LAND IQ

April 11, 2017

Ms. Stephie Jennings
NEPA Document Manager
SSFL Area IV EIS
US Department of Energy
4100 Guardian St., Suite 160
Simi Valley, CA 93063

RE: Measures To Mitigate Impacts To Braunton's Milk-Vetch And Santa Susana Tarplant Related To Soil Cleanup In SSFL Area IV And NBZ

Dear Ms. Jennings,

We have reviewed the Draft Environmental Impact Society (DEIS) for remediation Area IV and the Northern Buffer Zone (NBZ) of the Santa Susana Field Laboratory (SSFL) prepared by the U.S. Department of Energy (DOE), and supporting documents related to impacts to Braunton's milk-vetch (*Astragalus brauntonii*) and Santa Susana tarplant (*Deinandra minthornii*) from cleanup of the soil to background levels in Area IV and the NBZ, including the placement of backfill soil and re-contouring. Both plants are California endemics and occur with California sage scrub and chaparral vegetation communities at SSFL.

The requirements for cleanup of the contaminated soil are set forth in the 2010 DOE and California Department of Toxic Substance Control (DTSC) Administrative Order on Consent (AOC). There is a narrow exemption in the AOC for biological exemption if the United States Fish and Wildlife Service (USFWS) issues a Biological Opinion that finds that the particular cleanup in a particular SSFL location would violate Section 7(a)(2) or Section 9 of the Endangered Species Act and no reasonable and prudent measures or reasonable and prudent alternatives exist that would allow for the use of the specified cleanup standard in that portion of the site, and the exception is unavoidable by other means. USFWS has not made this finding.

In our professional opinion, the unavoidable impacts for these species related to soil cleanup to background levels as agreed to in the 2010 AOC can be reasonably mitigated with a combination of specific conservation, restoration, and management measures. This opinion is based on the available reports for these two species, the existing examples of successful restoration activities of the species at other SSFL sites, and our own experience successfully restoring habitat of sensitive species in southern California.

There are estimated to be about 850 Santa Susana tarplants in Area IV and NBZ total (SAIC 2009 as cited in DOE 2016), a small fraction of the estimated population of over 13,500 at SSFL, which is one of 30 locations known in the CNDDB in Ventura and Los Angeles counties (DOE 2016). The preferred substrate for the persistent populations of tarplant in Area IV and NBZ are sandstone outcrops and thin sandy soils, some of which will not be included in the footprint of the AOC soil cleanup areas; hence, impacts to many of the plants may be avoided altogether. The tarplant occurring in the developed area is often located in areas such as cracked pavement that mimics crevices in the naturally occurring sandstone outcrops. The seed source for the plants in the developed area is likely the sandstone outcrop population.

Braunton's milk-vetch is known from 16 remaining populations in the southwestern Transverse Ranges (eastern Santa Monica Mountains, east end Simi Hills, south base San Gabriel Mountains) and northern Peninsular Ranges (northwest side Santa Ana Mountains) within Los Angeles, Orange, and Ventura Counties (USFWS 2009). The milk-vetch is often found growing in disturbed areas, especially in carbonate soils areas, and is a early successional disturbance follower. Less than 1.8 percent of Braunton's milk-vetch critical habitat throughout its range potentially occurs within cleanup areas in Area IV and NBZ (USFWS 2010). Known populations of the milkvetch are concentrated on the western portion of Area IV on two hills with calcareous soils derived from the Santa Susana formation, primarily in the Gaviota rocky sandy loam soil type (DEIS 2017).

Nothing in the record related to these two species indicates that there is reason to believe that restoration is not a viable method of mitigation. It is imperative, however, to prepare comprehensive restoration plans in advance of the actual start of soil cleanup at SSFL so that all aspects of the plans will be afforded the time necessary to achieve success. Depending on the actual soil cleanup plan and timeline, a phased approach for restoration for each species at the site would be preferable. Such an approach would provide data from the first implementation to refine methods in the later phases.

The following outline presents reasonable and specific, but not necessarily exhaustive, techniques and approaches for mitigating the unavoidable impacts to these populations by seed collection and conservation, plant propagation, and re-introduction of both seeds and plants to the site post cleanup. Key to the mitigation of the sensitive plant species is the overall revegetation of the site with appropriate native vegetation.

Seed Collection and Conservation

Before soil cleanup activity, viable seed should be collected from both sensitive plant species that occur in Area IV and NBZ, as well as adjacent populations that occur within SSFL and adjoining contiguous properties. Seed collection need not be limited to the footprint of the soil cleanup impact areas. Seed should be collected over multiple years, with at least one year in average to above average rainfall year conditions in order to maximize both the size of the seed collection and the genetic diversity of the collection across years. Seed outside of the project area could be collected within the limits of applicable natural resource agency collection permits (e.g.

collecting only a small percentage of available seed from each population). Specific methods to increase collections can be implemented. For example, since Braunton's milk-vetch is a disturbance follower, if there are not enough plants to collect from, then it may be necessary to crush or mow vegetation in suitable soils for the species (e.g. carbonate limestone soils) where there is likely a soil seed bank to open up the canopy and provide mechanical scarification to promote germination from the hard seed coat. This practice can be limited to scheduled cleanup areas where the soil will be removed to limit unnecessary disturbance to areas that would remain. Seed collected from the milk-vetch should occur at least in the second growing year following germination, to maximize the potential of seed collection.

A portion of the seed from both species should be deposited in a conservation collection at an authorized seed repository, such as Rancho Santa Ana Botanic Garden (RSABG), which has experience with both species, and the remainder should be cleaned, tested for viability (germination and purity), and properly stored for future nursery propagation when the cleanup areas are ready for re-introduction. The amount of pure live seed deposited in the conservation collection should be determined in consultation with the seed repository and responsible natural resource agencies. An established off-site nursery experienced with the germination and propagation of sensitive species should be selected for growing container plants and seed bulking one generation from the wild collected seed.

Propagation and Re-Introduction

Both plant species have been successfully propagated in a nursery setting. Therefore, it may be prudent to grow plants for the purpose of planting back on the site.

Braunton's milk-vetch has been propagated by seed coat scarification techniques and germinated on calcareous soils in a nursery with 80 percent or more survivorship by Fotheringham and Keeley (1998) under various watering regimes in full sun, including 60 percent survivorship under a high watering regime on clay soil derived from volcanic parent material. Therefore, it seems likely that restoration using a temporary irrigation system may aid seed germination on soils other than just calcareous soils. And, RSABG has collected and germinated milk-vetch with a 100 percent success rate. Plants can produce hundreds of seeds when mature, beginning in the second year, and once successfully transplanted will multiply the contribution to the soil seedbank of the restored area of the long lived seed, estimated to have seed banks existing between 15 to 95 years (USFWS 2009).

Braunton's milk-vetch has been observed in Area IV in Gaviota rocky sandy loam soils (DEIS 2017), which are weathered from sedimentary parent material and classified in the Entisol Soil Order. Entisols develop in unconsolidated parent material and because they are relatively "young soils," or rather when weathering processes are slow (e.g. in arid or semi-arid environments), there are usually no soil horizons except for an A horizon. Backfilled soil in the cleanup areas will mimic these conditions of young soils with poorly developed soil horizons and low organic material. The most likely source of backfill soil, the Gillibrand site, primarily consists of loamy soils that have weathered from sedimentary parent material (NRCS 2017). While the milk-vetch

can establish on very shallow soils (<21 cm deep), they are more common on deeper soils (Fotheringham and Keeley 1998), and as such, the re-contoured Gillibrand backfill material is not expected to be limiting to the milk-vetch. In fact, high levels of bare ground and open canopy, combined with a lower nutrient environment, will favor the life history characteristics of this nitrogen-fixing pioneer legume species. Although milk-vetch may be most readily established from seed, nursery grown material also can be transplanted into suitable areas, either in disturbed areas with or without backfill soils, using a temporary irrigation system. Thus, both strategies can be employed to establish this species.

Other potential restoration methods include identification of soil arbscular mycohrrizaal (AM) fungi by off-site soil research prior to transplantation to determine if specific AM fungi are associated with either the milk-vetch or the tarplant. Over 80 percent of terrestrial plant species form associations with AM fungi. We routinely use annual tarplants within the genus *Deinandra* to increase AM fungi at revegetation sites because this genus of plants is easily colonized. It is likely that Santa Susana tarplant also would form the beneficial symbiosis with AM fungi. AM fungi could be propagated for inclusion in soil amendments for seeding the site and/or for the nursery production of container plants.

Santa Susana tarplant has already been readily collected and nursery grown for re-introduction on SSFL (DOE 2016) and in other mitigation projects (e.g. see Fiedler 1991). The tarplant can be bulked one generation in the nursery to increase the amount of seed available for seeding back into the site. Tarplant can be seeded in adjacent un-disturbed sandstone outcrops without readily available source populations to seed them, disturbed shallow (approximately <21 cm) sandstone derived soils, and in select backfill soils that are determined to potential tarplant habitat.

Potential Management Actions for Rare Plants

Over time, the native vegetation in the revegetation areas will develop closed canopies between perennial shrub species in suitable sites in the cleanup area. There may remain microsites that preclude the development of a closed canopy, but most of the area is expected to increase in shrub canopy cover. Increasing canopy cover will result in reduced germination of Braunton's milk-vetch. If it is determined by agency consultation that the milk-vetch population requires larger growing populations to increase additions to the long-lived soil seed bank, then an adaptive management plan could be developed to artificially disturb the sites to increase canopy cover and hence bare ground to stimulate germination of known seed bank populations within the revegetated area. Alternatively, if access is provided to the SSFL after remediation is complete, then milk-vetch populations could be planned to occur along trails or access roads, which will be subject to trail maintenance, maintaining a more open canopy that is conducive to milk-vetch plant growth.

Two types of populations are expected, microsites with certain conditions that favor the fairly regular germination and growth of plants; and those areas where the population exists as part of the seed bank, which will be expressed following a future disturbance, such as fire or grazing.

General Revegetation of the Soil Cleanup Areas

General revegetation of the cleanup areas with appropriate native plant species will improve the overall quality of the restored and adjacent sensitive plant species habitat. Revegetation of the cleanup area with native plants would also increase the frequency of visitation by pollinators from the immediately adjacent habitat where both sensitive plant species produce viable seed. Regardless, Area IV and NBZ are not isolated from adjacent habitat that is frequented by pollinators, including on SSFL, and will not prohibit pollinators from finding the restored sensitive plant species.

A comprehensive restoration plan will include methods to select soil for backfilling at the site. Following soil cleanup, bare areas and the re-contoured backfill should be restored with appropriate native habitats based on the constructed soil conditions, aspect and landscape position in order to stabilize the soils. Habitat restoration of the cleanup areas in Area IV and NBZ would buffer the existing and restored sensitive plant populations at the site. In our experience, a defined, well-managed restoration plan and implementation can successfully reestablish native habitat over time that supports not only sensitive plants and plant communities but also wildlife.

Properly managed restoration will prevent the establishment of invasive weed species on the bare backfill soil and provide ecological integrity to the site. In order to prevent competition in the virgin backfill material from invasive species that already exist on site, such as fountain grass (*Pennisetum setaceum*), should be eradicated from Area IV and NBZ, as well as any adjoining potential source populations, prior the general native habitat restoration and the re-introduction of the sensitive species.

Note, backfill soil should be selected that is weed free, and could potentially include soil salvage from native areas scheduled for development. If the backfill soil contains weed seed material, then before installing native seed material, a weed management program must be performed successfully to ensure that the near-surface weed seed is effectively managed prior to seeding. With natural rainfall, multiple years of grow-and-kill may be required to deplete the near surface soil weed seed bank in the backfill. Horticultural visual observations of weed germination rates in the growing season prior to control, in any year with an average to above average rainfall winter season, should be used to determine the status of weed management at the site prior to seeding. Failure to adequately control the weed seed bank prior to seeding may result in unnecessary and significant costs for weed maintenance post-seeding.

Plant lists for revegetation should consist of early successional and seral subshrub species typical of the surrounding chaparral and California sage vegetation communities. In our experience, revegetation would be best achieved by seeding the site where possible, as it is more cost effective and establishes higher quality and diverse plant communities than container planting-focused methods. Relying on seeding, rather than using container planting, will ensure the native plant species will develop in their preferred microclimate within the revegetation and restoration areas.

The diverse seed mix should be designed to mimic the native habitat's response to a natural or historic disturbance regime (e.g. fire or grazing pressure from a large mammal) developing over time from fast germinating and growing annuals to shrubs. Relying upon natural rainfall for establishment, a subshrub dominated community, typical of a local mature California sage scrub vegetation community is expected to establish in approximately five to seven years. The exact timing of the development of the subshrub canopy will depend on each year's growing conditions, which are predominately determined by rainfall events, temperature and humidity in the winter and spring.

Not only will the use of a diverse seed mix promote the development of appropriate native habitat in the revegetated areas, but will provided sufficient native flowering annual and perennial plants to attract pollinators to areas that are selected for seeding and/or transplantation of the two sensitive plant species, Braunton's milk-vetch and Santa Susana tarplant. A recent Boeing-funded study to test revegetation methods at SSFL found more pollinators using areas seeded with a more diverse native seed mix (Galea and Wojcik 2017).

The seed mix should be sufficiently diverse and installed at sufficient pure live seed rates to ensure successful establishment. The timing and technique of seeding is important for success and to avoid the need for re-seeding areas. All seeding must be accomplished in the early fall before onset of winter rains. Therefore, to have enough seed for the project, seed collection for general revegetation must be implemented for several years within the local bioregion in similar habitats, but not restricted unnecessarily to the populations within Area IV and the NBZ. Widening the collection area will increase the potential for increasing the genetic diversity and fitness of the seed mix, as well as allowing for the collection of a sufficiently diverse species mix of early successional species that may not all be immediately available within the project area, since the site was last disturbed in the 2005 Topanga wildfire.

A number of seeding methods are available for the varied conditions over the site. Each seeding method has been successfully used to establish and restore native habitat. In the backfill areas, imprint seeding may be most appropriate, depending on the final topography. In the adjacent disturbed areas without significant soil disturbance and no backfill soil placement, drill seeding or hydroseeding methods may work best, depending on the depth of the soil. The point is that there are many alternative methods that can be employed to seed restoration sites such as the SSFL.

Natural rainfall is sufficient to establish the seed mix over multiple growing season but may require up to ten years to achieve a target seral subshrub community composition and cover., The development of longer-lived perennial species typical of the surrounding chaparral vegetation communities will likely take at least five to 10 years based on the results of other restoration projects in southern California. It will be necessary to manage the site for weeds following seeding of the general revegetation areas, with maintenance weeding expected in the first three years. An adaptive monitoring and management program should be used to determine if weeding

events are necessary to prevent the establishment of invasive weeds or significant cover of non-native plants within any portion of the site.

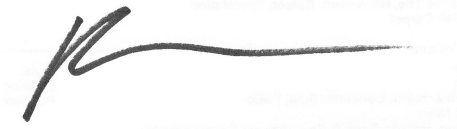
It should be noted that no herbicide should be used in the first growing season following seeding and only targeted applications of herbicide should be used in following years; hand weeding and weeding methods that do not disturb the soil surface or native seedlings are required when seeding with native species (e.g. no weed eaters or mowers).

Discrete nodes of select transplanted material, as discussed previously for sensitive species, have been used in successful restoration projects, but these container plants generally require irrigation using a temporary above-ground irrigation system. After the transplanted material has successfully established in a irrigated node (e.g. following one year from the end of winter rains to the beginning of the following winter rain season, or as needed), the irrigation should be turned off in subsequent years to allow the native vegetation to develop with natural rainfall

In summary, with comprehensive restoration plans in place in advance of soil cleanup of Area IV and NBZ, we have a high level of confidence that the unavoidable impacts to Braunton's milk-vetch and Santa Susana tarplant from cleanup to AOC standards can be mitigated to a less than significant level.

Land IQ has been retained by the Committee to Bridge the Gap to review the mitigation potential of Braunton's milk-vetch and Santa Susana tarplant in the Area IV and NBZ cleanup areas.

Respectfully,



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References

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Firm Description

Land IQ has a multi-disciplinary team of ecologists and biologists, environmental planners, soil scientists, agronomists, remote sensing and GIS specialists with offices in Sacramento and Los Angeles. Our Los Angeles Office (formerly known as Earthworks Restoration, Inc. and NewFields AER, LLC) is expert in native plant ecology, habitat assessment and restoration, management of conservation lands for habitat value, biological resource monitoring and environmental and mitigation planning. We have a depth of experience in revegetation and reclamation of drastically disturbed landscapes, detailed habitat evaluation, soil mapping, and exotic species assessment and management. We have managed, prepared resource management plans and restored habitat over more than 15,000 acres and on dozens of projects in Ventura, Los Angeles, Orange and San Diego Counties. Our expertise includes knowledge and planning for native plant seed collection, storage and use as an effective and cost saving method for habitat restoration.

Mr. Travis Brooks, Restoration Ecologist for Land IQ, has over sixteen years of experience in restoring habitat in southern California, including for sensitive species, and graduate studies in Ecology and Evolutionary Biology at the University of California, Los Angeles (PhD Candidate 2010). His recent and on-going projects include the following:

- Development of Best Management Practices for Grassland and Forbland Habitat Restoration, including for Quino Checkerspot Butterfly (*Euphydryas editha quino*, federally endangered) habitat and Otay Tarplant (*Deinandra conjugens*, federally threatened and state endangered) habitat, for the San Diego Association of Governments (SANDAG).
- Update of the Habitat Restoration Plan for the Central/Coastal Orange County NCCP/HCP Habitat Reserve (more than 37,000 acres) for the Natural Communities Coalition.
- Brooks, T. M. Griswold, B. V. Brown, J. P. Dines, K. L. Garrett, M. Ordeñana, G. B. Pauly, T. Longcore, and K. Sloniowski. Chapter 5: Habitat Enhancement Opportunities. Pp. 5-1 to 5-16 *in* Water Supply and Habitat Resiliency for a Future Los Angeles River: Site-Specific Natural Enhancement Opportunities Informed by River Flow and Watershed-Wide Action: Los Feliz to Taylor Yard. The Nature Conservancy, Urban Conservation Program, Los Angeles (December 2016).