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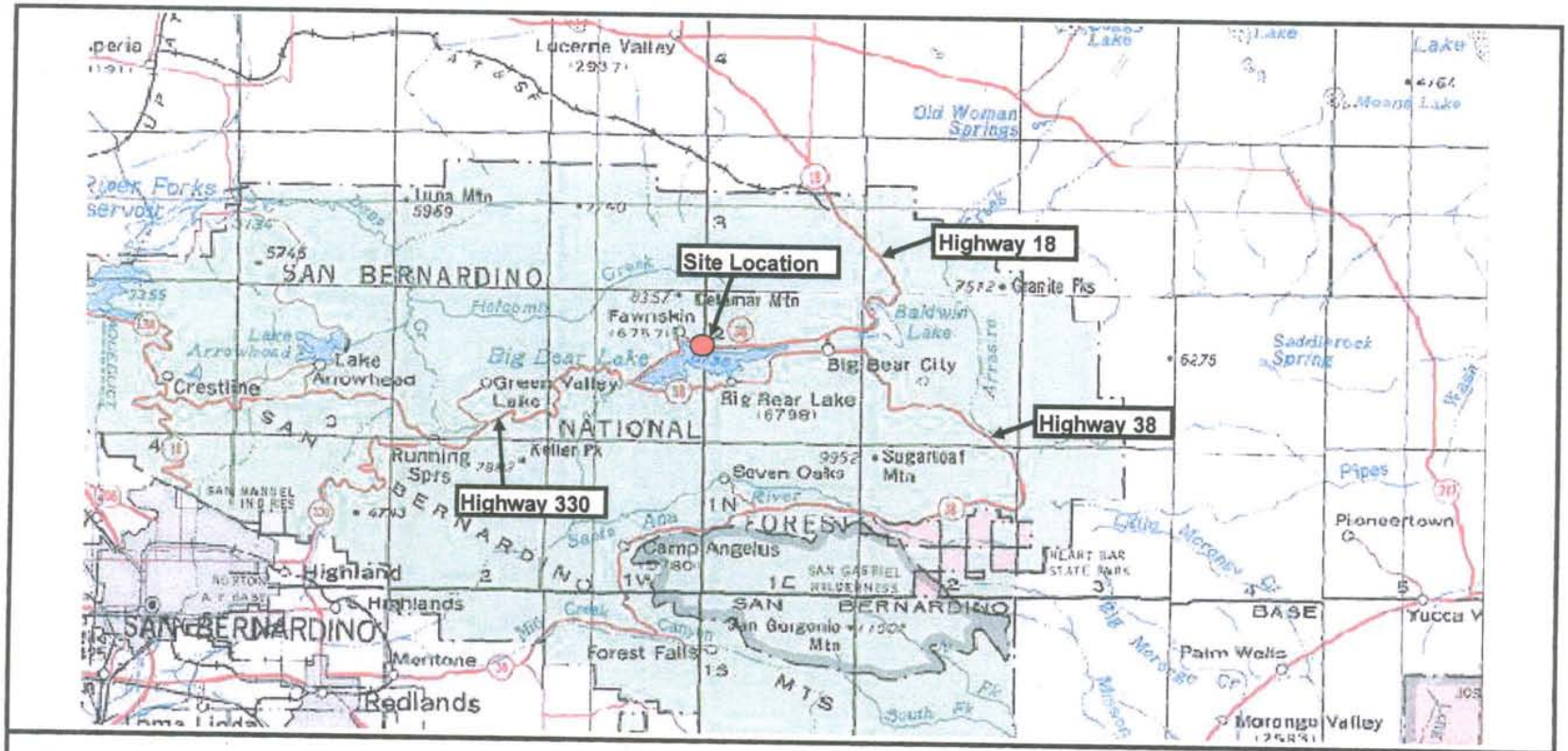
Figure 1:
Vicinity Map



Proposed Moon Camp Tenative Tract

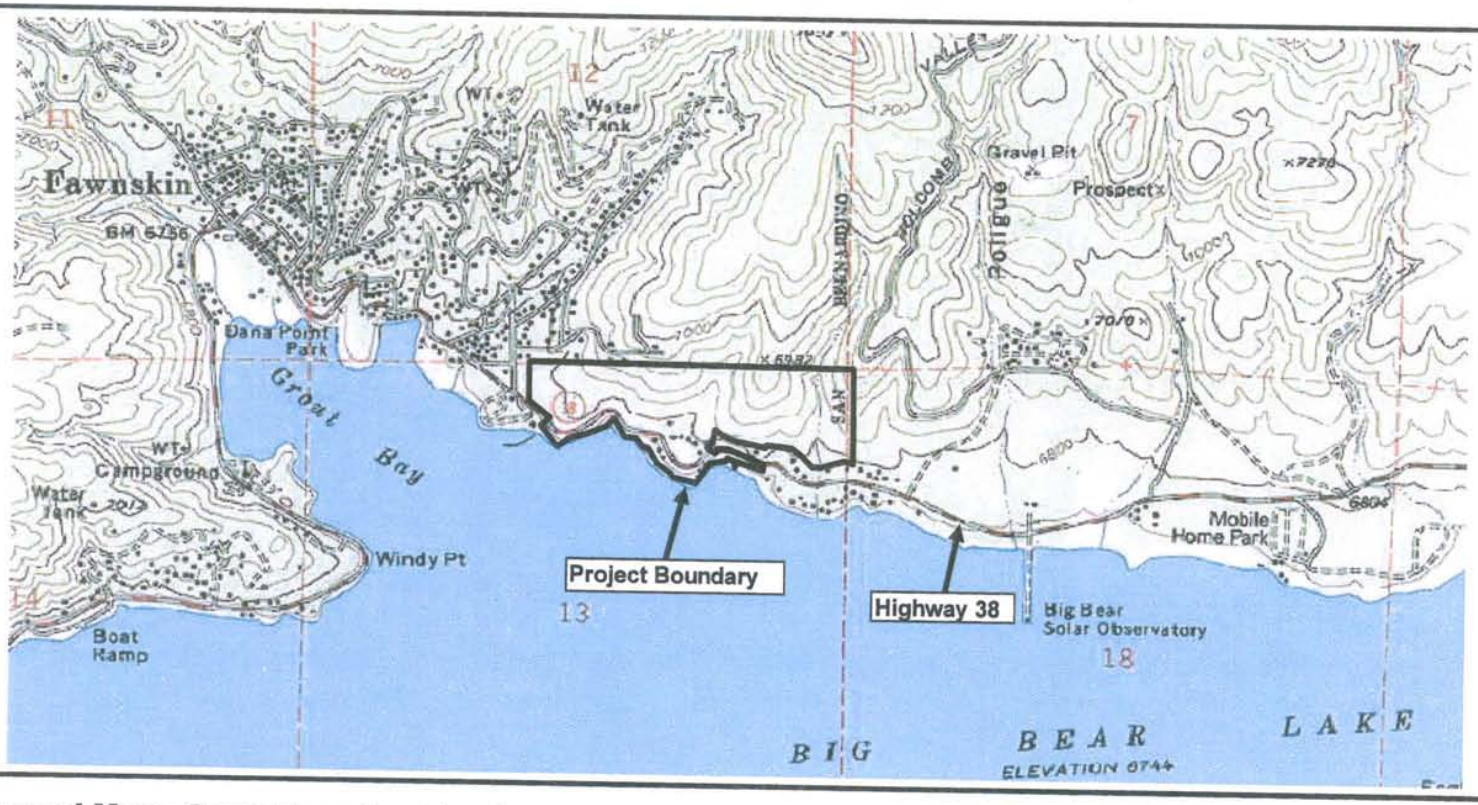
Figure 1: Vicinity Map

Scott White Biological Consulting

Map source: TOPO! 7½ minute topographic
JW: 15 Aug 2007

NORTH

Figure 2:
Project Site Map



Proposed Moon Camp Tenative Tract

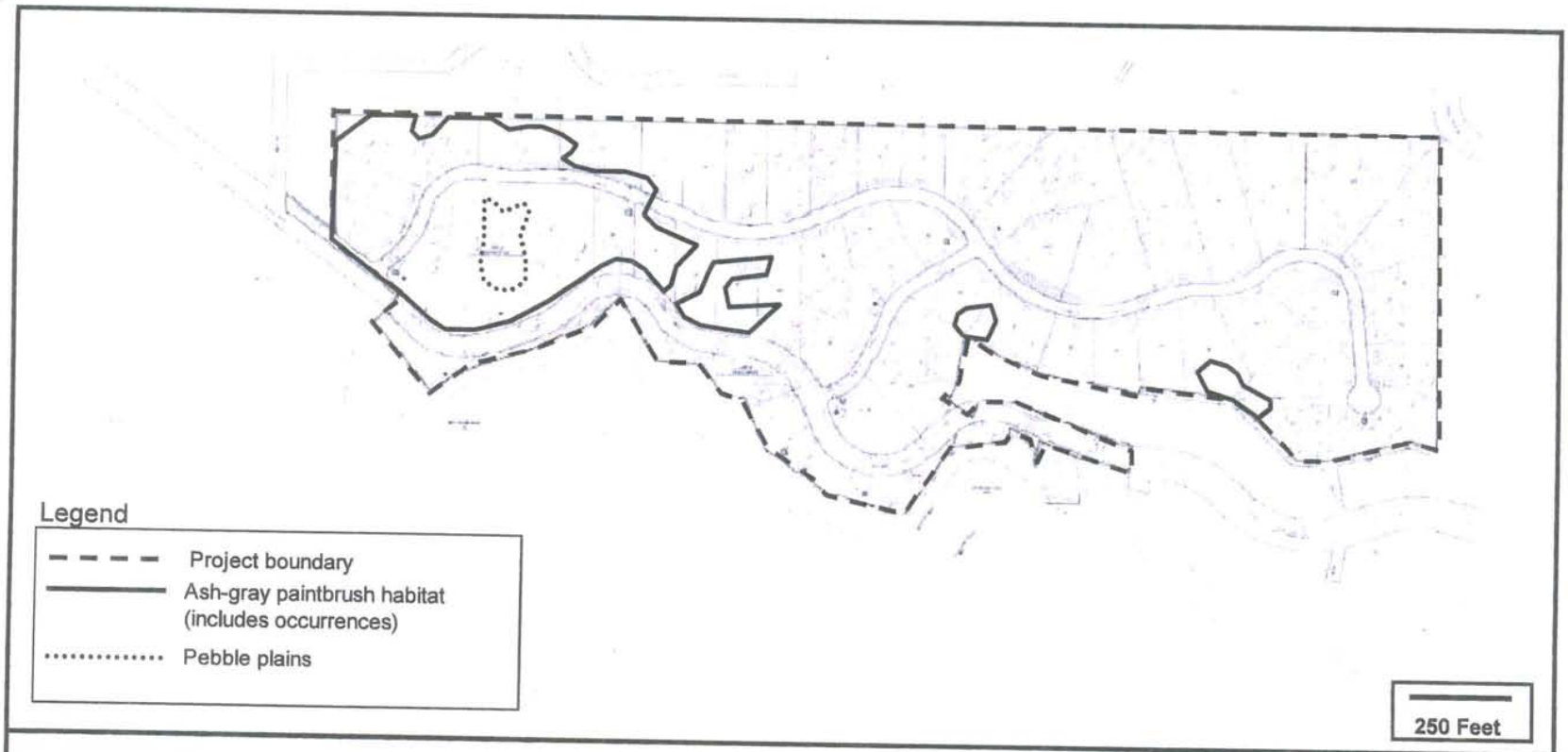
Figure 2: Site Map

Scott White Biological Consulting

Map source: TOPO! 7½ minute topographic, Fawnskin, CA
JW: 15 Aug 2007

NORTH

Figure 3:
Rare Plant Habitat



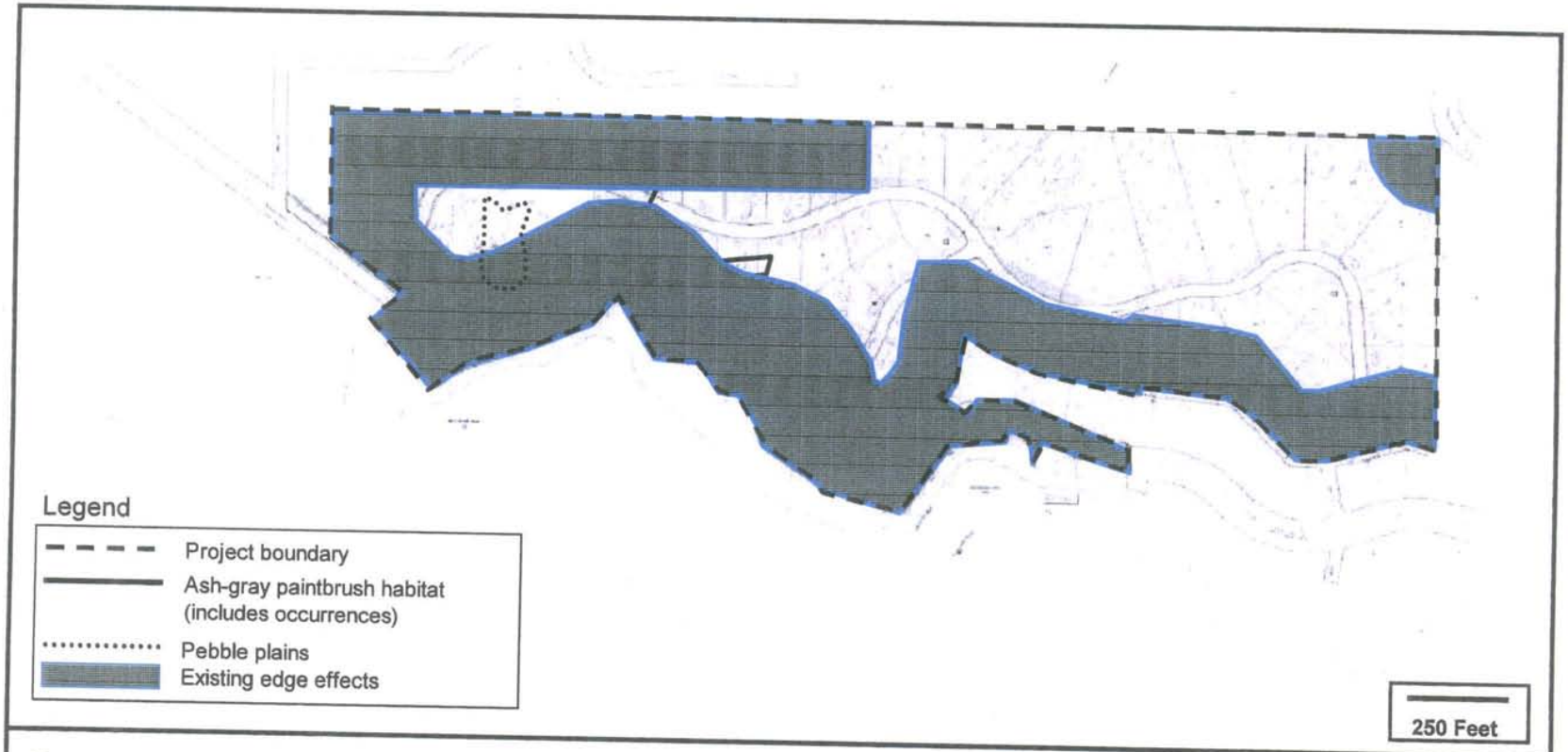
Proposed Moon Camp Tenative Tract

Figure 3: Rare Plant Habitat

Scott White Biological Consulting

Map source: Michael Brandman Associates
JW: 15 Aug 2007

Figure 4:
Edge Effect Map



Proposed Moon Camp Tenative Tract

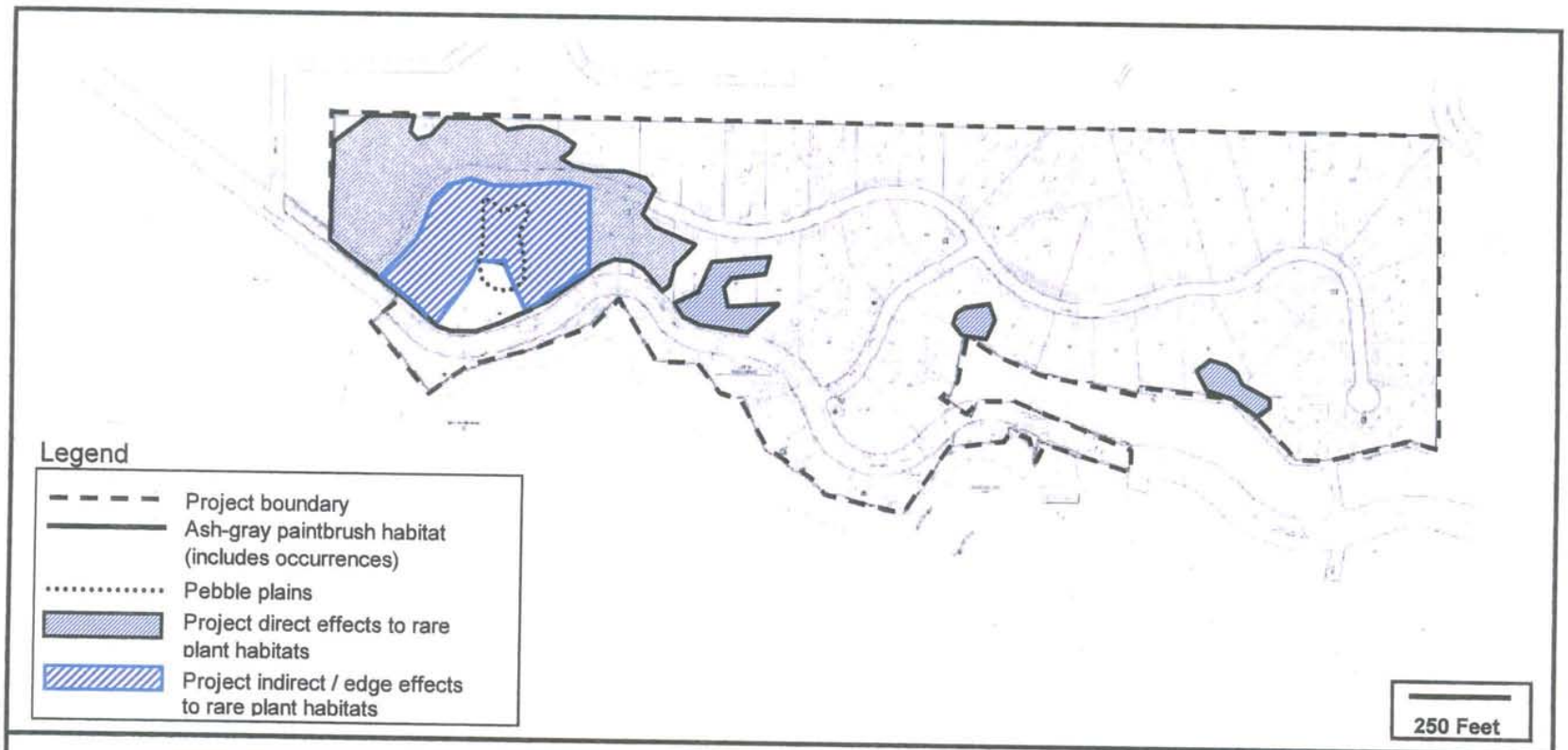
Figure 4: Existing Edge Effects

Scott White Biological Consulting

Map source: Michael Brandman Associates

JW: 15 Aug 2007

Figure 5:
Project Effects



Proposed Moon Camp Tenative Tract

Figure 5: Project Effects

Scott White Biological Consulting

Map source: Michael Brandman Associates
JW: 15 Aug 2007

Appendix 1:
Special Status Species Not Addressed

Appendix 1: Special status plants of the Bear Valley region not addressed due to habitat or range.

Common name	Latin name	Reason for exclusion
White-margined everlasting	Antennaria marginata	Outside geogr. range (only local occurrences in Barton Flats area)
Pinyon rock-cress	Arabis dispar	Outside geogr. range (only local occurrences on desert-facing slopes)
Shockley's rock-cress	Arabis shockleyi	Outside geogr. range (only local occurrences on desert-facing slopes)
Cushenbury milk-vetch	Astragalus albens	No suitable habitat (carbonate)
Triple-ribbed milk-vetch	Astragalus tricarinatus	No habitat (desert shrubland), well above elev. range (below about 4000 ft.), Cushenbury Cyn report erroneous
Parish's small-scale	Atriplex parishii	No suitable habitat (alkali sink)
Fremont barberry	Berberis fremontii	No local occurrences (presumed extinct in Cushenbury area)
Scalloped moonwort	Botrychium crenulatum	No suitable habitat (marshes, bogs)
Plummer's mariposa lily	Calochortus plummerae	Above elev. range (below about 5500 ft.)
Alkali mariposa lily	Calochortus striatus	No habitat (desert alkaline meadows, seeps) above elev. range (below about 5300 ft.)
Parish's daisy	Erigeron parishii	No suitable habitat (carbonate)
Cushenbury buckwheat	Eriogonum ovalifolium var. vineum	No suitable habitat (carbonate)
Moss gentian	Gentiana fremontii	Well below elev. range (occurs in San Gorgonio Wilderness)
Los Angeles sunflower	Helianthus nuttallii ssp. parishii	Well above elev. range (below about 4000 ft. elev.)
Barton Flats horkelia	Horkelia wilderae	Outside geogr. range (endemic to Barton Flats area)
California satintail	Imperata brevifolia	Well above elev. range (below about 3000 ft.)
San Bernardino Mtn. bladderpod	Lesquerella kingii ssp. bernardinus	No habitat (carbonate)
Adder's mouth	Malaxis monophyllos ssp. brachypoda	Well below elev. range (occurs in San Gorgonio Wilderness)
Cienega Seca oxythexca	*Oxytheca parishii* var. *cienegensis*	Outside geogr. range (known only from Cienega Seca and Pipes Cyn areas)
Cushenbury oxytheca	Oxytheca parishii var. goodmaniana	No habitat (carbonate)

Appendix 1: Special status plants of the Bear Valley region not addressed due to habitat or range.

Common name	Latin name	Reason for exclusion
Frosted mint	Poliomintha incana	No suitable habitat (desert dunes and sandy flats)
Narrow-leaved cottonwood	Populus angustifolia	No San Bernardino Mountain occurrences (local reports unverified)
Latimer's woodland gilia	Saltugilia latimeri	No habitat (desert shrubland,pinyon woodland); above elev. range (below about 6200 ft.)
Slender-petaled thelypodium	Thelypodium stenopetalum	No habitat (alkaline meadows)

Appendix 2:
Special Status Species

APPENDIX 2: Special status plants of the Big Bear Valley and surrounding mountains.

Special Status Plants	Habitat and Distribution	Flower season	Conservation Status	Occurrence Probability
Abronia nana ssp. *covillei* Coville's dwarf abronia	Perennial herb; carbonate and sandy soils within pinon-juniper woodlands; San Bernardino Mts. and mountains of E Mojave, about 5200 - 10,200 ft.	May - August	Fed: none Calif: S3.2 CNPS List 4.2	Low (marginally suitable habitat)
Allium parishii Parish's onion	Bulb; open shrubland & woodland, gen. sandy bajadas or mtn slopes, often carbonate soil, about 3000 - 5500 ft. elev.; N San Bern Mtns and Moj Des Mtns, to W Ariz.	Apr - May	Fed: none Calif: S3.3? CNPS List 4.3	Minimal (above elev. range)
Arabis parishii Parish's rock cress	Perennial herb; pebble plains, occas. on carbonate soil; open dry sites in conifer forest; about 5800 - 9500 ft. elev.; San Bernardino Mtns. endemic	April - May	Fed: none Calif: S2.1 CNPS List 1B. 2	Occurs (2007 survey; NDDB report)
Arenaria lanuginosa ssp. *saxosa* (*A. confusa*) Rock sandwort	Perennial herb; sandy soils, streams or meadows; about 5900 to 8600 ft. elev.; San Bernardino Mtns, W US and N Baja Calif.	July - Aug	Fed: none Calif: S1.3 CNPS List 2.3	Moderate (moderately suitable habitat)
Arenaria ursina Bear Valley sandwort	Perennial herb, pebble plains, occas. on carbonate soils, about 5900 - 9500 ft. elev.; San Bernardino Mtns. endemic	June - July	Fed: **THR** Calif: S 2.1 CNPS: List 1B.2	Occurs? (NDDB record #23)
Aster bernardinus (*Symphyotrichum defoliatum*) San Bernardino aster	Perennial herb; wetlands and margins, near sea level to about 6700 ft. elev.; formerly widespread, Kern Co to San Diego Co, but most sites extirpated	July - Nov	Fed: none Calif: S 3.2 CNPS List 1B.2	Low (field surveys; upper margin of elev. range)
Astragalus bicristatus Crested milk vetch	Perennial herb; rocky slopes, montane conifer forest; about 5500 - 9000 ft. elev.; San Bernardino, San Gabriel, and San Jacinto Mtns	May - August	Fed: none Calif: S3.3 CNPS List 4.3	High (suitable habitat occurs)
Astragalus lentiginosus var. *sierrae* Big Bear Valley milk vetch	Perennial herb; open rocky soils or compacted areas in pine forest; about 5900 - 8500 ft. elev.; San Bernardino Mtns endemic	April - August	Fed: none Calif: S1? CNPS List 1B.2	High (suitable habitat occurs)
Astragalus leucolobus Bear Valley woollypod	Perennial herb; open or disturbed soils, pine forests and sagebrush scrub, about 5600-8800 ft. elev.; San Gabriel Mtns to Santa Rosa Mtns	May - July	Fed: none Calif: S 2.2 CNPS List 1B.2	Occurs
Calochortus palmeri vars. *palmeri* and *munzii* Palmer's & Munz's mariposa lilies	Bulb; meadows or seasonally moist sites; about 3300 - 7200 ft. elev.; var. *palmeri* occurs S Coast & Transverse Ranges, reported but not verified San Jacinto Mtns; var. *munzii* endemic to San Jacintos, reported but not verified in San Bernardinos	May - July	Fed: none CNPS List 1B.2 var *palmeri*: Calif: S 2.1 var. *munzii*: Calif: S 1.2	Moderate (marginally suitable habitat)

APPENDIX 2: Special status plants of the Big Bear Valley and surrounding mountains.

Special Status Plants	Habitat and Distribution	Flower season	Conservation Status	Occurrence Probability
Carex occidentalis Western sedge	Rhizomatous perennial; meadows & seeps; San Bernardino Mtns, White Mtns, scattered in western states; about 6200 - 10,300 ft. elev.	June - Aug	Fed: none Calif: S2S3 CNPS List 2.3	Moderate (marginal habitat)
Castilleja cinerea Ash-gray Indian paintbrush	Perennial herb; pebble plains, dry meadows, about 5900 to 9100 ft. elev.; partially parasitic usually on matting buckwheats; San Bernardino Mtns endemic	May - August	Fed: THR Calif: S2.2 CNPS List 1B.2	Occurs (field survey and CNDDB report)
Castilleja lasiorhyncha (*Orthocarpus lasiorhynchus*) San Bernardino Mountain owl's clover	Annual; meadows, streamsides, seeps, etc., about 4200-7800 ft. elev.; San Bernardino Mtns. and (historically) San Jacinto Mtns.; reports from San Diego Co. unconfirmed	June - Aug	Fed: none Calif: S2.2 CNPS List 1B.2	Moderate (marginal habitat)
Castilleja applegateii ssp. *martinii* × *C. angustifolia* (=*C. montigena, C. martinii* var. *ewanii*) Heckard's paintbrush	Perennial herb; conifer forest; San Bernardino Mountains endemic (treated as a species by CNPS but considered a hybrid by Chuang & Heckard in Jepson Manual)	March - July	Fed: none Calif: S3.3 CNPS List 4.3	Occurs (Jeffrey pine forest)
Dryopteris filix-mas Male fern	Perennial herb; widespread in N hemisphere, esp. at high latitudes; only two reports in Calif., incl. Holcomb Valley	July - Sept.	Fed: none Calif: S 1.3 CNPS List 2.3	Low (local rarity)
Dudleya abramsii ssp. *affinis* San Bernardino Mts. dudleya	Perennial herb, pebble plains & rock outcrops (often carbonate); pinyon woodland, open pine forests, about 5200-8500 ft. elev.; San Bernardino Mtns endemic	April - June	Fed: none Calif: S 2.2 CNPS: List 1B.2	Moderate (marginal habitat)
Eriogonum foliosum (*E. evanidum*) Leafy buckwheat	Annual; sandy soil, woodlands or shrublands; about 3900-7200 ft. elev.; scattered locations, Big Bear Valley to N Baja Calif.; may be extinct in Calif.	July - Oct.	Fed: none Calif: SH CNPS List 1B.2	Minimal (presumed extinct, local rarity)
Eriogonum kennedyi var. *austromontanum* Southern mountain buckwheat	Matting woody perennial; pebble plains and similar soils, about 5800 - 7800 ft. elev.; nearly endemic to Big Bear area, also reported at Mt. Pinos	July - August	Fed: **THR** Calif: S2.2 CNPS: List 1B.2	Apparent introgression w/ Wright's buckwheat (see text)
Eriogonum microthecum var. *lacus-ursi* Bear Lake buckwheat	Subshrub; montane forests and shrublands; only known occurrence at Big Bear Lake shore ca. 7200 ft. elev.	July - Sept	Fed: none Calif: S 1 CNPS List 1B.1	Minimal (field survey)
Eriophyllum lanatum var. *obovatum* Southern Sierra woolly sunflower	Perennial herb; open montane coniferous forests, 4200-8200 ft. elev.; S Sierra Nevada and western San Bernardino Mtns	June - July	Fed: none Calif: S3.3 CNPS: List 4.3	High (suitable habitat occurs)

APPENDIX 2: Special status plants of the Big Bear Valley and surrounding mountains.

Special Status Plants	Habitat and Distribution	Flower season	Conservation Status	Occurrence Probability
Galium jepsonii (*G. angustifolium* var. *subglabrum*) Jepson's bedstraw	Perennial herb; sandy or gravelly soils, montane conifer forest, 6500-8100 ft. elev.; San Gabriel and San Bernardino Mtns	July - August	Fed: none Calif: S3.3 CNPS: List 4.3	High (suitable habitat occurs)
Galium johnstonii (*G. angustifolium* var. *pinetorum*) Johnston's bedstraw	Perennial herb, dry slopes, chaparral, lower montane forest, pinyon and juniper woodland; about 4000-7600 ft. elev.; San Bernardino, San Gabriel, maybe San Jacinto mtns	June - July	Fed: none Calif: S3.3 CNPS: List 4.3	Low-moderate (suitable habitat occurs; margin of elev. range)
Gilia leptantha ssp. *leptantha* San Bernardino Mtn. gilia	Annual; sandy or gravelly soils, open pine forest; endemic to upper Santa Ana Riv. watershed, San Bernardino Mtns., about 5000 to 7700 ft. elev.	June - Aug	Fed: none Calif: S2.3 CNPS: List 1B.3	Low (probably outside geogr. range)
Heuchera hirsutissima Shaggy-haired alum root *Heuchera parishii* Parish's alumroot	Perennial herbs; rocky outcrops, cliffs, slopes; montane forest or alpine boulderfields; above about 4800 ft. elev.; *H. hirsutissima* is endemic to San Jacinto and Santa Rosa Mtns (unconfirmed from San Bernardino Mtns); *H. parishii* endemic to San Bernardino Mtns	May - July	Fed: none Calif: S2.3 CNPS: List 1B.3	Low (poorly suitable habitat)
Hulsea vestita ssp. *parryi* Parry's sunflower	Perennial herb; gen. conifer forests, on loose eroding soil and talus; San Bernardino Mtns and Little San Bern. Mtns; about 5500-9500 ft. elev.	April - August	Fed: none Calif: S 3.3 CNPS: List 4.3	Low-moderate (marginal habitat)
Ivesia argyrocoma Silver-haired ivesia	Perennial herb; pebble plains, seasonal meadows, drainages; about 4900-8800 ft. elev.; San Bernardino Mtns and a long-disjunct site in Baja Calif mtns	June - August	Fed: none Calif: S2.2 CNPS: List 1B.2	Occurs (field survey & NDDB record)
Juncus duranii Duran's rush	Perennial herb; meadows, seeps, etc., montane forest, about 5800-9000 ft. elev.; San Bernardino, San Gabriel, and San Jacinto Mtns	July - August	Fed: none USFS: none Calif: S 3.3 CNPS: List 4.3	Low (masrginal habitat occurs)
Lewisia brachycalyx Short-sepaled lewisia	Perennial herb; wet meadows, mesic forest openings, about 4500-7600 ft. elev.; San Bernardino Mtns to Baja Calif, Utah, New Mexico	May - June	Fed: none Calif: S3.2 CNPS: List 2.2	Low-Moderate (marginal habitat)
Lilium parryi Lemon lily	Bulb; meadows and streambanks, about 4200 - 8600 ft. elev.; mtns of S Calif. and SE Arizona	July - August	Fed: none Calif: S2.1 CNPS: List 1B.2	Low (marginal habitat)
Linanthus killipii Baldwin Lake linanthus	Annual; pebble plains, alkaline meadows, forest openings, about 5500-7900 ft. elev.; San Bernardino Mtns endemic	May - July	Fed: none Calif: S 2.1 CNPS: List 1B.2	High (suitable habitat occurs)

APPENDIX 2: Special status plants of the Big Bear Valley and surrounding mountains.

Special Status Plants	Habitat and Distribution	Flower season	Conservation Status	Occurrence Probability
Mimulus exiguus San Bernardino Mountain monkeyflower	Annual; open, seasonally moist meadows, seeps, drainages, about 5900 - 7600 ft. elev.; San Bernardino Mtns. and high mtns of Baja Calif.	June - July	Fed: none Calif: S 2.2 CNPS: List 1B.2	High (suitable habitat occurs)
Mimulus purpureus Purple monkeyflower	Annual; meadow edges, forests, drainages, seeps, about 6200 - 7600 ft. elev.; San Bernardino Mtns and high mtns of Baja Calif.	May - July	Fed: none Calif: S 2.2 CNPS: List 1B.2	High (suitable habitat occurs)
Navarretia peninsularis Baja navarretia	Annual herb; open, seasonally wet places in coniferous forests, about 4900 -7600 ft. elev.; mtns of central and S Calif. and N Baja Calif.	June - August	Fed: none Calif: S2.2 CNPS: List 1B.2	Low (small patches of marginal habitat)
Oxytheca caryophylloides Chickweed oxytheca	Annual; sandy soils in conifer forests, 3900-8500 ft. elev.; S Sierra Nevada, Transverse Ranges, San Jacinto Mtns	July - Sept.	Fed: none Calif: S3.3 CNPS: List 4.3	High (suitable habitat occurs)
Perideridia parishii ssp. *parishii* Parish's yampah	Perennial herb; meadows, moist areas in conifer forest, about 4800 - 9900 ft. elev.; San Bernardino Mtns and (disjunct) AZ, Nevada, New Mexico	June - August	Fed: none Calif: S2.2? CNPS: List 2.2	Low - moderate (marginal habitat)
Phacelia exilis (*P. mohavensis* var. *exilis*) Transverse Range phacelia	Annual; sandy or gravelly soils, forest openings, meadows, pebble plains, about 3600 - 8900 ft. elev.; S Sierra Nevada and Transverse Ranges	May - August	Fed: none Calif: S 3.3 CNPS: List 4.3	High (suitable habitat occurs)
Phacelia mohavensis Mojave phacelia	Annual; sandy or gravelly soil; dry meadows and streambeds gen. within pine forest, about 4500-8100 ft. elev.; San Gabriel & San Bernardino Mtns.	April - August	Fed: none Calif: S 3.3 CNPS: List 4.3	High (suitable habitat occurs)
Phlox dolichantha Bear Valley phlox	Perennial herb; montane forest and pebble plains; about 6000 - 9800 ft. elev.; San Bernardino Mtns endemic	May - July	Fed: none Calif: S 2.2 CNPS: List 1B.2	High (suitable habitat occurs)
Poa atropurpurea San Bernardino bluegrass	Open, flat meadows, about 6700 - 7500 ft. elev. in the San Bernardinos; endemic to San Bernardino Mtns and San Diego Co. (Palomar and Laguna Mtns where it ranges down to about 4400 ft. elev.)	May - June	Fed: **END** Calif: S2.2 CNPS: List 1B.2	Low (habitat marginal at best)
Potentilla glandulosa ssp. *ewanii* Ewan's cinquefoil	Perennial herb; mesic conifer forest, about 6200-7900 ft. elev.; nearly endemic to San Gabriel Mtns., but also reported from Fawnskin area, San Bernardino Mtns.	June - July	Fed: none Calif: S 1.3 CNPS List 1B.3	Low (field survey)
Pyrrocoma uniflora ssp. *gossypina* (*Haplopappus uniflorus* ssp. *gossypinus*) Bear Valley pyrrocoma	Perennial herb; meadows (usually alkaline), pebble plains, about 5200 - 7600 ft. elev.; San Bernardino Mts endemic	July - August	Fed: none Calif: S2.2 CNPS: List 1B.2	Low - moderate (marginally suitable habitat occurs)

APPENDIX 2: Special status plants of the Big Bear Valley and surrounding mountains.

Special Status Plants	Habitat and Distribution	Flower season	Conservation Status	Occurrence Probability
Rupertia rigida (*Psoralea rigida*) Parish's rupertia	Perennial herb; chaparral, forests, and woodlands, about 2300-8200 ft. elev.; San Bernardino Mtns, Peninsular Ranges, Baja Calif.	June - July	Fed: none Calif: S3.3 CNPS: List 4.3	High (suitable habitat occurs)
Selaginella asprella Bluish spike-moss	Herb; rocks, crevices, & rocky soils, dry sites in conifer forests, about 5200-8800 ft. elev.; scattered mtn. ranges of cent. & S Calif., Baja Calif.	July	Fed: none Calif: S3.3 CNPS: List 4.3	Low (marginal habitat)
Senecio bernardinus (*Packera bernardinoa*) San Bernardino butterweed	Perennial herb; dry meadows (incl. alkaline), about 5900-7600 ft. elev.; San Bernardino Mtns endemic	May - July	Fed: none Calif: S 2.2 CNPS: List 1B.2	Low (marginally suitable habitat)
Senecio ionophyllus Tehachapi ragwort	Perennial herb; crevices, rocky places in dry conifer forest, about 4800-8900 ft. elev.; S Sierra Nevada, San Gabriel and San Bernardino Mtns	June - July	Fed: none Calif: S3.3 CNPS: List 4.3	Moderate (suitable habitat)
Sidalcea hickmanii ssp. *parishii* Parish's checkerbloom	Perennial herb; chaparral, oak shrubland or woodland, pine forest; San Bernardino Mtns. and a few Santa Barbara Co. sites, about 3200 - 6000 ft. elev.	June - August	Fed: none CA: **Rare** S 1.2 CNPS: List 1B.2	Minimal (marginal habitat, above elev. range)
Sidalcea pedata Bird's foot checkerbloom	Perennial herb; meadows (freshwater or alkaline clay), sometimes streambanks, about 5200-8200 ft. elev.; San Bernardino Mtns endemic	May - July	Fed: **END** Calif: **END**, 1.1 CNPS: List 1B.1	Low (habitat marginal at best)
Sphenopholis obtusata Prairie wedge grass	Perennial grass; riparian woodlands, meadows, streambanks; about 1000 - 6600 ft. elev.; few scattered locns in Calif. but widespread in N America	April - July	Fed: none Calif: S2.2 CNPS: List 2.2	Low (upper margin elev. range; poor habitat)
Streptanthus bernardinus Laguna Mountains jewelflower	Perennial herb; chaparral, hardwood & conifer forest, about 3900-8100 ft. elev.; mtns of S Calif. (gen. W half of San Bernardino Mtns)	June - July	Fed: none Calif: S 3.3 CNPS: List 4.3	Moderate (margin of geogr. range)
Streptanthus campestris Southern jewelflower	Perennial herb; shrublands, forests, woodlands, often rocky sites, about 2900 -7600 ft. elev.; Transverse and Peninsular Ranges, Baja Calif.	May - July	Fed: none Calif: S 2.3 CNPS: List 1B.3	High (suitable habitat occurs)
Swertia neglecta (*Frasera neglecta*) Pine green-gentian	Perennial herb; conifer forests and pinyon woodland., about 4600-8200 ft. elev.; S Coastal Ranges and Transverse Ranges	May - July	Fed: none Calif: S 3.3 CNPS: List 4.3	High (suitable habitat occurs)
Taraxacum californicum California dandelion	Perennial herb; wet meadows, about 5300 - 9200 ft. elev.; San Bernardino Mtns endemic	May - Aug	Fed: **END** Calif: S2.1 CNPS: List 1B.2	Low - moderate (suitable habitat occurs)

APPENDIX 2: Special status plants of the Big Bear Valley and surrounding mountains.

Special Status Plants	Habitat and Distribution	Flower season	Conservation Status	Occurrence Probability
Thelypodium stenopetalum Slender-petaled thelypodium	Perennial herb; meadows (mesic, usually alkaline clay), about 5200 - 8200 ft. elev.; endemic to Big Bear and Holcomb Valleys	May - Aug	Fed: **END** Calif: **END**, 1.1 CNPS: List 1B.1	Minimal (no alkaline meadow habitat)
Trichostema micranthum Small-flowered bluecurls	Annual; dry margins of lakes, meadows, and streams, 5000-7600 ft. elev., San Bernardino Mtns and Baja Calif.	July - Sept.	Fed: none Calif: S3.3 CNPS: List 4.3	High (suitable habitat occurs)
Viola pinetorum ssp. *grisea* Grey-leaved violet	Perennial herb; montane forests, about 4900 -11,200 ft. elev.; S Sierra Nevada and reported San Bernardino Mtns (CNPS but no other source)	April - July	Fed: none Calif: S 1.3 CNPS: List 1B.3	Low (suitable habitat occurs; may be outside geogr. range)

General references: CDFG 2007a, 2007b; CNPS 2007; Hickman (ed.) 1993; Munz 1974; Sanders et al. 1995; Tibor 2001, US Fish and Wildlife Service 2006.

Conservation Status

Federal designations: (federal Endangered Species Act, US Fish and Wildlife Service). Until 1996, FWS maintained a list of "category 2 candidates," described as species of concern, but with insufficient data to support listing. This list is no longer maintained and FWS has no "SOC" category.

- END: Federally listed, endangered.
- THR: Federally listed, threatened.
- Candidate: Sufficient data are available to support federal listing, but not yet listed.
- Proposed: Formally proposed for federal status shown.

State designations: (California Endangered Species Act, California Dept. of Fish and Game)

- END: State listed, endangered.
- THR: State listed, threatened.
- RARE: State listed as rare (applied only to certain plants).
- CSC: California species of special concern. Considered vulnerable to extinction due to declining numbers, limited geographic ranges, or ongoing threats.
- FP: Fully protected. May not be taken or possessed without permit from CDFG.

CDF&G Natural Diversity Data Base Designations: Applied to special status plants and sensitive plant communities; where correct category is uncertain, CDF&G uses two categories or question marks.

- S1: Fewer than 6 occurrences or fewer than 1000 individuals or less than 2000 acres.
- S1.1: Very threatened
- S1.2: Threatened
- S1.3: No current threats known
- S2: 6-20 occurrences or 1000-3000 individuals or 2000-10,000 acres (decimal suffixes same as above).
- S3: 21-100 occurrences or 3000-10,000 individuals or 10,000-50,000 acres (decimal suffixes same as above).
- S4: Apparently secure in California; this rank is clearly lower than S3 but factors exist to cause some concern, i.e., there is some threat or somewhat narrow habitat. No threat rank.
- S5: Demonstrably secure or ineradicable in California. No threat rank.
- SH: All California occurrences "historical" (i.e., no records in > 20 years).

APPENDIX 2: Special status plants of the Big Bear Valley and surrounding mountains.

California Native Plant Society (CNPS) designations. Note: According to CNPS (Tibor, ed., 2001 p. 54-55), plants on Lists 1A, 1B, and 2 meet definitions as threatened or endangered and "are eligible" for state listing. That interpretation of the state Endangered Species Act is not in general use.

List 1A: Plants presumed extinct in California.
List lB: Plants rare and endangered in California and throughout their range.
List 2: Plants rare, threatened or endangered in California but more common elsewhere in their range.
List 3: Plants about which we need more information; a review list.
List 4: Plants of limited distribution; a watch list.

CNPS Threat Rank:

.1 Seriously endangered in California (over 80% of occurrences threatened / high degree and immediacy of threat)
.2 Fairly endangered in California (20-80% occurrences threatened)
.3 Not very endangered in California (<20% of occurrences threatened or no current threats known)

Watch Lists: Several public and private conservation organizations maintain lists of wildlife species of concern. See CDFG 2007 introductory section for further explanations and references.
ABC: American Bird Conservancy Green List
Audubon: National Audubon Society Watch List
IUCN: World Conservation Union Species Survival Commission Red List

Definitions of occurrence probability: Estimated occurrence probabilities based literature sources cited earlier and field surveys and habitat analyses reported here.

Occurs: Observed on the site by qualified biologists.
Expected: Not observed or recorded on the site, but very likely present during at least a portion of the year.
High: Habitat is a type often utilized by the species and the site is within the known range of the species.
Moderate: Site is within the known range of the species and habitat on the site is a type occasionally used.
Low: Site is within the species' known range but habitat is rarely used, or the species was not found during focused surveys covering less than 100% of potential habitat or completed in marginal seasons.
Minimal: No suitable habitat on the site; or well outside the species' known elevational or geographic ranges; or a focused study covering 100% of all suitable habitat, completed during the appropriate season and during a year of appropriate rainfall, did not detect the species.
Unknown: No focused surveys have been performed in the region, and the species' distribution and habitat are poorly known.

Appendix 3:
Species List

Appendix 3: Species list

Latin Name	**Common Name**		
CUPRESSACEAE	CYPRESS FAMILY		
Calocedrus decurrens	Incense cedar	Occas. / forest	
Juniperus occidentalis	Western juniper	Comm. / forest	
PINACEAE	PINE FAMILY		
Abies concolor	White fir	Occas. / forest	
Pinus jeffreyi	Jeffrey pine	Comm. / forest	
Pinus monophylla	Pinyon pine	Occas. /forest	
APIACEAE	CELERY FAMILY		
Lomatium nevadense	Nevada lomatium	Uncomm. / forest	11669
Tauschia parishii	Parish tauschia	Scarce / open places	11668
ASTERACEAE	ASTER FAMILY		
Achillia millefolium	California yarrow	Comm. / esp. mesic sites	
Agoseris retrorsa	Spear-leaved agoseris	Occas. / throughout	
Antennaria dimorpha	Low everlasting	Comm. / pebble plains	
Artemisia dracunculus	Tarragon	Occas. / esp. near road, lakeshore	
Artemisia ludoviciana	Western mugwort	Occas. / open places, washes	
Artemisia tridentata	Great Basin sagebrush	Comm. / open forest	
Aster frondosus	Short-rayed alkali aster	Occas.-comm. / near shore	
Chrysothamnus nauseosus	Common rabbitbrush	Occas. / throughout	
Chrysothamnus viscidiflorus	Curlleaf rabbitbrush	Occas.-comm. / throughout	
Cirsium occidentale var. californicum	California thistle	Uncomm. / open sites	
* *Cirsium vulgare*	Bull thistle	Occas. / near shore	
Erigeron breweri	Brewer's daisy	Occas. / forest	
Erigeron divergens	Diffuse daisy	Comm. / gen. open places	11667
Eriophyllum confertiflorum	Golden yarrow	Comm. / ± throughout	
Gnaphalium canescens	Perennial cudweed	Uncomm. / gen. open places	
* *Gnaphalium luteo-album*	Pearly everlasting	Occas. / roadside, shoreline	
Hymenopappus filifolius	Columbia cutleaf	Uncomm. / open forest	
* *Lactuca serriola*	Prickly lettuce	Occas. / mostly roadside	
Lessingia filaginifolia (Corethrogyne filaginifolia)	Chaparral aster	Occas. / open forest	
Madia elegans	Elegant tarplant	Occas. / forest	
* *Senecio vulgaris*	Common groundsel	Uncomm. / gen. roadside	
Solidago californica	Calif. goldenrod	Occas. / mesic sites	
* *Sonchus oleraceus*	Common sow thistle	Occas. / near shore	
* *Taraxacum officinale*	Common dandelion	Occas. / roadside, shoreline	
Tetradymia comosa	Hairy horsebrush	Occas. / open forest	
* *Tragopogon dubius*	Oyster plant, salsify	Occas. / roadside, forest	
BORAGINACEAE	BORAGE FAMILY		
Cryptantha micrantha	Purple root cryptantha	Occas. / open places	
Cryptantha simulans	Popcorn flower	Scarce / open places	11670
BRASSICACEAE	MUSTARD FAMILY		
Arabis holboellii (?)	Holboell's rock-cress	Occas. / open forest	
** *Arabis parishii*	Parish's rock-cress	Occas. / pebble plains	11665
Caulanthus major	Slender wild-cabbage	Occas. / forest	
Descurainia incisa (D. richardsonii)	Mountain tansy mustard	Uncomm. / near road	

Alien species indicated by asterisk, special status species indicated by two asterisks. This list includes only species observed on the site. Others may have been overlooked or unidentifiable due to season. Plants were identified using keys, descriptions, and illustrations in Abrams (1923-1951), Hickman (1993), Munz (1974), and other regional references. Taxonomy and nomenclature generally follow Hickman. Some plants were collected as vouchers (see collection numbers at right) and will be donated to the Herbaria at Rancho Santa Ana Botanic Garden or UC Riverside.

Appendix 3: Species list

BRASSICACEAE, cont.			
Descurainia pinnata	Tansy mustard	Occas. / mostly open forest	
Erysiumum capitatum	Douglas wallflower	Occas. / ±throughout	
* *Lepidium virginicum v. pubescens*	Wild peppergrass	Occas. / mostly roadside, shoreline	
* *Sisymbrium altissimum*	Tumble mustard	Occas. / roadside	
CACTACEAE	CACTUS FAMILY		
Opuntia basilaris var. basilaris	Common beavertail cactus	Uncomm. / open forest	
CAPRIFOLIACEAE	HONEYSUCKLE FAMILY		
Symphoricarpos rotundifolius var. parishii	Parish snowberry	Occas. / shaded forest	
CARYOPHYLLACEAE	CARNATION FAMILY		
Silene verecunda ssp. platyota	Cuyamaca campion	Occas. / forest	
CHENOPODIACEAE	GOOSEFOOT FAMILY		
* *Chenopodium album (?)*	Common goosefoot	Occas. / throughout	
* *Salsola tragus*	Russian thistle, tumbleweed	Occas. / mostly roadside	
CONVOLVULACEAE	MORNING GLORY FAMILY		
Calystegia malacophylla ssp. fulcrata (C. fulcrata)	Morning glory	Occas. / throughout	
ERICACEAE	MANZANITA FAMILY		
Arctostaphylos patula	Greenleaf manzanita	Occas.-comm. / forest	
EUPHORBIACEAE	SPURGE FAMILY		
Chamaesyce albomarginata	Rattlesnake spurge	Occas. / open forest	
Euphorbia palmeri	Wood spurge	Occas. / uplands	
FABACEAE	PEA FAMILY		
Amorpha californica	Calif. false indigo	Occas. / mesic forest	
** *Astragalus leucolobus*	Bear Valley woollypod	Comm. / pebble plains	11705
Astragalus douglasii	Douglas rattleweed	Uncomm. / open places	
Lotus argyraeus	Silver lotus	Occas. / open forest	
Lotus nevadensis	Nevada lotus	Comm. / open places	
Lupinus cf. breweri	Silver mat lupine	Comm. / pebble plains, etc.	
Lupinus excubitus var. austromontanus	Southern mountain lupine	Occas. / ±throughout	11666
Lupinus lepidus v. confertus	Prairie lupine	Occas. / lakeshore	
* *Medicago lupulina*	Black medick	Uncomm. / near lakeshore	
* *Melilotus alba*	White sweet-clover	Occas.-comm. / roadsides, shore	
FAGACEAE	OAK FAMILY		
Quercus kelloggii	California black oak	Comm. / forest	
GERANIACEAE	GERANIUM FAMILY		
* *Erodium cicutarium*	Red-stemmed filaree	Occas.-comm. / roadsides, etc.	
HYDROPHYLLACEAE	WATERLEAF FAMILY		
Eridictyon trichocalyx	Yerba santa	Occas. / open forest	
Phacelia distans (?)	Common phacelia	Uncomm. / open forest	
Phacelia imbricata	Broad-sepaled phacelia	Uncomm. / open forest	
LAMIACEAE	MINT FAMILY		
Monardella linoides (?) (or M. odoratissima)	Flax-leaved monardella	Occas. / forest	
Scutellaria siphocampyloides (S. austinae)	Austin's skullcap	Uncomm. / mesic forest	
LOASACEAE	STICK-LEAF FAMILY		
Mentzelia sp.	Unid. stick-leaf	Uncomm. / uplands	11674
MALVACEAE	MALLOW FAMILY		
* *Malva parviflora*	Cheeseweed	Occas. / mostly lakeshore	
ONAGRACEAE	EVENING PRIMROSE FAMILY		
Clarkia sp.	Unid. annual clarkia	Uncomm. / shaded forest	

Appendix 3: Species list

ONAGRACEAE (cont.)			
Epilobium brachycarpum (E. paniculatum)	Summer cottonweed	Occas.-comm. upland margins	
Epilobium ciliatum	Willow-herb	Occas. / mostly lakeshore	
Gaypohytum sp.	Unid. gayophytum	Comm. / open forest	
POLEMONIACEAE	PHLOX FAMILY		
Gilia latiflora (?)	Broad-flowered gilia	Uncomm. / open forest	
Gilia modocensis	Modoc gilia	Occas. /open places	11,659
Eriastrum densifolium ssp. densifolium	Mojave woolly-star	Occas. / open forest	
Eriastrum sapphirinum	Sapphire woollystar	Occas. / open forest	
Linanthus breviculus	Mojave linanthus	Comm. / open forest	
Phlox gracilis	Slender phlox	Comm. / open places	11660
POLYGONACEAE	BUCKWHEAT FAMILY		
Eriogonum davidsonii (=E. molestum var. davidsonii)	Davidson buckwheat	Occas. / open forest	
** *Eriogonum kennedyi var. austromontanum*	Southern mountain buckwheat	Uncomm., pebble plain, intergrade w/ E. wrightii?	11760
Eriogonum wrightii ssp. subscaposum	Wright's buckwheat	Comm. & characteristic / pebble plains	
Eriogonum umbellatum v. munzii	Munz sulfur buckwheat	Occas. / open forest	
* *Polygonum arenastrum*	Common knotweed	Occas. / roadside, lake shore	
* *Rumex crispus*	Curly dock	Occas. / mostly lakeshore	
Rumex salicifolius	Willow dock	Uncomm. / near lakeshore	
PORTULACACEAE	PURSLANE FAMILY		
Lewisia rediviva	Bitter root	Occas.-comm. / pebble plains	
RANUNCULACEAE	BUTTERCUP FAMILY		
Delphinium parishii (?)	Parish larkspur	Occas. / forest	
* *Ranunculus sceleratus*	Cursed buttercup	Occas. / lakeshore	11656
RHAMNACEAE	BUCKTHORN FAMILY		
Ceanothus cordulatus	Mountain whitethorn	Occas. / open forest	
Ceanothus greggii	Cupleaf ceanothus	Uncomm. / open forest	
Ceanothus integerrimus	Deerbrush	Occas. / forest	
ROSACEAE	ROSE FAMILY		
Amelanchier utahensis	Service berry	Comm. / ± throughout	
Cercocarpus betuloides	Birch-leaf mountain mahogan	Uncomm.	
Cercocarpus ledifolius	Curlleaf mountain mahogany	Comm. / ± throughout	
Horkelia rydbergii (H. bolanderi s. parryi)	Transverse range horkelia	Occas. / mostly near lake	
** *Ivesia argyrocoma*	Silver-haired ivesia	locally comm. / pebble pl.	11658
Potentilla anserina	Silverweed	Comm. / lakeshore	
Potentilla biennis	Biennial cinquefoil	Comm. / lakeshore	11671
Potentilla gracilis	Slender cinquefoil	Occas. / mesic places	
Potentilla wheeleri	Wheeler cinquefoil	Scarce / near lakeshore	11673
RUBIACEAE	COFFEE FAMILY		
* *Galium aparine*	Goose grass	Uncomm. / shaded forest	
Galium parishii	Parish bedstraw	Occas. / forest	
SALICACEAE	WILLOW FAMILY		
Populus balsamifera trichocarpa	Black cottonwood	Seedlings only / lakeshore	
Salix laevigata (?)	Red willow	Uncomm. / lakeshore	
Salix lasiolepis (?)	Arroyo willow	Comm. / lakeshore	
SCROPHULARIACEAE	SNAPDRAGON FAMILY		
** *Castilleja cinera*	Ash-gray paintbrush	Localized / pebble plains	11657
** *Castilleja montigena (C. applegatei ssp. martinii)*	Heckerd's paintbrush	Occas. / forest	

Appendix 3: Species list

SCROPHULARIACEAE, cont.			
Collinsis parviflora	Small-flowered blue-eyed Mar	Comm., patchy / peb. pl.	11661
Limosella acaulis	Mudwort	Comm.-abund. / wet lakeshoi	11655
Mimulus guttatus	Seep monkeyflower	Occas. / lakeshore	
Pedicularis semibarbata	Pine-woods lousewort	Occas. / forest	11664
Penstemon eatonii	Eaton firecracker	Occas. / forest	
* *Verbascum thapsus*	Common muellin	Occas. / throughout	
SOLANACEAE	NIGHTSHADE FAMILY		
Solanum xanti	Chaparral nightshade	Uncomm. / forest	
STERCULIACEAE	CACAO FAMILY		
Fremontodendron californicum	Flannel bush	Occas.-comm. / open forest	
TAMARICACEAE	TAMARISK FAMILY		
Tamarix ramosissima	Mediterranean tamarisk	Occas. / lakeshore	
URTICACEAE	NETTLE FAMILY		
Urtica dioica ssp. holosericea	Stinging nettle	Occas. / lakeshore	
VIOLACEAE	VIOLET FAMILY		
Viola douglasii	Douglas violet	Occas. / pebble plains	11663
Viola purpurea	Mountain violet	Occas. / throughout	11662
VISCACEAE	MISTLETOE FAMILY		
Arceuthobium campylopodum	Dwarf mistletoe	Uncomm. / on yellow pines	
CYPERACEAE	SEDGE FAMILY		
Carex athrostachya	Slender-beaked sedge	Occas. / near lake	
Carex sp.	Unid. sedge	Uncomm. / near lakeshore	11671
JUNCACEAE	RUSH FAMILY		
Juncus arcticus (incl. vars. balticus and mexicanus)	Wire-grass	Occas.-comm. / mesic areas	
LILIACEAE	LILY FAMILY		
Allium parryi	Parry's onion	Occas. / mostly pebble plains	
Calochortus kennedyi	Kennedy's mariposa lily	Uncomm. / open forest	
POACEAE	GRASS FAMILY		
Agrostis sp.	Unid. bentgrass	Occas. / lakeshore	
Alopecurus aequalis	Short-awn foxtail	Comm., patchy / near shore	
Bromus carinatus	California brome	Occas. / uplands, ±throughout	
Bromus orcuttianus (?)	Orcutt brome	Uncomm. / mesic forest	
* *Bromus tectorum*	Cheat grass	Comm. / ± throughout	
Elymus elymoides (Sitanion hystrix v. hystrix)	Bottlebrush squirreltail	Occas. / ±throughout	
Elymus glaucus	Blue wild-rye	Occas. / ± throughout	
Hordeum jubatum	Foxtail barley	Uncomm. / mostly near lake	
* *Koeleria macrantha*	Junegrass	Occas. / mesic forest, uplands	
Melica stricta	Nodding melic	Uncomm. patchy, uplands	
Muhlenbergia rigens	Deergrass	Occas. / throughout	
Poa fendleriana	Fendler bluegrass	Occas.-comm. / forest	
Poa secunda	Nodding bluegrass	Comm. / ± throughout	
* *Polypogon monspeliensis*	Rabbitfoot grass	Occas.-comm. / near shore	
Pucinellia nuttalliana	Alkali grass	Uncomm. / low-lying mesic site	
Stipa coronata ssp. depauperata (Achnatherum parishii)	Parish needlegrass	Occas. / mostly open forest	
Stipa lettermannii	Letterman's needlegrass	Occas. / forest	
Vulpia microstachys (Festuca microstachys, F. reflexa, F. pacifica, F. confusa)	Annual fescue	Uncomm. patchy / upland	

Attachment 1:
California Natural Diversity Data Base Query Results

California Department of Fish and Game
Natural Diversity Database
Selected Elements by Scientific Name - Portrait
USGS 7½' quads: Fawnskin, Big Bear City, Big Bear Lake, Butler Pk, Keller Peak, and Moonridge

Scientific Name/Common Name	Element Code	Federal Status	State Status	GRank	SRank	CDFG or CNPS
1 ***Accipiter cooperii*** Cooper's hawk	ABNKC12040			G5	S3	SC
2 ***Antennaria marginata*** white-margined everlasting	PDAST0H1G0			G4G5	S1.3	2.3
3 ***Arabis dispar*** pinyon rock cress	PDBRA060F0			G3	S2.3	2.3
4 ***Arabis parishii*** Parish's rock cress	PDBRA061C0			G2	S2.1	1B.2
5 ***Arabis shockleyi*** Shockley's rock cress	PDBRA061V0			G3	S2.2	2.2
6 ***Arenaria lanuginosa ssp. saxosa*** rock sandwort	PDCAR040E4			G5T5	S1.3	2.3
7 ***Arenaria ursina*** Big Bear Valley sandwort	PDCAR040R0	Threatened		G2	S2.1	1B.2
8 ***Astragalus albens*** Cushenbury milk-vetch	PDFAB0F0A0	Endangered		G1	S1.1	1B.1
9 ***Astragalus lentiginosus var. sierrae*** Big Bear Valley milk-vetch	PDFAB0FB9L			G5T1	S1?	1B.2
10 ***Astragalus leucolobus*** Big Bear Valley woollypod	PDFAB0F4T0			G2	S2.2	1B.2
11 ***Astragalus tricarinatus*** triple-ribbed milk-vetch	PDFAB0F920	Endangered		G1	S1.2	1B.2
12 ***Atriplex parishii*** Parish's brittlescale	PDCHE041D0			G1G2	S1.1	1B.1
13 ***Botrychium crenulatum*** scalloped moonwort	PPOPH010L0			G3	S2.2	2.2
14 ***Calochortus palmeri var. palmeri*** Palmer's mariposa lily	PMLIL0D122			G2T2	S2.1	1B.2
15 ***Calochortus plummerae*** Plummer's mariposa lily	PMLIL0D150			G3	S3.2	1B.2
16 ***Calochortus striatus*** alkali mariposa lily	PMLIL0D190			G2	S2.2	1B.2
17 ***Castilleja cinerea*** ash-gray Indian paintbrush	PDSCR0D0H0	Threatened		G2	S2.2	1B.2
18 ***Castilleja lasiorhyncha*** San Bernardino Mountains owl's-clover	PDSCR0D410			G2	S2.2	1B.2
19 ***Chaetodipus fallax pallidus*** pallid San Diego pocket mouse	AMAFD05032			G5T3	S3	SC
20 ***Charina trivirgata*** rosy boa	ARADA02010			G4G5	S3S4	
21 ***Charina umbratica*** southern rubber boa	ARADA01011		Threatened	G5T2T3	S2S3	
22 ***Corynorhinus townsendii*** Townsend's big-eared bat	AMACC08010			G4T3T4	S2S3	SC
23 ***Dryopteris filix-mas*** male fern	PPDRY0A0B0			G5	S1.3	2.3

	Scientific Name/Common Name	Element Code	Federal Status	State Status	GRank	SRank	CDFG or CNPS
24	***Dudleya abramsii ssp. affinis*** San Bernardino Mountains dudleya	PDCRA04013			G3T2	S2.2	1B.2
25	***Empidonax traillii extimus*** southwestern willow flycatcher	ABPAE33043	Endangered	Endangered	G5T1T2	S1	
26	***Erigeron parishii*** Parish's daisy	PDAST3M310	Threatened		G2	S2.1	1B.1
27	***Eriogonum kennedyi var. austromontanum*** southern mountain buckwheat	PDPGN083B2	Threatened		G4T2	S2.2	1B.2
28	***Eriogonum microthecum var. lacus-ursi*** Bear Lake buckwheat	PDPGN083WF			G5T1	S1.1	1B.1
29	***Eriogonum ovalifolium var. vineum*** Cushenbury buckwheat	PDPGN084F8	Endangered		G5T1	S1.1	1B.1
30	***Euchloe hyantis andrewsi*** Andrew's marble butterfly	IILEPA5032			G3G4T1	S1	
31	***Gasterosteus aculeatus williamsoni*** unarmored threespine stickleback	AFCPA03011	Endangered	Endangered	G5T1	S1	
32	***Gentiana fremontii*** moss gentian	PDGEN060Y0			G4	S2.3	2.3
33	***Gila orcuttii*** arroyo chub	AFCJB13120			G2	S2	SC
34	***Gilia leptantha ssp. leptantha*** San Bernardino gilia	PDPLM040W1			G4T2	S2.3	1B.3
35	***Glaucomys sabrinus californicus*** San Bernardino flying squirrel	AMAFB09021			G5T2T3	S2S3	SC
36	***Haliaeetus leucocephalus*** bald eagle	ABNKC10010	Threatened	Endangered	G5	S2	
37	***Helianthus nuttallii ssp. parishii*** Los Angeles sunflower	PDAST4N102			G5TH	S1.1	1A
38	***Heuchera parishii*** Parish's alumroot	PDSAX0E0S0			G2	S2.3	1B.3
39	***Horkelia wilderae*** Barton Flats horkelia	PDROS0W0J0			G1	S1.1	1B.1
40	***Hydroporus simplex*** simple hydroporus diving beetle	IICOL55050			G1?	S1?	
41	***Icteria virens*** yellow-breasted chat	ABPBX24010			G5	S3	SC
42	***Ivesia argyrocoma*** silver-haired ivesia	PDROS0X020			G2	S2.2	1B.2
43	***Lampropeltis zonata (parvirubra)*** California mountain kingsnake (San Bernardino population)	ARADB19062			G4G5	S2?	SC
44	***Lesquerella kingii ssp. bernardina*** San Bernardino Mountains bladderpod	PDBRA1N0W1	Endangered		G5T1	S1.1	1B.1
45	***Lewisia brachycalyx*** short-sepaled lewisia	PDPOR04010			G4G5	S3.2	2.2
46	***Lilium parryi*** lemon lily	PMLIL1A0J0			G3	S2.1	1B.2

	Scientific Name/Common Name	Element Code	Federal Status	State Status	GRank	SRank	CDFG or CNPS
47	***Linanthus killipii*** Baldwin Lake linanthus	PDPLM090N0			G2	S2.1	1B.2
48	***Malaxis monophyllos ssp. brachypoda*** adder's-mouth	PMORC1R010			G4?T4	S1.1	2.1
49	***Mimulus exiguus*** San Bernardino Mountains monkeyflower	PDSCR1B140			G2	S2.2	1B.2
50	***Mimulus purpureus*** purple monkeyflower	PDSCR1B2B0			G2	S2.2	1B.2
51	***Myotis evotis*** long-eared myotis	AMACC01070			G5	S4?	
52	***Myotis thysanodes*** fringed myotis	AMACC01090			G4G5	S4	
53	***Myotis volans*** long-legged myotis	AMACC01110			G5	S4?	
54	***Navarretia peninsularis*** Baja navarretia	PDPLM0C0L0			G3?	S2.2	1B.2
55	***Neotamias speciosus speciosus*** Lodgepole chipmunk	AMAFB02172			G4T2T3	S2S3	
56	***Oxytheca parishii var. cienegensis*** Cienega Seca oxytheca	PDPGN0J042			G4?T1	S1.3	1B.3
57	***Oxytheca parishii var. goodmaniana*** Cushenbury oxytheca	PDPGN0J043	Endangered		G4?T1	S1.1	1B.1
58	***Pebble Plains***	CTT47000CA			G1	S1.1	
59	***Perideridia parishii ssp. parishii*** Parish's yampah	PDAPI1N0C2			G4T3T4	S2.2?	2.2
60	***Phlox dolichantha*** Big Bear Valley phlox	PDPLM0D0P0			G2	S2.2	1B.2
61	***Phrynosoma coronatum (blainvillii*** Coast (San Diego) horned lizard	ARACF12021			G4G5	S3S4	SC
62	***Piranga rubra*** summer tanager	ABPBX45030			G5	S2	SC
63	***Poa atropurpurea*** San Bernardino blue grass	PMPOA4Z0A0	Endangered		G2	S2.2	1B.2
64	***Poliomintha incana*** frosted mint	PDLAM1L020			G5	SH	1A
65	***Populus angustifolia*** narrow-leaved cottonwood	PDSAL01020			G5	S2S3	2.2
66	***Potentilla glandulosa ssp. ewanii*** Ewan's cinquefoil	PDROS1B0S3			G5T1	S1.3	1B.3
67	***Psychomastax deserticola*** desert monkey grasshopper	IIORT15010			G1G2	S1S2	
68	***Pyrrocoma uniflora var. gossypina*** Bear Valley pyrrocoma	PDASTDT0K1			G5T2	S2.2	1B.2
69	***Rana muscosa*** mountain yellow-legged frog	AAABH01140	Endangered		G2	S2	SC

	Scientific Name/Common Name	Element Code	Federal Status	State Status	GRank	SRank	CDFG or CNPS
70	***Saltugilia latimeri*** Latimer's woodland-gilia	PDPLM0H010			G2	S2.2	1B.2
71	***Senecio bernardinus*** San Bernardino ragwort	PDAST8H0E0			G2	S2.2	1B.2
72	***Sidalcea hickmanii ssp. parishii*** Parish's checkerbloom	PDMAL110A3	Candidate	Rare	G3T1	S1.2	1B.2
73	***Sidalcea pedata*** bird-foot checkerbloom	PDMAL110L0	Endangered	Endangered	G1	S1.1	1B.1
74	***Southern California Threespine Stickleback Stream***	CARE2320CA			G?	S?	
75	***Sphenopholis obtusata*** prairie wedge grass	PMPOA5T030			G5	S2.2	2.2
76	***Streptanthus campestris*** southern jewel-flower	PDBRA2G0B0			G2	S2.3	1B.3
77	***Symphyotrichum defoliatum*** San Bernardino aster	PDASTE80C0			G3	S3.2	1B.2
78	***Taraxacum californicum*** California dandelion	PDAST93050	Endangered		G2	S2.1	1B.2
79	***Thamnophis hammondii*** two-striped garter snake	ARADB36160			G3	S2	SC
80	***Thelypodium stenopetalum*** slender-petaled thelypodium	PDBRA2N0F0	Endangered	Endangered	G1	S1.1	1B.1

Attachment 2:
California Natural Diversity Data Base Forms

California Native Species Field Survey Form

Mail to:
Natural Diversity Database
California Dept. of Fish & Game
1416 Ninth Street, 12th Floor
Sacramento, CA 95814

For office use only

Source Code		Quad Code	
Elm Code		Occ #	
Copy to		Map Index #	

Date of Field Work (*Month – Day – Year*) *April 30 2007*

Scientific Name : *Arenaria ursina*

Common Name :

Species Found?	Yes	No	*If not, why?*	*Total Number of Individuals:*
		XX	Drought? Vehicle disturbance?	

Is this an existing NDDB occurrence?	Yes	*Occurrence #*	No		**Is this a Subsequent Visit?**	Yes	No	*#s of individuals since last visit* More ?	Fewer ?	Same ?
	XX	23			Also not seen in 2002, also a drought year	XX				xx

Collected?	no	*Coll. #,Museum/Herbarium:*
	xx	

Reporter: Scott D. White
Address: Scott White Biological Consulting, 201 North First Ave., No. 102, Upland, Calif. 91786
Phone: (909) 949-2686
E-mail: scottbioservices@earthlink.net

Plant Phenology Information

dormant %	*sterile* %	*senescent* %
budding %	*flowering* %	*fruiting* %

Animal Information

Age Structure:	# of adults	# of juveniles	# of unknown		
Wintering	*Foraging*	*Breeding*	*Roosting*	*Burrow site*	*Other*

Location: (*please attach map*)
San Bernardino Mtns., just north of Big Bear Lake near community of Fawnskin at former "Moon Camp" site.

County:	**Quad Name:**	**Landowner:**	
San Bernardino Co.	Fawnskin	private	
Elevation: 6800-6900 ft	*Township* 2N	*Range* 1W	*Section (s)* 13 (N half)
Latitude: Ca. 34°16' N	*Longitude:* Ca. 116°56' W		
UTM Data *Zone*	*Datum*	*Source*	*Accuracy*
X coordinate (E)	*Y coordinate (N)*		

Habitat Description: (*plant communities, dominants, associates, substrates/soils, aspects/slope*)
Pebble plain surrounded by arid Jeffrey pine forest.
Other rare species? Arabis parishii, Astragalus leucolobus, Ivesia argyrocoma, Castilleja cinerea, "C. montigena,"

Site Information

Current/surrounding land use: Vacant, short distance S of residential development, short distance N of well-used highway
Visible Disturbances; possible threats: Significant vehicle damage to habitat; site proposed for development

Overall site quality: ??	*Excellent*	*Good*	*Fair*	*Poor*

Comments:

Determination method:	*Photographs:*	Slides	Prints	Digital
[] *Keyed in a site reference:*	*Organism*			
[] *Compared with other specimen*	*Habitat*			
[] *Compared with photo/sketch*	*Diagnostic Features*			
[] *By knowledgeable individual*	*Other*			
[] *Other method:*	*Permission to duplicate*	yes []	no []	

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Sacramento, CA 95814

For office use only

Source Code		Quad Code	
Elm Code		Occ #	
Copy to		Map Index #	

Date of Field Work (*Month – Day – Year*) *April 30 2007*

Scientific Name : *Arabis parishii*

Common Name :

Species Found?	Yes	No	*If not, why?*	*Total Number of Individuals:*
	xx			Uncommon on pebble plains

Is this an existing NDDB occurrence?	Yes	*Occurrence #*	No		**Is this a Subsequent Visit?**	Yes	No	*#s of individuals since last visit*		
	xx	32			Not seen in 2002			*More ?*	*Fewer ?*	*Same ?*
								xx		

Collected?	Yes	*Coll. #,Museum/Herbarium:*
	xx	11665 / RSA

Reporter:	Scott D. White
Address:	Scott White Biological Consulting 201 North First Ave., No. 102 Upland, Calif. 91786
Phone: **E-mail:**	(909) 949-2686 / scottbioservices@earthlink.net

Plant Phenology Information

dormant %	*sterile* %	*senescent* %
budding %	*flowering* xx %	*fruiting* %

Animal Information

Age Structure:	*# of adults*	*# of juveniles*	*# of unknown*		
Wintering	*Foraging*	*Breeding*	*Roosting*	*Burrow site*	*Other*

Location: *(please attach map)*
San Bernardino Mtns., just north of Big Bear Lake near community of Fawnskin at former "Moon Camp" site

County:	**Quad Name:**	**Landowner:**	
San Bernardino Co.	Fawnskin	private	
Elevation:	*Township* / *Range* / *Section (s)*	*Latitude:*	*Longitude:*
6800-6900 ft	2N / 1W / 13 (N half)	Ca. 34°16' N	Ca. 116°56' W
UTM Data *Zone* / *Datum* / *Source* / *Accuracy*		*X coordinate (E)*	*Y coordinate (N)*

Habitat Description: *(plant communities, dominants, associates, substrates/soils, aspects/slope)*
Pebble plain surrounded by arid Jeffrey pine forest.
Other rare species? Arabis parishii, Astragalus leucolobus, Ivesia argyrocoma, Castilleja cinerea, "C. montigena,"

Site Information

Current/surrounding land use: Vacant, short distance S of residential development, short distance N of well-used highway
Visible Disturbances; possible threats: Significant vehicle damage to habitat; site proposed for development

Overall site quality: ?? / *Excellent* / *Good* / *Fair* / *Poor*

Comments:

Determination method:	*Photographs:*	Slides	Prints	Digital
[x] *Keyed in a site reference:*	*Organism*			
[x] *Compared with other specimen*	*Habitat*			
[] *Compared with photo/sketch*	*Diagnostic Features*			
[x] *By knowledgeable individual*	*Other*			
[] *Other method:*	*Permission to duplicate*	yes []	no []	

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Sacramento, CA 95814

For office use only
Source Code _____ Quad Code _____
Elm Code _____ Occ # _____
Copy to _____ Map Index # _____

Date of Field Work (*Month – Day – Year*) *April 30 2007*

Scientific Name : *Ivesia argyrocoma*
Common Name :

Species Found?	Yes	No	If not, why?	Total Number of Individuals:
	xx			Common on pebble plains

Is this an existing NDDB occurrence?	Yes	Occurrence #	No		Is this a Subsequent Visit?	Yes	No	#s of individuals since last visit: More ?	Fewer ?	Same ?
	xx	24			Also noted in 02	xx				xx

Collected?	Yes	Coll. #,Museum/Herbarium:
	xx	11658 / RSA

Reporter: Scott D. White
Address: Scott White Biological Consulting
201 North First Ave., No. 102
Upland, Calif. 91786
Phone: (909) 949-2686 / scottbioservices@earthlink.net
E-mail: scottbioservices@earthlink.net

Plant Phenology Information

dormant	sterile	senescent
%	%	%
budding	flowering	fruiting
%	%	%

Animal Information

Age Structure:	# of adults	# of juveniles	# of unknown

Wintering	Foraging	Breeding	Roosting	Burrow site	Other

Location: (*please attach map*)
San Bernardino Mtns., just north of Big Bear Lake near community of Fawnskin at former "Moon Camp" site

County:	Quad Name:	Landowner:
San Bernardino Co.	Fawnskin	private

Elevation:	Township	Range	Section (s)	Latitude:	Longitude:
6800-6900 ft	2N	1W	13 (N half)	Ca. 34°16' N	Ca. 116°56' W

UTM Data	Zone	Datum	Source	Accuracy	X coordinate (E)	Y coordinate (N)

Habitat Description: (*plant communities, dominants, associates, substrates/soils, aspects/slope*)
Pebble plain surrounded by arid Jeffrey pine forest.
Other rare species? Arabis parishii, Astragalus leucolobus, Ivesia argyrocoma, Castilleja cinerea, "C. montigena,"

Site Information

Current/surrounding land use: Vacant, short distance S of residential development, short distance N of well-used highway
Visible Disturbances; possible threats: Significant vehicle damage to habitat; site proposed for development

Overall site quality: ??	Excellent	Good	Fair	Poor

Comments:

Determination method:	Photographs:	Slides	Prints	Digital
[x] Keyed in a site reference:	Organism			
[] Compared with other specimen	Habitat			
[] Compared with photo/sketch	Diagnostic Features			
[x] By knowledgeable individual	Other			
[] Other method:	Permission to duplicate	yes []	no []	

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Elm Code _____ Occ # _____
Copy to _____ Map Index # _____

Date of Field Work (*Month – Day – Year*) *April 30 2007*

Scientific Name : *Astragalus leucolobus*
Common Name :

Species Found?	Yes	No	*If not, why?*	*Total Number of Individuals:*
	xx			Occasional to common on pebble plains

Is this an existing NDDB occurrence?	Yes	*Occurrence #*	No		***Is this a Subsequent Visit?***	Yes	No	*#s of individuals since last visit*		
			xx		Also noted in 02	xx		*More ?*	*Fewer ?*	*Same ?* xx

Collected?	Yes	*Coll. #,Museum/Herbarium:*
	xx	11705

Reporter:	Scott D. White
Address:	Scott White Biological Consulting 201 North First Ave., No. 102 Upland, Calif. 91786
Phone: / ***E-mail:***	(909) 949-2686 / scottbioservices@earthlink.net

Plant Phenology Information

dormant %	*sterile* %	*senescent* %
budding %	*flowering* %	*fruiting* %

Animal Information

Age Structure:	*# of adults*	*# of juveniles*	*# of unknown*		
Wintering	*Foraging*	*Breeding*	*Roosting*	*Burrow site*	*Other*

Location: (*please attach map*)
San Bernardino Mtns., just north of Big Bear Lake near community of Fawnskin at former "Moon Camp" site

County:	***Quad Name:***	***Landowner:***	
San Bernardino Co.	Fawnskin	private	
Elevation:	*Township* / *Range* / *Section (s)*	*Latitude:*	*Longitude:*
6800-6900 ft	2N / 1W / 13 (N half)	Ca. 34°16' N	Ca. 116°56' W
UTM Data *Zone* / *Datum* / *Source* / *Accuracy*		*X coordinate (E)*	*Y coordinate (N)*

Habitat Description: (*plant communities, dominants, associates, substrates/soils, aspects/slope*)
Pebble plain surrounded by arid Jeffrey pine forest.
Other rare species? Arabis parishii, Astragalus leucolobus, Ivesia argyrocoma, Castilleja cinerea, "C. montigena,"

Site Information

Current/surrounding land use: Vacant, short distance S of residential development, short distance N of well-used highway
Visible Disturbances; possible threats: Significant vehicle damage to habitat; site proposed for development

Overall site quality: ??	*Excellent*	*Good*	*Fair*	*Poor*
Comments:				

Determination method:	*Photographs:*	Slides	Prints	Digital
[x] *Keyed in a site reference:*	*Organism*			
[x] *Compared with other specimen*	*Habitat*			
[] *Compared with photo/sketch*	*Diagnostic Features*			
[x] *By knowledgeable individual*	*Other*			
[] *Other method:*	*Permission to duplicate*	yes []	no []	

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Source Code _____ Quad Code _____
Elm Code _____ Occ # _____
Copy to _____ Map Index # _____

Date of Field Work (*Month – Day – Year*) *April 30 2007*

Scientific Name : *Castilleja cinerea*
Common Name :

Species Found?	Yes	No	*If not, why?*	*Total Number of Individuals:*
	xx			Occasional on pebble plain and open forest, with Eriogonum wrightii subscaposum

Is this an existing NDDB occurrence?	Yes	*Occurrence #*	No		**Is this a Subsequent Visit?**	Yes	No	*#s of individuals since last visit* More ?	Fewer ?	Same ?
	xx	24			Also noted in 02	xx				xx

Collected?	Yes	*Coll. #,Museum/Herbarium:*
	xx	11657 / RSA

Reporter:	Scott D. White
Address:	Scott White Biological Consulting 201 North First Ave., No. 102 Upland, Calif. 91786
Phone: **E-mail:**	(909) 949-2686 / scottbioservices@earthlink.net

Plant Phenology Information

dormant	*sterile*	*senescent*
%	%	%
budding	*flowering*	*fruiting*
%	%	%

Animal Information

Age Structure:	*# of adults*	*# of juveniles*	*# of unknown*

Wintering	*Foraging*	*Breeding*	*Roosting*	*Burrow site*	*Other*

Location: (*please attach map*)
San Bernardino Mtns., just north of Big Bear Lake near community of Fawnskin at former "Moon Camp" site

County:	**Quad Name:**	**Landowner:**
San Bernardino Co.	Fawnskin	private

Elevation:	*Township*	*Range*	*Section (s)*	*Latitude:*	*Longitude:*
6800-6900 ft	2N	1W	13 (N half)	Ca. 34°16' N	Ca. 116°56' W

UTM Data	*Zone*	*Datum*	*Source*	*Accuracy*	*X coordinate (E)*	*Y coordinate (N)*

Habitat Description: (*plant communities, dominants, associates, substrates/soils, aspects/slope*)
Pebble plain surrounded by arid Jeffrey pine forest.
Other rare species? Arabis parishii, Astragalus leucolobus, Ivesia argyrocoma, Castilleja cinerea, "C. montigena,"

Site Information

Current/surrounding land use: Vacant, short distance S of residential development, short distance N of well-used highway
Visible Disturbances; possible threats: Significant vehicle damage to habitat; site proposed for development

Overall site quality: ??	*Excellent*	*Good*	*Fair*	*Poor*

Comments:

Determination method:	*Photographs:*	Slides	Prints	Digital
[x] *Keyed in a site reference:*	*Organism*			
[x] *Compared with other specimen*	*Habitat*			
[] *Compared with photo/sketch*	*Diagnostic Features*			
[x] *By knowledgeable individual*	*Other*			
[] *Other method:*	*Permission to duplicate*	yes []	no []	

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California Dept. of Fish & Game
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Sacramento, CA 95814

For office use only
Source Code _____ Quad Code _____
Elm Code _____ Occ # _____
Copy to _____ Map Index # _____

Date of Field Work (Month – Day – Year) April 30 2007

Scientific Name : *Castilleja "montigena"*
Common Name :

Species Found?	Yes	No	If not, why?	Total Number of Individuals:
	xx			Occasional in forest

Is this an existing NDDB occurrence?	Yes	Occurrence #	No		Is this a Subsequent Visit?	Yes	No	#s of individuals since last visit: More ?	Fewer ?	Same ?
			xx		Also seen in 02	xx				xx

Collected?	Yes / No	Coll. #,Museum/Herbarium:

Reporter: Scott D. White
Address: Scott White Biological Consulting, 201 North First Ave., No. 102, Upland, Calif. 91786
Phone / E-mail: (909) 949-2686 / scottbioservices@earthlink.net

Plant Phenology Information

dormant	sterile	senescent
%	%	%
budding	flowering	fruiting
%	%	%

Animal Information

Age Structure:	# of adults	# of juveniles	# of unknown

Wintering	Foraging	Breeding	Roosting	Burrow site	Other

Location: (please attach map)
San Bernardino Mtns., just north of Big Bear Lake near community of Fawnskin at former "Moon Camp" site

County:	Quad Name:	Landowner:
San Bernardino Co.	Fawnskin	private

Elevation:	Township	Range	Section (s)	Latitude:	Longitude:
6800-6900 ft	2N	1W	13 (N half)	Ca. 34°16' N	Ca. 116°56' W

UTM Data	Zone	Datum	Source	Accuracy	X coordinate (E)	Y coordinate (N)

Habitat Description: (plant communities, dominants, associates, substrates/soils, aspects/slope)
Arid Jeffrey pine forest; generally in relatively shaded places
Other rare species? Arabis parishii, Astragalus leucolobus, Ivesia argyrocoma, Castilleja cinerea, "C. montigena,"

Site Information

Current/surrounding land use: Vacant, short distance S of residential development, short distance N of well-used highway
Visible Disturbances; possible threats: Significant vehicle damage to habitat; site proposed for development

Overall site quality: ??	Excellent	Good	Fair	Poor
Comments:				

Determination method:	Photographs:	Slides	Prints	Digital
[] Keyed in a site reference:	Organism			
[] Compared with other specimen	Habitat			
[] Compared with photo/sketch	Diagnostic Features			
[x] By knowledgeable individual	Other			
[] Other method:	Permission to duplicate	yes []	no []	

B.9 - Supplemental Focused Rare Plant Survey (Tim Krantz, June 2008

MOON CAMP TENTATIVE TRACT 16136

SUPPLEMENTAL FOCUSED RARE PLANT SURVEY

Prepared for:
Michael Brandman Associates
621 E. Carnegie Dr., Suite 100
San Bernardino, CA 92408

Prepared by:
Dr. Timothy P. Krantz
Timothy Krantz Environmental Consulting
(a division of Pangaea Nova LLC)
P.O. Box 33
Angelus Oaks, CA 92305

June 29, 2008

Project site location:	USGS Fawnskin 7½-minute topographic map, Township 2 North, Range 1 West, portion of Section 13.
Assessors Parcel Nos.:	0304-082-04 and 0304-091-12, 13 and 21
Owner /Applicant:	Tim Wood, P.O. Box 6820, Big Bear Lake, CA 92315
Principal Investigator:	Dr. Timothy P. Krantz, (909)748-8590

MOON CAMP TENTATIVE TRACT
SUPPLEMENTAL FOCUSED RARE PLANT SURVEY

TABLE OF CONTENTS

MAPS, APPENDICES, AND ATTACHMENTS

MOON CAMP TENTATIVE TRACT 16136
SUPPLEMENTAL RARE PLANT SURVEY

I. EXECUTIVE SUMMARY

A focused rare plant survey of the Moon Camp Tentative Tract 16136 was completed for the property. This survey supplements a general botanical survey of the property conducted by Scott White Biological Consulting, dated August 2007 (White 2007, henceforth, "White survey"). The White survey positively identified one federally-listed plant species—ashy-gray Indian paintbrush (*Castilleja cinerea)*—and four special-status species: Parish's rock-cress (*Arabis parishii*), Big Bear Valley woollypod (*Astragalus* leucolobus), Heckard's paintbrush (*Castilleja montigena*) and silver-haired rattails (*Ivesia argyrocoma*) (Table 1).

This supplemental survey affirmed the presence of these species, and added two additional special-status species: purple monkeyflower (*Mimulus purpureus*) and Sugarloaf phlox (*Phlox dolichantha*); and disaffirmed presence of a list of other special-status and federally-listed plant species deemed to potentially occur on the property, according to White (Table 2).

The White survey had identified 13.81 acres of ashy-gray paintbrush habitat, distributed among four occurrences (Figure 1). This supplemental survey found the two easternmost occurrences to be erroneous. No ashy-gray Indian paintbrush plants occur at those two sites. In addition, the occupied habitat of the middle occurrence was found to cover less than one-third the estimated acreage reported by White, and the western occurrence exhibited a somewhat smaller occupied habitat footprint, but was deemed to generally conform to White's estimated acreage. Altogether, the occupied habitat of ashy-gray Indian paintbrush has been recalculated to approximately 7.71 acres.

II. PROJECT AND PROPERTY DESCRIPTION

The San Bernardino County Planning Department is reviewing an application for Moon Camp Tentative Tract 16136—a proposed 50-lot residential development on the former Moon Camp site in Fawnskin. The project site is on the north shore of Big Bear Lake, in the eastern part of the community of Fawnskin, in unincorporated San Bernardino County. The project site is comprised of about 62 acres, situated on both sides of State Highway 38, between Oriole Lane and Polique Canyon Road (on the Fawnskin USGS 7½' quadrangle map, in the north half of Section 13, Township 2N and Range 1W). The project site slopes from north to south. Elevation ranges from 6,960 feet in the northeastern portion of the site to 6,750 feet near the lakeshore (see Figures 1 and 2).

The project site occurs within an area that is described by the Open Space element of San Bernardino County's General Plan as, "This area includes the entire watershed area of Big Bear Lake, and contains a number of specialized habitat areas, which support a large number of endangered plants and animals (as well as commonly occurring mountain species). Habitat values

here should be maintained, potentially by controlling development to prevent damage to important habitat areas."

III. FOCUSED STUDY / SPECIES OF CONCERN

The White survey was conducted on three dates, April 30, June 7, and August 8, during the 2007 season. The 2007 precipitation season (measured from July 1 to June 30 annually) was a record drought year for the San Bernardino Mountains, with only 11.66 inches of precipitation recorded at Big Bear Dam, compared to an average annual precipitation of 36.00 inches. For this reason, White recommended that additional surveys be accomplished to determine presence or absence of four federally-listed endangered plant species known to occur in montane meadow habitats; and that a subsequent survey should be accomplished on site to determine presence or absence of three federally-listed species known to occur on pebble plain habitat. In addition, there are numerous other special-status plant species potentially occurring in the area , particularly annual species, that would not be identifiable during extreme drought years.

The 2008 precipitation year was average, with 35.29 inches through May this year, and flowering of both annual and perennial species exhibited good anthesis.

This report focuses on determining presence or absence of the following plant species:

Montane Meadow Species:

- San Bernardino bluegrass (*Poa atropurpurea*) (federally endangered);
- Bird-foot checkerbloom (*Sidalcea pedata*) (federal- and state-endangered);
- California dandelion (*Taraxacum californicum*) (federal-endangered); and
- Slender-petaled thelypodium (*Thelypodium stenopetalum*) (federal-endangered).

Pebble Plain Species:

- Bear Valley sandwort (*Arenaria ursina*) (federally threatened);
- Ash-gray Indian paintbrush (*Castilleja cinerea*) (federal-threatened); and
- Southern mountain buckwheat (*Eriogonum kennedyi* var. *austromontanum*) (federal-threatened).

IV. METHODOLOGY

California Department of Fish and Game field survey protocols were followed for each of the target federal-listed species considered to potentially occur on site (CDFG 2000). These protocols basically require that surveys are conducted following these guidelines: (1) conducted during flowering seasons for the special status plants known from the area, (b) were floristic in nature, (c) were consistent with conservation ethics, (d) systematically covered all habitat types on the site, and (e) are well documented by this report.

A walkover of the Moon Camp property was conducted on May 5, 12 and June 6, 2008. The May 5 and 12th surveys focused on the "meadow" habitat along the lakeshore of the Big Bear Lake reservoir; and on identification of any special-status early-blooming annual plant species. The June 6 survey focused on delineation of the ashy-gray Indian paintbrush occurrences; and on identification of late-blooming annuals and perennials.

May surveys for other projects elsewhere in Big Bear Valley (North Baldwin Lake, Pan Hot Springs, Sawmill/Sugarloaf pebble plains, Eagle Point) had indicated that all seven federal-listed species considered to potentially occur on site, according to the White survey, were observed and reliably identifiable at the time of the early May surveys; and the ashy-gray paintbrush and other potential pebble plain species were readily visible, with fully-mature inflorescences, at the time of the June survey.

Positive findings (only pebble plain-associated species, including ashy-gray paintbrush) were precisely located using a Garmin GPS; and GPS data was downloaded and displayed at the Redlands Institute GIS laboratory, and transferred to the EIR consultant, Michael Brandman Associates, to their Palm Springs office; and to the project engineer, Hicks and Hartwick Engineering, in Redlands.

The meadow habitat was carefully walked throughout its narrow distribution along the lakeshore, and any other vernal springs or areas of persistent surface soil moisture were closely examined for potential endangered meadow species; and for the presence of special-status vernal annual species, such as eye-strain monkey-flower (*Mimulus exiguus*) or yellow owl's-clover (*Castilleja lasiorhyncha*).

The White survey reported four ashy-gray paintbrush occurrences, and these were the focus of the June 6 field survey—to confirm those locations and obtain an accurate GPS delineation of the ashy-gray paintbrush distribution and pebble plain habitat on the property.

V. RARE, ENDANGERED OR SENSITIVE SPECIES AND HABITATS (RESULTS)

Endangered Meadow Species

Of the four federally-listed endangered meadow species (Section 3, above), none were identified on site; and they are not considered likely to occur on site. The lakeshore habitat is not indigenous meadow habitat, such as supports the endemic meadow flora elsewhere in Big Bear Valley (Krantz 1979, 1980, 1981a, et alus); rather, it is what this author calls "ruderal" reservoir habitat. Ruderal means, "growing where the natural vegetational cover has been disturbed by man." (Webster's 9th Collegiate Dictionary) In this case, the ruderal reservoir habitat is comprised of a mix of native and non-native, aquatic and semi-aquatic plant species, existing in the zone between the high water level of the reservoir and the draw-down area. Native meadow species sometime occur along the narrow margin just above the high water level, but in the case of the Moon Camp property, this is very limited to a strand of willows (*Salix scouleriana)* and a non-diverse assemblage of common wetland species, such as wiregrass (*Juncus balticus*), yarrow (*Achillea millefolium*) and silver-leaved cinquefoil (*Potentilla anserina*).

No endangered, threatened, or special-status meadow plant species were identified on the Moon Camp property, and the potential for any occurrence of such species is considered to be extremely low.

Pebble Plain Species

The White survey had previously mapped a known pebble plain occurrence on the western portion of the property. This pebble plain contains many of the characteristic species occurring on other pebble plains in Big Bear and Holcomb Valleys, but for the Kennedy's southern mountain buckwheat (*Eriogonum kennedyi* var. *austromontanum*), which is replaced by the closely-related taxon, Wright's matting buckwheat (*Eriogonum wrightii* var. *subscaposum*), and absence of Bear Valley sandwort (*Arenaria ursina*). Kennedy's southern mountain buckwheat and Bear Valley sandwort were used as indicator species of pebble plains by the author, during his original systematic surveys of this endemic plant community (Krantz 1981b, 1983). The lack of both indicator species on the Moon Camp property resulted in this area not being indicated as pebble plain habitat during those initial surveys. However, the area indicated as "pebble plain" within Open Space Lot A has many other species commonly associated with true pebble plain habitat, and has been mapped as such on Figure 3.

Ashy-gray paintbrush (*Castilleja cinerea*) had been mapped as four distinct occurrences by White, but the author, in conjunction with this survey, found that the two eastern occurrences, indicated as occurring behind (north of) Lots 22, and 29-30-31 of the adjacent existing residential tract, do not support any ashy-gray paintbrush plants. There were openings of Wright's matting buckwheat at these locations, with silver rat-tails (*Ivesia argyrocoma*), which is sometimes associated with pebble plains, and Heckard's paintbrush (*Castilleja montigena*) was found on the perimeter of the openings, but no ashy-gray paintbrush exists at those locations. To verify that the author was, indeed, at the proper locations, the areas considered to be concurrent with those areas indicated by White were delineated with GPS data points to confirm the negative findings.

Similarly, the GPS delineation of the middle ashy-gray paintbrush occurrence was found to be less than one-third the size of the occupied habitat indicated in the White survey (0.11-acre actual occupied habitat, consisting of approximately 50 plants). This occurrence corresponds to the

southernmost portions of proposed Lots 47 and 48, adjoining Highway 18. In this case, it appeared that White had mapped the Wright's matting buckwheat distribution, without regard to association with the ashy-gray paintbrush.

Another very small ashy-gray paintbrush occurrence was located at the rear of Lot 49, comprised of 0.01-acre, and consisting of 10 plants.

A single point, representing three ashy-gray paintbrush plants, was located at the vernal spring on the rear portion of Lot 50; and the easternmost portion of the primary pebble plain occurrence on Lot A extends into Lot 50 on its southwestern quarter, comprising about 0.11-acre of occupied habitat.

The primary pebble plain (the westernmost occurrence according to White) was found to be more restricted than indicated by White at the eastern portion of the occurrence on Lots 49 and 50, but generally conformed to the area indicated by White in the area of the central pebble plain (within the proposed rare plant preserve) and toward the western portion of the pebble plain and ashy-gray paintbrush area. The actual occupied habitat of ashy-gray paintbrush on Lots 1 through 5 was calculated to comprise 2.07 acres.

The most exemplary pebble plain habitat on the Moon Camp property was found to conform to the area indicated by White, and would be entirely included within the proposed 4.2 acre conservation easement area. Fencing of the highway frontage has stopped the unauthorized off highway vehicle use that was evidenced on the pebble plain habitat from years past.

To summarize the results of the survey of ashy-gray paintbrush occupied habitat, it is distributed among four occurrences: Lot 47—0.11 acre, Lot 49—0.01 acre, Lot 50—0.11 acre, and the pebble plain and more extensive western occurrence, comprising 4.91 acres within Lot A, 2.07 acres within Lots 1-5, and 0.5 acre within Road A, for a total of 7.7 acres of occupied ashy-gray paintbrush.

Other Special Status Species

Two new special status species were added to the project list: purple monkeyflower (*Mimulus purpureus*) and Sugarloaf phlox (*Phlox dolichantha*). Purple monkeyflower was found to be rather widely distributed on the pebble plain and extending down into the draw to the east, corresponding to the southern half of proposed Lot 50. This draw exhibited vernal spring habitat characteristics; that is, an association of very tiny, ephemeral annuals, such as moss juncus (*Juncus bryoides*), hispid popcorn flower (*Plagiobothrys hispidulus*) and other minute monkeyflower species, such as *Mimulus androsaceus* and *M. suksdorfii*. Most of the purple monkeyflower distribution is included within the proposed 4.2 acre conservation easement area.

Sugarloaf phlox was found to be rather widely distributed on the Moon Camp property in open black oak woodland and under Jeffrey pines. Although restricted to Big Bear and Holcomb Valleys, its regional distribution extends up to the summit of Sugarloaf Mountain south of Big Bear Valley, and as far north as White Mountain, northwest of Holcomb Valley; the taxon is fairly common within its range, and is not considered to be a high priority candidate for listing or more formal protection (Krantz 1983).

Table 1: Special Status Species Occurring on the Moon Camp Property

Arabis parishii	Parish's rock-cress	Fed.: none; S2.1; List 1B.2
Astragalus leucolobus	Bear Valley woollypod	Fed.: none; S2.2; List 1B.2
Castilleja cinerea	Ashy-gray Indian paintbrush	Fed.Threatened; S2.2; List 1B.21B, 2-2-3;
Castilleja applegateii Ssp. *martinii*	Mountain paintbrush	Fed: none; S3.3; List 4.3
Ivesia argyrocoma	Fuzzy rat-tails	Fed: none; S2.2; List 1B.2
Mimulus purpureus	Purple Monkeyflower	Fed: none; S2.2; List 1B.2
Phlox dolichantha	Sugarloaf phlox	Fed: none; S2.2; List 1B.2

Fed. (Federal Rank)
State Rank (S), California Natural Diversity Database
- **S1**: Fewer than six occurrences or fewer than 1000 individuals or less than 2000 acres
- **S1.1**: Very threatened
- **S1.2**: Threatened
- **S1.3**: No current threats known
- **S2**: 6-20 occurrences or 1000-3000 individuals or 2000-10000
- **S3**: 21-100 occurrences or 3000-10000 individuals or 10000-50000 acres
- **S4**: Apparently secure in California; this rank is clearly lower than S3, but factors exist to cause some concern, *i.e.*, there is some threat or somewhat narrow habitat. No threat rank.
- **S5**: Demonstrably secure or ineradicable in California. No threat rank.

Table 2: Threatened or Endangered Species Determined Not to Occur On Site

Federal Threatened—FT
Federal Endangered—FE

Arenaria ursina	Bear Valley sandwort	FT
Eriogonum kennedyi var. *austromontanum*	Southern mountain buckwheat	FT
Poa atropurpurea	San Bernardino bluegrass	FE
Sidalcea pedata	Bird-foot checkerbloom	FE
Taraxacum californicum	California dandelion	FE
Thelypodium stenopetalum	Slender-petaled thelypodium	FE

VI. RECOMMENDATIONS

A. Establishment of a Conservation Easement and Rare Plant Habitat Preserve

A 4.91-acre rare plant preserve is proposed to be established over the pebble plain habitat. As indicated on the Tentative Tract map, this preserve will protect the most exemplary and best quality of the pebble plain habitat on site, including all seven of the special status species observed on site. A detailed management plan for the preserve area shall be adopted and recorded with the conservation easement, specifying the terms and conditions for allowed and disallowed uses within the preserve area.

The conservation easement shall be conveyed to the San Bernardino Mountains Land Trust or other land stewardship entity, together with a management endowment to cover annual costs of maintenance (replacing signs, mending fences). Interpretive literature, signs, and trails shall be developed for homeowners and visitors to provide an understanding of the sensitive resources occurring in the preserve area.

B. Building Envelopes for Paintbrush Habitat

Construction to the rear portions of Lots 47, 48, 49 and 50 shall be restricted by means of building envelopes or building setback lines, to prevent construction in the occupied ashy-gray paintbrush habitat. The rear portions of these lots abut the Highway 38 frontage, in any case, and are thus largely within the Caltrans right of way and required rear lot setbacks. Lot 50 is constrained by a drainage easement along the eastern length of the parcel, by the Caltrans right-of-way along the highway, and by pebble plain resources.

C. Offsite Compensation for Paintbrush Habitat

Off-site compensation for direct and indirect impacts to ashy-gray Indian paintbrush and pebble plain habitat outside of the 4.91-acre Conservation Easement and not protected by building setbacks (2.57 acres) may be accomplished by acquisition and protection of similar or better habitat resources elsewhere in the valley.

There is a limited amount of privately-held ashy-gray paintbrush and pebble plain habitat available for off-site mitigation. One of the best remaining examples of pebble plain habitat in private ownership that may be used to off-set impacts on the Moon Camp property is the "Sugarloaf pebble plain", situated at the northern terminus of Dixie Lee Lane in the unincorporated community of Sugarloaf. This is a 10-acre, high-quality pebble plain. It was fenced and has been protected from off-highway vehicles since the mid-1980s as a mitigation for construction of the Big Bear High School, the intention being to set aside a 2-acre portion of the 10-acre parcel as mitigation for impacts to pebble plains resources for the High School site, and use the remaining eight acres for mitigation of other projects. The parcel was surveyed by Hicks & Hartwick, but was never formally recorded.

The proposal for off-site mitigation of direct and indirect impacts to ashy-gray paintbrush and pebble plains resources on the Moon Camp property is to acquire fee title interest of the entire Sugarloaf Pebble Plain parcel (less a proposed road easement to accommodate the County's

westerly extension of Baldwin Lane); record the parcel, and convey a Conservation Easement to a responsible stewardship entity, such as the San Bernardino Mountains Land Trust (SBMLT). The conveyance of the easement shall be accompanied by a habitat management and monitoring endowment to be deposited into an escrow account for that purpose. In addition to the initial deposit to establish the habitat management account, Homeowner's Association fees shall be collected annually to provide funding in the long-term. Management guidelines, terms and conditions of the conservation easement shall be clearly defined in a Habitat Management Plan, to be recorded with the easement. These management conditions shall include maintenance of fencing and signs, maintenance of the trail across the pebble plain, and development of interpretive materials for the pebble plains resources.

D. Onsite Management

Impacts to the pebble plains habitat and sensitive plants will be minimized by the project's design, which will place the pebble plain area, including ashy-gray Indian paintbrush habitat and all six special-status species, into a permanently protected Conservation Easement. The long-term conservation value of the proposed open space requires active onsite land management to prevent "edge effects" from existing and proposed adjacent land uses.

A habitat management plan (HMP) should be developed for the Conservation Easement area. The HMP shall address management of the rare plant preserve with respect to the following indirect impacts:

- Removal and control of invasive non-native plants;
- Trampling or soil damage caused by foot traffic, vehicles, bicycles, or other recreation;
- Alteration of surface hydrological conditions caused by irrigation on adjacent lots, road runoff, or water diversions installed for erosion control;
- Vegetation clearing, especially for fuel modification to reduce fire hazards to adjacent homes; and

The HMP shall be administered by the SBMLT or other land stewardship entity. Funding for implementation of habitat management measures shall be derived from interest earned from the habitat management endowment and from annual Homeowner's Association fees.

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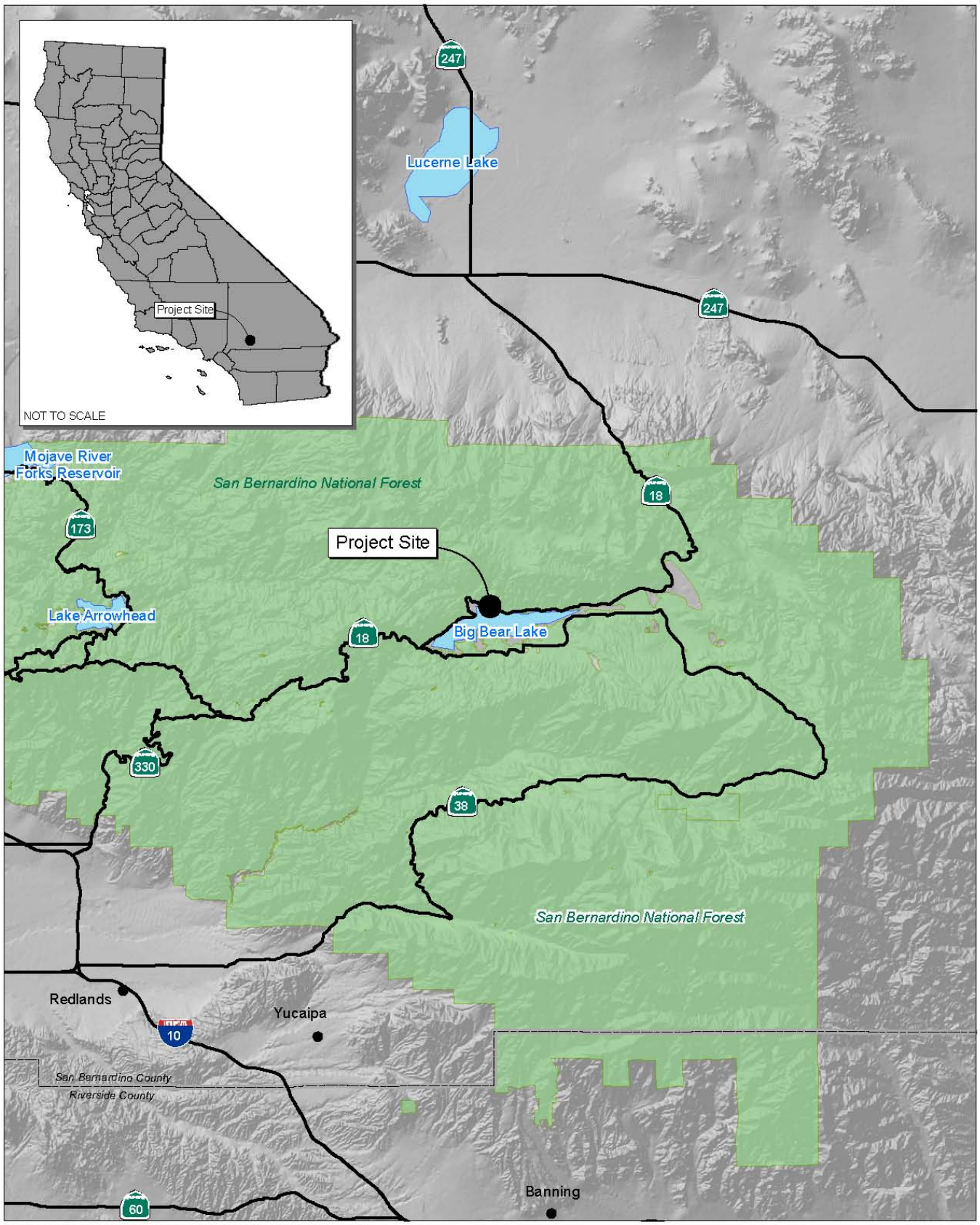
VIII. CERTIFICATION

I hereby certify that the statements furnished above and in the attached exhibits present the data and information required for this supplemental rare plant survey, and that the facts, statements, and information presented are true and correct to the best of my knowledge and belief. Field work conducted for this assessment was performed by me. I certify that I have not signed a nondisclosure or consultant confidentiality agreement with the project applicant or applicant's representative and that I have no financial interest in the project.

DATE: June 29, 2008 SIGNED: 



Source: Census 2000 Data, The CaSIL, MBA GIS 2007.

NORTH

5 2.5 0 5 Miles

Michael Brandman Associates

00520089 • 07/2009 | 1_Krantz_regional.ai

Figure 1
Regional Location Map

MOON CAMP TENTATIVE TRACT 16136
FOCUSED RARE PLANT SURVEY

Source: Hicks & Hartwick, Inc. (July, 2009).

NORTH

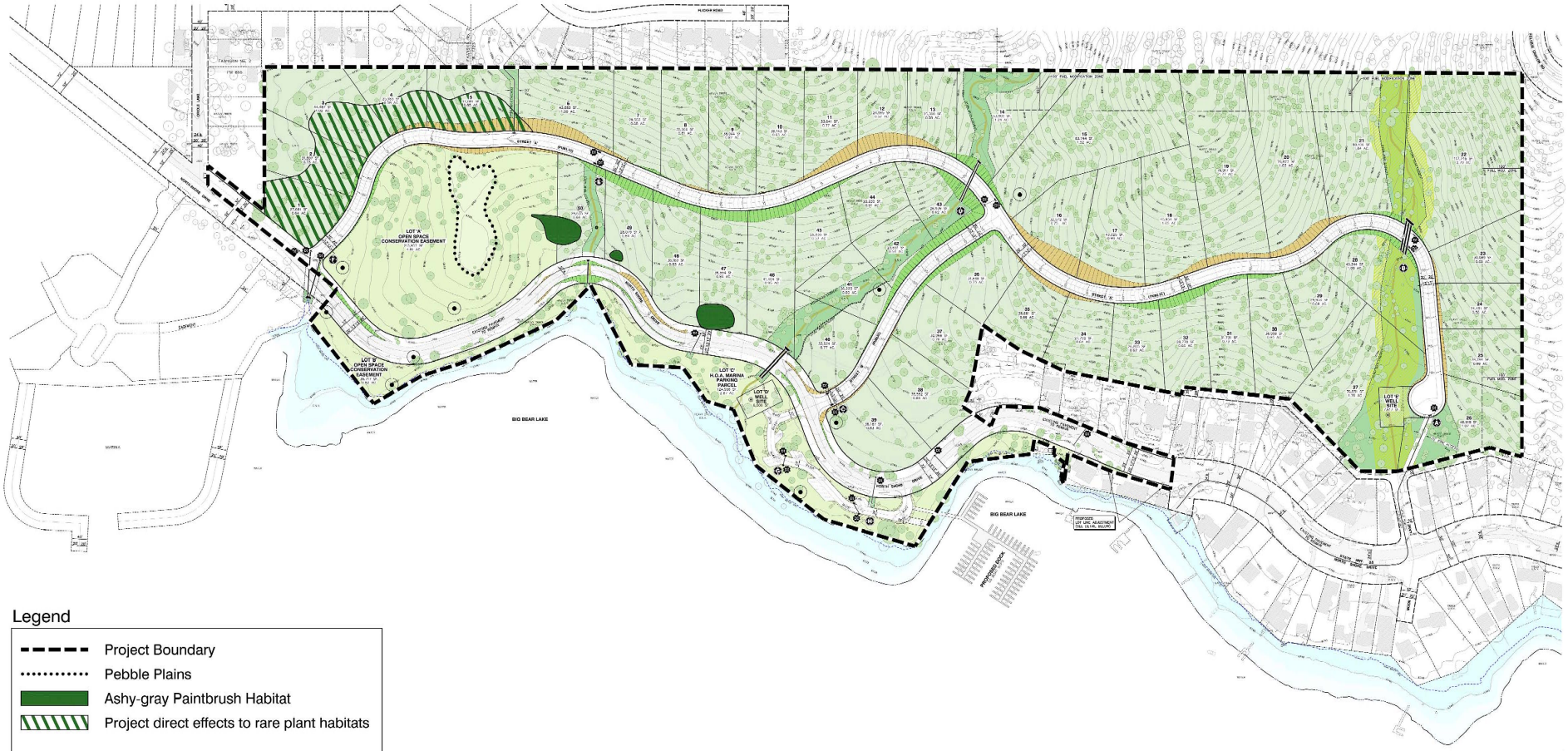
260 130 0 260 Feet

Michael Brandman Associates

00520089 • 07/2009 | 2_Krants_ttm16136.ai

Figure 2
Project Map

MOON CAMP TENTATIVE TRACT 16136
FOCUSED RARE PLANT SURVEY



Source: Hicks & Hartwick, Inc. (July, 2009) & Tim Krantz, Ph.D (July, 2009).

NORTH

260 130 0 260 Feet

Michael Brandman Associates

00520089 • 07/2009 | 3_Krants_Pebble_Plain.ai

Figure 3
Map of Pebble Plain and Ash-gray Paintbrush Habitat

MOON CAMP TENTATIVE TRACT 16136
FOCUSED RARE PLANT SURVEY

B.10 - Southern Rubber Boa Letter Report (Glen Stewart, February 2007)

CALIFORNIA STATE POLYTECHNIC UNIVERSITY, POMONA

Biological Sciences
College of Science

February 18, 2007

Mr. Michael Perry
California Collaborative Solutions
P. O. Box 706
Big Bear City, CA 92314

Dear Mr. Perry,

This letter reports my observations and evaluation of potential habitat for the Southern Rubber Boa (SRB, *Charina bottae umbratica*), a State of California Threatened Species, on two properties in the Big Bear Lake area on February 9, 2007. Accompanied by you, Lisa Kegarice, and Marni McKernan, I walked the 62 acre "Moon Camp Tract" in Fawnskin between about 11:20 AM and 12:20 PM. After lunch, you and I walked about half of the 160 acre "High Timber Ranch" tract in the Moonridge area, also driving to briefly view two other parts of the tract, between approximately 1:45 PM and 3:15 PM. Lisa and Marni accompanied us for a few minutes at the beginning of our walk there.

The Moon Camp Tract in Fawnskin is immediately adjacent to the north shore of Big Bear Lake and has a south-facing exposure at an elevation of about 6,800 feet. Roughly the western third of the tract is bounded by developed property while the eastern two thirds is bounded by Forest Service land on the north and, I believe, undeveloped private property on the east. The tract is quite dry, sloping unevenly upward to the north and east with a couple of shallow, dry ravines in the eastern portion. In the western portion, the vegetation is composed of an open stand of Jeffrey Pine, with a sparse understory of Great Basin Sagebrush and herbaceous plants. Here, there also is an open "pebble plain" habitat. The stands of pine become somewhat more dense in the eastern part of the tract with larger sagebrush shrubs. Throughout the tract, litter and duff are very thin, but there are a few moderately weathered, medium-sized logs scattered around. Significantly, there are no rock outcrops, which generally are used by SRBs for hibernation sites.

My assessment of the Moon Camp Tract is that it is poor SRB habitat. Further, it is outside of the area mapped as potential SRB habitat in the 1985 Forest Service habitat management guide for the SRB, and there have been no sightings of SRBs reported in the area. My recommendations for mitigating development of the tract are that trees and downed logs be allowed to remain in place, to the extent that clearing is not required by the development process, and that a 50 foot setback be maintained along the deepest ravine at the eastern edge of the property. These measures will serve to protect a limited amount of habitat for native wildlife, such as lizards, snakes, salamanders, chipmunks, mice and wood rats, as well as incidental SRBs.

The High Timber Ranch tract is located on Moonridge, immediately west of Sawmill Canyon and Sugarloaf, with developed property existing along the southwestern boundary. It has a north-facing exposure with several shallow ravines draining to the north-northwest and alternating with gently sloping ridges oriented in the same direction. The crowns of the ridges

are rather flat with small "pebble plain" habitats. Elevation at the upper levels of the property is about 7,200 feet. The vegetation is dominated by fairly open stands of Jeffrey Pine, mixed with small Black Oaks in much of the area. A shrubby understory is present in places, but with little sagebrush. Toward the eastern portion of the property there are occasional Pinyon Pines. Leaf litter and duff are moderately thick where there are Black Oaks, and well weathered medium-sized to large logs are common throughout the site. Significantly, again, no rock outcrops were observed.

My assessment of the High timber Ranch tract is that it is marginally suitable as SRB habitat. The northern exposure, denser vegetation, thicker layers of litter and duff, and greater abundance of large logs provide potential cover for SRBs and other forest floor wildlife. However, the site is outside of the area of potential habitat mapped in the 1985 SRB habitat guide, and no SRBs have been reported in the area. Still, I recommend that the portion of the site that I was not able to survey on foot be surveyed for rock outcrops by an experience field biologist, specifically Lisa Kegarice. Mitigations for development should be similar to those recommended for the Fawnskin site, with 50 foot setbacks along the ravines. If any rock outcrops 10 feet or greater in diameter are discovered in future surveys, they also should be protected by 50 foot setbacks.

I hope that the information and assessments I have provided above are sufficient for your purposes. Please find my invoice enclosed. If you have any questions or concerns, however, please do not hesitate to contact me by e-mail (grstewart@csupomon.edu) or phone (909-869-4093).

Sincerely yours,

Glenn R. Stewart, Ph.D.
Professor Emeritus of Zoology
and Environmental Science

TOM DODSON & ASSOCIATES
2150 N. ARROWHEAD AVENUE
SAN BERNARDINO, CA 92405
TEL (909) 882-3612 • FAX (909) 882-7015
E-MAIL tda@tdaenv.com

May 1, 2007

Michael Perry
California Collaborative Solutions
P.O. Box 706
Big Bear City, CA 92314

RE: High Timber Ranch Survey

Dear Mr. Perry,

On February 9, 2007 I accompanied you and Dr. Glenn Stewart on a walking survey of the High Timber Ranch Property in the upper Moonridge area of Big Bear Lake. Dr. Stewart was able to survey approximately one half of the High Timber Ranch site that day and provided a February 18, 2007 letter report (attached) detailing his findings.

In his February 18, 2007 letter report, Dr. Stewart recommended that I survey the remainder of the High Timber site on foot to verify the absence of any rock outcrops.

On March 9, 2007, I surveyed the remainder of the site on foot with you and verified that there are no rock crops within the area of the site that Dr. Stewart did not survey on February 9, 2007.

If you need any additional information, please do not hesitate to contact me.

Sincerely,

Lisa Kegarice
Ecologist / Regulatory Specialist

Csp07/0501LK1 (CCS-193)

Appendix C:
Hydrology Study/Water Quality Management Plan

C.1 - Post Construction Water Findings (AEI CASC, October 2007)

AEI CASC CONSULTING

October 5, 2007

Nancy Ferguson
Michael Brandman Associates
220 Commerce, Suite 200
Irvine, CA 92602

Subject: Tentative Tract 16136, Moon Camp – Post Construction Water Quality Findings

Dear Ms. Fergueson,

We have reviewed the proposed Tentative Tract 16136 Moon Camp Project for Post Construction Best Management Practices (BMPs) which will address Pollutants of Concern for this project while being in compliance with the standards set forth in the document, "San Bernardino County Stormwater Program - Model Water Quality Management Plan Guidance". The purpose of this letter is to provide the results of that review.

PROJECT DESCRIPTION

The Moon Camp Project is a 62.4 acre site proposing 50 subdivided lots for individual home sale. The project also proposes a portion of the project's total acreage, approximately 8.6 acres, for dedication as open space. This project is located on the North Shore of Big Bear Lake, in the City of Big Bear, nestled in the San Bernardino Mountains.

HYDROLOGIC CONDITIONS OF CONCERN

Post-project runoff flows are proposed to generally remain in the existing natural drainage pattern, with culvert crossings occurring at low points along the highway and under interior roads, with ultimate discharge into Big Bear Lake. The Moon Camp Project development will have a minor impact on the overall existing hydrology, effecting primarily minor redirection of natural flows, with the outfall into the lake remaining largely unchanged in both location and quantity.1 Project runoff flows will be carried to the lake via six proposed storm culverts which drain directly into the lake itself; thus, runoff from the project becomes a small part of the vast storage volume in Big Bear Lake.

The Moon Camp Project is proposing minor grading and minimal increases of impervious surfaces on each lot by utilizing stemwall construction and a reduced overall construction footprint. Each lot will further reduce project runoff with the implementation of bioretention BMPs, while roads constructed as part of the project will have runoff directed to bioretention areas. Big Bear Lake has a storage capacity of approximately 73,000 Ac-ft. The project site is estimated to produce runoff equivalent to 0.04 percent of lake volume before development and 0.09 percent of lake volume after development. Thus, project runoff is a miniscule fraction of lake storage.

[1] Tract 16136 - Moon Camp Hydrology & Hydraulic Preliminary Report, July 2007, Hicks & Hartwick, Inc.

Big Bear Lake possesses a controlled release point for project runoff flows at Big Bear Dam, which is controlled by Big Bear Municipal Water District (BBMWD). The primary goal of the BBMWD is maintaining the water level of Big Bear Lake as level as possible given the availability of water and finances. The belief is that a constant water level increases recreational use, stabilizes property value, improves water quality and supports a healthier fish and wildlife environment. BBMWD accomplishes their goal by implementing a water management plan that includes the following: [2]

- Stabilization of Big Bear Lake by managing the amount of water released to the downstream water rights holder
- Watershed/water quality management
- Recreation management
- Bear Valley Dam and Reservoir Maintenance

In many seasons, BBMWD will elect to keep water in the lake and then purchase "in-lieu" water to meet demands of the downstream water rights holder. This "in-lieu" water is purchased from the San Bernardino Valley Municipal Water District and consists of water supplied via the State Water Project.

Releases from Big Bear Dam encounter another controlled release point further downstream at the Seven Oaks Dam, which is controlled by the United States Army Corps of Engineers (USACE). The USACE operates Seven Oaks Dam in tandem with the Prado Dam, located 40.3 miles downstream on the Santa Ana River, by implementing the following strategies: [3]

- Runoff during the early flood season is stored behind Seven Oaks Dam to build a debris pool to protect outlet works;
- Small releases from Seven Oaks Dam are made on continual basis to maintain downstream water supply;
- During a flood, Seven Oaks Dam will store runoff for as long as the reservoir pool at Prado Dam is rising;
- After the flood threat has passed, Seven Oaks Dam will release stored water at a rate which does not exceed the downstream channel capacity; and
- After the flood season, Seven Oaks Dam will be gradually drained and the Santa Ana River will flow through unhindered.

BBMWD and the USACE's regulation of their structures is a function of irrigation demand, availability of water from other sources, and flood control purposes. Because these two organizations and their structures regulate and control discharges to downstream waters, and because runoff from the project is miniscule compared to the volume stored in Big Bear Lake, Hydrologic Conditions of Concern (HCOC) for the Moon Camp Project development are independently minimal and not expected to directly and significantly impact down stream receiving waters.

[2] http://www.bbmwd.org/, Accessed Oct 1, 2007
[3] http://www.spl.usace.army.mil/resreg/htdocs/7oaks.html, Accessed Oct 1,2007

PROJECT RECEIVING WATERS

Big Bear Lake is the primary downstream receiving water for the Moon Camp project. As project runoff flows continue westerly, further downstream receiving waters are the Santa Ana River, Reaches 6 through 1, which ultimately drain to the Pacific Ocean. As Table 1 indicates, one or more of these receiving waters are impaired.

Table 1 – Project Receiving Waters and Impairments

Storm Drains and Receiving Waters	Receiving Water Classification		Primary Hydro Unit Basin No.	303(d) Listing		TMDL Pollutants
	Proximate	Downstream		Listed?	Pollutant Causing Impairment	
Big Bear Lake	Yes	Yes	801.71	Yes	Copper, Mercury & Metals – Source: **Resource Extraction** Noxious Aquatic Plants, Nutrients & Sedimentation/siltation – Source: **Construction/Land Developement** PCBs (Polychlorinated biphenyls) – Source: **Unknown**	Adopted Phosphorus
Santa Ana River (Reach 6)	No	Yes	801.72	No	None	None
Santa Ana River (Reach 5)	No	Yes	801.52	No	None	None
Santa Ana River (Reach 4)	No	Yes	801.25	Yes	Pathogens – Non Point Source	Not Adopted
Santa Ana River (Reach 3)	No	Yes	801.21	Yes	Pathogens – "Dairies"	Not Adopted
Prado Basin Management Zone	No	Yes	802.21	No	None	None
Santa Ana River (Reach 2)	No	Yes	801.11	No	None	None
Santa Ana River (Reach 1)	No	Yes	801.11	No	None	None
Pacific Ocean	No	Yes	801.11	No	None	None

PROJECT POLLUTANTS AND POLLUTANTS OF CONCERN

Table 2 lists the pollutants likely to be associated with the development of the Moon Camp Project and compares these pollutants to pollutants causing stress in local receiving waters. When a project pollutant is the same as a pollutant causing stress in the receiving waters, the San Bernardino County Model Water Quality Management Plan Guidance requires that project runoff be treated for said pollutants utilizing BMPs that are medium to high effectiveness. Pollutants of concern for the Moon Camp project are bacteria/virus, heavy metals, nutrients, and sediments, see Table 2.

Nutrients are of particular concern because a TMDL for phosphorus has been adopted for Big Bear Lake. The current TMDL assigned to Big Bear Lake is 475 lbs per year for Urban Waste Load Allocation for phosphorus. For urban areas, compliance with this TMDL requires compliance with the Municipal separate storm sewer system (MS4) Permit which, in turn, requires implementation of Best Management Practices (BMPs) which treat pollutants of concern at a medium to high level of effectiveness.

Table 2 – List of Project Pollutants [5]

Land Use	Associated Project Pollutants		Is Pollutant 303(d) Listed and / or TMDL for Receiving Water[4]
	Pollutants	Status	
Home Subdivisions of 10 units or more & Streets/Highways/Freeways	Bacteria/Virus	Expected	Yes
	Heavy Metals	Expected	Yes
	Nutrients	Expected	Yes
	Pesticides	Expected	No
	Organic Compounds	Expected	No
	Sediments	Expected	Yes
	Trash and Debris	Expected	No
	O_2 Demanding Substances	Expected	No
	Oil and Grease	Expected	No

PERMIT REGULATIONS

WQMP Requirements

The Santa Ana Regional Water Quality Control Board Order Number R8-2002-0012, NPDES Permit No. CAS618036 (Permit) requires post-construction BMPs to be implemented for new development and significant redevelopment projects, for both private and public agencies. A Water Quality Management Plan (WQMP) is then used to guide the development and implementation of a program to minimize the detrimental effects of urbanization on the beneficial uses of receiving waters, including effects caused by increased pollutants loads and changes in hydrology. [5] Under the permit's requirements, Moon Camp will be required to comply with the WQMP guidance document by implementing the following:

- Incorporate and implement site design BMPs
- Incorporate and implement all applicable source control BMPs

[4] California Regional Water Quality Control Board, 2006 CWA Section Proposed 303(d) List of Water Quality Limited Segments, approved by the USEPA October 25, 2006.

[5] San Bernardino Stormwater Program – Model Water Quality Management Plan Guidance Document, June 2005

- Incorporate or implement Treatment Control BMPs
- Utilize a combination of site design, source control and/or treatment control that addresses all identified pollutants and hydrologic conditions of concern.

TMDL Requirements

The Santa Ana Regional Water Quality Control Board Resolution No. R8-2006-0023, amending the Water Quality Control Plan for the Santa Ana River Basin to Incorporate a Nutrient Total Maximum Daily Load (TMDL) for Dry Hydrological Conditions for Big Bear Lake, was approved by the Office of Administrative Law (OAL) on August 21, 2007. Under this resolution, it appears that the only TMDL implementation provision applicable to the Moon Camp project is the item referring to the MS4 Stormwater Permit:

> **Implementation Task 3.1** – "Waste Discharge Requirements for the San Bernardino County Flood Control and Transportation District, the County of San Bernardino and the Incorporated Cities of San Bernardino County within the Santa Ana Region, Areawide Urban Runoff, NPDES No. CAS 618036 (Regional Board Order No. R8-2002- 0012). The current Order has provisions to address TMDL issues. In light of these provisions, revision of the Order may not be necessary to address TMDL requirements."

The deadline for the Regional Board's update to the MS4 permit is February 29, 2008; however, as noted in Implementation Task 3.1, changes to the MS4 permit may not be necessary to address TMDL issues.

The County of San Bernardino, in compliance with its MS4 permit, has adopted a program that requires new development projects, such as the Moon Camp project, to prepare and implement a Water Quality Management Plan (WQMP) that includes a combination of site design, source control, and treatment control BMPs to reduce the discharge of pollutants and hydrologic conditions of concern resulting from the development. This letter report outlines the site design BMPs, source control BMPs, and treatment control BMPs to be implemented by the Moon Camp project, with said controls to ultimately be documented in a project-specific WQMP. Therefore, by preparing and implementing a WQMP including the prescribed BMPs, the Moon Camp project will be compliant with the County's requirements, and by extension, the MS4 permit and TMDL implementation plan.

PROJECT BMPs

In order to address the project POCs and to reduce the chance of pollutants entering Big Bear Lake, the project will implement a treatment BMP that is effective for all POCs and also prepare a Water Quality Management Plan (WQMP) which shall incorporate the following:

Site Design

Lots in the Moon Camp Project are proposed to be low density with stem wall construction, thereby reducing the area of construction. This criteria in planning reduces the overall footprint of construction and minimizes the imperviousness of each lot.

Source Control

Activity restrictions and property owners' education are crucial to the project's success at preserving water quality. The more informed each property owner is the more likely they are to participate in compliance with imposed water quality standards. Conditions, covenants & restrictions (CC&R) shall be utilized in this project to clearly spell out activities that are not beneficial to water quality and shall not be

allowed on the project site. The CC&Rs will be implemented and maintained by the project's Property Owner's Association (POA).

Treatment Control

Assuming a generous average house footprint of 3,500 sf on a 43,560 sf lot, with an estimated driveway surface of 3,000 sf, produces and impervious percentage of 15. Using this average 15% yields a water quality volume (V_0) of 1.56 Ac-ft for all project lots. Calculating the water quality volume of street runoff at 90% yields a V_0 of 0.37 Ac-ft. Therefore the individual lot treatment BMPs shall be designed to address 1.56 Ac-ft of total water quality volume, approximately 0.03 Ac-ft per lot, while the street treatment BMPS shall address the remaining 0.37 Ac-ft of the water quality volume.

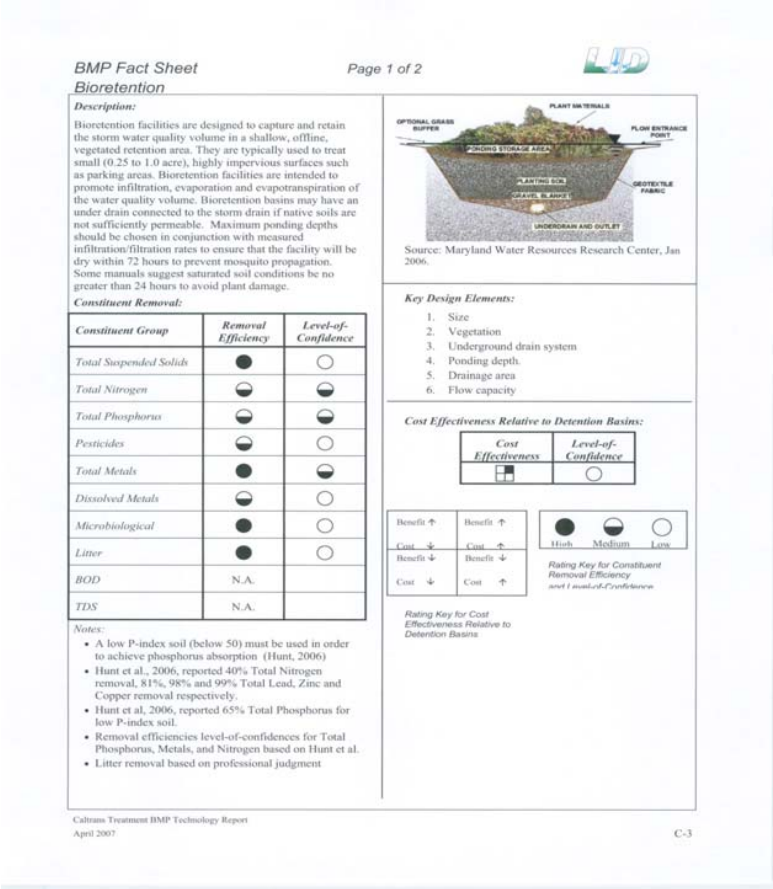
Table 3 –BMPs Level of Treatment [6]

Pollutant of Concern	Treatment Control BMP Categories	
	Biofilter	Filtration
Sediment/Turbidity	H/M	H/M
Nutrients	L	L/M
Organic Compounds	U	H/M
Trash & Debris	L	H/M
Oxygen Demanding Substances	L	H/M
Bacteria & Viruses	U	H/M
Oils & Grease	H/M	H/M
Pesticides (non-soil bound)	U	U
Metals	H/M	H

Bioretention is the selected treatment BMP for the Moon Camp Project and operates similar to that of a biofilter and filtration. The individual lots will each treat their water quality volume prior to discharging from the site, with maintenance provided from the site, with maintenance provided by individual owners. The street runoff will also be treated with bioretention that is located in common areas or on open space lots, with maintenance by the POA.

As shown on Table 3, the combination of a biofilter and filtration will treat the project pollutants of concern at medium to high level of effectiveness. The Caltrans Treatment BMP Technology Report (April 2007) provides results of their full-scale pilot studies performed on various BMPs. The report shows that bioretention will effectively treat nutrients from the project, including nitrogen and phosphorus, at a medium level of effectiveness, see attached fact sheet.

[6] San Bernardino Stormwater Program – Model Water Quality Management Plan Guidance Document, June 2005



BMP Fact Sheet
Bioretention

Page 1 of 2

Description:

Bioretention facilities are designed to capture and retain the storm water quality volume in a shallow, offline, vegetated retention area. They are typically used to treat small (0.25 to 1.0 acre), highly impervious surfaces such as parking areas. Bioretention facilities are intended to promote infiltration, evaporation and evapotranspiration of the water quality volume. Bioretention basins may have an under drain connected to the storm drain if native soils are not sufficiently permeable. Maximum ponding depths should be chosen in conjunction with measured infiltration/filtration rates to ensure that the facility will be dry within 72 hours to prevent mosquito propagation. Some manuals suggest saturated soil conditions be no greater than 24 hours to avoid plant damage.

Constituent Removal:

Constituent Group	Removal Efficiency	Level-of-Confidence
Total Suspended Solids	●	○
Total Nitrogen	◒	◒
Total Phosphorus	◒	◒
Pesticides	◒	○
Total Metals	●	◒
Dissolved Metals	◒	○
Microbiological	●	○
Litter	●	○
BOD	N.A.	
TDS	N.A.	

Notes:
- A low P-index soil (below 50) must be used in order to achieve phosphorus absorption (Hunt, 2006)
- Hunt et al., 2006, reported 40% Total Nitrogen removal, 81%, 98% and 99% Total Lead, Zinc and Copper removal respectively.
- Hunt et al, 2006, reported 65% Total Phosphorus for low P-index soil.
- Removal efficiencies level-of-confidences for Total Phosphorus, Metals, and Nitrogen based on Hunt et al.
- Litter removal based on professional judgment

Source: Maryland Water Resources Research Center, Jan 2006.

Key Design Elements:

1. Size
2. Vegetation
3. Underground drain system
4. Ponding depth
5. Drainage area
6. Flow capacity

Cost Effectiveness Relative to Detention Basins:

Cost Effectiveness	Level-of-Confidence
■	○

Benefit ↑ Cost ↓ | Benefit ↑ Cost ↑
Benefit ↓ Cost ↓ | Benefit ↓ Cost ↑

Rating Key for Cost Effectiveness Relative to Detention Basins

● High ◒ Medium ○ Low

Rating Key for Constituent Removal Efficiency and Level-of-Confidence

Caltrans Treatment BMP Technology Report
April 2007

C-3

The key factor in bioretention success is utilizing soils that have an initial low phosphorus index (P-Index) rating existing in the soil. The P-Index of the soil is the measurement of how much phosphorus already exists in the soil media. The lower the P-Index, the greater the amount of phosphorus the media can capture. The success of this BMP to properly address phosphorous is based on the appropriate fill media being used.

RECOMMENDATION

Therefore, it is our recommendation that the Moon Camp Project development include site design, source control and appropriate treatment control BMPs, such as bioretention, that meet the requirements of the MS4 Permit, TMDL requirements and the requirements of the San Bernardino County Water Quality Management Plan Guidance. The bioretention areas must be situated to capture runoff from the project and must be constructed utilizing an engineered planting and filtering media with a low P-Index.

Best regards,

AEI-CASC Consulting

Melanie E. Sotelo
Design Engineer

Jeffrey D. Endicott, P.E., DEE
Engineering Director
R.C.E. 40658
Expiration 3-31-2009

C.2 - Drainage Study Review for "Hydrology and Hydraulics Preliminary Report" in Conjunction with Development of Tentative Tract 16136 (AEI CASC, May 2007)

AEI CASC ENGINEERING

May 7, 2007

Ms. Nancy M. Ferguson
Regional Manager
Michael Brandman Associates
340 S. Farrell Drive, A210
Palm Springs, CA 92262

Re: Drainage Study Review for "Hydrology and Hydraulics Preliminary Report" in conjunction with the development of Tract 16136 in the County of San Bernardino

Dear Ms. Ferguson:

INTRODUCTION:

Michael Brandman Associates (MBA) in conjunction with the County of San Bernardino requested AEI-CASC Consulting Inc. to provide technical services in order to assist the County in the review of the study "Hydrology and Hydraulics Preliminary Report" for Tract 16136. The study was prepared by Hicks& Hartwick, Inc. and was prepared October 2006.

DRAINAGE REVIEW AND EVALUATION COMMENTS

In general the report performed an existing and proposed hydrology analysis based on the San Bernardino County Flood Control Hydrology Manual. The rational method hydrology was performed for the 100-yr and 10-yr storm events for a drainage area of approximately 181-acres. The drainage area~~consistence~~ of several natural streams that cross the State Highway 18 at various locations along the project limits. The drainage area and project are tributary to Big Bear Lake. The hydrology calculations performed are complete and in accordance with the San Bernardino County Flood Control Hydrology Manual.

Upon completing the review of the Study, we offer the following comments and recommendations:

- The Study included section in the report for "Surface Hydraulics" and "Storm Hydraulics", but calculations were not included. Calculations for these sections should be provided or the sections removed from the report.
- The Proposed hydrology map showed the proposed lot lines and street alignments, but elevations and proposed grading was not shown. To verify the proposed boundaries and conveyance of storm flows a copy of the TTM should be included in the report. Additionally, to assist in the verification of the proposed routing and drainage boundaries, the proposed TTM grading should be added to the proposed hydrology map and the scale increased to show the requested detail.

- Tract 16136 drains to Big Bear Lake, an impaired water body based on the San Bernardino County WQMP manual. The report should include a description of the proposed water quality treatment methods, calculation of treatment volumes and flows, and locations where treatment facilities are proposed. If a Preliminary WQMP report was prepared for Tract 16136 a copy of the report could be included as an appendices to the report.
- It appears that the proposed development will increase the nuisance flows ("Urban Slobber") to two or three of the existing downstream residences. Please describe how this will be mitigated and or minimized with the development.
- The proposed condition hydrology calculations show the developed flows increase the peak flow rate downstream of the project and into Big Bear Lake. Per the San Bernardino County Flood Control District Hydrology manual and guidelines, the increased flow rates should be decreased via detention basins to 90% of the existing condition flow rates or demonstrate that the increase in flow will not impact any downstream facilities. Based on the calculations provided the project does not meet this condition. The exemption of this condition should be discussed and approved by San Bernardino County Flood Control District.
- The proposed condition hydrology map shows that drainage areas "A" and "F" will be conveyed via roadway culverts and natural stream sections through project site. Due to the high flow rates and steep terrain it is recommended that a storm drain system be extended to intercept these drainage flows. The flows should include debris and bulking factor in the analysis. San Bernardino County Flood Control typically requires a bulking factor of 2.0 when a debris analysis is not performed.
- It is recommended that a flood plain analysis and review be performed for Drainage "A". The drainage flows for this stream are shown as 323.0 cfs for the 100-yr storm event (646 cfs for bulked flow condition). Additionally, a debris basin should be considered prior to discharge of flows into an underground storm drain. This recommendation could also be applied to drainage area "F".
- The proposed condition map shows that a storm drain will be extended from the project site (drainage area "A") to Big Bear Lake. The proposed alignment appears to require the acquisition of a drainage easement and/or right-of-way. Please demonstrate the size of required storm drain and that the proposed facility could be constructed through this area. Also, coordination with the affected property owner to provide the above mentioned rights should be demonstrated to the County of San Bernardino. This issue should be discussed in detail since it appears that the development will impact these existing residents.

If there are any questions or clarifications needed please feel free to call me at 951-342-7990 ext. 105

Sincerely,
AEI-CASC CONSULTING, INC.

Aric M. Torreyson, P.E.
Project Manager
AMT/bc

C.3 - Drainage Study Review for "Hydrology and Hydraulics Preliminary Report" in Conjunction with Development of Tentative Tract 16136 (AEI CASC, October 2007)

AEI CASC ENGINEERING

October 12, 2007

Ms. Nancy M. Ferguson
Regional Manager
Michael Brandman Associates
340 S. Farrell Drive, A210
Palm Springs, CA 92262

Re: Drainage Study Review for "Hydrology and Hydraulics Preliminary Report" in conjunction with the development of Tract 16136 in the County of San Bernardino

Dear Ms. Ferguson:

INTRODUCTION:

Michael Brandman Associates (MBA) in conjunction with the County of San Bernardino requested AEI-CASC Consulting Inc. to provide technical services in order to assist the County in the review of the study "Hydrology and Hydraulics Preliminary Report" for Tract 16136. The study was prepared by Hicks& Hartwick, Inc. and was revised July 2007.

DRAINAGE REVIEW AND EVALUATION COMMENTS

In general the report performed an existing and proposed hydrology analysis based on the San Bernardino County Flood Control Hydrology Manual. The rational method hydrology was performed for the 100-yr and 10-yr storm events for a drainage area of approximately 181-acres. The drainage area consists of several natural streams that cross the State Highway 18 at various locations along the project limits. The drainage area and project are tributary to Big Bear Lake. The hydrology calculations performed are complete and in accordance with the San Bernardino County Flood Control Hydrology Manual. Based upon the last review by AEI-CASC Consulting, the drainage report has been partially revised. Please note that no response letter addressing the comments and recommendations by AEI-CASC Consulting (May 7, 2007 letter) has been provided by Hicks& Hartwick, Inc.

Upon completing the review of the Study, we offer the following comments and recommendations:

- The Proposed hydrology map showed the proposed lot lines and street alignments, but elevations and proposed grading was not shown. To verify the proposed boundaries and conveyance of storm flows a copy of the TTM should be included in the report. Additionally, to assist in the verification of the proposed routing and drainage boundaries, the proposed TTM grading should be added to the proposed hydrology map and the scale increased to show the requested detail. *A response to this issue has not been obtained. Clarification should be provided in the report.*

CIVIL ENGINEERING PLANNING SUVEYING ENVIRONMENTAL ENGINEERING
5053 La Mart Drive, Suite 205 ♦ Riverside, CA 92517 ♦ 951.342.-7990♦ 951.275.01 FAX
www.aei-casc.com

- The proposed condition hydrology calculations show the developed flows increase the peak flow rate downstream of the project and into Big Bear Lake. Per the San Bernardino County Flood Control District Hydrology manual and guidelines, the increased flow rates should be decreased via detention basins to 90% of the existing condition flow rates or demonstrate that the increase in flow will not impact any downstream facilities. Based on the calculations provided the project does not meet this condition. The exemption of this condition should be discussed and approved by San Bernardino County Flood Control District. *A response to this issue has not been obtained. Clarification should be provided in the report or response letter format.*
- The proposed condition hydrology map shows that drainage areas "A" and "F" will be conveyed via roadway culverts and natural stream sections through the project site. Due to the high flow rates and steep terrain it is recommended that a storm drain system be extended to intercept these drainage flows. The flows should include debris and bulking factors in the analysis. San Bernardino County Flood Control District typically requires a bulking factor of 2.0 when a debris analysis is not performed. *A response to this issue has not been obtained. Clarification should be provided in the report.*
- A flood plain analysis was performed for the project. The calculations could not be review since a flood plain map showing the cross sections and floodplain widths was not provided. It is recommended that a map showing the above information be included to support the calculations.
- The proposed condition map shows that a storm drain will be extended from the project site (drainage area "A") to Big Bear Lake. The proposed alignment appears to require the acquisition of a drainage easement and/or right-of-way. Please demonstrate the size of required storm drain and that the proposed facility could be constructed through this area. Also, coordination with the affected property owner to provide the above mentioned rights should be demonstrated to the County of San Bernardino. This issue should be discussed in detail since it appears that the development will impact these existing residents. *A response to this issue has not been obtained. Clarification should be provided in the report.*

It should be noted that some of these comments and recommendations could be addressed in the final design stage of the project. It is at the discretion of San Bernardino County to postpone of eliminate any of the comments and recommendations. If there are any questions or clarifications needed please feel free to call me at 951-342-7990 ext. 105

Sincerely,
AEI-CASC CONSULTING, INC.

Aric M. Torreyson, P.E.
Project Manager
AMT/bc

C.4 - Peer Review Memorandum (AEI CASC, March 2007)

AEI-CASC CONSULTING

Memorandum

To: Ms. Nancy Ferguson
MICHAEL BRANDMAN ASSOCIATES

From: Aric Torreyson, P.E.
AEI-CASC Consulting

Date: March 23, 2007

Re: Moon Camp, Tentative Tract Map 1616

Cc: Ceazar Aguilar, **AEI-CASC Consulting**

Comments to the Engineer:

1st PLAN CHECK COMMENTS

HYDROLOGY AND WATER QUALITY TECHNICAL APPENDIX

AEI-CASC Engineering, Inc. has performed a review of the report entitled, "Moon Camp Tentative Tract 16136, Hydrology and Water Quality Technical Appendix", prepared by R.B.F. Consulting and we offer the following comments:

I. Hydrology Study

- In the narrative, please indicate the rainfall values, slope of intensity duration curve, and antecedent moisture condition values used in the analysis.
- Provide a hydrologic soils map and rainfall charts in the report. Show and

label the general location of the project on all maps and charts.

- For the proposed condition rational method calculations, please verify area "J". (The calculations do not match the tables shown in the narrative)
- Consider creating a large scale land use map – figure 6. (i.e. the information is difficult to read)
- Consider replacing the pictures provided for figure 5 with pictures that are more presentable.
- Please provide a FIRM map showing that there will be no existing flood hazards within the project site.
- For consistency in the narrative, please provide the pipe lengths in the tables.
- Please re-format the rational method output files to display all of the input parameters used. (i.e. slope of intensity duration curves and rainfall values)
- Please provide an R.C.E. stamp. (With signature)
- Please see the report for additional comments.
- It is mentioned in the report that the project will increase the run off to Big bear Lake. It should be noted that San Bernardino County Flood Control Hydrology Manual states that developed flows should be mitigated to 90% of existing flow rates. This project may need to provide this mitigation. Coordination with the district may be a required.

II. Hydrology Map

For the existing condition hydrology map it is recommended that the following information be provided:

- Consider creating a large scale map. (The information is difficult to read)
- Existing drainage facilities, in and around the project site, as appropriate. (and label them).
- Contour elevations.
- Add soil type "D" to the hydrologic data table.
- Label the flow path lengths.
- A vicinity map.
- Provide a leader line for all nodal points.
- Node elevations.
- Street names.
- Delete one of the north arrows.

For the proposed condition hydrology map it is recommended that the

following information be provided:

- Consider creating a large scale map. (The information is difficult to read)
- Existing drainage facilities, in and around the project site, as appropriate. (and label them).
- Contour elevations.
- Add a hydrologic data table. (See the existing hydrology map)
- A vicinity map.
- Street names.

III. Hydraulics Study

1. Please provide preliminary pipe sizes for the cross culverts.

Please include a response to comments letter with the next plan check. Failure to do so may result in the return of submittal without plan check.

Sincerely,

AEI-CASC Consulting, Inc.

Aric M. Torreyson, P.E.
Project Manager

C.5 - Water Supply Analysis (California Collaborative Solutions, February 2009)

Nancy @ MBA

California Collaborative Solutions

Water Supply Analysis

Tentative Tract No. 16136

Moon Camp Tract

Fawnskin, Ca

February 11, 2009

P.O. Box 706 Big Bear City, CA 92314 909 586-5819 calcolsol@gmail.com

Tentative Tract No. 16136 --- Moon Camp

Water Supply Analysis

February 11, 2009

Background:

The Moon Camp Tract was originally proposed as a 92 lot subdivision. An existing, onsite domestic water well, FP2, was proposed to provide the water supply for the subdivision. Well FP2 extracts its groundwater from Sub Area "A" of the North Shore Groundwater Basin. During the evaluation of the Water Supply, it was determined that the Perennial Yield of Sub Area "A" is between 14 and 44 acre-feet per year (Geoscience Support Services, December 2, 2003 Focused Geohydrologic Evaluation, Summary of North Shore Subareas, Page 3, copy attached). The Geoscience Focused Evaluation and the DWP's Master Plan (November, 2006, Table 4-2, copy attached) uses the mid-point of this range, 29 acre-feet per year, as Sub Area A's annual yield. However, County Planning Staff stated that they would only support a project that utilized the most conservative 14 acre-feet per year. ALDA Engineering completed a Final Feasibility Study that determined that 50 lots (occupied full-time) could be served by the 14 acre-feet per year (DWP report dated March 6, 2007, Page 2, copy attached). As a result, the Proposed Subdivision was redesigned as 50, one-half acre minimum lots.

During the preparation of the Draft EIR by MBA, it was discovered that the existing Private Well production within Sub Area "A" is 5 acre-feet per year (Table 4-2, DWP Water Master Plan, November, 2006, copy attached). In order to provide 5 acre-feet per year of groundwater yield to the subdivision from a groundwater basin other than Sub Area "A", the developer has drilled Well FP4 in the adjoining Grout Creek Groundwater Basin. The Grout Creek Basin has a Perennial Yield of 280 acre-feet per year; existing private well production of 7 acre-feet per year; and DWP domestic well production of 121 acre-feet per year (Tables 4-1 and 4-2, DWP Water Master Plan, November, 2006, copies attached). Based on this data, the Grout Creek Basin has 152 acre-feet per year of Perennial Yield available.

Water Well FP2:

In order to produce 9 - 14 acre-feet per year from Sub Area "A", Well FP2 would need to pump at a rate of 5.6 – 8.7 gpm. In June, 2008, Well FP2 was cleaned, pump tested and a Title 22 Water Quality Analysis was performed (Geoscience Support Services Report, August 7, 2008, copy attached). Geoscience concluded:

- Well FP2 can be pumped at a rate of 35 gpm on a long-term basis with less than 10 feet of drawdown in the well (Well FP2 is 380' deep and the static water level is 2 feet below ground surface)
- At the 35 gpm discharge rate, pumping interference with the closest private well is expected to be less than 0.3 feet (the nearest private well is approximately 1,000 feet to the east of Well FP2)

- Title 22 Ground water quality data from Well FP2 indicates the water from the well is suitable for municipal supply

The 35 gpm rate from Well FP2 can produce 56 acre-feet per year and supports Geoscience's Focused Evaluation and the DWP Master Plan's conclusion that Sub Area A can produce 29 acre-feet per year.

Water Well FP4:

In December of 2008, Harich Enterprises drilled Well FP4 to a depth of 240 feet. Well FP4 is located in the north-west corner of the proposed subdivision, within the Grout Creek Groundwater Basin. In order to produce 5 acre-feet per year from the Grout Creek Basin, Well FP4 would need to pump at a rate of 3.1 gpm. Harich pump tested Well FP4 at 3.4 gpm (Harich Driller's Report, February, 2009, copy attached) and the County's Special Districts Department obtained Title 22 Water Quality samples for analysis. The results concluded:

- Well FP4 can be pumped at a rate of 3.4 gpm on a long-term basis with 87 feet of drawdown in the well (Well FP4 is 240 feet deep and the static water level is 22 feet below ground surface)

The 3.4 gpm pumping rate from Well FP4 will produce 5.5 acre-feet per year from the Grout Creek Basin.

Water Service Provider:

Based upon the January 24, 2008 letter from LAFCO Executive Officer Kathleen Rollings-McDonald (copy attached), County Service Area 53C can own and operate the Moon Camp Subdivision Water System, including Water Wells FP2 and FP4. Special Districts staff has stated that they would operate the water system with their existing staff. Currently, Special Districts staff operate the Fawnskin Sewer System through CSA 53B.

Conclusion:

The combined pumping capacity of FP2 and FP4 is more than adequate to meet the long term water supply needs of the proposed 50 lot subdivision without adverse impacts to either Sub-Area "A" of the North Shore Basin, or the Grout Creek groundwater basin.

References:

GEOSCIENCE Support Services Inc., 2003. Focused Geohydrologic Evaluation of the Maximum Perennial Yield of the North Shore and Grout Creek Hydrologic Subunit Tributary Subareas. Prepared for the City of Big Bear Lake, Department of Water and Power. December 2, 2003.

ALDA Engineering, Inc., 2007. Final Feasibility Study to Serve the Proposed Moon Camp Residential Development (Tentative Tract No. 16136). Prepared for the City of Big Bear Lake, Department of Water and Power. March 6, 2007.

Camp, Dresser & McKee, Inc., 2006. Water Master Plan. Prepared for the City of Big Bear Lake, Department of Water and Power. November, 2006.

GEOSCIENCE Support Services Inc., 2008. Results of Rehabilitation and Aquifer Testing Moon Camp Well FP-2. Prepared for California Collaborative Solutions. August 7, 2008.

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Focused Geohydrologic Evaluation of the Maximum Perennial Yield of the North Shore and Grout Creek Hydrologic Subunit Tributary Subareas

Prepared for: City of Big Bear Lake Department of Water and Power

December 2, 2003

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- Long-term precipitation records from weather stations within the Big Bear Lake watershed,
- Evapotranspiration data from evaporation pans and weather stations within the watershed,
- Ground water levels, and
- Ground water production.

However, most of the input parameters that are required for a detailed evaluation of the average annual ground water recharge had to be estimated or assumed from data collected outside the Grout Creek and North Shore subunits or outside the Big Bear Lake Watershed due to lack of measured data in the area. Although the assumed values are published and are from reliable sources (i.e. the U.S. Environmental Protection Agency, United States Geological Survey, etc.), they are not specific to the area of interest. Numerous additional monitoring features can be developed to collect the data necessary to refine the ground water recharge estimates. However, priority should be given to the construction of monitoring wells and the development of a reliable ground water level baseline for the tributary subareas.

The results of the ground water recharge analysis for the North Shore Subunit are as follows:

Summary of Ground Water Recharge Results
North Shore Tributary Subareas

Tributary Subarea	Area [acres]	Annual Precipitation [inches]	Average Annual Ground Water Recharge - Low Estimate [acre-ft/yr]	Average Annual Ground Water Recharge - High Estimate [acre-ft/yr]	Average of Ground Water Recharge Estimate Range [acre-ft/yr]
A	247	27.87	14	44	29
B	720	25.45	36	110	73
C	828	23.01	37	107	72
D	558	21.45	22	63	43
E	392	20.01	15	39	27
F	814	18.27	23	66	44

WATER MASTER PLAN

November 2006

Department of Water and Power

Big Bear Lake, California

Mission

The mission of the DWP is to manage our limited water resources through responsible planning in order to assure quality water and essential services in the most cost-effective manner for our current and future customers.

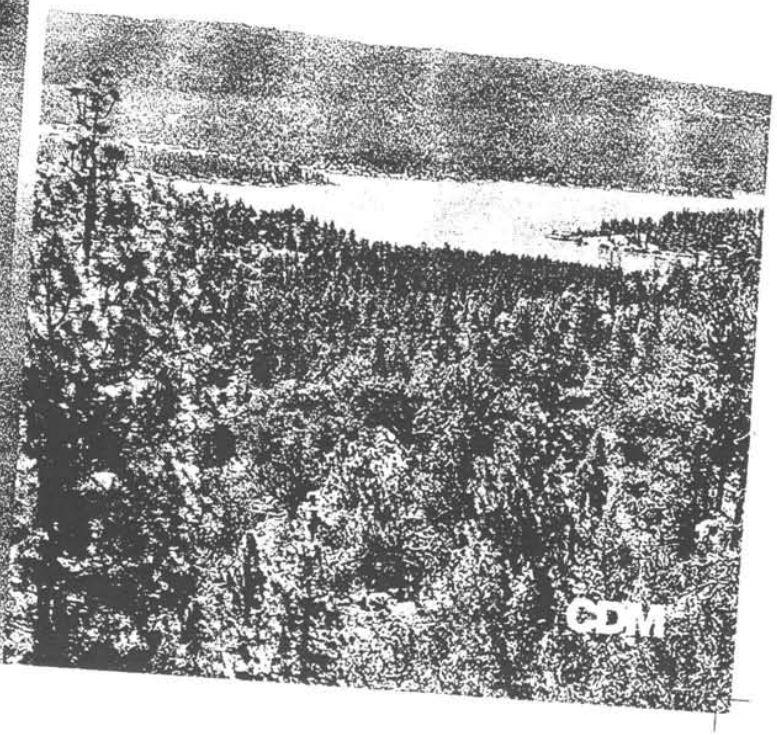

Table 4-1
Current and Projected Annual Demand and Supply Requirements by Pressure Zone

Current and Projected Annual Demand and Supply Requirements by Pressure Zone

Pressure Zone	Current		Full Development			
			25% Full-Time Equivalent		50% Full-Time Equivalent	
	Consumption (ac-ft/yr)	Supply (ac-ft/yr)	Consumption (ac-ft/yr)	Supply (ac-ft/yr)	Consumption (ac-ft/yr)	MDD (gpm)
Erwin Lake / Sugarloaf/ Lake William						
Erwin Lake	87	93	144	154	194	208
Lower Sugarloaf	173	186	225	241	339	363
Upper Sugarloaf	86	92	120	129	201	215
Lake William	28	29	45	48	57	61
Sub-total	374	400	535	572	791	846
Moonridge						
Wolf Booster	31	33	53	56	84	90
Wolf Tank	117	125	162	173	284	303
Lassen	54	58	70	75	104	111
Minton	11	12	17	18	30	32
Traventine	4	5	8	9	14	15
Lower Moonridge	162	173	207	221	286	306
High Timber Ranch	-	-	45	48	64	68
Sub-total	378	405	562	601	865	926
Big Bear Lake						
Town (1)	1,585	1,696	2,370	2,536	2,847	3,046
Conklin Booster	14	15	26	27	41	44
Ironwood Booster	18	19	35	37	48	51
Sub-total	1,617	1,730	2,431	2,601	2,935	3,141
Unmatched	61	65	--	--	--	--
"BIG FOUR" TOTAL:	2,431	2,601	3,527	3,774	4,591	4,913
Fawnskin						
Lower Fawnskin	102	109	172	184	224	240
Upper Fawnskin	19	20	32	35	51	54
Sub-total	121	129	204	219	275	294
Rim Forest	47	50	47	50	47	50
OVERALL TOTAL	2,598	2,780	3,778	4,043	4,913	5,257

(1) Includes Knickerbocker and Ponte pressure zones.

Table 4-2
Maximum Perennial Yield Estimate by Subunit (ac-ft/yr)

Maximum Perennial Yield Estimates by Hydrologic Subunit (ac-ft/yr)			
Subunit	*Perennial Yield Estimate*	*Private Wells Production*	*Available to DWP (ac-ft/yr)*
Grout Creek [1]	280	7	273
Mill Creek	100-175	3	147
Village	250	3	247
Rathbone	1,100	135	965
Division	496	2	494
North Shore			
Sub-Area A [1]	29	5	24
Sub-Area B	71		71
Sub-Area C	70		70
Sub-Area D	43		43
Sub-Area E	27		27
Sub-Area F	44		44
Erwin [2]	890	14	576
TOTAL:	3,400 - 3,475	169	2,981

(1) Assumed to be available to the Fawnskin system only.

(2) Only 576 ac-ft/yr are available to DWP from the Erwin Lake Subunit as an estimated 300 ac-ft/yr are produced by CSD. An additional 14 ac-ft/yr are produced by private wells.

The Perennial Yield from the Grout Creek subunit (280 ac-ft per year) and from Sub A of the North Shore subunit (29 ac-ft per year) is only available to the Fawnskin area. However, only 297 ac-ft per year are available to the DWP as an estimated 12 ac-ft per year are pumped by private wells. Therefore, an estimated 2,684 ac-ft per year are available to DWP to meet the water needs of the "Big Four" system on the south side of the lake. This number assumes that DWP would be able to develop all water sources in the remaining sub-areas in the North Shore subunit given that they are located in United States Forest Service (USFS) lands.

A comparison of supply requirements from Table 4-1 with available local supplies from Table 4-2 indicates that local supplies are capable of meeting current and projected water demands in the Fawnskin system. Local groundwater supplies available to the "Big Four" system are sufficient to meet current water demand of 2,601 ac-ft per year in that system; however, there would be a need to either reduce projected demands through conservation, secure additional supplies, or a combination of both options to meet demands at full development or resulting from conversion to full-time equivalent use. The supply deficit in the "Big Four" is estimated at approximately 1,090 ac-ft per year to meet projected demands at full development assuming the current distribution of full-time equivalent use is maintained; an additional 1,139 ac-ft per year of new supplies would be required to address the impact from demographics.

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March 6, 2007

Mr. Scott Heule, C.E.G./C.H.G., Assistant General Manager
City of Big Bear Lake
Department of Water & Power
41972 Garstin Drive
Big Bear Lake, CA 92315

Subject: **Final Feasibility Study to Serve the Proposed Moon Camp Residential Development** (Tentative Tract No. 16136)

Dear Mr. Heule:

Pursuant to your request, ALDA Engineering Inc. (ALDA) has conducted a feasibility study to determine the necessary system facilities to serve the above referenced development. This report summarizes the results of our investigation and recommendations. This report presents the project background, an assessment of demand and supply issues, the results of the system analysis, and the recommended improvements.

Project Background

The proposed Moon Camp development consists of 50 residential lots to be developed over approximately 62 acres of land. The proposed development is located along North Shore Drive, in the community of Fawnskin on the north side of Big Bear Lake, and ranges in elevation from approximately 6,750 ft. near the lake to approximately 6,950 ft. in the northeasterly quadrant. Individual lots range in size from approximately half an acre to well over two acres depending on location and are anticipated to be developed as single family residential units; average lot size is approximately one and a quarter acres. Because of its location and lot size, some of the residential units are anticipated to be fairly large and potentially exceed 4,000 square feet in size.

Water service to the proposed development will be provided off the Upper Fawnskin pressure zone as the Lower Fawnskin zone would not provide enough static head to provide the development adequate fire flow. DWP's closest pipeline off the Upper Fawnskin system is a single 6-inch diameter pipeline located near the intersection of Flicker Road and Chinook Road, approximately 2,000 ft away from the westerly boundary of the proposed development. Significant transmission improvements in the Fawnskin system are needed to provide fire flow to the proposed tract.

Currently, there are two groundwater production wells within the proposed residential tract. These wells are located in subarea A of the North Shore hydrologic subunit. It is our understanding that these wells will be deeded to the DWP at the time the tract map is recorded. The developer plans to equip the FP-2 well initially to meet the development projected water demands. The DWP will use excess capacity from this well to help reduce reliance on the leased North Shore Well No. 1. Groundwater production capacity from this well is estimated at approximately 100 gallons per minute. The second well (FP-3), located to the east of the FP-2 well, will not be initially equipped by DWP.

Pressure Zone Service Area

Based on the elevation range of the proposed development, 6,750 ft. to 6,950 ft., the development can be served off the Upper Fawnskin pressure zone. This pressure zone has an operating hydraulic grade of 7,113 ft. set by the high water level of the existing 0.25-million gallon Racoon Reservoir. Based on this hydraulic elevation, static pressures would range from a low of 71 psi at the highest point in Lot 18 to 157 psi near the lake. Individual pressure regulators would be required for all lots with static pressures exceeding 80 psi.

Water supply in the Fawnskin area is provided by two groundwater wells in the Lower Fawnskin pressure zone and by slant wells in the vicinity of the Racoon Reservoir. Excess groundwater production from the Lower Fawnskin pressure zone is conveyed to the Upper Fawnskin pressure zone through a booster station located at the Cline Miller Reservoir.

Water Demand

Projected water demand for the proposed development is based on the average consumption rate of 250 gallons per day per connection. Maximum day demand is estimated based on information provided in the recently completed water master plan and it is equivalent to 1.76 times the average day demand. Therefore, the average and maximum day demands for the proposed 50-lot subdivision are estimated as follows:

- Average Day Demand (ADD) = 12,500 gpd or 8.68 gpm
- Maximum Day Demand (MDD) = 15.27 gpm

Based on an estimated average day demand of 12,500 gallons, the annual water demand for the development is estimated at 4.56 million gallons or 14.00 ac-ft per year.

LOCAL AGENCY FORMATION COMMISSION
COUNTY OF SAN BERNARDINO

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DATE: **JANUARY 24, 2008**

FROM: **KATHLEEN ROLLINGS-McDONALD, Executive Officer**

TO: **MATTHEW SLOWIK, Senior Planner**
Advance Planning Division – Land Use Services Department

SUBJECT: **WATER SERVICE TO TENTATIVE TRACT 16136; MOONCAMP RESIDENTIAL SUBDIVISION**

In response to your memorandum, dated January 15, 2008, I would like to provide a description of the three options for water service to this tract and the implications of Government Code Section 56133 to them from the LAFCO staff perspective.

First, Option #1, as previously identified to LAFCO staff, would be for the City of Big Bear Lake Department of Water and Power (hereafter DWP) to extend its infrastructure to serve the entirety of the residential subdivision. As I understand it, a portion of the tract is within the boundaries of the former SoCal Water Company which was condemned and acquired by the City of Big Lake and now operates under the DWP. Pursuant to the provisions of Government Code Section 56133 and LAFCO policies, the DWP has been authorized to continue to expand its services within the former boundaries of the SoCal system without the need for review and approval of LAFCO pursuant to Govt. Code Section 56133, but not beyond. Therefore, a review of the current project with our Special Counsel indicated that Option #1, to extend services by the DWP, was not viable since it would require consideration under §56133 which precludes service outside an agency's sphere of influence. None of the Fawnskin community is within the City of Big Bear Lake sphere of influence.

Please note that there is an area outside the existing DWP boundary defined as the former certificated service area of the SoCal Water Company that is receiving water service from DWP. The agreement between the DWP and Big