

APPENDIX P – BIOLOGICAL SPECIES AND HABITAT SURVEY REPORT

**FINAL REMEDIAL INVESTIGATION REPORT
CASMALIA RESOURCES SUPERFUND SITE
CASMALIA, CALIFORNIA**

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ACRONYMS AND ABBREVIATIONS

BSHS	Biological Species and Habitat Survey Report
CDFG	California Department of Fish and Game
cm	centimeter
CNDDB	California Natural Diversity Database
CNPS	California Native Plant Species
CRLF	California Red-Legged Frog
CSC	Casmalia Steering Committee
CTS	California Tiger Salamander
ERA	Ecological Risk Assessment
kHz	kilohertz
msl	mean sea level
PCB	polychlorinated biphenyl
ppt	parts per thousand
RCRA	Resource Conservation and Recovery Act
RI/FS	Remedial Investigation/Feasibility Study
RWQCB	Regional Water Quality Control Board
SVL	snout-vent length
TDS	total dissolved solid
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service

EXECUTIVE SUMMARY

The Casmalia Steering Committee (CSC) has prepared this *Biological Species and Habitat Survey Report* (BSHS Report) relative to the upcoming Remedial Investigation/Feasibility Study (RI/FS) for the former Casmalia Resources Superfund Site (Site). This report follows recommendations from the U.S. Environmental Protection Agency (USEPA) Region 9 and direction provided by USEPA provided in a letter dated October 19, 2000. The original intent of the BSHS was to establish a foundation upon which to develop the RI/FS ecological risk assessment (ERA) work plan. This BSHS Report is intended to synthesize the results of the surveys conducted within and proximate to the Site between fall 2000 and spring 2005. Data included in this report were extracted from previously presented BSHS interim reports, as well as from recent 2004-2005 survey efforts not previously presented.

Each set of surveys conducted at the Site was focused on determining the presence or absence of 39 known or potentially occurring sensitive species within or proximate to the Site. This list of 39 species was developed in cooperation with and approved by the USEPA, the U.S. Fish and Wildlife Service (USFWS), the California Department of Fish and Game (CDFG), and the California Central Coast Regional Water Quality Control Board (RWQCB). When applicable, the surveys used established protocols that have been prepared by state and/or federal regulatory agencies. In addition, the intent of the BSHS surveys was to develop species lists that would assist in understanding the presence and absence of plants, amphibians, reptiles, birds, and mammals that utilize the Site annually, seasonally, or transiently.

Coulter's goldfields (*Lasthenia glabrata* ssp. *coulteri*), a California Native Plant Society (CNPS) List 1B "rare, threatened, or endangered species in California and elsewhere," was identified by the surveys within the Site boundaries in 2001 and 2002. Its occurrence within the Site has been traced back to a seed mix used in revegetation efforts that followed construction of the Pesticides/Solvents landfill cap. The species is assumed to be extant onsite. Another List 1B species, black-flowered figwort (*Scrophularia atrata*), was identified by informal surveys in spring 2001 within the eucalyptus grove to the north of the Site. It is assumed to be extant in this region. However, given the widespread soil and vegetation disturbance within the Site boundaries, this species is unlikely to have occurred or to become established onsite.

The California red-legged frog (CRLF) (*Rana aurora draytonii*), listed as a "threatened species" by the USFWS and a "species of special concern" by the CDFG, was identified within or proximate to the stormwater runoff ponds in the southern portion of the Site between 1998 and 2002. Two surveys, one in the spring of 2003 and one in 2004, did not identify any larval, subadult, or adult CRLF. The absence of CRLF during this interval is likely the result of high salinity levels in the ponds. However, drift fence/pitfall trap surveys conducted during 2004-2005 captured six CRLF. These survey results indicate that CRLF are breeding and recruiting in two man-made ponds on top of a hill approximately 1,200 feet south of the A-Series Pond.

Drift fence/pitfall trap surveys conducted in 2004-2005 identified the first occurrences of California tiger salamanders (CTS) (*Ambystoma californiense*) on the landfill Site. Three individuals were captured over the interval of December 2004 and February 2005, coinciding with significant or protracted rainfall events. Consistent with conclusions for the CRLF, onsite ponds do not likely provide stable breeding habitat from year to year.

The Western spadefoot toad (*Scaphiopus hammondi*) identified by the California Department of Fish and Game as a “species of special concern” was identified within the northwest end of the RCF Pond in April 1999. Since 1999 and throughout all subsequent surveys, the species has not been identified within the site. However, suitable habitat, consisting of ponded water in which to breed and rodent burrows within 1,500 feet of the water source in which to bury themselves, does exist onsite.

Two reptile species of conservation concern were identified during surveys within the Site boundaries: the coastal horned lizard (*Phrynosoma coronatum frontale*) and the two-striped garter snake (*Thamnophis hammondi*). The coastal horned lizard, listed by the USFWS as a “federal species of concern” and by the CDFG as a “special concern species,” is assumed to be extant in the upland (northern) portions of the Site. The lizards were observed in April and July of 2001. Suitable habitat of ruderal grassland communities and small mammal burrows characterize the landfill caps. The two-striped garter snake, also listed as a “Federal Species of Concern” and a “Special Concern Species,” was observed within and/or proximate to the stormwater runoff ponds in spring 2001 and 2002. This species is assumed extant within the Site boundaries.

Nine bird species of conservation concern were identified by surveys conducted in spring and fall 2001 and spring 2002 within or proximate to the Site. All nine species likely utilize the Site for foraging, and three species potentially utilize the Site for nesting habitat. The nine species include the Cooper’s hawk (*Accipiter cooperii*), golden eagle (*Aquila chrysaetos*), loggerhead shrike (*Lanius ludovicianus*), black-capped chickadee (*Poecile atricapillus*), merlin (*Falco columbarius*), osprey (*Pandion haliaetus*), northern harrier (*Circus cyaneus*), California horned lark (*Eremophila alpestris*), and long-billed curlew (*Numenius americanus*). Of these nine species, only the Cooper’s hawk, loggerhead shrike, and northern harrier are believed to frequently utilize the Site.

Surveys determined that the American badger (*Taxidea taxus*), ringtail (*Bassariscus astutus*), and mountain lion (*Puma concolor*) likely utilize the Site or areas proximate to Site for foraging. The American badger and ringtail likely have dens within the Casmalia Creek riparian corridor, while the location of the mountain lion is unknown. The mountain lion and ringtail are listed by the CDFG as “fully protected furbearing species,” and the American badger is listed as a “species of special concern.”

Two bat species, both listed by CDFG as “special concern species,” were identified onsite by acoustic detection. Pallid bats (*Antrozous pallidus*) were detected by acoustic monitoring in 2004 throughout the Site and in the North Drainage and Casmalia Creek riparian corridor. They utilize the Site for foraging and likely roost in dead trees within the eucalyptus grove. Western red bats (*Lasiurus blossevillii*) were detected by acoustic monitoring only around Pond A-5 in 2004. Given the feasibility of detecting this species by acoustic monitoring, it is believed that only a small population utilizes the Site for foraging.

1. INTRODUCTION

The Casmalia Steering Committee (CSC) has prepared this *Biological Species and Habitat Survey Report* (BSHS Report) relative to the upcoming Remedial Investigation/Feasibility Study (RI/FS) for the former Casmalia Hazardous Waste Management Facility (Site). This report follows recommendations from the U.S. Environmental Protection Agency (USEPA), Region 9 and direction provided by USEPA provided in a letter dated October 19, 2000. The original intent of the BSHS was to establish a foundation upon which to develop the RI/FS ecological risk assessment (ERA) work plan. This BSHS Report has been prepared by ARCADIS BBL for the CSC and is intended to synthesize the results of the surveys conducted within and proximate to the Site between fall 1998 and spring 2005. This report includes data previously presented in BSHS interim reports (e.g., Hunt & Associates, 2001; Harding ESE, 2001; MACTEC, 2003), as well as data from recent survey efforts (e.g., spring and fall 2004) not previously presented. The report has been revised to include survey data from initial presence/absence surveys conducted onsite and within the Casmalia Creek riparian zone during the spring of 1998 and 1999 (CSC, 1999), which pre-dated the publication of the *Biological Species and Habitat Survey Work Plan* (BSHS Work Plan) (GeoSyntec Consultants, 2000). In addition, the CSC has addressed all comments received from pertinent reviews of past BSHS interim or draft reports.

Each set of surveys conducted at the Site was focused on determining the presence or absence of 39 known or potentially occurring sensitive species within or proximate to the Site. This list of 39 species was developed in cooperation with and approved by the USEPA, the U.S. Fish and Wildlife Service (USFWS), the California Department of Fish and Game (CDFG), and the California Central Coast Regional Water Quality Control Board (RWQCB). When applicable, the surveys used established protocols that have been prepared by state and/or federal regulatory agencies. In addition, the intent of the BSHS surveys was to develop species lists that would assist in understanding the communities and populations of plants, amphibians, reptiles, birds, and mammals that utilize the Site annually, seasonally, or transiently.

This report is organized to remain consistent with the general format of the BSHS Work Plan (GeoSyntec Consultants, 2000). The main body of this report is intended to discuss background information relating to the Site and BSHS project, present the methodology for conducting surveys, provide the results of those surveys, and discuss the results.

1.1 Site Background

The Site is an inactive Class I hazardous waste management facility located in the northwestern corner of Santa Barbara County, California. The Site, which was owned and operated by Casmalia Resources, began accepting wastes in the early 1970s. Site operations had ceased by 1991. Former waste management operations at the Site were conducted within an approximate 252-acre area (Figure P-1). Former waste management features included landfills, storage and evaporation ponds, evaporation pads, oil field spreading areas, treatment units, and disposal wells and trenches.

The Site lies approximately 4 miles from the Pacific Ocean, approximately 10 miles southwest of the City of Santa Maria and approximately 16 miles north-northwest of the city of Lompoc. The nearest population center is the unincorporated community of Casmalia, located approximately 1.2 miles south-southeast of the Site. The Site slopes generally toward the south and is situated

along the south-facing slopes of the Casmalia Hills. Surface elevations within the Site range from 835 feet above mean sea level (msl) at the crest of a ridge, which forms the northern facility boundary, to 375 feet msl at the southern boundary, which is located at the foot of two small hills that rise to the south of the Site. Approximately 1.2 miles north and east of the facility, the Casmalia Hills gradually rise to heights of approximately 500 feet above the highest portion of the facility, located along the northern Site boundary. The Casmalia Hills constitute one of a series of three ranges of low west-northwest-trending hills that form the southern border of the Santa Maria Valley. The predominant Site topography and surrounding hills is characterized by rounded hills and slopes of gentle to moderate steepness. Valleys are typically broad with streams cut into alluvial valley fill sediments.

Casmalia Canyon and Creek flank the Site on the west, and an unnamed surface drainage flanks the Site on the north-northeast (Figure P-1). Both drainages are relatively broad and eventually empty into Shuman Creek. Casmalia Creek merges with Shuman Creek approximately 2 miles south of the Site and approximately 1 mile west of the Town of Casmalia. Shuman Creek empties into the Pacific Ocean approximately 4 miles west of the confluence with Casmalia Creek. The unnamed drainage located to the north and northeast of the Site has been referred to as the North Drainage in previous documents. Three unnamed surface drainages exit the southern facility boundary and have been identified in previous documents, from east to west, as the A-Drainage (southeast corner), the B-Drainage (south-central boundary), and the C-Drainage (southwest corner). The B- and C-Drainages are tributaries to the larger Casmalia Canyon and Creek (Figure P-1).

The Site vicinity is sparsely settled, and land use consists primarily of agriculture, cattle grazing, and oil field development. Oil field areas in proximity to the Site include the Casmalia Oil Field, the Orcutt Oil Field, the Guadalupe Oil Field, the Santa Maria Valley Oil Field, and the Jesus Maria Oil Field. Agricultural activities within the region consist primarily of dry land farming of wheat and beans, with minor areas devoted to production of grapes, tomatoes, strawberries, and other grain crops.

1.2 Survey Background and Purpose

In cooperation with the California Central Coast RWQCB, CDFG, USFWS, and USEPA, the CSC developed a list of known or potentially occurring species of concern within or proximate to the Site. The final list of species is presented in Table P-1. Generally, this list of potentially occurring special status species was developed by consulting the California Native Diversity Database (CNDDDB) maintained by the CDFG and by seeking the observations of regional experts. The CNDDDB map is presented as Figure P-2.

As outlined in the BSHS Work Plan (GeoSyntec Consultants, 2000), surveys were conducted onsite between fall 1998 and spring 2005 to assess the presence/absence of the special status plants, amphibians, reptiles, birds, and/or mammals identified in Table P-1. As mentioned above, this report also includes data from initial presence/absence surveys during the spring of 1998 and 1999 (CSC, 1999) that were used to develop the BSHS Work Plan. When applicable, the surveys conducted specific to special status species were based on established surveys prepared by state and/or federal regulatory agencies. In addition to the surveying specifically for special status species, the surveys also developed species lists that would assist in understanding the communities and populations of plants, amphibians, reptiles, birds, and mammals that utilize the Site annually, seasonally, or transiently.

2. METHODS

As indicated by the USEPA in a letter dated October 19, 2000, and as agreed upon by the respective regulatory agencies, the surveys were designed to cover the entire Site (Figure P-1). To accomplish comprehensive surveys, the Site was subdivided into discrete areas that corresponded to previous land uses such as individual landfills, surface water runoff ponds, or other Site features. These subdivided regions (Figure P-3) include:

- RCF Pond,
- Pond 13,
- Pond 18,
- A-Series Pond,
- Pond A-5,
- Former Resource Conservation and Recovery Act (RCRA) Landfill,
- Ravine west of polychlorinated biphenyl (PCB) Landfill,
- Grassland between Former RCRA Landfill and Casmalia Creek,
- PCB Landfill,
- Pesticides/Solvent Landfill,
- Slopes south of Pesticides/Solvent Landfill,
- Metals Landfill,
- Caustic/Cyanide Landfill,
- Acids Landfill,
- Borrow area, and
- North Drainage and Eucalyptus Grove.

Methodologies to address each of the identified known or potentially occurring sensitive species onsite are identified in Table P-1. Focused surveys were incorporated into the surveys when protocols outlined by state and/or federal regulatory agencies were available. Approved, focused survey methodologies, which are included in Attachment P-1, specifically address the:

- California red-legged frog (CRLF) (*Rana aurora draytonii*),
- California tiger salamander (CTS) (*Ambystoma californiense*),
- Western spadefoot toad (*Scaphiopus hammondi*),
- Southwestern pond turtle (*Clemmys marmorata pallida*),
- Least Bell's vireo (*Vireo belli pusillus*), and
- Southwestern willow flycatcher (*Epidonax traillii extimus*).

Standardized survey methods (transects, focused, point, and acoustical) were also used to address all other sensitive species that may be present onsite. Surveys were conducted at appropriate times of the day and year to maximize detection of these species (Table P-1). The following discussion details each survey methodology used to complete the surveys for the Site.

Specifics such as the day, time, location, and participants of each BSHS survey conducted between 1998 and 2005 are included in Table P-2.

2.1 Plants

Eleven sensitive plant species were identified to potentially occur onsite. These species included (regional blooming period in brackets):

- Blochman's dudleya (*Dudleya blochmaniae* ssp. *Blochmaniae*) [April – June];
- Seaside bird's beak (*Cordylanthus rigidus* ssp. *littoralis*) [May to September]
- La Purissima manzanita (*Arctostaphylos purissima*) [shrub, visible all year if present];
- Sand mesa manzanita (*Arctostaphylos rudis*) [shrub, visible all year if present];
- Dune larkspur (*Delphinium parryi* ssp. *blochmaniae*) [April – June];
- Kelloggs horkelia (*Horkelia cuneata* ssp. *sericea*) [May – October];
- Black-flowered figwort (*Scrophularia atrata*) [May];
- Chaparral ragwort (*Senecio aphanactis*) [February – March];
- Gambel's water cress (*Rorippa gambellii*) [April – July];
- La graciosa thistle (*Cirsium loncholepis*) [July]; and
- Gaviota tar plant (*Deinandra increscens* ssp. *villosa*) [April - September]

Plant surveys for the above-listed species of concern were conducted according to protocols outlined in CDFG (1996) guidelines (Attachment P-1). Please note that initial reconnaissance-level surveys were conducted across the Site to identify the distribution and quality of habitats and their potential to support identified plant species, and to determine the appropriate number of standardized surveys to be conducted in subsequent surveys. This reconnaissance-level survey allowed the survey team to refine techniques to better address surveying for the identified species of concern.

For the 2001 reconnaissance-level surveys, the Site was divided into subregions (Figure P-4) smaller than the subregions discussed above and presented on Figure P-3. Transects surveyed within each of these smaller subregions covered the entire region. In addition, random-walk surveys of representative undisturbed grassland and coastal sage scrub north and west of the Site were conducted in order to characterize pre-landfill conditions on the Site. All plant species observed were recorded. Potentially sensitive plant species were identified in the field. All plant nomenclature followed the Jepson Manual (Hickman, 1993). Non-sensitive plants that could not be identified in the field were collected for identification at a later date.

Subsequent vegetation surveys (spring 2002; spring and fall 2004) utilized the broader division of the Site presented on Figure P-3. Transect surveys consistent with the methodology outlined above were utilized in each subregion of the Site.

2.2 Amphibians

Three sensitive amphibian species were identified as potentially occurring onsite. These species included CTS, CRLF, and western spadefoot toad. Focused surveys were conducted for all three of the above-mentioned amphibians. Recommended survey protocols are included in Attachment P-1 and discussed below. In addition to the focused surveys, walkover/reconnaissance surveys were conducted for non-special status amphibians to locate and evaluate suitable habitats and microhabitats in both water features (catchment basins, surface water runoff ponds) and uplands (squirrel burrows). Surveys were implemented by first dividing the Site into discrete areas that corresponded to individual landfills, surface water runoff ponds, or other Site features (Figure P-3). A team of qualified biologists then walked over each

of the discreet areas and focused on identifying any region of the property that may provide suitable habitat for amphibian species. All species observed during these surveys, as well as suitable habitat, were recorded.

2.2.1 California Red-Legged Frog

Surveys for CRLF were conducted in 1998, 1999, 2001, 2002, 2003, and 2004. Focused surveys collected data relative to the distribution, habitat use, and reproductive potential of the CRLF in water storage basins within Site boundaries.

Protocols were customized from the standard USFWS survey protocols (Attachment P-1) in order to provide information on the current status of the CRLF onsite and on potential project-related impacts to this special status species. Surveys focused on ephemeral and/or permanent water sources found within the Site boundaries (A-Series Pond, RCF Pond, Pond 13, Pond A-5, and Pond 18) (Figure P-3). Surveyors attempted to detect egg masses; larval, subadult, and adult CRLF; and suitable habitat so that the occurrence and spatial distribution of breeding could be evaluated. All surveys were conducted by a biologist (i.e., Lawrence E. Hunt) permitted to survey CRLF by the USFWS.

Surveys conducted in 1998 focused on both Casmalia Creek, and the five onsite water features identified above. Creek surveys were completed on April 17 and May 5, 1998. The April 17 survey focused on both a daytime and nighttime walking survey of Casmalia Creek and the perimeter of each pond. Creek surveys started approximately 1,200 feet north of the windmill located within the floodplain adjacent to the landfill and extended downstream to a un-named tributary associated with Pond 13 that connects to Casmalia Creek. Only nocturnal surveys were conducted on May 5, 1998. Nighttime surveys utilized high-powered headlamp and binoculars to detect eye shines as a means to determine presence/absence of identified species. Pond surveys were conducted on April 17, May 5, and October 7, 1998. The April 7 surveys consisted of walking surveys around the perimeter of identified ponds. The May 5 and October 7 surveys utilized kayaks along the perimeter of each pond. During these surveys, headlamps and binoculars were used to detect eye-shines within the kayak.

Presence/absence surveys were again conducted in April 14 and 23, 1999, around the perimeter of identified water features within the site. Surveys consisted of both daytime and nighttime surveys. Nighttime surveys utilized kayaks as described above.

Surveys conducted in 2001 surveyed the entire perimeter of each pond on April 24, May 2, May 14, June 1, July 31, and November 20. During each Site visit, observations were made prior to sunset and again after sunset of the same day. Visual surveys were conducted at several locations around the perimeter of each pond. Perimeter surveys included inspection of all burrows and cover objects to detect occupancy. During nighttime surveys, kayaks were used by two biologists traveling in opposite directions around a pond with strong headlamps and/or flashlights shone on the perimeter of each pond to detect eye shines. Data recorded at each pond included survey counts of larval, subadult, and adult frogs; the number and location of egg masses; a habitat map; and a potential retreat site map. In addition, attempts were made to locate egg masses so that oviposition sites could be mapped and characterized. Care was taken to locate the sampling sites away from potential oviposition sites so that egg masses were not disturbed.

In 2002, CRLF-focused surveys were completed on April 8 and 9, and on April 22 and 23. Again, four daytime and four nighttime surveys were completed around the perimeter of each pond. Nighttime surveys again involved two biologists in kayaks traveling in opposite directions around a pond. Methods used were consistent with those described above for the 2001 surveys. In addition, larval surveys were conducted using minnow traps, concurrent with CTS surveys.

Two nighttime and two daytime surveys were completed again in 2003, on May 19 and June 5. Methods used were consistent with those described above. However, the shoreline of Pond 18 was not surveyed during nighttime surveys because of shallow water and poor water quality conditions and the fact that CRLF had never been sighted in or around this water body during previous surveys (Hunt, 2003). Larval surveys were also not completed in Pond 18. In addition, kayaks were used during nighttime surveys in the RCF Pond, A-Series Pond, Pond A-5, and Pond 13. Again, powerful flashlights were used to detect the eye shine of frogs.

Surveys completed in 2004 were conducted during two Site visits on April 12 and 26. Methods used were consistent with those described above. Kayaks were used during nighttime surveys around the perimeter of the RCF Pond and A-Series Pond. Two biologists completed the nighttime surveys of Pond 13, Pond 18, and Pond A-5 by slowly walking along the shoreline of each pond in opposite directions.

2.2.2 California Tiger Salamander

Surveys of the CTS were completed in 2002 on May 9 through 10, 13 through 16, 20, 23 through 24, and 28 through 29, and in 2003 on March 26 through 29, April 22 through 25, and May 14 through 17 (Table P-3). These surveys focused primarily on minnow trap sampling. In addition, drift fence surveys were completed during the interval of October 26, 2004 and February 23, 2005. The pitfall traps associated with the drift fence surveys were open for 29 days over this interval. All survey work was conducted under USFWS 10(1)1(a) Handling Permits (Nos. TE023892-1 and TE023892-2) issued to Lawrence E. Hunt.

2.2.2.1 Minnow Trap Surveys

Minnow traps with a 0.25-inch mesh size were used to sample on-site aquatic habitats for CTS larvae. During 2002 surveys, 60 traps were placed in the five surface runoff ponds over the survey period and were left in place for 12 hours on the sampling dates noted above. Traps were checked every 4 hours, per USFWS permit requirements, because of the known presence of subadult and adult CRLF. Ten to 25 traps were placed in each pond between the hours of approximately 8 a.m. and 8 p.m. (daytime). Two partial day/night surveys were conducted on May 10 and 28, 2002, when the traps were left in the ponds between noon and midnight. Traps were moved to different locations around the ponds before each survey period. Each pond was sampled at least three times during the May 9 through 29 period. The traps were placed between 5 and 40 feet offshore in water varying from 2 to 20 feet deep and tied to stationary objects on the shore. Surface water temperatures varied between 55 and 60 degrees Fahrenheit (°F). When not in use, the traps were left on the shoreline.

Surveys were continued in the spring of 2003 by increasing the number of traps to 128 in four of the surface runoff ponds. Pond 18 was excluded from 2003 surveys due to low water levels and poor water quality conditions. Table P-3 provides locations and trap densities during each CTS survey in spring 2003. Traps were generally spaced approximately 30 feet apart and typically placed in shallow water so that the top of the trap projected above the surface of the water.

However, 20 percent of the traps at each location were thrown farther offshore to sample water up to 6 feet deep. Traps were checked every 4 hours, per USFWS permit requirements, because of the known presence of subadult and adult CRLF.

2.2.2.2 Drift Fence / Pitfall Trap

The drift fence surveys followed USFWS and CDFG protocol (Attachment P-1). Drift fences are used to direct movement of ground-dwelling animals towards pitfall traps, which are placed at grade at intervals along the drift fence. A total of 5,408 linear feet of drift fence was placed onsite between September 20, 2004 and October 25, 2004. The distribution of fencing and number of pitfall traps at each site is summarized in Table P-3 and shown in Figure P-5. Three-foot-high, UV-resistant plastic silt fence was used as drift fence because of its low cost and ease of installation. The bottom 3 to 4 inches of the fence was placed below ground in a hand-dug or machine-dug trench. A small trenching machine was used to install most of the below-ground portion of the silt fence because of the dense soils found throughout the Site. Wooden stakes placed at 10-foot intervals along the silt fence were pounded into the soil, were later supplemented with additional wooden stakes, and were secured to the fence material with cable ties. In the end, wooden supports averaged 5 feet apart because of the high wind conditions typically found at the Site. Drift fence sections were typically 66 feet long, with a 7- to 10-foot-wide opening between adjacent fence sections. Pitfall traps, consisting of 2-gallon plastic buckets, were installed along both sides of the silt fence at 33-foot intervals so that a 66-foot-long fence section supported six pitfall traps, two in the center and four at either end, on both sides of the fence.

The western and southern edges of the Site, adjacent to open grassland and scrub vegetation, were selected as the most likely places to capture CTS that might be moving from off-site locations towards the surface runoff ponds. Pond A-5 and Pond 18 were not surveyed because these were interior to the Site and thus thought to have less of a chance of receiving CTS moving from potential off-site locations.

The pitfall traps were first opened on October 26, 2004 and closed on February 23, 2005. The traps were open on 29 nights between these dates, for a total of approximately 14,442 trap-nights (29 nights x 498 pitfall traps). The traps were opened to coincide with predicted rainfall events and were typically opened in late afternoon, just before sundown. The traps were left open during the night and checked the following morning between 7 and 10 am.

2.2.3 Western Spadefoot Toad

Western spadefoot toad surveys were completed concurrently with all CRLF surveys between 1998 and 2004. Surveys focused on ephemeral and/or permanent water sources found within the Site boundaries (A-Series Pond, RCF Pond, Pond 13, Pond A-5, and Pond 18) (Figure P-3). Surveyors attempted to detect egg masses; larval, subadult, and adult frogs and suitable habitat so that the occurrence and spatial distribution of breeding could be evaluated. All surveys were conducted by a biologist (i.e., Lawrence E. Hunt) permitted to survey Western spadefoot toad by the USFWS.

During each Site visit, observations were made prior to sunset and again after sunset of the same day. Visual surveys were conducted at several locations around the perimeter of each pond. Perimeter surveys included inspection of all burrows and cover objects to detect occupancy. During nighttime surveys, headlamps and/or flashlights were used to detect eye

shine along the perimeter of each pond. Kayaks were used during nighttime surveys in 2003 and 2004 surveys. Data recorded at each pond included survey counts of larval, subadult, and adult frogs; the number and location of egg masses; a habitat map; and a potential retreat site map. Daytime surveys were conducted on April 14 & 23, 1999. Nocturnal surveys were conducted on April 17, May 5, and October 7, 1998, as well as April 14 & 23, 1999. Kayaks were utilized during all nocturnal surveys, with the exception of April 17, 1998, which focused on walking the perimeter of each pond.

2.3 Reptiles

Initial surveys were conducted for four sensitive reptilian species that were identified as potentially occurring onsite:

- Southwestern pond turtle (*Emys marmorata pallida*);
- Coast horned lizard (*Phrynosoma coronatum*);
- Coast patch-nosed snake (*Salvadora hexalepis virgultea*); and
- Two-striped garter snake (*Thamnophis hammondi*).

Focused surveys were required by the BSHS Work Plan (GeoSyntec Consultants, 2000) for the southwestern pond turtle. General reptilian surveys to address the other listed and non-special status species were implemented by dividing the Site into discrete areas that corresponded to the delineated regions based on previous land uses (Figure P-3). In addition, adjacent grassland habitats north and west of the Site and the Casmalia Creek riparian corridor west of the Site were also surveyed. Surveys completed in spring 2001 included walkover surveys throughout all delineated regions onsite (Figure P-2). A fall 2001 survey included a single transect along Casmalia Creek, and the spring 2002 surveys included a transect around each of the five ponds in the southern portion of the Site (Figure P-6).

Focused surveys, which were required to address the southwestern pond turtle, are discussed in greater depth below.

2.3.1 Southwestern Pond Turtle

Surveys for the southwestern pond turtle were routinely conducted around all ephemeral and/or permanent water sources found within the Site boundaries (A-Series Pond, RCF Pond, Pond 13, Pond A-5, and Pond 18) during CRFL, CTS, and bird surveys. Observations during each Site visit were made prior to sunset and again after sunset of the same day. Visual surveys were conducted at several locations around the perimeter of each pond. During nighttime surveys, headlamps and/or flashlights were used to detect eye shine along the perimeter of each pond. Kayaks were used during nighttime surveys in 2003 and 2004 surveys. Data recorded at each pond included survey counts of identified individuals (including age class information when available), potential/identified nesting locations, and a habitat map within the site boundaries.

Surveys were conducted monthly in 2001 between April and August and again in November. Surveys conducted in 2002, 2003, and 2004 focused on two daytime and nighttime survey efforts in the spring of each year.

2.4 Birds

Thirteen special-status bird species were initially identified as potentially occurring on the Site (Table P-1).

- American peregrine falcon (*Falco peregrinus anatum*),
- Western burrowing owl (*Athene cunicularia*),
- Western snowy plover (*Charadrius alexandrinus nivosus*),
- Cooper's hawk (*Accipiter cooperii*),
- White-tailed kite (*Elanus leucurus*),
- Golden eagle (*Aquila chrysaetos*),
- Loggerhead shrike (*Lanius ludovicianus*),
- Least Bell's vireo (*Vireo bellii pusillus*),
- Southwestern willow flycatcher (*Empidonax traillii extimus*),
- Sharp-shinned hawk (*Accipiter striatus*),
- Yellow-breasted chat (*Icteria virens*)
- Yellow warbler (*Dendroica petechia brewsteri*)
- Northern harrier (*Circus cyaneus*)

Focused surveys were required by the BSHS Work Plan (GeoSyntec Consultants, 2000) for the Least Bell's vireo and southwestern willow flycatcher. Recommended USFWS survey protocols are included in Attachment P-1. However, please see discussion below relative to reasoning for why these focuses surveys for the Least Bell's vireo and willow flycatcher were not conducted.

Surveys for all other species of birds were conducted using a point-count methodology (Ralph et al. 1993). Counts were made from seven established stations (Figure P-7) at vantage points throughout the Site, as well as along the Casmalia Creek riparian corridor and the eucalyptus grove west and north of the landfill, respectively. These seven established stations and two walking transects include:

- Station #1 – east corner of RCF Pond
- Station #2 – north perimeter Pond 13
- Station #3 – south perimeter of A-Series Pond
- Station #7 – north perimeter of Acids Landfill
- Station #8 – northwest perimeter of Pond A-5
- Station #9 – south of Pesticide/Solvent Landfill
- Station #A – northern portion of Former RCRA Landfill
- Station #12 – north of Metals Landfill
- Walking Transect #4 – Casmalia Creek
- Walking Transect #6 – eucalyptus grove

Point-count surveys were completed at 15-minute intervals for each station on the following dates: March 20, April 20, May 11, May 25, and November 21 and 30, 2001; March 15 and September 24, 2002; and November 3, 4, 5, 8, 9, and 10, 2004. Binoculars and a spotting scope, along with tape-playbacks for particular species, were employed during the surveys. These formal surveys were also supplemented with informal surveys made at various locations on and adjacent to the Site on April 27, 2000, April 24, May 4, and July 5, 11, 16 through 24, 2001.

The 2004 methodologies were modified to provide compatibility with data from previous point-count surveys conducted in 2001 (Hunt & Associates) and 2002 (MACTEC). Observations

made within 15 minutes of the survey start time were grouped into 0 to 3, 3 to 5, and 5 to 15 minute intervals (Appendix A - 2004 Point Count Datasheets). Observations within 50 meters of the survey point, from 50 to 100 meters of the survey point, and flyovers were quantified when possible; however, several observations were qualified as vocalizations only. Incidental observations made beyond 100 meters during surveys or coincident with non-survey activities (e.g., traveling between survey points, while considering potential new point locations, or during inclement weather and other conditions unsuitable for surveys) were also recorded. The observation intervals and distances used in previous studies are not known at this time.

The original seven survey locations established in 2001 were supplemented with three additional locations in 2004 that provided coverage of Pond 13, Pond 18, and the Eucalyptus Grove south of the PCB landfill. To the extent practicable, the 2004 surveys were scheduled to coincide with peak fall migration. Each of the 10 survey locations were monitored at least twice, and at least once within the 4-hour period following sunrise. Multiple surveys were conducted at several points and at a total of 36 times.

2.4.1 Least Bell's Vireo

Focused surveys for the Least Bell's vireo were not completed because it was concluded that suitable breeding habitat does not occur on or proximate to the Site. Although Casmalia Creek is vegetated with willow woodland, intense cattle grazing has destroyed much of the horizontal and vertical structure to the understory vegetation and has eliminated adjacent riparian scrub habitat required for nesting by this species.

Thus, it was determined that general point-count surveys throughout the Site were sufficient to determine the presence/absence of this federally protected bird species.

2.4.2 Southwestern Willow Flycatcher

Consistent with survey methodology for the Least Bell's vireo as discussed above, focused surveys for the southwestern willow flycatcher were not completed because it was concluded that suitable breeding habitat does not occur on or proximate to the Site. Although Casmalia Creek is vegetated with willow woodland, intense cattle grazing has destroyed much of the horizontal and vertical structure to the understory vegetation and has eliminated adjacent riparian scrub habitat required for nesting by this species.

Thus, it was determined that general point-count surveys throughout the Site were sufficient to determine the presence/absence of this federally protected bird species.

2.5 Mammals

Initial surveys were conducted for eight sensitive mammal species, including five bat species that were identified as potentially occurring onsite.

- American badger (*Taxidea taxus*),
- Ringtail (*Bassariscus astutus*),
- Mountain lion (*Puma concolor*),
- Greater western mastiff bat (*Eumops perotis*),
- Spotted bat (*Euderma maculatum*),
- Townsend's big-eared bat (*Corynorhinus townsendii pallescens*),

- Pallid bat (*Antrozous pallidus*), and
- Western red bat (*Lasiurus blossevillii*).

Consistent with the above-mentioned surveys, mammal surveys were implemented using the Site division that corresponded to the delineated regions based on previous land uses (Figure P-3). In addition, adjacent grassland habitats north and west of the Site and the Casmalia Creek riparian corridor west of the Site were also surveyed. Mammal species were typically detected by their signs (tracks, burrows, scat, or foraging sites) but were occasionally visually identified. Habitat use by each species was noted within each of delineated regions of the Site. The type and number of other mammal species directly or indirectly observed during the course of surveys for other plant or animals were also recorded.

Surveys completed in spring 2001 were walkover surveys within each delineated region of the Site and areas proximate to the Site. Specific dates of these surveys included April 20 and 27; May 14; June 1 and 11; and July 16 through 24, and 31. Surveys completed in fall 2001 and spring 2002 specifically followed transects strategically located throughout the Site (Figure P-8). Specific dates included November 19 through 21, 2001 and March 11 through 14, April 30, and May 1 and 2, 2002.

2.5.1 Bat Species

Multiple survey techniques were used to determine the presence/absence and relative abundance of sensitive bat species (e.g., Townsend's big-eared bat [*Corynorhinus townsendii*], pallid bat [*Antrozous pallidus*], and western red bat [*Lasiurus blossevillii*]), as well as to characterize the general bat assemblage in the area. Each of the available survey methods (acoustic sampling, mist-net surveys, and roost surveys) has inherent biases and different detection likelihood for each bat species (Kalko *et al.*, 1996; Pierson *et al.*, 1996; Pierson and Rainey, 1996; Simmons and Voss, 1998). The western red bat can be detected and identified with Anabat acoustic equipment. With focused attention, the pallid bat is also identifiable with Anabat. The Townsend's big-eared bat is not easily detected with acoustic equipment. Both the pallid bat and the Townsend's big-eared bat have very distinctive guano characteristics and are easily detected through roost surveys.

Surveys conducted in 2001 focused on visual searches of potential roost sites during the daytime, as well as acoustic surveys of foraging at night. Acoustic survey stations (Figure P-8) were located at sites where bats were likely to feed: around lights, surface runoff ponds, and the Casmalia Creek riparian corridor, as well as on landfill caps and at other locations throughout the Site. Specifically, there were 11 bat survey stations. Each station was typically surveyed for 1 hour on three different occasions: June 1 and 11, and July 31, 2001.

Microphones were used to detect high-frequency calls emitted by bats during foraging. These calls were processed and transformed into visual signals displayed on a laptop computer. In this way, species-specific calls could be identified and analyzed even though the bats could not be seen or heard without specialized equipment. These signals were saved as computer files for voucher records at the Santa Barbara Museum of Natural History.

Surveys in 2004 included visual searches for potential roost sites, acoustical surveys, and mist-net surveys. Using all three survey methods provided not only the most thorough evaluation of occurrence of the three target species but also the best assessment of the entire bat species assemblage for the area.

2.5.1.1 Mist-Netting

Mist-nets similar to those used to capture birds were set over water and trails and in other known flyways. Bats were handled to collect the following data: reproductive condition, sex, age, and body measurements. After data were collected, the animal was released onsite. Mist-netting does not give an adequate indication of the activity or abundance of bats in an area, but is used to gather data that cannot be obtained without an animal in hand. Mist-netting sites are generally augmented by acoustic monitoring near the mist-nets to assess relative abundance/activity. All bats that were captured were recorded on release to confirm species identification and for future use in species call identification. One night of mist-netting was conducted in fall 2004. Nets were set near Pond 13 over trails because of the possibility of pallid bats foraging or commuting along the roads and trails. No captures were made. Mist-netting was not conducted over the ponds because of the nature of the water and sediments impounded in the ponds.

2.5.1.2 Roost Sampling

The Site provides little or no roosting habitat suitable for bats. Most of the structures are metal buildings and have relatively high levels of human activity. Townsend's big-eared bats prefer large cavernous spaces such as caves, attics, and barns. Pallid bats are crevice roosters as well as cavern roosters and will use crevices in rocks, bridges, and dilapidated buildings. The western red bat is a foliage-roosting bat that roosts in the foliage of trees and has been documented roosting in the foliage of cottonwood and willow trees (Pierson *et al.*, 2002).

The administration building was visually assessed for potential roosting habitat, but none was found. The small shed and horse stalls near the administration buildings were checked for signs of bat use, but no sign was detected.

2.5.1.3 Acoustic Sampling

Acoustic sampling was conducted with an Anabat II bat detector system (Titley Electronics). The Anabat system uses a bat detector to detect bat ultrasonic echolocation calls in the field and uses a z-caim unit to convert the detected signals into time/frequency (kilohertz [kHz]) graphs on a computer. Acoustic units (Anabat bat detector and CF-Storage ZCAIM) were placed in appropriate settings (e.g., pond edges, eucalyptus groves, and riparian corridors) to collect bat calls. Acoustic units operated and collected data from sunset until sunrise. Nine detectors were placed and operated between 7:30 p.m. and 6:30 a.m. throughout the 7-day survey period.

Detecting and identifying bat species with acoustic sampling is bound by two constraints: 1) how easily a bat is detected in the field and 2) how reliably it can be identified by its call parameters once detected. Detectability depends on call intensity, call frequency, and distance from the detector. In general, species with low-frequency, high-intensity calls are detected at the greatest distance and, therefore, are more frequently represented in acoustic sampling surveys (Pierson *et al.*, 2001).

Identifying bat species by echolocation calls involves analyzing several call parameters such as base frequency, call shape, call pattern, call duration, and interpulse time interval. Some bat species are more readily identifiable by their echolocation call features than other species.

Knowledge of the local bat fauna and the ecology and biology of the bat species is necessary when analyzing acoustic data.

Five of the bat species likely to occur in the region are readily identified using the Anabat system. These species are the Townsend's big-eared bat, pallid bat, western red bat, hoary bat, and western mastiff bat. Although discernible, Townsend's big-eared bat is rarely detected by acoustic units because it has a low-intensity, high-frequency call, and the bat must fly in extremely close proximity to the detector unit in order to be recorded.

Three groups of bats are difficult to distinguish by Anabat call sequence. The first group, which includes the silver-haired bat (*Lasionycteris noctivagans*), big brown bat (*Eptesicus fuscus*), and Mexican free-tailed bat (*Tadarida brasiliensis*), all share similar call characteristics in the 20 kHz to 30 kHz frequency range. Some calls can be diagnostic, but most calls are difficult to differentiate. These calls are identified as the 25 kHz group in the analysis.

The California myotis (*Myotis californicus*) and Yuma myotis (*Myotis yumanensis*) have call frequencies between 45 kHz and 50 kHz. Call shape can be diagnostic, although it is often difficult to discern. The two species are best differentiated by their foraging behavior and the location of the detector site. Yuma myotis flies close over water surfaces, foraging for emerging insects, while California myotis flies along vegetation edges, often at canopy height, in an erratic flight pattern. Calls that were indistinguishable between these two species were labeled 50 kHz myotis in the analysis.

Western small-footed myotis (*Myotis ciliolabrum*), long-legged myotis (*Myotis volans*), and little brown myotis (*Myotis lucifugus*) comprise the third group of bats that are difficult to distinguish by Anabat call sequence. These three species all have similar calls between 35 and 45 kHz and are very difficult to distinguish by call sequences. No 40 kHz calls were recorded.

3. RESULTS

The following section presents results of the surveys described in Section 2. The results are discussed in Section 4, and additional information is provided in Attachments P-2 through P-5.

3.1 Plants

3.1.1 Special Status Species

Of the eleven special status plant species identified as potentially occurring onsite, only one species was identified on or proximate to the Site. The black-flowered figwort was identified to the north of the Site in the eucalyptus grove. In addition, Coulter's goldfields (a CNPS List 1B species) was identified onsite during the 2001 surveys. This species was unexpected, as it was not included in the original list of eleven species to potentially occur on site as detailed in the BSHS Work Plan.

3.1.1.1 Coulter's Goldfields

One special status species, Coulter's goldfields (*Lasthenia glabrata* ssp. *Coulteri*) was identified onsite during the 2001 surveys. This species is listed as a List 1B.1 species ("seriously threatened in California [high degree/immediacy of threat]" by the CNPS. Please note that this species was not included in the original list of target species (Table P-1). It is believed that this List 1B species was introduced to the Site through a revegetation effort for the Pesticides/Solvents Landfill following construction of a cap. Coulter's goldfields was included in a seed mix used in 1997 and 1998. The species apparently germinated and persisted in response to irrigation measures to control dust. Figure P-9 provides the species distribution as documented in 2001 (Hunt & Associates, 2001). Generally, Coulter's goldfields distribution generally coincides with the margins of dirt access roads, extending the distance that water can be sprayed from the trucks.

Coulter's goldfields was again identified during spring 2002 surveys in the northeast corner of the PCB Landfill and also near a water utility in the flats north of the RCF Pond.

3.1.1.2 La Purisima Manzanita

La purisima manzanita is listed as a List 1B.1 species ("seriously threatened in California [high degree/immediacy of threat]" by the CNPS. Commonly, this species grows on sandstone outcrops and old beach sand in coastal chaparral. The CNDDDB does not include any known occurrences on or proximate to the Site.

La purisima manzanita was not identified as occurring onsite during any of the surveys. Suitable habitat for the species is not found onsite given the absence of sandy soils. Because this species is a shrub, it would be expected to be clearly visible throughout the year.

3.1.1.3 Sand Mesa Manzanita

Sand mesa manzanita is listed as a List 1B.2 species ("fairly threatened in California [moderate degree/immediacy of threat]" by the CNPS. The species is known to occur on sandy soils in

coastal chaparral. The species has been documented only on Vandenberg Air Force Base as reported by the CNDDDB.

Sand mesa manzanita was not identified as occurring onsite during any of the surveys. Again, suitable habitat for the species is not found onsite given the absence of sandy soils. In addition, because this species is a shrub, it would be expected to be clearly visible throughout the year.

3.1.1.4 Seaside Bird's Beak

Seaside bird's beak is listed as "endangered" by the State of California, and as a List 1B.1 species ("seriously threatened in California [high degree/immediacy of threat]") by the CNPS. The species was previously identified approximately 1 mile north of Vandenberg Air Force Base as reported by the CNDDDB.

This species was not identified onsite during any of the surveys.

3.1.1.5 Dune Larkspur

Dune larkspur is listed as a List 1B.2 species ("fairly threatened in California [moderate degree/immediacy of threat]") by the CNPS. It is known to typically occur in stabilized sand dunes. Locations cited in Smith (1998) are sandy soils around Lompoc and Burton Mesa, northward to Nipommo Mesa, and south of Arroyo Grande. The only known occurrence documented within the CNDDDB in the region proximate to the Site is within Vandenberg Air Force Base.

Dune larkspur was not identified onsite during any of the surveys. Given the absence of sandy soils onsite, the species was not expected to occur.

3.1.1.6 Kellogg's Horkelia

Kellogg's horkelia is listed as a List 1B.1 species ("seriously threatened in California [high degree/immediacy of threat]") by the CNPS. This subspecies of *Horkelia* has been found in northern Santa Barbara County, but apparently is very uncommon. The only documented occurrence within the CNDDDB is "Antonio Siding, near surf." Hickman (1993) identifies suitable habitat as old dunes and coastal sandhills.

Kellogg's horkelia was not identified onsite during any of the surveys. Given the absence of sandy soils onsite, the species was not expected to occur.

3.1.1.7 Black-Flowered Figwort

Black-flowered figwort is listed as a List 1B.2 species ("fairly threatened in California [moderate degree/immediacy of threat]") by the CNPS. This species is endemic to northern Santa Barbara County, where it is widely distributed on clay soils derived from diatomaceous parent material.

Black-flowered figwort was identified during a survey conducted on March 20, 2001 as occurring in the eucalyptus grove to the north of the Site, but has not been surveyed since that time.

3.1.1.8 Chaparral Ragwort

Chaparral ragwort is listed as a List 2.2 B species (“fairly threatened in California [moderate degree/immediacy of threat], common elsewhere” by the CNPS. This species is typically found in coastal sage and chaparral habitats following burns or other disturbances. This species has been found near the coast on Hollister Ranch and apparently prefers alkaline soils.

Rayless ragwort was not identified onsite during any of the surveys.

3.1.1.9 Blochman’s Dudleya

Blochman’s dudleya is listed as a List 1B.1 species (“seriously threatened in California [high degree/immediacy of threat]”) by the CNPS. This species commonly is found on open, rock slopes, often serpentine or clay-dominated soils (Hickman 1993).

Blochman’s dudleya was not identified onsite during any of the surveys. It was not expected to occur onsite given the extent of disturbance to native clay soils over the past decades.

3.1.1.10 Gambel’s Watercress

Gambel’s watercress is listed by the State of California as “threatened” and by the federal government as “endangered.” In addition, the CNPS lists this species as a List 1B.1 species (“seriously threatened in California [high degree/immediacy of threat]”). Of the three populations known nationwide, one population of 100 individuals occurs at the Vandenberg Air Force Base. This population was identified in 1996 within a deep slow-moving channel between clumps of willows on the south side of Purisima Hills. Suitable habitat for the species exists in marsh habitats along the margins of lakes or slow-moving streams.

Although suitable habitat likely occurs proximate to the ponds in the southern portion of the Site, Gambel’s watercress was not identified during any of the surveys.

3.1.1.11 La Graciosa Thistle

La graciosa thistle is listed by the State of California as “threatened” and by the federal government as “endangered.” In addition, the CNPS lists this species as a List 1B.1 species (“seriously threatened in California [high degree/immediacy of threat]”). Only seven populations are known to occur in California, all within San Luis Obispo and Santa Barbara Counties. Like the Gambel’s watercress, la graciosa thistle requires habitat in freshwater marshes (sometimes brackish), along dunes, and on river bottom lands with high subsurface water levels.

Although suitable habitat likely occurs proximate to the ponds in the southern portion of the Site, la graciosa thistle was not identified during any of the surveys.

3.1.1.12 Gaviota Tar Plant

Gaviota tar plant is listed as “endangered” by the State of California and “endangered” by the federal government. In addition, the CNPS lists this species as a List 1B.1 species (“seriously threatened in California [high degree/immediacy of threat]”). This tarplant is largely restricted to one extended population along a 2-mile stretch of coastal terrace near the City of Gaviota in Santa Barbara County. Recently, several small populations have been identified up the coast on Hollister Ranch and near Pt. Sal. It grows only on sandy loam soils of the Milpitas-Positas-Concepcion series that have a subsurface clay layer.

Gaviota tar plant was not identified onsite during any of the surveys. This result was expected given the limited known distribution of this rare species.

3.1.2 Non-Special Status Species

While surveys undertaken to complete this BSHS Report focused on special status plant species, the surveys also produced comprehensive species lists for each of the delineated regions throughout the Site (Table P-4). These data provide significant information relative to plant community species composition, which can be useful to characterize Site habitat. This BSHS Report consolidates previously presented data so that each region of the Site can be reviewed separately, and changes or differences in surveys throughout the survey period can easily be tracked and/or reviewed. Data sheets from all plant survey efforts (i.e., 2001 and 2002) are included as Attachment P-2.

Generally, there appears to be a decrease in the species richness throughout the Site between the first surveys (conducted in spring 2001) to subsequent surveys (conducted in spring and fall 2002). In addition, a decrease in the percent of native species was apparent in the majority of these delineated regions of the Site. Table P-5 provides the species richness and percent native species of each region of the Site for all conducted surveys. Please note there are several species not identified to the species level; these were not incorporated into the calculation for percent native species.

3.2 Amphibians

3.2.1 Special Status Species

All three amphibians identified as potentially occurring onsite were identified during the surveys conducted from 1998 to 2004. The CRLF was identified within the majority of the ponds on the southern portion of the Site during surveys conducted between 2001 and 2002, and again in 2004. CTS were observed along the western and northwestern sides of the A-Series Pond in 2004-2005. Finally, the Western spade foot toad was observed along the northwestern shoreline of the RCF Pond during 1999 surveys.

3.2.1.1 California Tiger Salamander

CTS are listed by the federal government as "threatened," and by the State of California as a "species of special concern." CTS larvae and/or adults were not identified on or proximate to the Site during the 2002 or 2003 focused aquatic surveys. However, 2004-2005 upland drift fence / pitfall trap surveys captured three adult male CTS in pitfall traps located along the western and northwestern sides of the A-Series Pond (Figure P-5). CTS were not captured at other drift fence locations onsite. The capture dates (December 32, 2004; January 27, 2005; and February 17, 2005) coincided either with significant or protracted rainfall events or both. CTS were measured to the nearest millimeter (snout-vent length [SVL] and total length), sexed, and a small (1 mm) piece of tissue was clipped from the dorsal tip of the tail and preserved in 70 percent ethyl alcohol for subsequent genetic analysis at UC-Davis. Each CTS was photographed from above in order to record its dorsal spotting pattern. The photos were compared to determine that each of the CTS captured were unique individuals and not re-captures of the same individual. Within 15 minutes of initial handling, each CTS was released into a California ground squirrel burrow closest to the capture point on the opposite side of the

fence from the capture point. However, two of the three CTS captured were released into burrows on the same side of the fence as the capture point because there were no burrows close to the capture point on the opposite side of the fence.

3.2.1.2 California Red-Legged Frog

CRLF are listed by the federal government as “threatened,” and by the State of California as a “species of special concern.” CRLF were identified in or proximate to the RCF Pond, Pond A-5, the A-Series Pond, and Pond 13 during surveys completed in the spring and fall 2001 and in spring 2002. In addition, CRLF have been previously identified in Casmalia Creek and in Shuman Canyon Creek at and downstream of the confluence with Casmalia Creek. Locations of all CRLF observations are presented on Figure P-10. Table P-6 includes all field notes specific to the CRLF. Field data sheets are included in Attachment P-3.

Specifically, Site observations at the RCF Pond detected greater than 40 larvae and three adults on May 5, 1998; 4 subadults on October 7, 1998; 13 subadult and 10 adults on April 12, 1999; 2 subadult and 9 adult frogs during daytime and 9 subadult and 14 adults during evening surveys on April 23, 1999; 1 subadult CRLF on April 24, 2001; 1 subadult on May 2, 2001; 1 subadult on June 1, 2001; 1 adult on April 8, 2002; and no individuals on April 22, 2002. Given the observation of larvae within the pond in 1998, this pond was used for breeding at that time. Observations at Pond A-5 detected seven adult and eleven subadult frogs along the southern and northwestern shorelines during nocturnal surveys on April 14 & 23, 1998; at least two adult frogs calling along the northern shore on April 23, 1999; and one adult and one subadult along the northwest shoreline of the pond on May 2, 2001. Again, population numbers of the CRLF in Pond A-5 are likely small. Observations at the A-Series Pond identified 2 adults along the western shores on May 5, 1998; 5 adults and subadult frogs along the southwestern and northwest corners of the pond during daytime surveys on October 7, 1998; 15 adult and subadult frogs during nighttime surveys on the same date; 2 adults along the northeast shoreline during daytime surveys on April 14, 1999; 21 adults and 35 subadults during nighttime surveys on the same date; 5 adults on the northeast corner of pond on April 23, 1999; 4 adult and 2 subadult CRLF on May 2, 2001; no frogs on June 1, 2001; 10 adults and 3 subadults on April 8, 2002; and 5 adults on April 22, 2002. Finally, observations at Pond 13 produced 8 subadults during daytime and 27 subadults and 11 adults during nighttime surveys on October 7, 1998; 14 subadult and 16 adults on April 12, 1999; 1 subadult and 1 adult on April 23, 1999; 5 auditory detections on November 20, 2001; 4 visual observations on April 9, 2002; and an average of 35 visual observations on April 23, 2002. The only remaining pond onsite, Pond 18, was repeatedly surveyed from 2001 to 2002. However, CRLF were never identified in or proximate to this surface runoff pond.

Focused surveys in spring 2003 and 2004 did not document any egg masses, larvae, subadult, or adult CRLF. Habitat conditions appeared to be consistent with past surveys; however, water levels varied in many of the ponds. In 2003, water levels in all the ponds were significantly lower than 2002 conditions due to pumping of water for cap construction. Water levels were not fully replenished by below-normal seasonal precipitation. In 2004, the RCF Pond, A-Series Pond, and Pond 18 were higher than expected. Water levels in Pond A-5 and Pond 13 appeared to be as low as the previous year.

Total dissolved solids (TDS) concentrations and salinity levels in parts per thousand (ppt) significantly increased during the 2003-2004 interval. On April 12, 2004, salinity levels within the

five ponds ranged from 14 to 25 ppt. Increasing salinity in the ponds may be a limiting factor on CRLF species presence and population densities.

However, during the 2004-2005 drift fence / pitfall trap surveys, six CRLF were captured in pitfall traps. All captures were clustered between January 1 and 12, 2005. Of these six captures, one was a recent metamorph (approximately less than 5 months old), three were subadults (approximately 18 months old), one was a small adult male, and the last was a large adult male. These individuals were measured (SVL), sexed, and released into ground squirrel burrows as close as possible to the capture point. The six captures in pitfall traps occurred at the following locations: (1) northwest side of A-Series Pond, (2) two captures along the northeast corner of Pond 13, (3) south side of RCF pond, (4) southwest side of RCF pond, and (5) southeast side of A-Series Pond.

The data presented above are provided in graphical format on Figure P-11.

3.2.1.3 Western Spadefoot Toad

Prior to the formal surveys that followed protocols articulated in the BSHS Work Plan, four or five western spadefoot toads were identified along the northwestern shoreline of the RCF Pond during nocturnal surveys on April 12, 1999. Since that time, the western spadefoot toad has not been observed onsite. This species is listed by CDFG as a "species of special concern."

Adult western spadefoot toads require ponded water to breed and rodent burrows within 1,500 feet of the water source to bury themselves. While suitable habitat for the toad is found onsite, this species has not been observed since 1999. Given the extent of surveys conducted onsite, and the overlapping breeding season with CTS and CRLF, and especially with the drift net surveys, it would seem likely that the species would have been observed/captured if it did still occur onsite. However, we do recognize the possibility to re-colonize portions of the site.

3.2.2 Non-Special Status Species

Three other common, non-special status amphibian species were observed onsite during the surveys. These species included the western toad (*Bufo boreas*), Pacific chorus frog (*Pseudacris regilla*), and ensatina (*Ensatina eschscholtzii*). Table P-7 provides specific Site observations for both species, and Attachment P-3 includes data sheets and tables from past BSHS interim reports. Generally, western toads were observed in Pond 18, RCF Pond, and the A-Series Pond during the May 2001 surveys. They were again captured as part of the 2004-2005 drift fence / pitfall trap survey proximate to the A-Series Pond, RCF Pond, and Pond 13. Pacific chorus frogs were observed in May and November 2001, April 2002, and April 2004 in all ponds onsite (the RCF Pond, Pond 13, Pond 18, the A-Series Pond, and Pond A-5). In addition, Pacific chorus frogs were captured as part of the 2004-2005 drift fence / pitfall trap survey proximate to the A-Series Pond, Pond 13, and RCF Pond. Finally, the 2004-2005 drift fence surveys captured six ensatina proximate to Pond 13, A-Series Pond, and the RCF Pond.

3.3 Reptiles

3.3.1 Special Status Species

Two of the four reptiles identified as potentially occurring onsite were identified onsite during the surveys: the coastal horned lizard and the two-striped garter snake.

3.3.1.1 Southwestern Pond Turtle

Southwestern pond turtles were not observed onsite during any of the surveys. This species is listed by the CDFG as a “species of special concern.”

A juvenile (3-inch carapace length) was observed in Shuman Canyon Creek on April 27, 2000 approximately 300 feet downstream of its confluence with Casmalia Creek. However, no turtles have been found onsite during the many routine surveys. Although the ponds appear to provide suitable aquatic habitat for turtles, the turtles would have to disperse to the Site via Casmalia Creek, which does not provide suitable habitat due to the high longitudinal gradient, absence of deep pools, and lack of understory vegetation with vertical and horizontal complexity.

3.3.1.2 Coastal Horned Lizard

Coastal horned lizards are listed by the State of California as a “species of special concern.” This species was observed in four locations onsite during surveys conducted in spring 2001. One adult lizard was observed in April 2001 in the disturbed grassland/coastal sage scrub in the steep ravine west of the PCB Landfill. One adult was observed in disturbed grasslands on the northeast corner of the Caustics/Cyanide Landfill cap in April 2001. Surveys conducted in July 2001 documented two adults and two subadults in the grasslands adjacent to the Caustics/Cyanide Landfill. Numerous rodent burrows found throughout the landfill caps may provide refuge for the coastal horned lizards.

Subsequent reptile surveys in fall 2001 and spring 2002 focused only on areas proximate to the ponds in southern portion of the Site. Therefore, it is expected that these surveys did not detect any coastal horned lizards onsite.

3.3.1.3 Coast Patch-Nosed Snake

The coast patch-nosed snake was not observed onsite during any of the surveys conducted in spring 2001. This species is listed by the CDFG as a “species of special concern.”

Again, subsequent reptile survey transects in fall 2001 and spring 2002 focused only on areas proximate to ponds in southern portion of the Site. Therefore, it was unlikely that these surveys would have documented any coast patch-nosed snakes onsite.

3.3.1.4 Two-Striped Garter Snake

Two-striped garter snakes are listed as a “species of special concern” by the State of California. Two two-striped garter snakes were observed onsite during the spring 2001 surveys, and one snake was observed in March 2002. Snakes identified in 2001 were found in ruderal/grassland habitats in the relatively flat ground between the RCF Pond and the landfill caps. This area includes the catchment basins at the terminus of the V-ditches that drain the Pesticides/Solvents and Metals Landfills. The one subadult identified in 2002 was found in Pond A-5. The two-striped garter snake typically inhabits pond margins and riparian corridors but is also found in grassland and scrub habitats in the vicinity of water. Consequently, two-striped garter snakes probably tend to stay in the low-lying areas at the toe of the landfills, but could forage on the slopes of the landfill caps. Finally, limited data indicate that this species utilizes small mammal burrows as overwintering sites (Rathbun et al., 1993).

3.3.2 Non-Special Status Species

Reptile surveys throughout the Site also identified two additional lizard species, one skink species, and seven snake species. A summary of field observations is provided in Table P-7. Generally, the two lizard species (western fence lizard [*Sceloporus occidentalis*] and southern alligator lizard [*Elgaria multicarinata*]) are presumed to be ubiquitous throughout the Site. The western skink (*Eumeces skiltonianus*) was observed offsite along the riparian corridor on the eastern banks of Casmalia Creek. Finally, seven non-special status snake species were identified throughout the Site in both upland and aquatic habitats. Attachment P-3 includes past reptile survey data sheets and tables from previous BSHS interim reports.

3.4 Birds

Summary data for all bird-focused point-count surveys are presented in Table P-8. This table summarizes the occurrence of all special status bird species as well as observations of five state “watch list” species not identified in Table P-1. Attachment P-4 includes past bird data sheets and tables from previous BSHS interim reports.

3.4.1 Special Status Species

3.4.1.1 American Peregrine Falcon

American peregrine falcons were not observed onsite during any of the surveys. While areas on or immediately adjacent to the Site do not provide suitable nesting habitat, the Site does provide suitable foraging habitat. The CNDDDB does not include any records of observations for this species in the near vicinity of the Site. Peregrine falcons are a delisted federally “endangered” species, but are still listed by the State of California as a “candidate for delisting” and a fully protected species.

3.4.1.2 Western Burrowing Owl

Western burrowing owls were not observed onsite during any of the surveys. In addition, the CNDDDB does not include any records of observations of this species in the near vicinity of the Site. While the Site may provide suitable habitat for the owl due to burrows throughout the landfill caps, it is unlikely that this species utilizes the Site for foraging, nesting, resting, or other activities. Western burrowing owls are listed by the State of California as a “species of special concern.”

3.4.1.3 Western Snowy Plover

Western snowy plovers were not observed onsite during any of the surveys. The pacific coast population of the western snowy plover breeds and forages primarily in tidally influenced coastal waters. Therefore, it is unlikely that the western snowy plover would be identified on or proximate to the Site. The western snowy plover is a “threatened” species as listed by the federal government and a “species of special concern” by the State of California.

3.4.1.4 Cooper’s Hawk

The Cooper's hawk was observed during point-count surveys at Point 3 on November 21, 2001 and at Point 4 on November 30, 2001 and September 24, 2002. Generally, the Cooper's hawk was observed foraging in broken woodland and habitat edges. It is anticipated that the Cooper's hawk commonly uses the Site for foraging. Local nesting sites for the Cooper's hawk are unknown. The Cooper's hawk is listed as a federal "sensitive species" (formally called Federal Category 2 Species) and by the State of California as a "watch list" species.

3.4.1.5 White-Tailed Kite

White-tailed kites were not observed onsite during surveys. This species is listed by the CDFG as a "full protected" species. While the Site may provide suitable foraging habitat for the white-tailed kite, it is unlikely that this species occurs onsite or utilizes the Site regularly.

3.4.1.6 Golden Eagle

Two golden eagles were observed foraging over the landfill caps and grasslands immediately north of the Site boundary in April and May 2001. A golden eagle was again observed during CRLF and/or CTS surveys during the spring of 2003. Two golden eagles were observed foraging east of Casmalia Creek on November 3, 2004, and a single golden eagle was observed foraging in the same area on November 9, 2004. An incidental observation of a golden eagle was also made West of Pond 13 on November 9, 2004.

One or more eagles likely include the Site in their home range from roosts and/or nest sites elsewhere in the Casmalia Hills, the north slope of the Santa Ynez Mountains, or the San Rafael Mountains. The golden eagle is listed by CDFG as a "fully protected" species. In addition, it is protected under the federal Bald Eagle and Golden Eagle Protection Act (1962). It can be assumed that golden eagles infrequently/irregularly utilize the Site for foraging given the range of their territories and the frequency of observations.

3.4.1.7 Loggerhead Shrike

Loggerhead shrikes are listed by the State of California as a "species of special concern." Two adult loggerhead shrikes were repeatedly observed perched on power lines and shrubs in the area between the RCF Pond and Pond 13 on July 5, 2001. Loggerhead shrikes were again observed during the point-count surveys at both Points 3 and 4 on November 30, 2001 and again during CRLF and/or CTS surveys in the spring of 2003.

Two loggerhead shrikes were observed near point 9 on November 3, 2004, and a single shrike was observed at point 10 on November 5, 2004; points A, 4, and 12 on November 9, 2004; and at point 9 on November 10, 2004.

It is likely that loggerhead shrikes nest (or nested in 2001) on or in the immediate vicinity of the Site. The landfill caps, surface runoff ponds, and adjacent scrub and grassland provide suitable foraging and nesting habitat for shrikes.

3.4.1.8 Least Bell's Vireo

The least Bell's vireo was not observed during surveys on or proximate to the Site. Although Casmalia Creek is vegetated with willow woodland, intense cattle grazing has destroyed much of the horizontal and vertical structure to the understory vegetation and has eliminated adjacent

riparian scrub habitat required for nesting by this species. The least Bell's vireo is listed as "endangered" by both the federal government and the State of California.

3.4.1.9 Southwestern Willow Flycatcher

The southwestern willow flycatcher was not observed during surveys on or proximate to the Site. Like the least Bell's vireo, it is unlikely that this species will occur onsite due to intense, long-term grazing that has diminished the vegetative structural complexity of the Casmalia Creek riparian willow woodland as well as adjacent riparian scrub habitat. The southwestern willow flycatcher is listed as "endangered" by both the federal government and the State of California.

3.4.1.10 Sharp-Shinned Hawk

Several suspected observations and one confirmed incidental observation of a single sharp-shinned hawk were made on November 8 and 9, 2004. Sharp-shinned hawk is a State of California "watch list" species.

Like the Cooper's hawk, this species commonly hunts at the edges of woodlands, hedgerows, brushy pastures, and shorelines, especially where migrating birds are found. However, it usually nests in dense pole and small-tree stands of conifers, which are cool, moist, well shaded; with little ground cover; and near water. While the Site may provide suitable foraging habitat for the sharp-shinned hawk, it is unlikely that this species nests in areas on or proximate to the Site.

3.4.1.11 Yellow-Breasted Chat

The yellow-breasted chat was not observed during surveys on or proximate to the Site. This species has been in decline throughout California as a direct result of the loss of riparian woodlands. It is unlikely that this species occurs onsite or within the Casmalia Creek riparian corridor due to long-term intense grazing that has reduced the horizontal and vertical structural complexity of the remaining vegetative community(ies). The yellow-breasted chat is listed by the CDFG as a "species of special concern."

3.4.1.12 Yellow Warbler

The yellow warbler was not observed during surveys on or proximate to the Site. Like the yellow-breasted chat, this species has been in decline throughout California as a direct result of the loss of riparian woodlands. It is unlikely that this species occurs onsite or within the Casmalia Creek riparian corridor due to long-term intense grazing that has reduced the horizontal and vertical structural complexity of the remaining vegetative community(ies). The yellow warbler is listed by the CDFG as a "species of special concern."

3.4.1.13 Black-Capped Chickadee

The black-capped chickadee was observed during point-count surveys at Point 4 on March 15, 2002. Generally, this species is found in northern California montane riparian habitat. It is rarely observed outside Del Norte, Humboldt, and Siskiyou Counties. However, it is believed to occasionally wander during winter months. Therefore, assuming that the identification of this species onsite was correct, the recurrence of this species onsite is unlikely. This species is listed by the State of California as a "watch list" species.

3.4.1.14 Merlin

A single merlin, listed by the State of California as a “watch list” species, was observed during point-count surveys at Point 4 on September 24, 2002. The merlin does not breed in California, but occurs as a transient throughout most of California. The observed merlin was likely a transient that infrequently/irregularly utilizes the Site for foraging. Generally, it is observed in open habitats near water and tree stands, where it preys primarily on smaller birds.

3.4.1.15 Osprey

One osprey, listed by the State of California as a “watch list” species, was observed flying low over the RCF Pond on April 24, 2001. Ospreys may occasionally visit the Site; however, the absence of fish in and perch sites adjacent to on-site water bodies precludes use of the Site as favorable foraging or roosting habitat.

3.4.1.16 Northern Harrier

Northern harriers were commonly observed during both the spring and fall point-count surveys. They were observed at Point 3 on November 21, 2001 and September 24, 2002; at Point 7 on November 30, 2001; and at Point 9 on March 15, 2002. Potential nesting habitat proximate to ponds can be found within the Site. While nesting sites are unknown, this species appears to frequently use the Site for foraging. The Northern harrier is listed by the State of California as a “species of special concern.”

3.4.1.17 California Horned Lark

Several California horned larks were observed feeding in the grassland adjacent to Casmalia Creek, approximately 0.25 mile from the Site, on April 27, 2000. This species was again observed during CRLF and/or CTS surveys in the spring of 2003. Although not observed during any of the point-count surveys, California horned larks likely use the landfill caps and adjacent weedy grassland areas as foraging habitat. The California horned lark is a California “watch list” species.

3.4.1.18 Long-Billed Curlew

A flock of approximately 35 long-billed curlew was observed foraging in the grassland east of Casmalia Creek, approximately 0.25 mile southwest of the Site, on April 27, 2000. This species was again observed during CRLF and/or CTS surveys in the spring of 2003. On November 9, 2004, approximately 50 long-billed curlew were observed west of Casmalia Creek. The species potentially uses areas proximate to the Site for nesting and likely uses the landfill caps as foraging habitat. The long-billed curlew is a California “watch list” species.

3.4.2 Non-Special Status Species

Three species observed onsite were identified as watch list species on either the United States Bird Conservation Watch or by the Audubon Society. These species are the oak titmouse (*Baeolophus inornatus*), Nuttall’s woodpecker (*Picoides nuttallii*), and Allen’s hummingbird (*Selasphorus sasin*). The oak titmouse was observed frequently throughout the Site at Points 4, A, 5, 7, 8 and 9. The oak titmouse nests in natural cavities and sometimes in old woodpecker

holes. The bird requires an elevated perch from which to forage, and changes its feeding strategy to correspond with the seasons. Nuttall's woodpeckers were also found throughout the Site during both spring and fall point-count surveys. Numerous sightings were observed at almost all established stations including Points 1, 2, 3, 4, E, 5, 6, 7, 8, and 9. This species might be directly tied to suitable habitat of the oak titmouse. Finally, Allen's hummingbird was identified at Points A, E, 5, and 6 during many of the spring 2001 surveys. This species generally inhabits mixed evergreens, riparian woodlands, eucalyptus and cypress groves, oak woodlands, and coastal scrub areas in breeding season. Males maintain territories that overlook open coastal scrub or riparian shrubs, where they perch in conspicuous places. Females choose nest sites in areas where there is more tree cover. They locate the nest in shrubs and trees with dense vegetation (such as vines and thickets) anywhere from 0.5 to 15 meters off the ground.

The 2001 – 2003 surveys identified 105 different species of birds on or proximate to the Site. Data collected from all BSHS bird surveys are presented in Table P-8. The 2004 surveys observed, not including vocalization, 46 species. The results of the 2004 Casmalia Landfill Migratory Bird Survey are included in a Table P-8.

The most common species observed in 2004 were white-crowned sparrow (*Zonotrichia leucophrys*) (143 individuals) and house finch (*Carpodacus mexicanus*) (128 individuals). Six species were observed only once, including ash-throated flycatcher (*Myiarchus cinerascens*), ferruginous hawk (*Buteo regalis*), marsh wren (*Cistothorus palustris*), scrub jay (*Aphelocoma californica*), sharp-shinned hawk, and Wilson's warbler (*Wilsonia pusilla*). Morning surveys produced an average of 4.1 observations per hour. Summary data for 2004 include the following: the average mean diversity is 6.08 species per survey; the highest mean diversity (11 species) was reported at Point 4 at 15:20 on November 9, 2004; and the lowest mean diversity (1 species) was observed at Point A at 16:02 on November 4, 2004 and again at Point 11 at 14:50 on November 8, 2004.

3.5 Mammals

Summary data for all mammal surveys are offered as Table P-9. Generally, the fauna observed within the Site boundaries represents a depauperate subset of species normally found in grassland, coastal sage scrub, and oak savannah/oak woodland habitats surrounding the Site. Soil and vegetation disturbance over decades has created conditions that tend to favor generalist mammal species. Attachment P-5 includes mammal data sheets and tables from previous BSHS interim reports.

3.5.1 Special Status Species

3.5.1.1 American Badger

The American badger is listed by CDFG as a "species of special concern." An abandoned den of the American badger was identified in the berm above the southeastern shoreline of the A-Series Pond, along with other dens on the grassy slopes between the landfill and Casmalia Creek. Foraging digs for rodents were identified in the surveys in adjacent grassland/ruderal habitat. On April 27, 2000, an adult badger was observed in grasslands approximately 0.5 mile south of the Site. In March 2002, an adult badger was observed deceased along the road adjacent to the Pesticides/Solvent Landfill. Mortality appeared to be the result of a car strike.

Generally, badgers are expected to forage throughout the Site, including the landfill caps that support high densities of prey (e.g., California ground squirrels, pocket gophers).

3.5.1.2 Ringtail

Ringtail tracks were observed during the spring 2001 surveys along the Casmalia Creek riparian corridor southwest of the Site. This nocturnal carnivore typically constructs dens in dense, rocky scrub near water. While the Site or areas proximate to the Site do not provide suitable denning habitat for the ringtail, the species may utilize the Site and the neighboring Casmalia Creek corridor for foraging. This species is listed by CDFG as a fully protected furbearing species.

3.5.1.3 Mountain Lion

One mountain lion was detected by the presence of tracks and scat during November 2001 surveys. Historically, this species has commonly been observed by landfill staff onsite or in neighboring habitats. Generally, mountain lions are thought to utilize the Site for foraging for wild pigs, deer, and other smaller mammals. They are listed by the CDFG as a fully protected furbearing species.

3.5.1.4 Greater Western Mastiff Bat

The greater western mastiff bat is listed by CDFG as a “species of special concern.” The bat species was not observed during the surveys. Greater mastiff bats appear to favor rugged, rocky areas, where suitable crevices are available for day roosts. The crevices must open downward, be at least 5 centimeters (cm) wide and 30 cm deep, and narrow to at least 2.5 cm at the upper end (Vaughan, 1959). The crevices typically open high on a cliff and are at least 2 meters above the substrate (Krutzschnig, 1955; Vaughan, 1959). Greater mastiff bats have great difficulty taking flight and must drop at least 2 to 3 meters for launching. Greater mastiff bats also frequently roost in buildings, provided these have sheltering spaces with conditions similar to those described above. It is assumed that the Site does not provide suitable roosting habitat.

3.5.1.5 Spotted Bat

The spotted bat was not observed onsite during any of the surveys. Generally, the spotted bat is believed to roost in small cracks found in cliffs and stony outcrops. However, they forage in open habitat due to their low frequency of echolocation. Due to absence of suitable roosting habitat, it is assumed that this bat does not utilize the Site for roosting or foraging. The spotted bat is listed by the CDFG as a “species of special concern.”

3.5.1.6 Townsend’s Big-Eared Bat

No Townsend’s big-eared bats were detected during the surveys. This species is very difficult to detect acoustically and is not often caught in mist nets. There appears to be no roosting habitat for Townsend’s big-eared bat onsite, but there is suitable foraging habitat. This species is known to be common in the coastal region of central California and could potentially use the Site for foraging. The Townsend’s big-eared bat is listed by the CDFG as a “species of special concern.”

3.5.1.7 Pallid Bat

Pallid bats were detected during the 2004 surveys at six of the nine sites. Two of the sites were offsite in the North Drainage and along Casmalia Creek. Both of these stations offsite are in areas that provide natural foraging habitat; the North Drainage provides roosting habitat in the dead trees in the eucalyptus grove. Several call sequences were recorded very early in the night around the time of emergence. All of these sites appear to be foraging areas for pallid bats, and all call sequences were detected well after emergence. The pallid bat is listed by the CDFG as a “species of special concern.”

3.5.1.8 Western Red Bat

Western red bat call sequences were detected at Pond A-5 during the 2004 surveys. These bats are easily detected with acoustic monitoring, and the low number of calls and few sites with detections suggest that western red bats are not abundant in the area. Western red bats are not known to reproduce along the California coast but are detected in higher numbers during fall and spring migrations. The western red bat is listed by the CDFG as a “species of special concern.”

3.5.2 Non-Special Status Species

Eighteen species of non-special status mammals, not including bats, were observed on and adjacent to the Site during the surveys. As noted, data collected from the surveys are summarized in Table P-9. Five non-special status species of bats were also observed roosting and/or foraging on and adjacent to the Site. In addition, a survey report on the 2004 bat surveys is included in Attachment P-5.

4. DISCUSSION

This discussion of the results from surveys completed during the interval between 2001 and 2004 on the Casmalia Landfill Site has been organized only to address federal, state, and/or locally listed special status species observed on the Site. In addition, a summary table (Table P-10) has been included that synthesizes these results and subsequent discussions.

4.1 *Plants*

As of the fall of 2004, surveys have not identified any of the initially identified eleven special status plant species as occurring within Site boundaries. However, the black-flowered figwort was identified north of the Site in the eucalyptus grove, and Coulter's goldfields was documented throughout the northern portion of the Site in 2001. Coulter's goldfields, which was identified onsite, was not initially identified as a potential species of concern occurring on or proximate to the Site. As discussed below, Coulter's goldfields likely became established onsite due to revegetation efforts following construction of the Pesticides/Solvents Landfill cap.

4.1.1 Black-Flowered Figwort

While the black-flowered figwort was not identified onsite, it was documented during a casual vegetation survey in spring 2001 within the eucalyptus grove to the north of the Site. This species is endemic to northern Santa Barbara County and is commonly found on clay soils that are prevalent within the region. It is unknown whether this species still persists in the eucalyptus grove because surveys have not been conducted in this region since 2001. Given the widespread soil and vegetation disturbance that has occurred over decades, it is unlikely that species occurs or has the potential to successfully establish within Site boundaries.

4.1.2 Coulter's Goldfields

Coulter's goldfields was identified widely across the northern portion of the Site in spring 2001. Although found on alkaline soils at widely scattered localities throughout southern California, including a location on the San Antonio Terrace on the Vandenberg Air Force Base, approximately 4 to 6 miles southwest of the Site, its occurrence onsite was not expected and is believed to be attributable to anthropogenic sources (Hunt & Associates, 2001). Its occurrence can evidently be traced to the revegetation effort that followed construction of the Pesticides/Solvents Landfill cap. Coulter's goldfields was included in the seed mix used to revegetate this landfill cap in 1997 and 1998. S&S Seeds in Carpinteria, California collected the seed from a naturally occurring population in Hemet, San Jacinto Valley, Riverside County (Hunt & Associates, 2000).

Coulter's goldfields was again identified during spring 2002 surveys in the northeast corner of the PCB Landfill and also near a water utility in the flats north of the RCF Pond. While its distribution was identified to be more limited than in spring 2001, the species is still assumed to be extant onsite.

4.2 *Amphibians*

Three amphibian species of federal and/or state concern have been documented as occurring onsite: the California tiger salamander, the California red-legged frog, and the western

spadefoot toad. CTS were documented in 2005 in pitfall traps associated with a drift fence / pitfall trap survey. CRLF were documented repeatedly in 2001 and 2002 within the stormwater ponds and offsite in Casmalia Creek, and then again in January 2005 in pitfall traps associated with the drift fence survey.

The western spadefoot toad was observed in 1999 prior to surveys within and proximate to the RCF Pond, but this species not been observed onsite since that time.

4.2.1 California Tiger Salamander

The first records of CTS on the property were during the 2004-2005 drift fence / pitfall trap survey. Three individuals, widely spaced throughout the survey interval (one capture each month during December, January, and February 2005) were captured in pitfall traps. Only adult male CTS were captured; all captures occurred on the pond side of the fence, possibly indicating movement away from the ponds, and all of the captures occurred along the western and northwestern side of the A-Series Pond. The drift fence and pitfall trap array in this area were placed along the eastern side of the existing dirt road at a distance of approximately 50 feet west of and 30 feet above the shoreline of this pond.

CTS observations occurred after a series of significant rainfall events. Rainfall was recorded on 18 separate days or nights between October 17, 2004, the date of the first rainfall of the season, and December 28, 2004, when the first amphibian was captured in the pitfall traps. CTS were not captured until December 31, 2004. The storms in October 2004 did not result in amphibian movement above ground. An approximate 2-month hiatus in rainfall ensued before a series of powerful storms occurring over a few days dropped significant amounts of precipitation on the Site. The second of these storms, on December 30 and 31, 2004, resulted in the first of three CTS captures on the landfill Site. CTS capture records were widely spaced (one capture each month during December, January, and February 2005).

Despite the capture of CTS and CRLF onsite using drift fence / pitfall trap arrays, there is only inferential evidence that these species were attempting to breed in one or more of the surface runoff ponds. The surface runoff ponds onsite, although being permanent pond sources of water, probably do not represent reliable breeding or larval development habitat for CTS or CRLF. Salinity and TDS concentrations increase rapidly as a result of evaporation beginning in the spring and peaking in fall prior to the onset of winter rains. For example, TDS concentrations measured at the surface of the ponds in late September 2004 prior to the onset of the 2004/2005 rainy season and following 2 years of below-normal annual precipitation, were two to four times higher than similar measurements taken in late April 2005. Surface versus mid-point depth TDS levels are highly stratified in the spring, with relatively low TDS water lying above a denser, higher TDS layer. By fall, this stratification disappears, and the water column has relatively high TDS levels throughout. Seasonally fluctuating TDS levels are correlated with seasonal variation in pond depth (see Casmalia Steering Committee Bi-annual Groundwater Summary Reports). TDS concentrations in the relatively shallow water along the shoreline of these ponds, where amphibians are likely to lay eggs and where larval development is likely to occur, are probably relatively low due to freshwater inputs and exhibit similar seasonal fluctuations. It is expected that these ponds will continue to exhibit dramatic seasonal fluctuations in TDS, although the magnitude of variation in 2005-2006 may be dampened relative to previous years because water levels in the ponds are high as a result of significantly above-normal rainfall this year.

From year to year, these ponds may not provide stable breeding habitat for CTS and CRLF. However, one or more consecutive years of above-normal precipitation could improve water quality enough to support breeding and larval development, at least for CTS. The larval development periods for CTS are around 70 to 75 days post-hatching, while CRLF larvae require 120 to 150 days post-hatching to metamorphose. This means that CTS larvae could metamorphose by early June at the latest, before water quality declines, while CRLF larvae may not metamorphose until mid- to late August, during which water quality may become lethal.

The closest known CTS breeding locations are GUAD-4 and GUAD-1, situated approximately 13,000 feet and 12,000 feet northeast, respectively, from the on-site capture locations along the western and northwestern sides of the A-Series Pond (County of Santa Barbara Planning and Development Department CTS Distribution Map Locations). These distances exceed the known dispersal distances reported to date for CTS between breeding ponds or between breeding ponds and upland habitat (up to 6,500 feet). CTS are capable of long-distance overland movements, but whether the male CTS captured at the Casmalia Landfill Site came from populations around these distant breeding locations is unknown. More likely, there are other, as yet unknown, breeding sites situated between these locations in the form of natural or man-made pools. It is highly unlikely that CTS breed in Casmalia Creek. Examination of aerial photographs of the lands surrounding the Casmalia Site, taken in 2000 and 2004, did not reveal any obvious off-site breeding sites for CTS.

A reconnaissance-level survey of surrounding lands was conducted on April 18, 2005. Two man-made ponds containing large numbers of CRLF larvae, as well as Pacific tree frog larvae, were found on top of a hill approximately 1,100 feet south of the A-Series Pond. These ponds were located in two deep excavations presumably made to create seasonal water sources for livestock. The ponds measured approximately 100 to 200 feet long by 15 to 20 feet wide and were at least 3 feet deep at the time of the survey. They appear to have a sufficiently long hydroperiod (at least 120 days) to support successful development and metamorphosis of CRLF larvae. These scrape ponds are visible in aerial photographs taken in 2000. The top of the hill is 200 feet higher than the Casmalia Creek floodplain to the west, is vegetated only with non-native annual grassland, and offers nothing that would distinguish it from the surrounding grassland and other hills. CTS exhibit impressive powers of dispersal across upland habitats, and these man-made off-site ponds also provide suitable larval development habitat for CTS.

4.2.2 California Red-Legged Frog

The CRLF is listed as "threatened" by the USFWS, and as a "species of special concern in California" by the CDFG. Surveys conducted between 1998 and 2002 identified the CRLF as occurring onsite in ponds and off site in the Casmalia Creek riparian corridor. Specifically, the CRLF was identified onsite in or proximate to the RCF Pond, Pond A-5, the A-Series Pond, and Pond 13. However, surveys conducted in the spring of 2003 and 2004 did not identify any CRLF within any of the ponds. A letter report dated April 30, 2004, which presents the 2004 survey results conducted by Lawrence Hunt, notes high salinity levels in all five ponds. Salinity levels ranged from 14.0 to 25.0 ppt. A sensitivity of the CRLF to high salinity levels has been previously documented. Research has shown 100 percent mortality of eggs exposed to salinity levels of 4.5 ppt (Jennings and Hayes, 1990) and high mortality rates of larvae when exposed to salinity levels higher than 7.0 ppt. (Jennings, 1993 *in litt.* as cited in Miller et. al., 1996). Drift fence / pitfall trap surveys conducted during 2004-2005 captured six CRLF, with the captures clustered between January 1 and 12, 2005 (Table P-6).

Nighttime surveys to detect eye shine of CRLF have been conducted around each of the ponds using kayaks each spring during the interval of 1998 to 2004 (with exception of 2000), when this species was first detected onsite. CRLF observations around these ponds have been declining dramatically since 115 individuals were found here in 1999, presumably because of deteriorating water quality. The capture of CRLF in the pitfall traps during the 2004-2005 survey was the first record of CRLF on the Site since 2003. California red-legged frogs did not appear in the traps until after several soaking rainfall events, and the capture interval was narrow, occurring only between January 1 and 12, 2005 (Table P-6). Red-legged frog captures were evenly spaced between the A-Series Pond, RCF Pond, and Pond 13 (two captures each). Interestingly, two metamorph CRLF were captured including one individual that metamorphosed just the preceding summer (less than 4 to 5 months prior to capture). Most of the initial captures (four of six) were on the land sides of drift fences, indicating movement towards the ponds in early January, and all of the adult frogs captured were males (Table P-6) (also see discussion of potential breeding locations in following section).

It is highly unlikely that CRLF bred and successfully reached metamorphosis in the ponds during spring and summer 2003 or 2004, as discussed above, because of high TDS levels. However, the recent (2003 and 2004) metamorphs captured in the pitfall traps south of the RCF Pond and A-Series Pond demonstrated that CRLF are successfully breeding and recruiting metamorphs somewhere in the vicinity of the southern Casmalia Landfill Site and possibly elsewhere. As discussed above, a reconnaissance-level survey of surrounding lands conducted on April 18, 2005 identified two man-made ponds containing large numbers of CRLF larvae, as well as Pacific tree frog larvae. These ponds were found on top of a hill approximately 1,100 feet south of the A-Series Pond, and were located in two deep excavations presumably made to create seasonal water sources for livestock. The ponds measured approximately 100 to 200 feet long by 15 to 20 feet wide and were at least 3 feet deep at the time of the survey. They appear to have a sufficiently long hydroperiod (at least 120 days) to support successful development and metamorphosis of CRLF larvae. These scrape ponds are visible in aerial photographs taken in 2000. The top of the hill is 200 feet higher than the Casmalia Creek floodplain to the west, is vegetated only with non-native annual grassland, and offers nothing that would distinguish it from the surrounding grassland and other hills. The fact that CRLF found these ponds and bred there demonstrates the extraordinary ability of this species to move long distances through the landscape to colonize new breeding locations. These ponds, together with Casmalia Creek, may be the source of the metamorph CRLF captured in the pitfall traps onsite.

4.2.3 Western Spadefoot Toad

Four to five western spadefoot toads were identified in the northwest west end of the RCF Pond in April 1999. The species has not been identified onsite since that time. Suitable habitat, consisting of ponded water in which to breed and rodent burrows within 1,500 feet of the water source in which to bury themselves, does exist onsite. However, the species was not observed during any of the surveys between 2001 and 2005.

4.3 Reptiles

Surveys conducted on and proximate to the Site identified a diversity of reptiles, including three lizard species, one skink species, and eight snake species. Of these identified reptiles, two are listed as "species of special concern in California" by the CDFG. These species are the coastal horned lizard and the two-striped garter snake. The coastal horned lizard was observed

throughout the disturbed grasslands in the upland (northern) portions of the Site. In contrast, the two-striped garter snake was observed in or proximate to the stormwater runoff ponds in the southern portion of the Site.

4.3.1 Coastal Horned Lizard

Surveys conducted between April and July of 2001 identified coastal horned lizards in the disturbed grassland/coastal sage scrub in the steep ravine west of the PCB Landfill and in the disturbed grasslands on the northeast corner of the Caustics/Cyanide Landfill cap.

Coastal horned lizards generally utilize a diversity of habitat types that include but are not limited to grasslands, chaparral, disturbed sites with scattered shrubs, and clearings in riparian woodlands. It is also assumed that the coastal horned lizard utilizes small mammal burrows or burrows into loose soils under surface objects during extended periods of inactivity or hibernation. Therefore, it can be assumed that the Site provides suitable habitat for the coastal horned lizard given the predominance of ruderal grassland communities and small mammal burrows that characterize the landfill caps.

Subsequent reptile surveys in fall 2001 and spring 2002 focused primarily on areas proximate to the ponds in the southern portion of the Site; therefore, it is expected that these surveys did not detect any coastal horned lizards. It is assumed that this species is still extant within Site boundaries.

4.3.2 Two-Striped Garter Snake

The two-striped garter snake is listed by the CDFG as a “special concern species in California.” Individuals were observed during both the spring 2001 and 2002 surveys in ruderal/grassland habitats in the relatively flat ground between the RCF Pond and the landfill caps to the north, the catchment basins at the terminus of the V-ditches that drain the Pesticides/Solvents and Metals Landfills, and in Pond A-5. It is assumed this species is present in the southern portion of the Site proximate to the stormwater runoff ponds. The snakes likely forage within the ponds or in low-lying areas at the tow of the landfills. In addition, it is possible that the snakes utilize small mammal burrows as overwintering sites.

It is assumed that the two-striped garter snake is extant within Site boundaries.

4.4 Birds

The surveys identified 105 different species of birds during the 2001, 2002, and 2004 point-count surveys on or proximate to the Site. Of these species, ten are species of special conservation concern listed by the state and/or federal governments. All ten species likely use the Site for foraging, and two of the ten (loggerhead shrike and northern harrier) potentially utilize the Site for nesting habitat. In addition, three non-special status species were identified as occurring on watch lists of either the United States Bird Conservation Watch or the Audubon Society. These species are the oak titmouse, Nuttall’s woodpecker, and Allen’s hummingbird.

4.4.1 Cooper’s Hawk

The Cooper’s hawk was observed onsite proximate to the A-Series Pond and offsite within the Casmalia Creek riparian corridor. The hawk was observed foraging in the fall of both 2001 and

2002. It is likely that the Cooper's hawk commonly utilizes the ruderal/grasslands on the landfill caps for foraging. However, while nesting sites are unknown, they potentially occur in nearby riparian forests with structural complexity in the tree and shrub canopies.

4.4.2 Sharp-Shinned Hawk

The Sharp-shinned hawk was observed in November 2004, likely utilizing the Site for foraging. It is likely that the Sharp-shinned hawk commonly utilizes the ruderal/grasslands on the landfill caps for foraging. However, while nesting sites are unknown, they potentially occur in nearby riparian forests with structural complexity in the tree and shrub canopies.

4.4.3 Golden Eagle

The golden eagle commonly utilizes a large territory for foraging. A pair of eagles was twice observed foraging over the landfill caps in spring 2001, again observed in the spring of 2003, and finally in the fall of 2004. It is therefore likely that this eagle pair nests farther up in the Casmalia Hills, on the north slope of the Santa Ynez Mountains, or in the San Rafael Mountains. It can be assumed that this species occasionally utilizes the Site as foraging habitat.

4.4.4 Loggerhead Shrike

The loggerhead shrike was repeatedly observed during summer and fall 2001 within the southern portion of the Site proximate to the stormwater runoff ponds. They were again observed in the spring of 2003 during CTS and/or CRLF surveys and at multiple locations throughout the Site during the fall 2004 migratory bird surveys. The Site and surrounding lands provide suitable habitat for the loggerhead shrike, which prefers open habitats with scattered shrubs, trees, posts, fences, utility lines, or other natural or anthropogenic features on which to perch. It preys primarily on large insects, but also on small birds, mammals, amphibians, reptiles, fish, carrion, and various invertebrates. It can also be assumed that the Site and adjacent woodland communities provide suitable habitat for both foraging and nesting.

4.4.5 Black-Capped Chickadee

The identification of this species, which is rarely observed out of Del Norte, Humboldt, and Siskiyou Counties in northern California, was likely an anomaly. As previously stated, the observation was likely of a wandering individual during the winter. The recurrence of this species onsite is unlikely.

4.4.6 Merlin

The observation of a single merlin during the surveys was likely the result of a transient bird temporarily using the Site for foraging. Merlins feed primarily on small birds, mammals, and insects. They forage in open habitats, commonly with water features in proximity. However, total reports of merlin observations during winter are in steep decline, and it is unlikely that this species frequently utilizes the Site for foraging.

4.4.7 Osprey

A single osprey was observed flying low over the RCF Pond in spring 2001. Because osprey feed primarily on fish, it is unlikely that this species utilizes the Site for foraging due to the

absence of fish in the stormwater runoff ponds. Therefore, the observation was likely the result of a transient bird searching for suitable foraging habitat.

4.4.8 Northern Harrier

Northern harriers were observed frequently throughout the Site during surveys conducted in 2001 and 2002. The Site provides suitable foraging habitat and, potentially, nesting habitat proximate to the stormwater ponds. However, nests were not observed during any of the surveys. It must be assumed that the Site provides suitable foraging habitat, and that potential nesting habitat is proximate to the Site.

4.4.9 California Horned Lark

California horned larks were observed only in spring 2000 in grassland areas proximate to the Site and Casmalia Creek. They were again observed onsite during CTS and/or CRLF surveys in the spring of 2003. While California horned larks were not observed during any formal BSHS surveys, it must be assumed that the Site still provides suitable foraging habitat.

4.4.10 Long-Billed Curlew

A flock of long-billed curlews was observed in grasslands between the Site and Casmalia Creek in spring 2000. The long-billed curlew is commonly found in grassland areas proximate to open water/wetland habitats. This species was again observed onsite during CTS and/or CRLF surveys in the spring of 2003 and observed in the fall of 2004 west of Casmalia Creek. It must be assumed that the Site provides suitable foraging habitat, and that potential nesting habitat is proximate to the Site.

4.5 Mammals

Surveys identified 29 mammal species, including seven bat species, on or proximate to the Site. Of these species, five were listed by the State of California or the federal government as "species of conservation concern."

4.5.1 American Badger

The American badger is assumed to utilize the Site and the Casmalia Creek riparian corridor for foraging and denning. Surveys noted individuals or signs in both 2001 and 2002. An abandoned den was observed onsite in 2001, as were several dens in the grasslands between the Site and Casmalia Creek. In addition, the 2001 surveys noted frequent foraging digs in the grassland proximate to the A-Series Pond and the areas between the Site and Casmalia Creek. The Site likely provides ample prey for the American badger. It is presumed that the badger likely utilizes the Site and adjacent grassland areas, primarily around Casmalia Creek, for both foraging and denning.

4.5.2 Ringtail

Ringtails likely den in upstream portions of the Casmalia Creek riparian corridor. While they were observed only during the 2001 surveys, they are known as a secretive and primarily nocturnal species. It is presumed that ringtails still occasionally utilize the southern portion of the Site in areas proximate to the stormwater ponds for foraging.

4.5.3 Mountain Lion

Mountain lions are believed to utilize the Site for foraging for wild pigs, deer, and other smaller mammals. Historically, landfill staff has commonly observed mountain lions foraging throughout the Site. In addition, scat and tracks were observed during a survey conducted in fall 2001. Den locations are unknown. However, mountain lions require large tracts of land for foraging. Therefore, it is assumed that this species will occasionally utilize the Site for foraging.

4.5.4 Pallid Bat

A year-round resident of California, the pallid bat is found in arid desert areas, grasslands and oak savanna, coastal forested areas, and coniferous forests of the mountain regions of California. Roost sites are typically rock outcroppings, caves, hollow trees, mines, buildings, and bridges (Hermanson and O'Shea, 1983). Pallid bats make use of similar structures for night roosting and will use more open sites, such as eaves, awnings, and open areas under bridges, for feeding roosts. The pallid bat feeds on large insects (20 to 70 millimeters long). Prey is most often caught on the ground. Jerusalem crickets, scorpions, and beetles make up most of the diet of pallid bats in central California. Pallid bats were detected foraging throughout the Site and in the North Drainage and Casmalia Creek riparian corridor during the 2004 surveys. The North Drainage and Casmalia Creek corridor likely provide suitable roosting habitat in the dead trees and within the eucalyptus grove.

4.5.5 Western Red Bat

The western red bat was detected at one location, Pond A-5, during the 2004 bat surveys. The fact that acoustic detection of these bats is fairly easy and that only a low number of calls was identified during surveying generally suggests that a small population may be utilizing the Site for foraging. Roosting sites were not located onsite.

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