

FINDING OF NO SIGNIFICANT IMPACT
PACIFIC GAS & ELECTRIC GAS PIPELINE L-109 REPLACEMENT PROJECT
National Park Service, U.S. Department of the Interior
Golden Gate National Recreation Area

July 2017

INTRODUCTION

This Finding of No Significant Impact (FONSI) has been prepared by Golden Gate National Recreation Area (GGNRA) for the PG&E Pipeline L-109 Replacement Project (Project) in accordance with the 1969 National Environmental Policy Act (NEPA) and NPS NEPA guidance in Director's Order-12 (DO-12). The FONSI combined with the Project Environmental Assessment (EA) comprise the NEPA record of the analysis of environmental impacts for the project, support the National Park Service (NPS) decision rationale for choosing among the alternatives, the Proposed Action Alternative for implementation by PG&E, and explain why the selected alternative would result in no significant impacts to the environment as defined by the NEPA regulations (40 CFR parts 1500-1508) and NPS NEPA guidance in DO-12.

As stated in the Project EA, the project is located in the San Francisco Peninsula Watershed in San Mateo County, California and would consist of replacing three segments of Gas Line 109 (L-109), i.e., the Cañada Road, the Bunker Hill, and the Crystal Springs segments, totaling approximately 4.7 miles of new pipeline. The pipeline replacements would modernize the pipe and standardize pipe sizes to allow for the use of automated, in-line inspection tools. These tools are currently not available due to variations in pipe diameter. For construction and future maintenance of the new segments, the project would require approximately 37.8 acres of temporary construction easements and approximately 9.3 acres of permanent expansions of PG&E's existing utility right-of-way (ROW) within the Watershed.

On May 2, 2016, the San Francisco Planning Department completed a Final Mitigated Negative Declaration (FMND) for the project, in accordance with the California Environmental Quality Act (CEQA). The FONSI and the attached Mitigation Measures, which were incorporated into the Proposed Action Alternative in the EA, are specific to the various components of the Project.

PURPOSE AND NEED FOR ACTION

The purpose of the project is to upgrade and replace existing transmission gas pipeline segments in PG&E's gas system as part of their modernization and safety program. Specifically, these activities require the replacement of aging infrastructure and standardization of pipe sizes in order to accommodate automated in-line pipe inspection tools. The project would increase the reliability and integrity of the natural gas delivery system in the state of California and ensure reliable delivery to PG&E customers located on the San Francisco Peninsula.

As a result of the 2010 San Bruno pipeline explosion, the California Public Utility Commission (CPUC) issued Decision Number 11-06-017 that directed PG&E to modernize and enhance safety of its gas transmission operations. In response, PG&E prepared and began implementing a Pipeline Safety Enhancement Plan (PSEP) approved by the CPUC in 2011 that called for automating system-wide valves, pipe strength-testing, gas line pressure reductions, and replacing and upgrading pipes that would allow in-line inspections. The PSEP is divided in two phases and this is one of the projects required under Phase 2.

SELECTED ALTERNATIVE

The Selected Alternative is the Proposed Action Alternative. Under this alternative, PG&E would replace 4.7 miles of new 24 and 30-inch-diameter pipes in three pipeline segments within the NPS Scenic and Recreation Easement of the San Francisco Peninsula Watershed. The three L-109 segments requiring replacement – Bunker Hill (Figure 1), Crystal Springs (Figure 2), and Cañada Road (Figure 3) – contain pipe which was installed in the 1930s and is a diameter that prohibits PG&E's ability to operate automated in-line inspection (ILI) gauges and other inspection/integrity management tools.



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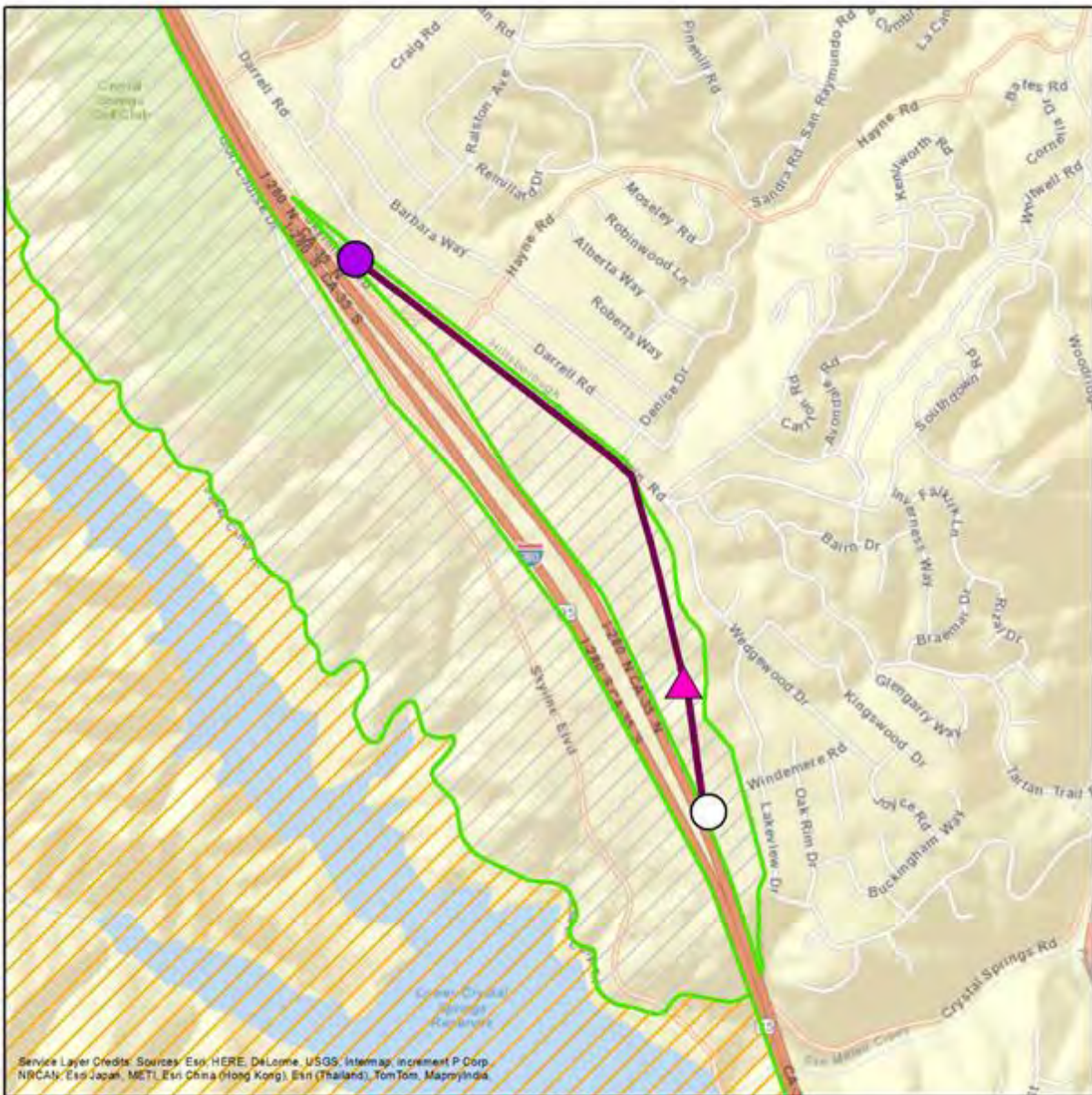
Legend

-  Replacement Start
-  Replacement End
-  Bunker Hill Segment
-  GGNRA Scenic Easement
-  GGNRA Scenic and Recreation Easement

Bunker Hill Replacement Segment

San Francisco
Peninsula Watershed
Gas Line 109
Replacement Project





Service Layer Credits: Sources: Esri, HERE, DeLorme, USGS, Intermap, increment P Corp, NRCAL, Esri Japan, METI, Esri China (Hong Kong), Esri (Thailand), TomTom, Mapbox, Inc.



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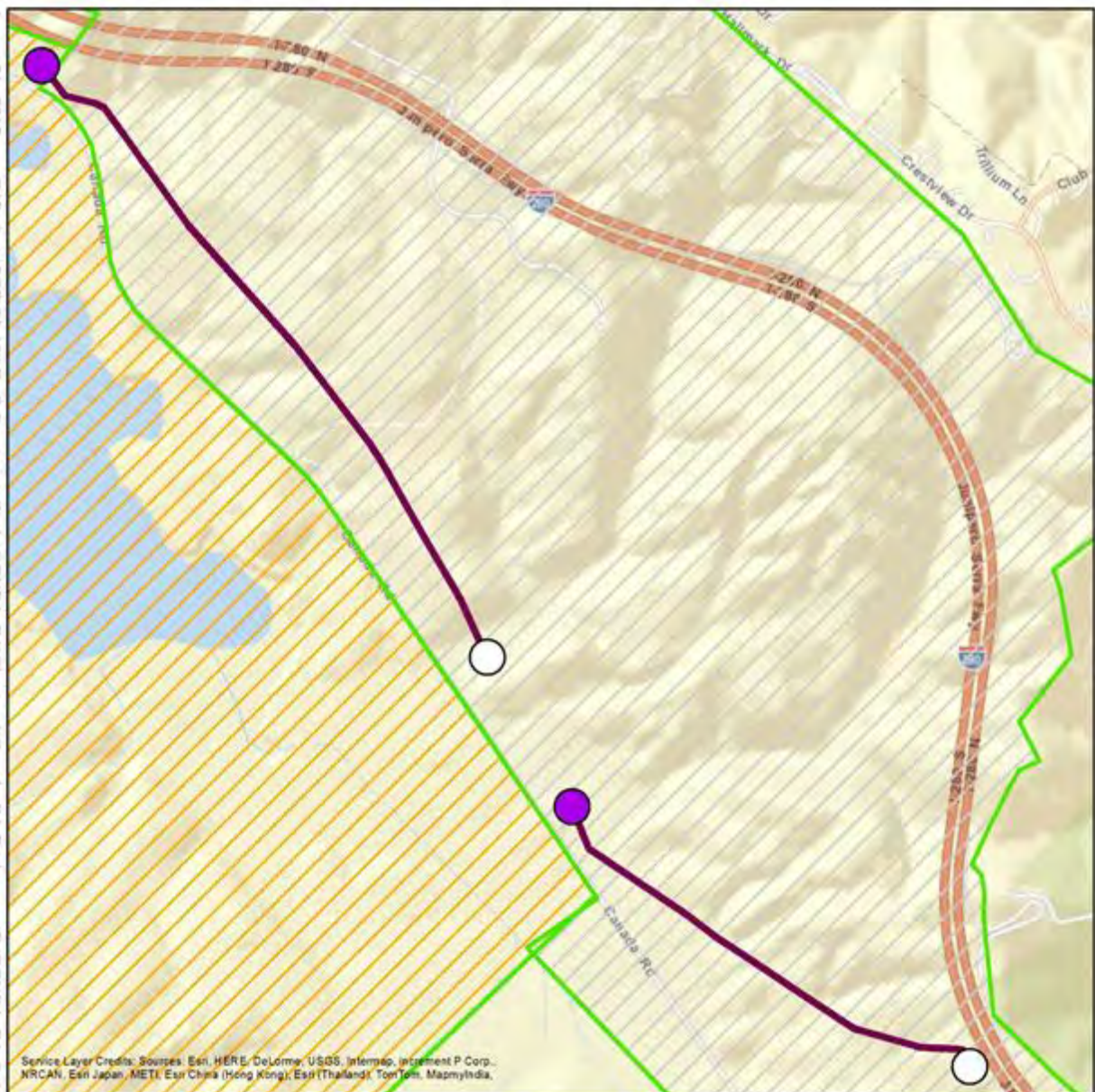
Legend

-  Crystal Springs Valve Lot
-  Replacement Start
-  Replacement End
-  Crystal Springs Segment
-  GGNRA Scenic Easement
-  GGNRA Scenic and Recreation Easement

Crystal Springs Replacement Segment

San Francisco
Peninsula Watershed
Gas Line 109
Replacement Project





Service Layer Credits: Sources: Esri, HERE, DeLorme, USGS, Intermap, increment P Corp., NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri (Thailand), TomTom, MapmyIndia.



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Legend

-  Replacement Start
-  Replacement End
-  Cañada Road Segment
-  GGNRA Scenic Easement
-  GGNRA Scenic and Recreation Easement

Cañada Road Replacement Segment

San Francisco
Peninsula Watershed
Gas Line 109
Replacement Project



The three segments are located east of the Upper and Lower Crystal Springs Reservoir adjacent to Interstate 280. The Watershed lands are owned by City and County of San Francisco (CCSF) and managed by the San Francisco Public Utilities Commission (SFPUC). The U.S. Department of the Interior (DOI) NPS GGNRA holds a Scenic Easement and a Scenic and Recreation Easement over lands in the Watershed. The Scenic and Recreation Easement was authorized January 15, 1969 and requires SFPUC to obtain concurrence/approval from the GGNRA for certain actions that may affect the scenic and recreation resources, and that the activity—with agreed upon mitigation—is compatible with the purposes of these easements (GGNRA 2005). When approving development and construction as provided by both GGNRA easements, such approval constitutes a federal action under the National Environmental Policy Act (NEPA).

As part of earlier 2012 gas line improvements within the Watershed, PG&E obtained approximately 5.6 acres of additional easement for automated valve lot upgrades and two pipeline segment replacements. Although all ground disturbance for the proposed activities associated with this current project proposal would be located within the Scenic and Recreation Easement, cumulatively, the Scenic Easement and the Scenic and Recreation easements would be affected by the proposed Project and the earlier gas line improvements.

Replacing the L-109 lines in their current alignment for the Cañada Road and Bunker Hill segments was not considered feasible due to an unreasonable risk to the gas system for required outages during in-place construction. Therefore, new PG&E utility easements are necessary for the Cañada Road and Bunker Hill segments, which require subsequent authorizations from CCSF and GGNRA.

The gas pipeline would be replaced primarily by direct burial in an open trench along or adjacent to the existing pipe alignment. In addition to excavated trenches, segments would be replaced using horizontal directional drilling (HDD), jack and bore, and aerial span construction techniques. Associated construction activities include potholing, benching and leveling, stringing and welding, hydrostatic testing, venting and tie-in, and site restoration. In total, approximately 4.7 miles of existing pipeline would be retired. To minimize ground disturbance, retired pipe would be cleaned, capped, and left in place; however, the Crystal Springs segment and three above ground spans located on the Cañada Road segment would be removed. On the three spans removed from the Cañada Road segment, the ends of the existing pipe would be cut off below the surface and capped, and the surface would be restored. Two other aerial spans on this segment would be retired in place. Major construction equipment would typically include trackhoes, backhoes, side-booms, an HDD drill rig, water trucks, a bulldozer, a grader, welding rigs, and dump trucks.

As part of the pipeline replacement work, electrolysis test stations—used to locate and assist in corrosion testing of the underground pipeline—and cathodic protection stations would be installed. The test stations are composed of metal pipes that measure approximately 6 inches in diameter and rise approximately 4 feet from the ground surface.

Construction of the proposed Bunker Hill Segment is scheduled to occur from June through October 2016; construction for the Crystal Springs segment would take place in 2017; and the Cañada Road segment in 2018. Construction activities would typically occur between the hours of 7:00 a.m. and 5:30 p.m., Monday through Saturday. It is possible that HDD activities could occur during one night at each HDD location, because some portions of the HDD work must be performed continuously. However, it is not anticipated that this would be required. In the case of an emergency condition (e.g., if the drill becomes stuck or if drilling is progressing slower than expected) it is possible that HDD activities maybe prolonged into the evening and night time hours. No work would be performed on Sundays.

After the new segments have been placed, tested, pressurized, and the existing segments deactivated, all disturbed areas would be graded and restored to pre-construction conditions. In grassland areas, the disturbed areas would be restored to native grassland. To protect pipeline integrity and allow for pipeline inspections, the area within five to ten feet on either side of the centerline of the pipe would be kept clear of trees and brush in riparian and brushy areas.

NO ACTION ALTERNATIVE

Under the No Action Alternative, the proposed pipeline replacements would not occur. Implementation of the No Action Alternative would result in no additional ROW acquisition and no new construction activities associated with the pipeline. Current maintenance and line inspection procedures and activities on the existing L-109 pipeline would continue with substantial changes to operations.

The No Action Alternative would have substantial impacts to operations from a customer and maintenance perspective. The No Action Alternative would mean that PG&E could not perform the proposed upgrades to its pipeline. If PG&E cannot upgrade the pipeline, it must operate the pipeline at reduced pressure and this could mean gas service would not be available for all customers at all times. Further, without the upgrades, PG&E would not be able to inspect the pipeline with ILI technologies, such as ILI gauges. Thus, while the No Action Alternative would result in no additional ROW acquisitions, no new construction along the line, and no impacts within the Project area, it would prevent the pipeline from being modernized, prohibiting the ability to provide safe and reliable service to all customers reliant on the pipeline.

ALTERNATIVES CONSIDERED AND DISMISSED FROM FURTHER ANALYSIS

Cañada Road Alternative

This alternative includes significant disadvantages that preclude further consideration. The location of this alternative would place the pipeline adjacent to Crystal Springs Reservoir for a greater length than the proposed route alignment, increasing disturbance adjacent to the Reservoir. Cañada Road is constrained due to existing in-ground utilities.

The Cañada Road-Segment Alternative would not provide the same level of operation, safety, and maintenance improvements as the proposed Project alignment and was, therefore, dismissed from further consideration.

Cañada Road and West I-280 Alternative

This alternative would start south of the current southern tie-in point and extend in a westerly direction to Cañada Road. At Cañada Road, the pipeline would be installed in a public ROW until reaching a segment of pipe that does not require replacement, which is located adjacent and west of the SFPUC Balancing Reservoir. The alternative's northern replacement segment would follow a dirt access road to unpaved Sheep Camp Trail towards Gate Vista viewpoint access road. Departing from the Sheep Camp Trail, the alternative would parallel a drainage channel along the base of I-280 on the western boundary of the Caltrans ROW. The alternative would remain on the north side of the creek until entering a parallel alignment to the existing pipe and reaching the Cañada Road northern tie-in point.

Along the southern portion of this alternative, disadvantages similar to those in the Cañada Road alternative preclude it from further consideration. Issues include existing in-ground utilities, and a decreased level of operation, safety, and maintenance ability.

The northern section of this alternative cannot be considered reasonable or feasible because of environmental concerns. This alternative would require significant construction related activity inside a drainage and earthwork directly below I-280. This alternative increases the length of disturbance by nearly 3,000 feet, a far greater distance than the Proposed Action Alternative northern sub-segment. For these reasons, this alternative was dismissed from further consideration.

Bunker Hill/Lexington Avenue Alternative

The Lexington Avenue Alternative would begin southeast of the Bunker Hill segment's southern tie-in, which is adjacent to the access road near the intersection of Lexington Avenue and Allegheny Way. The Lexington Avenue Alternative would extend northwest the Lexington Avenue public ROW until the

alignment intersects with Bunker Hill Drive. The alignment then extends southwest the public ROW until reaching the gravel access road east of I-280. This alternative would extend along the gravel access road until reaching the northern tie-in point.

This alternative includes significant disadvantages that preclude further consideration. The location of this alignment would bisect a suburban residential development. Construction would be constrained due to existing in-ground utilities located within the public ROWs.

The Lexington Avenue Alternative would not provide the same level of operation, safety, and maintenance improvements as the proposed Project alignment and was, therefore, dismissed from further consideration.

Bunker Hill/I-280 East Alternative

The I-280 East Alternative would begin southeast of the Bunker Hill segment's southern tie-in which is adjacent to the access road near the intersection of Lexington Avenue and Allegheny Way. The alternative would extend southwest across SFPUC lands towards the I-280 ROW. Adjacent to the I-280 ROW, the alignment extends into the disked section of soil adjacent and parallel to I-280. The alternative alignment remains inside the disked section until Bunker Hill Drive. At Bunker Hill Drive, the alignment crosses underneath the road and extends along the gravel access road past the substation until reaching the northern tie-in point.

The I-280 East Alternative has several disadvantages that preclude it from further analysis. This alternative would require the disjunction of the existing utility corridor on SFPUC lands, resulting in greater environmental disturbance over both the short and long term. Due to the alternative's location inside an area regularly disked for fire management activities, the I-280 East Alternative would not provide the same level of operation, safety, and maintenance improvements as compared to the proposed Project alignment. For these reasons, this alternative was dismissed from further consideration.

Crystal Springs/I-280 East Alternative

The I-280 East Alternative would begin at the Crystal Springs segment's southern tie-in point which is near a dirt access road, located adjacent to the eastern I-280 ROW. The I-280 East Alternative extends north-northeast along the previously disturbed L-109 ROW to connect into the Crystal Springs Valve Lot. The alternative would make the necessary connection to the valve lot and would then extend west within a previously disturbed corridor before aligning parallel to and outside of, the I-280 ROW. The alternative continues parallel to I-280, extending beyond Hayne Road, and a small non-developed space before extending along the Highway 35 alignment until reaching the Crystal Springs northern tie-in point.

The I-280 East Alternative includes significant disadvantages that preclude it further consideration. The location of this alignment would place the pipeline outside of the existing PG&E utility corridor and directly adjacent to I-280 ROW.

Due to the alternative alignment's location in an area regularly disked for fire management activities, the I-280 East Alternative would not provide the same level of operation, safety, and maintenance improvements as compared to the proposed Project alignment and was, therefore, dismissed from further consideration.

Crystal Springs/Black Mountain Road Alternative

The Black Mountain Road Alternative would begin at the Crystal Springs segment's southern tie-in point which is near a dirt access road, located adjacent to the eastern I-280 ROW. The alignment would extend east to connect with an existing disturbance located directly east of a PG&E electric power line. The alternative would briefly realign in the existing L-109 ROW prior to connecting to the Crystal Springs Valve Lot. The alternative would make the necessary connection to the valve lot and would then follow the boundary of the open space until reaching Black Mountain Road. At Black Mountain Road, the alignment would enter a public ROW for the next several thousand feet. North of the I-280 SR 35

interchange the alternative would extend north along the dirt access road until reaching the Crystal Springs northern tie-in point.

The Black Mountain Road Alternative includes significant disadvantages that preclude further consideration. Notably, this alternative would be located adjacent to an existing PG&E power line. Additionally, construction of this alternative would require temporary disruption to Black Mountain Road, a main arterial road. For these reasons, this alternative alignment was dismissed from further consideration.

ENVIRONMENTALLY PREFERRED ALTERNATIVE

The National Park Service has determined that the environmentally preferred alternative for this project is the No Action Alternative. The environmentally preferred alternative is the alternative that will promote the national environmental policy expressed in NEPA (sec. 101 (b)). This includes alternatives that:

1. Fulfill the responsibilities of each generation as a trustee of the environment for succeeding generations.
2. Ensure for all Americans safe, healthful, productive, and esthetically and culturally pleasing surroundings.
3. Attain the widest range of beneficial uses of the environment without degradation, risk of health or safety, or other undesirable and unintended consequences.
4. Preserve important historic, cultural, and natural aspects of our national heritage and maintain, whenever possible, an environment that supports diversity and variety of individual choice.
5. Achieve a balance between population and resource use that will permit high standards of living and a wide sharing of life's amenities.
6. Enhance the quality of renewable resources and approach the maximum attainable recycling of depletable resources.

The CEQ Regulations implementing NEPA and the NPS NEPA guidelines require that "the alternative or alternatives which were considered to be environmentally preferable" be identified (Council on Environmental Quality Regulations, Section 1505.2). This means the alternative that causes the least damage to the biological and physical environment; it also means the alternative that best protects, preserves, and enhances historic, cultural, and natural resources.

Although the Selected Alternative would not cause less damage to the environment compared to the No Action Alternative, it does create a beneficial compromise that protects, preserves, and enhances historic, cultural, and natural resources that would not otherwise be protected by the NPS. At the same time, with the implementation of Mitigation Measures to reduce impacts to the greatest extent practicable to ensure there will be no degradation to the human environment, it allows PG&E to replace and modernize the pipeline, including installation of ILI technologies to routinely inspect the gas line for safety.

Under the No Action Alternative, the proposed pipeline replacements would not occur. Implementation of the No Action Alternative would result in no additional PG&E permanent utility easement expansions, temporary work spaces and no new construction activities associated with the pipeline. It would also mean that PG&E would need to operate the pipeline at reduced pressure and limit full time gas service to Bay Area customers. Further, without the upgrades, PG&E would not be able to utilize modern inline inspection equipment in order to provide safe and reliable service to all customers reliant on the pipeline. Although the Selected Alternative would not meet all six criteria, it does meet NEPA criteria five, by achieving a balance between population needs and preserving resources.

PUBLIC INVOLVEMENT

PG&E presented the project at a San Mateo Highlands Community Association Board Meeting on April 22, 2014. Public scoping as a "Notification of Project Receiving Environmental Review" by the SF

Planning Department was initiated on July 3, 2014 and completed on July 17, 2014. SF Planning received seven (7) comments that were considered in its preparation of the Preliminary Mitigated Negative Declaration (PMND) and Initial Study from the following:

- The Friends of Edgewood , San Mateo County
- California Native Plant Society (Santa Clara Valley Chapter) (CNPS)
- Committee for Green Foothills (CGF)
- San Mateo Highlands Community Association
- An adjacent Watershed resident
- Director of the Filoli Estate
- U.S. Fish and Wildlife Service

The Planning Department circulated a Notice of Availability and Intent to Adopt a PMND and Initial Study on September 9, 2015. The Department received comments from one member of the public and from the California Department of Fish and Wildlife (CDFW). All comments were considered in the Final Mitigated Negative Declaration (FMND). The FMND was approved May 2, 2016. See FMND for detailed comments and responses at <http://sf-planning.org/environmental-impact-reports-negative-declarations>.

The NPS conducted public scoping for the proposed project from August 14 to August 29, 2014. A scoping notice was sent to more than 1,560 individuals, nearby residents, regulatory and public agencies, San Mateo County environmental organizations, and other groups, and posted on the NPS Planning, Environment, and Public Comment (PEPC) website.

The scoping notice described the purpose and need for the project, the location, and the proposed work to replace three segments of the L-109 pipeline. The notice requested the interested public to consider the following in their comments:

- Alternative approaches and ideas for accomplishing project goals;
- The range of issues that need to be considered;
- Other potential projects that might affect or be affected by this project;
- Effects that should be considered and why; and
- Information on resources within or adjacent to this area that your agency has jurisdiction

No comments were received as a result of NPS project scoping.

The Pacific Gas and Electric Company (PG&E) Gas Line 109 Pipeline Replacement Project EA was released for public review, February 26, 2016 to March 28, 2016, and extended from March 28, 2016 to April 15, 2016. Twenty printed EAs with CD were distributed to the public. NPS received one hundred seventy (170) agency and public comments. See attached Errata for detailed comments/responses.

Required Local, State, Federal Agencies, and Tribal Consultations/Permitting

The proposed PG&E project will require the following permits, consultations and other regulatory approvals prior to project implementation:

- U.S. Army Corps of Engineers Clean Water Act (CWA) Section 404 Nationwide Permit 12: Utility Line Activities
- U.S. Fish and Wildlife Service Federal Endangered Species Act Section 7 Consultation
- CDFW California Fish and Game Code Section 1602 Lake or Streambed Alteration Agreement

- San Francisco RWQCB CWA Section 401 Water Quality Certification
- State Water Resources Control Board CWA Section 402 Permits National Pollutant Discharge Elimination System Program – General Construction Storm Water Permit
- CCSF and SFPUC Environmental Review, Revocable License Agreement for Temporary Workspaces, and Permanent Easement Approval
- U.S. Department of the Interior, Golden Gate National Recreation Area Scenic Easement and Scenic and Recreation Easement concurrence
- As required under the Archeological Resources Protection Act of 1979, PL 96-95, 93 Stat. 712, 16 USC §470aa et seq. and 43 CFR 7, subparts A and B, 36 CFR, record and field searches were conducted and the Native American Heritage Commission (NAHC) was contacted regarding prehistoric, historic, and ethnographic land use and sites of Native American traditional or cultural value that might be known to exist within the project vicinity. The NAHC responded on June 5, 2013, and indicated that no Native American traditional cultural places are recorded in the NAHC Sacred Lands file. The NAHC also enclosed a list of Native American individuals and/or organizations that might have further knowledge of cultural resources in or near the proposed project area. Letters were sent to the Native American individuals and/or organizations on June 6, 2013, with follow-up emails sent on June 13, 2013. Additional follow-up phone calls were placed on June 21, 2013. Additional letters were sent on August 11, 2013 and October 4, 2013. Six responses were received. See FMND on the SF Planning Department website noted above for detailed responses. It was determined there are no known sites that would be impacted by the Proposed Project.

WHY THE SELECTED ALTERNATIVE WILL NOT HAVE A SIGNIFICANT EFFECT ON THE QUALITY OF THE HUMAN ENVIRONMENT

The NPS used the following NEPA criteria and factors defined in 40 CFR §1508.27 to evaluate whether the Selected Alternative would have a significant impact on the environment.

Impacts that may have both beneficial and adverse aspects and which on balance may be beneficial, but that may still have significant adverse impacts that require analysis in an EIS.

Whether taken individually or as a whole, the impacts of the Selected Alternative do not reach the level of significant adverse effect. Most adverse impacts associated with implementation of the Selected Alternative will be temporary during construction of the pipeline segments and not likely long term following completion with the implementation of Mitigation Measures, including Vegetation Restoration and Weed Management Plans.

Degree of effect on public health or safety.

The Selected Alternative will have beneficial impacts to Public Health and Safety. Upgrading, modernizing, and standardizing the pipe sizes of the three segments in this section of the L-109 gas pipeline, and installing ILI technologies will improve system operations and increase public safety.

Unique characteristics of the geographic area such as proximity to historic or cultural resources, park lands, prime farmlands, wetlands, wild and scenic rivers, or ecologically critical areas.

Research and surveys conducted for the Selected Alternative have identified six previously recorded sites in the vicinity of the proposed pipeline replacement segments. Two of these sites were determined to be either within or directly adjacent to the area of potential effect. Project construction could result in some disturbance and impact to buried archaeological sites, but with the implementation of appropriate Mitigation Measures, the Selected Alternative is expected to result in minimal impacts to cultural resources and “No Effects to Historic Properties”.

Construction activities of the Selected Alternative could result in the indirect loss of wetlands or riparian areas through degradation of water quality, diversion of water sources, or erosion and sedimentation from

altered drainage patterns. Erosion resulting from construction activities could cause sedimentation in the wetland near Cañada Road. Several of the riparian streams in the Cañada Road segment could also experience erosion or sedimentation from construction activities. With the implementation of the SWPP prepared by PG&E, BMPs, and other protective measures, including post construction erosion and vegetation restoration plans, construction activities will not have significant adverse impacts to wetlands and riparian stream within the project areas.

Degree to which effects on the quality of the human environment are likely to be highly controversial.

The project generated substantial public concern related primarily to visual impacts on GGNRA's Scenic and Scenic & Recreation Easements with the removal of trees and other vegetation and impacts to serpentine habitat within the Watershed. Implementation of the mitigation measures as described in the EA, including the preparation and implementation of a Vegetation Restoration Plan, is expected to reduce controversy associated with these issues. The overall success and effectiveness of the vegetation restoration and visual resource mitigation techniques will ultimately determine reduced or continued levels of controversy.

Degree to which the possible effects on the quality of the human environment are highly uncertain or involve unique or unknown risks.

Generally, the potential impacts are well defined and analyzed in the GGNRA EA. All of the mitigation measures related to the project, including those related to vegetation removal, vegetation restoration, and weed management, have been incorporated into the SFPUC Revocable License (June 7, 2016) and its Certificate of Completion of the Project Review Process (Exhibit C, specifically page 9, "PG&E will be responsible for any mitigation measures imposed by NPS in connection with its concurrence and the GGNRA Easements." Executed May 25, 2016.). PG&E is therefore required to implement and satisfy all of the mitigation requirements identified by NPS, SFPUC, and CDFW. Successful implementation of these measures would minimize the potential for uncertain or unknown risks to resources.

Impacts related to visual and scenic resources as a result of project construction are estimated in the EA by considering revegetation, vegetation screening of certain facilities, context sensitive painting of valve lot fencing and related infrastructure, as well as for compensation for the combined Phase 1 and 2 temporary and permanent project impacts on GGNRA's easements, including substantial removal of vegetation and trees, and the need for PG&E to maintain the permanent expanded utility easements (that will be granted by SFPUC) in a modified post construction plant community. As agreed to by PG&E, May 26, 2016, GGNRA, SFPUC, and PG&E will meet at a time TBD during or post project construction to discuss which of the following post construction actions would be required. Per the Findings in the Certificate of Completion of the Project Review Process, PG&E would be responsible for performing any such actions.

- improvements to recreational facilities, such as trails or trailheads, within or adjacent to the watershed; and/or
- habitat enhancement and/or restoring vegetation elsewhere in the watershed, or if there is not an opportunity within the watershed, mitigation should be accomplished on other lands adjacent to the watershed.

No adverse impacts to cultural resources are expected; however, ground-disturbing activities associated with the project present the potential of encountering unanticipated cultural resources during project construction. Measures have been taken to reduce this risk such as surveys, preparation and implementation of a Cultural Resources Treatment Plan, and construction personnel training. Should unknown resources be discovered during construction, work will be temporarily halted while the resource is evaluated and SHPO consulted as needed. Impacts to certain special status plant and animal species are unknown, but mitigation involving pre-construction surveys and construction monitoring is expected to minimize adverse impacts to biological resources.

Degree to which the action may establish a precedent for future actions with significant effects or represents a decision in principle about a future consideration.

The Scenic and Recreation Easement calls for preservation of the land in its present natural state, and requires that the land not be used for any purpose other than “for the collection, storage, and transmission of water and protection of water quality; outdoor recreation; ecological preservation and other purposes which shall be compatible with preserving said land as open-space land for public use and enjoyment.”

The GGNRA was proactive throughout the EA process, and related CEQA process, and will protect the values and carry out its responsibilities under the Easement. The GGNRA contributed to the environmental analysis and mitigation development for actions within the Easement area. It is possible that other segments of this and other pipelines that extend through the easement area will need to be repaired or replaced in future years. The GGNRA will continue to protect its interest in the land, to ensure that no other actions are imposed that could diminish the protected resources within the Easement.

Whether the action is related to other actions with individually insignificant but cumulatively significant impacts.

The EA considered the cumulative impacts of the Proposed Action Alternative with numerous past, present, and reasonably foreseeable future projects. The analysis for all environmental resources indicated that the Proposed Action Alternative could result in minimal, and not collectively significant, cumulative effects.

Degree to which the action may adversely affect districts, sites, highways, structures, or objects listed on National Register of Historic Places or may cause loss or destruction of significant scientific, cultural, or historical resources.

Research and surveys conducted for this project identified six previously recorded sites in the vicinity of the proposed pipeline replacement segments. Of these six sites, two sites were determined to be either within or directly adjacent to the area of potential effect. These are the Hetch Hetchy Aqueduct and P-41-002111, the Woodside-Crystal Springs Road Bridge, both of which are along the Cañada Road segment. Neither feature has been formally evaluated for the national Register of Historic Places. The Woodside Crystal Springs Road Bridge (P-41-002111) would not be affected by the proposed Project because the aerial span in this area would be left in place. The Hetch Hetchy Aqueduct crosses a portion of the proposed Project in which the pipeline is not being replaced; therefore, this feature would not be impacted by Project implementation.

Degree to which the action may adversely affect an endangered or threatened species or its critical habitat.

Federally listed species population, range, and critical habitat known to occur in the Project area and potentially impacted by the Proposed Action Alternative include the: California red-legged frog, San Francisco garter snake, Marin western flax, White-rayed pentachaeta, Crystal Springs fountain thistle, Mission blue butterfly and Bay checkerspot butterfly. As described in the EA, adverse effects to these species will be local, short-term, and minor to moderate and will be further minimized through the mitigation measures proposed for the project.

Whether the action threatens a violation of Federal, state, or local environmental protection laws

Implementing the Proposed Action Alternative would not violate any federal, state or local environmental protection laws. Assessment of the proposed action has been performed pursuant to the National Environmental Policy Act, which requires consideration of environmental protection laws and regulations. In addition, the proposed Project was analyzed separately by the SFPUC through the preparation of an Initial Study and Mitigated Negative Declaration (IS/MND), and no substantial, long-term environmental impacts were identified.

MITIGATION MEASURES

Extensive mitigation measures were included as a key component of the Selected Alternative. Since the release of the EA, additional CEQA FMND measures from SF Planning, SFPUC, and CDFW were developed. The mitigation measures from the EA and these additional measures are itemized in Appendix A. Under the terms of the SFPUC license for the project, PG&E is required to implement and comply with all mitigation measures identified through the NEPA process.

FINDING

The NPS has considered the information and analysis in the EA and supporting environmental documentation, the comments of agencies and the public, and the decision file for the project. Based on NPS guidance, policies, monitoring, and experience, and the capability of mitigation measures to avoid, minimize, or eliminate impacts; it is the determination of the NPS that the Selected Alternative is not a major federal action having the potential to significantly affect the quality of the human environment. Therefore, in accordance with the National Environmental Policy Act of 1969, applicable NEPA regulations, and NPS policy, an environmental impact statement will not be prepared.

Recommended:  17 July 2017
Cicely Muldoon, Acting General Superintendent Date
Golden Gate National Recreation Area, National Park Service

for Approved:  Aug. 1, 2017
Laura E. Joss, Regional Director Date
Pacific West Region, National Park Service

APPENDIX A – EA/FMND MITIGATION MEASURES

The following mitigation measures for the Selected Alternative were published in the EA-FMND and will be implemented by PG&E and its Contractors.

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MITIGATION MEASURES

Air Quality

Prior to construction, PG&E shall submit a Construction Emissions Minimization Plan to the Environmental Review Officer (ERO) for review and approval by an Environmental Planning Air Quality Specialist. The plan shall detail project compliance with the following requirements:

- All on-road and off-road construction equipment engine tiers shall be consistent with the United States Environmental Protection Agency (USEPA) engine tiers provided in the Construction Equipment Summary. Documentation of equipment tiers for in-use equipment shall be maintained on site as part of the plan.
- Construction equipment shall be equipped with CARB-approved Level III Verified Diesel Emission Control Strategies (VDECS). Documentation of VDECS for in-use Tier III equipment shall be maintained on site as part of the plan. To accomplish this, diesel particulate filters (DPF) will be used.
- For the Cañada Road segment and any other areas not already subject to the Asbestos Air Toxic Control Measure, PG&E shall post one or more publicly visible signs with the telephone number and person to contact at PG&E with complaints related to excessive dust or vehicle idling. This person shall respond to complaints and, if necessary, take corrective action within 48 hours. The telephone number and person to contact at the BAAQMD's Compliance and Enforcement Division shall also be provided on the sign(s) in the event that the complainant also wishes to contact the applicable air district.
- In addition, to limit dust, criteria pollutants, and precursor emissions associated with project construction, the following BAAQMD-recommended Basic Construction Measures shall be required for the Cañada Road segment and any other areas not already subject to the Asbestos Air Toxic Control Measure:
 - Water all active construction areas with exposed soil surfaces (e.g., parking areas, staging areas, soil piles, graded areas, and unpaved access roads that have not been stabilized with soil binder, mulch, gravel, vegetation or other cover) sufficiently to prevent dust from becoming airborne. Reclaimed water should be used whenever possible.
 - All haul trucks transporting soil, sand, or other loose material offsite shall be covered.
 - All visible mud or dirt track-out onto adjacent public roads shall be removed using wet power vacuum street sweepers at least once per day. The use of dry power sweeping is prohibited.
 - Vehicle speeds on unpaved areas shall be limited to 15 mph.
 - All roadways, driveways, and sidewalks to be paved shall be completed as soon as possible. Building pads shall be laid as soon as possible after grading unless seeding or soil binders are used.
 - Idling times for construction equipment (including vehicles) shall be minimized either by shutting equipment off when not in use or reducing the maximum idling time to 5 minutes, except for situations allowed under California's commercial vehicle idling regulations. California's Clear signage of this requirement shall be provided for construction workers at all access points to construction areas.
 - All construction equipment shall be maintained and properly tuned in accordance with manufacturer's specifications. All equipment shall be checked by a certified mechanic and determined to be running in proper condition prior to operation.

Biological Resources

Only biologists approved by the USFWS shall participate in the capture, handling, or relocation of listed species. A qualified biologist shall be present on site during all project activities at the Cañada Road segment and during vegetation clearing and grading activities of the Bunker Hill segment that is closest to San Mateo Creek. The biological monitor shall have the authority to stop any action that may result in take of listed species or unanticipated impacts on their habitats, provided that it does not risk the safety of the construction crews or the public.

General for All Segments

- Vehicles and equipment shall use pavement, existing roads, and previously disturbed areas to the extent practicable or as submitted as part of the proposed Project area.
- Where safe to do so vehicles should not exceed 15 miles per hour on un-surfaced roads such as ROW access roads.
- PG&E will comply with the SWPPP obtained for the proposed Project regarding restoration and erosion control.
- The disturbance or removal of vegetation within the work area shall not exceed the minimum necessary to complete operations safely.
- All food scraps, wrappers, and other containers and garbage from the work area must be disposed of in closed trash containers. If full, the containers shall be removed from the site.

- Smoking is prohibited on SFPUC lands.
- Erosion-control materials that do not pose an entrapment hazard to reptiles and amphibians shall be used. Plastic monofilament netting (e.g., matting, fiber rolls, wattles, silt fence backing) shall not be used.

Training for All Segments

Before the start of construction, a qualified biologist shall conduct an environmental awareness training session for all construction workers. Environmental awareness training may be provided by recorded video or via webinar. The training shall be repeated as new workers join the project. The training shall include a description of California red-legged frog and San Francisco garter snake (including photographs and their habitats), as well as other species that have the potential to be impacted by the project; general measures—as they relate to proposed project activities—that shall be implemented to conserve these species; penalties for non-compliance; and the limits of the construction work area. Construction workers shall sign a log indicating that they have received this training. No work (including material staging, fence installation, parking, excavation, or driving) shall be performed by individuals who have not received this training.

Riparian Areas for All Segments

- Foot access only in riparian zone unless otherwise allowed through applicable CDFW permits.
- No work will be conducted within the wetted active channel otherwise agreed to by the resource agency with jurisdiction over the area.
- Trees will be felled away from the bed, bank, and channel.
- Rope and lower large limbs to avoid limbs and personnel from entering the bed, bank, and channel to the extent possible.
- Cleared or pruned vegetation and woody debris (including chips) shall be disposed of in a manner to ensure that it does not enter surface water or a watercourse. Diverting water, discharging chips to the streambed, or removing or excavating soil are prohibited without a specific permit.
- Vehicles, tools and heavy equipment must be refueled at least 100 feet away from riparian areas. The fueling operator must stay with the fueling operation at all times. Do not top off tanks. Vehicles and heavy equipment will be checked daily to prevent leaks of materials that, if introduced to water, could be harmful to aquatic life.

Protection Measures for Jurisdictional Water Bodies and Riparian Areas

The following measures shall be implemented during project design, construction, and post-construction, as relevant:

- Design and installation of pipeline spans and temporary bridges shall be such that the water flow (velocity and low-flow channel width) is not impaired.
- Prior to construction, the construction work area shall be flagged or fenced to identify its limits within the stream. Vegetation shall not be removed or intentionally damaged beyond these limits.
- Any materials placed in or adjacent to the stream that could be washed downstream shall be removed prior to the rainy season.
- Equipment shall not be operated in jurisdictional areas without prior written approval of the relevant resource agencies.
- Within 3 days following construction, all disturbed channels shall be restored to their original condition.
- No construction shall occur outside of the dry season (April 15 through October 15), unless approved by a relevant resource agency, as appropriate.
- The contractor shall stabilize exposed slopes within 3 days of completion of construction/installation activities. Erosion-control measures shall be installed adjacent to suitable aquatic habitat to prevent soil from eroding or falling into these areas.
- If a federal status wildlife species is killed or injured as a result of proposed Project activities, the incident must be reported immediately to a supervisor and the PG&E representative for appropriate management and PG&E will report the incident to the appropriate resource agencies responsible for the species.

Federal Status Species for All Segments

- No plastic monofilament will be used for erosion control (e.g. matting, fiber rolls, wattles, silt fence backing, etc.). Appropriate materials include burlap, coconut fiber, or as identified in the general and site-specific SWPPP.
- All excavated, steep-walled holes or trenches more than two feet deep will be covered at the end of each working day by plywood or similar materials or provided with one or more escape ramps constructed of earthen fill or wooden planks at no more than a 3:1 slope.
- If feasible, open ended pipes left on site overnight are to be capped at the ends to prevent wildlife from entering them. These materials will be checked prior to moving.
- If a federal status species is observed in the work area, work shall stop immediately and the biological monitor shall be mobilized to the location. No federal status wildlife or plant species shall be touched, picked up, harassed, and/or removed from the site by anyone unless otherwise authorized by the applicable resource agencies.

Nesting Birds for All Segments

- If work is scheduled to occur during the avian nesting season (February 15- September 1), nest detection surveys will be conducted no more than 15 days prior to initial work activities at designated construction areas to determine nesting status in the area. Nest surveys will be accomplished by ground surveys and will support phased construction, with surveys scheduled to be repeated if construction lapses in a work area for 30 days during this time. Nest surveys will follow standard biological survey methods, and survey efforts will be tailored by Project location, with visits planned at appropriate timeframes/intervals to detect nesting activity. In addition, biologists monitoring construction will conduct nest surveys and/or nest monitoring in areas adjacent to ongoing construction as directed to do so by the PG&E biologist. If nests are found, the Project biologist will establish an appropriate buffer to be in compliance with the Migratory Bird Treaty Act (MBTA) and Fish and Game Code 3503. PG&E will apply standardized species-specific no activity buffers developed as part of PG&E's avian management program. Active nests will be monitored and exclusion buffer sizes adjusted if the monitoring biologist determines this is necessary based on disturbance behavior exhibited by nesting birds in proximity to proposed Project construction. To prevent encroachment, the established buffer(s) will be clearly marked for avoidance. The established buffer(s) will remain in effect until the young have fledged or the nest is no longer active (containing eggs or young) as confirmed by the biologist

Pre-construction Tree Surveys and Tree Removal

- A qualified arborist would conduct a preconstruction tree survey of the oak woodland areas, recording diameter at breast height (DBH) information and identifying each tree to species. Any tree removal, pruning, or work within the drip line of trees, other than in paved areas, must be reviewed and approved by a PG&E-approved arborist or their designee. A PG&E-approved arborist will be required to conduct all tree trimming and removal.
- Tree removal is to be conducted outside of the bird nesting season to the extent possible. If this is not feasible, a qualified biologist will perform a preconstruction survey for active nests prior to tree removal. If an active nest of a special-status or Migratory Bird Treaty Act (MBTA) protected species is observed in the tree, the tree would not be removed until the bird has finished nesting.
- Additional measures (such as root pruning, monitoring, stump grinding) may be required by the arborist. Tree removal and pruning will follow GGNRA Sudden Oak Death (SOD) sanitation measures including disinfecting of tools and equipment and worker education.

Invasive Species Control

A Weed Management Plan was prepared by PG&E. SFPUC and GGNRA have reviewed and approved measures to reduce the potential introduction or spread of noxious weeds. This plan incorporates best management practices from *Preventing the Spread of Invasive Plants: Best Management Practices for Land Managers* (Cal-IPC 2012) and *Preventing the Spread of Invasive Plants: Best Management Practices for Transportation and Utility Corridors* (Cal-IPC 2012). Measures to be implemented include, but are not limited to the following:

- All equipment arriving onsite will be clean and free of soils and plant material. All equipment and material arriving on site will be clean and free of soils and plant material except for materials such as coir or fiber rolls which are made with plant material themselves; those will be kept clean of foreign plant material and soils. Two wash stations will be established near the work area access points to local roadways: one at the north end of the project near Bunker Hill Road and one at the south end of the project near the entrance. A wash station will also be established at an offsite staging area on Paul Scannel Drive, near the project site; when feasible, vehicles will preferably be washed at the Paul Scannel staging area prior to accessing the site. The entire work area is expected to be mowed or scraped prior to the start of construction. Areas that can be mowed rather than scraped will be identified during preconstruction meetings. Mowing will be conducted in sections prior to scraping to avoid spreading non-native annual grass propagules into the serpentine grassland. Areas that contain invasive weed species or are dominated by non-native species will be scraped and the topsoil handled as specified below to avoid the spread of non-native plant propagules.
- The topsoil, where scraping and excavation is necessary, shall be salvaged and stockpiled separately in upland construction work areas. Serpentine grassland topsoil will be salvaged and stockpiled separately from non-native grassland soil and clearly labeled. All topsoil shall be stored in such a way that it is protected from non-native plant propagules, but minimizes the risk of overheating and killing the native plant propagules.
- Only serpentine grassland topsoil will be spread in serpentine grassland areas. Once the salvaged topsoil has been spread and the area returned to the preexisting topography, the area will be revegetated.
- Prior to and during construction, where feasible (such as along the access road and at the Half-Moon Bay tap area), invasive weeds outside of the work area that have the potential to spread into the work area via wind-borne propagules will be controlled. Control will include mowing or cutting and disposal of propagules since soil disturbance outside of the work area is not allowed.

- Invasive weed identification and avoidance measures will be included in the preconstruction environmental tailboard meeting. The training will include field identification of invasive plants in the project area, reproductive biology of invasive plants, and invasive plant prevention Best Management Practices. The training will also include a summary of serpentine grassland, the rare plants associated with serpentine grassland, and threats to serpentine grassland including non-native annual grasses and forbs. The training will also include a summary of *Phytophthora*, its issues, spread, and Best Management Practices based on SFPUC's BMPS for Pathogens (SFPUC 2016).
- Boots (worn by restoration specialists during applicable work on FRFI salvage and restoration implementation involving seed and transplanting) and their hand-equipment such as shovels, spades, trowels, will also be brushed clean, washed in the vehicle wash station or prior to being brought on site, and sprayed with a 0.525% sodium hypochlorite concentrations (5000 ppm available chlorine) bleach solution or preferably a 70-90% ethyl alcohol (ethanol) or isopropyl alcohol (isopropanol) solution (such as Lysol disinfectant or a prepared solution) to sanitize the equipment for invasive plant and soil borne pathogen control.
- The project area and access routes will be periodically surveyed for invasive weeds throughout project construction so invasive weed species that were not detectable during the preconstruction surveys (because they germinate later in the season) will be detected. Invasive weeds that are detected in the work area will be removed and seeds or flowers will be placed in garbage bags and removed from the site. Invasive weeds adjacent to the work area will be mowed if feasible to minimize the risk of propagules entering the work area.
- All construction material sources will be weed-free. Only rice straw or weed-free straw or fiber roll logs will be used. For mulching after restoration seeding, weed-free rice straw or hydromulch will be used. Following construction, the site will be stabilized with appropriate weed-free erosion control materials.
- During restoration, the project area will be revegetated as soon as possible with locally collected materials to reduce the likelihood of invasive weed and non-native plant establishment. All restoration activities will follow the **Vegetation Restoration Plan** as described below for the project. All seed mixes will be weed free and will contain an analysis label detailing the contents of the seed mix. No vegetation restoration will be implemented on pre-existing access roads.
- As detailed in the **Vegetation Restoration Plan** below, the site will be monitored annually for five years. Monitoring will occur quarterly for the first two years and then annually at a minimum for the remainder of the monitoring period. Monitoring will be sufficient to demonstrate that the restoration site is on track to meet success criteria contained in this plan. During annual monitoring, the extent of invasive weed populations will be mapped and the cover of invasive weed species will be estimated. Data on the extent and cover of non-native grass and forb species will be collected annually for all five years. Success criteria will be used to measure the extent of restoration after five years. Success criteria as they relate to invasive weeds and non-native plants are as follows:
 - Data on plant species composition and cover will be recorded in the restored work areas and reference sites in both non-native annual grassland, serpentine grassland, and oak woodland. The location of reference sites will be selected prior to the start of construction based on similarity to the work area, mapped and provided to SFPUC and CDFW.
 - Species composition and cover values within the seeded areas will be comparable to the reference sites. Total cover and native cover of vegetation in the work areas will be at least 75 percent of total and native cover of reference sites. Species richness will also be measured in the work areas and reference sites. The data used for comparison will be collected during the same monitoring year (e.g. Year 1) and at the same time of year (sampled within a few weeks or when the conditions are phenologically appropriate for correct comparisons). Areas that were mapped as non-native grassland prior to construction (baseline conditions) will be compared to non-native grassland reference sites that were selected prior to the start of construction. Areas that were serpentine grassland prior to construction (baseline conditions) will be compared to serpentine grassland reference sites that were selected prior to the start of construction. The fire breaks that are disked annually by SFPUC will be exempt from continued management/monitoring after initial restoration.
 - Any infestations of invasive weeds that are not present in the adjacent reference sites or were not recorded in the work area prior to construction will be controlled. Areas that were non-native grassland prior to construction will be compared to non-native grassland reference sites that were selected prior to the start of construction. Areas that were serpentine grassland will be compared to serpentine grassland reference sites that were selected prior to the start of construction.
 - Any new species of invasive weeds that were not recorded during preconstruction surveys will be controlled. In areas that were serpentine grassland prior to construction, the total cover of non-native plant species will be no more than 120 percent of the total cover of non-native plant species in serpentine grassland reference sites.

- Annual monitoring reports shall be sent to the SFPUC and CDFW and data from the quarterly site visits will be made available to these agencies upon request.
- Invasive weed species will be removed and controlled in all revegetated areas during the five-year monitoring period as necessary to stay on track to meet success criteria. Non-native plant species, including annual grasses, will be controlled in serpentine grassland areas as necessary to keep the site on track to meet success criteria. The decision to control annual grasses will be based on the observations during early spring site visits and the results of spring data collection compared to reference and existing site data. If it is determined that invasive weeds or non-native grasses and forbs appear to be preventing the lessingia or fragrant fritillary restoration areas from meeting the performance criteria then additional non-native plant control in these areas may be necessary. Monitoring and control will target all invasive weed species including those known to occur in the immediate project vicinity as well as species not currently known from the site. Weed control activities may include hand weeding and timed mowing (using mowers and string lined trimmers) and will be based on the invasive weed or native species of concern.

Vegetation Restoration Plan (VRP)

A VRP for the Bunker Hill segment was prepared by PG&E. SFPUC, CDFW, and GGNRA have reviewed and approved the plan for restoring the areas disturbed during construction of the Bunker Hill segment. Separate restoration plans will be prepared for the Crystals Springs and Cañada Road segments. Measures to be implemented for the Bunker Hill segment in 2016 will include, but are not limited to the following:

- Mitigation will consist of at least a 1:1 ratio of onsite restoration of plant communities. All disturbed areas will be revegetated with locally collected native plant species. The revegetation goal is to return vegetation to as close to pre-construction conditions as possible with the exception of non-native trees and shrubs. In addition, the area near the centerline cannot be planted with trees or woody vegetation as required for pipeline safety. All revegetation will be accomplished by direct seeding grasses and forbs, and shrubs and trees as appropriate, with the exception of fragrant fritillary salvage in which dormant or nearly dormant bulbs would be removed prior to the start of construction, stored, and then replanted in the work area once construction is complete. To decrease the possibility of introducing pathogens (including *Phytophthora*) from a plant nursery to the site, container stock will not be used for revegetation. Areas where existing land management practices are not compatible with native plant restoration on those areas, such as the SFPUC fire break, will be exempt from continued management/monitoring after initial restoration. However, if there is a continued source of non-native invasive species which have a Cal-IPC Weed Ranking Definition of High (Cal-IPC 2016), targeted non-native invasive removal will occur annually within the project limits. No vegetation restoration will be implemented on pre-existing access roads.
- There are 24 native and 23 non-native or introduced trees that will be removed for project construction. Of the 24 native trees to be removed, all are coast live oak. Sixteen of the native trees are considered to be significant trees and 2 are considered to be heritage trees as defined in the San Mateo County Tree Ordinance. Of the 23 non-native or introduced trees to be removed, 17 are considered to be significant trees and none are considered to be heritage trees. Non-native or introduced tree species to be removed from the project site include Monterey pine (*Pinus radiata*), Italian stone pine (*Pinus pinea*), and Monterey cypress (*Hesperocyparis macrocarpa*). Tree trimming will be required where the tree canopy overhangs access roads or at other locations to provide equipment access. The degree of trimming is evaluated by a qualified arborist on a case by case basis; where trimming is considered likely to impact the health or stability of the tree, the tree is then included in those to be removed and it will not be left standing as a hazard tree. The information as to final counts of trimmed versus removed trees, which may vary slightly due to construction requirements, will be included in the As-Built information. Currently, 10 trees are planned for trimming.
- The number of trees removed will be tracked and confirmed prior to the implementation of restoration activities. The number of trees that are direct-seeded will be adjusted as necessary to achieve the final performance targets.
- Significant or Heritage Trees in the work area are defined in the San Mateo County Tree Ordinance. Removal of any Significant or Heritage Trees as well as any other Native oak trees will be replaced at a 3:1 ratio.
- A total of 3 acorns per tree will be used at each planting location. Removal of any other native or non-native trees will be replaced at a 1:1 ratio. With the exclusion of non-natives, replacement trees will be the same species as those removed. Trees will be direct-seeded rather than planted with container stock. Additional trees beyond those impacted will be direct-seeded to allow for some mortality and ensure replacement ratios are met after five years.
- Trees will be seeded outside of restricted areas near the pipeline centerline as required for pipeline safety (PG&E 2014). Due to this restriction, seeding of trees in narrow portions of the work area may be confined to the site periphery. However, to avoid unnatural, dense, linear plantings, trees will be seeded in a pattern and density that reflects the surrounding vegetation patterns and preexisting tree densities, as feasible. If insufficient room occurs in the work area due to pipeline safety standards, direct seeding of trees will need to be performed elsewhere

with CDFW approval. As necessary, other agreed-upon mitigation may be performed to meet revegetation goals commensurate with level of effort and expenditure associated with tree planting mitigation.

- Two special-status plant species were recorded within the planned work areas that will be impacted by the Bunker Hill segment construction: fragrant fritillary (*Fritillaria liliacea*; California Rare Plant Rank 1B.2) and Crystal Springs lessingia (*Lessingia arachnoidea*; California Rare Plant Rank 1B.2). The locations of fragrant fritillary plants were mapped again in March of 2016. No List 4 plants were found that would meet the locally rare criteria, and neither were any plant communities found that would be considered rare locally but common elsewhere.
- Marin western flax (*Hesperolinon congestum*, California Rare Plant Rank 1B.1, federally- and State- Threatened) and San Francisco wallflower (*Erysimum franciscanum*, California Rare Plant Rank 4.2) are situated in or near the project area but will be fully avoided through protective measures. One additional small population of Marin dwarf flax (comprising 150 individuals) was found during preconstruction surveys in May 2016. The work area will be modified to avoid this population. The HDD trenchless construction methods will be undertaken to avoid the HECO populations that are scattered in the HDD area.
- Separate memoranda have been prepared that detail salvage and revegetation methods, success criteria, monitoring, and reporting requirements for fragrant fritillary and Crystal Springs lessingia; these memoranda are included in the FMND, Appendix B and C. As described in Appendix C, the total number of Crystal Springs lessingia will also be re-confirmed in June 2016 and information will be submitted in an Addendum.
- The goal of fragrant fritillary salvage is to minimize impacts to fragrant fritillary within the work area. Salvaging and replanting the bulbs is believed to be the most successful salvage method as no existing documented methodology is available to reference since we were unable to find a single instance of this having been performed previously. Dormant or nearly dormant bulbs would be removed prior to the start of construction, stored, and then replanted in the work area once construction is complete.
- In order to restore impacted Crystal Springs lessingia habitat, seed that was collected in 2015 prior to the start of construction will be stored during construction and distributed in the work area once construction is complete. Seed was collected from the gas line pipeline right-of-way (ROW) and project work area on October 5 and 6, 2015. Seed was collected by collecting whole plants and putting them in paper bags. Inflorescences were stored indoors in paper bags for several weeks to allow seeds to further mature. Seeds were separated from other plant material (stems, inflorescence branches, and flowering parts) by hand sorting them in plastic containers. Seeds and fine chaff were stored in paper envelopes indoors in a cool, dry, dark storage room. The number of seeds collected and stored is estimated to be 35,000 seeds. Topsoil and surface material in occupied habitat will also be salvaged.
- In coordination with the PG&E biologist, a qualified botanist or restoration ecologist will oversee and monitor implementation of this plan. Qualified botanists or restoration ecologists will have a minimum of 5 years of experience working with native habitat restoration and be familiar with the flora of the SF Bay region.
- A minimum of two reference sites were chosen for each vegetation community to be impacted and restored (i.e., serpentine grassland and non-native annual grassland). Reference sites were chosen to be as similar as possible to the work areas. Reference sites for serpentine grassland that were sampled include an area west of the access road, an area north of the southern segment of the project, the undisturbed serpentine grassland area between the work area and access road, and an undisturbed serpentine grassland area between the disked fuelbreak and the work area. Non-native grassland reference sites that were sampled include an area at the southern end of Bunker Hill, the disked fuel break, and an area north of Bunker Hill.
- Observations of soil type will be collected at all excavation sites where restoration will occur, at roughly 30 meter intervals in serpentine sites and approximately 50 meter intervals in non-serpentine grasslands. In areas with homogenous soils, fewer samples will be collected (at intervals spaced more widely apart). If portions of the trench differ in soil type, more samples will be taken (narrower spacing) to capture the range of variation.
- The following construction methods will be implemented to successfully prepare the work area for revegetation activities:
 - Vegetation clearing (e.g., mowing, blading, grubbing) in natural vegetation will be limited to the minimum necessary to safely complete construction to preserve existing plants, seeds, and microorganisms. Areas that can be mowed rather than scraped will be identified during preconstruction meetings.
 - Tree and shrub removal will be minimized as much as possible. Shrubs and trees that must be removed for safe construction will be cut at ground level and excavated if necessary. Mulch from woody vegetation may be chipped and stored on-site (in disturbed non-native habitat or in coast live oak woodland). Mulched material will not be stored or spread in serpentine bunchgrass grassland.
 - Soil disturbance and transport will be minimized to the extent possible and topsoil will be managed. The topsoil, where scraping and excavation is necessary, shall be salvaged and stockpiled separately in upland construction work areas. Serpentine grassland topsoil will be salvaged and stockpiled separately and clearly

labeled.

- Following construction, the salvaged topsoil will be spread over the disturbed area from which it was removed, and the area will be graded to match as close to the pre-construction natural grade as feasible. Once the salvaged topsoil has been spread and the area returned to the pre-existing topography, the area will be revegetated.
- In areas that have a substantial population of non-native plant species (including fire breaks and access roads), the topsoil will be scraped and stockpiled separately taking care not to spread the topsoil and invasive weed propagules it contains. The topsoil will be stockpiled during construction activities and will be buried below the subsoil during backfill or off-hauled, and the soils from deeper in the trench placed on the surface. Areas where topsoil will be buried due to the presence of invasive weeds will be based on the species present and absolute cover. Two areas have been identified: one of French broom adjacent to a residence separated by the fire break from the serpentine grassland, and another of teasel adjacent to a coyote brush/poison oak thicket.
- After construction is completed, the spoils material will be returned to the trench, compacted as required to industry standard guidelines, and the contours returned to as close to pre-project conditions as possible. After final grading is complete, stockpiled topsoil will be spread over the full width of the scraped work area. Care will be taken to not compact the topsoil.
- If determined to be necessary by the Project Restoration biologist, portions of the site may be scarified to better prepare the site for seeding.
- Sites will be revegetated as soon as feasible after construction completion. Seeding will occur in the late fall and early winter, before the onset of or during winter rains, and no later than December 15, 2016, so that sufficient rainfall and appropriate temperatures are reached to trigger germination and support growth. This will avoid the need for irrigation in most cases. If project construction is completed at a different time of year, and seeding cannot occur in late fall or early winter, the site will be temporarily stabilized with BMPs or mulch and the site will be seeded the following late fall.
- To compensate for the additional temporal loss of habitat in the event that initial restoration is not completed by December 15, 2016, PG&E shall submit a mitigation proposal for the anticipated impact, i.e., anticipated date of restoration of serpentine habitat at the project site and resulting requirements for compensatory mitigation, for approval to CDFW within 60 days of start of construction.
- Custom collected and amplified seed will be used along with other seed with geographic and ecological origins as similar as possible to the project area. Grass and forb seed will be purchased from Pacific Coast Seed, S&S Seed, and Hedgerow Farms. Pacific Coast Seed custom collected seed from serpentine grassland and non-serpentine grassland habitats in 2014 and 2015 from a nearby PG&E right-of-way and they are currently amplifying this seed at the S&S Seed growing facility. This seed will be available for seeding in 2016. Seed of local origin is scarce and the seed mix will be limited by availability.
- Proposed seed mixes are subject to change based on recommendations by the PG&E biologist, site conditions, and seed availability. New seed mixes shall be approved by the PG&E biologist before purchase and application. Any changes in seed mix will be provided to CDFW and SFPUC for their review and approval. If comments from CDFW and SFPUC on seed mix changes are not received by PG&E within 3 weeks following submittal, it will be assumed that CDFW and SFPUC approve of the seed mix changes.
- Seeds may be sowed using hydroseeding in all vegetation types except serpentine bunchgrass grassland. The hydroseeding method uses the hydraulic application of a slurry of seeds, and mulch.
- Hydroseeding materials will be applied in three separate applications in order to increase the likelihood that the seeds are in contact with the soil and are lightly overlain with mulch, which increases seeding success.
- Serpentine bunchgrass grassland sites will be broadcast seeded. Hydroseeding is not recommended for serpentine sites as the addition of nitrogen (fertilizer) to serpentine habitats can negatively affect serpentine plant communities and can favor non-native plant species. Other vegetation types can be broadcast seeded instead of hydroseeded if desired.
- In all areas, a layer of protective mulch will be added to broadcast seeded areas, to conserve moisture, reduce soil erosion, and increase germination. In serpentine grassland areas, weed-free rice straw will be used, with test plots in flat areas comprising between 2% and 5% of total serpentine bunchgrass grassland left without straw to observe variations in success. Locations of these plots will be specified in reporting, and the project biologist may elect to modify the extent of rice straw usage in subsequent seeding on the basis of results. Such modifications shall be recorded. In other vegetation types, weed-free rice straw or hydromulch will be used. Straw will be applied at a rate of approximately 500 to 1,000 pounds per acre (depending on slope, exposure, and other permit requirements) and can be applied by hand or blown on.
- Woody species will be direct-seeded where necessary with locally-collected seed to meet replacement ratios for the removal of trees and to establish shrubs in coastal sage and coyote brush scrub vegetation.

- Trees will be seeded outside areas of restricted areas near the pipeline centerline as required for pipeline safety and will be seeded in a pattern and density that reflects the surrounding vegetation and preexisting tree densities. Due to this restriction, seeding sites may need to be moved to the site periphery or elsewhere outside the project area. Locations of these external plantings will be identified in the annual reports.
- The direct seeding palette was chosen based on dominant species present in the vegetation type and those species that have the highest rates of germination.
- Native trees that are removed will be replaced with the same species. Additional trees beyond those impacted will be direct-seeded to allow for some mortality and ensure a 3:1 replacement ratio for native oaks and a 1:1 replacement ratio for other native species after five years.
- Shrubs will not be replaced based on the number of shrubs removed; instead, the number of direct-seeded shrubs will be based on acreage of planting area and average spacing of planting. Shrubs will be planted in clusters, not evenly spaced throughout the planting area.
- Seeds will be collected from different trees and shrubs to ensure diversity. Seeds will be collected from healthy, vigorous, well formed, mature trees and shrubs, and isolated trees will be avoided.
- Acorns will be collected in early fall, several weeks after the first acorns have started to drop, and after the acorns on the tree can be dislodged easily from the acorn cap by gentle twisting. Collecting acorns from the ground will be avoided when possible. If acorns are collected from the ground they will be soaked in a 5% bleach solution for 1 minute. Immature acorns cannot be ripened artificially after removal from the tree; therefore, acorns will not be collected until they are ripe.
- Acorn caps will be removed before storage. All acorns will be stored in a cooler or refrigerator in partially open plastic bags, but will not be stored for more than 1 or 2 months before planting, to provide the greatest viability. The acorns will be checked regularly to make sure they are not drying out. If acorns start to germinate during storage, they will be removed and planted as soon as possible. If mold develops during storage and the acorns are discolored or slimy, the acorns will be discarded.
- Direct tree and shrub seeding will be done in the fall, after rainfall has moistened the soil, using locally collected seeds obtained during the previous spring, summer, and fall. Direct seeding should occur prior to the end of February; later seeding may require additional irrigation.
- Before planting, seeds, grasses and other low vegetation will be scraped in an approximate 3-foot-diameter area. If seeding is on a slope, a level planting site should be established. Depending on the size of the seed, 3 seeds (for the largest, such as acorns) to 20 seeds (for the smallest, such as coyote bush) will be planted. Small seeds will be lightly covered with soil, and large seeds like acorns will be placed 0.5 to 1.0 inch deep.
- After the seeds and protective herbivory hardware are installed, water will be applied slowly to the seeding site, so that all water percolates and no runoff occurs. Additional watering will be needed if rainfall is lower than average or seeding is performed outside the rainy season. The need for supplemental watering during the winter will be determined by the PG&E biologist.
- Direct seeded trees will be irrigated via hand watering using an aboveground temporary drip system to be designed by the installation contractor, or with the use of products such as DriWater. If a drip system is used, the system will be set to deep water intermittently. The direct seeding locations will be watered thoroughly when installed, and irrigated weekly to monthly depending on weather conditions. If DriWater is used (only after plants have germinated), the product will need to be replaced approximately every 60 days during the dry season. Shrubs will not receive irrigation unless the PG&E biologist determines irrigation is necessary based on planting times and rainfall patterns.
- Following revegetation, an as-built report will be prepared to document the completion of revegetation activities. The report will be provided to SFPUC and CDFW within 60 days after recontouring and seeding is complete. It will include a summary of: the total numbers of trees impacted (by species); acreages of each habitat type revegetated; numbers, species, and locations of direct seeded trees and shrubs; the species, application method and quantity of native plant seed broadcast; and photographs documenting the restoration. A map will be prepared showing the location of restoration activities. Any changes to activities specified in the Vegetation Restoration Plan will be noted and discussed in this as-built report. Actions to be undertaken in the following year including any additional seed collection or procurement may also be included in the as-built report.
- Success criteria will be used to measure the extent of revegetation after construction completion. At a minimum, the success criteria shall be met for the final 2 years of the monitoring period. If any of the listed criteria are not met by the end of the monitoring period, additional management and monitoring shall be required until the success criteria are met.
- For the last two years of the 5 year monitoring period after revegetation, recovery success criteria will be as follows:
 - Species composition and cover values within the seeded areas will be comparable to the reference sites. Total cover and native cover of work areas will be at least 75 percent of total and native cover of reference sites.

Species richness will also be measured in the work areas and reference sites. The data used for comparison will be collected during the same monitoring year (e.g. Year 1) and at the same time of year (sampled within a few weeks or when the conditions are phenologically appropriate for correct comparisons). Areas that were mapped as non-native grassland prior to construction (baseline conditions) will be compared to non-native grassland reference sites that were selected prior to the start of construction. Areas that were serpentine grassland prior to construction (baseline conditions) will be compared to serpentine grassland reference sites that were selected prior to the start of construction.

- A sufficient number of replacement trees are alive to meet the 3:1 replacement ratio for native oaks and 1:1 replacement ratio for other native species.
- Absolute cover of invasive weeds in the work area will be less than or equal to the reference sites. Any infestations of invasive weeds that are not present in the adjacent reference sites or were not recorded in the work area prior to construction will be controlled. Areas that were non-native grassland prior to construction will be compared to non-native grassland reference sites that were selected prior to the start of construction. Areas that were serpentine grassland will be compared to serpentine grassland reference sites that were selected prior to the start of construction.
- Any new species of invasive weed that was not recorded during preconstruction surveys will be controlled.
- In areas that were serpentine grassland prior to construction, the total cover of non-native plant species will be no more than 120 percent of the total cover of non-native plant species in serpentine grassland reference sites.
- A sufficient number of replacement trees are alive to meet the 3:1 replacement ratio for native oaks and 1:1 replacement ratio for other native species.
- Restored areas will be stable (i.e., no significant indicators will be noted during the monitoring period).
- The site will be monitored for a minimum of five years and newly planted trees will be monitored for a minimum of seven years. Monitoring site visits will occur quarterly for the first two years and then annually, at a minimum, for the remainder of the monitoring period. Vegetation cover data will be collected annually all five years. Monitoring will be sufficient to allow evaluation of ongoing restoration and its trajectory to meet success criteria contained in this plan. All monitoring will be conducted by a qualified biologist. Annual monitoring reports shall be sent to the SFPUC and CDFW and data from the quarterly site visits will be made available to these agencies upon request.
- Permanent photo-documentation points will be established in representative locations to document recovery. Additional photo points may be taken in representative areas and in potential problem areas where restoration success appears to be lagging or uncertain to meet success criteria. At each photo point, the location will be recorded with GPS coordinates. Once per year in spring, photographs will be taken from each photo point, using a digital camera.
- Data on plant species composition and cover will be recorded in the restored work areas and reference sites in both non-native annual grassland, serpentine grassland, and oak woodland. The location of reference sites will be selected prior to the start of construction based on similarity to the work area, mapped and provided to SFPUC and CDFW.
 - Plant species composition and cover data will be collected using randomly selected, independent sampling units (1 meter x 1 meter quadrats) within each habitat type within the disturbance area to be restored and the reference sites that were established prior to the start of construction. Cover estimation in quadrats was chosen as the sampling method in order to provide cover data and capture species richness. Random points, stratified by habitat type, will be generated using GPS and the sampling units (quadrats) will be placed randomly according to these points. The locations of the quadrats will be randomly selected each year; the location of plots are not permanent.
 - Within each quadrat, absolute cover of plants will be visually estimated and recorded for the quad as a whole (total vegetation cover) and for each individual plant species using the CNPS method for estimating cover values. The CNPS method for estimating cover values uses a “bird’s eye view” looking from above and estimating cover for the living plants only. Litter/duff should not be included in these estimates and the porosity of the vegetation should be taken into consideration when estimating percent cover. Percent cover diagrams (available on the CNPS Vegetation Program website) should be used to facilitate cover estimates. To ensure consistency and accuracy in cover estimation, prior to collecting cover data, the survey team will calibrate themselves by reviewing cover estimation methodology and conducting visual estimations over several quadrats together.
 - Total cover of vegetation, bare ground, thatch, and straw (restoration site only) will also be recorded. Total cover contributed by natives, total cover contributed by non-natives, cover contributed by invasive weed species, species richness, and other data as determined by the PG&E biologist will be calculated from this data. A power analysis will be used to determine the sample size required to statistically test the Year 5

performance criteria (total cover, native cover, invasive weed cover, and non-native plant cover) with a 95% confidence interval level [$\alpha = 5\%$, where α is the acceptable probability of incorrectly concluding the proportion is less (for total cover and native cover) or more (for non-native and invasive species) than the threshold]. The small size and variability of the restoration area and variability of the reference sites may prevent these statistically parameters from being met, however every effort will be made to conduct the sampling and analysis in a scientifically sound method. In an effort to balance sampling effort and scientific rigor, a maximum of 120 quadrats will be sampled in the work area and reference sites.

- In addition, the extent of invasive weed populations will be mapped using a high precision GPS unit to map the boundary of the weed population. Percent cover will be estimated for the population. A map will be included in the annual report.
- Sampling will be carried out annually in the spring and will be timed to ensure that vegetation is identifiable and has achieved its maximum growth.
- Plant survival will be measured for all of the direct-seeded trees, to determine that the replacement ratios have been attained. Heath and vigor ratings will also be recorded to track the health of the plantings but are not tied to project success. Once per year in the summer or early fall, all direct-seeded tree plantings will be counted, height measured, and a condition rating assigned. The general condition of each plant will be recorded using the following criteria:
 - Excellent: No evidence of stress; minor pest or pathogen damage may be present; no chlorotic leaves; no or very minor herbivory
 - Good: Some evidence of stress; pest or pathogen may be present; few chlorotic leaves (less than 10 percent); minor evidence of herbivory
 - Fair: Moderate level of stress; high levels of pest or pathogen damage; some chlorotic leaves (between 10 and 30 percent); some herbivory damage such as nipped leaves, wear marks
 - Poor: High level of stress; high levels of pest or pathogen damage; many chlorotic leaves (greater than 30 percent), severe herbivory damage
- Remedial efforts may include reseeding, weeding, and/or erosion control. Remedial measures will be implemented, after consultation with SFPUC and CDFW, if the annual success criteria target values are not met or if annual success criteria are being met but there are issues that may prevent the site from meeting future success criteria. Given implementation may be time sensitive, if no response has been received from either agency within 3 weeks, PG&E will implement the measures as planned. Remedial measures will be implemented for areas that have not achieved acceptable survivorship or vegetative cover compared to reference sites. All monitoring visits will include an evaluation of the need for remedial measures if necessary.
- Areas will be supplementally seeded if success criteria are not met or the site is not on track to meet success criteria in the future. Supplemental seeding maybe needed only on portions of the site if other portions are meeting success criteria. Rice straw may need to be moved if it is observed that germination or growth is being impeded. Based on monitoring data and seed availability, the PG&E restoration biologist will determine what species for revegetation should be used. All supplemental seeding will have to adhere to the guidelines presented in this plan. Should supplemental seeding and irrigation occur in the last two years of monitoring and reporting used to meet success criteria, a corresponding extension of the monitoring would occur for those areas. All planned supplemental seeding and maintenance actions will be reported to SFPUC and CDFW for review and approval. Given implementation may be time sensitive, if no response has been received from either agency within 3 weeks, PG&E will implement the measures as planned.
- Non-germinating seed or dead plants will be replaced as necessary to meet success criteria. Replacement shall not occur in the last two years of monitoring and reporting used to meet success criteria unless a corresponding extension of the monitoring occurs for those areas. The PG&E biologist will determine when reseeding is necessary and what species should be used. If certain species are not successful they will be replaced with other species.
- Invasive weed species will be removed and controlled in all revegetated areas during the five-year monitoring period as necessary to meet success criteria. Non-native plant species, including annual grasses, will be controlled in serpentine grassland areas as necessary to keep the site on track to meet success criteria. The decision to control annual grasses will be based on the observations during early spring site visits and the results of spring data collection. If it is determined that invasive weeds or non-native grasses are preventing the lessingia or fragrant fritillary restoration areas from meeting the performance criteria as described in Appendix B, then non-native plant species control in these areas may be necessary. Monitoring and control will target all invasive weed species including those known to occur in the immediate project vicinity as well as species not currently known from the site.
- At the end of each monitoring year, an annual report will be prepared that includes methods used, results of monitoring, photomonitoring photographs, representative photographs, a summary of reference and restoration

site data, an assessment of progress toward meeting success criteria, discussion of any remedial actions taken, recommendations, and implemented actions. Annual monitoring reports will be sent to SFPUC and CDFW by February 28 of the following year. Data from the quarterly site visits will be made available to these agencies upon request.

General Habitat Protection Measures

The following general habitat protection measures shall be implemented for the proposed project:

- Prior to construction, PG&E shall coordinate with the SFPUC to prepare and equipment and material arriving on site is clean and free of soils and plant material, and will include tire-wash requirements for equipment that has been driven off-road prior to arriving at the proposed project sites.
- Riparian and other wetland areas within the proposed project sites shall be denoted as environmentally sensitive areas and will be avoided during construction, to the extent practicable, or as otherwise directed by the regulatory agencies.
- Special-status plant colonies that have been identified for avoidance shall be fenced to prevent encroachment by construction activities.
- Crystal Springs lessingia individuals that cannot be avoided in areas to be cleared or grubbed shall have seed or vegetative material containing seed collected at the appropriate time, to be stored and distributed on top of the salvaged topsoil when it is redistributed.
- The topsoil from trenching through grasslands, and other plant communities with predominantly native plant species, shall be salvaged and stockpiled separately in upland construction work areas. Topsoil shall be stored in such a way that it is protected from invasive propagules, but does not overheat and kill off the native plant propagules. This shall include placing the stored topsoil where it is not in contact with non-native grassland soil and protecting it with weed-free straw mulch or other suitable cover. Following construction, the salvaged topsoil will be spread over the disturbed area from which it was removed, and the area will be graded to match the pre-construction natural grade. Once the salvaged topsoil has been spread and the area returned to the pre-existing topography, the area will be revegetated with locally collected (where possible) native grassland species. If topsoil in grasslands has a substantial population of non-native plant species, as identified in the Vegetation Restoration Plan, it may be buried below the subsoil during backfill, and the serpentine soils from deeper in the trench placed on the surface.
- Existing topography shall be restored to pre-project conditions to the extent possible. For herbaceous and grass-dominated riparian areas, it is expected that revegetation will naturally occur once the topography is restored using topsoil salvage requirements. Riparian areas will be revegetated with an appropriate mix of native plants, including species such as creeping wild rye, meadow barley, blue wild rye, arroyo willow, California bay, and coast live oak, as shall be detailed in the Vegetation Restoration Plan.

California red-legged frog (CRLF) and San Francisco garter snake (SFGS), Cañada Road Segment (this is the only segment with potential for impacting CRLF, SFGS, and habitat)

- Before the start of work, a USFWS-approved biologist shall identify acceptable locations to which California red-legged frog may be relocated if the species is encountered in a project work location.
- Prior to the start of any ground disturbing activities within the Cañada Road segment in habitat for CRLF, vegetation will be hand cleared to a height that allows for visual inspection of the ground. Ground-level vegetation including downed logs and duff that may provide cover for CRLF s and San Francisco garter snakes (SFGS) will be removed before using any hand tools (including weed eaters and chain saws) under the supervision of a qualified biologist. No vegetation cut in habitat will be stored on site; it will be off-hauled daily. Following vegetation removal, rodent burrows and other potential subterranean retreats within the proposed Project excavation area, and areas where work could result in the crushing of burrows in project impact areas identified to be potential habitat for CRLF and SFGS will be inspected for the presence of CRLF and SFGS. After inspection, a qualified biologist will excavate burrows and other potential subterranean retreats in these identified areas by hand unless otherwise directed by the USFWS.
- Each morning before the start of work at the Cañada Road segment, a biological monitor shall inspect proposed project work locations—including those for staged materials and equipment, excavations, and fencing—to verify that no listed species are present within designated work areas.
- Before moving vehicles and equipment that have been parked on site for more than 30 minutes, operators at the Cañada Road segment shall check beneath these vehicles/equipment and notify the biological monitor if any reptile or amphibian is observed.
- Before the start of any ground-disturbing activities at the Cañada Road segment, ground-level vegetation that may provide cover for California red-legged frog and San Francisco garter snake shall be removed from excavation areas, including trench and HDD work locations. Immediately before removal, the biological monitor

shall visually survey the area. Vegetation from station 125+00 to station 140+00 shall be cut using hand tools (including weed whackers and chain saws), and loose vegetation shall be removed to increase visibility. The biological monitor shall then visually survey the location a second time to verify that no listed species are present.

- Vegetation cleared from construction locations along the Cañada Road segment shall be loaded into containers. On-site chipping may be allowed, subject to approval by the landowner. No cleared vegetation in this area shall be stored on site, unless in a container.
- Rodent burrows, soil crevices, and other potential subterranean retreats in the Cañada Road segment shall be inspected for the presence of CRLF and SFGS. After inspection, a USFWS-approved biologist shall excavate burrows, soil crevices, and other potential subterranean retreats by hand—or as otherwise directed by the USFWS—to verify that no California red-legged frogs or San Francisco garter snakes are present. Burrow excavation shall take place between April 1 and October 15.
- At least 30 days prior to commencement of project activities, a Wildlife Exclusion Plan for the Cañada Road segment shall be submitted to the SFPUC for review.
- As detailed in the Wildlife Exclusion Plan, temporary wildlife exclusion fencing shall be installed within San Francisco garter snake habitat—as determined by the PG&E biologist—along the edge of the Cañada Road segment construction work areas and access roads. The fencing, which can be made of wood, geotextile fabric, or other durable material, shall be a minimum of 3 feet in height and shall be buried at least 6 inches underground. In areas where this is infeasible, (such as on asphalt), alternative measures will be developed. Gates shall be installed to allow vehicles to enter from access roads. These gates shall be kept closed to the extent practicable during construction activities, and they shall be closed at the end of each workday. Exit funnels shall be installed every 100 feet, or where appropriate (determined by the PG&E biologist), to allow small vertebrates to leave work locations unharmed. A qualified biological monitor shall be on site during installation of the fencing to ensure that the fencing is installed as required. Relocation of federally listed species can only be done if authorized by the USFWS. Relocation of state-listed species can only be done if authorized by the CDFW. Once exclusion fencing is in place, it shall be maintained by PG&E via their contractor until all work within the enclosure has been completed. During construction activities, the biological monitor shall inspect the exclusion fencing each morning before the start of work and again at the end of each workday. Any damaged areas shall be reported to PG&E and shall be repaired by the contractor as soon as practicable. After construction is complete, the exclusion fencing shall be removed under supervision of a qualified biologist.
- Vegetation removal within San Francisco garter snake habitat along the Cañada Road segment shall take place between June 1 and October 15, to the extent feasible, so that any San Francisco garter snakes present can find a suitable alternative winter retreat before the onset of cold-weather conditions. Once these activities are completed, temporary wildlife exclusion fencing shall be installed around construction work areas and shall be maintained to prevent the re-entry of California red-legged frog and San Francisco garter snake.
- Prior to dewatering trenches along the Cañada Road segment, these locations shall be visually surveyed by the biological monitor for the presence of San Francisco garter snake and California red-legged frog adults, egg masses, and tadpoles. Pumps used for dewatering shall be equipped with a mesh screen to help prevent the entrainment of California red-legged frog and San Francisco garter snake. Dewatering shall not take place during the California red-legged frog breeding season (December through March) if egg masses are present in aquatic habitats. Thirty days prior to commencement of project activities, PG&E shall submit a plan detailing the water-diversion method to the SFPUC for review.
- The limits of the access roads shall be staked and flagged or fenced so that vehicle traffic is confined to the designated areas.
- Speed limit signs shall be posted along the access roads within the entrances to designated construction work areas. All vehicles must adhere to a 15 mile-per-hour (mph) speed limit on access roads within the proposed project areas, or as otherwise required through agency or SFPUC permits.
- Signs shall be posted notifying all personnel of the potential presence of sensitive species on the access roads for the Cañada Road segment.
- The total area of construction activities shall be limited to the minimum necessary within the designated construction work areas to achieve the goal of the proposed project. All environmentally sensitive areas outside of designated construction work areas and access routes shall be avoided.
- All steep-walled excavations more than 2 feet deep shall be either covered at the end of each work day or equipped with one or more escape ramps positioned at no greater than a 45-degree angle, so that wildlife will not become entrapped. All open excavations shall be inspected for wildlife at the beginning of each day, before the start of work. Other entrapment hazards that are shallower than 2 feet will be identified by the biological monitor, and measures will be taken to prevent entrapment (i.e., installation of covers or placement of escape methods, such as a branched object).

- All fueling and maintenance of vehicles and other equipment shall occur at least 100 feet from any riparian habitat or water body, unless a shorter distance is agreed to by the regulatory agencies or SFPUC due to specific site conditions. Before the start of project construction, PG&E shall develop a prompt and effective response to any accidental spills. All workers shall be informed of the importance of preventing spills and the appropriate measures to take if a spill occurs.
- Erosion-control materials that do not pose an entrapment hazard to reptiles and amphibians shall be used. Plastic monofilament netting (e.g., matting, fiber rolls, wattles, silt fence backing) shall not be used.
- Following the completion of construction activities, areas with listed species habitat that are subject to ground disturbance will be restored pursuant to the Vegetation Restoration Plan.
- If a San Francisco garter snake is found in a work location during proposed project activities, the individual shall be allowed to move out of the area on its own volition, as determined and monitored by the biological monitor.
- If CRLF is found inside an exclusion fence or in another work location where it may be harmed, it shall be moved to a previously identified relocation area under the procedure outlined in permits obtained from regulatory agencies. Only USFWS-approved biologists shall be allowed to handle, transport, and relocate CRLFs.
- The USFWS-approved biologist shall ensure that any CRLFs are relocated to an area where they are not imperiled by predators or other dangers.

Pallid bat, Crystal Springs and Cañada Road segments

The Crystal Springs and Cañada Road segments contain trees and habitat that are potentially suitable for use as daytime roosting and foraging for pallid bats. To avoid potentially adverse impacts on pallid bats, trees shall be evaluated for their potential to serve as maternity or daytime roosts. A qualified biologist (i.e., one familiar with the identification of bats and signs of bats) shall identify trees that might be potential day or maternity roosts. Prior to start of construction, a qualified biologist shall perform a survey for roosting bats or maternity colonies at the proposed project sites. Surveys shall focus on trees slated for removal and shall evaluate the probability for trees to host roosting bats. If day-roosting bats are found or evidence of use by bats is present, the following procedures shall be implemented before felling the tree:

- Trees shall be removed under warm conditions. Noise and vibrations—including running a chainsaw and making shallow cuts in the trunk (where bark has been), and striking the tree base with fallen limbs or tools, such as hammers—shall be created on the tree itself. Disturbance shall be near-continuous for 10 minutes, and then another 10 minutes shall pass before the tree is felled. When cutting sections of the trunk, if any hollows or cavities (such as woodpecker holes) are discovered, they shall be carefully checked for the presence of bats. Cutting shall be done slowly and carefully at all times. If possible, the trunk shall be sectioned near cavities to focus noise and vibrations, and hollows shall be opened by sectioning off a side.
- Additional measures may include monitoring trees, excluding bats from a tree until it is removed and/or restricting the timing of tree removal, and using a construction buffer to avoid disturbance of breeding colonies or disturbance of young before they are able to fly (for pallid bats, this period is between April and August).

San Francisco Dusky-footed Woodrat

Prior to and during construction, before any clearing of, or work within, riparian, oak woodland, or coyote brush scrub habitat, a qualified biologist shall conduct a survey for San Francisco dusky-footed woodrat nests no more than 30 days prior to the start of construction in that area. Where nests are found, the following procedures shall be observed:

- If practicable, exclusion fencing shall be installed and a buffer of at least several feet around nests shall be maintained, and moving or bumping the nests—or logs or branches on which the nests rest—shall be avoided.
- If avoidance of nests is not practicable, CDFW shall approve any relocation and post monitoring plan. This plan shall include the following, although CDFW could require additional measures:
 - Woodrat houses shall be live-trapped each night until the project is complete.
 - If no woodrat are captured at a given house, the house will be slowly dismantled by hand so that it is not reoccupied.
 - Captured woodrat will be contained in shaded traps while the stick house is dismantled and the artificial shelter is installed. Each artificial shelter will be installed within approximately 50 to 200 feet of the capture location. Only occupied woodrat houses will be replaced with an artificial shelter, however all stick houses will be disassembled to prevent woodrat occupation of unused houses.
 - At the request of CDFW, remote cameras will be used to monitor five of the artificial shelters for at least one week; if the site is secure, the cameras may be left for approximately 30 days.
 - A post-construction survey will be made at approximately one month following the trapping effort to determine activity at each artificial shelter. Within 60 days of the first post-construction survey, a report will be prepared for the ERO and CDFW in standard CDFW format that details the results of the live-trapping and initial monitoring of the artificial shelters, including results from the camera monitoring.

Fragrant Fritillary Protection Measures

- A qualified biologist shall conduct surveys for fragrant fritillary within suitable habitat of the Cañada Road and Bunker Hill segments in the same year prior to construction and during the appropriate blooming period, to ensure that any plants that were not blooming during previous surveys are identified, as well as to obtain specific locations of previously identified plants. Prior to surface-disturbing activity, the locations of individuals within the construction work area shall be flagged and documented in the field using a sub-meter accuracy global positioning system (GPS) unit. The extent of the colonies shall be staked and marked in the field, and their boundaries collected using a sub-meter accuracy GPS.
- Bulbs and seeds shall be collected by hand prior to mechanical topsoil salvage. Biologists shall record the approximate average depth at which bulbs are collected so that they can be replanted at the same average depth during site restoration. Topsoil salvaged from these areas shall be stored separately from other materials. Any bulbs exposed during the stripping of topsoil, as described in M-BI-1f, Habitat Protection Measures, shall be collected and stored until construction is complete. After collection, bulbs and seeds shall be stored in a cool and dry location.
- Colonies removed during construction shall be restored. The restoration area for a colony shall be the extent of the removed colony, unless otherwise specified through agreement between the SFPUC and PG&E prior to restoration. If bulbs and seeds cannot be replanted by November 1, they will be properly stored and replanted the following fall, September 1 to October 31.
- The Vegetation Restoration Plan shall contain the following specific monitoring and performance criteria for the restoration of fragrant fritillary:
 - Areas replanted with fragrant fritillary bulbs and seeds shall be monitored for a minimum period of 5 years.
 - Flowering fragrant fritillary shall be censused annually within the work area and an adjacent reference population. The number of detectable fragrant fritillary in leaf and/or flower is expected to vary in the work area and in the reference site from year to year, depending on precipitation, herbivory and other ecological variables.
 - Restoration will be considered to have been a success if, in addition to success criteria identified for the overall vegetation restoration area, for the final period of 2 years of monitoring, the number of individual fragrant fritillary in the restoration area is at least 70 percent of the number censused in the construction work area during the 2015 blooming season (350 plants), as adjusted annually based on reference site plant counts. The numbers of fragrant fritillary counted in the reference population each year will be compared to the 2015 pre-construction reference population number to adjust the yearly plant targets. For example, if only half of the plants known to occur in the undisturbed reference population are present in any given year, the target number of plants for the reestablished population in the work area will be adjusted (lowered) proportionately.
 - If the number of plants does not reach the performance criterion or if data from earlier years suggest the site is not on a trajectory to meet this success criterion, then adaptive management actions will be developed and supplemental activities may be performed. These could include supplemental salvage and transplantation, seed collection and plant propagation (on site only), or seed collection and direct sowing.

Marin Western Flax, Bunker Hill and Crystal Springs Segments

- A qualified biologist shall flag the Marin Western Flax populations with highly-visible flagging prior to work. Only approved work areas and access will be used by all vehicles, equipment, and personnel for staging, and work activities. On the Bunker Hill Segment a population will be avoided through use of HDD boring underneath the population. On Crystal Springs, the populations will either be avoided through fencing, bored under, or otherwise as approved by the resource agencies. Marin western flax will be avoided to the greatest extent practicable.
- Before vehicles are brought onto work sites, they shall be cleaned of weeds, seeds, and soil by hand washing, power spraying, dry brushing, compressed air, hand picking, etc. Vehicles parked in areas with invasive weeds will also be cleaned before driving in areas with sensitive plants.
- Project activities will minimize foot traffic and disturbance to the amount required to perform work safely.

White-rayed Pentachaeta, Bunker Hill and Crystal Springs Segments

- A qualified biologist shall flag work areas and access routes with highly-visible flagging prior to work. Only approved work areas and access will be used by all vehicles, equipment, and personnel for staging, and work activities.
- Before vehicles are brought onto access roads, they shall be cleaned of weeds, seeds, and soil by washing, power spraying, dry brushing, compressed air, hand picking, etc. Vehicles parked in areas with invasive weeds will also be cleaned before driving through the sensitive plant areas.
- Prior to workers walking to work sites, all workers shall be required to inspect boots, tools, and clothing and will be required to remove weeds, seeds, and soil. Project activities will minimize foot traffic and disturbance to the extent practicable.

Crystal Springs Fountain Thistle, Crystal Springs, and Bunker Hill Segments

- A qualified biologist shall place signage near the fountain thistle populations. High-visible flagging or exclusion fencing may be applicable. Only approved work areas and access will be used by all vehicles, equipment, and personnel for staging, and work activities. Work areas and access routes will be designed to avoid Crystal Springs fountain thistle to the greatest extent practicable.
- Crystal Springs fountain thistle mitigation areas will either be fenced off as avoidance areas or training and signage will be placed to ensure no impacts to these areas at the direction of the PG&E biologist.
- Before vehicles are brought onto work areas, they shall be cleaned of weeds, seeds, and soil by washing, power spraying, dry brushing, compressed air, hand picking, etc.
- Project activities will minimize foot traffic and disturbance to the extent practicable.

Mission blue butterfly (MBB), Crystal Springs Segment

- No more than two weeks prior to the onset of work activities (including equipment mobilization) and immediately prior to commencing work, a qualified biologist shall verify avoidance of lupine phenology and butterfly flight season and shall survey grassland habitat in the project area for Mission blue butterfly and its larval host plant. Host plants identified within the project boundaries shall be fenced or flagged.
- Only approved work areas and access will be used by all vehicles, equipment, and personnel for staging and work activities. Work areas and access routes will be designed to avoid MBB host plants to the maximum extent practicable
- Temporary fencing shall be installed around the workspace perimeter, and for 100 feet along Golf Course Drive on each side of the workspace, to prevent equipment parking off the road. The fencing shall remain in place until the completion of construction adjacent to lupine patches.
- All workers shall receive educational awareness training about Mission blue butterfly, its food plants, and its habitat.
- If a qualified biologist observes emergent or flighted MBBs within the work area, the project's PG&E Biologist will be notified.
- Before vehicles drive on access roads in MBB suitable habitat, they shall be cleaned of weeds, seeds, and soil by washing, power spraying, dry brushing, compressed air, hand picking, etc. Vehicles parked in areas with invasive weeds will also be cleaned before driving through MBB suitable habitat.
- Prior to walking to work sites in MBB suitable habitat, all workers shall be required to inspect boots, tools, and clothing and will be required to remove weeds, seeds, and soil.
- Topsoil shall be segregated during excavation and placed back on the surface upon completion of work to maintain the seed-bank of dormant host plant species seeds in the soil unless the area contains a high proportion of non-native species in which case the topsoil will be placed in the trench to prevent the spread of weeds.

Cultural Resources**Ground Disturbing Activities**

- If PG&E revises the location of ground-disturbing activities that affect areas beyond those surveyed for this EA, those areas will be subjected to a cultural resources inventory to ensure that any newly identified sites are not subject to ground-disturbing activities.

Unanticipated Discoveries

- PG&E shall inform and train all construction personnel on identification of cultural resources and the procedures to follow in the event of an unanticipated discovery.

Potentially Significant Prehistoric or Historic Resources

- PG&E will minimize or avoid impacts to any potentially significant prehistoric and historic resources that might be discovered during construction by implementing standard protocols that include ceasing all work within 50 feet of the discovery, protecting the discovery from further impacts, and immediately contacting a PG&E Cultural Resources Specialist. This requirement is described in Section II of the PA.

Archeological Monitoring

- The following measures shall be undertaken to avoid any potentially significant adverse effect from the proposed project on buried or submerged historical resources within areas of moderate and high sensitivity for buried resources. The project sponsor shall retain the services of an archeological consultant from the rotational Department Qualified Archeological Consultants List (QACL) maintained by the SF Planning Department archeologist. The project sponsor shall contact the Planning Department archeologist to obtain the names and contact information for the next three archeological consultants on the QACL. The archeological consultant shall undertake an archeological monitoring program. All plans and reports prepared by the consultant, as specified herein, shall be submitted first and directly to the SF Planning Department Environmental Review Officer (ERO) for review and comment, and shall be considered draft reports subject to revision until final approval by the

ERO. Archeological monitoring and/or data recovery programs required by this measure could suspend construction of the project for up to a maximum of 4 weeks. At the direction of the ERO, the suspension of construction can be extended beyond 4 weeks only if such a suspension is the only feasible means to reduce potential effects on a significant archeological resource.

Archeological Monitoring Program (AMP)

- The archeological consultant, project sponsor, and ERO shall meet and consult on the scope of the AMP reasonably prior to any project-related ground-disturbing activities. The ERO—in consultation with the project archeologist—shall determine which project activities shall be archeologically monitored. In most cases, any ground-disturbing activities—such as demolition, foundation removal, excavation, grading, utilities installation, foundation work, driving of piles (foundation, shoring, etc.), site remediation, etc.—shall require archeological monitoring because of the potential risk that these activities pose to archeological resources and to their depositional context. The results of this meeting, including the schedule, shall be documented in a brief monitoring plan that shall be distributed to the ERO, project sponsor, and the archeological consultant.
- The archeological consultant shall advise all project contractors to be on the alert for evidence of the presence of the expected resource(s), of how to identify the evidence of the expected resource(s), and of the appropriate protocol in the event of apparent discovery of an archeological resource.
- The archeological monitor(s) shall be present at the project site according to a schedule that is agreed upon by the archeological consultant and the ERO until the ERO has, in consultation with the archeological consultant, determined that project construction activities would have no impact on significant archeological deposits.
- The archeological monitor shall record and be authorized to collect soil samples and artifactual/ecofactual material, as warranted for analysis.
- If an intact archeological deposit is encountered, all soil-disturbing activities in the vicinity of the deposit shall cease. The archeological monitor shall be empowered to temporarily redirect demolition/excavation/pile driving/construction crews and heavy equipment until the deposit is evaluated. If in the case of pile-driving activity (foundation, shoring, etc.), the archeological monitor has cause to believe that the pile-driving activity may affect an archeological resource, the pile-driving activity shall be terminated until an appropriate evaluation of the resource has been made in consultation with the ERO. The archeological consultant shall immediately notify the ERO of the encountered archeological deposit. The archeological consultant shall, after making a reasonable effort to assess the identity, integrity, and significance of the encountered archeological deposit, present the findings of this assessment to the ERO.

Consultation with Descendant Communities

- On discovery of an archeological site associated with descendant Native Americans or other appropriate descendent group, an appropriate representative of the descendant group and the ERO shall be contacted. The representative of the descendant group shall be given the opportunity to monitor archeological field investigations of the site and to consult with the ERO regarding appropriate archeological treatment of the site, of recovered data from the site, and, if applicable, any interpretative treatment of the associated archeological site. A copy of the Final Archeological Resources Report shall be provided to the representative of the descendant group.
- If the ERO, in consultation with the archeological consultant, determines that a significant archeological resource is present and that the resource could be adversely affected by the proposed project, at the discretion of the project sponsor, either:
 - the proposed project shall be re-designed so as to avoid any adverse effect on the significant archeological resource; or
 - an archeological data recovery program shall be implemented, unless the ERO determines that the archeological resource is of greater interpretive than research significance and that interpretive use of the resource is feasible.
- If an archeological data recovery program is required by the ERO, the archeological data recovery program shall be conducted in accord with an archeological data recovery plan (ADRP). The project archeological consultant, project sponsor, and ERO shall meet and consult on the scope of the ADRP. The archeological consultant shall prepare a draft ADRP that shall be submitted to the ERO for review and approval. The ADRP shall identify how the proposed data recovery program will preserve the significant information that the archeological resource is expected to contain. That is, the ADRP will identify what scientific/historical research questions are applicable to the expected resource, what data classes the resource is expected to possess, and how the expected data classes would address the applicable research questions. Data recovery, in general, should be limited to the portions of the historical property that could be adversely affected by the proposed project. Destructive data recovery methods shall not be applied to portions of the archeological resources if nondestructive methods are practical.
- The scope of the ADRP shall include the following elements:
 - Field Methods and Procedures. Descriptions of proposed field strategies, procedures, and operations.

- Cataloguing and Laboratory Analysis. Description of selected cataloguing system and artifact analysis procedures.
- Discard and Deaccession Policy. Description of and rationale for field and post-field discard and deaccession policies.
- Interpretive Program. Consideration of an on-site/off-site public interpretive program during the course of the archeological data recovery program.
- Security Measures. Recommended security measures to protect the archeological resource from vandalism, looting, and non-intentionally damaging activities.
- Final Report. Description of the proposed report format and distribution of results.
- Curation. Description of the procedures and recommendations for the curation of any recovered data having potential research value, identification of appropriate curation facilities, and a summary of the accession policies of the curation facilities.

Human Remains, Associated or Unassociated Funerary Objects

The treatment of human remains and of associated or unassociated funerary objects discovered during any ground-disturbing activities shall comply with applicable state and federal laws, including immediate notification of the coroner of the County of San Mateo and, in the event of the coroner's determination that the human remains are Native American, notification of the California Native American Heritage Commission, who shall appoint a most likely descendant (MLD) (Public Resources Code Section 5097.98). The archeological consultant, project sponsor, landowner, and MLD shall make all reasonable efforts to develop an agreement for the treatment of, with appropriate dignity, human remains and associated or unassociated funerary objects (CEQA Guidelines Section 15064.5[d]). The agreement should take into consideration the excavation, removal, recordation, analysis and curation (as appropriate), possession, and final disposition of the human remains and associated or unassociated funerary objects.

Final Archeological Resources Report

- The archeological consultant shall submit a Draft Final Archeological Resources Report (FARR) to the ERO that evaluates the historical significance of any discovered archeological resource and describes the archeological and historical research methods employed in the archeological testing/monitoring/data recovery program(s) undertaken. Information that may put at risk any archeological resource shall be provided in a separate removable insert within the draft final report.
- Copies of the Draft FARR shall be sent to the ERO for review and approval. Once approved by the ERO, copies of the FARR shall be distributed as follows: California Archeological Site Survey NWIC shall receive one copy and the ERO shall receive a copy of the transmittal of the FARR to the NWIC. The Environmental Planning division of the Planning Department shall receive one bound; one unbound; and one unlocked, searchable PDF copy on CD of the FARR along with copies of any formal site recordation forms (CA DPR 523 series) and/or documentation for nomination to the National Register of Historic Places/California Register of Historical Resources. In instances of high public interest or interpretive value, the ERO may require a different final report content, format, and distribution than that presented previously.

Unanticipated Discoveries for Human Remains

- In the unlikely event that human remains or potential human remains are uncovered during construction, the find shall be secured and the project Head Foreman and/or PG&E shall immediately notify the ERO and suspend any ground-disturbing activities within 100 feet, or a distance recommended by the monitor, of the discovery until the ERO has determined what additional measures should be undertaken.
- If the remains are not human, the ERO shall determine whether the find represents an archeological deposit and whether the Mitigation Measure identified under Archeological Monitoring above applies. If the remains are human, the ERO shall immediately implement the applicable state law, which can be found in Sections 5097.9 through 5097.996 of the Public Resources Code. This shall begin with the immediate notification of the San Mateo County Coroner. All archeological work conducted under this mitigation measure shall be subject to review by the ERO or designee.

Tribal Cultural Resources Interpretive Program

If the Environmental Review Officer (ERO) determines that preservation-in-place of previously unidentified archeological resources pursuant to the Archeological Monitoring Mitigation Measure above is not a sufficient or feasible option, and if in consultation with the affiliated Native American tribal representatives, the ERO determines that the resource constitutes a TCR, the project sponsor shall implement an interpretive program of the TCR in consultation with affiliated tribal representatives. An interpretive plan produced in consultation with the ERO and affiliated tribal representatives, at a minimum, and approved by the ERO would be required to guide the interpretive program. The plan shall identify, as appropriate, proposed locations for installations or displays, the proposed content and materials of those displays or installation, the producers or artists of the displays or installation, and a long-term maintenance program. The interpretive program may include artist installations, preferably by local

Native American artists, oral histories with local Native Americans, artifacts displays and interpretation, and educational panels or other informational displays.

Geology, Mineral Resources, and Soils

Paleontological Resources Discovered During Construction.

If construction crews discover fossils or fossil-like material during excavation and/or earthmoving operations, all earthwork and other types of ground disturbance within 50 feet, or as recommended by the paleontologist, of the find shall stop immediately until a qualified paleontologist—as defined by the Society of Vertebrate Paleontology guidelines—can assess the nature and importance of the find. Based on the uniqueness of the find, the qualified paleontologist may record the find and allow work to continue, or recommend salvage and recovery of the fossil. If required, treatment for fossil remains may include preparation and recovery of fossil materials so that they can be housed in an appropriate museum or university collection, and may also include preparation of a report describing the finds. Fossil remains collected during monitoring and/or salvage shall be cleaned, repaired, sorted, cataloged, and deposited in a scientific institution with permanent paleontological collections, and a paleontological report shall be written. The paleontologist's recommendations shall be subject to review and approval by the ERO or designee.

Soundscapes

Install Sound Barrier Wall

- A 20-foot-high sound barrier—consisting of transportable wall with acoustical absorptive fiber fill or foam panel inserts—shall be used during daytime and nighttime construction activities to shield HDD equipment from nearby noise-sensitive uses at the Bunker Hill entry and exit locations, such that daytime and nighttime noise levels at nearby sensitive receptors are reduced. This sound barrier wall shall be long enough to block the line-of-sight between the noise-generating equipment and receptors.
- Although all HDD activities are expected to occur during the daytime hours, there is a possibility that the work may be required to extend into the evening/nighttime hours. PG&E's Mitigation Measure to Install Sound Barrier Wall would reduce the daytime and nighttime noise levels at nearby residences as much as feasible. However, even with a 20-foot-high barrier wall in place, the noise level to some of the nearest residences would remain above the nighttime exterior threshold. Therefore, PG&E would also implement a Mitigation Measures to Notify Nearby Residents of HDD Activities, which would include notification of residents both two weeks and one day prior to the daytime and nighttime HDD work, and a Mitigation Measure to Temporarily Relocate Nearby Residents from Nighttime HDD Activities, in which PG&E would offer to relocate homeowners with special medical conditions to a nearby hotel during the potential one night of HDD work.

Notify Nearby Residents of HDD Activities

PG&E shall notify residents that may experience sound levels above 70 dBA during daytime drilling and above 50 dBA during nighttime drilling at the Bunker Hill segment—based on modeling results—in writing two weeks prior and again one day prior to daytime and potential nighttime HDD activities.

Temporarily Relocate Nearby Residents from Nighttime HDD Activities

For the limited locations where PG&E is unable to mitigate noise through resident notification, PG&E shall, on a case-by-case basis when there are special circumstances, such as those residents with verified special medical conditions, offer to temporarily relocate residents to a nearby hotel for the one night of potential HDD activities.

Visitor Use and Experience

Reduce Noise, Dust, and Traffic-Related Impacts During Previously Scheduled Special Events

PG&E would provide notice to the public of the construction timeframe and potential construction-related impacts. PG&E would prepare a Traffic Control and Safety Plan to minimize potential impacts.

Reduce Road Debris for Bicycle Sunday Events

PG&E would provide street sweeping with water sweepers as necessary to clear excess debris from roadways prior to each Bicycle Sunday Event during the construction period. No construction work would be permitted on Sundays.

Reduce Road Debris and Other Potential Construction Equipment Traffic Related Hazards

PG&E would provide street sweeping with water sweepers as necessary to clear excess debris from roadways. Construction equipment and vehicles entering and exiting the project site along Cañada Road will be cautious of bicyclists and other recreationists, and use adequate traffic control measures to alert recreationists of their presence. As part of a Traffic Control and Safety Plan, traffic on Cañada Road along the project route may be restricted and PG&E would install temporary road signs to encourage motorists and other users to share the road.

Visitor Health and Safety

Notify and Consult with Affected Schools

- PG&E shall provide written notification of the proposed project to schools located within 0.25 mile of the project site, including West Hillsborough Elementary School and Highlands Elementary School. PG&E also shall consult with appropriate school or district personnel about the types of construction activities that shall occur and the estimated timing of such activities, as well as provide examples of the types of hazardous materials that could be used during construction activities.

Fire Avoidance and Suppression

- PG&E shall clear trees and shrubs in accordance with utility corridor standards, which include no structures or trees within a 20-foot pipe zone (10 feet on each side of the pipeline). On-site chipping may be allowed, subject to approval by the landowner. If chipping is allowed, all debris less than 6 inches in diameter shall be chipped by the PG&E contractor if the site is within 100 feet of a service road. Chips shall be broadcast or hauled away. All wood from trimming and removals that is larger than 16 inches in diameter may be left on site in lengths of 8 feet or less. Tree debris less than 16 inches in diameter that is not chipped shall be hauled away. Project personnel shall be directed to drive on areas that have been cleared of vegetation; park away from dry vegetation; and carry water, shovels, and fire extinguishers in times of high fire hazard. PG&E shall also prohibit trash burning, and no smoking is permitted within SFPUC Watershed lands. Additionally, clearly marked fire-suppression materials and equipment shall be stored adjacent to all work areas and within staging areas.
- PG&E and/or its contractor shall contact the SFPUC Natural Resources and Lands Management Division (NRLMD) Watershed Forester 24 hours in advance of work to confirm that conditions are suitable for construction. In addition, the project sponsor and/or its contractor shall submit fire prevention measures, particularly for any hot work (e.g., welding), to the NRLMD Watershed Forester for review and approval. During construction, the project sponsor and/or its contractor shall contact the National Weather Service daily to confirm that local weather conditions are suitable for construction activity. The project sponsor and/or its contractor will cease all construction activities during red flag days (high fire hazard periods) or if directed to do so by the NRLMD Watershed Forester.

Visual Resources**Best Management Practices**

- Limited clearing of vegetation in temporary work areas, particularly large oak trees
- Brush hogging/mowing of vegetation in temporary work areas
- Overland travel where possible rather than grading of temporary access routes
- Irregular graded edges rather than straight lines
- Organically shaped work spaces rather than straight lines and sharp corners

Nighttime Lighting

Construction lighting shall be shielded and directed specifically onto work areas to minimize light spillover, away from sensitive receptors such as the residences and open spaces adjacent to the project areas.

Proposed action, 4B and 4D replacement, future projects

- Blend facilities into the landscape by using context sensitive paint to screen these facilities
- Carefully plan vegetation clearing within temporary work zones to either side of the permanent ROW to mimic natural patterns, and, where necessary, request additional temporary disturbance to clear additional vegetation as appropriate.

Crystal Springs valve lot

- Use vegetation to screen facilities from the Caltrans rest stop

Edgewood valve lot

- Use context sensitive paint/materials

Half Moon Bay valve lot

- Use context sensitive paint/materials to limit visibility from residences

Water Resources**Hazardous Substance Control**

- PG&E will develop and implement general Project-wide hazardous substance control and emergency response measures included in the SWPPP. Additionally, care shall be exercised to minimize, contain, and properly dispose of paint flakes generated during removal and dismantling of equipment coated with lead-based paint.
- If any stained or odiferous soils that may be considered hazardous materials are encountered during project-related excavation activities, PG&E shall immediately halt work and properly characterize the material, and shall take appropriate measures specific to the materials to protect human health and the environment.

- PG&E will comply with all existing federal and state hazardous materials regulations. If the results of soil testing indicate that the project spoils are hazardous, PG&E shall manage and dispose of the waste through a separately contracted vendor certified through the Contractors State Licensing Board for hazardous waste removal, and send the waste to an appropriate Class 1 disposal facility. Hazardous spoils awaiting disposal shall be appropriately labeled and shall be contained or stockpiled with plastic encapsulation to prevent sedimentation.

Trench Plugs

- Trench plugs (1-cubic-foot burlap sacks with rock-free earth) will be spaced at every 25 to 100 feet along the alignment. The spacing of the trench plugs will be based on the slope of the terrain, sharp changes (greater than 5 degrees) along the trench line, and locations where backfill material may cause the trench to act as a drain.

HDD Fluid Release Contingency Plan

- PG&E shall prepare and implement an HDD Fluid Release Contingency Plan. The plan shall include specific frac-out contingency measures, material required to contain a frac-out or fluid spill, and control measures to ensure that drilling mud is contained. PG&E shall submit the HDD Fluid Release Contingency Plan to the CDFW for review (if required by that agency) at least 30 days prior to the commencement of project activities. If an HDD Fluid Contingency Plan is not required by the CDFW, PG&E shall submit the plan to the ERO at least 30 days prior to commencement of project activities. HDD-related project activities may not start until PG&E has received written notification either from the CDFW that the HDD Fluid Release Contingency Plan has been accepted, or from the ERO. PG&E shall ensure that all material necessary to contain a frac-out or fluid spill shall be on site and immediately available prior to the commencement of HDD activities.

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PG&E EXHIBIT A – VEGETATION RESTORATION PLAN

The following Vegetation Restoration Plan for the Selected Alternative, Bunker Hill segment, will be implemented by PG&E and its Contractors.

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EXHIBIT A

VEGETATION RESTORATION PLAN

PG&E GAS TRANSMISSION LINE 109 4A2 BUNKER HILL
PIPELINE REPLACEMENT PROJECT

Prepared for

Pacific Gas and Electric Company

Prepared by



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June 2016

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Appendix B -- Technical Memorandum -- Fragrant Fritillary (*Fritillaria liliacea*) Salvage and Supplemental Seeding for Gas Line 109 Bunker Hill Pipeline Replacement Project, San Mateo County, California

Appendix C -- Technical Memorandum -- Crystal Springs Lessingia (*Lessingia arachnoidea*) Restoration on the Gas Line 109 Bunker Hill Pipeline Replacement Project, San Mateo County, California.

Appendix D – IS/MND Measures for Restoration, Gas Line 109 Bunker Hill Pipeline Replacement Project, San Mateo County, California.

Appendix E – Baseline Population Data and Reference Site

Section 1. INTRODUCTION

1.1. PURPOSE

This Vegetation Restoration Plan details restoration and monitoring activities for areas disturbed during construction of the Pacific Gas and Electric Company (PG&E) Gas Transmission Line 109 Bunker Hill Pipeline Replacement Project (Figure 1). This segment is part of the overall Gas Transmission Line 109 Pipeline Replacement Project; separate restoration plans will be prepared for other segments of the project. The project is on lands owned by the San Francisco Public Utilities Commission (SFPUC) in San Mateo County.

This plan discusses revegetation planning and monitoring efforts including: a brief description of the work areas; a summary of vegetation communities, trees, and special-status plant species potentially impacted by project activities; recommendations for site revegetation, including seed mixes and seeding methodology; and monitoring and reporting for the project. This plan complies with all relevant requirements of the Final Mitigated Negative Declaration for the project, as shown in Appendix D (San Francisco Planning Department May 2, 2016).

1.2. PROJECT LOCATION

The project site is located on the eastern edge of the Peninsula Watershed. The Bunker Hill project is north of Highway 92 and east of Interstate 280 (Figure 1).

The Peninsula Watershed is owned by the City and County of San Francisco and is managed by the SFPUC Natural Resources Division. The Natural Resources Division is responsible for monitoring, protecting, and restoring those lands and ecological resources under the management of the SFPUC. Land uses of the Peninsula Watershed are primarily water collection, storage, delivery and associated facilities, recreation trails, and open space. Other land uses include Crystal Springs Golf Course and PG&E utilities and transmission rights-of-way. Surrounding land uses to the north and east are primarily residential and include the communities of Pacifica, San Bruno, Millbrae, Burlingame, Hillsborough, Belmont, San Mateo, San Carlos, and Woodside.

Vegetation within the project area consists of serpentine bunchgrass grassland, non-native grassland, coyote brush scrub, and coast live oak woodland. Annually disced firebreaks are present in non-native grassland communities. Serpentine bunchgrass grassland and coast live oak woodland (riparian) are considered sensitive natural communities (Orion Environmental Associates 2014a).

1.3. PROJECT SUMMARY

PG&E proposes to replace an approximately 1.1-mile segment of gas pipeline that originates 0.2 mile north of the intersection of Lexington Avenue and Loop Road and terminates approximately 0.2 mile northwest of the intersection of Bunker Hill Drive and Highlands Fire Trail in San Mateo County (Figures 1 and 2). The existing gas transmission pipeline has a diameter varying from 22 to 30 inches and will be replaced with a 24-inch diameter pipeline. The new pipeline would follow the existing route, but would be offset from the existing alignment by

approximately 5 feet. To avoid trenching through Bunker Hill Drive and several rare plant populations, the pipeline would be installed under approximately 2,000 feet of watershed land and Bunker Hill Road using Horizontal Directional Drilling (HDD); in this trenchless area, the alignment deviates up to approximately 42 feet from the existing alignment. The trenched area is approximately 4,000 feet in length.

Section 2.

PROJECT IMPACTS AND REVEGETATION

This section describes potential impacts on vegetation communities, trees, and special-status plant species, and the revegetation actions that will be undertaken to reestablish vegetation in the work area¹. Potential impacts from invasive weeds are also discussed.

2.1. BOTANICAL RESOURCES

Baseline data of botanical resources, as of June 1, 2016, is provided in Appendix E. PG&E will provide the remaining baseline data of botanical resources in an Addendum to this plan, provided within 60 days of the beginning of construction activities. Figures 3a through 3f in Appendix A show the location of the work area and the botanical resources.

2.1.1 VEGETATION COMMUNITIES

Project Impacts

Vegetation communities that will be impacted at the project site include serpentine bunchgrass grassland, non-native grassland, coyote brush scrub, and coast live oak woodland (Table 1). Some of the non-native grassland to be disturbed is located in fire breaks that are annually disked by SFPUC.

Table 1. Impacts by Vegetation Community

VEGETATION COMMUNITY	APPROX. IMPACT (ACRE)
serpentine bunchgrass grassland	2.49
non-native grassland (disturbed)	7.25
coyote brush scrub	0.96
coast live oak woodland	0.20
Total to be Revegetated	10.89

Note: The amount of vegetation disturbed will be re-confirmed following construction.
The total acreage of revegetation will be adjusted, if needed, based on the as-built condition.

Revegetation

Mitigation will consist of at least a 1:1 ratio of onsite restoration of plant communities. All disturbed areas will be revegetated with locally collected native plant species. The revegetation goal is to return vegetation to as close to pre-construction conditions as possible with the exception of non-native trees and shrubs. In addition, the area near the centerline cannot be planted with trees or woody vegetation as required for pipeline safety (PG&E 2014). All revegetation will be accomplished by direct seeding grasses and forbs, and shrubs and trees as appropriate, with the exception of fragrant fritillary salvage in which dormant or nearly dormant bulbs would be removed prior to the start of construction, stored, and then replanted in the work area once construction is complete. To decrease the possibility of introducing pathogens

(including *Phytophthora*) from a plant nursery to the site, container stock will not be used for revegetation. Seed mixes, plant palettes, and seeding methodology are described in Section 3, Revegetation Activities.

Areas where existing land management practices are not compatible with native plant restoration on those areas, such as the SFPUC fire break, will be exempt from continued management/monitoring after initial restoration. However, if there is a continued source of non-native invasive species which have a Cal-IPC Weed Ranking Definition of High (Cal-IPC 2016), targeted non-native invasive removal will occur annually within the project limits. No vegetation restoration will be implemented on pre-existing access roads.

2.1.2 TREES

Project Impacts

There are 24 native and 23 non-native or introduced trees that will be removed for project construction (Table 2). Of the 24 native trees to be removed, all are coast live oak. Sixteen of the native trees are considered to be significant trees and 2 are considered to be heritage trees as defined in the San Mateo County Tree Ordinance¹. Of the 23 nonnative or introduced trees to be removed, 17 are considered to be significant trees and none are considered to be heritage trees. Non-native or introduced tree species to be removed from the project site include Monterey pine (*Pinus radiata*), Italian stone pine (*Pinus pinea*), and Monterey cypress (*Hesperocyparis macrocarpa*) (Davey Resource Group 2014, 2015, 2016a, 2016b). Tree trimming will be required where the tree canopy overhangs access roads or at other locations to provide equipment access. The degree of trimming is evaluated by a qualified arborist on a case by case basis; where trimming is considered likely to impact the health or stability of the tree, the tree is then included in those to be removed and it will not be left standing as a hazard tree. The information as to final counts of trimmed versus removed trees, which may vary slightly due to construction requirements, will be included in the As-Built information. Currently, 10 trees are planned for trimming.

Table 2. Proposed Tree Removal

TREE SPECIES	TOTAL NO. OF TREES TO BE REMOVED	SIGNIFICANT TREES TO BE REMOVED	HERITAGE TREES TO BE REMOVED
coast live oak (<i>Quercus agrifolia</i>)	24	16	2
non-native or introduced trees	23	17	0

Source: Davey Resource Group 2014, 2015, 2016a, 2016b

¹ The San Mateo Tree Ordinance defines “significant trees” as “any live woody plant rising above the ground with a single stem or trunk of circumference of 38 inches and having the inherent capacity of naturally producing one main axis”. “Heritage trees” are defined as several tree species found in the county based primarily on their dbh, which is considered to be 4.5 feet above ground.

Table 3. Proposed Tree Trimming

TREE SPECIES	TOTAL NO. OF TREES TO BE TRIMMED	SIGNIFICANT TREES TO BE TRIMMED	HERITAGE TREES TO BE TRIMMED
coast live oak (<i>Quercus agrifolia</i>)	4	3	1
non-native or introduced trees	6	6	0

Source: Davey Resource Group 2014, 2015, 2016a, 2016b

The number of trees removed will be tracked and confirmed prior to the implementation of restoration activities. The number of trees that are direct-seeded will be adjusted as necessary to achieve the final performance targets.

Revegetation

Significant or Heritage Trees in the work area are defined in the San Mateo County Tree Ordinance². In compliance with the Final MND, removal of any Significant or Heritage Trees as well as any other Native oak trees will be replaced at a 3:1 ratio. As discussed in Section 3.6, a total of 3 acorns per tree will be used at each planting location. Removal of any other native or non-native trees will be replaced at a 1:1 ratio. With the exclusion of non-natives, replacement trees will be the same species as those removed. Trees will be direct-seeded rather than planted with container stock. Additional trees beyond those impacted will be direct-seeded to allow for some mortality and ensure replacement ratios are met after five years. Details regarding direct-seeding are included in Section 3.6.

Trees will be seeded outside of restricted areas near the pipeline centerline as required for pipeline safety (PG&E 2014)³. Due to this restriction, seeding of trees in narrow portions of the work area may be confined to the site periphery. However, to avoid unnatural, dense, linear plantings, trees will be seeded in a pattern and density that reflects the surrounding vegetation patterns and preexisting tree densities, as feasible. If insufficient room occurs in the work area due to pipeline safety standards, direct seeding of trees will need to be performed elsewhere with California Department of Fish and Wildlife (CDFW) approval. As necessary, other agreed-upon mitigation may be performed to meet revegetation goals commensurate with level of effort and expenditure associated with tree planting mitigation.

² The San Mateo Tree Ordinance defines “significant trees” as “any live woody plant rising above the ground with a single stem or trunk of circumference of 38 inches and having the inherent capacity of naturally producing one main axis”. “Heritage trees” are defined as several tree species found in the county based primarily on their dbh, which is considered to be 4.5 feet above ground.

³ For example, trees, woody shrubs, or woody vegetation that may exceed 8 inches diameter at breast height at maturity cannot be planted within 10 feet of the pipeline centerline. Trees expected to grow to or exceed 36 inches diameter at breast height cannot be planted within 14 feet of the pipeline centerline.

2.1.3 SPECIAL-STATUS PLANTS

Impacts

Two special-status plant species were recorded within the planned work areas and will be impacted by the project (Orion Environmental Associates 2014a; CH2M HILL 2015): fragrant fritillary (*Fritillaria liliacea*; California Rare Plant Rank 1B.2) and Crystal Springs lessingia (*Lessingia arachnoidea*; California Rare Plant Rank 1B.2) (Table 4). The locations of fragrant fritillary plants were mapped again in March of 2016. No List 4 plants were found that would meet the locally rare criteria, and neither were any plant communities found that would be considered rare locally but common elsewhere.

Marin western flax (*Hesperolinon congestum*, California Rare Plant Rank 1B.1, federally- and State- Threatened) and San Francisco wallflower (*Erysimum franciscanum*, California Rare Plant Rank 4.2) are situated in or near the project area but will be fully avoided through protective measures as described in the Preliminary Mitigated Negative Declaration (San Francisco Planning Department 2016). One additional small population of Marin dwarf flax (comprising 150 individuals) was found during preconstruction surveys in May 2016 near Station 25+10, approximately 50 feet southeast of the tower. The work area will be modified to avoid this population. The HDD trenchless construction methods described in Section 1.3 will be undertaken to avoid the HECO populations that are scattered in the HDD area.

Table 4. Estimated Impacts to Special-Status Plant Species

SPECIAL-STATUS PLANT SPECIES	NO. OF PLANTS IN WORK AREA
fragrant fritillary (<i>Fritillaria liliacea</i>)	1,084*
Crystal Springs lessingia (<i>Lessingia arachnoidea</i>)	2,800**

* Reflects the number of fragrant fritillary plants mapped inside the work area in March 2016.

**Reflects estimates based on surveys by Orion Environmental 2013. This total number will be re-confirmed in June 2016 and information submitted in an Addendum.

Salvage and Revegetation

Two separate memoranda have been prepared that detail salvage and revegetation methods, success criteria, monitoring, and reporting requirements for fragrant fritillary and Crystal Springs lessingia (Nomad Ecology 2016a, 2016b); these memoranda are included in Appendix B and C. As described in Appendix C, the total number of Crystal Springs lessingia will also be re-confirmed in June 2016 and information will be submitted in an Addendum.

The goal of fragrant fritillary salvage is to minimize impacts to fragrant fritillary within the work area. Salvaging and replanting the bulbs is believed to be the most successful salvage method as no existing documented methodology is available to reference since we were unable to find a single instance of this having been performed previously. Dormant or nearly dormant bulbs would be removed prior to the start of construction, stored, and then replanted in the work area

once construction is complete (Nomad 2016a). PG&E's consultant, Nomad, consulted with experts regarding the best way to perform this requirement in the IS-MND. The salvage methodology described in the attached document was developed based on discussions with bulb propagation experts: Stephen Edwards, former Director of the Regional Parks Botanic Garden in Tilden Park; and Ed Rustvold, an expert in California Liliales and Asparagales who has over 30 years of experience propagating fritillaries and is regarded as a California native bulb propagation expert (Edwards pers. comm. 2015; Rustvold, pers. comm. 2015).

In order to restore impacted Crystal Springs lessingia habitat, seed that was collected in 2015 prior to the start of construction will be stored during construction and distributed in the work area once construction is complete. Seed was collected from the gas line pipeline right-of-way (ROW) and project work area on October 5 and 6, 2015. Seed was collected by collecting whole plants and putting them in paper bags. Inflorescences were stored indoors in paper bags for several weeks to allow seeds to further mature. Seeds were separated from other plant material (stems, inflorescence branches, and flowering parts) by hand sorting them in plastic containers. Seeds and fine chaff were stored in paper envelopes indoors in a cool, dry, dark storage room. The number of seeds collected and stored is estimated to be 35,000 seeds. Topsoil and surface material in occupied habitat will also be salvaged (Nomad 2016b).

2.2. INVASIVE SPECIES AND SOIL BORNE PATHOGENS

Detailed weed control measures that will be implemented for the project are included in the separate Weed Management Plan for the project. Portions of the right of way are currently disked for fire control (see Photographs in Appendix E). Several invasive weed species, including yellow starthistle (*Centaurea solstitialis*), teasel (*Dipsacus sativus*), bristly ox-tongue (*Helminthotheca echioides*), Bermuda buttercup (*Oxalis pes-caprae*), and French broom (*Genista monspessulana*), among others, were recorded in the work areas during preconstruction surveys conducted in March and May 2016 (Table 5). Project-related activities may potentially introduce or spread invasive weed species⁴ within the work areas.

The project will minimize the introduction, spread, and/or proliferation of invasive weeds in work areas. Implementation of minimization measures will reduce the likelihood that invasive weeds that are present at the site prior to work based on existing conditions on site will proliferate or that new species will be introduced in the project area.

The project also has the potential to spread non-native annual grass species from non-native grassland portions of the work area into the serpentine bunchgrass grassland portion of the work area. Non-native annual grass species including ripgut brome (*Bromus diandrus*), wild oats (*Avena fatua*), and Italian ryegrass (*Festuca perennis*) are present in abundance on site in non-native annual grassland/disturbed portions of the work area. Non-native annual grasses are known to pose a threat to serpentine grasslands in the region. The project will minimize the introduction, spread, and/or proliferation of non-native grasses in serpentine grassland portions of the work area. Implementation of minimization measures will reduce the likelihood that non-

⁴ For the purposes of this document, invasive weeds are plant species that are listed on the California Noxious Weed List (CDFA 2016) or have a Cal-IPC Weed Ranking Definition of High (Cal-IPC 2016). Some (but not all) species with a Cal-IPC Weed Ranking Definition of Moderate will also be considered invasive weeds particularly if they are a species of high concern for the SFPUC Watershed. Plants that are considered Moderate or High shall not be used in re-vegetation areas.

native grasses that are present at the site prior to work based on existing conditions on site will be spread into serpentine grassland portions of the work area. The project also has the potential to spread soil borne pathogens.

Additionally, the site is subject to current conditions beyond PG&E control that could affect success criteria. Two activities observed onsite during the preparation of this plan include regular SFPUC maintenance of a fuel break and use of access roads, as well as local residents trespassing within the right of way. These two activities could be a potential source of weeds and pathogens or restoration habitat damage unrelated to PG&E's construction or restoration activities. Since PG&E does not have authority or ability to continually monitor and manage property access, the current management regime of the site shall be taken into consideration when evaluating performance metrics during restoration. Further, as part of this restoration plan, SFPUC shall agree to coordinate with PG&E on any matters of significance regarding property maintenance that could affect the site restoration.

Implementation of minimization measures will reduce the likelihood that soil borne pathogens are introduced in the project area. The restoration area will be monitored post-construction and invasive weeds will be controlled as part of this plan. The percent cover of invasive weeds throughout the project and non-native annual grasses in serpentine grassland that is acceptable is based on existing baseline cover data and comparison to reference sites and is addressed in Section 4.1, Success Criteria. Weed Control is addressed in Section 4.3, Remedial Measures.

Invasive Weed, Non-Native Grass and Soil Borne Pathogen Minimization Measures

- Data will be collected on populations of invasive weed species in the work area and along access roads during preconstruction surveys. Data to be collected includes the extent and location of target invasive weed species, and a cover estimate within the extent boundaries. All weeds on the CDFA noxious weed list as well as Cal-IPC species with a rank of High and Moderate will be surveyed for and mapped. Baseline invasive weed mapping occurred in the work area and immediately adjacent on April 25, 2016 and May 19, 2016. This information shall be included in an Addendum prepared within 60 days after construction has started, and also included in annual reports provided to SFPUC and CDFW.
- The extent and boundary of serpentine grassland on site will be mapped carefully to plan for soil management during construction to avoid introducing non-native annual grasses into serpentine grassland areas.
- The entire work area will be mowed or scraped prior to the start of construction. All access for project construction will be within the established work area that has been mowed or scraped. The soil surface will be disturbed the minimum amount necessary to complete construction activities, which will reduce ground disturbance and consequently will help minimize the proliferation of invasive weeds and non-native grasses. Areas that can be mowed rather than scraped will be identified during preconstruction meetings. Mowing will be conducted in sections to avoid spreading non-native annual grass propagules into the serpentine grassland. Areas that contain invasive weed species or are dominated by non-native species, including annual grasses will be scraped and the topsoil treated as specified below to avoid the spread of non-native plant propagules. The differentiation of these areas

will be mapped and included in an Addendum prepared within 60 days after construction has started, and also included in annual reports provided to SFPUC and CDFW.

- Soil disturbance and transport will be minimized to the extent possible and topsoil will be managed. The topsoil, where scraping and excavation is necessary, shall be salvaged and stockpiled separately in upland construction work areas. Serpentine grassland topsoil will be salvaged and stockpiled separately and clearly labeled. All topsoil shall be stored in such a way that it is protected from non-native plant propagules, but does not overheat and kill the native plant propagules. This shall include placing the stored topsoil where it is not in contact with non-native grassland soil and protecting it with weed-free straw mulch, jute netting or other suitable cover. Following construction, the salvaged topsoil (with the exception of topsoil containing a prevalence of non-native plant species, as specified below) will be spread over the disturbed area from which it was removed, and the area will be graded to match the preconstruction natural grade. Only serpentine grassland topsoil will be spread in serpentine grassland areas. Once the salvaged topsoil has been spread and the area returned to the pre-existing topography, the area will be revegetated.
- In areas such as disked fire breaks and access roads that have been determined by professional judgement of a qualified botanist to have a substantial population of non-native plant species (as identified in the Vegetation Restoration Plan), the topsoil will be scraped and stockpiled separately, taking care not to spread the topsoil and non-native plant propagules it contains. No special topsoil preservation measures will be undertaken in these areas. The topsoil will be stockpiled during construction activities and will be buried below the subsoil during backfill or off hauled, and the soils from deeper in the trench placed on the surface. Area where topsoil will be buried due to the presence of invasive weeds or high non-native cover will be based on the species present and absolute cover. After initial restoration, the fire breaks will be exempt from continued management/monitoring.
- All equipment and material arriving on site will be clean and free of soils and plant material except for materials such as coir or fiber rolls which are made with plant material themselves; those will be kept clean of foreign plant material and soils. Two wash stations will be established near the work area access points to local roadways: one at the north end of the project near Bunker Hill Road and one at the south end of the project near the entrance. A wash station will also be established at an offsite staging area on Paul Scannel Drive, near the project site; when feasible, vehicles will preferably be washed at the Paul Scannel staging area prior to accessing the site. Contractor vehicles and equipment that have been used or driven off-road prior to arriving at the proposed project sites will be cleaned upon arriving on site at the Paul Scannel site or at the on-site wash stations before entering further into the work site, to minimize bringing invasive weed propagules, plant pathogens, insects, and soil from elsewhere onto the project. The construction workers will also brush off soil and plant material off of their boots at the wash station; however, bleach will not be used on the construction team boots. In lieu of multiple decontaminations, crew personnel can choose to have two pairs of boots (one cleaned prior to entry to SFPUC and one for use outside SFPUC) if they so choose. In this case, the boots would only be washed once prior to entry to SFPUC property. Vehicles as described that require washing will not access the work site without using one of the wash stations or the Paul Scannel wash station. The monitoring biologist will verify the condition of the equipment and vehicles for proper cleaning before

entering the project site. In compliance with the MND, vehicle cleaning will remove soil, seeds, and plant parts from the undercarriage, tires, sideboards, tailgates, and grills of all vehicles and equipment.

- Boots (worn by restoration specialists during applicable work on FRFI salvage and restoration implementation involving seed and transplanting) and their hand-equipment such as shovels, spades, trowels, will also be brushed clean, washed in the vehicle wash station or prior to being brought on site, and sprayed with a 0.525% sodium hypochlorite concentrations (5000 ppm available chlorine) bleach solution or preferably a 70-90% ethyl alcohol (ethanol) or isopropyl alcohol (isopropanol) solution (such as Lysol disinfectant or a prepared solution) to sanitize the equipment for invasive plant and soil borne pathogen control. The chart below will be used to prepare bleach solutions. For example, adding 100 ml of 5.25% bleach to 900 ml of water will make 1000 ml of 0.525% NaOCl solution. If using 8.3% bleach, 100 ml of bleach would be added to 1480 ml of water to make 1490 ml of 0.525% NaOCl.

Dilutions of commonly available bleach products needed to obtain approximately 0.525% sodium hypochlorite concentrations (5000 ppm available chlorine).

Percent sodium hypochlorite in bleach	Parts bleach	Parts water	Diluted bleach percent sodium hypochlorite
5.25%	1	9	0.525%
6.0%	1	10.4	0.526%
8.25%	1	14.6	0.529%
8.3%	1	14.8	0.525%

- Invasive weed identification and avoidance measures will be included in the preconstruction environmental tailboard meeting. The training will include field identification of invasive plants in the project area, reproductive biology of invasive plants, and invasive plant prevention Best Management Practices. The training will also include a summary of serpentine grassland, the rare plant associated with serpentine grassland, and threats to serpentine grassland including non-native annual grasses. The training will also include a summary of *Phytophthora*, its issues, spread, and Best Management Practices. The biological monitor will ensure that construction staff understand provisions for invasive and non-native plant prevention and soil borne pathogen spread prevention throughout the project. Invasive and non-native plant and soil borne pathogen considerations will be routinely addressed during regular tailboard meetings. The monitoring biologist shall ensure that all staff have participated in the training by establishing and keeping a sign-in sheet that will record attendees.
- All construction material sources will be weed-free. Only rice straw or weed-free straw or fiber roll logs will be used.⁵

⁵ To decrease the possibility of introducing pathogens (including *Phytophthora*) from a plant nursery to the site, container stock will not be used for revegetation.

Table 5. Invasive Weeds Observed in the Vicinity of the Project Area

COMMON NAME SCIENTIFIC NAME	CALIFORNIA INVASIVE PLANT COUNCIL RANK (CAL-IPC 2016)*	CALIFORNIA DEPARTMENT OF FOOD AND AGRICULTURE NOXIOUS WEED LIST (CDFA 2016)**
Italian thistle <i>Carduus pycnocephalus</i>	Moderate	On List
toalote <i>Centaurea melitensis</i>	Moderate	On List
yellow star thistle <i>Centaurea solstitialis</i>	High	On List
bull thistle <i>Cirsium vulgare</i>	Moderate	On List
poison hemlock <i>Conium maculatum</i>	Moderate	-
teasel <i>Dipsacus sativus</i>	Moderate	-
French broom <i>Genista monspessulana</i>	High	On List
bristly ox-tongue <i>Helminthotheca echinoides</i>	Limited	-
Bermuda buttercup <i>Oxalis pes-caprae</i>	Moderate	-
Harding grass <i>Phalaris aquatica</i>	Moderate	-
milk thistle <i>Silybum marianum</i>	Limited	-

*Cal-IPC Weed Ranking Definitions:

High: These species have severe ecological impacts on physical processes, plant and animal communities, and vegetation structure. Their reproductive biology and other attributes are conducive to moderate to high rates of dispersal and establishment. Most are widely distributed ecologically.

Moderate: These species have substantial and apparent - but generally not severe - ecological impacts on physical processes, plant and animal communities, and vegetation structure. Their reproductive biology and other attributes are conducive to moderate to high rates of dispersal, though establishment is generally dependent upon ecological disturbance. Ecological amplitude and distribution may range from limited to widespread.

Limited: These species are invasive but their ecological impacts are minor on a statewide level or there was not enough information to justify a higher score. Their reproductive biology and other attributes result in low to moderate rates of invasiveness. Ecological amplitude and distribution are generally limited, but these species may be locally persistent and problematic (Cal-IPC 2016).

** Species considered a noxious weed by CDFA are listed on the California Noxious Weed List (CDFA 2016).

Section 3. REVEGETATION ACTIVITIES

3.1. RESTORATION BIOLOGIST

In coordination with the PG&E biologist, a qualified botanist or restoration ecologist will oversee and monitor implementation of this plan. Qualified botanists or restoration ecologists will have a minimum of 5 years of experience working with native habitat restoration and be familiar with the flora of the SF Bay region. The PG&E biologist will be responsible for supervising site preparation, approving final seed mixes, and overseeing revegetation activities.

3.2. REVEGETATION ACTIVITIES BY VEGETATION TYPE

Table 5 summarizes each vegetation type that will be impacted due to project activities, the revegetation that will occur for that vegetation type, and the seed mix to be used⁶.

Table 5. Revegetation Activities by Vegetation Type

VEGETATION COMMUNITY	REVEGETATION	SEED MIX
serpentine bunchgrass grassland	seeding with seed mix (broadcast seeding only)	Serpentine Grassland Mix
non-native grassland	seeding with seed mix (broadcast or hydroseed)	Needlegrass Grassland Mix
coyote brush scrub	seeding with seed mix (broadcast or hydroseed)	Coyote Brush Scrub Mix
coast live oak woodland (upland and riparian)	seeding with seed mix (broadcast or hydroseed), acorn planting, direct seeding shrub species	Oak Woodland Mix
disced firebreaks*	seeding with seed mix (broadcast or hydroseed)	Native Annual Mix*

* A seed mix was designed for the disced firebreaks. The seed mix comprises early flowering native annual species that will mature and disperse seed in early spring prior to the discing of firebreaks. These seed of these species will be in the seed bank at the time of discing and may germinate in subsequent years. The fire breaks will be exempt from continued management/monitoring after initial restoration.

3.3. BASELINE DATA COLLECTION AND REFERENCE SITE ESTABLISHMENT

Baseline data collection methodology, reference site selection methodology, and baseline cover data collected in April and May 2016 are included in Appendix E. Additional reference site data will be collected and provided to SFPUC and CDFW in an Addendum.

Baseline data on plant species cover and composition was collected in the work areas and reference sites to establish baseline conditions prior to the start of construction, document the similarity and differences of the work areas and reference sites pre-construction, and to select reference sites that were very similar to work area sites. Categories of plant cover used to

⁶ Areas where existing land management practices are not compatible with native plant restoration on those areas, such as the SFPUC fire break, will be exempt from continued management/monitoring after initial restoration. No vegetation restoration will be implemented on pre-existing access roads.

reference sites include total percent cover, native species, non-native species, native grass, and non-native grass cover.

A minimum of two reference sites were chosen for each vegetation community to be impacted and restored (i.e., serpentine grassland and non-native annual grassland). Reference sites for serpentine grassland that were sampled include an area west of the access road, an area north of the southern segment of the project, the undisturbed serpentine grassland area between the work area and access road, and an undisturbed serpentine grassland area between the disked fuelbreak and the work area. Non-native grassland reference sites that were sampled include an area at the southern end of Bunker Hill, the disked fuel break, and an area north of Bunker Hill.

Reference sites were chosen to be as similar as possible to the work areas. Data on species composition and percent cover, as well as site attributes identification of outcrops if any, aspect, slope, topography, and drainages were recorded during reference site establishment. Plant species composition was used as a guide to select reference sites that were very similar to work area sites (e.g., they varied only by a few percent, on average).

Plant cover data was collected by placing transects in representative portions of the work area and reference sites. Data was collected using square 1 meter x 1 meter quadrats placed along the transect. Within each quadrat, absolute cover of plants was visually estimated and recorded for the quadrat as a whole and for each individual plant species using the California Native Plant Society's (CNPS) method for estimating cover values (CNPS 2014). The CNPS method for estimating cover values uses a "bird's eye view" looking from above and estimating cover for the living plants only (CNPS 2014). Litter/duff should not be included in these estimates and the porosity of the vegetation should be taken into consideration when estimating percent cover (CNPS 2014). Percent cover diagrams were used to facilitate cover estimates. The coordinates of the starting and ending points of each transect were recorded using GPS.

Categories of plant cover used to compare and select work area and reference sites include total percent cover, native species, non-native species, native grass, and non-native grass cover. As described in Appendix E, work area and reference sites have very similar cover values to each other in all categories based on transect by transect comparison as well as the cover averages. The cover averages between work area sites and reference sites vary by a few percent for all categories which is not a significant difference when estimating percent cover over many plots. Additional transects and reference site data collection will be performed in June 2016 to further supplement the reference site dataset.

To avoid impacts to native plant communities in reference sites, soil pits or cores were not obtained; soils types are inferred from surface expression and plant communities characterization. Observations of soil type will be collected at all excavation sites where restoration will occur, at roughly 30 meter intervals in serpentine sites and approximately 50 meter intervals in non-serpentine grasslands. In areas with homogenous soils, fewer samples will be collected (at intervals spaced more widely apart). If portions of the trench differ in soil type, more samples will be taken (narrower spacing) to capture the range of variation. As described in Appendix E, the selection of representative reference sites was limited due to differences in microtopography, more or less mesic, small scale variation in plant communities, and disturbance regime, among others. Collection of baseline data attempts to account for these

differences. Vegetation sampling during annual monitoring will occur in both the impacted work area and associated reference sites. Results of annual monitoring will be included in annual monitoring reports that will be submitted to CDFW and SFPUC.

3.4. SITE PREPARATION

The following discussion describes construction methods that will be implemented to successfully prepare the work area for revegetation activities.

- Vegetation clearing (e.g., mowing, blading, grubbing) in natural vegetation will be limited to the minimum necessary to safely complete construction to preserve existing plants, seeds, and microorganisms. Areas that can be mowed rather than scraped will be identified during preconstruction meetings.
- Tree and shrub removal will be minimized as much as possible. Shrubs and trees that must be removed for safe construction will be cut at ground level and excavated if necessary. Mulch from woody vegetation may be chipped and stored on-site (in disturbed non-native habitat or in coast live oak woodland). Mulched material will not be stored or spread in serpentine bunchgrass grassland. Anticipated tree removal numbers are shown in Table 2. Any change will be documented in As-Builts.
- Stockpiling of material will be allowed only in uplands within established work areas
- Vehicles and equipment will be parked on pavement, existing roads, and previously disturbed areas within identified work areas or on access roads.
- Soil disturbance and transport will be minimized to the extent possible and topsoil will be managed. The topsoil, where scraping and excavation is necessary, shall be salvaged and stockpiled separately in upland construction work areas. Serpentine grassland topsoil will be salvaged and stockpiled separately and clearly labeled. All topsoil shall be stored in such a way that it is protected from non-native plant propagules, but does not overheat and kill native plant propagules. This shall include placing the stored topsoil where it is not in contact with non-native grassland soil and protecting it with weed-free straw mulch or other suitable cover. Following construction, the salvaged topsoil will be spread over the disturbed area from which it was removed, and the area will be graded to match as close to the pre-construction natural grade as feasible. Once the salvaged topsoil has been spread and the area returned to the preexisting topography, the area will be revegetated.
- In areas that have a substantial population of non-native plant species (including fire breaks and access roads) as identified in the Vegetation Restoration Plan, the topsoil will be scraped and stockpiled separately taking care not to spread the topsoil and invasive weed propagules it contains. The topsoil will be stockpiled during construction activities and will be buried below the subsoil during backfill or off-hauled, and the soils from deeper in the trench placed on the surface. Area where topsoil will be buried due to the presence of invasive weeds will be based on the species present and absolute cover. Two areas have been identified: one of French broom adjacent to a residence separated by the fire break from the serpentine grassland, and another of teasel adjacent to a coyote brush/poison oak thicket.

- During construction, the biological monitor may remove visible bulbs or roots from the stockpile where feasible and consistent with safety practices. Bulbs and roots will be stored in labeled containers and maintained under dark, dry and secure conditions.
- After construction is completed, the spoils material will be returned to the trench, compacted as required to industry standard guidelines, and the contours returned to as close to pre-project conditions as possible. After final grading is complete, stockpiled topsoil will be spread over the full width of the scraped work area. Care will be taken to not compact the topsoil.
- Grading and compaction of surface soil caused by construction does not provide the ideal conditions for germination and growth of plant species. Soil scarification can ameliorate these conditions. If determined to be necessary by the Project Restoration biologist, portions of the site may be scarified to prepare the site for seeding.
- Following construction, the site will be stabilized with appropriate weed-free erosion control materials (coir, weed-free rice straw or jute netting). No plastic monofilament netting will be used.

3.5. SEEDING AND SEED MIXES

3.5.1 TIMING

Sites will be revegetated as soon as feasible after construction completion. Seeding will occur in the late fall and early winter, before the onset of or during winter rains, and no later than December 15, so that sufficient rainfall and appropriate temperatures are received to trigger germination and support growth. This will avoid the need for irrigation in most cases. If project construction is completed at a different time of year, and seeding cannot occur in late fall or early winter, the site will be temporarily stabilized with BMPs or mulch and the site will be seeded the following late fall.

Planting in fall 2017 is preferable to seeding in early spring, which would likely require irrigation and may have limited success due to the requirements of the seeded species. The need for irrigation will be determined by the PG&E biologist and will be based on the timing of seeding and the amount of precipitation received after seeding.

To compensate for the additional temporal loss of habitat in the event that initial restoration is not completed by December 15, 2016, PG&E shall submit a mitigation proposal for the anticipated impact (i.e. anticipated date of restoration of serpentine habitat at the project site and resulting requirements for compensatory mitigation, in accordance with the final MND), for approval to CDFW within the Addendum (i.e. within 60 days of start of construction).

3.5.2 SEED MIXES

Baseline vegetation data were collected to characterize existing vegetation structure and composition. In April 2014 and April 2016, data was collected along transects established in serpentine grassland and non-native grassland at the Bunker Hill project site (Orion Environmental Associates 2014b and preconstruction data 2016). Data was also collected in coast live oak woodland and coyote brush scrub at Canada Road (Orion Environmental

Associates 2014b). This information was used to determine appropriate seed mixes for the site. Additional data was collected along transects in May 2016 prior to the start of construction in serpentine grassland and non-native grassland habitats to further refine the seed mix composition.

Custom collected and amplified seed will be used along with other seed with geographic and ecological origins as similar as possible to the project area. Grass and forb seed will be purchased from Pacific Coast Seed, S&S Seed, and Hedgerow Farms. Pacific Coast Seed custom collected seed from serpentine grassland and non-serpentine grassland habitats in 2014 and 2015 from a nearby PG&E right-of-way and they are currently amplifying this seed at the S&S Seed growing facility. This seed will be available for seeding in 2016. Seed of local origin is scarce and the seed mix will be limited by availability.

Seed mixes for each vegetation type are listed in Tables 6 to 10. Seed lot documentation will be provided to the SFPUC for their review. Proposed seed mixes are subject to change based on recommendations by the PG&E biologist, site conditions, and seed availability. New seed mixes shall be approved by the PG&E biologist before purchase and application. Any changes in seed mix will be provided to CDFW and SFPUC for their review and approval. If comments from CDFW and SFPUC on seed mix changes are not received by PG&E within 3 weeks following submittal, it will be assumed that CDFW and SFPUC approve of the seed mix changes.

Table 6. Serpentine Grassland Seed Mix

SPECIES	SEEDING RATE (PURE LIVE SEED POUND/ACRE)
yarrow <i>Achillea millefolium</i>	0.5
Chilean trefoil <i>Acmispon wrangelianus</i>	1
four-spot <i>Clarkia purpurea</i> var. <i>quadrivulnera</i>	0.5
California poppy <i>Eschscholzia californica</i>	0.5
small fescue <i>Festuca microstachys</i>	10
Goldfields <i>Lasthenia gracilis</i>	0.5
tidy tips <i>Layia platyglossa</i>	3
dwarf plantain <i>Plantago erecta</i>	15
purple needlegrass <i>Stipa pulchra</i>	7
meadow barley <i>Hordeum brachyantherum</i>	3
Total	41

7. Needlegrass Grassland Seed Mix Proposed for the Non-Native Grassland

SPECIES	SEEDING RATE (PURE LIVE SEED POUND/ACRE)
yarrow <i>Achillea millefolium</i>	0.5
Chilean trefoil <i>Acemisson wrangelianus</i>	1
four-spot <i>Clarkia purpurea</i> var. <i>quadrivulnera</i>	0.5
California poppy <i>Eschscholzia californica</i>	1
small fescue <i>Festuca microstachys</i>	10
tidy tips <i>Layia platyglossa</i>	1
sky lupine <i>Lupinus nanus</i>	1.5
dwarf plantain <i>Plantago erecta</i>	8
blue-eyed grass <i>Sisyrinchium bellum</i>	1
foothill needlegrass <i>Stipa lepida</i>	3
purple needlegrass <i>Stipa pulchra</i>	10
Total	37.5

Table 8. Coyote Brush Scrub Seed Mix

SPECIES	SEEDING RATE (PURE LIVE SEED POUND/ACRE)
yarrow <i>Achillea millefolium</i>	2
California brome <i>Bromus carinatus</i>	8
blue wildrye <i>Elymus glaucus</i> subsp. <i>Glaucus</i>	8
California poppy <i>Eschscholzia californica</i>	0.5
small fescue <i>Festuca microstachys</i>	5
sky lupine <i>Lupinus nanus</i>	2
foothill needlegrass <i>Stipa lepida</i>	4
purple needlegrass <i>Stipa pulchra</i>	8
Total	37.5

Table 9. Oak Woodland Seed Mix

SPECIES	(PURE LIVE SEED POUND/ACRE)
yarrow <i>Achillea millefolium</i>	1
California brome <i>Bromus carinatus</i>	16
blue wildrye <i>Elymus glaucus</i> subsp. <i>Glaucus</i>	15
small fescue <i>Festuca microstachys</i>	5
sky lupine <i>Lupinus nanus</i>	2
California buttercup <i>Ranunculus californica</i>	1
Total	40

3.5.3 SEED APPLICATION**Hydroseeding**

Seeds may be sowed using hydroseeding in all vegetation types except serpentine bunchgrass grassland. The hydroseeding method uses the hydraulic application of a slurry of seeds, and mulch. Hydroseeding will be done according to the specifications below or as adjusted by the PG&E biologist. A 3-step application method will increase the likelihood that the seeds are in contact with the soil and are lightly overlain with mulch, which increases seeding success. Hydroseeding materials will be applied in separate applications in the approximate sequence as follows:

1. Seed Application - Apply the hydroseeding mixture with hydroseeding equipment at the rates indicated within 60 minutes after the seed has been added to the mixture:

MATERIAL	POUNDS PER ACRE
Seed	as specified in seed mix
wood fiber or equivalent	500

2. Straw Application - Apply straw at the rate of 1 to 2 tons per acre. Incorporation of straw will not be required. Distribute straw evenly without clumping or piling.
3. Fiber and Tackifier Application - Apply the following mixture with hydroseeding equipment at the corresponding rates:

MATERIAL	POUNDS PER ACRE
wood fiber or equivalent	500
Tackifier	125

The ratio of total water to total tackifier in the mixture will be as recommended by the manufacturer. Hydroseed materials must be applied so they are in contact with the ground surface.

Broadcast Seeding

Serpentine bunchgrass grassland sites will be broadcast seeded. Hydroseeding is not recommended for serpentine sites as the addition of nitrogen (fertilizer) to serpentine habitats can negatively affect serpentine plant communities and can favor non-native plant species (Weiss 1999). Other vegetation types can be broadcast seeded instead of hydroseeded if desired.

In all areas, a layer of protective mulch will be added to broadcast seeded areas, to conserve moisture, reduce soil erosion, and increase germination. In serpentine grassland areas, weed-free rice straw will be used, with test plots in flat areas comprising between 2% and 5% of total serpentine bunchgrass grassland left without straw to observe variations in success. Locations of these plots will be specified in reporting, and the project biologist may elect to modify the extent of rice straw usage in subsequent seeding on the basis of results. Such modifications shall be recorded. In other vegetation types, weed-free rice straw or hydromulch will be used. Straw will be applied at a rate of approximately 500 to 1,000 pounds per acre (depending on slope, exposure, and other permit requirements) and can be applied by hand or blown on. Hydromulch will be applied at the rate as specified by the manufacturer.

3.6. DIRECT SEEDING TREES AND SHRUBS

Woody species will be direct-seeded where necessary to meet replacement ratios for the removal of trees and to establish shrubs in coastal sage and coyote brush scrub vegetation. Direct seeding does not carry the risk of introducing exotic soil pathogens into native plant communities. Direct seeding has been shown to be more cost effective than container stock planting for woody species in California (Palmerlee and Young 2010). Many species will grow as well from seed as will nursery-grown transplants (Chan et al. 1977). Therefore, the primary approach proposed for woody species replacement for this project is to direct seed locally-collected seed.

Trees will be seeded outside areas of restricted areas near the pipeline centerline as required for pipeline safety (PG&E 2014)⁵ and will be seeded in a pattern and density that reflects the surrounding vegetation and preexisting tree densities. Due to this restriction, seeding sites may need to be moved to the site periphery or elsewhere outside the project area. Locations of these external plantings will be identified in the annual reports.

3.6.1 TREE AND SHRUB PLANT PALETTES

The direct seeding palette was chosen based on dominant species present in the vegetation type and those species that have the highest rates of germination success (Tables 11 and 12). Native trees that are removed will be replaced with the same species.

Additional trees beyond those impacted will be direct-seeded to allow for some mortality and ensure a 3:1 replacement ratio for native oaks and a 1:1 replacement ratio for other native species after five years.⁷

Table 11. Direct Seeding Plant Palette for Oak Woodland

SPECIES	NO. OF SEEDS PER PLANTING SITE	AVERAGE SPACING OF PLANTING SITES
coast live oak (<i>Quercus agrifolia</i>)	3	20 feet on center (109 plants/acre)
toyon (<i>Heteromeles arbutifolia</i>)	20	20 feet on center (109 plants/acre)

Shrubs will not be replaced based on the number of shrubs removed; instead, the number of direct-seeded shrubs will be based on acreage of planting area and average spacing of planting (Table 12). Shrubs will be planted in clusters, not evenly spaced throughout the planting area.

Table 12. Direct Seeding Plant Palette for Coyote Brush Scrub

SPECIES	NO. OF SEEDS PER PLANTING SITE	PROPORTION BY SPECIES	AVERAGE SPACING OF PLANTINGS
coyote brush (<i>Baccharis pilularis</i>)	20	90%	20 feet on center (109 plants/acre)

Shrubs will not be replaced based on the number of shrubs removed; instead, the number of direct-seeded shrubs will be based on acreage of planting area and average spacing of planting (Table 12). Shrubs will be planted in clusters, not evenly spaced throughout the planting area.

3.6.2 TREE AND SHRUB SEED COLLECTION

Locally-collected tree and shrub seed typically is not available commercially. Relatively small quantities of these species are needed for direct seeding for this project. It is anticipated that this seed will be collected locally.

Seeds will be collected from different trees and shrubs to ensure diversity. Seeds will be collected from healthy, vigorous, well formed, mature trees and shrubs, and isolated trees will be avoided (NRCS 2009). Seed collection will be well documented, clearly indicating the following information: collectors' names, species, date and location of collection, and the date storage began and ended.

Acorns

Acorns will be collected in early fall, several weeks after the first acorns have started to drop, and after the acorns on the tree can be dislodged easily from the acorn cap by gentle twisting (McCreary 2009). Collecting acorns from the ground will be avoided when possible. If acorns

⁷ For example, trees, woody shrubs, or woody vegetation that may exceed 8 inches diameter at breast height at maturity cannot be planted within 10 feet of the pipeline centerline. Trees expected to grow to or exceed 36 inches diameter at breast height cannot be planted within 14 feet of the pipeline centerline.

are collected from the ground they will be soaked in a 5% bleach solution for 1 minute. Immature acorns cannot be ripened artificially after removal from the tree; therefore, acorns will not be collected until they are ripe.

Acorn caps will be removed before storage. All acorns will be stored in a cooler or refrigerator in partially open plastic bags, but will not be stored for more than 1 or 2 months before planting, to provide the greatest viability (McCreary 2009). The acorns will be checked regularly to make sure they are not drying out. If acorns start to germinate during storage, they will be removed and planted as soon as possible. If mold develops during storage and the acorns are discolored or slimy, the acorns will be discarded (McCreary 2009).

Other Seeds

Other seed will be collected and stored for planting post construction.

Coyote brush (*Baccharis pilularis*) is easily grown from seed, especially if these seeds are propagated the same day they are collected. The ripe fruits can be collected by hand or by brushing them into containers or ground cloths. If not planting the same day as collecting, the achenes should be spread out to dry in a warm, well-ventilated room, or in the sun, protected from the wind (Elkhorn Slough 2001). When dried, they may be rubbed through a fine screen to remove the pappus for ease in handling. Cleaned seeds of coyote brush can be stored at 2 to 5° C in sealed containers (Elkhorn Slough 2001).

3.6.3 TREE AND SHRUB DIRECT SEEDING METHODOLOGY

Seeding will be done in the fall, after rainfall has moistened the soil, using locally collected seeds obtained during the previous spring, summer, and fall. Direct seeding should occur prior to the end of February; later seeding may require additional irrigation.

Before installing seeds, grasses and other low vegetation will be scraped in an approximate 3-foot-diameter area. If seeding is on a slope, a level planting site should be established. Depending on the size of the seed, 3 seeds (for the largest, such as acorns) to 20 seeds (for the smallest, such as coyote bush) will be planted. Small seeds will be lightly covered with soil, and large seeds like acorns will be placed 0.5 to 1.0 inch deep.

Trees and shrubs that are direct-seeded will be protected from herbivory using either a Tubex or a double cage system. An 8-inch-diameter tube constructed of half-inch wire mesh will be sunk 6 inches into the ground around the seeds and will extend above the ground at least 12-inches. Each tree or woody shrub will then have a wire cage installed around it, either at the time of planting or within 1 year. Two wooden posts or T-posts will be wired to the cage for stabilization. The purpose of these large outer cages is protection from deer as the tree grows. Other herbivory protection methods may be used as recommended by the restoration biologist. Rice straw will be installed as mulch around each planting to control weeds in the immediate vicinity of the planting.

After the seeds and protective hardware are installed, water will be applied slowly to the seeding site, so that all water percolates and no runoff occurs. Additional watering will be needed if rainfall is lower than average or seeding is performed outside the rainy season. The need for supplemental watering during the winter will be determined by the PG&E biologist.

3.6.4 IRRIGATION

Direct seeded trees will be irrigated via hand watering, an aboveground temporary drip system to be designed by the installation contractor, or with the use of products such as DriWater. If a drip system is used, the system will be set to deep water intermittently. The direct seeding locations will be watered thoroughly when installed, and irrigated weekly to monthly depending on weather conditions. If DriWater is used (only after plants have germinated), the product will need to be replaced approximately every 60 days during the dry season. Shrubs will not receive irrigation unless the PG&E biologist determines irrigation is necessary based on planting times and rainfall patterns.

3.7. As BUILT PLAN

Following revegetation, an as-built report will be prepared to document the completion of revegetation activities and provided to SFPUC and CDFW within 60 days after recontouring and seeding is complete. The as-built report will include a summary of: the total numbers of trees impacted (by species); acreages of each habitat type revegetated; numbers, species, and locations of direct seeded trees and shrubs; the species, application method and quantity of native plant seed broadcast; and photographs documenting the restoration. A map will be prepared map showing the location of restoration activities. Any changes to activities specified in the Vegetation Restoration Plan will be noted and discussed in this as-built report. Actions to be undertaken in the following year including any additional seed collection or procurement may also be included in the as-built report.

Section 4. SUCCESS CRITERIA, MONITORING AND REPORTING

4.1. SUCCESS CRITERIA

Success criteria will be used to measure the extent of revegetation after construction completion (Table 13). At a minimum, the success criteria shall be met for the final 2 years of the monitoring period. If any of the listed criteria are not met by the end of the monitoring period, additional management and monitoring shall be required until the success criteria are met.

For the last two years of the 5 year monitoring period after revegetation, recovery success criteria will be as follows⁸:

- Species composition and cover values within the seeded areas will be comparable to the reference sites. Total cover and native cover of work areas will be at least 75 percent of total and native cover of reference sites. Species richness will also be measured in the work areas and reference sites. The data used for comparison will be collected during the same monitoring year (e.g. Year 1) and at the same time of year (sampled within a few weeks or when the conditions are phenologically appropriate for correct comparisons). Areas that were mapped as non-native grassland prior to construction (baseline conditions) will be compared to non-native grassland reference sites that were selected prior to the start of construction. Areas that were serpentine grassland prior to construction (baseline conditions) will be compared to serpentine grassland reference sites that were selected prior to the start of construction.
- A sufficient number of replacement trees are alive to meet the 3:1 replacement ratio for native oaks and 1:1 replacement ratio for other native species.
- Absolute cover of invasive⁹ weeds in the work area will be less than or equal to the reference sites. Any infestations of invasive weeds that are not present in the adjacent reference sites or were not recorded in the work area prior to construction will be controlled. Areas that were non-native grassland prior to construction will be compared to non-native grassland reference sites that were selected prior to the start of construction. Areas that were serpentine grassland will be compared to serpentine grassland reference sites that were selected prior to the start of construction.
- Any new species of invasive weed that was not recorded during preconstruction surveys will be controlled.

⁸ Areas where existing land management practices are not compatible with native plant restoration on those areas, such as the SFPUC fire break, will be exempt from continued management/monitoring after initial restoration. No vegetation restoration will be implemented on pre-existing access roads.

⁹ For the purposes of this document, invasive weeds are plant species that are listed on the California Noxious Weed List (CDFA 2016) or have a Cal-IPC Weed Ranking Definition of High (Cal-IPC 2016). Some (but not all) species with a Cal-IPC Weed Ranking Definition of Moderate will also be considered invasive weeds particularly if they are a species of high concern for the SFPUC Watershed.

- In areas that were serpentine grassland prior to construction, the total cover of non-native plant species will be no more than 120 percent of the total cover of non-native plant species in serpentine grassland reference sites.
- A sufficient number of replacement trees are alive to meet the 3:1 replacement ratio for native oaks and 1:1 replacement ratio for other native species.
- Restored areas will be stable (i.e., no significant indicators¹⁰ will be noted during the monitoring period).

Table 13. Success Criteria for the Project

PERFORMANCE INDICATOR	TARGET VALUE AFTER 5 YEARS
Total Cover	75 percent of total cover of reference sites (excluding oak woodland)*.
Native Cover	75 percent of native cover of reference sites (excluding oak woodland)*.
Cover of Invasive Weeds	Absolute cover of invasive weeds will be less than or equal to reference sites. Any infestations of invasive weeds that are not present in the adjacent reference site or were not mapped during preconstruction baseline surveys will be controlled*.
Cover of Non-Native Plant Species in Serpentine Grassland Areas	In areas that were serpentine grassland prior to construction, the total cover of non-native plant species will be no more than 120 percent of the total cover of non-native plant species in serpentine grassland reference sites.
Number of Replacement Trees	A sufficient number of replacement trees are alive to meet the 3:1 replacement ratio for native oaks and 1:1 replacement ratio for other native species.
Restored Areas are Stable	No significant indicators noted**.
Fragrant Fritillary	70 percent of the pre-construction number of plants will be established in the work area by the end of five years (i.e., if 1,084 plants impacted x 70% = 759 plants).
Crystal Springs Lessingia	70 percent of the preconstruction number of plants will be established in the work area at the end of five years (i.e., if 2,800 plants impacted x 70% = 1,960 plants)***.

* Areas that were non-native grassland prior to construction will be compared to non-native grassland reference sites. Areas that were serpentine grassland prior to construction will be compared to serpentine grassland reference sites. The fire breaks that are disked annually by SFPUC will be exempt from continued management/monitoring after initial restoration.

**Significant indicators include erosion, unvegetated areas, and invasive weed infestations, among other issues.

*** The numbers of Crystal Springs lessingia counted in the reference plots each year will be compared to the 2016 pre-construction reference plot numbers to adjust the yearly plant targets. For example, if only half of the plants known to occur in the reference plots are present in any given year, the target number of plants for the reestablished population in the work area will be adjusted (lowered) proportionately.

4.2. MONITORING

The site will be monitored for a minimum of five years and newly planted trees will be monitored for a minimum of seven years. Monitoring site visits will occur quarterly for the first

¹⁰ Significant indicators include erosion, unvegetated areas, and large invasive weed infestations, among other issues.

two years and then annually, at a minimum, for the remainder of the monitoring period. Vegetation cover data will be collected annually all five years. Monitoring will be sufficient to allow evaluation of ongoing restoration and its trajectory to meet success criteria contained in this plan. All monitoring will be conducted by a qualified biologist. Annual monitoring reports shall be sent to the SFPUC and CDFW and data from the quarterly site visits will be made available to these agencies upon request.

4.2.1 PHOTOMONITORING

Permanent photo-documentation points will be established in representative locations to document recovery. Additional photo points may be taken in representative areas and in potential problem areas where restoration success appears to be lagging or uncertain to meet success criteria. At each photo point, the location will be recorded with GPS coordinates. Once per year in spring, photographs will be taken from each photo point, using a digital camera.

4.2.2 VEGETATIVE COVER

Data on plant species composition and cover will be recorded in the restored work areas and reference sites in both non-native annual grassland, serpentine grassland, and oak woodland. The location of reference sites will be selected prior to the start of construction based on similarity to the work area, mapped and provided to SFPUC and CDFW, as described in Section 3.3.

Plant species composition and cover data will be collected using randomly selected, independent sampling units (1 meter x 1 meter quadrats) within each habitat type within the disturbance area to be restored and the reference sites that were established prior to the start of construction. Cover estimation in quadrats was chosen as the sampling method in order to provide cover data and capture species richness. Random points, stratified by habitat type, will be generated using GPS and the sampling units (quadrats) will be placed randomly according to these points. The locations of the quadrats will be randomly selected each year; the location of plots are not permanent.

Within each quadrat, absolute cover of plants will be visually estimated and recorded for the quad as a whole (total vegetation cover) and for each individual plant species using the CNPS method for estimating cover values (CNPS 2014). The CNPS method for estimating cover values uses a “bird’s eye view” looking from above and estimating cover for the living plants only (CNPS 2014). Litter/duff should not be included in these estimates and the porosity of the vegetation should be taken into consideration when estimating percent cover (CNPS 2014). Percent cover diagrams (available on the CNPS Vegetation Program website) should be used to facilitate cover estimates. To ensure consistency and accuracy in cover estimation, prior to collecting cover data, the survey team will calibrate themselves by reviewing cover estimation methodology and conducting visual estimations over several quadrats together.

Total cover of vegetation, bare ground, thatch, and straw (restoration site only) will also be recorded. Total cover contributed by natives, total cover contributed by non-natives, cover contributed by invasive weed species, species richness, and other data as determined by the PG&E biologist will be calculated from this data. A power analysis will be used to determine the sample size required to statistically test the Year 5 performance criteria (total cover, native cover, invasive weed cover, and non-native plant cover) with a 95% confidence interval level [$\alpha = 5\%$,

where α is the acceptable probability of incorrectly concluding the proportion is less (for total cover and native cover) or more (for non-native and invasive species) than the threshold]. The small size and variability of the restoration area and variability of the reference sites may prevent these statistically parameters from being met, however every effort will be made to conduct the sampling and analysis in a scientifically sound method. In an effort to balance sampling effort and scientific rigor, a maximum of 120 quadrats will be sampled in the work area and reference sites.

In addition, the extent of invasive weed populations will be mapped using a high precision GPS unit to map the boundary of the weed population. Percent cover will be estimated for the population. A map will be included in the annual report.

Sampling will be carried out annually in the spring and will be timed to ensure that vegetation is identifiable and has achieved its maximum growth.

4.2.3 PERCENT SURVIVORSHIP AND HEALTH AND VIGOR (TREES)

Plant survival will be measured for all of the direct-seeded trees, to determine that the replacement ratios have been attained. Health and vigor ratings will also be recorded to track the health of the plantings but are not tied to project success. Once per year in the summer or early fall, all direct-seeded tree plantings will be counted, height measured, and a condition rating assigned. The general condition of each plant will be recorded using the following criteria:

- Excellent: No evidence of stress; minor pest or pathogen damage may be present; no chlorotic leaves; no or very minor herbivory
- Good: Some evidence of stress; pest or pathogen may be present; few chlorotic leaves (less than 10 percent); minor evidence of herbivory
- Fair: Moderate level of stress; high levels of pest or pathogen damage; some chlorotic leaves (between 10 and 30 percent); some herbivory damage such as nipped leaves, wear marks
- Poor: High level of stress; high levels of pest or pathogen damage; many chlorotic leaves (greater than 30 percent), severe herbivory damage

4.3. REMEDIAL MEASURES

Remedial efforts may include reseeding, weeding, and/or erosion control. Remedial measures will be implemented, after consultation with SFPUC and CDFW, if the annual success criteria target values are not met or if annual success criteria are being met but there are issues that may prevent the site from meeting future success criteria. Given implementation may be time sensitive, if no response has been received from either agency within 3 weeks, PG&E will implement the measures as planned. Remedial measures will be implemented for areas that have not achieved acceptable survivorship or vegetative cover compared to reference sites. All monitoring visits will include an evaluation of the need for remedial measures if necessary.

4.3.1 SUPPLEMENTAL SEEDING AND MAINTENANCE

Areas will be supplementally seeded if success criteria are not met or the site is not on track to meet success criteria in the future. Supplemental seeding maybe needed only on portions of the site if other portions are meeting success criteria. Rice straw may need to be moved if it is observed that germination or growth is being impeded. Based on monitoring data and seed availability, the PG&E restoration biologist will determine what species for revegetation should be used. All supplemental seeding will have to adhere to the guidelines presented in this plan. Should supplemental seeding and irrigation occur in the last two years of monitoring and reporting used to meet success criteria, a corresponding extension of the monitoring would occur for those areas. All planned supplemental seeding and maintenance actions will be reported to SFPUC and CDFW for review and approval. Given implementation may be time sensitive, if no response has been received from either agency within 3 weeks, PG&E will implement the measures as planned.

4.3.2 PLANT REPLACEMENT

Non-germinating seed or dead plants will be replaced as necessary to meet success criteria. Replacement shall not occur in the last two years of monitoring and reporting used to meet success criteria unless a corresponding extension of the monitoring occurs for those areas. The PG&E biologist will determine when reseeding is necessary and what species should be used. If certain species are not successful they will be replaced with other species.

4.3.3 NON-NATIVE PLANT SPECIES REMOVAL

Invasive weed species will be removed and controlled in all revegetated areas during the five-year monitoring period as necessary to meet success criteria. Non-native plant species, including annual grasses, will be controlled in serpentine grassland areas as necessary to keep the site on track to meet success criteria. The decision to control annual grasses will be based on the observations during early spring site visits and the results of spring data collection. If it is determined that invasive weeds or non-native grasses are preventing the lessingia or fragrant fritillary restoration areas from meeting the performance criteria as described in Appendix B, then non-native plant species control in these areas may be necessary. Monitoring and control will target all invasive weed species including those known to occur in the immediate project vicinity (Table 4) as well as species not currently known from the site.

4.3.4 IRRIGATION

Irrigation will be carried out in areas with direct seeding of trees as described in Section 3.5.2. The PG&E Biologist will determine if additional irrigation is needed for direct seeded trees and shrubs or other seeded areas.

4.4. MONITORING REPORTING

At the end of each monitoring year, an annual report will be prepared that includes methods used, results of monitoring, photomonitoring photographs, representative photographs, a summary of reference and restoration site data, an assessment of progress toward meeting success criteria, discussion of any remedial actions taken, recommendations, and implemented actions.

Annual monitoring reports will be sent to SFPUC and CDFW by February 28 of the following year. Data from the quarterly site visits will be made available to these agencies upon request.

Section 5. REFERENCES

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APPENDIX A FIGURES

APPENDIX B FRAGRANT FRITILLARY TECHNICAL MEMORANDUM



March 28, 2016

Chrissie Klinkowski, M.S.
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Environmental - Gas
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Technical Memorandum - Fragrant Fritillary (*Fritillaria liliacea*) Salvage and Supplemental Seeding for Gas Line 109 Bunker Hill Pipeline Replacement Project, San Mateo County, California.

Dear Ms. Klinkowski,

This technical memorandum provides the proposed methodology for salvaging fragrant fritillary (*Fritillaria liliacea*; California Rare Plant Rank 1B.2) plants present within Segment 4B of the Gas Line 109 Pipeline Replacement Project. This memorandum also includes project background, a summary of impacts, performance criteria, monitoring requirements, and reporting.

PROJECT BACKGROUND

Pacific Gas & Electric (PG&E) proposes to replace an approximately 1.1 mile long portion of Line 109 (Segment 4B; Bunker Hill) located in San Mateo County, California (Figures 1 and 2, in the *Vegetation Restoration Plan*) (Nomad 2016). The Bunker Hill project is south of Crystal Springs Road, north of Highway 92, and east of Interstate 280. The project is within the Peninsula Watershed owned by the San Francisco Public Utilities Commission.

The project at Bunker Hill is scheduled to be constructed in summer 2016. PG&E proposes to replace an approximately 1.10 mile segment of gas pipeline starting at the Half Moon Bay valve lot just west of Lexington Ave and High Plains Court, continuing across Bunker Hill Drive, and terminating just west of Laurel Hill Drive in San Mateo County. The existing gas transmission pipeline has a diameter varying from 22 to 30 inches and will be replaced with a 24-inch diameter pipeline and one segment of 30-inch diameter pipeline. Construction activities include excavation in the approximately 85-foot wide project area, stockpiling of the soil, and replacement of the pipeline. Following pipe replacement, the stockpiled soil will be backfilled and the site will be revegetated. A portion of the project will be constructed via tunneling to avoid additional impacts to special-status species.

Protocol-level special-status plant surveys were conducted for the project on select dates from April 2013 to April 2014 by Orion Environmental Associates. Fragrant fritillary was observed and mapped within the project area in March and April 2014 (Orion Environmental Associates 2014). During these surveys,

approximately 10,000 individuals were recorded within the project area and the adjacent habitat. The location of fragrant fritillary is shown on the Figure included in Attachment B-1).

Preconstruction surveys for fragrant fritillary were conducted on March 18, 2015 (CH2M HILL 2015). A total of 333 fragrant fritillary plants were counted within the proposed project work area in 2015 (CH2M HILL 2015). A separate survey by San Francisco Public Utilities Commission in 2015 counted 371 fragrant fritillary plants within the work area. PG&E Biologists conducted three separate follow-up pre-construction surveys in March 2016 and counted 1,084 fritillary plants within the work area. The number of fragrant fritillary plants that are in the work area (excluding the tunneling area) in 2016 prior to the start of work will be considered the number of fragrant fritillary impacted by the project.

The fragrant fritillary plants within the proposed project area cannot be avoided during construction activities (although impacts will be minimized because of the use of tunneling); therefore, salvage is recommended to minimize impacts to this species. Fragrant fritillary plants in the tunneling area are outside of the work area and will not be salvaged. The fragrant fritillary plants inside the work area were flagged with pin flags at the base of each plant in spring 2015 and 2016. Fragrant fritillary plants are located between Stations 9+20 and 17+50 with the majority between Stations 14+00 and 16+20.

Fragrant fritillary seeds were collected in 2015 and 2016. The details are included under Supplemental Seed Collection. Seeds will be spread on site during site restoration after construction is complete.

FRAGRANT FRITILLARY ECOLOGY AND STATUS

Fragrant fritillary, a California endemic, is designated a California Rare Plant Rank 1B.2 species, indicating that it is rare and moderately threatened in California. It is a perennial, bulbiferous herb in the lily (Liliaceae) family. This species has 2-7 large bulb scales and 1-2 small bulb scales (Baldwin et al. 2012). It has white flowers that are striped green and is differentiated from other species in the genus by having less than ten leaves, obscure nectaries, small bulb scales, and nodding white flowers (Baldwin et al. 2012). Like all fritillary species, it has a capsule fruit with three chambers containing many seeds in two rows per chamber. Similar to most bulbiferous species, the plant stem and leaves senesce after flowering, and plant nutrients and carbohydrates are stored in the bulb. The fritillary will grow the next season from the energy stored in the bulb that was generated during previous growing seasons. They do not necessarily flower every year. Plants reproduce primarily by small bulblets or by seed.

Fragrant fritillary blooms from February to April (CNPS 2015, Jepson Flora Project 2015). It is recorded from Alameda, Contra Costa, Monterey, Marin, San Benito, Santa Clara, San Francisco, San Mateo, Solano, and Sonoma counties (CNPS 2015). This species is found in clayey or serpentinite soils in cismontane woodlands, coastal prairies, coastal scrub, valley and foothill grasslands near the coast at elevations from 10 to 1,345 feet (3 to 410 meters).

Fragrant fritillary bulbs within the work area were found at depths of approximately 8 cm (Leitner, pers. comm. 2015). Soils were loose and friable in April 2015 and March 2016; however, the bulbs will likely become more difficult to dig up and salvage as soil moisture decreases in late spring/summer as soils harden. Soils in the work area where fragrant fritillary occurs are mapped as Fagan loam, 15 to 50 percent slopes (Natural Resource Conservation Service 2015).

FRAGRANT FRITILLARY SALVAGE

The goal of fragrant fritillary salvage is to minimize impacts to fragrant fritillary within the work area. Salvaging and replanting the bulbs is believed to be the most successful salvage method and is recommended by horticulture and *Fritillaria* experts. Dormant or nearly dormant bulbs will be removed prior to the start of construction, stored, and then replanted in the work area once construction is complete. The salvage methodology described below was developed based on discussions with bulb propagation experts: Stephen Edwards, former Director of the Regional Parks Botanic Garden in Tilden Park; and Ed Rustvold, an expert in California Liliales and Asparagales who has over 30 years of experience propagating fritillaries and is regarded as a California native bulb propagation expert.

(Edwards pers. comm. 2015; Rustvold, pers. comm. 2015).

As of April 24, 2015, fragrant fritillary plants at the project site had completed flowering, were in fruit, and seeds were maturing (Leitner, pers. comm. 2015). For the best chance of success, bulbs should be salvaged after flowering is completed but prior to the stems and leaves fully drying and withering as they are much easier to locate and excavate with visible plant material attached and before soils are fully dry (Rustvold, pers. comm. 2015). In case plants cannot be salvaged while above-ground leaves and stem are still present, fragrant fritillary plants in the work area at Bunker Hill are/will be individually flagged with pin flags which will aid in re-locating them. Salvaging the plants prior to the full maturation of seeds will not preclude seed collection as immature stems and capsules can be harvested and kept until seed ripens; this methodology is detailed after the discussion of bulb salvage.

Two different methods for salvaging bulbs are presented below: the soil core method and the bare bulb method. Seed salvage is also discussed. Based on conversations with Mr. Rustvold, the easiest way to salvage fritillary bulbs, and the method that is expected to be the most successful, is to use the soil core method while soils are still moist. The bare bulb method can also be used but it is much more difficult to dig the bulbs up and separate them from the soil without damaging the bulbs. Mr. Rustvold has indicated that the bare bulb method will likely have lower success rate, but salvage using this method can still be performed. These two different salvage methods, including constraints, are described below. It is expected that slight adjustments to the salvage methodology, regardless of which of the two methods is chosen, will be required in the field.

Recommended Pre-Construction Fragrant Fritillary Salvage and Storage Methodologies

Salvage Method 1 - Soil Core Method

Bulbs are harvested by digging a soil core around the bulb (for example, by using a Japanese digging knife [“hori hori”] combined with a pry bar or other digging tool or a hand auger with appropriate fitting). The goal of digging a soil core is to keep the bulb, roots, and underground portion of the stem intact in the soil core and disturb the bulb and roots as little as possible. The depth of the soil core should be generally 4 to 8 inches, sufficient to capture the bulb and fibrous roots. The core is best dug in spring before soils have completely dried out. This makes digging the core easier, helps keep the core intact, and protects the bulb and roots. Water should not be added to soil because it may make the bulb susceptible to fungal infections or rot. Once the soil core is removed, it should be placed in a container of sufficient depth or stored in the ground on site. If stored in containers, sterilized kiln-dried fine sand can be packed around the soil core to stabilize it if necessary. Coconut coir or an alternate dry and sterile material can be used in place of sand. The material packed around the soil core helps to keep the soil core intact and cool. The soil core should be stored in a cool, dry, dark place or in the ground until time for replanting.

If soil cores are dug too late in the season when soils are very dry, the soil core will be more susceptible to fracture and it will not remain intact. If, during salvage, soils are found to be too dry to hold together in an intact core, the bulb should be salvaged as specified under the bare bulb method below.

Digging tools and storage containers will all be washed and sterilized prior to salvage to avoid introducing any pathogens (e.g., *Phytophthora*) to the site or to the bulbs. Tools shall be sprayed with disinfectant. Other applicable best management practices (BMPs) to avoid the introduction or spread of pathogens will be used.

Salvage Method 2 - Bare Bulb Salvage

The bare bulb salvage method will be used if soils are too dry to remove the bulb along with an intact soil core or if soil cannot be removed and stored due to concerns about soil borne pathogens. Bulbs are harvested by digging up a soil core in the same manner as above with the goal of disturbing the bulbs and roots as little as possible. If the soil core will not remain intact, bulbs will be removed from the core. The bulb and fine roots shall be disturbed as little as possible; however, if all soil needs to be removed from the bulb due to concerns about soil borne pathogens, then soil and roots will be removed. Bulbs should be

placed in containers and packed in sterilized kiln-dried fine sand or another suitable material. The bulbs need to be completely covered so they stay cool and dry. The bulbs should be stored in a cool, dry, dark place until time for replanting. During salvage, the range of bulb depths encountered should be recorded to help determine the depth to place the bulbs during replanting. This method is more laborious than the soil core method because dry soils are more difficult to dig and damage to the bulb is more likely to occur, necessitating more careful digging. Fibrous roots are often damaged and the bulb may fracture into individual scales.

As described above, digging tools, sand or other alternate packing materials, and storage containers should all be either new or washed and sterilized with a 10% solution of bleach prior to salvage to avoid introducing or spreading any pathogens to the site or to the bulbs.

Table 1. Comparison of Bulb Salvage and Replanting Methods

Methods			
Details	Soil Core (Soil + Bulb)	Bare Bulb	SUPPLEMENTAL SEED
Success	Better success expected	Lower success expected	Lowest success expected
Collection	Dig up the bulb in an intact soil core deep enough to capture bulb and roots. Best if done before plant senescens entirely for ease of locating bulb. Best if done before soil dries out completely. If soils are moist, digging out the bulb with an intact soil core is expected to result in the least amount of damage to the bulb.	Dig up soil around the bulb carefully, keeping bulb as intact as possible. Remove soil surrounding bulb, retaining roots. If soil is dry, the soil and bulb may fracture, and the bulb might disarticulate into smaller scales, harming the bulb. Digging up bulbs and separating them from the soil is more laborious.	Collect seed heads by cutting stem above leaves. Prior to seed maturity but after seeds have formed. Seeds may need to be ripened by placing cut stems into water and allowing capsule to mature off the plant. Harvest seed and store in natural fiber bag.
Storage	Store in sterile pots/boxes or in the ground outside of the work area. Sterilized kiln dried fine sand or other suitable material may be used to support cores in containers, if necessary. Bulbs can be stored in soil cores for a longer period of time (compared to the bulb only salvage method) which may be beneficial if project is delayed and they cannot be replanted immediately after the first rain. If stored off site it needs to be stored in soil free location to avoid soil pathogen contamination.	Store in sterile pots or boxes in sterile sand or other suitable material. If stored off site it needs to be stored in soil free location to avoid soil pathogen contamination.	Store off site.
Replanting	Replant soil core at original depth.	Replant bulb at original bulb depth.	Seed on prepared seed bed.
Issues	Larger volume of soil to handle and store.	Less soil involved but much lower success rate due to damage to bulb by excavation.	Should supplement bulb salvage but not replace it.

Based on conversations with fritillary experts, higher success may be achieved by using the soil core method. This method will require a larger area for storage due to the volume of the soil cores. In addition, this method results in soil being stored with the bulbs, and soil can harbor pathogens including *Phytophthora* species. For this reason, soil cores shall be stored in containers or in the ground on site in the Peninsula Watershed or stored off site in containers in a clean location without any plants or soil that could cause contamination. Storage off site requires a storage area that stays dark, dry, and cool and is protected from sun, rain, and herbivory.

Salvaging the bulbs without a soil core may have a lower success rate as bulbs will likely disarticulate into scales and fibrous roots would be damaged. This method has advantages, however as storage will require less space and less soil will be moved.

Seed collection will also occur along with bulb salvage, regardless of the method used for bulb salvage. The success of seeding is likely to be low, therefore resources should be focused on successful bulb salvage.

Seed Collection

To supplement the bulb salvage, seed was collected from all individuals in the impact area prior to salvaging bulbs. Fragrant fritillary seeds were collected on May 23, 2015 from plants located in the work area assuming individuals would not finish seed production in 2016 prior to the start of construction. Seeds were also collected on May 11 and 19, 2016 from plants located in the work area. Capsules were monitored, and when they began to split and open, seed was collected by opening the capsule and pushing seeds into a bag or collecting the entire capsule. Approximately 30,000 seeds were collected in 2015 and approximately 20,000 seeds were collected in 2016. The seeds are being stored in sealed paper envelopes on an open shelf in a dark, dry, cool storage space. Seeds will be spread on site during site restoration after construction is complete.

Post-Construction Planting and Seeding Methodologies

The planting area will be prepared as detailed in the Vegetation Restoration Plan for the project. This includes stockpiling topsoil material, backfilling soil, soil surface preparation, and seeding with an appropriate native seed mix. The site will be seeded with native seed mix when construction is complete and the fritillary will be outplanted after seeding occurs.

A stockpile of native soil that has been broken up mechanically to remove clods will be set aside to use as backfill around the bulb plantings.

Bulbs

In compliance with the project CEQA document, replanting of bulbs must be completed between September 1 and October 31 or deferred to the following year during this period. Soil cores should also be watered prior to planting. Soil cores or bulbs should be planted in the area where fragrant fritillary plants were present originally. Holes should be dug individually. The soil cores or individual bulbs should be planted, paying careful attention to place the bulbs at the same depth they were originally found, as feasible. Native soil should be backfilled around the soil cores or bulbs and tamped to provide good soil contact. Bulbs shall be watered in following planting. Pin flags and other durable materials such as metal tree tags should be placed at the location where soil cores or bulbs are planted to help relocate the plants for future monitoring.

Seeding

Salvaged topsoil shall be respread on site and the topsoil will likely contain seeds of fragrant fritillary. In addition, fragrant fritillary seeds should be spot or broadcast seeded in the impact area following construction. Seeding should occur at two separate times: immediately after construction prior to hydroseeding and in May the year following construction. Seeding in May will mimic the naturally timing of fragrant fritillary seed dispersal which may be important for seed stratification or planting depth

due to shrinking of clay soil and high temperatures in summer months. When seeding, a seed bed should be prepared by removing competing non-native vegetation and decompacting soil at the surface. Seeds shall be placed on the surface and raked in to facilitate soil and seed contact, covered with a light layer of soil as needed, and lightly tamped down by hand.

REFERENCE PLOT SAMPLING

The goal of sampling a reference population is to track annual variation in natural population abundance to determine population trends. These trends are desired for two reasons: 1) to determine how the baseline population estimates compare to population trends over several years of sampling; and 2) to correlate natural population trends with the monitoring for restored fragrant fritillary populations within project impact areas to compare abundance against an undisturbed reference condition.

Three permanent reference plots were established in the fragrant fritillary populations on Bunker Hill outside of the work area. The three fragrant fritillary reference sites were selected based on the following criteria: 1) a sufficient number of plants (at least 100 individuals per reference location); 2) in areas with similar soils; 3) relatively close to the work area, but placement on the southwest side of the existing access road was needed to ensure they would not be impacted by any mowing or disking activities conducted by SFPUC.

The number of fragrant fritillary individuals were counted in the reference plots in 2016 prior to the start of construction at the same time that fragrant fritillary individuals are counted in the work area. The number of fragrant fritillary individuals (both flowering and nonflowering) will be counted annually in the reference plots to establish patterns of annual variation in fragrant fritillary populations. This data will be used to adjust performance criterion as necessary as detailed below. In addition, two populations are being divided by the project and a substantial portion of each will remain after the project is done; the portions remaining will be used as reference sites as well.

PERFORMANCE CRITERION

The goal of the fragrant fritillary salvage is to reestablish a population of fragrant fritillary in the work area within five years following the completion of construction. Areas replanted with fragrant fritillary bulbs and seeds shall be monitored for a minimum period of five years. Fragrant fritillary shall be censused annually within the work area and the established reference plots. The number of detectable fragrant fritillary in leaf and/or flower is expected to vary in the work area and in the reference plots from year to year, depending on precipitation, herbivory and other ecological variables. During monitoring, the phenological stage of development of the fragrant fritillary plants (e.g., in leaf, bud, flower, or senesced) will also be tracked in both the reference population and the plants reestablished in the work area. Leaves may be present for several years until bulbs reach sufficient size to flower, and a fragrant fritillary plant that sends up a leaf will be considered a successful plant; flowering is not required.

For fragrant fritillary, the performance criterion is that 70 percent of the pre-construction number of plants will be established in the work area by the end of five years (i.e., if 1,084 plants impacted $\times 70\% = 759$ plants). At a minimum, the success criteria shall be met for the final 2 years of the monitoring period. If the criterion is not met by the end of the monitoring period, additional management and monitoring shall be required until the success criteria are met. Fragrant fritillary will be surveyed for and counted in the work area in March 2016 prior to the start of construction.

The numbers of fragrant fritillary counted in the three reference plots each year will be compared to the 2016 pre-construction reference plot numbers to adjust the yearly plant targets. For example, if only half of the plants known to occur in the undisturbed reference plots are present in any given year, the target number of plants for the reestablished population in the work area will be adjusted (lowered) proportionately. If the number of plants does not reach the performance criterion or if the site is not on a

trajectory to meet this success criterion, then adaptive management actions will be developed and supplemental activities may be performed. These could include supplemental salvage and transplantation, seed collection and plant propagation, or additional seed collection and direct sowing. PG&E will provide an annual report to CDFW in which it will provide restoration success data. If criteria have not been met, adaptive management shall be proposed to SFPUC and CDFW and shall be subject to consultation and approval prior to implementation. Given the implementation may be time sensitive, if no response has obtained from either agency within 3 weeks, PG&E will implement the measures as planned.

Monitoring will also include collecting data on invasive weeds and non-native plant species in the fritillary restoration areas. Target invasive weed species (as defined in the Vegetation Restoration Plan) in the work area and adjacent reference population will be identified and the extent of any infestations will be mapped and included in the annual monitoring reports. Weed control will be initiated if invasive cover exceeds the performance criteria in the Restoration Plan or if it determined that invasive weeds or non-native plant species are preventing the fragrant fritillary restoration area from being on track to meeting performance criterion. Cover data for non-native plant species will also be compared to baseline cover values collected pre-construction.

Monitoring activities, including methods, results, and a discussion of any remedial measures proposed, will be described in annual reports. Annual monitoring results will be submitted by February 1 of the following year.

Please feel free to contact me at (925) 228-1027 if you have any questions.

Sincerely,

Erin L. McDermott Principal

ISA Certified Arborist - WE7318A

Botanist, Wetland & GIS Specialist

Nomad Ecology

Attachment B-1 Fragrant Fritillary map

PERSONAL COMMUNICATION

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APPENDIX C Crystal Springs Lessingia Technical Memorandum



March 3, 2016

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Technical Memorandum - Crystal Springs Lessingia (*Lessingia arachnoidea*) Restoration on the Gas Line 109 Bunker Hill Pipeline Replacement Project, San Mateo County, California.

Dear Ms. Klinkowski,

This technical memorandum provides the proposed methodology to restore Crystal Springs lessingia (*Lessingia arachnoidea*; California Rare Plant Rank 1B.2) in the Gas Line 109 Bunker Hill Pipeline Replacement Project within the San Francisco Public Utilities Commission's (SFPUC) Peninsula Watershed. This memorandum also includes project background, a summary of impacts, performance criteria, monitoring requirements, and reporting.

PROJECT BACKGROUND AND IMPACTS

PG&E proposes to replace an approximately 1.10 mile segment of gas pipeline located at Pulgas Ridge starting at the Half Moon Bay valve lot just west of Lexington Ave and High Plains Court, continuing across Bunker Hill Drive, and terminating just west of Laurel Hill Drive in San Mateo County. (Figures 1 and 2, in the *Vegetation Restoration Plan*) (Nomad 2016). The existing gas transmission pipeline has a diameter varying from 22 to 30 inches and will be replaced with a 24-inch diameter pipeline and one segment of 30-inch diameter pipeline. Construction activities include excavation in the approximately 85-foot wide project area, stockpiling of the soil, and replacement of the pipeline. Following pipe replacement, the stockpiled soil will be backfilled and the site will be revegetated. The project at Bunker Hill is scheduled to be constructed in 2016.

Protocol-level special-status plant surveys were conducted for the Bunker Hill project on select dates from April 2013 to April 2014 by Orion Environmental Associates. Crystal Springs lessingia was observed and mapped within the Bunker Hill project area in August 2013 (Orion Environmental Associates 2014). Four populations were present between Stations 10+10 and 26+60. Based on census data collected in plots and mapped extents of colonies, the proposed work area was estimated to contain 0.1 acre of occupied Crystal Springs lessingia habitat comprising approximately 2,800 plants (Orion Environmental Associates 2014). This represents approximately one percent of the total known population on Pulgas Ridge (Orion Environmental Associates 2014). The location of Crystal Springs lessingia is shown on Figures 3a through 3f, in Appendix A.

2016 CRYSTAL SPRINGS LESSINGIA Surveys

The number of Crystal springs lessingia within and adjacent to the work area will be re-confirmed in June 2016. The number of individuals in large colonies will be estimated and the number of individuals in small colonies will be directly counted. The boundary of the colonies will be mapped using GPS with sub-meter accuracy. The colonies will be photographed to document the existing condition. General notes on phenology (flowering, seeding) will be obtained concurrent with the surveys.

CRYSTAL SPRINGS LESSINGIA ECOLOGY AND STATUS

Crystal Springs lessingia, a California endemic known primarily from San Mateo County in the vicinity of the Crystal Springs Reservoir, is designated a California Rare Plant Rank 1B.2 species indicating it is rare and moderately threatened in California. It is an annual herb in the sunflower (Asteraceae) family. This species has pink to lavender flowers, cobwebby tomentose phyllaries, and an erect stem with ascending branches (Baldwin et al. 2012). It is differentiated from other *Lessingia* species by these characters as well as having glandless cauline leaves, basal leaves that are withered at flower and a short triangular style-branch appendage. Crystal Springs lessingia is an annual species, which means that in one growing season, a plant grows from seed, blooms, sets seed, and dies.

Crystal Springs lessingia blooms from July to October (CNPS 2015, Jepson Flora Project 2015). This species has an indeterminate flowering pattern; that is, it tends to have only a few flower heads open at a time. Early flowers mature and shed their seed while later flowers develop, and individual plants continue to produce flowers and shed relatively small quantities of seed over a period of several months, often for as long as conditions are suitable.

Crystal Spring lessingia is recorded from San Mateo and Sonoma counties, however occurrences from Sonoma County need taxonomic verification (CNPS 2015). This species is supported by serpentinite soils in cismontane woodlands, coastal scrub, valley and foothill grasslands near the coast at elevations from 197 to 656 feet (60 to 200 meters). It is often found on roadsides (CNPS 2015).

CRYSTAL SPRINGS LESSINGIA RESTORATION

The goal of this plan is to minimize impacts to Crystal Springs lessingia plants within the work area. Crystal Springs lessingia is a deep rooted annual that is not suitable for transplanting. Therefore seed collection and sowing is the recommended approach. Seed was collected prior to the start of construction, stored during construction, and distributed in the work area once construction is complete. Topsoil and surface material in occupied habitat will also be salvaged. The seeding methodology, described below, was developed based on discussion with Staci Markos, Assistant Director for Development & Outreach for the Jepson Herbarium and author of the *Lessingia* treatment in the Jepson Manual (Markos pers. comm. 2015).

Pre-Construction Seed Collection and Storage

Crystal Springs lessingia was monitored throughout the summer of 2015 to track phenology and to determine when seeds were mature and ready for collection. Seed was determined to be ready for collection in late September 2015. Seed was collected from the gas line pipeline right-of-way (ROW) and project work area on October 5 and 6, 2015. Seed was collected by collecting whole plants and putting them in paper bags. Inflorescences were stored indoors in paper bags for several weeks to allow seeds to further mature. Seed were separated from other plant material (stems, inflorescence branches, and flowering parts) by hand sorting them in plastic containers. Seeds and fine chaff were stored in sealed paper envelopes indoors in a cool, dry, dark storage room. The number of seeds collected and stored is estimated to be 35,000 seeds.

Surface Material Salvage

As detailed in the Revegetation Plan for these projects topsoil will be stockpiled and replaced on site to preserve the existing soil seed bank. In addition to stockpiling topsoil, the surface material (the top 3

inches) from any scraping or grading that occurs within occupied Crystal Springs lessingia habitat will be salvaged and stockpiled in identified upland work areas within the temporary construction easement. Salvaged surface material in occupied habitat will be kept separate from any other stored soil and spoils and labeled.

Post-Construction Seeding Methodology

The planting area will be prepared as detailed in the Revegetation Plan for the project. This includes stockpiling topsoil material, backfilling soil, soil surface preparation, and seeding with an appropriate native seed mix. The site will be seeded with the native seed mix when construction is complete. Crystal Springs lessingia will be seeded after the site is prepared for seeding but before hydroseeding occurs.

Ideally, seeding of Crystal Springs lessingia should occur in the fall prior to the first rains, but may need to be seeded later depending on the timing of construction. The collected seed will be hand broadcast in the impact area in areas where it originally occurred and in close proximity to existing undisturbed populations. Seeds should be broadcast on the soil surface and lightly raked in to facilitate soil and seed contact.

REFERENCE POPULATION SAMPLING

The goal of sampling a reference population is to track annual variation in natural population abundance over several years to determine population trends. These trends are desired for two reasons: 1) to determine how the baseline population estimates, provided by Orion Environmental Associates 2013, compare to population trends from several years of sampling; and 2) to correlate natural population trends with the population monitoring for restored Crystal Springs lessingia populations within project impact areas to compare abundance against an undisturbed reference condition.

The number of Crystal Springs lessingia individuals within undisturbed areas adjacent to the work area will be estimated or counted depending on the size of the colony. The number of individuals in large colonies will be estimated and the number of individuals in small colonies will be directly counted. Because counting each individual plant within large colonies is infeasible due to overall abundance, a portion of the population will be sampled to extrapolate the total number of individuals in that colony. Records of sampling process will be provided to SFPUC and CDFW for review with the as-built report, discussed in the Section 3.7 of the Restoration Plan.

The sampling methodology will follow a two-stage design with macroplots randomly placed throughout the sampling area. Smaller quadrats will be placed randomly within each macroplot. The macroplot boundaries will be placed permanently for the sampling duration, however the quadrats sampled annually will be randomized.

PERFORMANCE CRITERION

The goal of the Crystal Springs lessingia restoration is to reestablish a population of Crystal Springs lessingia in the work area within five years following the completion of construction. Plant survivorship of plants reestablished in the work areas will be monitored annually for five years to determine if this goal has been met. The performance criterion for Crystal Springs lessingia is that 70 percent of the pre-construction number of plants will be established in the work area at the end of five years. At a minimum, the success criteria shall be met for the final 2 years of the monitoring period. If the criterion is not met by the end of the monitoring period, additional management and monitoring shall be required until the success criteria are met. The numbers of Crystal Springs lessingia counted in the reference plots each year will be compared to the 2016 pre-construction reference plot numbers to adjust the yearly plant targets. For example, if only half of the plants known to occur in the reference plots are present in any given year, the target number of plants for the reestablished population in the work area will be adjusted (lowered) proportionately.

At Bunker Hill, 70 percent of the pre-construction number of plants is 1,960 plants (2,800 plants impacted x 70%). Annual monitoring will likely be performed by a census (count all of the plants) in the work area. The number of Crystal Springs lessingia individuals within the work area will be estimated or counted depending on the number of individuals present to see if performance criteria are met. During monitoring, the phenological stage of development of the Crystal Springs lessingia plants (e.g., in leaf, bud, flower, or senesced) will also be tracked in both the reference population and the plants reestablished in the work area.

If the number of plants do not reach this performance criterion, or if data from earlier years suggest the site is not on a trajectory to meet this success criterion, then adaptive management actions will be developed and supplemental activities may be performed. These could include supplemental seed collection and direct sowing.

Monitoring will also include a noxious weed component. Target invasive weed species (as defined in the Revegetation Plan) in the work area and adjacent reference population will be identified and the extent of any infestations will be mapped and included in the annual monitoring reports. If invasive weed cover exceeds that of the reference site (as detailed in the performance standards in the Revegetation Plan), then weed control will be initiated. If it is determined that invasive weeds are preventing the lessingia restoration area from meeting performance criterion, then PG&E will consult with SFPUC and CDFW regarding invasive weed control and remedial measures. Given the implementation may be time sensitive, if no response has obtained from either agency within 3 weeks, PG&E will implement the measures as planned.

Monitoring activities, including methods, results, and a discussion of any remedial measures proposed, will be described in annual reports. Annual monitoring results will be submitted by February 1 of the following year.

Please feel free to contact me at (925) 228-1027 if you have any questions.

Sincerely,

Erin L. McDermott Principal
ISA Certified Arborist - WE7318A
Botanist, Wetland & GIS Specialist
Nomad Ecology

PERSONAL COMMUNICATION

Markos, Staci. 2015. Personal communication with Erin McDermott on April 27 and 29, 2015.

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PG&E EXHIBIT B – INVASIVE WEED MANAGEMENT PLAN

The following Invasive Weed Management Plan for the Selected Alternative, Bunker Hill segment, will be implemented by PG&E and its Contractors.

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June 30, 2016

Chrissie Klinkowski, M.S.
Senior Biologist
Pacific Gas & Electric Company
Environmental - Gas Transmission
6111 Bollinger Canyon Road
3rd Floor, 3230B
San Ramon, CA 94583

Final SFPUC Approved - Technical Memorandum – Invasive Weed Management Plan for Gas Line 109 Bunker Hill Pipeline Replacement Project, San Mateo County, California.

Dear Ms. Klinkowski,

This technical memorandum outlines the measures that Pacific Gas & Electric will take to reduce the potential introduction and/or spread of invasive noxious weeds¹ and non-native plants during construction of the Gas Transmission Line 109 Bunker Hill Pipeline Replacement Project. This plan complies with Mitigation Measure M-BI-1f: Habitat Protection Measures in the Preliminary Mitigated Negative Declaration for the project (San Francisco Planning Department 2016). This plan incorporates best management practices from *Preventing the Spread of Invasive Plants: Best Management Practices for Land Managers* (Cal-IPC 2012) and *Preventing the Spread of Invasive Plants: Best Management Practices for Transportation and Utility Corridors* (Cal-IPC 2012).

SECTION 1. PROJECT BACKGROUND

PG&E proposes to replace an approximately 1.1-mile segment of gas pipeline that originates 0.2 mile north of the intersection of Lexington Avenue and Loop Road and terminates approximately 0.2 mile northwest of the intersection of Bunker Hill Drive and Highlands Fire Trail in San Mateo County (Figures 1 and 2, in Attachment A-1). The existing gas transmission pipeline has a diameter varying from 22 to 30 inches and will be replaced with a 24-inch diameter pipeline. The new pipeline would follow the existing route, but would be offset from the existing alignment by approximately 5 feet. To avoid trenching through Bunker Hill Drive and several rare plant populations, the pipeline would be installed under approximately 2,300 feet of watershed land and Bunker Hill the Road using Horizontal Directional Drilling (HDD); in this trenchless area, the alignment deviates up to approximately 42 feet from the existing alignment. In the trenchless section, the proposed alignment would depart from the existing pipeline approximately by 42 feet to avoid a rare plant population. The trenched area is approximately 4,000 feet in length.

Protocol-level special-status plant surveys were conducted for the project on select dates from April 2013 to April 2014 by Orion Environmental Associates. During these surveys all plant species observed were recorded including non-native and invasive plant species. The location of vegetation communities on site

¹ For the purposes of this document, invasive weeds are plant species that are listed on the California Noxious Weed List (CDFA 2016) or have a Cal-IPC Weed Ranking Definition of High (Cal-IPC 2016). Some (but not all) species with a Cal-IPC Weed Ranking Definition of Moderate will also be considered invasive weeds particularly if they are a species of high concern for the SFPUC Watershed. Plants that are considered Moderate or High shall not be used in re-vegetation areas.

including serpentine bunchgrass grassland and non-native grassland were mapped. Additional site visits have been conducted in 2015 and 2016 during which locations of invasive weeds have been recorded. Preconstruction baseline invasive weed mapping occurred in the work area and immediately adjacent on April 25 and May 19, 2016. The locations of areas of non-native plants including annual grasses were also mapped during the preconstruction surveys (see Maps 1 through 6, provided in Attachment A-2).

SECTION 2. POTENTIAL INVASIVE WEED IMPACTS

Project-related activities may potentially introduce and/or spread invasive weed species within the project area. Several invasive weed species [including yellow starthistle (*Centaurea solstitialis*), teasel (*Dipsacus sativus*), bristly ox-tongue (*Helminthotheca echioides*), Bermuda buttercup (*Oxalis pes-caprae*), and French broom (*Genista monspessulana*), among others] were recorded in the work area during preconstruction surveys conducted in March and May 2016 (Table 1). The portions of the project that have the highest abundance of invasive weeds include the access road from the south end of the project, Stations 0+00 to 3+00, and 48+00 to 58+00. Other portions of the project are either dominated by native vegetation (serpentine bunchgrass grassland) or non-native vegetation [(non-native grassland typically dominated by wild oats (*Avena barbata*) and/or Italian ryegrass (*Festuca perennis*)] and contain low numbers of invasive weeds. Portions of the non-native grassland to be disturbed is located in fire breaks that are annually disked by SFPUC. The project will minimize the introduction, spread, and/or proliferation of invasive weeds in work areas: implementation of minimization measures described in Section 3 will reduce the likelihood that invasive weeds that are present at the site prior to work will proliferate or that new species will be introduced in the work area.

The project also has the potential to spread non-native annual grass species from non-native grassland portions of the work area into the serpentine bunchgrass grassland portion of the work area. Non-native annual grass species including wild oats and Italian ryegrass are present in abundance on site in non-native annual grassland/disturbed portions of the work area. The project will minimize the introduction, spread, and/or proliferation of non-native grasses in serpentine grassland portions of the work area. Implementation of minimization measures discussed in Section 3 will reduce the likelihood that non-native grasses that are present at the site prior to work will be spread into serpentine grassland portions of the work area or that new non-native species will be introduced in the work area.

The project also has the potential to spread soil borne pathogens. Implementation of minimization measures summarized in Section 3 will reduce the likelihood that soil borne pathogens are introduced in the project area. A more complete discussion of soil borne pathogen minimization measures is included in the *Vegetation Restoration Plan (VRP)* (Nomad 2016).

The restoration area will be monitored post-construction and invasive weeds will be controlled as part of this plan. The percent cover of invasive weeds throughout the project and non-native annual grasses in serpentine grassland that is acceptable is based on existing baseline cover data and comparison to reference sites, as addressed in Section 3.2, Post Construction.

Table 1. Invasive Weeds Observed in the Vicinity of the Project Area

COMMON NAME SCIENTIFIC NAME	CALIFORNIA INVASIVE PLANT COUNCIL RANK (CAL-IPC 2016)*	CALIFORNIA DEPARTMENT OF FOOD AND AGRICULTURE NOXIOUS WEED LIST (CDFA 2016)**	LOCATION ON BUNKER HILL
Italian thistle <i>Carduus pycnocephalus</i> subsp. <i>pycnocephalus</i>	Moderate	On List	Observed in scrub habitat in the project vicinity. Present in scrub north of Bunker Hill Road (Station 52+00).
totalote <i>Centaurea melitensis</i>	Moderate	On List	Not observed in the project work areas but present in the vicinity.
yellow star thistle <i>Centaurea solstitialis</i>	High	On List	Located in and along access road in southern portion of the project.
bull thistle <i>Cirsium vulgare</i>	Moderate	On List	Not observed in the project work areas but present in the vicinity.
poison hemlock <i>Conium maculatum</i>	Moderate	-	Not observed in the project work areas but present in the vicinity.
teasel <i>Dipsacus sativus</i>	Moderate	-	One large population to west of access road in scrub habitat (Stations 3+00 to 5+00). In scrub habitat at Stations 19+50 to 20+00 and north of Bunker Hill Road.
French broom <i>Genista monspessulana</i>	High	On List	Scattered plants to north of Bunker Hill Road near trees. Dense stand under trees in project area at Station 8+00.
bristly ox-tongue <i>Helminthotheca echioides</i>	Limited	-	Abundant in the project area at Stations 0+00 to 1+00 and adjacent to the access road on the south end of the project.
Bermuda buttercup <i>Oxalis pes-caprae</i>	Moderate	-	In grassland at Stations 1+00 to 7+00 and at Stations 21+00 to 24+00. Located immediately north of Bunker Hill Road in the project area.
Harding grass <i>Phalaris aquatica</i>	Moderate	-	Not observed in the project work areas but present in the vicinity.
milk thistle <i>Silybum marianum</i>	Limited	-	Not observed in the project work areas but present in the vicinity.

*Cal-IPC Weed Ranking Definitions: High – These species have severe ecological impacts on physical processes, plant and animal communities, and vegetation structure. Their reproductive biology and other attributes are conducive to moderate to high rates of dispersal and establishment. Most are widely distributed ecologically. Moderate – These species have substantial and apparent - but generally not severe - ecological impacts on physical processes, plant and animal communities, and vegetation structure. Their reproductive biology and other attributes are conducive to moderate to high rates of dispersal, though establishment is generally dependent upon ecological disturbance. Ecological amplitude and distribution may range from limited to widespread. Limited – These species are invasive but their ecological impacts are minor on a statewide level or there was not enough information to justify a higher score. Their reproductive biology and other attributes result in low to moderate rates of invasiveness. Ecological amplitude and distribution are generally limited, but these species may be locally persistent and problematic.

** Species considered a noxious weed by CDFA are listed on the California Noxious Weed List (CDFA 2016).

*** Species noted in larger rare plant survey area (see IS/MND) in 2014 but not in work areas or immediately adjacent. Additional pre-construction weed surveys are being conducted in 2016, and will be documented in an Addendum.

SECTION 3. INVASIVE WEED SPREAD MINIMIZATION MEASURES

The following invasive weed spread minimization measures are based on *Preventing the Spread of Invasive Plants: Best Management Practices for Land Managers* (Cal-IPC 2012) and *Preventing the Spread of Invasive Plants: Best Management Practices for Transportation and Utility Corridors* (Cal-IPC 2012).

3.1. Before and During Construction

Baseline Invasive Weed Surveys

Baseline invasive weed mapping occurred in the work area and immediately adjacent on April 25, 2016. Additional surveys were performed on May 19, 2016. Data was collected on populations of invasive weed species in the work area and along access roads during preconstruction surveys. This data provides baseline information and identified the locations of weeds to avoid spreading weed propagules on site. Data collected includes the extent and location of invasive weed species, and a cover estimate within the extent boundaries. All weeds on the CDFA noxious weed list as well as Cal-IPC species with a rank of High and Moderate were surveyed for and mapped. As described in the *Vegetation Restoration Plan*, more detailed information on the baseline weed surveys will be included in an Addendum.

Baseline Vegetation Mapping

The extent and boundary of serpentine grassland on site is being carefully mapped to plan for soil management during construction to minimize introducing non-native annual grasses into serpentine grassland areas. Data will be recorded on the locations and species compositions of vegetation dominated by non-native species.

Work Site Preparation

The entire work area is expected to be mowed or scraped prior to the start of construction. All access for project construction will be within the established work area that has been mowed or scraped. The soil surface will be disturbed the minimum amount necessary to complete construction activities, which will consequently will help minimize the proliferation of invasive weeds and non-native grasses and forbs. Areas that can be mowed rather than scraped will be identified during preconstruction meetings. Mowing will be conducted in sections prior to scraping to avoid spreading non-native annual grass propagules into the serpentine grassland. Areas that contain invasive weed species or are dominated by non-native species will be scraped and the topsoil handled as specified below to avoid the spread of non-native plant propagules.

Topsoil Management

Soil disturbance and transport will be minimized to the extent possible and topsoil will be managed. The topsoil, where scraping and excavation is necessary, shall be salvaged and stockpiled separately in upland construction work areas. Serpentine grassland topsoil will be salvaged and stockpiled separately from non-native grassland soil and clearly labeled. All topsoil shall be stored in such a way that it is protected from non-native plant propagules, but minimizes the risk of overheating and killing the native plant propagules. This shall include placing the stored topsoil where it is not in contact with non-native grassland soil and protecting it with weed-free straw mulch or other suitable cover. Following construction, the salvaged topsoil (with the exception of topsoil containing a prevalence of non-native plant species) will be spread over the disturbed area from which it was removed, and the area will be graded to match the preconstruction natural grade. Only serpentine grassland topsoil will be spread in

serpentine grassland areas. Once the salvaged topsoil has been spread and the area returned to the pre-existing topography, the area will be revegetated.

In areas such as fire breaks and access roads that have been determined by professional judgement of a qualified botanist to have a substantial population of non-native plant species (as identified in the *Vegetation Restoration Plan*), the topsoil will be scraped and stockpiled separately, taking care not to spread the topsoil and invasive weed and non-native plant propagules it contains. No special topsoil preservation measures will be undertaken in these areas. Topsoil from the trench in these areas will be stockpiled during construction activities and will be buried below the subsoil during backfill or offhauled, and the soils from deeper in the trench placed on the surface. Area where topsoil will be buried due to the presence of invasive weeds or high non-native cover will be based on the species present and absolute cover. Two areas have been identified: one of French broom adjacent to a residence separated by the fire break from the serpentine grassland, and another of teasel adjacent to a coyote brush/poison oak thicket. In some cases within weedy areas of the firebreak, topsoil scraping may not be done separate from the underlying mineral soils, to minimize the amount of weed seed that will be left at the surface. These areas will be identified by a qualified restoration specialist during grading. After initial restoration, the fire breaks will be exempt from continued management/monitoring.

Invasive Weed Control Adjacent to the Work Area

Prior to and during construction, where feasible (such as along the access road and at the Half-Moon Bay tap area), invasive weeds outside of the work area that have the potential to spread into the work area via wind-borne propagules will be controlled. Control will include mowing or cutting and disposal of propagules since soil disturbance outside of the work area is not allowed.

Environmental Training

Invasive weed identification and avoidance measures will be included in the preconstruction environmental tailboard meeting. The training will include field identification of invasive plants in the project area, reproductive biology of invasive plants, and invasive plant prevention Best Management Practices. The training will also include a summary of serpentine grassland, the rare plants associated with serpentine grassland, and threats to serpentine grassland including non-native annual grasses and forbs. The training will also include a summary of *Phytophthora*, its issues, spread, and Best Management Practices based on SFPUC's BMPS for Pathogens (SFPUC 2016). The biological monitor will ensure that construction staff understand provisions for invasive and non-native plant prevention and soil-borne pathogen spread prevention throughout the project. Invasive and non-native plant and soil-borne pathogen considerations will be routinely addressed during regular tailboard meetings. The monitoring biologist shall ensure that all staff have participated in the training by establishing and keeping a sign-in sheet that will record attendees.

Cleaning of Equipment and Vehicles

- All equipment and material arriving on site will be clean and free of soils and plant material except for materials such as coir or fiber rolls which are made with plant material themselves; those will be kept clean of foreign plant material and soils. Two wash stations will be established near the work area access points to local roadways: one at the north end of the project near Bunker Hill Road and one at the south end of the project near the entrance. A wash station will also be established at an offsite staging area on Paul Scannel Drive, near the project site; when feasible, vehicles will preferably be washed at the Paul Scannel staging area prior to accessing the site. Contractor vehicles and equipment that have been used or driven off-road prior to arriving at the proposed project sites will be cleaned upon arriving on site at the Paul Scannel site or at the on-site wash stations before entering further into the

work site, to minimize bringing invasive weed propagules, plant pathogens, insects, and soil from elsewhere onto the project. The construction workers will also brush off soil and plant material off of their boots at the wash station; however, bleach will not be used on the construction team boots. In lieu of multiple decontaminations, crew personnel can choose to have two pairs of boots (one cleaned prior to entry to SFPUC and one for use outside SFPUC) if they so choose. In this case, the boots would only be washed once prior to entry to SFPUC property. Vehicles as described that require washing will not access the work site without using one of the wash stations or the Paul Scannel wash station. The monitoring biologist will verify the condition of the equipment and vehicles for proper cleaning before entering the project site. In compliance with the MND, vehicle cleaning will remove soil, seeds, and plant parts from the undercarriage, tires, sideboards, tailgates, and grills of all vehicles and equipment.

- Boots (worn by restoration specialists during applicable work on FRFI salvage and restoration implementation involving seed and transplanting) and their hand-equipment such as shovels, spades, trowels, will also be brushed clean, washed in the vehicle wash station or prior to being brought on site, and sprayed with a 0.525% sodium hypochlorite concentrations (5000 ppm available chlorine) bleach solution or preferably a 70-90% ethyl alcohol (ethanol) or isopropyl alcohol (isopropanol) solution (such as Lysol disinfectant or a prepared solution) to sanitize the equipment for invasive plant and soil borne pathogen control. The chart below will be used to prepare bleach solutions.

For example, adding 100 ml of 5.25% bleach to 900 ml of water will make 1000 ml of 0.525% NaOCl solution. If using 8.3% bleach, 100 ml of bleach would be added to 1480 ml of water to make 1490 ml of 0.525% NaOCl.

Dilutions of commonly available bleach products needed to obtain approximately 0.525% sodium hypochlorite concentrations (5000 ppm available chlorine).

Percent sodium hypochlorite in bleach	Parts bleach	Parts water	Diluted bleach percent sodium hypochlorite
5.25%	1	9	0.525%
6.0%	1	10.4	0.526%
8.25%	1	14.6	0.529%
8.3%	1	14.8	0.525%

Ongoing Invasive Weed Surveys

The project area and access routes will be periodically surveyed for invasive weeds throughout project construction so invasive weed species that were not detectable during the preconstruction surveys (because they germinate later in the season) will be detected. Invasive weeds that are detected in the work area will be removed and seeds or flowers will be placed in garbage bags and removed from the site. Invasive weeds adjacent to the work area will be mowed if feasible to minimize the risk of propagules entering the work area.

Weed Free Materials

All construction material sources will be weed-free. Only rice straw or weed-free straw or fiber roll logs will be used. For mulching after restoration seeding, weed-free rice straw or hydromulch will be used. Following construction, the site will be stabilized with appropriate weed-free erosion control materials.

3.2. Post Construction

Restoration

The site will be revegetated as soon as possible with locally collected materials to reduce the likelihood of invasive weed and non-native plant establishment. All restoration activities will follow the *Vegetation Restoration Plan* for the project (Nomad 2016). All seed mixes will be weed free and will contain an analysis label detailing the contents of the seed mix. No vegetation restoration will be implemented on pre-existing access roads.

Annual Monitoring

As detailed in the *Vegetation Restoration Plan*, the site will be monitored annually for five years. Monitoring will occur quarterly for the first two years and then annually at a minimum for the remainder of the monitoring period. Monitoring will be sufficient to demonstrate that the restoration site is on track to meet success criteria contained in this plan. During annual monitoring, the extent of invasive weed populations will be mapped and the cover of invasive weed species will be estimated. Data on the extent and cover of non-native grass and forb species will be collected annually for all five years. Success criteria will be used to measure the extent of restoration after five years. Success criteria as they relate to invasive weeds and non-native plants are as follows: |

- Data on plant species composition and cover will be recorded in the restored work areas and reference sites in both non-native annual grassland, serpentine grassland, and oak woodland. The location of reference sites will be selected prior to the start of construction based on similarity to the work area, mapped and provided to SFPUC and CDFW.
- Species composition and cover values within the seeded areas will be comparable to the reference sites. Total cover and native cover of vegetation in the work areas will be at least 75 percent of total and native cover of reference sites. Species richness will also be measured in the work areas and reference sites. The data used for comparison will be collected during the same monitoring year (e.g. Year 1) and at the same time of year (sampled within a few weeks or when the conditions are phenologically appropriate for correct comparisons). Areas that were mapped as non-native grassland prior to construction (baseline conditions) will be compared to non-native grassland reference sites that were selected prior to the start of construction. Areas that were serpentine grassland prior to construction (baseline conditions) will be compared to serpentine grassland reference sites that were selected prior to the start of construction. The fire breaks that are disked annually by SFPUC will be exempt from continued management/monitoring after initial restoration.
- Absolute cover of invasive weeds in the work area will be less than or equal to the reference sites. Any infestations of invasive weeds that are not present in the adjacent reference sites or were not recorded in the work area prior to construction will be controlled. Areas that were non-native grassland prior to construction will be compared to non-native grassland reference sites that were selected prior to the start of construction. Areas that were serpentine grassland will be compared to serpentine grassland reference sites that were selected prior to the start of construction.

- Any new species of invasive weeds that were not recorded during preconstruction surveys will be controlled.
- In areas that were serpentine grassland prior to construction, the total cover of non-native plant species will be no more than 120 percent of the total cover of non-native plant species in serpentine grassland reference sites.
- Annual monitoring reports shall be sent to the SFPUC and CDFW and data from the quarterly site visits will be made available to these agencies upon request.

Beyond re-grading, replacement of topsoil, and re-seeding with appropriate native seed-mix, no vegetation restoration will be implemented on SFPUC-managed fire breaks. Areas where existing land management practices are not compatible with native plant restoration on those areas, such as the SFPUC fire break, will be exempt from continued management/monitoring after initial restoration.

Remedial Activities

Invasive weed species will be removed and controlled in all revegetated areas during the five-year monitoring period as necessary to stay on track to meet success criteria. Non-native plant species, including annual grasses, will be controlled in serpentine grassland areas as necessary to keep the site on track to meet success criteria. The decision to control annual grasses will be based on the observations during early spring site visits and the results of spring data collection compared to reference and existing site data. If it is determined that invasive weeds or non-native grasses and forbs appear to be preventing the lessingia or fragrant fritillary restoration areas from meeting the performance criteria then additional non-native plant control in these areas may be necessary. Monitoring and control will target all invasive weed species including those known to occur in the immediate project vicinity (Table 1) as well as species not currently known from the site. Weed control activities may include hand weeding and timed mowing (using mowers and string lined trimmers) and will be based on the invasive weed or native species of concern.

Please feel free to contact me at (925) 228-1027 if you have any questions.

Sincerely,
Erin L. McDermott

Principal
ISA Certified Arborist - WE7318A
Botanist, Wetland & GIS Specialist
Nomad Ecology, LLC

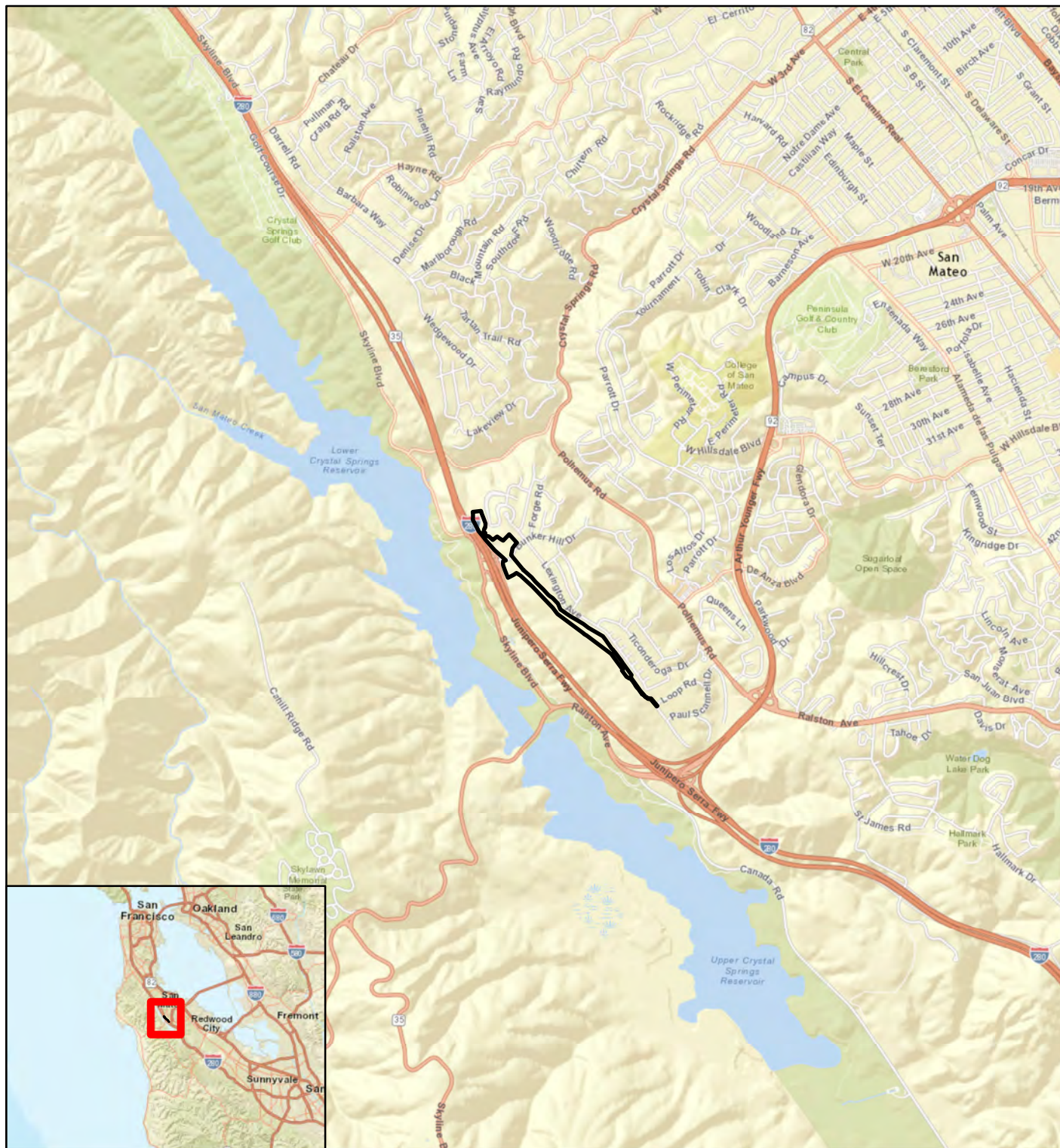
ATTACHMENT A-1

ATTACHMENT A-2

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Attachment A-1



LEGEND

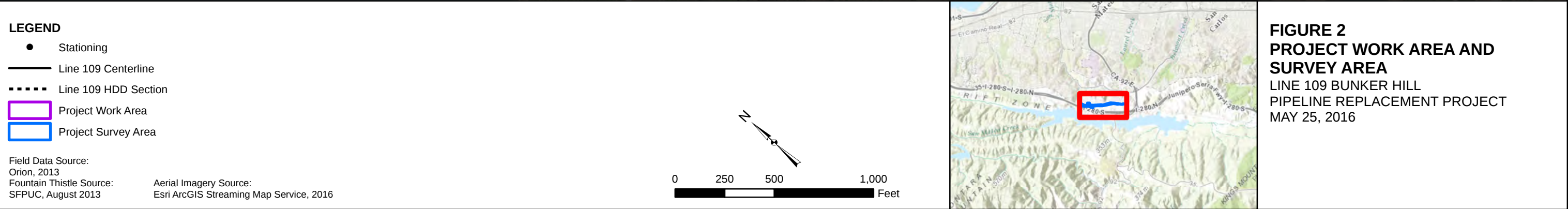
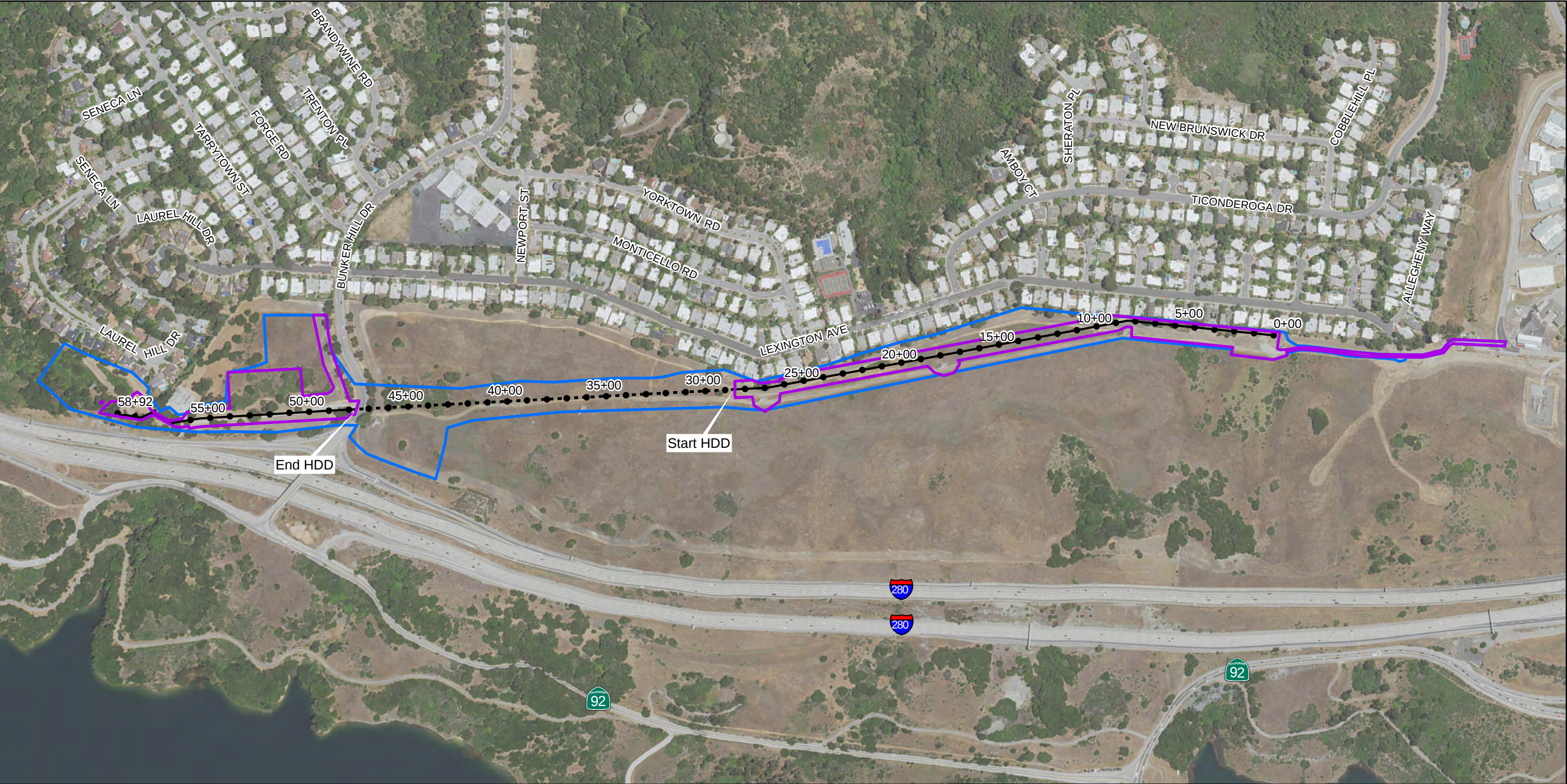
- Project Survey Area
- Interstate
- US or State Highway
- Local Road
- Railroad
- River
- Water
- Local Park

Basemap Data Source:
ESRI Data & Maps Streetmap North America

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Feet



FIGURE1
PROJECT LOCATION
LINE 109 BUNKER HILL
PIPELINE REPLACEMENT PROJECT
MAY 24, 2016



Attachment A-2



LEGEND

	Geotextile Exclusion Fence		Fuel Break 2014		French broom
	Delineation Fencing		Serpentine Vegetation		Italian thistle
	Line 109 Centerline		Marin dwarf flax (Hesperolinon congestum)		Bristly ox-tongue
	Line 109 HDD Section		Fragrant Fritillary (Fritillaria liliacea)		Milk thistle
	Stationing				Pampas grass
	Weed Control				Sow thistle
	Brush Removal Area				Teasel
	Potential Brush Removal Area				Yellow starthistle
	Wash Station				

Weeds

	French broom
	Italian thistle
	Bristly ox-tongue
	Milk thistle
	Pampas grass
	Sow thistle
	Teasel
	Yellow starthistle

Note:
Locations are approximate and subject to field verification.

0 75 Feet

MAP 1 OF 6
BASELINE INVASIVE WEED MAPPING
LINE 109 BUNKER HILL
PIPELINE REPLACEMENT PROJECT
MAY 24, 2016



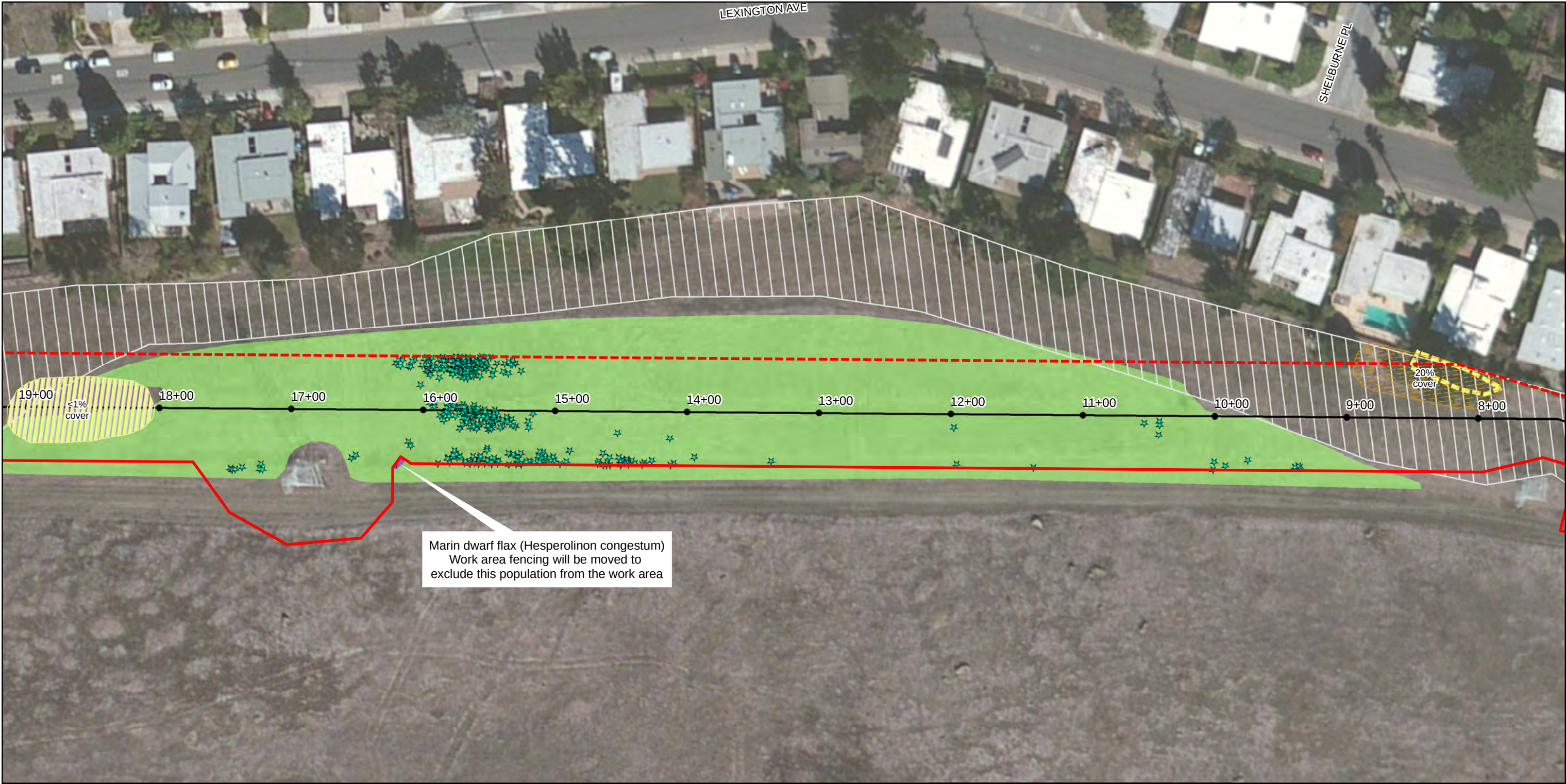
LEGEND

	Geotextile Exclusion Fence		Fuel Break 2014		French broom
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	Line 109 HDD Section		Fragrant Fritillary (Fritillaria liliacea)		Milk thistle
	Stationing				Pampas grass
	Weed Control				Sow thistle
	Brush Removal Area				Teasel
	Potential Brush Removal Area				Yellow starthistle
	Wash Station				

Note:
Locations are approximate and subject to field verification.

0 75 Feet

MAP 2 OF 6
BASELINE INVASIVE WEED MAPPING
LINE 109 BUNKER HILL
PIPELINE REPLACEMENT PROJECT
MAY 24, 2016



LEGEND

	Geotextile Exclusion Fence		Fuel Break 2014	Weeds <table><tr><td></td><td>French broom</td></tr><tr><td></td><td>Italian thistle</td></tr><tr><td></td><td>Bristly ox-tongue</td></tr><tr><td></td><td>Milk thistle</td></tr><tr><td></td><td>Pampas grass</td></tr><tr><td></td><td>Sow thistle</td></tr><tr><td></td><td>Teasel</td></tr><tr><td></td><td>Yellow starthistle</td></tr></table>		French broom		Italian thistle		Bristly ox-tongue		Milk thistle		Pampas grass		Sow thistle		Teasel		Yellow starthistle
	French broom																			
	Italian thistle																			
	Bristly ox-tongue																			
	Milk thistle																			
	Pampas grass																			
	Sow thistle																			
	Teasel																			
	Yellow starthistle																			
	Delineation Fencing		Serpentine Vegetation																	
	Line 109 Centerline		Marin dwarf flax (Hesperolinon congestum)																	
	Line 109 HDD Section		Fragrant Fritillary (Fritillaria liliacea)																	
	Stationing																			
	Weed Control																			
	Brush Removal Area																			
	Potential Brush Removal Area																			
	Wash Station																			

Note:
Locations are approximate and subject to field verification.

MAP 3 OF 6
BASELINE INVASIVE WEED MAPPING
LINE 109 BUNKER HILL
PIPELINE REPLACEMENT PROJECT
MAY 24, 2016



LEGEND

	Geotextile Exclusion Fence		Fuel Break 2014		French broom
	Delineation Fencing		Serpentine Vegetation		Italian thistle
	Line 109 Centerline		Marin dwarf flax (Hesperolinon congestum)		Bristly ox-tongue
	Line 109 HDD Section		Fragrant Fritillary (Fritillaria liliacea)		Milk thistle
	Stationing				Pampas grass
	Weed Control				Sow thistle
	Brush Removal Area				Teasel
	Potential Brush Removal Area				Yellow starthistle
	Wash Station				

Weeds

	French broom
	Italian thistle
	Bristly ox-tongue
	Milk thistle
	Pampas grass
	Sow thistle
	Teasel
	Yellow starthistle

Note:
Locations are approximate and subject to field verification.

0 75 Feet

MAP 4 OF 6
BASELINE INVASIVE WEED MAPPING
LINE 109 BUNKER HILL
PIPELINE REPLACEMENT PROJECT
MAY 24, 2016



LEGEND

	Geotextile Exclusion Fence		Fuel Break 2014		French broom
	Delineation Fencing		Serpentine Vegetation		Italian thistle
	Line 109 Centerline		Marin dwarf flax (Hesperolinon congestum)		Bristly ox-tongue
	Line 109 HDD Section		Fragrant Fritillary (Fritillaria liliacea)		Milk thistle
	Stationing				Pampas grass
	Weed Control				Sow thistle
	Brush Removal Area				Teasel
	Potential Brush Removal Area				Yellow starthistle
	Wash Station				

Weeds

	French broom
	Italian thistle
	Bristly ox-tongue
	Milk thistle
	Pampas grass
	Sow thistle
	Teasel
	Yellow starthistle

Note:
Locations are approximate and subject to field verification.

0 75 Feet

MAP 5 OF 6
BASELINE INVASIVE WEED MAPPING
LINE 109 BUNKER HILL
PIPELINE REPLACEMENT PROJECT
MAY 24, 2016



LEGEND

	Geotextile Exclusion Fence		Fuel Break 2014		French broom
	Delineation Fencing		Serpentine Vegetation		Italian thistle
	Line 109 Centerline		Marin dwarf flax (Hesperolinon congestum)		Bristly ox-tongue
	Line 109 HDD Section		Fragrant Fritillary (Fritillaria liliacea)		Milk thistle
	Stationing				Pampas grass
	Weed Control				Sow thistle
	Brush Removal Area				Teasel
	Potential Brush Removal Area				Yellow starthistle
	Wash Station				

Note:
Locations are approximate and subject to field verification.

0 75 Feet

North Arrow

MAP 6 OF 6
BASELINE INVASIVE WEED MAPPING
LINE 109 BUNKER HILL
PIPELINE REPLACEMENT PROJECT
MAY 24, 2016