Draft Conceptual Special-status Plant and Sensitive Habitat Restoration and Revegetation Plan

PG&E Gas Transmission Line 109 Farm Hill Blvd Pipeline Replacement Project

Pacific Gas & Electric
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FIGURES

APPENDICES

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1. Conceptual Restoration and Revegetation Plan

The general approach in this restoration plan includes the following measures:

- minimize the extent and intensity of surface disturbance;
- implement measures to reduce the spread of invasive weeds during the construction period;
- conserve seed bank;
- conserve surface material;
- after pipeline installation is completed, return contours and soil compaction to pre-project conditions;
- implement special final grading in selected areas;
- replace surface material after final grading;
- seed disturbed areas with species local to the site and habitat, using material with origins as similar (geographically and ecologically) as possible to the project site;
- apply straw mulch;
- when dominant species are unavailable for initial seeding, add them with supplemental seeding when they become available; and
- manage invasive weeds during the maintenance period;
- monitor to document progress toward performance goals; and
- perform additional planting if plant growth does not meet performance criteria.

The best method for reducing restoration requirements is to minimize the extent and intensity of surface disturbance, and to utilize previously-disturbed areas as feasible. These strategies have been employed in the final design of the work area.

Although the species composition differs in the two sensitive communities, serpentine bunchgrass and danthonia prairie, the restoration strategies are similar in the use of ecologically-adapted plant materials. This is especially appropriate because of the influence of serpentine soil chemistry in the project work area. Any tree replanting will be done consistent with the PG&E utility standard.

Table 1 presents a summary of the restoration actions for each restoration area.

TABLE 1. SUMMARY OF RESTORATION ACTIONS, BY RESTORATION AREA, PG&E GAS TRANSMISSION L 109 FARM HILL BLVD PIPELINE REPLACEMENT PROJECT

Action	**Serpentine bunchgrass** (Station 19+00 to 20+00, 35+00 to 54+00 and 58+70 to 65+00, as mapped)	**Danthonia prairie** (Station 52+75 to 58+50)	**Disturbed non-native** (Station 8+75 to 22+00, as mapped, laydown area at 65+00, between Station 65+00 and 71+00 and along centerline in oak woodland)	**Marin Western Flax Restoration Area** (portions of Station 22+00 to 35+00)
SITE PREPARATION				
Identify and stake work limits and areas to be scraped.	X	X	X	X
Chip and store woody vegetation outside serpentine bunchgrass and danthonia prairie or haul off-site.	X	X	X	X
Remove and dispose yellow star thistle appropriately off-site			X	X
String-trim, rather than machine mow, herbaceous vegetation in sensitive vegetation types within areas that do not require scraping.	X	X		X
Scrape work area and windrow surface material (litter and up to the top three inches of soil) at the outer edge of the working side. Do not scrape under the surface material windrow. Store separately from other material. Store separately by habitat. Cover surface material with geotextile or similar and label by habitat.	X	X		X
Minimize benching. Where benching is required, stockpile and store excess material separately from surface material.	X	X		X
DURING CONSTRUCTION				
Biological monitors will remove visible bulbs from stockpiles where feasible and in compliance with safety requirements. Bulbs will be stored dry in labeled containers in secure location.	X	X		X
POST-CONSTRUCTION				
Biological monitor verifies locations where surface material will be replaced.	X	X		X
Replace trench spoils and stockpiled material removed during benching, compact as required, and grade to pre-existing contours.	X	X	X	X
Contractor will carry out restoration grading				X

Action	**Serpentine bunchgrass** (Station 19+00 to 20+00, 35+00 to 54+00 and 58+70 to 65+00, as mapped)	**Danthonia prairie** (Station 52+75 to 58+50)	**Disturbed non-native** (Station 8+75 to 22+00, as mapped, laydown area at 65+00, between Station 65+00 and 71+00 and along centerline in oak woodland)	**Marin Western Flax Restoration Area** (portions of Station 22+00 to 35+00)
Spread surface material over work area only after grading activities are complete.	X	X		
Contractor applies conserved serpentine soil bank material				X
Spread chipped mulch over work area as ground cover.			X	
If necessary and as determined by the PG&E Biologist, lightly scarify compacted material, such as over the trench.	X	X	X	
Collect additional seed as needed.	X	X		
Restoration contractor to hand-broadcast and rake in specified seed mix (mixes 1, 2 and 3 as specified in Section 1.3).	Mix 1	Mix 2	Mix 3	
Contractor to hand-broadcast and rake in specified seed mix (mix 4 as specified in Section 1.3).				Mix 4
Apply weed-free rice straw mulch (1000 lbs per acre). Incorporate straw by punching, rolling or crimping as determined by the PG&E Biologist. Hydroseeding and tackifier shall not be used in sensitive habitats.	X	X	X	
Contractor to replant any salvaged bulbs.	X	X	X	X
Install any additional required SWPPP measures, consistent with this plan.	X	X	X	
MONITORING AND MAINTENANCE				
Restoration contractor to weed invasives monthly during first year, bi-monthly for next four years.	X	X		
Contractor to weed invasives monthly during first year, bi-monthly for next four years.				X
Apply supplemental seed as available and if needed to meet success criteria.	X	X		
Conduct annual success criteria monitoring.	X	X		X
Carry out remedial actions if performance does not meet success criteria.	X	X		X

1.1 Planning, Obtaining Materials, and Site Preparation

This section describes the planning, materials, and site preparation for the restoration area, except for areas of Marin Western Flax. Restoration of these areas is described in Section 1.5.

1.1.1 Planning the Planting Palette

As described in the introduction to this section, the dominant species for each planting area were determined by quantitative sampling. The planting palette for each planting area was developed based on the dominant native species present, the overall list of species observed in the survey area (Orion Environmental Associates, 2014), availability of seed from the site or from similar habitat in or near San Mateo County, and restoration objectives. Only native species known to occur naturally within the project area will be proposed for the planting palette in the area south of Station 71+00, and the plant materials to be used will be selected from available stock with origins as ecologically similar and geographically close to Farm Hill Blvd as possible. No substitutions to the species, origin, or quantity proposed in the sections that follow will be allowed without approval by the PG&E biologist.

The planting palette for serpentine bunchgrass will emphasize dominant grasses and herbs. Similarly, the palette for danthonia prairie will utilize dominant grasses and locally-occurring herbs to the extent possible. Coast live oak woodland will be restored to grassland. Any tree replanting will be done consistent with the PG&E utility standard.

1.1.2 Seed Procurement, Collection and Amplification

Seed will be obtained from sources with geographic and ecological origins as similar as possible to the project area. Fortunately, a variety of seed species have already been collected from serpentine habitats in Santa Clara County and are commercially available. These are the preferred sources for grassland restoration.

Some seed species will be custom-collected on-site from PG&E owned parcels for use in restoration at the Farm Hill Blvd project. Other species may be collected to augment commercially available supplies; this could include species such as Kellogg's yampah and wicker buckwheat *(Eriogonum luteolum)*. Seed collected directly from wild sources is seldom available in the quantities needed for broadcast seeding; thus, if other species are collected and amplified, they will be applied in the fall one year after initial seeding following rain.

1.1.3 Site Preparation

Minimizing disturbance. Prior to site clearance, the limits of work will be verified and staked. To preserve existing plants, seed and microorganisms, existing soil will be disturbed as little as possible. The primary method to achieve this is to minimize the extent of blading, grading, and grubbing.

Removing woody vegetation. 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. Mulch from woody vegetation may be chipped and stored on-site (in disturbed non-native habitat or in coast live oak woodland) or hauled off-site. Mulched material shall not be stored or spread in serpentine bunchgrass or danthonia prairie habitat.

Removing herbaceous vegetation. Herbaceous vegetation will be removed using mowers (in disturbed non-native habitat) or string trimmers (in serpentine bunchgrass and danthonia prairie habitat). In areas of localized yellow star thistle the resulting cut material will be collected and hauled off-site. See Section 1.5 for special measures for the Marin western flax restoration area which must be completed prior to scraping.

Scraping. The work area will be scraped, as needed, to reduce fire hazard. The resulting cut herbaceous vegetation, litter, and 1-3 inches of surface soil (collectively termed "surface material") will be windrowed on the outer edge of the working side and will be kept separate from any other stored soil and spoils. The area where surface material will be stored, estimated to be the outermost 8 feet of the work area, shall not be scraped. Surface material from different habitats will be stored separately and labeled, by habitat. Surface material will be covered with geotextile material.

Grading. Grading or benching may be necessary to provide an even surface on the working side. To accomplish this, topsoil may be moved and the excess (not required to create an even surface) windrowed separately from the surface material, usually on the working side. Topsoil will not include coarse woody debris, but may contain rocks.

Spoils storage. Spoils usually will be stored on the non-working side of the trench. Spoils will be stored separately from the surface material and topsoil. If necessary to avoid sensitive resources, spoils storage may be located on the working side of the trench.

1.1.4 Construction Practices

During construction, the biological monitors 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, maintained under dark, dry and secure conditions. As directed by the PG&E project biologist, monitors may also collect woody plant seeds from PG&E land in the vicinity of the work area. See Section 1.5 for special measures concerning collection of fine soil materials.

1.2 Final Grading, Compaction, and Preparation for Restoration

Prior to final grading, the biological monitor will verify the location where each of the labeled stockpiles of surface material are to be replaced. Surface material must be returned to the vegetation type from which it came.

First, the spoils material is returned to the trench. This is compacted as required for engineering specifications, and the contours returned to pre-project conditions. Topsoil will be used to return pre-project contours where benching or grading occurred. Excess spoils will be hauled off-site for disposal. After final grading is complete, surface material will be spread over the full width of the scraped work area. In coast live oak woodland, mulch shall be spread to cover the entire work area.

As available, mulch shall be used to cover the work area within coast live oak woodland, including the zone over the pipeline centerline which will not be planted with woody vegetation. To the extent available, mulch may also be used to cover disturbed non-native habitat within the work area.

At the direction of the PG&E biologist, compacted material over the trench and elsewhere may be lightly scarified to facilitate restoration.

1.3 Seeding and Installation of Plant Materials

1.3.1 Broadcast Seeding Herbaceous Planting Areas

Herbaceous planting areas will consist of serpentine bunchgrass, danthonia prairie, disturbed non-native areas, and above the pipeline centerline in coast live oak woodland, as needed. These areas will be seeded by hand-broadcasting followed by raking in. No hydroseeding is planned for the area covered by this plan, Station 8+75 to 71+00. Tables 2-4 present the seed mixes proposed for each planting area. No substitutions of species or source locations are allowed without review and approval. The planting mix shall not include any non-native species, or any species identified by the California Department of Food and Agriculture, the California Invasive Plant Council (2014), or the San Francisco Regional Water Quality Control Board (RWQCB, 2006) as invasive.

Species in Seed Mixes 1 and 2 were selected for their representation in the sensitive natural communities found in the work area. The application rate is intended to provide adequate cover to resemble the relatively low cover of undisturbed serpentine bunchgrass and danthonia prairie. When seed of certain desirable species is unavailable or in limited supply, it will be applied in the second season when it becomes available. Seed Mix 3 was selected from among native species known to occur on the project site. The composition does not mimic a natural community, but instead was intended to provide enough native seed to compete effectively with weed seeds in the soil bank.

TABLE 2 SEED MIX 1, FOR SERPENTINE BUNCHGRASS PLANTING AREA, PG&E GAS TRANSMISSION L 109 FARM HILL BLVD PIPELINE REPLACEMENT PROJECT

Species	Source County	Application rate (PLS, lb/ac)	Quantity required (lb)
Achillea millefolia	San Mateo	0.5	TBD
Castilleja exserta	Alameda	0.5	TBD
Clarkia purpurea var. *quadrivulnera*	Santa Clara	0.2	TBD
Elymus multisetus	San Mateo	1.0	TBD
Lasthenia californica	Santa Clara	0.3	TBD
Lupinus nanus	Santa Clara	1.0	TBD
Plantago erecta	Santa Clara	2.0	TBD
Sisyrhinchium bellum	San Mateo	1.0	TBD
Stipa lepida	San Mateo or Marin	4.0	TBD
Stipa pulchra	Santa Clara	8.0	TBD
Trifolium willdenovii	Alameda	1.0	TBD
Vulpia microstachys	Santa Clara	2.0	TBD
	Total	**21.5**	TBD

TABLE 3 SEED MIX 2, FOR DANTHONIA PRAIRIE PLANTING AREA, PG&E GAS TRANSMISSION L 109 FARM HILL BLVD PIPELINE REPLACEMENT PROJECT

Species	Source County	Application rate (PLS, lbs/ac)	Quantity required (lb)
Danthonia californica	Monterey or From On Site	10.0	TBD
Sisyrhinchium bellum	San Mateo	2.0	TBD
*Chlorogalum pomeridianum**	San Mateo	3.0	TBD
*Perideridia kelloggii**	San Mateo	2.0	TBD
Stipa pulchra	San Mateo or Santa Clara	3.0	TBD
Plantago erecta	Santa Clara	2.0	TBD
	Total	**22.0**	TBD

* May not be available in 2014; if so, seed to be applied in 2015

TABLE 4 SEED MIX 3, FOR DISTURBED NON-NATIVE AREAS, PG&E GAS TRANSMISSION L 109 FARM HILL BLVD PIPELINE REPLACEMENT PROJECT

Species*	Source County	Application rate (PLS, lbs/ac)	Qty. rqd. (lb)
Bromus carinatus var. *carinatus*	Bay Area	5.0	TBD
Clarkia purpurea var. *quadrivulnera*	Bay Area	1.0	TBD
Elymus glaucus ssp. *Glaucus*	Bay Area	5.0	TBD
Elymus multisetus	San Mateo	1.0	TBD
Eschscholzia californica	Colusa	3.0	TBD
Hordeum brachyantherum	Bay Area	3.0	TBD
Lupinus nanus	Santa Clara	3.0	TBD
Lupinus succulentus	Bay Area	4.0	TBD
Plantago erecta	Santa Clara	2.0	TBD
Stipa lepida	Bay Area	2.0	TBD
Stipa pulchra	Santa Clara, San Mateo	8.0	TBD
Trifolium willdenovii	Bay Area	2.0	TBD
Vulpia microstachys	Santa Clara	3.0	TBD
	Total	42.0	TBD

*Substitutions may be made for species in this mix as long as the species is reported from the project area (see Orion Environmental Associates, 2014), the plant material is not a cultivar, and the origin of the seed material is from the Bay Area

1.3.2 Mulch and Fertilizer

Mulches serve as an organic additive to the soil surface to aid in soil moisture retention and to control erosion, and may also serve as a physical barrier to weed growth around individual woody plantings (Newton and Claassen, 2003). It is assumed that chipped mulch from the woody vegetation removed during site preparation will be sufficient to cover the work area in the coast live oak woodland. Chipped mulch may also be used to cover disturbed non-native habitat. Straw mulch, punched or crimped into the soil, is specified here for grassland habitats, and may include areas where chipped mulch does not provide sufficient cover for erosion control.

Straw mulch will be applied as follows (Newton and Claassen, 2003). Clean rice straw, free of noxious weeds, will be used; barley, wheat or rye straw is not acceptable. The contractor will furnish evidence that clearance has been obtained from the County Agricultural commissioner, as required by law, before straw obtained from outside the county in which it is to be used is delivered to the site.

Following the completion of construction and hand-broadcast seeding, and prior to the onset of the rainy season, rice straw will be uniformly spread in one application of 1000 lb per acre in the serpentine bunchgrass and danthonia prairie areas; more may be applied in disturbed non-native habitat at the discretion of the PG&E Biologist. When weather conditions are suitable, straw may be pneumatically applied by means of equipment that will not render the straw unsuitable for incorporation into the soils. Straw may be incorporated into the soils with a crimper or a roller approved by the PG&E Biologist. Alternatively, straw may be punched in by hand, using round-tipped shovels. The PG&E Biologist shall approve the location and methods to be used for applying and incorporating straw. The end result will be that straw will not cover more than 20 percent of soil surface in the serpentine bunchgrass and danthonia prairie habitats.

Hydromulch, hydroseeding, tackifier or any similar application shall not be used in the area addressed in this plan; that is, from Station 8+75 to 71+00.

Fertilizer should not be added to a project without a valid reason (Newton and Claassen, 2003). Native California plants are typically adapted to low levels of available nutrients in the topsoil. An exception is that a small amount of slow-release fertilizer will be added to spot-seeding and liner-planting excavations, where it will provide a benefit to the target woody species in situations where ambient nutrient conditions have been diminished by the project.

1.3.3 Spot-seeding Conserved Roots and Bulbs

After seeding and mulching is completed in the serpentine bunchgrass and danthonia prairie habitats, the restoration contractor will plant any conserved root and bulb material into the habitat from which it was salvaged. The contractor shall document the location and quantity of material replaced.

1.4 Post-Installation Maintenance

Annually for five years following restoration, an evaluation will be made as to the adequacy of broadcast seeding toward meeting success criteria. In some instances, preferred species in the broadcast seed mixes were not available in the first fall season following completion of construction. These species will be hand-broadcast the following fall when they become available.Monthly during the first year, and at least four times per year thereafter during the five-year monitoring period, all restoration areas will be weeded for invasive plants. "Invasive" is defined as a non-native species listed by the California Invasive Plant

Council as "moderate" or "high" invasiveness (Cal-IPC, 2014), and/or rated by the San Francisco Regional Water Quality Control Board (SFRWQCB) as "Tier 1" and "Tier 2", invasive non-native species to be avoided in restoration sites (SFRWQCB, 2006). Exceptions will be those species noted by the SFRWQCB as naturalized aliens, and several grass species listed as moderately invasive by Cal-IPC but not ranked by the SFRWQCB. A list of target invasives is presented in Appendix B. Weeding will be done by hand-pulling. If the weeds are flowering or setting fruit, the weed material will be bagged and removed from the site for disposal. As will be discussed in the section on performance criteria, invasives will be maintained at levels below that of the reference sites. If after three years, restoration goals have been met, no further treatment will occur. If it is determined by the PG&E biologist that additional measures are required, adaptive management will be used to further the goals of restoration of the site.

1.5 Restoration of Marin Western Flax

A previously-unreported colony of Marin western flax was discovered in the L 109 project area during preconstruction surveys in May 2014; the estimated total population was 10,000-15,000 plants in an area comprising approximately 0.26 acre. The project design was modified to minimize impacts to the maximum degree feasible; about 1,244 plants, or about 8 to 12 percent of the total population (PG&E and Caltrans properties, combined), will be affected by the project in an area consisting of approximately 0.012 acre. This section of the restoration plan describes the approach, methods and objectives for restoration of Marin western flax.

1.5.1 Basis for Design

Like many annuals, Marin western flax responds to annual variation in temperature, rainfall, and perhaps other factors. Populations vary considerably in size from year to year (Elzinga, C., et al, 1998). Populations of Marin western flax are reported to naturally vary by several orders of magnitude (USFWS, 2011). Multiple-year CNDDB occurrence reports for this species support this generalization; some populations are reported in one year as being in the millions, while in other years hardly any plants are observed. Further, some populations of Marin western flax reportedly have very high population numbers in low rainfall years and low numbers in high rainfall years, while the opposite is true for other populations. The reason for this is unknown, but may be related to local physical or climatic conditions such as patchy rainfall, soil texture and depth, soil chemistry, slope or aspect.

Habitat restoration in general, and restoration for special-status plants in particular, can be technically challenging. However, several observations suggest restoration may be feasible for Marin western flax. First, this species grows exclusively in serpentine-based, nutrient-poor, low-competition situations. Second, within these parameters, it has been documented as colonizing, or possibly recolonizing, disturbed sites. These Marin western flax locations share some common features. Most are situated on thin, hard-packed, fine-textured soil, and most are situated in swales, micro-depressions, or topographically concave areas that receive additional precipitation runoff from nearby slopes. The fine-textured soils may retain soil moisture for slightly longer periods than the surrounding areas.

These observations suggest that Marin western flax may naturally colonize disturbed serpentine sites if necessary physical conditions are met. The only previous study of Marin western flax restoration available in the published literature focused on managing competition from other species (Niederer and Weiss, 2010); it did not address physical factors favoring the species. This plan will focus on creating a range of physical conditions similar to those in which Marin western flax grows; building up the soil seed

bank; performing maintenance to reduce weeds; and using adaptive management to build on success. The goal of this restoration plan is to restore on site.

Site restoration will employ the following strategies:

- careful site preparation so that as much as possible, surface material is salvaged from occupied Marin western flax habitat in areas that will be impacted;
- fencing and monitoring during construction to protect Marin western flax plants outside the work limits;
- creating microtopography in a large unoccupied area during restoration grading to match microsites in currently occupied habitat
- restoring Marin western flax in previously occupied areas (where feasible, given concerns regarding restrictions for planting within the existing and proposed gas line corridors);
- application of fine-textured serpentine-derived soil, as available, on top of the compacted final grade;
- monitoring of both the restoration area population and nearby reference sites; and
- adaptive management to maximize restoration success, such as building up the seed bank in those portions of the restoration area where plants thrive.

The area proposed for Marin western flax restoration consists of approximately 0.3 acre of the work area on PG&E-owned land currently containing serpentine bunchgrass habitat from Station 22+00 to 35+00 (see Figure 3, Proposed Western Flax Restoration Areas). The restoration area will be limited as follows: 1) will be limited to the work area only and will not include undisturbed habitat; 2) will beat least 8-10 feet from new and existing pipeline centerlines that supported pre-project Marin western flax colonies; and 3) are outside of existing, undisturbed Marin western flax colonies.

The restoration elements outlined below will be carried out by the construction contractor as part of the exaction of the soil under the supervision of a PG&E biological monitor to ensure the plan is followed.

These are annual plants that flower, mature, and set seed, persisting as seed bank to germinate the next season. The measures described below assume that construction will occur in late summer 2014, when the plants in the project area have matured and set seed and fully completed their life cycle.

1.5.2 Site Preparation and Salvage

Identify and stake work limits and areas to be scraped. The Marin western flax within the work limits and adjacent to the work area will be clearly marked. Marking will use acceptable materials, such as 4-foot rebar, 4" square plastic safety caps, and rope.

This action also includes removing existing Caltrans fencing within the Marin western flax colony within the work limits. If the existing Caltrans chain link fence within the work limits is removed while Marin

western flax plants are still present, the project botanist will be present to avoid inadvertent encroachment.

Remove Invasive Vegetation. Prior to surface-disturbing construction in the western flax restoration area, a biological monitor or restoration ecologist will identify and remove, bag, and dispose offsite target invasive plants such as yellow star thistle.

Document extent of Marin western flax colonies and associated serpentine bunchgrass in PG&E-owned land from Station 22+00 to 35+00. Prior to surface-disturbing activity, the extent of all Marin western flax colonies will be staked, marked and documented in the field throughout the work area and PG&E-owned land from Station 22+00 to 35+00, using a sub-meter accuracy GPS. Using the same equipment, the extent of the proposed western flax restoration area will be documented.

The following measures will be implemented for the Marin western flax:

- Scrape work area and windrow surface material (litter and up to the top three inches of soil) at the outer edge of the working side.
- The surface material windrow will not be scraped.
- Any salvaged topsoil will be stored separately from other materials and designated by bioloigsts.

String trim serpentine bunchgrass. Herbaceous vegetation throughout Station 22+00 to 35+00 not being benched or graded will be removed using string trimmers.

Scrape and windrow surface material. The upper part of the soil will be salvaged. The PG&E biologist will be present during initial blading in the western flax restoration area. Surface material accumulated from blading in and near occupied colonies will be placed on geotextile mats in a designated area, labeled, and covered as required. Scraping will not be performed in the area where surface material will be windrowed.

No special measures are described for soil accumulated from grading below the first few inches within the western flax restoration area; as elsewhere, this material will be used to create suitably-contoured work space for safe vehicle access, and then used to return the site to original contours following construction. Material (i.e., topsoil and spoils) from blading, grading and trenching will be stored in the same manner as for serpentine bunchgrass habitat.

1.5.3 Construction Measures

Biological Monitoring. A biological monitor will be present within the western flax restoration area during all construction activity.

Biological monitors will remove visible bulbs from stockpiles, where feasible and in compliance with safety requirements. Bulbs and seeds will be stored dry in labeled containers in a secure location.

Earthwork. As a standard practice for the L 109 Farm Hill project, spoils material will be conserved on site and fine material separated for use in the trench. Within the restoration area, any fine material (silt and clay) not required in the trench will be set aside and reserved for use in final surface treatment. If an

excess of fine material is available, up to 2 cubic yards of fine material will be retained for use in restoration grading.

Once the pipe is installed, the trench will be filled and compacted per specifications by the construction contractor. The work area between Station 22+00 and 35+00 will be returned to pre-project contours, with the addition of restoration grading as described in the next paragraph.

Final Restoration grading. After the grade is returned to pre-existing condition, the restoration grading will be performed by the construction contractor. As coordinated by the PG&E biologist, the work area within the restoration area will be given a final surface treatment consisting of the construction of microtopographic ridges and swales, especially in the areas of the restoration area that had not previously supported Marin western flax. These microtopographic features will have an elevational range of about 4 inches and will help hold soil moisture, capture runoff, and fine sediment, similar to microsites naturally supporting Marin western flax. The microtopography will consist of ridges swales in a variety of sizes, depths, textures, and aspects. As-built drawings will be developed by the restoration contractor to show the extent of the restored habitat within the restoration area. Thus, the restoration area will be used to create small "islands" of potentially suitable habitat within the total 0.3-acre restoration area.

Spreading surface material and surface soil. After final grading, the windrowed surface material will be returned and spread in approximately the same areas from which it was collected, in coordination with the PG&E biologist.

1.5.4 Post-Construction

Application of salvaged material. The salvaged material that was stored will be applied by hand methods under the direction of the PG&E biologist. Most will be applied in the areas where Marin western flax occurred prior to construction; a portion will be applied to constructed micro-depressions elsewhere in the restoration area to inoculate these areas.

Seeding. The western flax restoration area will be restored using hand-broadcast seeding methods, followed by raking in. The PG&E biologist will determine how the area will be seeded. In general, Seed Mix 1 will be used in serpentine bunchgrass habitat between constructed microhabitats. Seed Mix 4 (see Table 5) will be applied in areas of former Marin western flax colonies and in the constructed microhabitats. Seed Mix 4 consists of a light application of seed, mostly herbaceous annuals known to be plant associates of Marin western flax. The restoration ecologist will document the location, method, and quantity of application of each seed mix within the western flax restoration area.

Other areas within Station 22+00 to 35+00 but outside the Marin western flax restoration area will be seeded according to the specification for the habitat type, such as serpentine bunchgrass and disturbed non-native.

No straw mulch, wood chips, hydromulch, fertilizer, tackifier, or any other amendment will be applied to the western flax restoration area. No supplemental watering is proposed.

TABLE 5 SEED MIX 4, FOR MARIN WESTERN FLAX RESTORATION AREAS, PG&E GAS TRANSMISSION L 109 FARM HILL BLVD PIPELINE REPLACEMENT PROJECT

Species	Source County	Application rate (PLS, lbs/ac)	Qty. rqd. (lb)
Eriogonum luteolum var. *luteolum*	San Mateo	2.0	0.6
Lasthenia californica	Santa Clara	0.2	0.06
Stipa pulchra	San Mateo or Santa Clara	4.0	1.2
Plantago erecta	Santa Clara	4.0	1.2
Vulpia microstachys	Santa Clara	3.0	0.9
Calandrinia breweri, Microseris douglasii, Madia elegans, Hemizonia luzulaefolia, Chlorogalum pomeridianum	San Mateo	As available	As available
	Total	**13.2**	

1.5.5 Monitoring and Maintenance

Weeding. Monthly during the first year and bi-monthly in the next four years, the western flax restoration area will be weeded by hand and checked for the condition of the Marin western flax population. Additional weeding will be completed in subsequent years if determined necessary by PG&E. No herbicides will be used. All weeds included in Appendix A of this restoration plan will be hand-pulled, or using appropriately timed weed whacking, as well as any others that could interfere with the growth and establishment of Marin western flax.

Signage. Portions of the restoration area are located in an area that is open to public access via a trail that passes under Interstate 280 from Lindenbrook Drive in Woodside. PG&E, at its discretion, may wish to place stake and rope with informational signs advising visitors to remain on trails.

2. Restoration Monitoring and Reporting

Monitoring will be carried out by a qualified ecologist or restoration specialist to document progress toward restoration goals under direction of the PG&E biologist. Restoration monitoring will consist of the following elements. Section 2 describes special measures for restoration monitoring and reporting for the Marin western flax restoration area, including performance criteria:

- Assisting the contractors in interpreting this restoration plan
- Monitoring site preparation by the contractors
- Monitoring the progress of revegetation and reporting to PG&E, as necessary
- Identifying remedial measures, including replacement planting and erosion control measures, so that success criteria and permit conditions are met; and
- Ensuring that control of invasive plant species complies with this plan.

Sections 2.1 through 2.5 address monitoring and reporting for all areas except for areas of Marin Western Flax restoration, which are addressed in Section 2.6.

2.1 Photomonitoring

Permanent photo-documentation points will be established within the project site. A minimum of two photo points per restored habitat will be established, or two each for serpentine bunchgrass, danthonia prairie, and disturbed non-native habitat. At each site, the location will be recorded with GPS coordinates. An inconspicuous marker may be used to locate the photo-station, or two photos from different angles may be taken to show the location in relation to middle distance and horizon; when these are lined up, the observer is at the photo-station location. Once per year, a panorama series of photographs will be taken from each photo-station using a digital camera with a moderate wide angle lens. The photographs will be taken from approximately 5 feet in height.

2.2 Sampling Herbaceous Cover

In the serpentine bunchgrass and danthonia prairie, transects will be established to sample herbaceous cover. Transects will not be permanently located but will be placed in representative portions of the restoration areas. The coordinates of the starting and ending points of each transect will be recorded using GPS. Transects will be 25 meters long and will contain six meter-square quadrats with their midpoints at 0, 5, 10, 15, 20 and 25 meters. The number of transects per restoration area will be at least four for serpentine bunchgrass, and two for danthonia prairie.

Sampling will be carried out once annually in April of each year. This timing is to ensure that annual vegetation is identifiable and has achieved near-maximum growth. Transects will also be established in the nearby reference sites.

Within each quadrat, cover will be recorded for each individual species, as well as total cover, total cover contributed by natives, total cover contributed by non-natives, and cover contributed by target invasives (see discussion of invasives control in the preceding section). Cover intervals will be standard intervals used in CNPS vegetation rapid habitat assessment and releve methods: <1%; 1-5%; >5-15%; >15-25%; >25-50%; >50-75%; and >75-100% (CNPS, 2014). Percent cover diagrams (CNPS, 2014) shall be available in the field and used for training and as reference to ensure consistent cover estimation.

2.3 Performance Criteria

Performance criteria are based on a percentage of the reference transect cover data for the year of the evaluation and are shown in Table 6. As an example, the table shows 2014 baseline reference data. After five years, the performance standard for the grassland habitats is 80 percent of the absolute cover contributed by natives in the reference transect, and less than 5 percent absolute cover by target invasives. In the serpentine bunchgrass habitat, the baseline absolute cover was taken as the average of the Farm Hill wildlfower and the Edgewood bunchgrass phases for illustrative purposes. Additionaldata will be taken for the bunchgrass phase at Farm Hill in 2015 as part of monitoring activities.

TABLE 6 PERFORMANCE CRITERIA FOR RESTORATION PLANTINGS, PG&E GAS TRANSMISSION LINE 109 FARM HILL BLVD PIPELINE REPLACEMENT PROJECT

	Herbaceous Cover					
		Year				
	Baseline	1	2	3	4	5
Serpentine bunchgrass						
Absolute cover by natives compared to reference population		50%	55%	60%	70%	80%
Native plant cover (using 2014 data as an example)	19.2%	≥10%	≥11%	≥12%	≥13%	≥15%
Cover by target invasives		≤5%	≤5%	≤5%	≤5%	≤5%
Danthonia prairie						
Absolute cover by natives compared to reference population		50%	55%	60%	70%	80%
Native plant cover (using 2014 Farm Hill data as an example)	21.5%	≥11%	≥12%	≥13%	≥15%	≥17%
Cover by target invasives		≤5%	≤5%	≤5%	≤5%	≤5%

2.5 As-Built and Annual Monitoring Reporting Requirements

An as-built report will be prepared following the implementation of the restoration to document pre-construction conditions and the completion of restoration activities. The as-built report will include a summary of each kind of restoration action completed, a map showing the location of restoration, acreages of each habitat type restored, the species and amount of native plant seed broadcast, and photographs documenting the restoration. Any changes to the 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 will also be included in the as-built report. At the end of each monitoring year, an annual report shall be prepared including photomonitoring photographs, a summary of reference and restoration site data, an assessment of progress toward satisfaction of performance criteria, and any remedial actions recommended and sent to the PG&E Biologist.

2.6 Monitoring, Performance Criteria, Reporting and Adaptive Management for Marin Western Flax Restoration Area

2.6.1 Annual Performance Criteria Monitoring

Photomonitoring will be carried out in the same way as for other habitat areas.

A census of Marin western flax will be carried out annually in the restoration area and the adjacent reference colonies on PG&E land and other public lands as determined appropriate by the PG&E biologist. Using as-built drawings, the western flax restoration area will be divided into management units and the census created for each unit.

Performance Criterion. At a minimum, the goal of restoration is to return a site and its biological resources to its prior condition. Here, the overall performance criterion is to develop a population of

Marin western flax in the western flax restoration area in proportion to the number lost during construction. Full achievement of this goal is proposed within five years following initial restoration although if conditions are ideal, success could occur before then. It is anticipated that this much time will be needed to accumulate an adequate soil seed reserve. Adaptive management will be employed to achieve this goal, which has not been attempted previously with this species. This will be managed as follows. For five years, PG&E will annually monitor and evaluate performance. After the first 5 years, PG&E will evaluate whether the project is trending to or has reached its ultimate success criteria. If the success criteria have been met, monitoring will cease. If success criteria have not been met, PG&E will perform adaptive management and monitoring for the next year (year 6), and in subsequent year(s) as determined necessary by PG&E.

Because Marin western flax numbers naturally vary from year to year, the annual performance criterion for Marin western flax in the restoration area in a given year must be "indexed" against reference colonies to compare same-year population numbers in the restoration area to nearby natural populations. PG&E proposes to perform an annual census (complete counts of all plants) in all of the onsite unaffected colonies on PG&E property between Stations 22+00 and 35+00 to serve as the reference population for indexing the current year's performance criterion.

Table 7 illustrates how the performance criteria would integrate both the goal of an increasing population in the restoration area and expected natural annual variation. The line showing the percentage of the performance criterion, by year, indicates the gradual increase in the population expected over the performance period. The example of a stable reference population shows that the number of plants would increase by 20 percent each year, beginning with 20 percent, or 249 plants, in the first year and increasing to 100 percent, or 1,244 plants, in the fifth year. The next four lines show how the performance criterion in a given year would be adjusted based on a hypothetical census of the reference population. However, annual plant numbers vary dramatically from year to year. It is anticipated that the numbers will vary from year to year and not follow a predictable steady upward trend. Note that the restoration population may actually be lower from one year to the next, yet still meet the performance criterion for the year because it comprises an increased proportion compared with the reference population. Further, in some circumstances the census in the restoration population may actually exceed the 1,244 plant target, yet only represent a fraction of the ultimate target population.

The reported natural variation in Marin western flax numbers actually varies much more than the range shown in Table 7, which underscores the importance of the seed bank in providing carryover during unfavorable periods. A healthy seed bank allows for immediate response in plant numbers and replenishment of the seed bank when conditions are favorable, and protects the population by remaining dormant during unfavorable years.

TABLE 7 PERFORMANCE CRITERIA AND EXAMPLES, FOR MARIN WESTERN FLAX RESTORATION, PG&E GAS TRANSMISSION LINE 109 FARM HILL BLVD PIPELINE REPLACEMENT PROJECT

Target annual number of Marin western flax plants in Marin Western Flax Restoration Area, allowing for comparisons with reference populations, with examples of how the eriteria can apply (baseline year 2014 B= 5,762 plants)					
Monitoring Year	**1**	**2**	**3**	**4**	**5**
C = Performance criterion (as a percentage of 5,762 plants) required to fully replace 1,244 plants	4.32%	8.64%	12.96%	17.28%	21.60%
Example of a stable reference population at 100% of current year					
R = Reference population	5,762	5,762	5,762	5,762	5,762
T = Restored population target (T=C*R)	249	498	747	996	1,244
Example of with a variable reference population					
N= Reference population numbers	2,881	1,901	1,441	5,762	3,861
P = Reference population as a % of baseline (N/B)	50%	33%	25%	100%	67%
T = Restored population target (N*C)	62	82	93	498	417

2.6.7 Remediation Measures and Adaptive Management

Adaptive Management. The microtopography created during final grading will be designed to provide a range of soil texture, compaction, basin size, slope and aspect. As seed is set out experimentally in the restoration areas and the resulting plant growth observed, additional tests may be developed to further investigate habitat requirements, phenology, pollination ecology, soil chemistry, seed set and viability, and other variables. Depending on results, adjustments could be made to increase the moisture-capturing characteristics of the microtopography, augment species diversity, litter accumulation, or other factors that appear to benefit Marin western flax.

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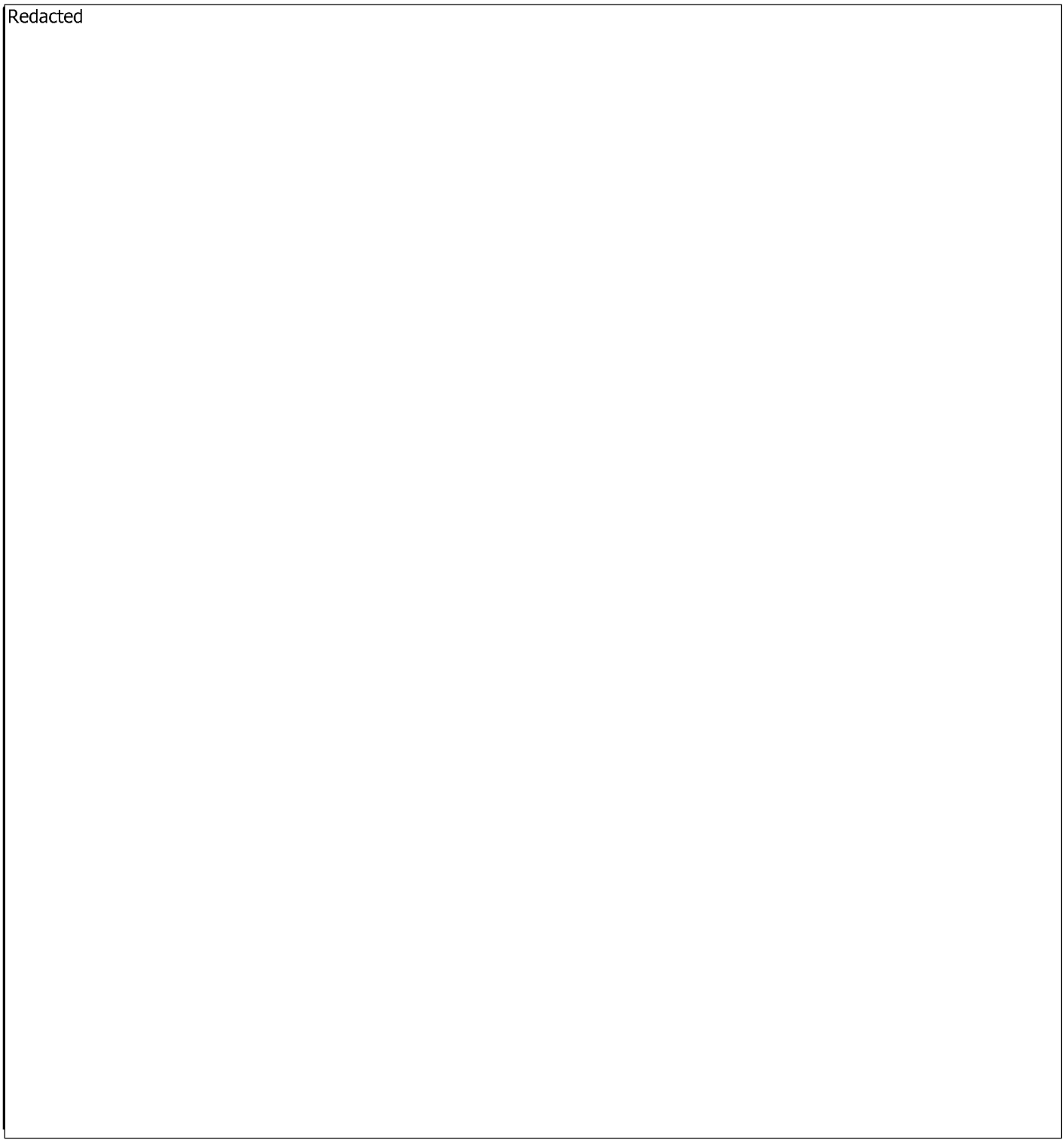
Figure 1 Project Area, PG&E Gas Transmission Line 109 Farm Hill Blvd Pipeline Replacement Project



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

0 2,500 5,000
Feet

FIGURE 1
PROJECT AREA
LINE 109 FARM HILL BLVD
PIPELINE REPLACEMENT PROJECT

Figure 2a Location of Natural Communities and Special-status Plants, PG&E Gas Transmission Line 109 Farm Hill Blvd Pipeline Replacement Project

Redacted

Stationing
Proposed Line 109 Centerline
Line 109 existing
Project Work Area
Project Survey Area

Special-status Plants
Franciscan onion (*Allium peninsulare* var. *franciscanum*)
Fountain thistle (*Cirsium fontinale* var. *fontinale*)
Marin western flax (*Hesperolinon congestum*)

Plant Species of Interest
Woolly-headed lessingia (*Lessingia hololeuca*)

Vegetation Communities
Danthonia californica prairie**
Riparian Forest and Scrub**
Serpentine bunchgrass**

MWF = Marin Western Flax
** Natural community of concern

0 250

Redacted

FIGURE 2a
Location of Natural Communities and Special-status Plants

LINE 109 FARM HILL BLVD
PIPELINE REPLACEMENT PROJECT

Field Data Source:
Orion, 2013, 2014

Aerial Imagery Source:
Esri ArcGIS Streaming Map Service, 2010

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Figure 2b Location of Natural Communities and Special-status Plants, PG&E Gas Transmission Line 109 Farm Hill Blvd Pipeline Replacement Project

Redacted

Stationing
Proposed Line 109 Centerline
Line 109 existing
Project Work Area
Project Survey Area

Special-status Plants
Franciscan onion (*Allium peninsulare* var. *franciscanum*)
Fountain thistle (*Cirsium fontinale* var. *fontinale*)
Marin western flax (*Hesperolinon congestum*)

Plant Species of Interest
Woolly-headed lessingia (*Lessingia hololeuca*)

Vegetation Communities
Danthonia californica prairie**
Riparian Forest and Scrub**
Serpentine bunchgrass**

MWF = Marin Western Flax
** Natural community of concern

0 250 500 Fee

3

Redacted

FIGURE 2b
Location of Natural Communities and Special-status Plants

LINE 109 FARM HILL BLVD
PIPELINE REPLACEMENT PROJECT

Field Data Source:
Orion, 2013, 2014

Aerial Imagery Source:
Esri ArcGIS Streaming Map Service, 2010

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Figure 2c Location of Natural Communities and Special-status Plants, PG&E Gas Transmission Line 109 Farm Hill Blvd Pipeline Replacement Project

Redacted

Stationing
Proposed Line 109 Centerline
Line 109 existing
Project Work Area
Project Survey Area

Special-status Plants
Franciscan onion (*Allium peninsulare* var. *franciscanum*)
Fountain thistle (*Cirsium fontinale* var. *fontinale*)
Marin western flax (*Hesperolinon congestum*)

Plant Species of Interest
Woolly-headed lessingia (*Lessingia hololeuca*)

Vegetation Communities
Danthonia californica prairie**
Riparian Forest and Scrub**
Serpentine bunchgrass**

MWF = Marin Western Flax
** Natural community of concern

0 250 500 Feet

3

Redacted

FIGURE 2c
Location of Natural Communities and Special-status Plants

LINE 109 FARM HILL BLVD
PIPELINE REPLACEMENT PROJECT

Field Data Source:
Orion, 2013, 2014

Aerial Imagery Source:
Esri ArcGIS Streaming Map Service, 2010

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Figure 2d Location of Natural Communities and Special-status Plants, PG&E Gas Transmission Line 109 Farm Hill Blvd Pipeline Replacement Project

Redacted

- Stationing
- Proposed Line 109 Centerline
- Line 109 existing
- Project Work Area
- Project Survey Area

Special-status Plants

- Franciscan onion (*Allium peninsulare* var. *franciscanum*)
- Fountain thistle (*Cirsium fontinale* var. *fontinale*)
- Marin western flax (*Hesperolinon congestum*)

Plant Species of Interest

- Woolly-headed lessingia (*Lessingia hololeuca*)

Vegetation Communities

- Danthonia californica prairie**
- Riparian Forest and Scrub**
- Serpentine bunchgrass**

MWF = Marin Western Flax
** Natural community of concern

0 250 500 Feet

3

Redacted

FIGURE 2d
Location of Natural Communities and Special-status Plants

LINE 109 FARM HILL BLVD
PIPELINE REPLACEMENT PROJECT

Field Data Source:
Orion, 2013, 2014

Aerial Imagery Source:
Esri ArcGIS Streaming Map Service, 2010

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Figure 3 Proposed Marin Western Flax Restoration Areas, PG&E Gas Transmission Line 109 Farm Hill Blvd Pipeline Replacement Project

Redacted

- Stationing
- Proposed Line 109 Centerline
- Line 109 existing
- Caltrans Fence
- Project Work Area
- Project Survey Area
- Marin Western Flax Restoration Area
- Marin western flax (*Hesperolinon congestum*)

0 50 100 Feet

Redacted

FIGURE 3
Location of Marin Western Flax Within and Near the L 109 Farm Hill Blvd Pipeline Replacement Project Work Area

LINE 109 FARM HILL BLVD
PIPELINE REPLACEMENT PROJECT

Field Data Source:
Orion, 2013, 2014

Aerial Imagery Source:
Esri ArcGIS Streaming Map Service, 2010

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APPENDIX A

List of Target Invasive Species, PG&E Gas Transmission Line 109 Farm Hill Blvd Pipeline Replacement Project

APIACEAE	**Carrot Family**	**Cal-IPC Rank**	**SFRWQCB Tier**
Conium maculatum	Poison-hemlock	Moderate	Tier 2
Foeniculum vulgare	Fennel	--	Tier 1
APOCYNACEAE	**Dogbane Family**		
Vinca major	Periwinkle	Moderate	Tier 1
ASTERACEAE	**Aster Family**		
Carduus pycnocephalus	Italian thistle	Moderate	Tier 2
Centaurea melitensis	Tocalote	Moderate	--
Centaurea solstitialis	Yellow starthistle	High	Tier 1
Chondrilla juncea	Skeletonweed	Moderate	--
Cirsium vulgare	Bull thistle	Moderate	Tier 2
Dittrichia graveolens	Stinkwort	Moderate*	Tier 2
Helminthotheca echioides	Bristly ox-tongue	Limited	Tier 3
Hypochaeris radicata	Rough cat's-ear	Moderate	Tier 2
Silybum marianum	Milk thistle	Limited	Tier 3
BRASSICACEAE	**Mustard Family**		
Cardaria chalepensis, C. draba	Hoary cress, Whitetop	Moderate*	--
Raphanus sativus	Wild radish	Limited	Tier 2
DIPSACACEAE	**Teasel Family**		
Dipsacus sativus	Fuller's teasel	Moderate	--
FABACEAE	**Pea Family**		
Acacia species	Acacia, wattle	Limited to moderate	--
Genista monspessulana	French broom	High	Tier 1
Spartium junceum	Spanish broom	High	--
LAMIACEAE	**Mint Family**		
Mentha pulegium	Pennyroyal	Moderate	Tier 1
MYRTACEAE	**Myrtle Family**		
Eucalyptus globulus	Blue gum eucalyptus	Moderate	Tier 1
OROBANCHACEAE	**Broomrape Family**		
Bellardia trixago	Bellardia	Limited	--
OXALIDACEAE	**Wood Sorrel Family**		
Oxalis pes-caprae	Bermuda buttercup	Moderate	Tier 2
PLANTAGINACEAE	**Plantain Family**		
Plantago lanceolata	English plantain	Limited	Tier 3
POACEAE	**Grass Family**		
Aegilops triuncialis	Goat grass	High	--
Arundo donax	Giant reed	High	Tier 1
Brachypodium	Purple false brome	Moderate	--

distachyon			
Cortaderia jubata, C. selloana	Pampas/jubata grass	High	Tier 1
Cynodon dactylon	Bermuda grass	Moderate	Tier 2
Ehrharta erecta	Erect veldtgrass	Moderate	Tier 1
Elymus caput-medusae	Medusa head	High	Tier 1
Elytrigia pontica	Tall wheatgrass	--	Tier 1
Penisetum setaceum	Fountain grass	Moderate	Tier 1
Phalaris aquatica	Harding grass	Moderate	Tier 2
ROSACEAE	**Rose Family**		
Cotoneaster pannosa	Silverleaf cotoneaster	Moderate	Tier 2
Rubus armeniacus	Himalaya berry	High	Tier 1