CONTINGENCY PLAN

(HABITAT MITIGATION AND MONITORING PLAN)

GRADY RANCH, MARIN COUNTY, CALIFORNIA

May 2011

Prepared for:

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1.0 INTRODUCTION AND PURPOSE

The Grady Ranch Property (Project Area) is located northwest of San Rafael, Marin County, California, on Lucas Valley Road, approximately four miles west of U.S. Highway 101. The 109-acre Project Area represents approximately 46 percent of the larger Grady Ranch Property. The Project Area is bounded by Lucas Valley Road to the south, and the Grady Ranch Property boundary to the east. The Project Area boundaries to the north and west are located within the Grady Ranch Property, and do not represent the property boundary.

Skywalker Properties, Ltd. (Applicant) proposes the development of a 52-acre area devoted to digital production and other uses within the Project Area. Other elements of the proposed development include restoration of Miller and Grady Creeks, and preservation of 187 acres of private open space outside the designated development areas. Project implementation will result in impacts to areas under the jurisdiction of the U.S. Army Corps of Engineers (Corps), the San Francisco Bay Regional Water Quality Control Board (RWQCB), and the California Department of Fish and Game (CDFG). State and federal regulations require mitigation for impacts to “waters of the United States” (WOUS) and “waters of the State” (WOS).

Mitigation for permanent impacts to WOUS and WOS is being accomplished through preservation, restoration and enhancement of waters within Miller and Grady Creeks and several tributaries. This Contingency Plan (aka Habitat Mitigation and Monitoring Plan, “HMMP”) describes the specific and detailed mitigation activities and plans, performance criteria to measure success, initial monitoring and management actions, long-term management activities, and estimated costs to mitigate for unavoidable impacts to wetlands and waters resulting from Project implementation.

1.1 Responsible Parties

The Project Applicant is responsible for implementing Project mitigation through completion of the initial and long-term monitoring period. CSW Stuber Stroeh is the applicant's authorized agent and preparer of this HMMP.

Contact information for these parties is below:

Project Applicant:	Skywalker Properties, Ltd. 5858 Lucas Valley Rd. Nicasio, CA 94946 Contact: Mr. John Wynne
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1.2 Document Overview and Purpose

The purpose of the HMMP is to describe the implementation, monitoring, and management of mitigation within the Project Area.

The mitigation, monitoring, and management activities described in this HMMP are intended to meet the permit requirements of the Corps, CDFG, and RWRCB, as well as the Corps regulatory

requirements for preparation of mitigation plans set forth in 33 CFR § 332.4(c). The regulatory requirements contained in 33 CFR 332.4(c), as issued by the Corps in 2008, generally encompass the requirements of mitigation and monitoring plans for all of the applicable resource agencies (Corps 2008b).

The 2008 regulations require an HMMP to include:

- Mitigation Objectives, including resource type, amounts, and methods of compensation *(Section 2.0)*
- Site Selection, including key factors for providing mitigation at a site (*see Section 3.0*)
- Site Protection Instrument *(Section 4.0)*
- Baseline Information, including ecological characteristics of impacted and mitigation sites *(Section 5.0)*
- Determination of Credits, including a description of how the mitigation will provide compensatory mitigation for impacts *(Section 6.0)*
- Mitigation Work Plan, including detailed descriptions of the work to be performed in implementing mitigation *(Section 7.0)*
- Maintenance Plan, including maintenance activities to ensure continued viability of the mitigation site *(Section 8.0)*
- Ecologically-based Performance Standards *(Section 9.0)*
- Monitoring Requirements and Methods *(Section 9.0)*
- Long-term Management Plan *(Section 10.0)*
- Adaptive Management Plan *(Section 11.0)*
- Financial Assurances to ensure project mitigation will be effectively implemented and maintained *(Section 12.0)*

Project impacts are described in the Pre-Construction Notification (PCN) and Joint Aquatic Resources Permit Application (JARPA) package prepared for the Corps, CDFG, and RWQCB. Permit application documents contain a complete project description. A summarized project description is provided in Section 1.3 below. Project modifications have been made throughout the permit process to reduce environmental impacts, including those to streams and wetlands.

1.3 Project Description

The Grady Ranch Precise Development Plan (PDP) includes construction of the Main Building, Gate House Building, and Main Entry Road; realignment of Lucas Valley Road at the main entrance to the project; improvement of West Fire Road; replacement of the fire access road to the east side of Grady Creek (East Fire Road); realignment of the Upper Fire Road around the Main Building; nine bridges; and other related improvements such as the water tanks (Sheet EN4.2 Site Plan – Development Area). In addition, the Grady Ranch PDP details the restoration and enhancement of Miller Creek, Grady Creek, Landmark Creek and other tributaries located on the property. Restoration and enhancement plans include improving the habitat functions and values of the creek channels as well as the adjacent Stream Conservation Area (SCA). The project incorporates Low Development Impact (LDI) practices to manage stormwater through a natural system that is coordinated with SCA restoration and enhancement. The remaining 187 acres around the 52-acre development area will be preserved as private open space. A summary of the various components in this Project are provided below.

Main Building and Gate House

The Main Building will house offices to be used for advanced, digital technology-based film production. The building will have three stories over underground parking. The building footprint will be 123,145 square feet including the water stage and adjacent dock area.

The Gate House will be located on the Main Entry Road after crossing the bridge over Miller Creek and will be used to monitor arrivals/departures and as headquarters for on-site fire/maintenance and security. The Gate House will be 900 square feet of floor area in one story and will include an extended roof under which entering vehicles will pass.

Roads

As recommended by the Marin County Department of Public Works, an approximately 1,200 linear foot section of Lucas Valley Road will be realigned to eliminate two sharp curves and improve sight distances near the main entrance to the Project. The realigned road will cross over the realigned tributary (informally called the S-4 tributary) instead of the tributary being placed in a culvert as approved in the Lucasfilm Ltd. Grady Ranch/Big Rock Ranch Master Plan.

In addition to the improvements of Lucas Valley Road, six roads within the Project Area will be either improved from existing roads, realigned, or created. Three of these roads, Main Entry, Garage Entrance, and Service Road, will create 44,394 square feet of impervious surface. The other three roads, Upper Fire, West Fire, and East Fire, will be made of pervious material and total 73,523 square feet.

Nine bridges will be created within the Project Area. All bridges will span their respective creeks which will allow for long term dynamic channel stability. All bridges will have natural stream bottoms, which corresponds with guidance from NMFS as a preferred alternative for stream crossings (NMFS 2001).

Grading

Total Project grading will involve approximately 235,820 cubic yards of cut and 224,141 cubic yards of fill. The 224,141 cubic yards of fill includes 52,700 cubic yards that will be used as material for stream restoration activities. Most of the excavation will occur during the construction of the Main Building, Service Road, and Upper Fire Road.

Stream Conservation Area Restoration and Enhancement

The material generated from the excavation for the Main Building area provides the opportunity to reestablish the creek channel morphology of Miller, Grady and Landmark Creeks. The cut material (including boulders) plus the trees that will be removed due to grading will be used to repair the damage to these creeks created from headcutting as a result of development downstream on Miller Creek. The additional cut material will be placed to extend the ridge on the eastern side of Grady Creek. Approximately 52,700 cubic yards of fill will be used to reestablish Miller, Grady, and Landmark Creek channel morphology and allow fish passage in areas currently impassable.

Stormwater Control

Stormwater will be managed using a multi-tiered approach, and features are designed to address water quality, hydromodification control, reduce demand for municipal water, and aid in

flood control. Treatment controls will include stormwater basins designed as created wetlands that will capture runoff, bioretention areas and swales, and roof runoff collection from rainwater leaders and storage for later irrigation use.

Landscape and Agriculture

Appropriate native species will be planted in areas where the bottom of the creek channels will be raised to create functioning floodplains; where the eroded, vertical creek banks will be laid back to provide the opportunity for vegetation to grow; and in connection with proposed LID practices to control stormwater, including seasonal wetland species in the stormwater basin. Tree replacement and native grassland restoration are also proposed.

A terraced vineyard will be planted on the slope west of the Main Building. Additionally, a wine cave will be constructed at the southern end of the ridge to the west of the Main building.

Public Services

The development area of Grady Ranch will be annexed into the Las Gallinas Valley Sanitary District for sanitary sewer service. Water will be supplied by the Marin Municipal Water District via a 12 inch water main that will extend along Lucas Valley Road to the project entrance from its current terminus adjacent to Westgate Drive. The code-required fire flows will be met through the use of an on-site 400,000 gallon tank located on the hill behind the Main Building. Captured rain water runoff from the roof of the Main Building will be pumped up to a smaller 40,000 gallon tank for irrigation use.

2.0 MITIGATION GOALS AND OBJECTIVES

The goals of mitigation are to:

- Improve fish passage to Miller Creek and its tributaries;
- Restore and enhance stream functions within Miller, Grady and Landmark Creeks, including buffer and wildlife habitat functions;
- Stabilize existing creek channels against severe erosion and bank failure;
- Restore more natural stream morphology;
- Balance the risk of catastrophic bank failure and the loss of riparian habitat;
- Improve native species cover and diversity along the creek banks and surrounding upland slopes;
- Remove man-made structures and other impediments to flow.

Mitigation activities will include preservation, enhancement and restoration of intermittent stream, seasonal wetland and riparian habitat. Preservation, enhancement establishment and restoration are defined in the Corps 2008 Mitigation Rule (Corps 2008b) and described below:

Preservation: The permanent protection of ecologically important aquatic resources through the implementation of appropriate legal and physical mechanisms (i.e. conservation easements, title transfers). Preservation may include protection of upland areas adjacent to aquatic resources as necessary to ensure protection or enhancement of the aquatic ecosystem. Preservation does not result in net gain of aquatic resource area and may only be used in certain circumstances, including when the resources to be preserved contribute significantly to the ecological sustainability of the watershed.

Enhancement: Actions to manipulate the physical, chemical or biological characteristics of an aquatic resource that heighten, intensify, or improve one or more functions of the resource. Enhancement is often undertaken for a specific purpose such as to improve water quality, flood water retention or wildlife habitat. Enhancement results in a gain in aquatic resource function but does not result in a net gain in aquatic resource acres.

Establishment: Establishment (creation) means the manipulation of the physical, chemical, or biological characteristics present to develop an aquatic resource that did not previously exist at an upland site. Establishment results in a gain in aquatic resource area and functions.

Restoration: Re-establishment or rehabilitation of an aquatic resource with the goal of returning natural or historic functions and characteristics to a former or degraded aquatic resource. Restoration may result in a gain in aquatic resource function or area, or both. For the purpose of tracking net gains in an aquatic resource area, restoration is divided into two categories: re-establishment and rehabilitation. *Re-establishment* means the manipulation of the physical, chemical, or biological characteristics of a site with the goal of returning natural/historic functions to a former aquatic resource. Re-establishment results in rebuilding a former aquatic resource and results in a gain in aquatic resource area and functions. *Rehabilitation* means the manipulation of the physical, chemical, or biological characteristics of a site with the goal of repairing natural/historic functions to a degraded aquatic resource. Rehabilitation results in a gain in aquatic resource function, but does not result in a gain in aquatic resource area.

For the purposes of this report, we refer to all re-establishment and rehabilitation activities as restoration as the distinction between “natural/historic” and degraded is not easily provided.

3.0 SITE SELECTION

Several streams within the Project Area and larger Grady Ranch Property are deeply incised and show signs of heavy erosion along their banks. This process of down-cutting and erosion is likely due to grazing, road-building, and channel-clearing activities in the watershed over the last century. These activities have promoted soil compaction, reduced vegetative cover and increased soil instability in upland areas, which in turn promote higher, more powerful flows through adjacent stream channels, stream bank slumping, and channel scouring. Streams affected by scouring and slumping provide poor habitat for aquatic and riparian vegetation and associated aquatic wildlife species.

The Project Area provides the opportunity to restore heavily eroded and incised streams and restore and enhance riparian and wetland areas through native species revegetation and removal and management of invasive species. The Project Area also provides the opportunity to preserve adjacent aquatic resources on the larger Grady Ranch property.

Grady Creek is known to support Central California Coast ESU Steelhead (*Oncorhynchus mykiss*) (WRA 2008). The existing bridge at the Grady Ranch Entrance Road and the severe downcutting on the downstream side of the bridge currently provide an impassible barrier to Steelhead migration within Miller Creek. Restoration of Miller Creek will remove this barrier and permit Steelhead migration to high-quality habitat upstream within Miller Creek.

3.1 Watershed Setting and Context

Specific location information for the Project Area is listed below in Table1.

Table 1. Project Area Location Details

Mitigation Site Location	Six miles northwest of downtown San Rafael, north of Lucas Valley Road.
Mitigation Site Latitude/Longitude	38.039540, -122.602519
Name of Watershed and Hydrologic Unit	Petaluma River-Frontal San Pablo Bay Estuaries (HUC-10: 1805000206, HUC-12: 180500020607)
Mitigation Site County	Marin County

4.0 SITE PROTECTION INSTRUMENT

Long-term protection will be provided by the applicant, or landowner should the property change ownership. Long-term management needs are described in Section 10.

5.0 BASELINE INFORMATION

5.1 Jurisdictional Determination

A preliminary jurisdictional determination (PJD) of the extent of wetlands and waters within the Project Area was prepared in 2010 (WRA, 2010a). The PJD is was verified following a site visit with the Corps in December 2010. The Jurisdictional Determination (JD) is included in permit application packages for the Project. The PJD and JD were used during Project planning to avoid unnecessary impacts to, and quantify unavoidable impacts to jurisdictional wetlands and waters.

5.2 Baseline Conditions within the Project Area

The Project Area is bounded on the north and west by the larger Grady Ranch Property. Land use in this area is currently open space extending north towards Big Rock Ridge and the Grady Ranch Property boundary. Three unnamed USGS blue-line streams drain this steep south-facing slope into Miller Creek, which flows west to east at the floor of Lucas Valley. Two of these unnamed blue-line tributaries to Miller Creek flow through the Project Area. Mixed oak/bay woodlands exist within shaded, incised drainageways, commonly referred to as Grady and Landmark Creeks, and non-native annual grassland with a native grassland component is present on the exposed ridgelines and open slopes. A number of maintained dirt roads exist within the Project Area. Elevations range from approximately 230 to 530 feet NGVD.

Similar topographical conditions and vegetation communities occur to the east and west of the Grady Ranch Property, along the south-facing slope of Big Rock Ridge. A small ranch and a low-density housing development are located east of the property boundary, and Big Rock Ranch is located to the west of the property boundary. Dense mixed oak/bay woodland dominates the area south of the Project Area, on the north-facing slope of Lucas Valley. Land use in this area consists of rural development, with a few residences and ranchettes.

<u>Wetlands and Waters</u>

Miller Creek is the main watercourse draining the Gallinas Valley watershed. Miller Creek receives flows originating from higher elevations within Gallinas Valley, to the west of the Project Area. Flows within Miller Creek are intermittent, with surface water generally present throughout

the rainy season in the entire length of the creek. Surface water may remain present throughout the year in bedrock pools within deeper, shaded portions of Miller Creek within the Project Area in some years. The gravelly substrate of Miller Creek may also allow flows to be transported below the surface during the dry season. Miller Creek flows into San Pablo Bay approximately six miles to the east without receiving flows from, or contributing flows to, any other major drainageway.

Within the Project Area, Miller Creek receives flows from three unnamed USGS blue-line streams, and multiple ephemeral watercourses that originate both on and off of the Project Area. Grady Creek is located near the eastern edge of the Grady Ranch Property and converges with Miller Creek several yards downstream from Grady Bridge.

Small areas (less than 0.05 acre) of riparian, seasonal freshwater emergent, and perennial freshwater emergent wetlands were observed on gravel bars within the bed of Miller Creek (Wetland #1, #2 and #5, shown on Figure 1). These wetlands generally had a dense overstory of either riparian woodland or mixed oak/bay woodland, and were dominated by woody and herbaceous species including arroyo willow, California blackberry, stinging nettle (*Urtica dioica*), horsetail (*Equisetum arvense*), and mugwort (*Artemisia douglasiana*). Seasonal wetlands in the Project Area were found in a vegetated depression that collects flows from an unnamed ephemeral drainage during the rainy season. Seasonal wetlands within the Project Area were dominated by iris-leaf rush (*Juncus xiphioides*) and rattlesnake grass (*Briza maxima*). Perennial freshwater emergent, or seep wetlands, were dominated by sedge (*Carex* spp.), giant chainfern (*Woodwardia fimbriata*), seep monkeyflower (*Mimulus guttatus*), tall flatsedge (*Cyperus eragrostis*), and Douglas iris (*Iris douglasiana*).

The acreage and length of ephemeral and intermittent streams and wetlands are outlined in Table 2 below.

Table 2. Jurisdictional Features within the Project Area

	Area (acres)	**Length (linear feet)**
Other Waters	3.29 acres	18,642 l.f.
Wetlands	0.1 acre	n/a
TOTAL:	**3.39 acres**	**18,642 l.f.**

Soils

The USDA Soil Survey for Marin County (USDA 1985) indicates that the Project Area has four native soil types: Blucher-Cole complex, 2 to 5 percent slopes, Los Osos-Bonnydoon complex, 30 to 50 percent slopes, Saurin-Bonnydoon complex, 50 to 75 percent slopes, and Tocaloma-Saurin association, extremely steep. These soil types are described in detail below.

105–Blucher-Cole complex, 2 to 5 percent slopes. This map unit is in basins and on alluvial fans. The native vegetation is mainly annual grasses and forbs. This unit is 40 percent Blucher silt loam and 30 percent Cole clay loam. The Blucher soil is near drainageways, and the Cole soil is on basin rims and in depressional areas. This map unit is listed as Hydric on the Marin County hydric soils list (1986) and the National Hydric Soils List (NRCS 2008).

142–Los Osos-Bonnydoon complex, 30 to 50 percent slopes. This map unit is on uplands. The native vegetation is mainly annual grasses, forbs and shrubs. This unit is 60 percent Los Osos

loam and 20 percent Bonnydoon gravelly loam. The Los Osos soils are mainly on concave to plane side slopes, and the Bonnydoon soils are mainly on convex side slopes and ridges.

164–Saurin-Bonnydoon complex, 50 to 75 percent slopes. This map unit is on uplands. The native vegetation is mainly annual grasses, forbs, and scattered shrubs. This unit is 50 percent Saurin clay loam and 40 percent Bonnydoon gravelly loam. The Saurin soil is on convex side slopes, and the Bonnydoon soil is on ridgetops.

185–Tocaloma-Saurin association, extremely steep. This map unit is on uplands. Slope is 50 to 75 percent. The native vegetation is mainly hardwoods on the Tocaloma soils and annual grasses and forbs on the Saurin soils. The unit is 40 percent Tocaloma loam and 30 percent Saurin clay loam. The Tocaloma soil is on north- and east-facing side slopes and in drainageways, and the Saurin soil is on ridgetops and side slopes.

Vegetation

Vegetation communities within upland portions of the Project Area consist primarily of mixed oak/bay woodland and non-native annual grassland with a native grassland component. Dominant vegetation in mixed oak/bay woodland areas includes California bay (*Umbellularia californica*), coast live oak (*Quercus agrifolia*), and poison oak (*Toxicodendron diversilobum*). Dominant vegetation in non-native annual grassland includes wild oats (*Avena* sp.) and rattlesnake grass. Native perennial bunchgrasses including purple needlegrass (*Nassella pulchra*) occur in a number of stands within areas of non-native annual grassland. Detailed information regarding the vegetation communities present within the Project Area may be found in the Grady Ranch Biological Resources Assessment Report (WRA 2008).

Vegetation communities in wetlands and riparian corridors within the Project Area include riparian woodland, perennial freshwater emergent seep wetlands, and seasonal wetlands. Dominant vegetation in riparian woodland communities includes arroyo willow (*Salix lasiolepis*), California rose (*Rosa californica*), pink honeysuckle (*Lonicera hispidula*), and California blackberry (*Rubus ursinus*). Dominant vegetation in perennial emergent seep wetlands included sedge (*Carex* sp.), giant chainfern, seep monkeyflower, tall flatsedge, and Douglas iris. Dominant vegetation in seasonal wetlands included iris leaf rush.

Hydrology

Grady Ranch is located in the upper reaches of the 5,100-acre (eight-square mile) Miller Creek watershed. This creek is a major stream in Marin County and flows east through the Las Gallinas Valley for six miles to San Pablo Bay. Upstream (west) of the Wetsel Ranch bridge, the Miller Creek watershed drains 1,700 acres primarily north of Lucas Valley Road (the 1,039-acre Grady Ranch and 12-acre Wetsel Ranch) and a smaller sub-basin south of the road (650 acres). Natural hydrological sources for the Project Area include direct precipitation and surface run-off from adjacent lands.

5.3 Functional Assessment

Streams and wetlands within the Project Area provide a range of functions and services. Project impact areas are discussed below in Section 5.3.1. Section 5.3.2 summarizes functional assessments performed on Grady Creek using the California Rapid Assessment Method (CRAM) and a modified version of Surface Water Ambient Monitoring Protocol (SWAMP). Miller Creek was also assessed using the Wetland Evaluation Technique (WET), as presented in Section 5.3.3.

The upstream portion of Miller Creek and its tributaries within western Gallinas Valley are located in a rural area with little development. Natural vegetation communities can be found throughout this area. Streams and wetlands within this area therefore have the capacity to support a variety of native species, and likely have a high level of water quality compared to more developed areas.

While there is virtually no development within the Project Area, and native vegetation communities are well-represented, drainages within the eastern portion of the Project Area have had their functional capacity reduced by channel erosion and human modification. Erosion is most pronounced in the areas east of the Grady Entrance Road, which is an access corridor for the site including a bridge with a concrete spillway that crosses over Miller Creek. The areas east of the Grady Entrance road include an approximately 950-foot section of Miller Creek, as well as Grady Creek in its entirety. Both Grady Creek and Miller Creek in this area have lost a substantial amount of channel substrate. Streambanks in these areas also have far less riparian vegetation than areas to the west. These eroded and denuded conditions were likely caused in part by livestock grazing in this area in the past century, although grazing was discontinued on the property in recent years. The area of heavy erosion extends to the Grady Entrance Road Bridge over Miller Creek, which was built in 1941. Immediately below the concrete spillway of the bridge, the elevation of the Miller Creek channel drops approximately 8 feet. This erosion is likely related to migration of downstream knickpoints, as well as continued downcutting of Miller Creek. The Miller Creek corridor west of the Grady Entrance Road is less eroded, although erosion of a lower magnitude is still evident. Landmark Creek is currently being actively incised often to ten to twelve feet.

Issues of erosion and man-made channel modifications affect the functional capacity of Project Area streams in a number of ways. Notably, Miller Creek and its tributaries have high potential to provide spawning habitat for anadromous fishes such as Steelhead (*Oncorhynchus mykiss irideus*) due to its uninterrupted flow into San Pablo Bay. Steelhead in Bay Area streams are designated as “threatened” under the Federal Endangered Species Act, and preservation of anadromous fishes and their habitat is a matter of great regional concern in California. However, the immediate drop in the Miller Creek channel elevation below the spillway of the Grady Entrance Road bridge is an existing barrier that likely prevents Steelhead from migrating upstream beyond this point (WRA 2008). Erosion within Grady Creek has also resulted in a highly incised channel that reduces the habitat value for Steelhead. In addition, erosion within Project Area streams has effectively lowered the water table in a wide swath of the surrounding area. The lower water table, in turn, has likely altered the hydroperiod and overall hydrology of Miller Creek and its tributaries, and also altered vegetative communities dependent on this water source. As erosion continues within Miller Creek and its tributaries, these streams become increasingly entrenched within a deep, narrow channel where flood flows have little or no possibility to spill onto an adjacent floodplain, and high volumes of sediment are discharged to downstream stream reaches. This condition increases the likelihood of damaging floods, and also increases the likelihood of continued erosion.

5.3.1 Project impact areas

<u>Construction-related impacts</u>

Construction of the proposed Project, including construction of the Main Building, realignment of Lucas Valley Road and construction of access roads and bridges, will impact approximately 1,202 linear feet (0.09 acre) of other waters,.

Project impacts include re-routing of a small, ephemeral drainage (Reach G-2, Figure 1). A 573-foot portion of this stream will be filled, and flow will be diverted into a newly-constructed stream channel that will travel around the west edge of the proposed Main Building. The new channel will be bio-engineered to have a gradient, a cross-sectional profile, and microhabitat features considered beneficial within the local ecological context. Channel banks surrounding the restored channel would be planted with native riparian vegetation similar to the existing vegetation surrounding Reach G-2. Reach G-3 (153 linear feet) will also be impacted by the Main Building.

Project impacts also include re-routing of Reach S-4 (464 linear feet) to allow for realignment of Lucas Valley Road near the main entrance. The existing Reach S-4 is highly degraded, with severely eroding stream banks including the bank immediately adjacent to Lucas Valley Road. The newly aligned Reach S-4 will also be planted with native riparian vegetation and will represent an improvement over conditions in existing Reach S-4.

Project impacts also include improvements to the western access road which will impact approximately 16 linear feet (<0.01 acre) of an ephemeral tributary to Landmark Creek (Reach L-1).

Impacts to Reaches G-2, S-3, S-4, and L-1 total 1,270 linear feet. Realignment of Reaches G-2 and S-4 will result in a restored total of 1,230 linear feet.

<u>Restoration-related impacts</u>

Wetlands #1, #2, and #5 (Figure 1) are located on ephemeral gravel bars within Miller Creek. These small wetlands (totaling 0.04 acre) will be impacted by stream restoration activities; however, approximately 0.17 acre of potential wetland restoration areas will be created in the newly restored Miller Creek channel.

Stream restoration within Miller Creek will extend from a point approximately 950 linear feet downstream of the Grady Ranch Bridge to a point approximately 200 feet upstream of the western fire road crossing of Miller Creek (Figure 1). Additionally, Grady Creek, the newly-aligned G-2 and S-4 reaches, and several portions of tributaries to Landmark and Miller Creeks will be restored.

Restoration activities within these areas will generally include laying back creek banks and repairing deeply incised creek reaches in order to raise the water table within Miller Creek, beneficially modifying flow durations, velocities, and bed and bank stability. Native riparian vegetation would be planted throughout the restoration areas to further enhance functions and values.

5.3.2 CRAM and SWAMP assessments

A limited portion of the Study Area was assessed using both CRAM and SWAMP to quantitatively and qualitatively assess the functional capacity and ecological condition of the stream and riparian habitat. The portion of the Study Area assessed was the reach of Grady Creek proposed for restoration. Although Grady Creek will not be directly impacted by the Building Construction Project, the new facility will be constructed in relatively close proximity, and the Grady Creek channel, channel banks, and riparian surroundings will be restored as part of the Project. Analyses of the current condition of Grady Creek were compared to analyses of predicted future conditions based on site data, development plans, and restoration plans. The

CRAM and SWAMP assessments are fully detailed in the Riparian Habitat Functional Assessment Report (WRA 2010b), and summarized below.

Currently, Grady Creek is highly degraded. This is especially true for the northwestern side of the stream, where the new film production facility will be constructed. This area was observed to have especially high levels of erosion and invasion by non-native plants, apparently as a result of past land management activities.

Under predicted future conditions, the presence of the new film production facility in close proximity to the Grady Creek channel will have a negative effect on certain aspects of both CRAM and SWAMP functional assessments, although an overall improvement is made in functional assessment scores due to proposed restoration activities. The analyses suggest that implementation of the Development Plan, along with associated restoration actions along Grady Creek, will lead to a higher functional capacity of the riparian habitat than what currently exists. The highly eroded banks and entrenched channel of the creek would be addressed through grading with excavation equipment, and channel degradation (loss of channel substrate) would be rectified through placement of substrate within the channel. These actions to improve the grade and contours of the creek should reduce flow velocity within the creek, thereby slowing or stopping the process of erosion and improving the habitat quality for fish such as steelhead trout. These actions would also reduce Grady Creek's contribution to downstream flooding during storm events, because the restored channel would have a greater capacity to retain and reduce the velocity of floodwater. Planting of native riparian vegetation during restoration activities will also stabilize channel banks and improve habitat quality for native plants and animals.

The CRAM approach is intended to allow simple comparisons between the conditions of wetlands of the same type, or comparisons of the condition of the same wetland at different time periods, in terms of the CRAM scores. CRAM developers have performed assessments at a number of sites across California non-randomly selected to represent the range of conditions possible for a particular wetland type. These analyses are referred to as the CRAM "calibration," and the average results of the calibration for different wetland types are available on the CRAM website, in addition to CRAM results for individual sites. Table 3 compares the results of the current and projected future Grady Ranch CRAM analyses to the statewide calibration average as well as similar streams in Marin County (Collins *et al*. 2008). Comparisons of SWAMP scores require additional context and are discussed in the Riparian Habitat Functional Assessment Report (WRA 2010b).

Table 3. Comparison of Grady Creek CRAM Scores to Calibration and Reference Sites

	Study Area Scores*		Reference Site Scores				
Metric	CURRENT Average Score	FUTURE Predicted Average Score	Big Carson Creek	Little Carson Creek	Pine Gulch	Redwood Creek	CRAM Calibration Average
Buffer & Landscape	87	82	100	100	65	93	85
Hydrology	71	75	83	100	100	92	85
Physical Structure	44	75	75	53	67	83	69
Biotic Structure	67	89	63	75	75	88	69
CRAM SCORE	67	80	80	82	77	89	77

*Scores are percentages, out of 100 possible percentage points.

Overall, functional analyses performed for the Riparian Habitat Functional Assessment (WRA 2010b) show that the Grady Creek riparian area should have a higher functional flow and flood capacity following implementation of the Development Plan and associated restoration activities than it does in its current condition.

5.3.3 WET assessment

The Wetland Evaluation Technique (WET; Adamus *et al.* 1987) was conducted by Balance Hydrologics as a functional assessment methodology to examine the functions and values of Miller Creek. The portion of Miller Creek between Grady and Landmark Creeks was chosen as a representative reach for the assessment. The results of the assessment are presented in Table 4.

Table 4. WET Assessment of Current Functions and Values of Miller Creek

Function or Value	Rating of Function or Value	Rationale
Groundwater recharge	Low	Miller Creek is unlikely to allow a net recharge of groundwater. Groundwater is likely drained by the Miller Creek channel, particularly in degraded/eroded/incised areas.
Groundwater discharge	Moderate	Miller Creek may be partially fed by groundwater in the winter and spring. An unnatural amount of groundwater may discharge in this way, as the channel elevation may have dropped below the level of the water table at certain times of year.
Floodflow alteration	Moderate	The assessed portion of Miller Creek has a relatively low gradient and includes areas with a vegetated floodplain or low terrace that have a moderate potential to retain and slow floodwaters.
Sediment stabilization	Moderate	The assessed portion of Miller Creek includes a cobble and gravel bed that would reduce erosion, along with backwater areas and floodplains that have a moderate potential for binding and retaining soil particles.
Sediment/toxicant retention	Low	Miller Creek has limited adjacent wetlands and may therefore provide limited permanent retention of inorganic soil particles and toxic chemical substances.
Production export	Moderate	Many of the Miller Creek tributaries have a tree canopy that would contribute leaves and other organic plant materials to downstream areas.
Uniqueness/heritage	Low	The assessed portion of Miller Creek in its current state is unlikely to provide spawning habitat for Federal Threatened Steelhead (WRA 2008), and does not have exceptional historical significance or other indications of uniqueness/heritage.
Nutrient removal/transformation	Low	Miller Creek has little emergent vegetation and is unlikely to remove or transform a significant amount of nutrients.

Function or Value	Rating of Function or Value	Rationale
Wildlife diversity/abundance	Low	Miller Creek is likely important to a number of locally common wildlife species, although it may not have a notably great on-site abundance or diversity of wetland-dependent birds during wintering or breeding periods.
Aquatic diversity/abundance	Moderate	Miller Creek is likely to have a moderate diversity of aquatic life during the rainy season, particularly invertebrates. A small number of fish species may also be present.
Recreational opportunities	Low	Miller Creek holds little recreation value under the current private land management.

Implementation of the development portion of the project is unlikely to significantly impact the functions and values of the assessed portion of Miller Creek. However, following proposed restoration activities, functions and values of Miller Creek are expected to increase. WET attributes likely to improve following restoration are described in Table 5.

Table 5. WET Functions and Values Expected to Increase Following Restoration

Function or Value	Rating of Function or Value	Rationale
Groundwater discharge	Low	Some degree of groundwater discharge is likely to occur within Miller Creek following restoration. However, the unnatural loss of groundwater due to the lowered elevation of the stream channel is likely to be reduced or eliminated by stream restoration.
Floodflow alteration	High	Restoration activities should enhance the ability of Miller Creek to retain and slow the velocity of floodwaters. Boulders, logs, and other materials placed in the channel will absorb energy and reduce flow velocity. Raising the channel elevation will allow floodwaters easier access to adjacent terraces for floodwater retention. Riparian vegetation planted on the terraces will also reduce the velocity of floodwaters.
Uniqueness/heritage	Moderate	Proposed restoration activities would remove the existing Grady Fire Road bridge, which acts as a barrier to upstream movement of fish in Miller Creek. This is likely to allow spawning of fishes such as federal threatened steelhead in upstream portions of Miller Creek.

6.0 DETERMINATION OF CREDITS

Stream and wetland restoration activities described in Section 7.0 of this HMMP are proposed as mitigation for proposed Project impacts to aquatic resources within the Project Area. A summary of proposed impacts and mitigation are given in Table 6 below.

Table 6. Summary of Proposed Impacts and Mitigation within the Project Area

Resource Type	Impacts		Mitigation		
	Development-related (Permanent) Impacts	**Restoration-related (Temporary) Impacts**	**Restoration**	**Establishment**	**Total Mitigation Credit**
Other Waters	1,270 l.f.	7,090 l.f	7,090 l.f.	1,230 l.f.	8.320 l.f.
Wetlands		0.04 acre	0.17 acre	--	0.17 acre
Totals	**1,270 l.f.**	7,090 l.f. **0.04 acre**	**7,090 l.f.** **0.17 acre**	**1,230 l.f.**	**8,320 l.f.** **0.17 acre**

7.0 MITIGATION WORK PLAN

Section 7 provides a description of mitigation and implementation methods proposed within the Project Area.

7.1 Activities Planned at the Mitigation Site

Miller Creek, Grady Creek, Landmark Creek, Loma Alta Creek and several smaller tributaries within the Project Area are deeply incised and show signs of heavy erosion along their banks. Streams affected by scouring and slumping provide poor habitat for aquatic and riparian vegetation and associated wildlife species such as salmonids and other fish species. Evidence of these erosive processes are most apparent in lower reaches of Grady Creek and just downstream of Grady Bridge in Miller Creek where the creek channel bed is over eight feet lower than the channel bed upstream of the bridge.

To address areas of degraded aquatic habitat within the Project Area, a creek and tributary stabilization and restoration effort is proposed as part of the Master Plan project (Figure 1). Restoration is designed to stabilize existing channels against severe erosion and bank failure, protect planned structures, and where appropriate, to reestablish more natural channel morphology. Bank restoration efforts will aim to achieve a balance between the risk of significant or catastrophic bank failure and the loss of riparian habitat. The general location of the proposed restoration sites is shown on Figure 1.

Descriptions of mitigation activities within the Project Area have been separated into the categories of restoration and enhancement. Descriptions are provided in the following sections.

7.1.1 Restoration

Stream and wetland restoration efforts within the Project Area have been divided into three regions. Each region will feature unique restoration features including topography, and extent and composition of restored vegetation. Features of stream restoration are shown on Sheets EN 7.1-7.5 (SCA Restoration and Enhancement Plans and Longitudinal Profiles of Miller and Grady

wra
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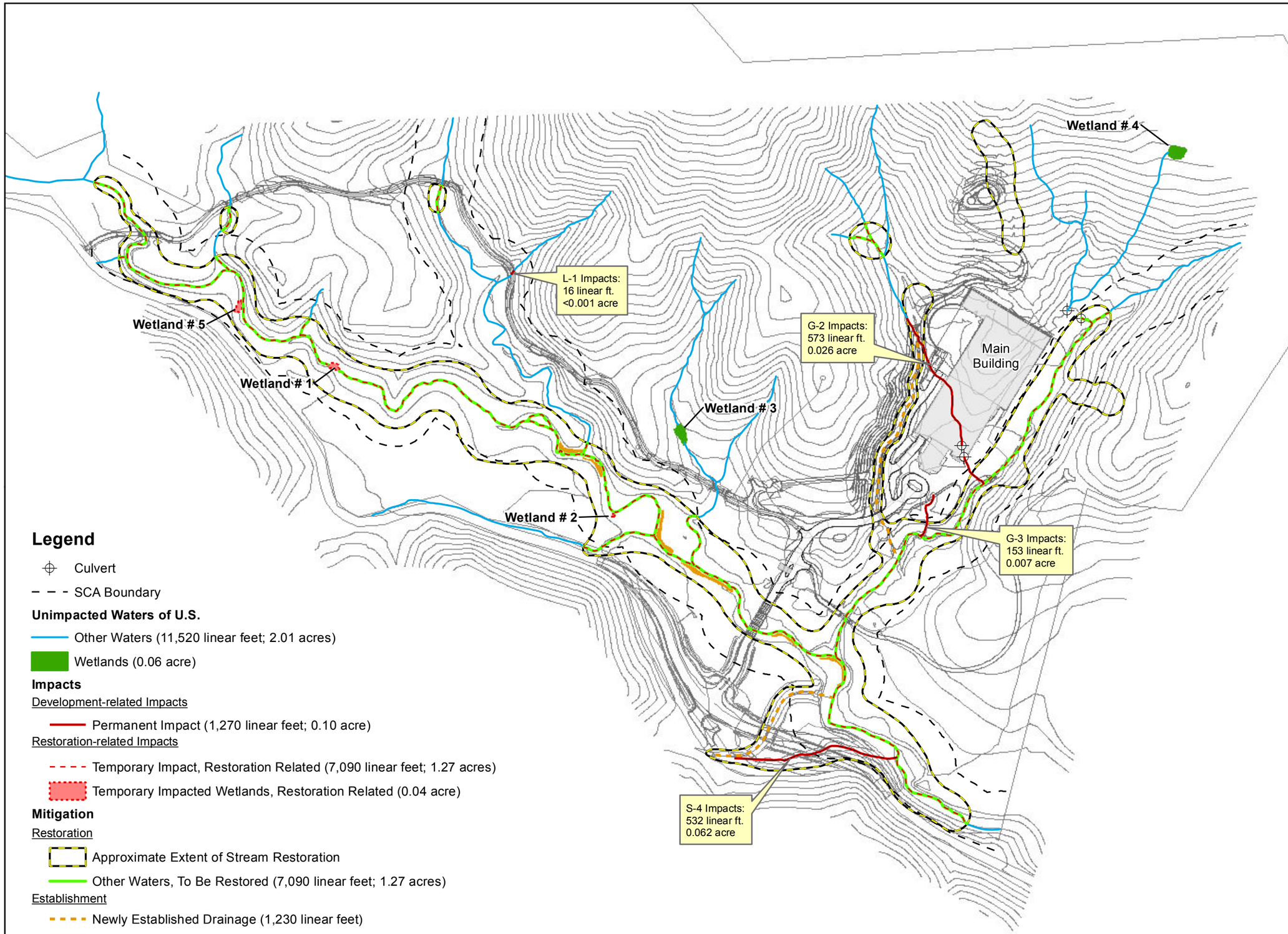
Grady Ranch

Marin County, California

Figure 1

Wetland and Stream Impacts and Mitigation



Legend

Culvert

SCA Boundary

Unimpacted Waters of U.S.

Other Waters (11,520 linear feet; 2.01 acres)

Wetlands (0.06 acre)

Impacts

Development-related Impacts

Permanent Impact (1,270 linear feet; 0.10 acre)

Restoration-related Impacts

Temporary Impact, Restoration Related (7,090 linear feet; 1.27 acres)

Temporary Impacted Wetlands, Restoration Related (0.04 acre)

Mitigation

Restoration

Approximate Extent of Stream Restoration

Other Waters, To Be Restored (7,090 linear feet; 1.27 acres)

Establishment

Newly Established Drainage (1,230 linear feet)

Potential Wetland Restoration Areas (> 2:1 mitgaion:impact ratio)

N
W E
S

0 100 200 400
Feet

Map Date: January 2011
Map By: Derek Chan
Base Source: Marin County, 2004

Path: L:\Acad 2000 Files\18000\18076\GIS\ArcMap\County Response\Fig1_Impacts_Mitigation_20110404.mxd

Creeks) and LA 1.3 (Stream Restoration Planting Details and Sections) of the Grady Ranch PDP.

Lower Miller Creek

Reaches of Miller Creek downstream of the existing Grady Bridge are significantly degraded by downcutting and incision of stream banks; therefore restoration efforts in this area will be more intensive than other parts of the Project Area. Restoration of this lower portion of Miller Creek will focus on backfill of the stream bed with local, native substrate. This backfill will bring the streambed to a more natural grade and the stream banks will be laid back to approximately a 3:1 slope. Double boulder weirs and step-pool sequences will also be placed at geomorphically-appropriate positions approximately every 100 feet to promote pool and run features in the streambed. Implementing these restoration techniques will increase the carrying capacity of the creek, allow space to create raised wetland benches corresponding to the two-year flood level and provide suitable conditions for riparian vegetation planting and establishment.

Upper Miller Creek

Scouring and downcutting of Miller Creek upstream of Grady Bridge is less extensive than in lower Miller Creek and thus a less intensive restoration strategy will be employed in this area. Double boulder weirs will be placed less frequently than in lower Miller Creek at approximately 200 foot intervals, again at appropriate locations chosen by geomorphologists. Additionally, natural woody debris will be placed along the stream bank to promote development of pools and provide suitable refuge for aquatic species.

Tributaries to Miller Creek

Restoration efforts in the tributaries to Miller Creek, including Grady Creek, Landmark Creek, and Loma Alta Creek, will focus on backfilling of the stream channels and bank stabilization. Cement structures and other debris will be removed from Grady Creek; small boulder weirs will be placed approximately every 50 feet and the stream banks in some areas will be regraded for improved stability. Natural woody debris will also be placed in Grady Creek and other tributaries to improve habitat for native aquatic species. Access to upstream spawning areas and bedrock pools used for steelhead rearing will be maintained.

7.1.2 Enhancement

Wetland and riparian planting

After implementation of the restoration activities described above in Section 7.1.1, native species will be planted throughout the restoration areas. Native species will generally be planted along graded creek banks along Miller, Grady and Landmark Creeks and tributaries. Seasonal wetland vegetation will be installed on raised wetland benches corresponding to the two-year flood level. Planting palettes are described below in Section 7.2.2.

Invasive plant removal

Non-native, invasive plant removal will occur throughout the extent of stream restoration shown on Figure 1. Non-native, invasive plant species to be removed include those species listed on the California Invasive Plant Council (Cal-IPC 2006) as having a high or moderate rating. The removal of non-native, invasive plant species will be focused on stream channels and adjacent stream banks and uplands within the Project Area. Priority non-native, invasive plant species

targeted within the Project Area have either been observed within the Project Area or are known to be present in the vicinity, and include yellow starthistle (*Centaurea solstitialis*), purple starthistle (*Centaurea calcitrapa*), sweet fennel (*Foeniculum vulgare*), French broom (*Genista monspessulana*) and Himalaya blackberry (*Rubus discolor*).

7.1.3 Establishment

Stream reaches G-2 and S-4 will both be impacted by construction activities including construction of the Main Building and realignment of Lucas Valley Road. In both cases, the impacted streams will be realigned in adjacent uplands. Realignment will result in establishment of stream habitat, including beneficial functions and values. The amount of stream habitat that will be established by realigning Reaches G-2 and S-4 is 1,230 linear feet.

7.1.4 Sequence and timing

Mitigation activities within the Project Area will be concurrent with project construction. In general, grading will be performed between April 15 and October 15 to avoid working during the rainy season. Timing related to specific weed removal methods are described in Section 7.2.

7.2 General Mitigation Implementation

This section describes general methods for implementation of mitigation activities, including site preparation, weed removal, planting, and erosion control BMPs.

7.2.1 Implementation methods for control of non-native, invasive plant species

Non-native, invasive plant species removal will be implemented as part of enhancement activities, during site preparation for restoration activities, and as part of long-term management activities throughout. Non-native, invasive plant species removal will target all invasive species on Cal-IPC's High and Moderate lists, including but not limited to those species listed in Section 7.1.3 above. Specifics on the implementation of these methods are described in more detail below.

<u>Site preparation</u>

Target invasive weeds will be removed to prepare restoration and enhancement areas, as appropriate, prior to seeding and the installation of container plants.

<u>Removal of priority weed species</u>

Hand removal is the preferred method of removing weed species from the site to minimize ground disturbance and adverse effects to sensitive wildlife species. Hand removal methods include the use of such tools as pruners or weed wrenches. Mechanical methods of removal, such as mowing or the use of weed-eaters, may be acceptable in appropriate areas with the approval of the consulting biologist.

Plant materials that are removed will be disposed of carefully to prevent regeneration or spread. In general, removal will be performed first during the late winter or early spring when soils are moist enough to remove most plants without breaking the roots. A second weed removal effort will take place in late spring or early summer to remove any re-sprouted weeds and ensure that the weed control area is weed-free. Weeds will be removed before they set seed. When this is not feasible, seed heads will be removed from plants prior to removal of the remaining plant.

Seed heads of non-native, invasive plant species will be placed in plastic trash bags and removed from the project site for proper disposal.

If manual or mechanical removal methods are tried and found to be ineffective after repeated treatment or if the problem is too widespread for hand removal to be practical, then chemical controls may be implemented as described below. All of the methods described in this section will be adapted to each species based on its morphology and phenology.

Herbicides

Herbicides will be used when manual and mechanical removal methods are not effective and may be used in conjunction with manual and mechanical methods for species that are known to be difficult to control. The project will use glyphosate-, triclopyr-, or imazapyr- based herbicides, such as Rodeo®, Habitat®, or other products that are Environmental Protection Agency (EPA)-approved products for use near wetlands and streams. Herbicides will not be used when rain is predicted within 24 hours after application. The owner and applicator must comply with all state and local regulations regarding the application of herbicides.

Herbicides will be applied using a localized spot-treatment method and applied in a manner that will eliminate or reduce drift onto native plants. Herbicides may also be applied to cut stumps for large woody plants or large clumps of herbaceous weeds that cannot be effectively removed. If the species has the ability to sprout from the cut trunk, then the cut stump will be treated with Garlon® 4 or other approved herbicide in accordance with the manufacturer's specifications to ensure that the cut stump will not sprout. Cut stumps will be subsequently monitored and repeatedly cut and treated with herbicide until the stump is dead.

As an alternative to commercially manufactured herbicides, the project may use an organic alternative of horticultural vinegar (20%) spray or common household vinegar (5%) spray.

7.2.2 Planting implementation methods

The following planting methods may be used: topsoil with seed bank, direct seed, and containerized plants. This section describes the implementation methods that will be used at the sites to plant native plant species.

Topsoil with seed bank

Within the footprint of the proposed Project elements, topsoil may be salvaged from areas with existing native vegetation for use in stream restoration. In these areas, above-ground plant material will be removed and processed into mulch for re-use around newly planted, containerized upland plants. After plant material has been cleared, approximately four to six inches of topsoil will be removed and stockpiled for reuse. Salvaged topsoil with seed bank will be stored in a control area and monitored to prevent contamination and unauthorized use. Salvaged topsoil with seed bank will be utilized within 12 months of salvaging. Salvaged topsoil with seed bank will be spread on designated areas to a depth of two to four inches and stabilized using the erosion control measures outlined in this mitigation plan. Topsoil should not be stored in piles greater than two feet deep to maintain seed viability.

Direct seeding

Seed for revegetation efforts will either be collected from the Project Area or from similar habitats within the larger Grady Ranch Property, or obtained from a local native plant nursery. Seed

collection will be performed during the appropriate time of year for each species. Seeding will take place annually between October 1 and November 1 or as specified by the consulting biologist. The first seeding will be performed in conjunction with site preparation and the installation of erosion control measures. Seed will be over-seeded to counter potentially low germination rates.

Planting containerized plants

Containerized plants will be contract grown from local native nurseries and installed between December 1 and January 31. Revegetation areas will be planted with one of four plant palettes depending on the target habitat; Floodplain Terrace, Riparian – lower Miller and Grady Creek, Riparian – upper Miller Creek, and Seasonal Wetland (Table 7). Planting palettes are based on species observed within the Project Area.

Table 7. Native Plant Species Included in the Grady Ranch Restoration Plan

Scientific Name	Common Name
Floodplain Terrace	
Artemisia douglasiana	mugwort
Baccharis pilularis	coyote brush
Juncus effusus	bog rush
Juncus patens	common rush
Salix laevigata	red willow
Salix lasiolepis	arroyo willow
Riparian - Lower Miller and Grady Creek	
Aesculus californica	California buckeye
Baccharis piluaris	coyote brush
Heteromeles arbutifolia	toyon
Rosa californica	California rose
Quercus agrifolia	coast live oak
Quercus lobata	valley oak
Rhamnus californica	coffeberry
Sambucus nigra ssp. *caerulea*	blue elderberry
Symphoricarpos albus	snowberry
Riparian - Upper Miller Creek	
Aesculus californica	California buckeye
Baccharis piluaris	coyote brush
Heteromeles arbutifolia	toyon
Quercus agrifolia	coast live oak
Quercus lobata	valley oak
Rhamnus californica	coffeberry
Ribes californicum	California gooseberry
Seasonal Wetland	
Carex serratodens	two-toothed sedge
Eleocharis macrostachya	creeping spikerush
Juncus xiphioides	iris-leaved rush
Mimulus guttatus	seep monkeyflower

7.2.3 Irrigation

Supplemental dry season irrigation will need to be applied to mitigation plantings. Irrigation is required immediately after planting, during any dry spells during the first few months, and approximately weekly during the first one to two dry seasons. Native shrubs and trees will benefit from occasional (approximately bi-weekly), deep dry season watering in the subsequent two to three years, and do not need to be continually irrigated once they appear to be established. Excessive watering of these drought-resistant species may encourage root rot, excessive above ground growth without deep roots, or competition from weeds near the irrigation source.

7.2.4 Erosion control measures

Erosion control measures will be used where construction activities result in areas of bare ground. Erosion control BMPs may include use of rice straw, straw wattles, bales, or silt fencing.

7.2.5 Plant protection measures

Plant protection measures shall be installed around containerized plantings to discourage plant damage or mortality resulting from deer browse. Several of the species proposed for planting are attractive to browsing deer, which are common in the Project Area. Wire cages are the preferred method of plant protection. Cages may be removed after plants become established and resistant to damage by browse.

8.0 MAINTENANCE PLAN

Maintenance activities will include: 1) inspections of irrigation systems and plant protection devices, including repair, replacement, or removal of malfunctioning items, 2) remedial planting activities to replace unsuccessful native vegetation plantings in re-vegetation areas, if necessary, 3) inspections for colonization of the Project Areas by non-native plants and removal if necessary and 4) inspections of geoengineering stability and function and remedial actions, if necessary. Maintenance needs will be identified through annual monitoring as described in Section 9.0.

8.1 Site Inspection

The irrigation system will be inspected monthly during the dry season for the first three years and repaired as needed. Bent or fallen support structures, cages, and or fencing will be repaired as necessary by landscaping staff. Tree cages may be removed once the protected plants have attained heights where they are not significantly suppressed by deer browsing. Removal of temporary fencing and individual plant flagging or other identification should only occur when plants are sufficiently established to withstand foot traffic in the vicinity and the difference between native plantings and weeds can be easily determined by landscaping staff. Removal of protective structures or changes to the irrigation system or schedule may only occur when determined appropriate by consulting biologist.

The stability of all geoengineered slopes and features within the restoration areas will be inspected monthly during the rainy season and following any significant storm events for the first three years following construction. One of the three years must have an above normal rainfall total. Any slope failures or erosion will be identified and repaired as soon as is feasible. After

the first three years, geoengineered slope stability will be inspected during the annual monitoring visits and maintenance needs will be included in the annual monitoring reports.

Non-native plant inspections will be conducted during annual monitoring visits, and corrective actions taken as soon as is appropriate depending on the target species. Biologists will identify the extent of non-native plants on Cal-IPC's High and Moderate invasive lists, as well as any other locally-invasive species that threaten the success of the installed native plants. If present, appropriate mechanical or biological controls will be implemented as described below to either eliminate or to control any invasive species so that it will not have a significant impact on the survival of installed plantings or the ecological function of the restored habitat.

8.2 Invasive Plant Control

Invasive plant monitoring and control shall be an integral part of site preparation, short-term monitoring, and long-term maintenance of the Project Area and development landscaping. Monitoring for invasive plant population expansion or new invasion of the Project Area will occur as part of the annual site inspections described in Section 9.2 below. Recommendations for removal and control of weeds will be developed by the consulting biologist to be implemented by the Applicant's landscaping staff or a landscape contractor as necessary.

Weeds should be removed using hand tools if possible, before the species sets seed; removal is often most effective in late winter or early spring when soils are moist enough to remove entire plants without breaking the roots. Large areas of bare ground that would further encourage invasion are minimized by mulching or alternative weed removal techniques. Certified weed-free mulch is always preferable, although on-site sources such as chipped tree debris and other mulch resulting from landscape maintenance activities are also permitted.

8.2.1 Invasive weed removal techniques

Three invasive weed removal techniques are outlined below, and can be used individually or in combination to remove or contain most invasive plant populations encountered in the Project Area.

<u>Hand/Mechanical Removal</u>

Hand removal or use of small handheld equipment (such as a weed wrench or a chainsaw) is the preferred method of removing invasive plant species from the Project Area. Many species must be removed entirely and disposed of carefully, including stems and all root fragments, in order to prevent regeneration or spread. Also, pruning and disposal of seed heads and flowers of invasive species in plastic trash bags or a hot compost pile can help to prevent spread if removal of the entire plant is not possible or is planned for a later date. If hand removal methods are tried and found to be ineffective after several years of repeated treatment, or the problem is too widespread for hand removal to be practical, then chemical controls may be implemented as described below.

<u>Mowing</u>

The use of weed-eaters (or "weed-whackers") or similar trimmers with string or metal blades is appropriate for mowing contiguous patches or large individuals of certain invasive species. Perennial and annual grasses can often be managed effectively by mowing each time the inflorescence (flower/seed head) appears. Complete removal of perennial species also requires digging of the roots and/or rhizomes, but mowing can be used to suppress growth and prevent

seeding until future removal is performed. Any mowing should be performed with care to avoid native grasses and other interspersed native species within the treatment area.

Herbicides

Glyphosate- or triclopyr-based herbicides, such as Rodeo or others approved for use near streams, may be utilized if invasive plants cannot be managed through other methods. The herbicide must be applied by a certified applicator according to the label, using a localized spot-treatment method and with care to avoid drift onto native plants. Herbicide use in the Project Area may be necessary to control shrubs like French broom and Himalayan blackberry if removal of the root systems is not possible due to erosion concerns or access. If used near Miller Creek or any other watercourse, the herbicides must be approved for use near aquatic resources, and may not be used when rain is predicted within 24 hours after application. This recommendation does not obviate the need for the property owner to obtain any other applicable local or state approvals for the use of these chemicals. An organic alternative of horticultural vinegar (20%) spray or repeated treatments with common household vinegar (5%) may also be utilized on young plants as it can effectively suppress seedlings, particularly broadleaved species.

8.2.2 Priority invasive weed species

Presence of any invasive weed species within the re-vegetation areas will be documented and reported. If control measures are necessary, priority will be given to plants on Cal-IPC's High and Moderate invasive lists, with the exclusion of non-native grasses. The appropriate control method for treating the weed will be dependent on the species present and the location of the infestation (on steep slopes, near streams or aquatic resources, etc.), and will be determined in consultation between the site manager and consulting biologist.

Several Cal-IPC-listed species have been observed within the Project Area, and may require control measures within the re-vegetation areas. Invasive weeds observed in the Project Area include yellow starthistle (Cal-IPC High), Italian thistle (*Carduus pycnocephalus*), purple starthistle (*Centaurea calcitrapa*), poison hemlock (*Conium maculatum*), bull thistle (*Cirsium vulgare*), black mustard (*Brassica nigra*), all Cal-IPC Moderate, and firethorn (*Pyracantha angustifolia*), egg-leaf spurge (*Euphorbia oblongata*), and dock (*Rumex* spp.), all Cal-IPC Limited.

Other priority weeds include French broom and Scotch broom (*Cytisus scoparius*). Although not currently present in the Project Area, both are rated 'High' on the Cal-IPC list, and both are highly invasive weeds in Marin County that have the potential to colonize areas disturbed during project grading and may pose a high risk for re-vegetation failure.

9.0 MITIGATION SUCCESS CRITERIA AND MONITORING REQUIREMENTS

Vegetation monitoring within the Project Area will occur for a minimum five-year period. Hydrologic monitoring (groundwater, geomorphic, streamflow, sediment transport and infrastructure monitoring) will occur for a minimum five-year period. Monitoring will commence following the completion of construction and restoration activities, and will continue annually for five years or until performance criteria are satisfied.

9.1 Mitigation Success Criteria

Annual monitoring of the Project Restoration and Mitigation Areas will document the progress of project mitigation toward satisfying success criteria outlined in this section of the HMMP. Six categories of mitigation monitoring will be carried out within the Project Area: (1) vegetation monitoring, (2) groundwater monitoring, (3) geomorphic monitoring, (4) streamflow gaging, (5) sediment transport monitoring, and (6) infrastructure monitoring. Vegetation monitoring will track establishment and growth of mitigation plantings as well as cover of invasive weeds, if any. Groundwater monitoring will track post-project groundwater levels at select locations within the restored and enhanced stream and valley aquifer system. Geomorphic monitoring will document changes to the channel form, making recommendations for maintenance or repair to ensure it is functioning acceptably. Streamflow gaging will assess post-project changes to baseflow and provide data for sediment transport calculations. Sediment transport monitoring will track sediment loads transported by the restored and enhanced streams to compare to pre-restoration rates. Infrastructure monitoring will document the condition of grade control structures, culverts, channel transitions, bridge footings, and other proposed in-stream or in-bank infrastructure, including the stormwater basins. The criteria used to evaluate the success of mitigation are described below. Incremental success criteria benchmarks are given for post-construction monitoring years 1 and 3, in order to track progress towards completion of final success criteria in post-construction monitoring year 5.

9.1.1 Vegetation monitoring success criteria

YEAR 1

- Survival of planted trees and shrubs throughout the Project Restoration and Mitigation Areas will exceed 80 percent of the total number of required plantings;
- Native wetland herbaceous species in wetland terraces and/or the creek channel will exceed 35 percent relative vegetative cover;
- Invasive plants on the California Invasive Plant Council (Cal-IPC) High or Moderate lists will not exceed five percent relative cover.

YEAR 3

- Survival of planted trees and shrubs will exceed 75 percent of the total number planted.
- Native wetland herbaceous species in wetland terraces and/or the creek channel will exceed 45 percent relative vegetative cover.
- Invasive plants on the California Invasive Plant Council (Cal-IPC) High or Moderate lists will not exceed five percent relative cover.

YEAR 5

- Survival of planted trees and shrubs will exceed 70 percent of the total number planted.
- Native wetland herbaceous species in wetland terraces and/or the creek channel will exceed 60 percent relative vegetative cover.
- Invasive plants on the California Invasive Plant Council (Cal-IPC) High or Moderate lists will not exceed five percent relative cover.

As is noted elsewhere in this Plan, adaptive management is an integral part of post-construction strategy. If a particular species is determined by the project biologist to be underperforming, or suffers high rates of mortality, replacement shall be completed with a higher-performing species.

Success rates of other individual species planted within the mitigation area shall be used in determining the species of the replacement mitigation plantings.

9.1.2 Hydrological monitoring success criteria

YEAR 5

Groundwater monitoring success criteria

Changes in groundwater levels resulting from project implementation, if any, shall not adversely affect the success of the project in achieving the vegetation success criteria described above. Any changes in groundwater levels resulting from project implementation shall also not impair streamflow for Steelhead migration, particularly the streamflow duration for outgoing smolts. It is worth noting that groundwater elevations and flow patterns are known to alter, sometimes quite significantly, based on seasonal and multi-seasonal rainfall patterns and amounts, and this is expected to continue under post-project conditions. In addition, large seismic events may also cause shifts (temporary or permanent) in groundwater levels and fluctuation patterns. These and other similar factors must be considered in post-project assessment., For this and other reasons, assessment of changes in groundwater elevations and their related effects on flow duration should be under the direction of a state-licensed certified hydrogeologist or professional geologist.

Geomorphic monitoring success criteria

The relocated and restored channels will demonstrate a balance of erosional and depositional processes, deemed appropriate by the project hydrologist for the channel type. The channel form and the connectivity between geomorphic segments, its floodplain and the valley aquifer shall function appropriately, as concluded by the project hydrologist. Based on visual observations and/or longitudinal profile and cross-section surveys, the relocated and restored channels will not exhibit multi-year trends of excessive bank instability or bed aggradation or downcutting over significant stream lengths as a result of the restoration design and construction. Episodic mudflow deposition, however, is possible irrespective of any project restoration, for example following fire within the watershed and subsequent high rain intensities.

The amount of woody debris present in relocated and restored channels will reflect a balance between the aquatic habitat benefits derived from the presence of woody debris and the potential of such debris, when excessive, to initiate or contribute to excessive erosion or scour.

Streamflow gaging

The duration of baseflow recession and stream dry down resulting from project implementation shall not impair Steelhead migration, particularly for outgoing smolts, relative to pre-project conditions. It is important to note that the duration of baseflow in upper Miller Creek varies significantly from year to year based on rainfall and other conditions. This variability is expected to continue under post-project conditions and evaluation of success criteria should explicitly account for this expected condition (i.e. should include factors such as cross-correlation to other nearby stream gaging stations).

Sediment transport monitoring

As a result of the project implementation, changes in sediment transport rates from the relocated and restored channels on the property will not impair downstream reaches of Miller Creek as

concluded by the project hydrologist. Sediment availability in natural stream systems is related to the intensity and frequency of large storms that deliver sediment to the stream channel, potentially from off-site sources. The assessment will consider antecedent rainfall, episodic sediment-producing events, and related sediment availability in relation to hydrologic functions of the relocated and restored channels on the property.

Infrastructure monitoring

Grade control structures, engineered channel transitions, etc, will be structurally competent, shall successfully pass in-channel flows, and shall exhibit natural creek bed material and appropriate creek bed elevations. Engineered stormwater basins will function to achieve the design objectives, including those for 'hydromodification' controls.

9.2 Monitoring Schedule

9.2.1 Vegetation monitoring

Bi-annual vegetation monitoring will commence by the first growing season following construction. The first of the biannual visits will be conducted in April to document and map any non-native, invasive weeds within the Project Area, if present. Data collected during the April visit will be used to inform the Project Area maintenance contractor of necessary weed removal.

The second visit will be conducted at the end of the growing season (typically late summer) to measure plant survivorship, establishment, vigor and cover for the areas planted with native upland, wetland and riparian vegetation. The project biologist will take vegetation data to determine if the site is on track to meet the success criteria in each year. Digital photographs of the restoration site from established photo-monitoring points will be taken, in order to photo-document the progress of revegetation of the restoration site. Photographs will be included in the annual monitoring reports.

9.2.2 Hydrological monitoring

A five-year stream gaging, sediment transport, groundwater and geomorphic monitoring program will be performed following completion of construction and restoration activities. A data report will be issued annually and the five-year monitoring report will include data interpretation, conclusions, and recommendations. The following conditions will be monitored:

- A stream gaging and sediment transport monitoring station will be established at the furthest feasible downstream portion of the restoration area. Field visits will be conducted at appropriate times during the rainy season and baseflow recession in order to document conditions of the relocated and restored channels within the Project Area. Groundwater monitoring sites will be appropriately positioned near the restored channel and monitored with a datalogger and bi-annual hand measurements of depth to water level. The Water Year 2010 hydrologic monitoring report (Balance Hydrologics, 2011) outlines the types of methods and reporting formats which are to be used.

- Stream cross-sections and photographic stations will be established to monitor changes in channel form within the restoration area. Photographs will be collected each year during baseflow recession, while the stream has water. Cross sections will be surveyed each year after the stream has dried down.

- A ‘stream walk’ will be conducted each year to assess the stability of the stream bed, banks, grade control structures within the restored channels, and the connectivity of the channel with its floodplain and valley aquifer. The stream walk will also describe the height of the seasonal high-water marks above the bed, such that connection with geomorphic floodplains may be assessed. The locations of major instabilities, debris jams, and significant deltas at the mouths of tributaries will be described. If a ‘five-year’ or greater recurrence flow event is not experienced within the five-year monitoring period, then an additional stream walk will be conducted (along with photograph stations as described above) following the next five-year or greater flow event.

- Visual inspection of the functionality of the stormwater basins will be conducted each wet season.

9.3 Reporting Requirements

As-built report

An as-built report that summarizes post-construction conditions within the Project Area will be submitted to the permitting agencies within 90 days of completion of construction. The as-built report shall include pre- and post-construction photographs, as well as a map showing the locations of photo-documentation stations and major project features. The as-built report will include a figure that maps the final wetland and riparian Restoration and Mitigation Areas and engineered project features. This figure will serve as a baseline for future monitoring reports and maintenance recommendations.

Annual monitoring reports

Annual monitoring reports will be submitted to the permitting agencies by December 31 of each monitoring year. Annual monitoring reports will document the progress of the Project Area towards achieving success criteria. If warranted, recommendations to help the Project Area meet success criteria will be made in the annual monitoring report.

Completion of mitigation monitoring

Upon completion of the final year of the monitoring period, and if the Applicant believes final success criteria have been met, the Applicant shall notify the permitting agencies when submitting the annual report that documents this completion. A formal wetland delineation to document the final acreage of potentially jurisdictional features within the Project Area will be completed and submitted with the final annual monitoring report.

10.0 LONG-TERM MANAGEMENT PLAN

Long-term management within the Restoration Area will be conducted annually as needed by the Applicant’s staff. Long-term management activities are similar to maintenance activities described in Section 8 and Section 9 above. These activities may include, but are not limited to:

- Access control and maintenance of signage
- Control of invasive plant species
- Erosion control activities
- Fire management in coordination with local fire agencies
- Monitoring and clean-up of illegal dumping and general trash removal

- Special status species surveys
- Annual monitoring of project restoration
- Preparation of annual reports detailing results of annual monitoring and management activities
- Ongoing management of restoration and enhancement areas.

Long-term management funding

The applicant will be responsible for funding long-term management within the Mitigation Area. An appropriate long-term funding mechanism including non-wasting endowments, trusts, contractual arrangements with future responsible parties, and other appropriate financial instruments will be developed by the Applicant.

11.0 ADAPTIVE MANAGEMENT PLAN

The Project Applicant will be the responsible party for implementation of management activities during the mitigation monitoring period. Specific maintenance and management activities will be identified based on the results of each annual monitoring visit. As part of each annual monitoring report, maintenance and management activities implemented during the previous year will be described and the results will be evaluated under the framework of adaptive management. If management and maintenance methods are not successful in addressing negative environmental stressors identified as part of annual monitoring reports, the methods will be examined and altered to increase the potential for success based on best professional judgment and management methods that are shown to be successful based on scientific research. In some cases, success of management and maintenance activities may not be evident over the course of only one year. This will be accounted for in annual monitoring reports through evaluation of whether or not management actions are contributing to progress towards the ultimate goal. In these cases, it may be necessary to wait for two years or more before altering methods as part of an adaptive management strategy. Each annual monitoring report will contain a section dedicated to evaluation of management and maintenance actions as part of the adaptive management strategy.

11.1 Natural Occurrences

Contingencies have been included in the financial assurances (Section 12.0) to provide a cushion for any unforeseen costs of management activities to be carried out in the event that a fire, flood, or other natural disaster should have a negative impact on preserved, enhanced, and/or restored habitat during the monitoring period. Remedial actions will be carried out during the monitoring period if habitat quality is reduced due to the occurrence of fire and/or other natural disasters. These actions are described in the following section.

11.2 Potential Remedial Actions

Habitat remediation consists of minor restoration of habitat from the effects of erosion, replacement of mitigation planting mortality, unauthorized access or removal of invasive plants; it is not considered ecological habitat restoration or creation. This task may include native plant seeding with native seeds, replacement of mitigation plantings, raking, or weed removal. A significant modification of the compensatory mitigation project requires approval from the district engineer.

12.0 FINANCIAL ASSURANCES

The Applicant will be responsible for financial obligations related to the long-term management of the project.

13.0 REFERENCES

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