structures within approximately 500 feet	None	None	None	None
Multifamily Structures within approximately 500 feet	None	None	None	None
Single Family Houses within approximately 500 feet	16	16	16	16
Total Structures within approximately 500 feet	16	16	16	16
Agency/CEQA Consideration	San Mateo County	San Mateo County	San Mateo County	San Mateo County
Required Permits	San Mateo County, USACE Section404, RWQCB Section 401, CDFW Section 1602 and BO	San Mateo County, USACE Section404, RWQCB Section 401, CDFW Section 1602 and BO	San Mateo County, USACE Section404, RWQCB Section 401, CDFW Section 1602 and BO, Caltrans Encroachment	San Mateo County, USACE Section404, RWQCB Section 401, CDFW Section 1602 and BO, Caltrans Encroachment
ROW Acquisition Time	110 days	110 days	110 days	180 days
Meets Construction Start Schedule	Yes	Yes	Yes	Yes
Construction Time (work days)	86 days	82 days	172 days	249 days
Restoration Time (work days)	129 days	127 days	128 days	156 days
Cost Factor Comparison	1.02	1	1.65	1.75
*Measurements are approximate and require field verification. ^Calculations have been rounded to the nearest hundred.				



Figure 17



- Replacement Start
- Replacement End
- Service Corridor
- Existing L109
- Jurisdictional Boundary



0 1,000 2,000 Feet



Recommended Route
Edgewood Preserve

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