An example of a Right to Farm Ordinance (as modified from a notice used by Imperial County):

**IMPORTANT NOTICE FROM THE CITY OF ONTARIO**
**DISCLOSURE REQUIRED BY MUNICIPAL ORDINANCE NO. _____**

**RIGHT TO FARM**

The City of Ontario permits operation of properly conducted agricultural operations within the Agricultural Dairy Preserve. If the property you are purchasing or own is located near agricultural lands or operations or included within an area zoned for agricultural purposes, you may be subject to inconvenience or discomfort arising from such operations. Such discomfort or inconvenience may include, but are not limited to: noises, odors, light fumes, dust, smoke, insects, chemicals, operation of farm machinery (including aircraft) during any 24 hour period, storage and disposal of manure, and the application by spraying or otherwise of chemical fertilizers, Sphere of Influence amendments, herbicides, and pesticides. One or more of the inconveniences described may occur as a result of any agricultural operation which is in conformance with existing laws and regulations and accepted customs and standards. If you live near an agricultural area, you should be prepared to accept customs and standards. If you live near an agricultural area, you should be prepared to accept such inconvenience or discomfort as a normal and necessary aspect of living in an area with a transitional rural character and an active agricultural sector.

The City may also wish to establish a grievance committee to resolve any disputes which may arise between agricultural and urban uses. If so, the following could be added to the notice:

The City of Ontario has established a grievance committee to assist in the resolution of any disputes which might arise between residents to this city regarding agricultural operations. If you have any questions concerning this disclosure please contact the City at _____.

*For this General Plan Amendment, the implementation of a Right to Farm ordinance would function more to promote a good neighbor policy by advising purchasers and users of adjacent properties about the potential problems and inconveniences associated with coexistence with agricultural operations, than to prevent the loss of agricultural resources. The availability of a grievance committee would enhance its utility.*

**BIOLOGICAL RESOURCES**

This discussion of the Sphere of Influence's biological resources is based on field observations conducted on February 7 and 27, 1996, and reviews of existing documents. Supplemental accounts of the distribution and habitat requirements of wildlife are derived from: amphibians and reptiles - Jennings (1987), Stebbins (1985), California Statewide Wildlife Habitat Relationships System (CWHRS 1988); birds - Garrett and Dunn (1981), National Geographic Society (1987), CWHRS (1990); mammals - Ingles (1965), Burt and Grossenheider (1976), Hall and Kelson (1959), and CWHRS (1990).

Field observations were conducted while driving most passable public roads within the area, with frequent stops for observing plants and wildlife, within the limited range of accessibility. Binoculars and a spotting scope were used to observe habitats and wildlife beyond the fences. Aerial photographs[1] provided a basis for mapping of land use conditions and wildlife habitat features of the area.

***Environmental Setting***

The Sphere of Influence occupies a portion of a broad alluvial fan originating from the southern flank of the San Gabriel Mountains, dipping gradually southward to the confluence of Chino Creek and the Santa Ana River at the Prado Flood Control Basin in Riverside County. Cucamonga Creek and Deer Creek, originating 15 miles (24 km.) to the north in the Cucamonga Wilderness of the eastern San Gabriel Mountains traverse and converge within the Sphere of Influence before discharging into the Prado Basin. Recent (quaternary) alluvium underlies the entire valley, including the Sphere of Influence.

According to Küchler's[2] map of the potential natural vegetation of California, the Sphere of Influence area was historically dominated by coastal sage scrub vegetation. A distinct type of coastal sage scrub associated with alluvial fans and drainages along the base of the Transverse and Peninsular ranges called Riversidean sage scrub[3] probably once occupied the area. Cucamonga and Deer Creeks also once supported riparian vegetation; however, these drainages are now completely channelized as they traverse the Sphere of Influence.

Vegetation

The Sphere of Influence is currently dominated by agricultural fields, dairy operations, pasture, and croplands. Remnants of native vegetation are virtually absent. The predominant plant species over large areas are cultivated and irrigated row crops including alfalfa, barley, and strawberries. Grape vineyards were formerly extensive, but those still present appear to be abandoned. Cultivated areas are typically grazed by dairy cows after harvest, and subsequently left fallow. These grazed and fallow fields develop a characteristic ruderal vegetation which is composed of a number of weeds including cheeseweed (*Malva parviflora*), stinging nettle (*Urtica dioica*), common sunflower (*Helianthus annuus*), prickly lettuce (*Lactuca serriola*), wild radish (*Raphanus sativus*), London rocket (*Sisymbrium irio*), tumbleweeds (*Amaranthus* spp.), Russian-thistle (*Salsola tragus*), sow-thistle (*Sonchus oleraceus*), dock (*Rumex* spp.), and other introduced grasses such as bromes (*Bromus* spp.), wild oats (*Avena* spp.), barleys (*Hordeum* spp.), and Bermuda grass (*Cynodon*

1 Blueline prints at scale 1:2,400 (1"=200') dated June 13, 1995, provided by Airborne Systems, Inc. Anaheim, California.

2 Küchler, 1977.

3 Holland, 1986.

*dactylon*). Among native species evident in ruderal areas were sandbur (*Ambrosia acanthicarpa*), horseweed (*Conyza canadensis*), jimsonweed (*Datura wrightii*), and spurge (*Chamaesyce* sp.). Perennially wet drainages such as the one at Vineyard Avenue between Chino and Riverside Avenues support native shrubs and trees of riparian habitats including mule fat (*Baccharis salicifolius*) and willow (*Salix* spp.).

Windrows are prevalent along the internal roadways. The most common tree is blue gum (*Eucalyptus globulus*), although other species are used including olive (*Olea europaea*), pines (*Pinus* spp.), Athel tree (*Tamarix aphylla*), and cypresses (*Cupressus* spp.). These and other trees such as ash (*Fraxinus* spp.), mulberry (*Morus* spp.), Persian walnut (*Juglans regia*), palms (*Washingtonia and Victoria* spp.), and various fruit trees are found in many residential yards and dairy frontages.

Areas of intensive agricultural industry such as feedlots and permanent cattle holding pens are generally devoid of vegetation. A map of the Sphere of Influence showing these areas of intensive agriculture industry, cultivated and fallow fields,[4] and windrows is shown on **Figure 3-1** in the Community Development Chapter. In addition, the figure shows the locations of numerous State mandated dairy manure water retention basins and water impoundments throughout the Sphere of Influence area that were evident on aerial photographs taken June 13, 1995. The extent of areas subject to inundation is expected to be much greater than that which was evident on this late spring date.

Wildlife

The Ontario Sphere of Influence has been greatly altered from natural conditions, under the influence of intensive agriculture and dairy industry. Despite these continuing land use practices, the Sphere of Influence area supports a diversity of wildlife, especially that of birds. This is due, in part, to the relatively level topography that contributes to the accumulation of standing water that attracts numerous migratory birds. The absence of dense urbanization, such as that seen in the Archibald Ranch development, means that these open spaces may still support some of the native animal species that have persisted in the agricultural habitats. During two field surveys in February 1996, 49 bird species and seven mammal species (no amphibians or reptiles) were observed. Numerous other animal species are expected to be present; these are listed in **Appendix C**.

For wildlife, the area can be divided into open water, windrows, agricultural fields, and dairy operations/residences. Virtually all land in the Sphere of Influence is subject to changing patterns of grazing, agriculture, and the associated operations. The habitats for wildlife would not be classified as natural, in the sense of their being pristine. On the contrary, they are intensively managed for agricultural purposes. This does not imply that such agricultural habitats are without value for wildlife. Rather, accelerated urban growth in the region has caused resident and migratory wildlife to become increasingly dependent on these agricultural habitats.

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[4] It should be noted that this distinction is based upon interpretation of aerial photographs taken on June 13, 1995, which represents a 'snapshot' in time, and may not be accurate today. We noted several instances where photographically evident land use patterns in the June 1995 photographs were incorrect as of February 1996, because of subsequent tillage, cultivation, grazing, etc. Rather than combining evidently cultivated versus fallow lands on the map, the reader should note that the land use patterns are cyclic.

*Wildlife in Open Water Bodies*

There are several types of open water bodies throughout the Sphere of Influence. Most dairy operations have a State mandated dairy manure water retention basin, or a series of basins, to receive runoff from the dairy facilities. Other waterbodies include livestock-watering and freshwater irrigation ponds. Flooding in the Sphere of Influence is a noted occurrence, evidently affecting fields and roadways as late as June, in 1995. Most fields under cultivation or left fallow accumulate surface waters in ponds or ditches on their southern boundaries. Both Cucamonga and Deer Creeks, although concrete-lined, frequently support surface water. Impoundments located at the confluence of these creeks support large concentrations of wintering bird species.

There are likely to be few amphibian species due to the lack of vegetation around most open water, frequent disturbance, and the often poor quality of surface water from agricultural practices. No amphibians were observed, but expected amphibian species in wet areas include black-bellied slender salamander (*Batrachoseps nigriventris*), California toad (*Bufo boreas halophilus*), Pacific chorus frog [treefrog] (*Pseudacris regilla*), and introduced bullfrog (*Rana catesbeiana*).

Reptile species are likely to be few in number as well, due to the history of land use. Among those expected or potentially occurring in the Sphere of Influence (**Appendix C**), only one, southwestern pond turtle (*Clemmys marmorata pallida*)[5], is specifically associated with open waters.

The basins, reservoirs, drainages, and low areas subject to flooding are the focus of migratory bird activity in the area. Many of the species observed, and those likely to occur, are attracted to the open water and the basins' shoreline for food, cover from predators, and shelter from the elements. Of the 49 bird species observed during surveys for this report, 21 species were observed in wet areas, including: eared grebe,[6] double-crested cormorant, Canada goose, American wigeon, green-winged teal, cinnamon teal, mallard, gadwall, northern pintail, bufflehead, ruddy duck, common moorhen, American coot, black-necked stilt, American avocet, killdeer, greater yellowlegs, least sandpiper, Bonarparte's gull, ring-billed gull, and California gull. Notable open water areas include the basins adjacent to the Cucamonga and Deer Creek confluence and the larger stock or flood control ponds scattered throughout the area.

Numerous other migratory birds associated with wet areas are expected, as listed in **Appendix C**. Robert McKernan, curator of Ornithology for the San Bernardino County Museum of Natural History, stresses the importance of the entire area for migratory, or overwintering shorebirds, waterfowl, and raptors. The diversity is illustrated by the results of the annual Santa Ana River Valley Christmas Bird Count, which encompasses the southern edge of the Sphere of Influence. The 1993 Count reported 133 bird species and 53,810 individuals.[7] The 1994 Count reported 130 species and 52,075 individuals.[8]

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5 The potential for the occurrence of pond turtles is considered to be quite low in the Sphere of Influence, although that possibility cannot be discounted entirely, in the absence of additional investigation.

6 Scientific names are not given for birds, as the common names are standardized. Scientific names are provided in Appendix C.

7 American Birds, 1994.

8 American Birds, 1995.

Examination of these lists indicates that the majority of the species encountered would be considered migratory or overwintering. The diversity of waterfowl, wading birds, and shorebirds observed in the Santa Ana River Count Circle, and observed or likely to occur in the Sphere of Influence substantiates the importance of this area to migratory birds.

None of the mammals observed or listed in **Appendix C** would be considered dependent upon open water, although most would occasionally use these resources.

*Wildlife in Windrows*

The windrows represent the tallest vegetation in the area. The trees making up these windrows are primarily blue gum (*Eucalyptus*), although other non-native species are used near residences and structures. Among other biological functions, the trees are important as perching and nesting sites for raptors (birds of prey). The Sphere of Influence attracts numerous raptors, especially when resident species, such as red-tailed hawk and American kestrel, are joined in late summer by migratory or wintering species from breeding grounds to the north, with these migrants remaining until spring. Raptors observed during field surveys for this report included turkey vulture, red-tailed hawk, American kestrel, and white-tailed kite. **Appendix C** lists several other raptor species (Families Accipitridae, Falconidae, Tytonidae, Strigidae) that are likely to use the windrows when in the area.

Some mammals may use the trees in the windrows. Those mammals observed during field surveys and which are likely to use the windrows include raccoon (*Procyon lotor*) and Virginia opossum (*Didelphis virginianus*). Not observed but expected in the trees of the windrows are several of the common bat species listed in **Appendix C**.

*Wildlife in Agricultural Fields*

For wildlife, this habitat includes any open field, whether covered with crops, grazed, fallow, or disced. Most of the animal species (other than birds) in the Sphere of Influence are likely to occur in these areas because many of the wildlife species listed in **Appendix C** like dry habitats away from human disturbance. Most of the native species that occurred in the area prior to its conversion to agriculture (assuming the area was covered with coastal scrub as shown on Küchler, 1977) are most likely to occupy these fields, as they are the closest habitat to the natural condition.

While amphibians are expected to be uncommon in these fields, reptile species could be more common. No reptiles were seen during the surveys for this report, possibly due to cold weather. Among the more common reptiles expected are western fence lizard (*Sceloporus occidentalis*), side-blotched lizard (*Uta stansburiana*), southern alligator lizard (*Elgaria multicarinatus*), and gopher snake (*Pituophis melanoleucus*). These are ubiquitous reptile species in California, readily seen in most parts of the state under most conditions, due to their tolerance of a wide range of habitat types and human activity. Most other reptiles potentially occurring in the Sphere of Influence area are likely to be scarce, and the list of potentially occurring reptiles in **Appendix C** is considered optimistic. This is because other reptiles are closely tied to specific natural habitats, such as sage scrub or woodlands which are no longer present in the area; however, some of these scarce reptiles species may persist.

The agricultural fields are important for a number of bird species, as these areas represent the intermediate areas between the windrows and the wet areas. Agricultural

fields are used by raptors as foraging habitat, where small rodents or birds are most likely to be visible. Notably, ferruginous hawks (a sensitive species) often roost on the ground in open fields in the area, especially where vegetation is low. Other raptors, including migrants and winter visitors, may perch in trees or on power transmission structures, or soar over the fields while searching for prey. The number of raptors in the Sphere of Influence is enhanced by the combination of windrows and open fields.

Because drainage patterns of the area allow water to accumulate, the resulting wet fields also attract wading birds that forage on small animals that concentrate in the wet areas. Species observed in wet fields included cattle egret and white-faced ibis. Several other bird species were observed in the agricultural fields (wet or otherwise) during surveys for this report, including Canada goose, American crow, western meadowlark, red-winged blackbird, brown-headed cowbird, and savannah sparrow.

Agricultural fields provide the most suitable habitat for various small mammals, such as mice (several species) and California ground squirrels (*Spermophilus beecheyi*). These are in turn prey for the abundant raptors. Of the seven mammal species observed, all are likely to use the fields for all or a part of their life history needs. Observed mammals include Virginia opossum, California ground squirrel, domestic dog (*Canis familiaris*), raccoon, striped skunk (*Mephitis mephitis*), house cat (*Felis catus*), and cattle (*Bos* sp.).

*Wildlife Associated with Dairy Operations/Residences*

The concentration of human and livestock activity around structures displaces many of the animal species that are found elsewhere in the Sphere of Influence area. The animals likely to be observed in such areas are usually non-native, or more common native species that are tolerant of human activity. The most common species observed around structures during surveys for this report were house sparrow, rock dove, European starling, cattle, domestic dogs, and cats. Other less common species observed were house finch, cattle egret, Brewer's blackbird, and brown-headed cowbird.

In addition to the species observed near human dwellings, there are others (not observed) that are likely to be present. These include western fence lizard, Norway rat (*Rattus norvegicus*), and house mouse (*Mus musculus*). The Norway rat and house mouse are non-native species that do not normally thrive outside of human activity. They are especially common near agricultural facilities where they feed on grains, produce, and garbage.

***Sensitive Biological Resources***

Sensitive biological resources include plant, animal, or natural community which falls into any of the following categories:

- State- and/or Federally-listed Endangered, Threatened (or Rare) plants or animals;
- State or Federal candidates for listing;
- California Species of Special Concern;
- Special Plants and Special Animals of California;[9]
- Plant species included in "The Inventory of Rare and Endangered Vascular Plants of California";[10]

9 CDFG, 1993 and 1992, respectively.

10 Skinner and Pavlik, 1994.

- Declining or uncommon species as recognized by regional biologists familiar with the distributions and population trends of plants and animals.

The present analysis of sensitive biological resources includes a review of the California Natural Diversity Data Base (CNDDB) Rarefind report[11] for the Ontario quadrangle. This was supplemented with examination of published accounts of sensitive plants and animals, including: plants - Skinner and Pavlik (1994), CDFG (1996); wildlife - Jennings and Hayes (1994), USFWS (1994), CDFG (1994), Remsen (1978), and Williams (1986). In addition, lists of plants and animals generated from field investigations were cross-referenced with lists of sensitive plants and wildlife (CDFG, 1994; CDFG, 1996) to determine if any of the species observed or potentially occurring in the Sphere of Influence area are considered sensitive.

Sensitive Plant Species

The CNDDB Rarefind report for the Ontario quadrangle[12] identified the presence of many-stemmed dudleya (*Dudleya multicaulis*) and Santa Ana River woolly-star (*Eriastrum densiflorum* ssp. *sanctorum*) in the region. Neither of these sensitive species is expected to occur in the Sphere of Influence due to the history of land alteration and consequent lack of habitat for these species.

Sensitive Animal Species

Of special concern for the Sphere of Influence is the potential for the presence of Delhi sands flower-loving fly (*Raphiomidas terminatus abdominalis*); a Federally Endangered Species. This species was listed on September 23, 1993, because extinction within the foreseeable future is likely as the present distribution of the Delhi sands flower-loving fly encompasses less than 2 percent of its former range.[13] Only six sites totaling less than 45 acres are known to be occupied, and only one of these is permanently protected.

The former range of the species (coinciding with the Delhi sands soils formation) has been divided into three Recovery Units (RUs): Jurupa, Colton, and Ontario. The Sphere of Influence occupies approximately 30 percent of the Ontario RU for the Delhi sands flower-loving fly. The Draft Recovery Plan for the fly[14] makes the following statements about the Ontario RU:

> *"This area historically contained the largest block of the Colton Dunes (the Delhi sands formation); however, the majority of the area has been converted to agriculture, or developed for commercial and residential projects."*
>
> *"Based upon museum specimens, one of the populations containing the highest densities of Delhi sands flower-loving fly was located at Mira Loma in the Ontario RU."*

11 CDFG, 1995.

12 CDFG, 1996.

13 USFWS, 1996.

14 USFWS, 1996.

> *"The majority of Delhi sands flower-loving fly habitat in the Ontario RU has been eliminated by long-standing agricultural land uses. Recent actions that have eliminated the animal and its habitat include commercial and residential development, dumping of cow manure, and invasive exotic vegetation."*

Despite the conversion of most of the Sphere of Influence into human uses, the Draft Recovery Plan[15] indicates that restorable habitat is found along the Southern California Edison (SCE) powerline right-of-way, a shallow wash in southwestern Ontario, and a few other locations within the Ontario RU. The planned recovery of the Delhi sands flower-loving fly is partially dependent upon the restoration, management, and preservation of such areas.

The status of the Delhi sands flower-loving fly in the Sphere of Influence is uncertain. Given the almost complete conversion of the area to agricultural uses, it is likely that populations of the species do not persist in the area. However, the site should be surveyed by recognized (and permitted) experts on the Delhi sands flower-loving fly in the appropriate season, as is recommended in the Draft Recovery Plan for this species. The goals of such surveys would be to identify suitable habitat, locate individuals if present, and identify sites for restoration.

The City of Ontario has prepared written comments on the Draft Recovery Plan for the Delhi sands flower-loving fly. The City's position is best summarized by referring to the concluding statement in the comments which states:

> *The City of Ontario will work with the USFWS to identify effective mitigation for the protection of the endangered species and the proposal for downlisting the classification of the Delhi sands flower-loving fly. However, we believe the process must allow for development activities to proceed in accordance with City policies and regulations subject to appropriate mitigation measures.*

The City will provide further comment on the final recovery plan when it becomes available.

The CNDDB (1995) report for the Ontario and Guasti quadrangles which encompass the Sphere of Influence area also includes the following sensitive wildlife species:

- **San Diego horned lizard**
  (*Phrynosoma coronatum blainvillei*) - California Species of Special Concern
- **Western yellow-billed cuckoo**
  (*Coccyzus americanus occidentalis*) - State Endangered
- **California gnatcatcher**
  (*Polioptila californica*) - Federally Threatened

Western yellow-billed cuckoo is not expected in the Sphere of Influence, as the species occupies riparian forests with willows, cottonwoods, and a dense understory. California gnatcatcher is found only in coastal sage scrub. These habitat types do not exist in the Sphere of Influence area. The reports of these species are either historic (museum records), or are from other locations within the Ontario quadrangle. San Diego horned lizard has a

15 USFWS, 1996.

slight potential for occurrence, especially along undeveloped or less disturbed portions of the Sphere of Influence.

A review of the CNDDB reports for other nearby quadrangles (Corona North and Prado Dam) revealed another sensitive wildlife species with a slight potential for occurring in the study area:

- **Burrowing owl**
  (*Athene cunicularia*) – California Species of Special Concern

There is some habitat suitable for this species within the Sphere of Influence. Burrowing owl is known to inhabit portions of the adjacent Chino Airport. The numerous other species listed in these additional quadrangles are unlikely in the Sphere of Influence, due to the absence of suitable habitat.

The CNDDB does not necessarily include all sensitive wildlife species that could be present in the area. Observations made during field surveys for this report as well as observations by other biologists indicate that several sensitive bird species do occur in the area. The sensitive bird species reported for the area but not included in the CNDDB reports are listed in **Table B-1**. A brief habitat description for these species is provided therein, along with official status. Expected abundance data are included in **Appendix C**. Note that there are sensitive species listed in **Appendix C** that are not included in **Table B-1**. This is because those species are likely to occur in the area, given their known ranges and habitat preferences, but have not been reported in any available reference.

***Summary of Findings for Biological Resources***

Most environmental documents prepared for the Sphere of Influence portray the area as having little or no biological value, due to the history of agriculture and lack of native vegetation. To the contrary, field surveys and the experience of numerous observers with the area indicate that the Sphere of Influence is part of an important migratory and wintering bird area. Numerous raptor, waterfowl, wading bird, and shorebird species use the area's open water, wet fields, and windrows. Throughout California, such areas, where water can accumulate seasonally due to topography, have been dramatically reduced by conversion to urban development. Consequently, many of the animal species associated with these areas are considered sensitive. Many sensitive species have been reported from the area.

Of special concern is the potential presence of Delhi sands flower-loving fly. Because the Sphere of Influence encompasses nearly a third of one of the designated recovery units for this species,[16] focused surveys to determine the species' status in the area are recommended. There is opportunity for the City to coordinate with USFWS to restore lands under utility ROWs or in certain parts of the Sphere of Influence for the Delhi sands flower-loving fly. The mechanism to achieve down-listing of the species is to recover viable numbers of them, and ensure their ability to survive in the recovered areas, which presumably could include a portion of the Sphere of Influence.

16 USFWS, 1996.

**OBSERVED AND EXPECTED FAUNA OF THE SPHERE OF INFLUENCE, ONTARIO, CALIFORNIA**

***Legend***

Abundance

c = common – observed or expected throughout the area in high numbers
f = fairly common – observed or expected in moderate numbers over most of the area
u = uncommon – observed or expected in low numbers in a portion or all of the site
o = occasional – observed or expected only sporadically on the site
s = scarce – observed or expected only rarely
+ = presence noted by direct observation, identification of vocalization, or observation of diagnostic sign (tracks, scat, burrows, etc.)
* = non-native

Seasonality (Birds Only)

R = resident – expected on the site any time of the year
S = summer – present only during summer nesting season
W = winter – present only during winter; nesting occurs elsewhere
V = visitor – nests off-site but may occur on the site from areas nearby
T = transient – seen in migration; unlikely to nest in the region

Status Codes

F2 = Federal Candidate, Category 2 for listing as endangered or threatened
F3c = Federal Candidate, Category 3c
CSC = California Species of Special Concern (CDFG)
CP = California Fully Protected Species
CT = California Threatened
SA = CDFG Special Animal

| FAMILY<br>*Scientific Name* | *Common Name* | *Abundance* |
|---|---|---|
| **AMPHIBIANS** | | |
| PLETHODONTIDAE - Slender Salamanders | | |
| *Batrachoseps nigriventris* | black bellied slender salamander | o |
| *Batrachoseps pacificus* | Pacific slender salamander | s |
| PELOBATIDAE - Spadefoots | | |
| *Scaphiopus hammondi* | Hammond's spadefoot (CSC, F2) | s |
| BUFONIDAE - True Toads | | |
| *Bufo boreas halophilus* | California (western) toad | o |
| HYLIDAE - Treefrogs | | |
| *Pseudacris regilla* | Pacific treefrog | o |
| RANIDAE - True Frogs | | |
| * *Rana catesbeiana* | bullfrog | o |

| FAMILY<br>*Scientific Name* | *Common Name* | *Abundance* |
|---|---|---|
| **REPTILES** | | |
| EMYDIDAE - Box and Water Turtles | | |
| *Clemmys marmorata pallida* | southwestern (western) pond turtle (CSC, F2) | s |
| IGUANIDAE - Iguanids | | |
| *Sceloporus occidentialis biseriatus* | Great Basin (western) fence lizard | f |
| *Uta stansburiana hesperis* | California side-blotched lizard | f |
| *Phrynosoma coronatum blainvillei* | San Diego coast horned lizard (CSC, F2) | s |
| SCINCIDAE - Skinks | | |
| *Eumeces s. skiltonianus* | western skink | o |
| *Eumeces gilberti* | Gilbert's skink | s |
| TEIIDAE - Whiptails | | |
| *Cnemidophorus tigris multiscutatus* | coastal (western) whiptail (F2) | s |
| ANGUIDAE - Alligator Lizards | | |
| *Elgaria multicarinatus webbi* | San Diego (southern) alligator lizard | o |
| ANNIELLIDAE - California Legless Lizards | | |
| *Anniella p. pulchra* | silvery (California) legless lizard (CSC, F2) | s |
| LEPTOTYPHLOPIDAE - Slender Blind Snakes | | |
| *Leptotyphlops humilis* | western blind snake | s |
| COLUBRIDAE - Colubrids | | |
| *Diadophis punctatus modestus* | San Bernardino ringneck snake (F2) | s |
| *Masticophis flagellum piceus* | red coachwip (red racer) | s |
| *Coluber constrictor mormon* | western yellow-bellied racer | s |
| *Pituophis melanoleucus annectens* | San Diego gopher snake | u |
| *Salvadora hexalepis virgultea* | coast (western) patch-nosed snake (CSC, F2) | s |
| *Lampropeltis getulus californiae* | California (common) kingsnake | o |
| *Rhinocheilus l. lecontei* | western long-nosed snake | s |
| *Tantilla planiceps* | California black-headed snake | s |
| *Trimorphodon biscutatus vandenburghi* | California lyre snake | s |
| *Arizona elegans occidentalis* | California glossy snake | s |
| VIPERIDAE - Vipers | | |
| *Crotalis viridis helleri* | southern pacific (western) rattlesnake | s |

| FAMILY<br>*Scientific Name* | *Common Name* | *Abundance* |
|---|---|---|
| **BIRDS**[1] | | |
| PODICIPEDIDAE - Grebes | | |
| *Podilymbus podiceps* | pied-billed grebe | f,W/o,S |
| + *Podiceps nigricollis* | eared grebe | f,W |
| *Aechmophorus occidentalis* | western grebe | o,W |
| PHALACROCORACIDAE - Cormorants | | |
| + *Phalacrocorax auritus* | double-crested cormorant (CSC) | f,W/o,S |
| ARDEIDAE - Bitterns and Herons | | |
| *Ardea herodias* | great blue heron (SA) | f,W/o,S |
| *Ardea alba* | great egret (SA) | f,R |
| *Butorides virescens* | green heron | u,W/s,S |
| + *Bubulcus ibis* | cattle egret | f,R |
| + *Egretta thula* | snowy egret (SA) | f,R |
| THRESKIORNITHIDAE - Ibis | | |
| + *Plegadis chihi* | white-faced ibis (CSC, F2) | s,W |
| ANATIDAE - Swans, Geese and Ducks | | |
| *Anser albifrons* | greater white-fronted goose | o,T |
| *Anser caerulescens* | snow goose | o,W/T |
| + *Branta canadensis* | Canada goose | f,W |
| + *Anas americana* | American wigeon | c,W |
| + *Anas crecca* | green-winged teal | f,W |
| + *Anas platyrhynchos* | mallard | c,R |
| + *Anas strepera* | gadwall | u,W |
| + *Anas acuta* | northern pintail | o,W |
| *Anas discors* | blue-winged teal | s,W |
| + *Anas cyanoptera* | cinammon teal | f,T/o,S |
| + *Anas clypeata* | northern shoveler | f,W |
| *Aythya valisineria* | canvasback | o,W |
| + *Aythya collaris* | ring-necked duck | f,W |
| *Aythya americana* | redhead | s,W |
| *Ayhtya affinis* | lesser scaup | o,W |
| + *Bucephala albeola* | bufflehead | o,W |
| *Mergus serrator* | red-breasted merganser | u,W |
| + *Oxyura jamaicensis* | ruddy duck | f,W/o,S |
| CATHARTIDAE - New World Vultures | | |
| + *Cathartes aura* | turkey vulture | o,W/f,T |

[1] Some bird species names may be strange to those familiar with avian taxonomy. This is because the most recent (1995) supplement to the AOU checklist (AOU 1983) includes several changes which have been incorporated into this appendix.

| FAMILY<br>*Scientific Name* | *Common Name* | *Abundance* |
|---|---|---|
| **BIRDS (cont.)** | | |
| ACCIPITRIDAE - Hawks | | |
| + *Elanus leucurus* | white-tailed kite (SA, CP) | o,R |
| *Circus cyaneus* | northern harrier (CSC) | s,W |
| *Accipiter striatus* | sharp-shinned hawk (CSC) | u,W/T |
| *Accipiter cooperi* | Cooper's hawk (CSC) | s,W/o,T |
| *Buteo lineatus* | red-shouldered hawk | u,R |
| + *Buteo jamaicensis* | red-tailed hawk | f,R |
| *Buteo swainsoni* | Swainson's hawk (CT) | s,T |
| *Buteo regalis* | ferruginous hawk (CSC, F2) | o,W |
| FALCONIDAE - Falcons | | |
| + *Falco sparverius* | American kestrel | f,R |
| *Falco columbarius* | merlin (CSC) | s,W/T |
| *Falco mexicanus* | prairie falcon (CSC) | s,W |
| PHASIANIDAE - Grouse and Quail | | |
| *Callipepla californica* | California quail | u,R |
| RALLIDAE - Rails, Gallinules | | |
| *Rallus limicola* | Virginia rail | s,W |
| *Porzana carolina* | sora | o,W |
| + *Gallinula chloropus* | common moorhen | u,W/s,R |
| + *Fulica americana* | American coot | c,R |
| RECURVIROSTRIDAE - Stilts and Avocets | | |
| + *Himantopus mexicanus* | black-necked stilt | o,W/f,T |
| + *Recurvirostra americana* | American avocet | o,W/u,T |
| CHARADRIIDAE - Plovers | | |
| *Pluvialis squatarola* | black-bellied plover | u,W |
| + *Charadrius vociferus* | killdeer | c,R |
| *Charadrius monatnus* | mountain plover (CSC, F2) | s,W/T |
| SCOLOPACIDAE - Sandpipers and Phalaropes | | |
| + *Tringa melanoleuca* | greater yellowlegs | u,W |
| *Acutis macularia* | spotted sandpiper | o,W |
| *Catoptrophorus semipalmatus* | willet | o,W |
| *Numenius americanus* | long-billed curlew (CSC) | o,W |
| *Limosa fedoa* | marbled godwit | u,W |
| + *Calidris marui* | western sandpiper | u,T/o,W |
| + *Calidris minutilla* | least sandpiper | f,W/c,T |
| + *Limnodromus scolopaceus* | long-billed dowitcher | f,W |
| *Gallinago gallinago* | common snipe | o,R |
| LARIDAE - Gulls and Terns | | |
| + *Larus philadelphia* | Bonaparte's gull | f,W |

| FAMILY<br>*Scientific Name* | *Common Name* | *Abundance* |
|---|---|---|
| **BIRDS (cont.)** | | |
| LARIDAE - Gulls and Terns (cont.) | | |
| + *Larus delawarensis* | ring-billed gull | c,W/o,S |
| + *Larus californicus* | California gull (CSC) | c,W/o,S |
| *Sterna caspia* | Caspian tern (SA) | s,W/u,S |
| *Sterna forsteri* | Forster's tern (SA) | f,R |
| COLUMBIDAE - Doves and pigeons | | |
| + *Columba livia* | rock dove | c,R |
| + *Zenaida macroura* | mourning dove | f,R |
| *Streptopelia chinensis* | spotted dove | u,R |
| CUCULIDAE - Cuckoos | | |
| *Geococcyx americanus* | greater roadrunner | s,R |
| TYTONIDAE - Barn Owls | | |
| *Tyto alba* | barn owl | o,R |
| STRIGIDAE - Typical Owls | | |
| *Bubo virginianus* | great-horned owl | o,R |
| *Athene cunicularia hypugea* | western burrowing owl (CSC, F2) | s,R |
| CAPRIMULGIDAE - Goatsuckers (Nightjars) | | |
| *Chordeiles acutipennis* | lesser nighthawk | s,S/s,T |
| APODIDAE - Swifts | | |
| *Chaetura vauxi* | Vaux's swift | s,W/o,T |
| *Aeronautes saxatalis* | white-throated swift | u,W |
| TROCHILIDAE - Hummingbirds | | |
| *Archilochus alexandri* | black-chinned hummingbird | o,S |
| *Calypte costae* | Costa's hummingbird | o,T |
| *Calypte anna* | Anna's hummingbird | u,R |
| *Selasphorus rufus* | rufous hummingbird | o,T |
| *Selasphorus sasin* | Allen's hummingbird | o,T |
| ALCEDINIDAE - Kingfishers | | |
| *Ceryle alcyon* | belted kingfisher | o,W |
| PICIDAE - Woodpeckers | | |
| *Melanerpes formicivorus* | acorn woodpecker | o,R |
| *Sphyrapicus ruber* | red-breasted sapsucker | s,W |
| *Picoides nuttallii* | Nuttall's woodpecker | o,R |
| *Picoides pubescens* | downy woodpecker | o,W/s,S |
| *Colaptes auratus* | northern flicker (red-shafted) | u,R |

| FAMILY<br>*Scientific Name* | *Common Name* | *Abundance* |
|---|---|---|
| **BIRDS (cont.)** | | |
| TYRANNIDAE - Tyrant Flycatchers | | |
| *Tyrannus vociferans* | Cassin's kingbird | o,W/f,S |
| *Tyrannus verticalis* | western kingbird | f,S |
| *Myiarchus cinerascens* | ash-throated flycatcher | s,W/o,S |
| + *Sayornis nigricans* | black phoebe | f,R |
| *Sayornis saya* | Say's phoebe | u,W |
| *Empidonax difficilis* | Pacific-slope flycatcher | o,T |
| ALAUDIDAE - Larks | | |
| *Eremophila alpestris* | horned lark | u,R |
| HIRUNDINIDAE - Swallows | | |
| *Tachycineta bicolor* | tree swallow | o,T |
| + *Tachycineta thalassina* | violet-green swallow | o,T |
| *Stelgidopteryx serripennis* | northern rough-winged swallow | u,S |
| *Hirundo pyrrohnota* | cliff swallow | f,S |
| *Hirundo rustica* | barn swallow | u,T/o,S |
| CORVIDAE - Crows, Jays, and Magpies | | |
| + *Corvus brachyrhynchos* | American crow | f,R |
| + *Corvus corax* | common raven | u,R |
| *Aphelocoma californica* | western scrub-jay | u,R |
| PARIDAE - Chickadees and Titmice | | |
| *Parus inornatus* | plain titmouse | o,R |
| AEGITHALIDAE - Bushtits | | |
| *Psaltriparus minimus* | bushit | o,R |
| TROGLODYTIDAE - Wrens | | |
| *Troglodytes aedon* | house wren | u,R |
| MUSCICAPIDAE (part) - Kinglets and Gnatcatchers | | |
| *Regulus calendula* | ruby-crowned kinglet | u,W |
| MUSCICAPIDAE (part) - Thrushes | | |
| *Turdus migratorius* | American robin | o,W/s,S |
| *Catharus guttatus* | hermit thrush | o,W/T |
| *Sialia mexicana* | western bluebird | o,R |
| *Sialia currucoides* | mountain bluebird | s,W |
| MIMIDAE - Mimic Thrushes | | |
| + *Mimus polyglottos* | northern mockingbird | f,R |
| MOTACILLIDAE - Wagtails and Pipits | | |
| *Anthus rufescens* | American pipit | f,W |

| FAMILY<br>*Scientific Name* | *Common Name* | *Abundance* |
|---|---|---|
| **BIRDS (cont.)** | | |
| BOMBYCILLIDAE- Waxwings | | |
| *Bombycilla cedrorum* | cedar waxwing | o,W |
| PTILOGONATIDAE- Silky Flycatchers | | |
| *Phainopepla nitens* | phainopepla | s,W/o,S |
| LANIIDAE - Shrikes | | |
| *Lanius ludovicianus* | loggerhead shrike (CSC) | o,R |
| STURNIDAE - Starlings | | |
| + *Sternus vulgaris* | European starling | c,R |
| VIREONIDAE - Vireos | | |
| *Vireo gilvus* | warbling vireo | s,T |
| EMBERIZIDAE (part) - Wood Warblers | | |
| + *Dendroica coronata* | yellow-rumped warbler | f,W |
| *Dendroica townsendi* | Townsend's warbler | s,W/o,T |
| *Dendroica nigrescens* | black-throated gray warbler | s,W/o,T |
| *Wilsonia pusilla* | Wilson's warbler | s,W/o,T |
| *Vermivora celata* | orange-crowned warbler | s,W/o,T |
| *Geothlypis trichas* | common yellowthroat | s,W/o,T |
| EMBERIZIDAE (part) - Blackbirds, Orioles, and Tanagers | | |
| + *Euphagus cyanocephalus* | Brewer's blackbird | c,R |
| + *Agelaius phoeniceus* | red-winged blackbird | f,R |
| *Agelais tricolor* | tricolored blackbird (F2, CSC) | s,R |
| + *Sturnella neglecta* | western meadowlark | f,R |
| + *Molothrus ater* | brown-headed cowbird | f,R |
| *Icterus bullockii* | Bullock's oriole | o,S |
| *Icterus cucullatus* | hooded oriole | s,S |
| *Quiscalus mexicanus* | great-talied grackle | o,R |
| EMBERIZIDAE (part) - Sparrows | | |
| + *Zonotrichia leucophrys* | white-crowned sparrow | f,W |
| *Zonotrichia atricapilla* | golden-crowned sparrow | u,W |
| *Chondestes grammacus* | lark sparrow | u,R |
| + *Passerculus sandwichensis* | savannah sparrow | u,W |
| *Pipilo maculatus* | spotted towhee | o,R |
| *Pipilo crissalis* | California towhee | o,R |
| *Junco hyemalis oreganus* | dark-eyed junco (Oregon) | u,W |
| FRINGILIDAE - Finches | | |
| + *Carpodacus mexicanus* | house finch | f,R |
| *Carpodacus purpureus* | purple finch | o,W |
| *Carduelis tristis* | American goldfinch | u,R |
| *Carduelis psaltria* | lesser goldfinch | f,R |
| *Carduelis lawrencei* | Lawrence's goldfinch | s,S |

| FAMILY<br>*Scientific Name* | *Common Name* | *Abundance* |
|---|---|---|
| **MAMMALS** | | |
| PASSERIDAE - Weaver Finches | | |
| + *Passer domesticus* | house sparrow | c,R |
| DIDELPHIIDAE - Opossums | | |
| + *Didelphis marsupialis* | Virginia opossum | f |
| SORICIDAE - Shrews | | |
| *Notiosorex crawfordi* | desert shrew | s |
| *Sorex o. ornatus* | ornate shrew | s |
| TALPIDAE - Moles | | |
| *Scapanus latimanus* | broad-handed mole | o |
| VESPERTILIONIDAE - Plainnose Bats[2] | | |
| *Myotis thysanodes* | fringed myotis (F2) | |
| *Myotis evotis* | long-eared myotis (F2) | |
| *Myotis californicus* | California myotis | |
| *Myotis (subulatus) leibii* | small-footed myotis (F2) | |
| *Myotis yumanensis* | Yuma myotis (F2) | |
| *Myotis volans* | hairy-winged (long-legged) myotis | |
| *Lasiurus cinerea* | hoary bat | |
| *Lasiurus borealis* | red bat | |
| *Pipistrellus hesperus* | western pipistrelle | |
| *Eptesicus fuscus* | big brown bat | |
| *Euderma maculatum* | spotted bat (CSC, F2) | |
| *Plecotus townsendi pallescens* | pale big-eared bat (CSC, F2) | |
| *Antrozous pallidus* | pallid bat (CSC) | |
| MOLOSSIDAE - Freetail Bats[1] | | |
| *Eumops perotis californicus* | California (western) mastiff bat (CSC, F2) | |
| *Tadarida brasiliensis* | Brazilian (Mexican) freetail bat | |
| LEPORIDAE - Hares and Rabbits | | |
| *Lepus californicus bennettii* | San Diego black-tailed hare (CSC, F2) | s |
| *Sylvilagus audubonii* | desert cottontail | u |
| SCIURIDAE - Squirrels | | |
| + *Spermophilus beechyi* | California ground squirrel | f |
| GEOMYIDAE - Pocket Gophers | | |
| *Thomomys bottae* | Botta's pocket gopher | u |

[2] Abundance data is not provided for bats due to the paucity of information. The species listed are based upon maps of known ranges and habitat choice (CWHRS, 1990).

| FAMILY<br>*Scientific Name* | *Common Name* | *Abundance* |
|---|---|---|
| HETEROMYIDAE - Pocket and Kangaroo Mice and Rats | | |
| *Perognathus f. fallax* | San Diego pocket mouse | u |
| *Perognathus longimembris brevinasus* | Los Angeles little pocket mouse (CSC, F2) | s |
| *Perognathus californicus dispar* | California pocket mouse | o |
| *Dipodomys a. agilis* | Pacific kangaroo rat | s |
| *Dipodomys merriami* | Merriam's kangaroo rat | s |
| CRICETIDAE - Mice, Rats, Lemmings, Voles | | |
| *Reithrodontomys megalotis longicaudis* | western harvest mouse | o |
| *Peromyscus e. eremicus* | cactus mouse | o |
| *Peromyscus californicus insignis* | Parasitic (California) mouse | u |
| *Peromyscus maniculatus gambelii* | deer mouse | u |
| *Peromyscus boylii rowleyi* | brush mouse | o |
| *Neotoma lepida intermedia* | (San Diego) desert woodrat (F2) | o |
| *Microtus californicus sanctidiegi* | California vole | s |
| *Onychomys torridus ramona* | southern grasshopper mouse (F2) | s |
| MURIDAE - Old World Rats and Mice | | |
| *Rattus norvegicus* | Norway rat | f |
| *Rattus rattus* | black rat | f |
| *Mus musculus* | house mouse | c |
| CANIDAE - Dogs, Wolves, Foxes | | |
| *Canis latrans ochropus* | coyote | f |
| + *Canis familiaris* | domestic dog | f |
| *Urocyon cinereoargenteus californicus* | gray fox | s |
| PROCYONIDAE - Racoons, Coatis | | |
| + *Procyon lotor* | raccoon | u |
| MUSTELIDAE - Weasels, Skunks, etc. | | |
| *Mustela frenata* | long-tailed weasel | s |
| *Taxidea taxus* | American badger (SA) | s |
| *Spilogale gracilis* | western spotted skunk | o |
| + *Mephitis mephitis* | striped skunk | u |
| FELIDAE - Cats | | |
| *Felis rufus* | bobcat | s |
| + *Felis catus* | house cat | o |
| BOVIDAE - Cattle | | |
| + *Bos* sp. | cattle | c |

## GEOLOGIC HAZARDS

### *Environmental Setting*

The entire Sphere of Influence area is underlain by Pleistocene and Holocene (recent) alluvial deposits. Some of the earliest published mapping by the California Division of Mines and Geology, show the area as undifferentiated Quaternary alluvium.[1] Two different geologic and surficial deposit maps of the area portray the units in different ways. One map illustrates the northern 50 percent of the area as Quaternary fan deposits covered by eolian sand and incised/covered by wash deposits.[2] The eolian sand is shown to cover most of the eastern three-quarters of the area, with fan deposits on the west and a north-south strip of wash deposits about midway in the area along Cucamonga Creek. The other map shows about the eastern 40 percent covered by eolian sand, and the eastern 55 percent underlain by medium-grained alluvium (see **Figure 7-1** in the Hazards Chapter).[3] The far southwest corner of the area is underlain by fine-grained alluvium.

### *Surficial Geologic Units*

The Sphere of Influence's surface geology, as mapped by Cox and Morton contain three distinct geologic units: all three are Holocene to possibly latest Pleistocene in age. This geomorphic surface is very old and very active such that no clear differentiation between ages (Holocene; < 12,000 years old and late Pleistocene >12,000 years old) can be made.

Eolian Sand (Qhs)

The youngest surficial deposit in the Sphere of Influence is the eolian sand which is wind-deposited sand having fine to medium sized grains. This loose sand forms sheet and low dune deposits which have been stabilized by vegetation.[4] The Qhs is exposed in the eastern portion of the Sphere of Influence with the western boundary of occurrence on an approximate diagonal from Harrison Avenue on the south to Vineyard Avenue on the north. The topography is irregular due to the morphology of these small dunes and erosion due to runoff from the north. Since these deposits are essentially unconsolidated, they are subject to both wind and water erosion. Because of periodic flooding that has likely occurred along Cucamonga Creek, it can be expected that the eolian sands will be intermixed with both finer and coarser-grained stream wash deposits.

The Qhs is the second most prevalent unit in the Sphere of Influence (~40% of the area). The Qhs overlies, and may merge laterally with, the medium-grained Holocene alluvium (Qhm) discussed below. Young stream wash/flood deposits can be expected to be intermixed with the Qhs in a zone about 1,500-3,000 feet wide centered on Cucamonga Creek. The engineering characteristics of the Qhs are expected to be fairly consistent and generally will require some precautions. [5] It is expected that the materials will be mostly uncemented and subject to consolidation when saturated under structural loads. Erosion potential should be high to very high; wind erosion is a characteristic of the area known for its "blowsand," or blown sand deposits. Foundation and backfill suitability should be satisfactory with proper over-excavation, mixing with a finer-grained binder material, and compaction.

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1 Rogers, 1965 and 1967.

2 Bortugno and Spittler, 1986.

3 Cox and Morton, 1978.

4 Cox and Morton, 1977.

5 Bortugno and Spittler, 1986.

Medium-Grained Holocene Alluvium (Qhm)

The second youngest surficial unit is a medium-grained Holocene alluvium which is present west of the Qhs except for the far southwest corner of the Sphere of Influence, in the three alluvial stream valleys which trend north-south to northwest-southeast across the length of the Sphere of Influence. These are unconsolidated deposits of fine-to-coarse-grained sand with interbeds of gravel and silt. Topographically, the Qhm areas are more regular than the Qhs, having a fairly consistent slope to the south. These predominantly sand deposits are moderately to highly permeable and subject to erosion.

The Qhm unit covers the largest amount of the Sphere of Influence (~ 55%). The edges of the Qhm deposits merge with and overlie the older fine-grained Holocene alluvium (Qhf), described below, and underlie the younger Qhs described above. The engineering characteristics of the Qhm unit are expected to be variable, but generally will require precautions. It is expected that the materials will be relatively porous, compressible, and subject to consolidation under structural loads. Erosion potential should be moderate to high. Foundation and backfill suitability should be satisfactory with proper over-excavation and compaction.

Fine-Grained Holocene Alluvium (Qhf)

Qhf is the least abundant geologic unit within the Sphere of Influence (~5%). It underlies the extreme southwest corner of the Sphere of Influence along the distal edge of alluvial fan materials which have been shed from the San Gabriel Mountains. The fine-grained Qhf overlaps the older Pleistocene (Qpf) alluvium farther to the south well outside the southern boundary of the Sphere of Influence.

The fine-grained Holocene alluvium consists of clay and silty clay materials which contain interbeds of sand and variable quantities of organic material. This lithology makes the alluvium only moderately permeable to impermeable, and moderately to slightly erodible. Engineering characteristics of the Qhf will require precautions with regard to porosity, compressibility, and long-term consolidation under structural loads, particularly where organic deposits are present as interbeds, or dispersed within the silt and clay layers. Foundation and backfill suitability can be improved by implementing proper design recommendations.

***Bedrock Formations***

No bedrock is exposed in the Sphere of Influence and the depth to bedrock is 400-1050 feet, sufficiently deep to be of no concern to project development. Bedrock underlying the Sphere of Influence is reportedly either Tertiary sedimentary or older igneous basement rock.

Unique Geologic Formations

Geologic formations can be unique if their outcrop pattern, stratigraphic significance or fossil content is sufficiently unusual relative to other geologic deposits in the nearby region. Information from the San Bernardino County Museum (Kathleen Springer, personal communication, 1996) indicates that the Pleistocene deposits which typically contain the vertebrate fossils can be found at very shallow depths (typical of excavations for larger structures). There are also indications of vertebrate fossils as far north as Edison Avenue west of the Sphere of Influence in the Chino area.

*Faulting*

Faults are the planar features along which earthquakes occur. In cases where earthquakes are large or shallow enough, ground rupture can occur along the fault plane where it intersects the earth's surface. While earthquake shaking (discussed in the Seismicity section below) must be considered for the Sphere of Influence, fault rupture is not presently known to be a potential. Active (Holocene offset) and potentially active (Pleistocene) faults must be considered as potential sources for fault rupture. In general, the younger the last movement on a fault, the higher the potential for future movement. No active or potentially active faults have been mapped at the surface within or projecting toward the Sphere of Influence. Local and regional faults (see **Figure 7-2** in the Hazards Chapter) that affect the seismicity of the Sphere of Influence and the surrounding region are discussed below.

*Seismicity*

Numerous regional and local faults are capable of producing severe earthquakes, those of Richter magnitude (M) of 6.0 or greater. An analysis of all such potential earthquake producing faults was performed considering faults within a radius of 50 miles. **Table D-1** shows the faults, their maximum potential earthquakes, the likely maximum Modified Mercalli Intensity and peak horizontal ground acceleration near the center of the Sphere of Influence using the attenuation relationship of Campbell (1993).[6] Local faults[7] which do not appear in this Table (e.g., Central Avenue, San Jose, Red Hill, and Rialto-Colton) have much less information about their earthquake potential, and the high end of their potential is adequately accounted for by the larger adjacent faults (e.g., Chino, Sierra Madre, Cucamonga, and San Jacinto).

The Chino fault, the Whittier and North Elsinore faults, and the Cucamonga fault have the potential to generate the highest site accelerations. For the maximum probable earthquake (MPE), which is the 100-year event normally considered in design of non-critical structures, the range in value for the site is about 0.13 to 0.20 g (g = the unit force of gravity). Maximum credible earthquake (MCE) events must be considered in the design of certain critical or important facilities (e.g. hospitals, dams, class III landfills). For these three faults, the MCE should yield an estimated peak horizontal acceleration in the range of 0.33 to 0.52 g.

A zone of concentrated, relatively low magnitude earthquake seismicity extends to the southwest from the San Jacinto fault zone (Rialto-Colton branch) along what is referred to as "an inferred fault near Fontana".[8] Where the "inferred fault" (Fontana trend) stops, this zone of microseismicity continues in a southwesterly to westerly direction terminating in large part in the area of the Sphere of Influence. [9]

Based on recorded earthquakes in the Pomona Valley to Fontana area, responsible geologic structures exhibit primarily strike-slip movement with some dip slip component.[10] Based on this description, seismicity appears not to be associated with a buried thrust fault similar to those described in the Los Angeles basin (Southern California Earthquake Center, 1995). The Cramer and Harrington (1987) focal mechanisms suggest primary steeply dipping northeast-southwest structures with cross-cutting northwest-southeast structures. Because this inferred fault has not been adequately studied, it is not in the **Table D-1** compilation.

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6 Blake, 1989 and updates.

7 City of Ontario, 1992.

8 Jennings, 1992.

9 Wes Reeder, pers. comm., 1996.

10 Cramer and Harrington, 1987.

**TABLE 7-1**

Deterministic Site Parameters for Earthquakes Associated With
Active Faults Located Within Approximately 50 Miles of the Sphere of Influence

| ABBREVIATED FAULT NAME | APPROXIMATE DISTANCE (miles) | MAXIMUM CREDIBLE EVENT | | | MAXIMUM PROBABLE EVENT | | |
|---|---|---|---|---|---|---|---|
| | | Magnitude | Peak Accel. | Intensity | Magnitude | Peak Accel. | Intensity |
| Chino | 6 | 7.00 | 0.52 | X | 5.50 | 0.19 | VIII |
| Whittier - North Elsinore | 10 | 7.50 | 0.33 | IX | 6.00 | 0.13 | VIII |
| Cucamonga | 10 | 7.00 | 0.32 | IX | 6.25 | 0.20 | VIII |
| Sierra Madre - San Fernando | 15 | 7.50 | 0.30 | IX | 6.00 | 0.11 | VII |
| Glen Helen - Lytle Creek - Claremont | 17 | 7.00 | 0.15 | VIII | 6.50 | 0.11 | VII |
| Elsinore | 17 | 7.50 | 0.21 | VIII | 6.75 | 0.13 | VII |
| San Andreas (San Bernardino Mountains Segment) | 20 | 8.00 | 0.23 | IX | 6.75 | 0.10 | VII |
| San Andreas (Mojave Segment) | 21 | 8.3 | 0.26 | IX | 8.00 | 0.21 | VIII |
| San Gorgonio - Banning | 21 | 7.50 | 0.20 | VIII | 7.00 | 0.14 | VIII |
| North Frontal Fault Zone | 22 | 7.70 | 0.17 | VIII | 5.75 | 0.04 | VI |
| Raymond | 26 | 7.50 | 0.16 | VIII | 4.00 | 0.01 | III |
| Elysian Park Seismic Zone | 30 | 7.00 | 0.09 | VII | 5.75 | 0.04 | V |
| San Gabriel | 31 | 7.00 | 0.07 | VI | 5.75 | 0.03 | V |
| Verdugo | 32 | 6.70 | 0.07 | VI | 4.50 | 0.01 | III |
| Newport - Inglewood - Offshore Zone of Deformation | 33 | 7.00 | 0.06 | VI | 5.75 | 0.03 | V |
| Casa Loma - Clark (San Jacinto) | 35 | 7.00 | 0.06 | VI | 6.75 | 0.05 | VI |
| Santa Monica - Hollywood | 38 | 7.50 | 0.10 | VII | 5.25 | 0.02 | IV |
| Palos Verdes/Coronado Banks/Agua Blanca | 41 | 7.50 | 0.07 | VI | 6.75 | 0.02 | IV |
| Hot Springs - Buck Ridge (San Jacinto) | 41 | 7.00 | 0.05 | VI | 6.00 | 0.02 | IV |
| Helendale | 48 | 7.30 | 0.04 | VI | 5.75 | 0.01 | III |

**Notes**: The maximum credible event is the largest estimated earthquake magnitude (Richter scale) thought to be possible associated with a given fault or fault zone. The maximum probable event is the largest estimated earthquake magnitude likely to occur in a 100-year period associated with a given fault or fault zone. Peak acceleration is the estimated peak horizontal ground acceleration in percent gravity (abbreviated "g") using the attenuation relationship of Campbell (1993) with no uncertainty, but the mean value. The intensity is the estimated Modified Mercalli Intensity (MMI) at the site which represents an empirical measure of physical damage to structures and of disturbance to the earth's surface as a result of various magnitude earthquakes at various site distances.

However, it is expected that the MPE for this structure could be about M = 5-6 producing accelerations in the range of 0.3 to 0.5g.More distant faults are capable of larger earthquakes with a higher probability of occurrence. The two San Andreas fault segments can be expected to generate the MCE events approximately every 150 to 200 years. These events would yield a peak horizontal ground acceleration of approximately 0.21 to 0.26 g. While occurrence is considered about as likely as the MPE, these are appropriate design values for important facilities.

The potential ground shaking severity in the Sphere of Influence area was evaluated from maximum magnitude earthquakes on the Chino, Cucamonga, and San Andreas faults (**Figure 7-2** in the Hazards Chapter). It was concluded that accelerations (assumed to be peak horizontal on the buried bedrock) would be in the range of 0.25 to 0.45g considering all three faults with the highest levels being attributed to the San Andreas fault. Site response due to the presence of a thick section of non-bedrock (alluvium) is discussed and, in general, it is recommended that the design of important structures consider the site response spectra (acceleration, velocity and displacement) using standard techniques

A search of all earthquakes for magnitudes 4.0-9.0 (recorded and reported historic) within 100 miles of the Sphere of Influence was made.[11] A seismic recurrence curve indicates that based on this information alone, a magnitude 6.5 earthquake should occur about every 25 years within this radius of the Sphere of Influence. A magnitude 7+ event is theorized to have occurred in an area just east of the Sphere of Influence on December 16, 1858 based on reported damage and shaking intensity in the region.[12]

***Subsidence***

Subsidence is the gradual downward settling of the land surface with little or no horizontal movement. A principal cause can be the removal of large volumes of water from subsurface formations. Groundwater withdrawal has occurred in the Chino Basin for approximately 75-100 years. The presence of thick, poorly consolidated sediments, as exist in the Chino-Prado Basin area southwest of the Sphere of Influence, increase the possibility of subsidence. The City of Ontario recognizes this as a potential hazard, but reports that recent aquifer recharge has reduced this risk. Although specific instances of subsidence are not reported in the Sphere of Influence area, a north-south trending fissure is reported as being present less than two miles due west of the Sphere of Influence which seems to document active subsidence.[13] Morton confirms this observation and suggests that he has observed other such features in this portion of the Chino Basin which are likely attributable to subsidence.

[11] Draft Background Report Technical Study, April 1996.

[12] Ibid.

[13] Fife, et al, 1976.