# APPENDIX E

**Biotic Evaluation, Live Oak Associates, Inc.**

**Arborist Evaluation, Live Oak Associates, Inc.**

**Tree Survey, Moki Smith Professional Tree Care**

LIVE OAK ASSOCIATES, INC.

an Ecological Consulting Firm

# BIOTIC EVALUATION
# COCHRANE/PEET ROAD ORCHARD PROPERTY

# CITY OF MORGAN HILL, SANTA CLARA COUNTY, CALIFORNIA

By:


**LIVE OAK ASSOCIATES, INC.**

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March 8, 2012 Project No. 1546-02


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## TABLE OF CONTENTS

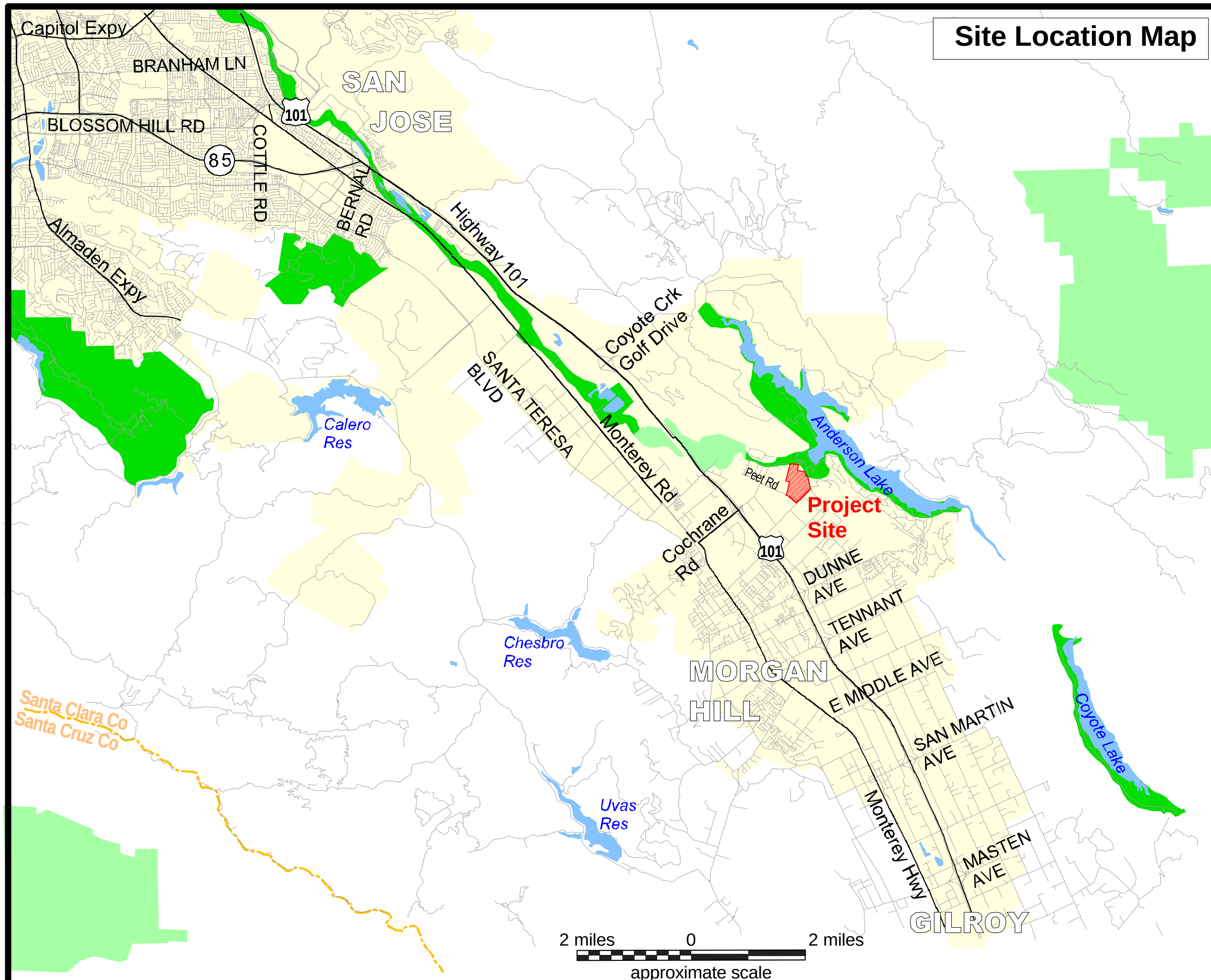
# 1.0 INTRODUCTION

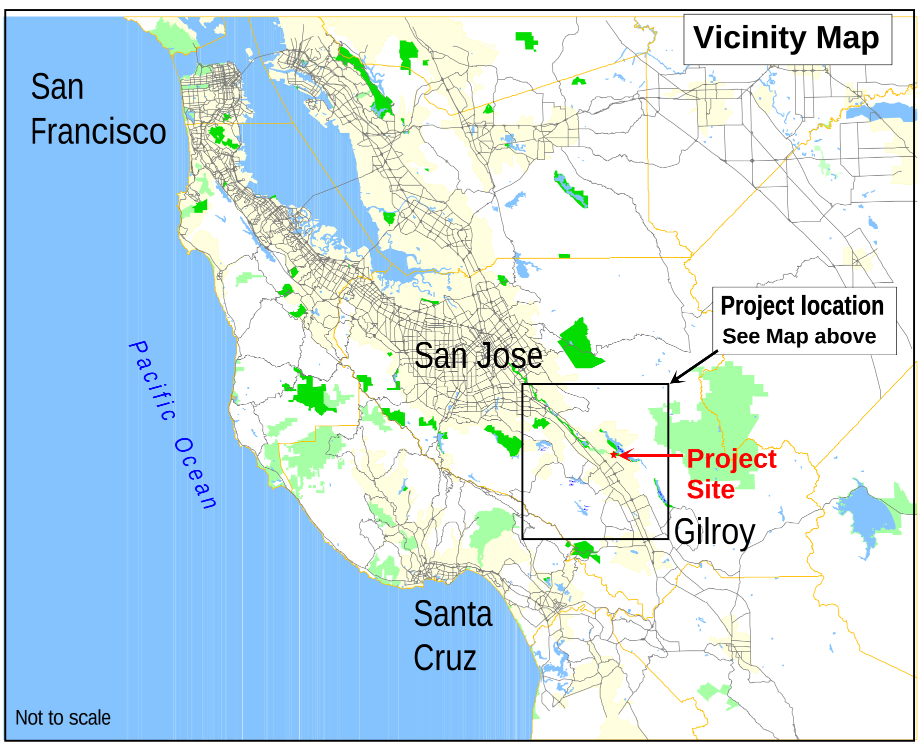
This report describes the biotic resources of the approximately 120-acre Cochrane/Peet Road Orchard Property (hereafter referred to as the "study area" or "site") and evaluates possible impacts to these resources resulting from future development into a residential community with associated stormwater basins over approximately 10-12 years in five phases. The site is bordered by Cochrane Road to the north and east, Half Road and orchard to the southeast, Peet Road to the south, and residences and a Santa Clara Valley Water District facility to the west, and is located in the City of Morgan Hill, Santa Clara County, California (APN 728-34-027)(Figure 1). The site can be found on the Morgan Hill U.S.G.S. 7.5' quadrangle in Sections 10 and 15 of Township 9 South, Range 3 East. The site is comprised of orchards, fallow field, row crop, a drying lot with sheds, and residences. Three large coast live oak trees are within and along the edge of the fallow field, and additional large trees are near the residences along Peet Road.

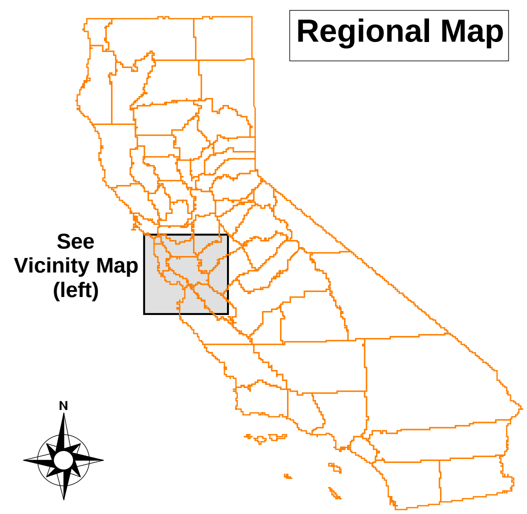
In this report, Live Oak Associates, Inc. (LOA) identifies sensitive biotic resources, significant biotic habitats, regional fish and wildlife movement corridors, and existing local, state and federal natural resource protection policies, ordinances, and laws regulating land use. Provisions of the California Environmental Quality Act (CEQA), the federal Clean Water Act (CWA), the state and federal endangered species acts (FESA and CESA respectively), California Fish and Game Code, and California Water Code could greatly affect project costs, depending on the natural resources present on the parcel. The primary objectives of this report are as follows:

- To summarize all site-specific information related to existing biological resources;
- To make reasonable inferences about the biological resources that could occur onsite based on habitat suitability and the proximity of the site to a species' known range;
- Summarize all state and federal natural resource protection laws that may be relevant to possible future site development;
- Identify and discuss natural resource issues specific to the site that could affect future development;

- Identify avoidance and mitigation measures that could significantly reduce the magnitude of likely biological resource issues associated with site development.




**Live Oak Associates, Inc.**

**Cochrane - Borello**
Vicinity Map

| Date | Project # | Figure # |
|---|---|---|
| 2/16/2012 | 1546-02 | 1 |

Natural resource issues related to these state and federal laws have been identified in past planning studies conducted in the general project area, and it is reasonable to presume that such issues could be relevant to the subject parcels examined in this report. A number of state and federally listed animals, as well as other special status animal species (i.e., candidate species for listing and California species of special concern), have been documented within 20 miles of the project site. These species include state and/or federally listed species such as the California tiger salamander as well as California species of special concern including the burrowing owl. This report evaluates the site's suitability for these and other species.

CEQA is also concerned with project impact on riparian habitat, wildlife movement corridors, fish and wildlife habitat, and jurisdictional wetlands, as well as project compliance with special ordinances and state laws protecting regionally sensitive biotic resources, and approved habitat conservation plans. Therefore, this report addresses the relevance of each of these issues to eventual site development.

Sources of information used in the preparation of this analysis included: (1) the California Natural Diversity Data Base (CDFG 2011); (2) the Inventory of Rare and Endangered Vascular Plants of California (CNPS 2011); (3) State and Federally Listed Endangered and Threatened Animals of California (CDFG 2011); (4) numerous planning documents and biological studies for projects in the area, many of which have been prepared by LOA; and (5) manuals and references related to plants and animals of the San Francisco Bay Area. Additional information was gathered during a field survey conducted by LOA ecologists Melissa Denena and Katrina Krakow on June 16, 2011, and an additional survey was completed by Katrina Krakow on February 14, 2012 to assess additional land south of Peet Road.

The project proposes to construct a gated community consisting of: 244 single-family homes, 49 secondary units, access roads, open space, and surrounding landscaping over approximately 10-12 years in five phases. The site's existing General Plan land use designation is *Single Family Low (1-3 du/ acre)*. There are three zoning designations divided equally within the property. These include: *Residential Estate District (RE-40,000 RPD)*, *Single Family* (*R1-20,000 RPD)*, and *Single Family (R1-12,000 RPD*). The existing zoning designations allow for a total of

225 units on the property. The proposed *Planned Development (PD)* overlay (allows for variances to the existing zoning standards) amendment and rezoning the *RE* portion of the property to *Single Family (R1-12,000 PD)* would allow for the remaining proposed project density.

## 2.0 EXISTING CONDITIONS

The approximately 127 acre irregularly shaped property is located in the City of Morgan Hill, Santa Clara County, California. The site is bordered by Cochrane Road to the north and east, Half Road to the southeast, Peet Road and orchards to the south, and residences and a Santa Clara Valley Water District facility to the west. The site is currently a producing farm, including orchards and row crops. Small irrigation ditches (approximately one foot deep) exist along the south side of the drying lot and a portion of the west side of the drying lot, and on the south side of Peet Road west of where the culvert extend goes under Peet Road; this ditch and was dug for irrigation purposes and extends southwest along the western edge of the orchard and does not connect with another water source. A slightly larger irrigation ditch (approximately two feet deep) intersects the row crop land. All irrigation ditches were dry at the time of the site visits except for some inundation at the culvert under the road between the drying lot and the row crop and the culvert that extends under Peet Road. The site is relatively flat with topography ranging from approximately 400 to 420 feet (122 to 128 meters) National Geodetic Vertical Datum (NGVD).

Ten soil-mapping units have been identified on the site and these soils are described in greater detail in Table 1 and depicted in Figure 2. Four of the soils occurring on the site are considered to be hydric.

**Table 1. Descriptions of soil mapping units of the Project Site (Web Soil survey-USDA 2011).**

| **Soil Mapping Unit** | **Drainage Class** | **Parent Material** | **Hydric?** |
|---|---|---|---|
| ArA | Well Drained | Arbuckle gravelly loam, 0 to 2 percent slopes | Yes |
| GaA | Well Drained | Garretson loam, gravel substratum, 0 to 2 percent slopes | No |
| GbB | Well Drained | Garretson gravelly loam, 0 to 5 percent slopes | No |
| GoF | Well Drained | Gilroy clay loam, 30 to 50 percent slopes | No |
| KeA | Well Drained | Keefers clay loam, 0 to 2 percent slopes | No |

**Table 1. Descriptions of soil mapping units of the Project Site (Web Soil survey-USDA 2011)--Continued.**

| Soil Mapping Unit | Drainage Class | Parent Material | Hydric? |
|---|---|---|---|
| KeC2 | Well Drained | Keefers clay loam, 2 to 9 percent slopes, eroded | Yes |
| PoA | Well Drained | Pleasanton loam, 0 to 2 percent slopes | No |
| PpC | Well Drained | Pleasanton gravelly loam, 2 to 9 percent slopes | No |
| Rg | - | Riverwash, 0 to 2 percent slopes | Yes |
| TeF | - | Terrace escarpments | Yes |

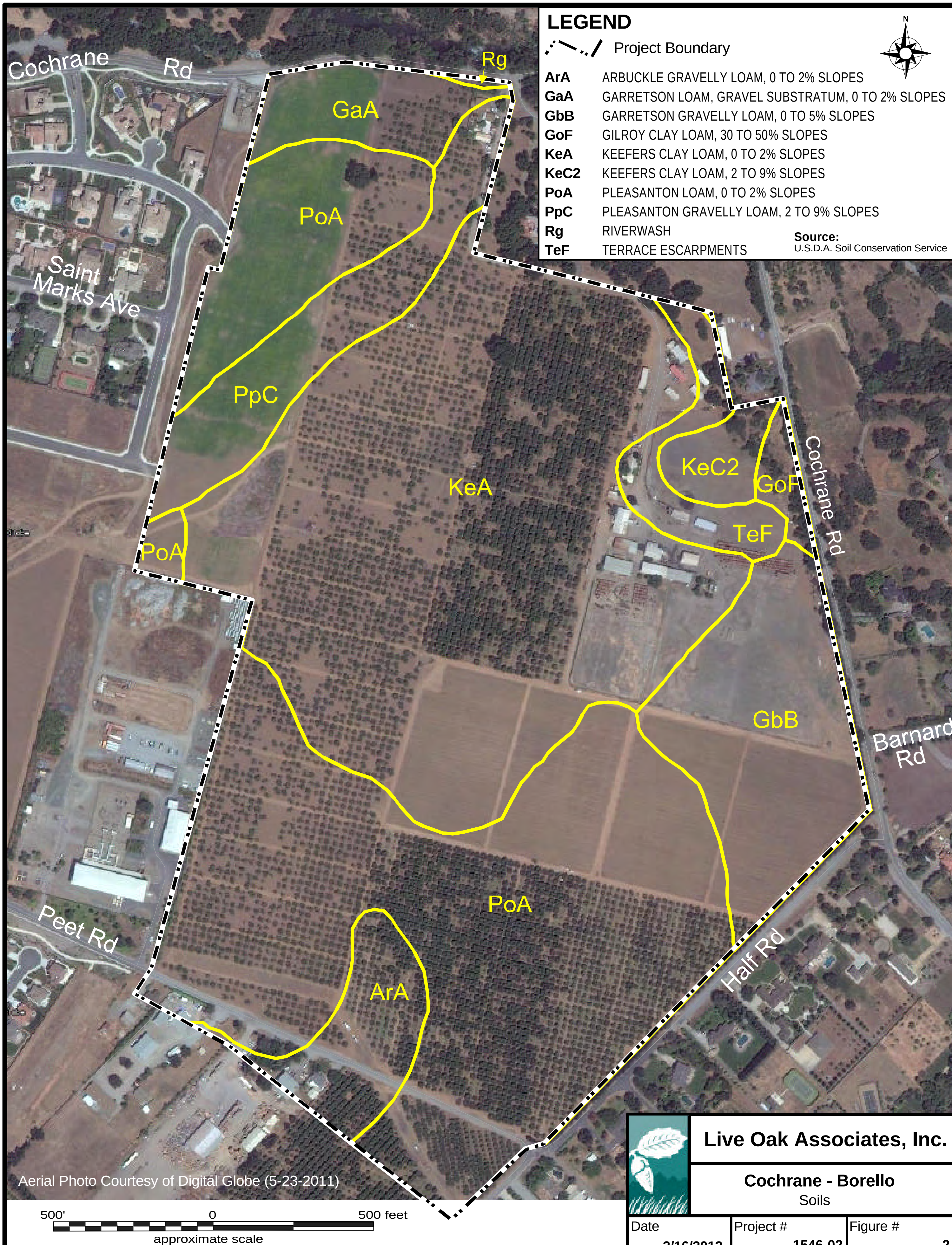
Annual precipitation in the general vicinity of the site is highly variable from year to year. Average annual rainfall is approximately 13 to 18 inches, most of which falls between October and April. Stormwater runoff appears to readily infiltrates the site's soils.

### 2.1 BIOTIC HABITATS/LAND USES

The site consists mainly of an orchard and associated land uses. The orchards have been in production on this site for approximately a century. The majority of trees on the site are orchard trees including cherry and apricots. Several apricot trees have been/are being pulled out because they have reduced fruit production due to age. Habitats consisting of fallow field, row crop, remnant woodland, and developed including a drying lot, sheds, and residences also occur onsite (Figure 3). These are described in greater detail below.

#### 2.1.1 ORCHARD

The eastern boundary along Cochrane Road and Half Road is bordered by Lombardy poplar (*Populus nigra* var. *italic*) trees with some yellow star thistle (*Centaurea solstitialis*), coyote brush (*Baccharis pilularis*), oleander (*Nerium oleander*), coast live oak (*Quercus agrifolia*), and tree of heaven (*Ailanthus altissima*) mixed in. Plants identified within the orchard itself included

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**Cochrane - Borello**

Soils

| Date | Project # | Figure # |
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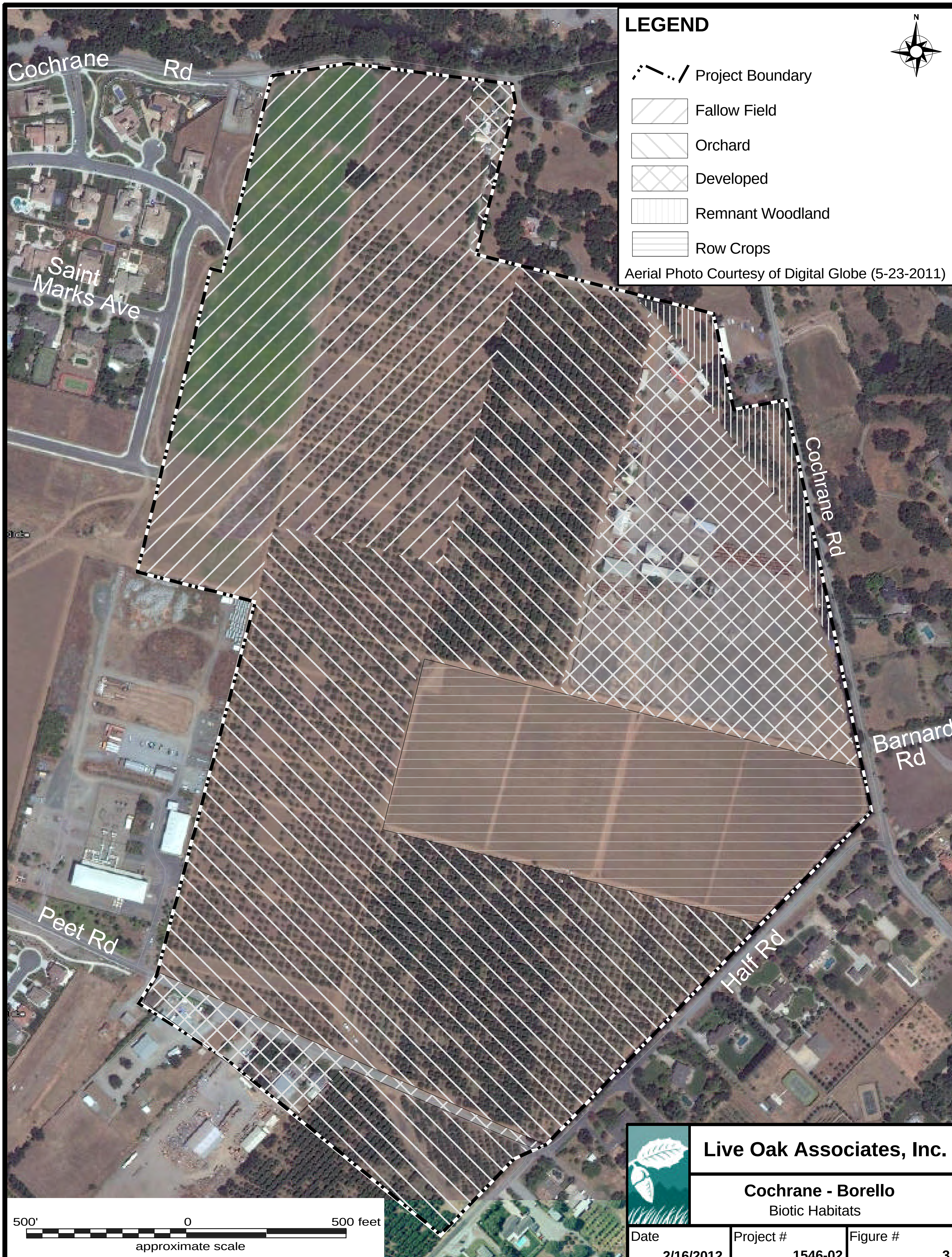
| 2/16/2012 | 1546-02 | 2 |




Live Oak Associates, Inc.

**Cochrane - Borello**

Biotic Habitats

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| 2/16/2012 | 1546-02 | 3 |

ripgut (*Bromus diandrus*), barley, (*Hordium murianum*), Bermuda grass (*Cynodon dactylon)*, pampas grass (*Cortaderia selloana*), puncture vine (*Tribulus terrestris*), annual fireweed (*Epilobium brachycarpum*), narrow leaved plantain (*Plantago lanceolata)*, black mustard (*Brassica nigra*), rape mustard (*B. rapa*), common mallow (*Malva neglecta*), morning glory (*Convolvulus arvensus*), spiny sowthistle (*Sonchus asper*), burclover (*Medicago sp*.), filaree (*Erodium sp*.), sourgrass (*Oxalis pes-caprae*), Canada horseweed (*Conyza canadensis*), prickly lettuce *(Lactuca serriola)*, cudweed (*Gnaphalium sp.*), solanum (*Solanum sp.*), atriplex (*Atriplex sp.*), and mimosa (*Acacia sp.*).

Amphibians would be limited on the site due to the managed nature of the site. However, the Pacific treefrog (*Hyla regilla*) was heard during the February 2012 site visit and species such as the western toad (*Bufo boreas*) could occur occasionally when portions of the site become damp especially along the irrigation ditches. Edges of this habitat could be used regularly by reptile species including the western fence lizard (*Sceloporus occidentalis*), southern alligator lizard (*Elgaria multicarinatus*), terrestrial garter snake (*Thamnophis elegans*), and gopher snake (*Pituophis melanoleucus*).

Avian species observed within the orchard during the site visits included the turkey vulture (*Cathartes aura*), mourning dove (*Zenaida macroura*), scrub jay (*Aphelocoma californica*), American crow (*Corvus brachyrhynchos)*, American robin (*Turdus migratorius*), California towhee (*Pipilo crissalis*), barn swallow (*Hirundo rustica*), and cliff swallow (*Petrochelidon pyrrhonota*). Other avian species that may occur in the orchard habitat include the western kingbird (*Tyrannus verticalis*), northern mockingbird (*Mimus polyglottos*), and Brewer's blackbird (*Euphagus cyanocephalus*), to name a few.

No mammals or mammal sign was observed in this habitat, and due to the management as an orchard, mammals are expected to be sparse in this habitat, but may include Botta’s pocket gopher (*Thomomys bottae*) and a variety of mice (*Peromyscus sp.*), which may attract a variety of larger predators including the coyote (*Canis latrans*), domestic dog (*Canis familiaris*), bobcat (*Lynx rufus*), and domestic cat (*Felis cattus*). As native habitat exists near the site, common mammals adapted to urban living and edge habitats such as opossum (*Didelphis virginiana*), striped skunk (*Mephitis mephitis*), and raccoons (*Procyon lotor*) are likely to forage onsite.

### 2.1.2 FALLOW FIELD

An additional portion of the site was apricot orchard until recently, but the trees were removed due to age and low fruit production resulting in the establishment of a large fallow field. Plants identified within the fallow field included wild oats (*Avena* sp.), Italian rye grass (*Lolium multiflorum*), rape mustard (*Brassica rapa*), black mustard, white stemmed filaree (*Erodium brachycarpum*), mourning glory, prickly lettuce, sow thistle, cheeseweed mallow (*Malva parviflora*), solanum, and pepper tree (*Schinus molle*). Three large mature coast live oaks also occur in this habitat, one on the western edge near the residential development, one near the middle of the field, and one on the eastern edge of the fallow field bordering the orchard.

No amphibian or reptile species were observed during the site visits; however, this habitat is likely to include species found in the orchard habitat.

Avian species observed within the fallow field included the turkey vulture, rock dove (*Columba livia*), and European starling (*Sturnus vulgaris*). This field could become burrowing owl (*Athene cunicularia*) habitat if left fallow for long. Additional avian species that may occur onsite include killdeer (*Charadrius vociferous*), white-crowed sparrow (*Zonotrichia albicollis*), and western meadowlark (*Sturnella neglecta*), to name a few.

Although no mammal species were observed in this habitat, the fallow field may include those species found in the orchard habitat as well as California ground squirrels (*Otospermophilus beecheyii*).

### 2.1.3 ROW CROP

Wild oats (*Avena sp.*) was the crop present at the time of the site visit; however, according to the farmer, peppers are planted most years. This habitat is split into west and east sections by an irrigation ditch a couple feet deep. At the time of the site visit, the ditch was dry except for some pooling by the culverts.

As this habitat supports most of the irrigation ditches on the site, this habitat is most likely to support amphibians such as the Pacific treefrog and western toad. Reptiles located in adjacent habitats may also use the row crop.

Avian species observed within the row crop included the turkey vulture, American crow, barn swallow, and cliff swallow. Other Avian species that may forage within or over this habitat may include species found in adjacent onsite habitats and the common raven (*Corvus corax*), red-winged blackbird (*Agelaius phoeniceus*), Brewer's blackbird, and raptors such as the white-tailed kite (*Elanus caeruleus*), red-tailed hawk (*Buteo jamaicensis*), and American kestrel (*Falco sparverius*).

Mammals expected to use this site include the same species of mammals as may be found in the adjacent habitats.

**2.1.4 DEVELOPED**

The main developed area is used as a drying lot to sun-dry apricots and tomatoes with associated open-air sheds. The actual drying lot is flat and graveled with sparse weeds. Several small residences with some ornamental trees are in this habitat type as well. The northeastern corner supports native trees and rock piles separating the remnant woodland and the lot. Plants identified within the drying lot habitat include black mustard, grape (*Vitis* sp.), cactus (*Opuntia* sp.), bearded iris (*Iris germanica*), English walnut (*Juglans regia*), and California walnut (*Juglans californica*). Additionally, Peet Road along the southwestern edge of the site and residences to the south of Peet Road are included as a part of this project. These residences include wooden houses, metal and wooden sheds, and a barn. Additional plants include foxtail barley (*Hordium murinum*), smilo grass (*Piptantherum miliaceum*), speedwell (*Veronica persica*), sourgrass, prunus (*Prunus sp.*), prickly sow-thistle, filaree, burclover, mallow, iceplant (*Carpobrotus edulis*), aloe (*Aloe sp.*), English ivy (*Hedera helix*), rose bushes (*Rosa sp.*), coyote brush, oleander, juniper bush (*Juniperus sp.*), spruce (*Picea sp.*), Peruvian peppertree (*Schinus molle*), elderberry (*Sambucus nigra*), privet (*Ligustrum sp.*), Douglas fir (*Pseudotsuga sp.*), fan palm (*Washingtonia sp.*), Monterey pine (*Pinus radiata*), and several other ornamental plants and trees.

Amphibians are likely to occur only occasionally in this habitat from the adjacent onsite habitats, however, reptiles such as the western fence lizard, southern alligator lizard, terrestrial garter snake, gopher snake and Pacific rattlesnake (*Crotalus oreganus*) are expected to occur in this habitat and along its edges.

Avian species observed within the developed habitat (drying lots, sheds, and residences) included the barn swallow and cliff swallow. Additionally, a nest was observed in an open-air drying shed. Killdeer (*Charadrius vociferous*) may use this habitat as nesting habitat. This habitat may also support flycatchers such as the black phoebe (*Sayornis nigricans*). Domestic chickens (*Gallus domesticus*) were observed on the roof of a shed at the residences south of Peet Road.

The only mammal species observed during the site visit was the domestic dog. Mammal species in the surrounding habitats may also occur within this habitat. All buildings and sheds in the interior of the site have metal roofing and are unsuitable for bat roosting; however, several buildings including wooden houses, sheds, and barn located south of Peet Road are potentially suitable for roosting bats, therefore, bats may be expected to roost within this habitat.

### 2.1.5 REMNANT WOODLAND

To the northeast of the drying lot, native trees and rock piles separate the remnant woodland area and the lot. Plants identified within the remnant woodland habitat include ripgut, soft chess (*Bromus hordeaceus*), wild oats, rape mustard, black mustard, Italian thistle (*Carduus pycnocephalus*), milk thistle (*Silybum marianum*), grape, poison-oak (*Toxicodendron diversilobum*), coyote brush, and coast live oak.

Amphibian and reptile species found in the adjacent habitats are likely to use this habitat as well. Additionally, this habitat may support the western skink (*Eumeces skiltonianus*).

Avian species observed within the remnant woodland only included the scrub jay (*Aphelocoma californica*). The American robin (*Turdus migratorius*) may also use this habitat.

Mammal species in the surrounding habitats may also occur within this habitat.

## 2.2 MOVEMENT CORRIDORS

Wildlife movement corridors are areas where regional wildlife populations regularly and predictably move during dispersal or migration. Movement corridors in California are typically associated with valleys, rivers and creeks supporting riparian vegetation, and ridgelines. With increasing encroachment of humans on wildlife habitats, it has become important to establish and maintain linkages, or movement corridors, for animals to be able to access locations containing different biotic resources that are essential to maintaining their life cycles.

The importance of an area as a "movement corridor" depends on the species in question and its consistent use patterns. Animal movements generally can be divided into three major behavioral categories:

- Movements within a home range or territory;
- Movements during migration; and
- Movements during dispersal.

While no detailed study of animal movements has been conducted for the study area, knowledge of the site, its habitats, and the ecology of the species potentially occurring onsite permits sufficient predictions about the types of movements occurring in the region and whether or not proposed development would constitute a significant impact to animal movements.

As noted in Section 2.1, a number of reptiles, birds, and mammals may use the site as part of their home range and dispersal movements. However, the site itself lacks intrinsic features necessary or desirable for the regular and predictable movement of wildlife species through it in order to meet ecological requirements.

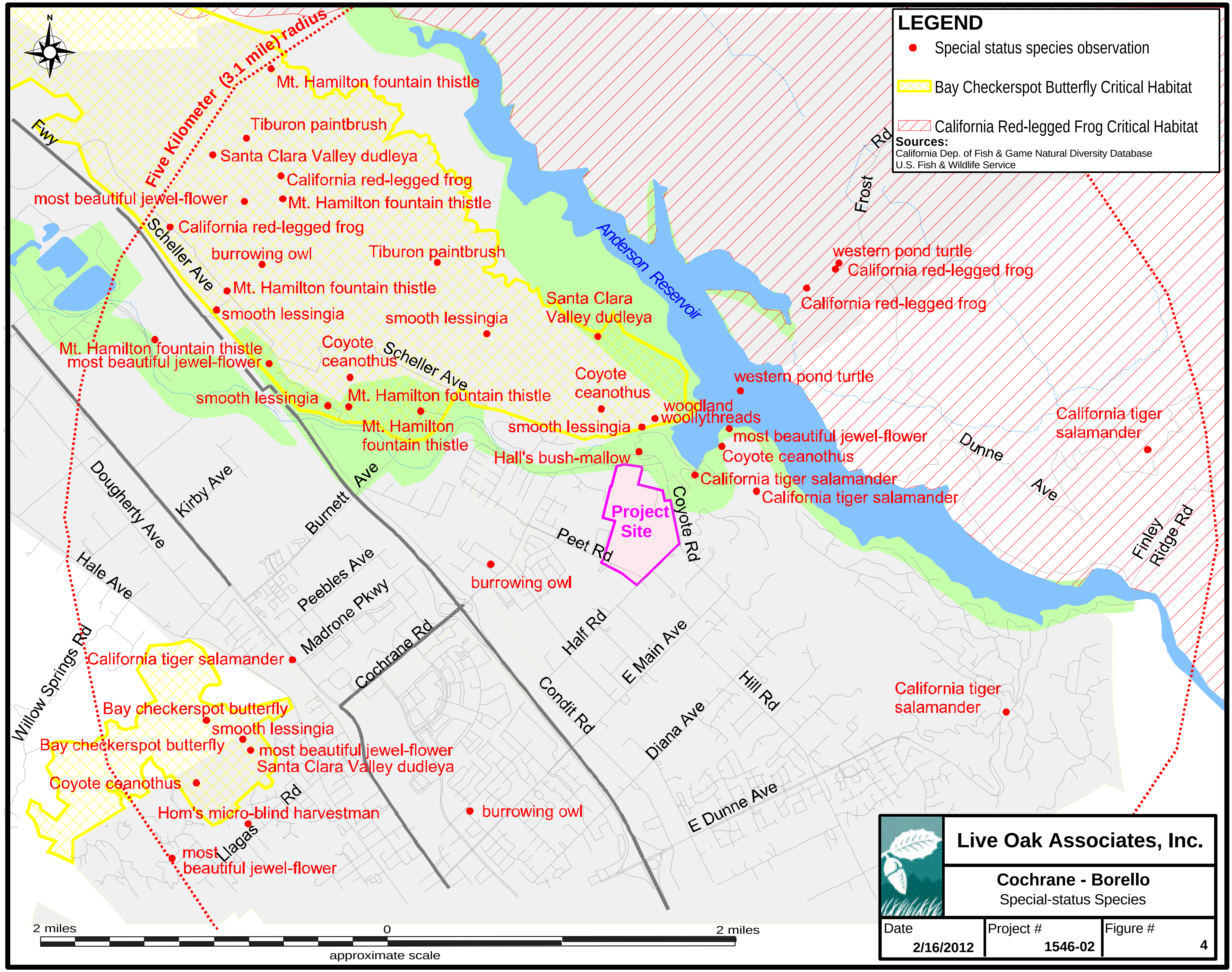
## 2.3 SPECIAL STATUS PLANTS AND ANIMALS

Several species of plants and animals within the state of California have low populations, limited distributions, or both. Such species may be considered "rare" and are vulnerable to extirpation as the state's human population grows and the habitats these species occupy are converted to agricultural and urban uses. As described more fully in Section 3.2, state and federal laws have provided the California Department of Fish and Game (CDFG) and the U.S. Fish and Wildlife Service (USFWS) with a mechanism for conserving and protecting the diversity of plant and animal species native to the state. A sizable number of native plants and animals have been formally designated as threatened or endangered under state and federal endangered species legislation. Others have been designated as "candidates" for such listing. Still others have been designated as "species of special concern" by the CDFG. The California Native Plant Society (CNPS) has developed its own set of lists of native plants considered rare, threatened, or endangered (CNPS 2011). Collectively, these plants and animals are referred to as "special status species."

A number of special status plants and animals occur in the vicinity of the site (Figure 4). These species and their potential to occur in the study area are listed in Table 2 on the following pages. Sources of information for this table included *California's Wildlife, Volumes I, II, and III* (Zeiner et. al 1988), *California Natural Diversity Data Base* (CDFG 2011), *Endangered and Threatened Wildlife and Plants* (USFWS 2011), *State and Federally Listed Endangered and Threatened Animals of California* (CDFG 2011), and *The California Native Plant Society's Inventory of Rare and Endangered Vascular Plants of California* (CNPS 2011). This information was used to evaluate the potential for special status plant and animal species that occur onsite. Figure 4 depicts the location of special status species found by the California Natural Diversity Data Base (CNDDB). It is important to note that the CNDDB is a volunteer database; therefore, it may not contain all known or gray literature records.

A search of published accounts for all of the relevant special status plant and animal species was conducted for the Morgan Hill USGS 7.5 minute quadrangle in which the project site occurs, and for the eight surrounding quadrangles (San Jose East, Lick Observatory, Isabel Canyon, Santa Teresa Hills, Mt. Sizer, Loma Prieta, Mt. Madonna, and Gilroy) using the California Natural Diversity Data Base Rarefind3 2011. All species listed as occurring in these quadrangles on CNPS Lists 1A, 1B, 2, or 4 were also reviewed (See Figure 4).

Serpentine soils are absent from the site; as such, those species that are uniquely adapted to serpentine conditions, such as the Tiburon paintbrush (*Castilleja affinis ssp. neglecta*), pink creamsacs (*Castilleja rubicundula ssp. rubicundula*), Coyote ceanothus (*Ceanothus ferrisiae*), Chaparral harebell (*Campanula exigua*) , Mt. Hamilton fountain thistle (*Cirsium fontinale var. campylon*), San Francisco collinsia (*Collinsia multicolor*), Santa Clara Valley dudleya (*Dudleya abramsii ssp. setchellii*), fragrant fritillary (*Fritillaria liliacea*), Loma Prieta hoita (*Hoita strobilina*), smooth lessingia (*Lessingia micradenia var. glabrata*), woodland woollythreads (*Monolopia gracilens*), and most beautiful jewel-flower (*Streptanthus albidus* ssp. *peramoenus*), are considered absent from the site. Other plant species occur in habitats not present in the study area (e.g., chaparral, brackish and freshwater marshes, coastal scrub, elevations above or below the elevation of the site etc.) and, therefore, are also considered absent from the site. These species include the Anderson's manzanita (*Arctostaphylos andersonii*), Santa Cruz Mountains pussypaws (*Calyptridium parryi var. hesseae*), robust spineflower (*Chorizanthe robusta* var. *robusta*), congdon's tarplant (*Centromadia parryi ssp. congdonii*), Santa Clara red ribbons (*Clarkia concinna ssp. automixa*), Hospital Canyon larkspur (*Delphinium californicum* ssp. *interius*), Brandegee's eriastrum (*Eriastrum brandegeeae*), Tracy's eriastrum (*Eriastrum tracyi*), legenere (*Legenere* limosa), Mt. Hamilton coreopsis (*Leptosyne hamiltonii*), Mt. Hamilton lomatium (*Lomatium observatorium*), arcuate bush-mallow (*Malacothamnus arcuatus*), Hall's bush-mallow (*Malacothamnus hallii*), Oregon meconella (*Meconella oregana*), Santa Cruz Mountains beardtongue (*Penstemon rattanii var. kleei*), San Benito pentachaeta (*Pentachaeta exilis ssp. aeolica*), Mt. Diablo phacelia (*Phacelia phacelioides*), hairless popcorn-flower (*Plagiobothrys glaber*), hooked popcorn-flower (*Plagiobothrys uncinatus*), Rrock sanicle (*Sanicula saxatilis*), and Mt. Hamilton jewel-flower (*Streptanthus callistus*).




**Live Oak Associates, Inc.**

**Cochrane - Borello**
Special-status Species

| Date | Project # | Figure # |
|---|---|---|
| 2/16/2012 | 1546-02 | 4 |

## TABLE 2. LIST OF SPECIAL STATUS SPECIES THAT COULD OCCUR IN THE PROJECT VICINITY

**PLANTS (adapted from CDFG 2011 and CNPS 2011)**

***Species Listed as Threatened or Endangered under the State and/or Federal Endangered Species Act***

| **Species** | **Status** | **Habitat** | ***Occurrence in the Study Area** |
|---|---|---|---|
| Monterey spineflower (*Chorizanthe pungens var. pungens*) | FT, CNPS 1B | Habitat: Occurs in sandy soils within chaparral, cismontane woodland, coastal dunes, coastal scrub and valley and foothill grassland. Elevation: 3-450 meters. Blooms: April-June. | **Absent**. This land has been used as an active orchard for over a century, suitable habitat in the form of chaparral, coastal dunes, and coastal scrub is absent from the site, and the nearest record of Monterey spineflower is more than three miles away. |
| Contra Costa goldfields (*Lasthenia conjugens*) | FE, CNPS 1B | Habitat: Occurs in cismontane woodland, playas, valley grasslands, foothills grasslands and vernal pools. Elevation: 0-470 meters. Blooms: March-June. | **Absent.** This land has been used as an active orchard for over a century, and the nearest record of Contra Costa goldfields is more than three miles away. |
| Metcalf Canyon jewel-flower (*Streptanthus albidus ssp. albidus*) | FE, CNPS 1B | Habitat: Occurs in valley and foothill grasslands. Elevation: 45-800 meters Blooms: April-July | **Absent.** This land has been used as an active orchard for over a century, and the nearest record of Metcalf Canyon jewel-flower is more than three miles away. |
| Showy rancheria clover (*Trifolium amoenum*) | FE, CNPS 1B | Habitat: Occurs in coastal bluff scrub, valley and foothill grassland and sometimes on serpentine. Elevation: 5-415 meters. Blooms: April-June | **Absent**. This land has been used as an active orchard for over a century, suitable habitat in the form of serpentine soils and coastal bluff scrub is absent from the site, although grasslands are nearby; the nearest record of showy rancheria clover is more than three miles away. |

***Other special status plants listed by CNPS***

| **Species** | **Status** | **Habitat** | ***Occurrence in the Study Area** |
|---|---|---|---|
| Bent-flowered fiddleneck (*Amsinckia lunaris*) | CNPS 1B | Habitat: Occurs in coastal bluff scrub, cismontane woodland, valley and foothill woodlands. Elevation: 3-500 meter Blooms: March-June | **Absent**. This land has been used as an active orchard for over a century, suitable habitat in the form of coastal bluff scrub and cismontane woodland is absent from the site, although valley and foothill woodlands are nearby; the nearest record of bent-flowered fiddleneck is more than three miles away. |
| Big-scale balsamroot (*Balsamorhiza macrolepis var. macrolepis*) | CNPS 1B | Habitat: Occurs in chaparral, cismontane woodland, and valley and foothill grassland, sometimes on serpentine. Elevation: 90-1400 meters. Blooms: March – June | **Absent**. This land has been used as an active orchard for over a century, suitable habitat in the form of serpentine soils chaparral, and cismontane woodland is absent from the site, although grasslands are nearby; the nearest record of big scale balsamroot is more than three miles away. |

## TABLE 2. LIST OF SPECIAL STATUS SPECIES THAT COULD OCCUR IN THE PROJECT VICINITY

**PLANTS – cont'd.**

***Other special status plants listed by CNPS***

| **Species** | **Status** | **Habitat** | ***Occurrence in the Study Area** |
|---|---|---|---|
| Round-leaved filaree (*California macrophylla*) | CNPS 1B | Habitat: Occurs on clay soils in cismontane woodlands and valley and foothill grasslands.<br>Elevation: 15-1200 meters.<br>Blooms: March-May. | **Absent**. This land has been used as an active orchard for over a century, suitable habitat in the form of cismontane woodland is absent from the site, although grasslands are nearby; the nearest record of round-leaved filaree is more than three miles away. |
| Showy golden madia (*Madia radiata*) | CNPS 1B | Habitat: Occurs in cismontane woodland, valley and foothill grassland<br>Elevation: 25-900 meters.<br>Blooms: March-May. | **Absent**. This land has been used as an active orchard for over a century, and the nearest record of showy golden madia is more than three miles away. |
| Robust monardella (*Monardella villosa ssp. globosa*) | CNPS 1B | Habitat: Occurs in openings in broadleafed upland forests, in openings in chaparral, cismontane, coastal scrub, and valley and foothill grasslands.<br>Elevation: 100-915 meters.<br>Blooms: June-August. | **Absent**. This land has been used as an active orchard for over a century, and the nearest record of robust monardella is more than three miles away. |
| Santa Cruz clover (*Trifolium buckwestiorum*) | CNPS 1B | Habitat: Occurs in gravelly soil and along margins within broadleafed upland forests, cismontane and coastal prairie.<br>Elevation: 105-610 meters.<br>Blooms: April-October | **Absent.** This land has been used as an active orchard for over a century, and the nearest record of Santa Cruz clover is more than three miles away. |

**ANIMALS (adapted from CDFG 2011 and USFWS 2011)**

***Species Listed as Threatened or Endangered under the State and/or Federal Endangered Species Act***

| **Species** | **Status** | **Habitat** | ***Occurrence in the Study Area** |
|---|---|---|---|
| Bay checkerspot butterfly (*Euphydryas editha bayensis*) | FT | Occurs in serpentine grasslands with the larval host plant *Plantago erecta*, and/or a secondary host plant of *Castilleja densiflora* or *Castilleja exserta*. | **Absent.** Serpentine habitat and host plants are absent from the site. BCB critical habitat is approximately one and a half miles to the west of the site and less than a quarter mile to the north of the site. The nearest record is approximately two and a half miles to the southwest of the site within the critical habitat. |
| Steelhead - Central California Coast DPS / South-Central California Coast DPS (*Oncorhynchus mykiss irideus*) | FT/<br>FT, CSC | Spawn in freshwater rivers or streams in the spring and spend the remainder of their life in the ocean. | **Absent.** The only water onsite are shallow, irrigation ditches that were dry at the time of the 2011 site visit. Habitat for steelhead is absent from the site. |

## TABLE 2. LIST OF SPECIAL STATUS SPECIES THAT COULD OCCUR IN THE PROJECT VICINITY

**ANIMALS – Cont'd.**

***Species Listed as Threatened or Endangered under the State and/or Federal Endangered Species Act***

| **Species** | **Status** | **Habitat** | ***Occurrence in the Study Area** |
|---|---|---|---|
| California tiger salamander (*Ambystoma californiense*) | FT, CT, CSC | Breeds in vernal pools and stock ponds of central California; adults aestivate in grassland habitats adjacent to the breeding sites. | **Unlikely.** No suitable breeding habitat for CTS in the form of vernal pools or stock ponds was observed onsite, and it is highly unlikely individuals are aestivating onsite. The site has been actively managed as an orchard for over a century and no suitable burrows were observed during the 2011 surveys, therefore CTS are unlikely to use this site. The nearest known population of CTS occurs at Rosenden Pond near Anderson Reservoir approximately half a mile away from the site. It is not expected that individuals from this pond would travel through unsuitable habitat and across Cochrane Road to aestivate within the highly managed site. |
| California red-legged frog (*Rana aurora draytonii*) | FT, CSC | Rivers, creeks and stock ponds of the Sierra foothills and coast range, preferring pools with overhanging vegetation. | **Absent.** Suitable habitat does not exist onsite for CRLF. The irrigation ditches on the site are shallow and were dry at the time of the 2011 survey, these irrigation ditches do not support pools with overhanging vegetation. CRLF critical habitat is located approximately one mile to the east of the site. |
| White-tailed kite (*Elanus leucurus*) | CP | Open grasslands and agricultural areas throughout central California. | **Possible.** White-tailed kite may forage over the site from time to time or as a resident. The white-tailed kite may also nest in the larger trees onsite. |
| Golden eagle (*Aquila chrysaetos*) | CP | Typically frequents rolling foothills, mountain areas, sage-juniper flats and desert. | **Unlikely.** The golden eagle may rarely to occasionally forage over the site. However, nesting habitat is not present on the site or in the immediate vicinity of the site. |
| Least Bell's vireo (nesting) (*Vireo bellii pusillus*) | FE, CE | Occurs in southern California during the breeding season March, migrates out of the state July through September. Dense brush, mesquite, or cottonwood-willow forests in riparian areas. | **Absent.** Suitable habitat for the LBV is absent from the site, and their breeding range does not include the location of the site. |
| San Joaquin kit fox (*Vulpes macrotis mutica*) | FE, CT | Frequents desert alkali scrub and annual grasslands and may forage in adjacent agricultural habitats. Utilizes enlarged (4 to 10 inches in diameter) ground squirrel burrows as denning habitat. | **Absent.** Suitable habitat for SJKF in the form of alkali scrub and grassland is absent from the site. The site is not within their range and has been managed as an orchard for over a century. No suitable burrows for or sign of SJKF were observed during the 2011 site visit. |

## TABLE 2. LIST OF SPECIAL STATUS SPECIES THAT COULD OCCUR IN THE PROJECT VICINITY

**ANIMALS – Cont'd.**

***Federal Protected Species and State Species of Special Concern***

| Species | Status | Habitat | *Occurrence in the Study Area |
|---|---|---|---|
| Western pond turtle (*Actinemys marmorata*) | CSC | Open slow-moving water of rivers and creeks of central California with rocks and logs for basking. | **Absent.** Suitable aquatic habitat for WPT does not exist onsite. Water was absent from all irrigation ditches at the time of the 2011 survey, and no ponds or stock ponds exist onsite. The nearest record of WPT is less than one mile to the northeast of the site. |
| Foothill yellow-legged frog (*Rana boylii*) | CSC | Occurs in swiftly flowing streams and rivers with rocky substrate with open, sunny banks in forest, chaparral, and woodland habitats, and can sometimes be found in isolated pools. | **Absent.** Suitable habitat for the FYLF is absent from the site, and running water was absent from irrigation ditches onsite. |
| Coast horned lizard (*Phrynosoma blainvillii*) | CSC | Grasslands, scrublands, oak woodlands, etc. of central California. Common in sandy washes with scattered shrubs. | **Absent.** Habitats required by coast horned lizards are absent because they have been heavily modified for agricultural use, mainly orchard and row crops. |
| Burrowing owl (*Athene cunicularia*) | CSC | Frequents open, dry annual or perennial grasslands, deserts, and scrublands characterized by low growing vegetation. Dependent upon burrowing mammals, most notably the California ground squirrel, for nest burrows. | **Possible.** Suitable habitat in the form of the fallow field exists onsite, and if left fallow, the field may support California ground squirrels and provide habitat for the BUOW, the bank of the irrigation ditch near the drying lot also may provide marginal habitat. |
| Black swift (nesting) (*Cypseloides niger*) | CSC | Migrants found in many habitats of state; in Sierra nests are often associated with waterfalls. | **Absent.** The site does not provide suitable breeding or foraging habitat for this species. |
| Tricolored blackbird (*Agelaius tricolor*) | CSC | Breeds near fresh water, primarily emergent wetlands, with tall thickets. Forages in grassland and cropland habitats. | **Unlikely.** Suitable breeding habitat is absent from the site, tricolored blackbird may use the site for foraging from time to time during migration. |
| Pallid bat (*Antrozous pallidus*) | CSC | Grasslands, chaparral, woodlands, and forests of California; most common in dry rocky open areas providing roosting opportunities. | **Possible.** Suitable habitat for the pallid bat in the form of residences, sheds, and a barn south of Peet Road is present on the site and may be suitable for roosting bats. |
| San Francisco dusky-footed woodrat (*Neotoma fuscipes annectens*) | CSC | Found in hardwood forests, oak riparian and shrub habitats. | **Absent.** No woodrat nests were located within the remnant woodland onsite during the site visit, the remainder of the site is unsuitable for woodrats due to the modifications made to the site and the management of the site as an orchard for over a century. |

## TABLE 2. LIST OF SPECIAL STATUS SPECIES THAT COULD OCCUR IN THE PROJECT VICINITY

**ANIMALS – Cont'd.**

***Federal Protected Species and State Species of Special Concern***

| Species | Status | Habitat | *Occurrence in the Study Area |
|---|---|---|---|
| American badger (*Taxidea taxus*) | CSC | Found in drier open stages of most shrub, forest and herbaceous habitats with friable soils, specifically grassland environments. Natal dens occur on slopes. | **Unlikely.** The site does not support suitable habitat for this species, however it may provide foraging habitat for this species as occasionally may pass through the site. No badger burrows or sign was observed during the 2011 site visit. |

***Explanation of Occurrence Designations and Status Codes**

Present: Species observed on the sites at time of field surveys or during recent past.
Likely: Species not observed on the site, but it may reasonably be expected to occur there on a regular basis.
Possible: Species not observed on the sites, but it could occur there from time to time.
Unlikely: Species not observed on the sites, and would not be expected to occur there except, perhaps, as a transient.
Absent: Species not observed on the sites, and precluded from occurring there because habitat requirements not met.

STATUS CODES

| | | | |
|---|---|---|---|
| FE | Federally Endangered | CE | California Endangered |
| FT | Federally Threatened | CT | California Threatened |
| FPE | Federally Endangered (Proposed) | CR | California Rare |
| FC | Federal Candidate | CP | California Protected |
| | | CSC | California Species of Special Concern |
| CNPS | California Native Plant Society Listing | | |
| 1A | Plants Presumed Extinct in California | 3 | Plants about which we need more information – a review list |
| 1B | Plants Rare, Threatened, or Endangered in California and elsewhere | 4 | Plants of limited distribution – a watch list |
| 2 | Plants Rare, Threatened, or Endangered in California, but more common elsewhere | | |

## 2.4 JURISDICTIONAL WATERS

Jurisdictional waters include rivers, creeks, and drainages that have a defined bed and bank and which, at the very least, carry ephemeral flows. Jurisdictional waters also include lakes, ponds, reservoirs, and wetlands. Such waters may be subject to the regulatory authority of the U.S. Army Corps of Engineers (USACE), the California Department of Fish and Game (CDFG), and the California Regional Water Quality Control Board (RWQCB). Aquatic features are typically only considered to be jurisdictional if they connect to other Waters of the United States per the U.S Supreme Court decision *Solid Waste Agency of Northern Cook County v. U.S. Army Corps of Engineers* (SWANCC Decision) and *Rapanos v. United States* and *Carabell v. Army Corps of Engineers* (referred together as the Rapanos decision). See Section 3.2.4 of this report for additional information.

A few small irrigation ditches exist onsite, all of which were dry except for a small amount of inundation near two culverts during the site visit. The irrigation ditches did not support hydrophytic vegetation, therefore, none of these features would meet the technical criteria for jurisdictional wetlands. It is highly unlikely that the USACE, RWQCB, and CDFG would exert jurisdiction over them, they are isolated, maintained, man-made features that are strictly used for farming purposes.

# 3.0 IMPACTS AND MITIGATIONS

## 3.1 SIGNIFICANCE CRITERIA

General plans, area plans, and specific projects are subject to the provisions of the California Environmental Quality Act (CEQA). The purpose of CEQA is to assess the impacts of proposed projects on the environment before they are constructed. For example, site development may require the removal of some or all of its existing vegetation. Animals associated with this vegetation could be destroyed or displaced. Animals adapted to humans, roads, buildings, pets, etc. could potentially replace those species formerly occurring on a site. Plants and animals that are state and/or federally listed as threatened or endangered may be destroyed or displaced. Sensitive habitats such as wetlands and riparian woodlands may be altered or destroyed. These impacts may be considered significant or not. According to *Guide to the California Environmental Quality Act*, "Significant effect on the environment" is interpreted as a substantial, or potentially substantial, adverse change in any of the physical conditions within the area affected by the project including land, air, water, minerals, flora, fauna, ambient noise, and objects of historic or aesthetic interest. Specific project impacts to biological resources may be considered "significant" if they will:

- have a substantial adverse effect, the directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service;
- have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations or by the California Department of Fish and Game or U.S. Fish and Wildlife Service;
- have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means;

- interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery site;
- reduce substantially the habitat of a fish or wildlife species, including causing a fish or wildlife population to drop below self-sustaining levels or threaten to eliminate an animal community;
- conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance;
- conflict with the provisions of an adopted Habitat Conservation Plan, or other approved local, regional, or state habitat conservation plan.

Furthermore, CEQA Guidelines Section 15065 states that a project may trigger the requirement to make a “mandatory findings of significance” if “the project has the potential to subsequently degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, reduce the number or restrict the range on an endangered, rare or threatened species, or eliminate important examples of the major periods of California history or prehistory.”

## 3.2 RELEVANT GOALS, POLICIES, AND LAWS

### 3.2.1 Threatened and Endangered Species

State and federal “endangered species” legislation has provided the California Department of Fish and Game (CDFG) and the U.S. Fish and Wildlife Service (USFWS) with a mechanism for conserving and protecting plant and animal species of limited distribution and/or low or declining populations. Species listed as threatened or endangered under provisions of the state and federal endangered species acts, candidate species for such listing, state species of special concern, and some plants listed as endangered by the California Native Plant Society are collectively referred to as “species of special status.” Permits may be required from both the CDFG and USFWS if activities associated with a proposed project will result in the “take” of a listed species. “Take” is defined by the state of California as “to hunt, pursue, catch, capture, or kill, or attempt to hunt, pursue, catch, capture or kill” (California Fish and Game Code, Section 86). “Take” is more broadly defined by the federal Endangered Species Act to include “harm” (16 USC, Section 1532(19), 50 CFR, Section 17.3). Furthermore, the CDFG and the USFWS are responding agencies under the California Environmental Quality Act (CEQA). Both agencies review CEQA documents in order to determine the adequacy of their treatment of endangered species issues and to make project-specific recommendations for their conservation.

### 3.2.2 Migratory Birds

State and federal laws also protect most birds. The Federal Migratory Bird Treaty Act (16 U.S.C., scc. 703, Supp. I, 1989) prohibits killing, possessing, or trading in migratory birds, except in accordance with regulations prescribed by the Secretary of the Interior. This act encompasses whole birds, parts of birds, and bird nests and eggs.

### 3.2.3 Birds of Prey

Birds of prey are also protected in California under provisions of the State Fish and Game Code, Section 3503.5, which states that it is “unlawful to take, possess, or destroy any birds in the order Falconiformes or Strigiformes (birds of prey) or to take, possess, or destroy the nest or eggs of any such bird except as otherwise provided by this code or any regulation adopted pursuant thereto.” Construction disturbance during the breeding season could result in the incidental loss of fertile eggs or nestlings, or otherwise lead to nest abandonment. Disturbance that causes nest abandonment and/or loss of reproductive effort is considered “taking” by the CDFG.

### 3.2.4 The Bald and Golden Eagle Protection Act

The Bald Eagle Protection Act of 1940 (16 U.S.C. 668, enacted by 54 Stat. 250) protects bald and golden eagles by prohibiting the taking, possession, and commerce of such birds and establishes civil penalties for violation of this Act. Take of bald and golden eagles is defined as follows: “disturb means to agitate or bother a bald or golden eagle to a degree that causes, or is likely to cause, based on the best scientific information available, (1) injury to an eagle, (2) a decrease in its productivity, by substantially interfering with normal breeding, feeding, or sheltering behavior, or (3) nest abandonment, by substantially interfering with normal breeding, feeding, or sheltering behavior'' (72 FR 31132; 50 CFR 22.3).

### 3.2.5 Bats

Section 2000 and 4150 of the California Fish and Game Code states that it unlawful to take or possess a number of species, including bats, without a license or permit as required by Section 3007. Additionally, Title 14 of the California Code of Regulations states it is unlawful to harass, herd, or drive a number of species, including bats. To harass is defined as "an intentional act which disrupts an animal's normal behavior patterns, which includes, but is not limited to, breeding, feeding or sheltering".

### 3.2.6 Wetlands and Other Jurisdictional Waters

Natural drainage channels and adjacent wetlands may be considered "Waters of the United States" (hereafter referred to as "jurisdictional waters") subject to the jurisdiction of the U.S. Army Corps of Engineers (USACE). The extent of jurisdiction has been defined in the Code of Federal Regulations but has also been subject to interpretation of the federal courts. Jurisdictional waters generally include:

- All waters which are currently used, or were used in the past, or may be susceptible to use in interstate or foreign commerce, including all waters which are subject to the ebb and flow of the tide;
- All interstate waters including interstate wetlands:
- All other waters such as intrastate lakes, rivers, streams (including intermittent streams), mudflats, sandflats, wetlands, sloughs, prairie potholes, wet meadows, playa lakes, or natural ponds, the use, degradation or destruction of which could affect interstate or foreign commerce;
- All impoundments of waters otherwise defined as waters of the United States under the definition;
- Tributaries of waters identified in paragraphs (a)(1)-(4) (i.e. the bulleted items above).

As recently determined by the United States Supreme Court in *Solid Waste Agency of Northern Cook County v. U.S. Army Corps of Engineers* (the SWANCC decision), channels and wetlands isolated from other jurisdictional waters cannot be considered jurisdictional on the basis of their use, hypothetical or observed, by migratory birds. However, the U.S Supreme Court decisions *Rapanos v. United States* and *Carabell v. U.S. Army Corps of Engineers* impose a "significant nexus" test for federal jurisdiction over wetlands. In June 2007, the USACE and Environmental Protection Agency (EPA) established guidelines for applying the significant nexus standard. This standard includes 1) a case-by-case analysis of the flow characteristics and functions of the tributary or wetland to determine if they significantly affect the chemical, physical, and biological integrity of downstream navigable waters and 2) consideration of hydrologic and ecologic factors (EPA and USACE 2007).

The USACE regulates the filling or grading of such waters under the authority of Section 404 of the Clean Water Act. The extent of jurisdiction within drainage channels is defined by “ordinary high water marks” on opposing channel banks. Wetlands are habitats with soils that are intermittently or permanently saturated, or inundated. The resulting anaerobic conditions select for plant species known as hydrophytes that show a high degree of fidelity to such soils. Wetlands are identified by the presence of hydrophytic vegetation, hydric soils (soils saturated intermittently or permanently saturated by water), and wetland hydrology according to methodologies outlined in the 1987 Corps of Engineers Wetlands Delineation Manual (USACE 1987).

All activities that involve the discharge of fill into jurisdictional waters are subject to the permit requirements of the USACE (Wetland Training Institute, Inc. 1991). Such permits are typically issued on the condition that the applicant agrees to provide mitigation that result in no net loss of wetland functions or values. No permit can be issued until the Regional Water Quality Control Board (RWQCB) issues a certification (or waiver of such certification) that the proposed activity will meet state water quality standards. The filling of isolated wetlands, over which the USACE has disclaimed jurisdiction under the SWANCC decision, is regulated by the RWQCB. It is unlawful to fill isolated wetlands without filing a Notice of Intent with the RWQCB. The

RWQCB is also responsible for enforcing National Pollution Discharge Elimination System (NPDES) permits, including the General Construction Activity Storm Water Permit. All projects requiring federal money must also comply with Executive Order 11990 (Protection of Wetlands).

The California Department of Fish and Game has jurisdiction over the bed and bank of natural drainages according to provisions of Section 1601 and 1602 of the California Fish and Game Code (2003). Activities that would disturb these drainages are regulated by the CDFG via a Streambed Alteration Agreement. Such an agreement typically stipulates that certain measures will be implemented which protect the habitat values of the drainage in question.

### 3.2.7 Local, Regional, and State Policies/Ordinances

The City of Morgan Hill has a tree ordinance (Chapter 12.32 of the City's Municipal Code) which seeks to protect all trees having a single stem or trunk with a circumference of forty inches or greater for nonindigenous species (except those in residential zones) and eighteen inches or greater for indigenous species measured at four and one-half feet vertically above the ground or immediately below the lowest branch. Indigenous trees are defined by the City as any tree that is native to the Morgan Hill region, including oaks (all types), California bays, madrones, sycamore and alder. The ordinance states that "it is unlawful for any person to cut down, remove, poison or otherwise kill or destroy, or cause to be removed any tree or community of trees on any city or private property without first securing a permit as provided in this chapter; provided, however, that a permit shall not be required for developments which have been reviewed and approved by the planning commission or architectural and site review board and the tree removal conforms with the landscape plans of those developments."

### 3.2.8 Habitat Conservation Plan

Six local partners (the County of Santa Clara, Santa Clara Valley Transportation Authority, Santa Clara Valley Water District, and the Cities of San Jose, Gilroy and Morgan Hill) and two wildlife agencies (the California Department of Fish and Game and the U.S. Fish and Wildlife Service) are in the process of designing a multi-species habitat conservation plan. The study area of the Santa Clara Valley Habitat Conservation Plan/Natural Communities Conservation Plan (HCP/NCCP) primarily covers southern Santa Clara County, which includes the City of Morgan

Hill. An administrative draft version is currently available for review. The HCP/NCCP will address listed species and species that are likely to become listed during the plan's 50-year permit term. The covered species include, but are not limited to, western burrowing owl, California tiger salamander, California red-legged frog, central California coast steelhead, and central valley Chinook salmon. The (HCP/NCCP) Planning Agreement requires that the agencies comment on reportable interim projects and recommend mitigation measures or project alternatives that would help achieve the preliminary conservation objectives and not preclude important conservation planning options or connectivity between areas of high habitat value.

## 3.3 ENVIRONMENTAL IMPACT/MITIGATION

As described in *Section 1.0,* the proposed project is the development of the site into a residential community. The potential impacts and mitigations resulting from future development of the property are discussed further below and have been divided into “potentially significant impact” and “less than significant impacts” to clearly divide the biological issues present onsite.

**<u>Potentially Significant Impacts</u>**

### 3.3.1 Potential Impacts to Special Status Animal Species

**Impact.** Seventeen special status animal species occur, or once occurred, regionally. Of these, 14 species would be absent or unlikely to occur on the site due to a lack of suitable habitat for these species. These species include the Bay checkerspot butterfly, steelhead, California tiger salamander, California red-legged frog, foothill yellow-legged frog, western pond turtle, coast horned lizard, black swift, least Bell’s vireo, tricolored blackbird, golden eagle, San Joaquin kit fox, San Francisco dusky-footed woodrat, and American badger.

The remaining three special status animal species from Table 2 potentially occur more frequently as regular foragers, transients, or may be resident to the site. These include the white-tailed kite, western burrowing owl, and pallid bat.

The currently designed proposed project is expected to result in a less-than-significant impact for all of the special status animal species listed in Table 2. Site development may result in direct mortality of individuals of these two species which are protected by state and federal law. Possible project impact to such species is discussed in detail below:

White-tailed Kite and Non-listed Raptors. Although the loss of habitat for white-tailed kite would not be considered significant, impacts to individuals would be considered significant. The trees of the site provide suitable nesting habitat for the white-tailed kite, as well as more common raptor species likewise protected by the California Fish and Game Code. No active stick nests or nests from previous years were observed onsite or within 250 feet of the site. Nonetheless, breeding pairs could choose to nest in the onsite trees or in the nearby trees in future years. Project construction at the time of nesting (February 1 through August 31) could induce the adults to abandon the nest when juveniles are present, thus leading to their starvation. The mortality of juveniles would constitute a significant adverse impact of the project.

Burrowing Owls. Development of the project site would result in the conversion of the fallow field and banks of the irrigation ditches into habitat unsuitable for this species. Protocol-level burrowing owl surveys were not conducted for this site. The mortality of individuals that could move onto the site in the future would be considered significant. Should site grading occur during the nesting season for this species (February 1 through August 31) nests and nestlings that may be present would likely be destroyed. Resident owls may also be buried in their nest burrows outside of the nesting season (September 1 through January 31). Any actions related to site development that result in the mortality of burrowing owls would constitute a violation of the federal Migratory Bird Treaty Act and provisions of the California Fish and Game Code. Therefore, the mortality of burrowing owls would constitute a significant adverse environmental impact.

Bats. The development of the project site would result in the demolition of several buildings onsite. The onsite buildings south of Peet Road include residences, sheds, and a barn that may provide roosting habitat for bats, including the pallid bat. If the project requires the demolition of the onsite buildings south of Peet Road, a detailed bat survey should be conducted.

**Mitigation.** Project impacts to several special status animal species would be potentially significant as discussed above. Measures have been described below that would be appropriate for mitigating the magnitude of impacts to these species.

White-tailed Kite and Non-listed Raptors. Site development during the white-tailed kite and non-listed raptor nesting season (February 1 through August 31) could result in the abandonment of an active nest. The mortality of individuals that may result would constitute a significant adverse impact of the project; the loss of habitat would not constitute a significant adverse impact. The following mitigation measures are warranted for each of the five phases; preconstruction surveys will be per phase, not the entire site:

- ***Mitigation Measure 3.3.1a:*** Should project construction be scheduled to commence between February 1 and August 31, a pre-construction survey will be conducted by a qualified biologist for nesting birds within the onsite trees as well as all trees within 250 feet of the site. This survey will occur within 30 days of the on-set of construction.

- ***Mitigation Measure 3.3.1b:*** If pre-construction surveys undertaken during the nesting season locate active nests within or near construction zones, these nests, and an appropriate buffer around them (as determined by a qualified biologist) will remain off-limits to construction until the nesting season is over. Suitable setbacks from occupied nests will be established by a qualified biologist and maintained until the conclusion of the nesting season.

Burrowing Owls. Site development will potentially result in the mortality of burrowing owls if they move onto the site in the future. Mitigation measures that protect burrowing owls from possible direct mortality or nest failure will be warranted. Therefore, the project applicant will implement the following measures to ensure that burrowing owl mortality from project construction is avoided.

- ***Mitigation Measure 3.3.1c:*** A pre-construction survey will be conducted by a qualified biologist for burrowing owls within 30 days of the on-set of construction. This survey will be conducted according to methods described in the *Staff Report on Burrowing Owl Mitigation* (CDFG 1995). All suitable habitats of the study area will be covered during this survey.

- ***Mitigation Measure 3.3.1d:*** If pre-construction surveys undertaken during the breeding season (February 1 through August 31) locate active nest burrows within or near construction zones, these nests, and an appropriate buffer around them (as determined by a qualified biologist) will remain off-limits to construction until the breeding season is over.

- ***Mitigation Measure 3.3.1e:*** During the non-breeding season (September 1 through January 31), resident owls may be relocated to alternative habitat. The relocation of resident owls must be according to a relocation plan prepared by a qualified biologist. Passive relocation will be the preferred method of relocation. This plan must provide for the owl's relocation to nearby lands possessing available nesting and foraging habitat. Any mitigation or relocation plan for the owls is subject to review and approval by CDFG.

<u>Bats.</u> Site development will potentially result in the mortality of roosting bats. Mitigation measures that protect roosting bats from possible direct mortality will be warranted. Therefore, the project applicant will implement the following measures to ensure that roosting bat mortality from project construction is avoided should demolition be necessary.

- ***Mitigation Measure 3.3.1f:*** A pre-construction survey will be conducted by a qualified bat biologist for roosting bats within 30 days of the on-set of construction. All suitable structures of the study area will be covered during this survey.

- ***Mitigation Measure 3.3.1g:*** If a non-breeding bat colony is found and construction will not include demolition, then a construction-free buffer of 25-50 feet should be established around the structure, if construction will include demolition, then the individuals should be humanely evicted via the partial dismantlement of the buildings prior to demolition under the direction of a qualified bat specialist to ensure that no harm or "take" would occur to any bats as a result of demolition activities.

- ***Mitigation Measure 3.31.h:*** If a maternity colony is detected in the buildings, then a construction-free buffer should be established around the structure and remain in place until it has been that the nursery is no longer active. If demolition is necessary, demolition should preferably be done between March 1 and April 15 or August 15 and October 15 to avoid interfering with an active nursery.

Full implementation of the measures identified above would mitigate impacts to special status animal species potentially occurring on the site.

**<u>Less than Significant Impacts</u>**

### 3.3.2 Potential Impact to Special Status Plant Species

**Impact.** Of the ten special status plant species potentially occurring in the region, none would occur or would be likely to occur on the site due to the absence of suitable habitat and management of the site as an orchard for more than a century. Possible impacts to regional populations of these species from eventual site development would not be significant as none of these special status plants would be impacted.

**Mitigation.** None warranted.

### 3.3.3 Potential Impacts to Riparian Habitat and Other Sensitive Natural Communities, Including Federally Protected Wetlands

**Impact.** The site does not support riparian habitat or other sensitive natural communities such as serpentine or wetland habitat. Therefore, sensitive habitats would not be impacted as a result of the proposed project.

**Mitigation.** None warranted.

### 3.3.4 Impact to Movement or Nursery Sites of Fish or Wildlife Species

**Impact.** The site does not appear to constitute a "movement corridor" for native wildlife, although many species potentially move within it and through it. Site development will have little effect on home range and dispersal movements of native wildlife now using habitats where site development may eventually occur. Many migratory species that now pass through the study area are neo-tropical migrant birds that are likely to pass through and over the site even when it is eventually developed. A considerable amount of open space lands in the vicinity of the site will continue to be used by native species for home range and dispersal movements. Therefore, this project will result in a less than significant effect on regional wildlife movements.

**Mitigation.** None warranted.

### 3.3.5 Impact to Habitat for Fish and Wildlife Species

**Impact.** Development of the project site would convert orchard, fallow field, row crop, developed, and a small amount of remnant woodland habitat used by some native wildlife species into an active residential community. While the site provides some habitat for regional wildlife populations, it is not of unique or particularly significant value to such populations. The project will not result in a fish or wildlife population dropping below self-sustaining levels, or threaten to eliminate an animal community. Therefore, development of the site would not constitute a significant adverse environmental impact on wildlife resources.

**Mitigation.** None warranted.

### 3.3.6 Conflict with Local Policies or Ordinances

**Impact.** The local ordinance in reference to the site's natural resources that the project would need to abide by is the City of Morgan Hill's Tree Ordinance. There are a number of trees present onsite that are planned to be retained onsite during development including three large coast live oaks in or near the fallow field.

The applicant currently plans to keep all onsite ordinance-sized trees intact. Should it become necessary to remove any of these trees, the applicant will be required to obtain a permit from the City of Morgan Hill. Removal of a few onsite trees will not, from a CEQA standpoint, constitute a significant adverse environmental impact, however, the applicant may need to obtain the appropriate permits from the City and implement required replacement plantings. If the applicant abides by the above requirements, impacts to onsite trees will be reduced to a less than significant level.

**Mitigation.** None warranted as long as appropriate permits are obtained should it become necessary to remove any onsite ordinance-sized trees.

### 3.3.7 Conflict with an Adopted Habitat Conservation Plan

**Impact.** There are no adopted Habitat Conservation Plans for the project area at this time. However, the Santa Clara Valley HCP/NCCP, if and when approved, would cover the Cochrane/Peet Road Orchard Property. HCP/NCCP Planning Agreement requires that the agencies comment on reportable interim projects and recommend mitigation measures or project alternatives that would help achieve the preliminary conservation objectives and not preclude important conservation planning options or connectivity between areas of high habitat value. Since the project lies within the interim referral area and may affect natural communities, a referral would be required. The project would be consistent with the HCP through the referral process.

**Mitigation.** None warranted.

### 3.3.8 Degradation of Water Quality in Seasonal Creeks, Reservoirs and Downstream Waters

**Impact.** The proposed project will require grading, excavation, and vegetation removal, thereby resulting in the project site becoming vulnerable to sheet, rill or gully erosion. Eroded soil is generally carried as sediment in surface runoff to be deposited in natural creek/river beds, canals, and adjacent wetlands. A grading permit must be obtained from the county.

To avoid or minimize sedimentation to offsite waters, the applicant will be required to develop an erosion control plan. The applicant must also comply with standard erosion control measures that employ best management practices (BMPs), will likely need to develop a SWPPP per State Water Quality Control Board Stormwater Permit. If the applicant abides by the above requirements, impacts to downstream waters from erosion and polluted stormwater runoff will be reduced to a less than significant level.

**Mitigation.** The applicant should employ best management practices (BMPs) including standard erosion control measures and comply with the provisions of a County grading permit where applicable. Projects involving the grading of large tracts of land must also be in compliance with provisions of a General Construction permit (a type of NPDES permit) available from the California Regional Water Quality Control Boards. Compliance with the above permits should result in no impact to water quality in seasonal creeks, reservoirs, and downstream waters from the proposed project.

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## APPENDIX A:
## VASCULAR PLANTS OF THE STUDY AREA

The plant species listed below have been observed on the Cochrane/Peet Road Orchard study area during the survey conducted by Live Oak Associates on June 16, 2011 and February 14, 2012. All plants have been named according to *The Jepson Manual* (Hickman 1993). The U.S. Fish and Wildlife Service indicator status of each plant has been shown following its common name.

**OBL** - Obligate
**FACW** - Facultative Wetland
**FAC** - Facultative
**FACU** - Facultative Upland
**UPL** - Upland
+/- - Higher/lower end of category
**NR** - No review
**NA** - No agreement
**NI** - No investigation

| | | |
|---|---|---|
| **AIZOACEAE – Fig-Marigold Family** | | |
| *Carpobrotus edulis* | Ice Plant | UPL |
| **ALOACEAE – Aloe Family** | | |
| *Aloe sp.* | Aloe sp. | UPL |
| **ANACARDIACEAE – Sumac Family** | | |
| *Schinus molle* | Pepper Tree | UPL |
| *Toxicodendron diversilobum* | Poison Oak | UPL |
| **APOCYNACEAE – Dogbane Family** | | |
| *Nerium oleander* | Oleander | UPL |
| **ARECACEAE – Palm Family** | | |
| *Washingtonia sp.* | Fan Palm | UPL |
| **ASTERACEAE - Sunflower Family** | | |
| *Baccharis pilularis* | Coyote Brush | UPL |
| *Carduus pycnocephalus* | Italian Thistle | UPL |
| *Centaurea solstitialis* | Yellow Star-thistle | UPL |
| *Conyza canadensis* | Canada Horseweed | UPL |
| *Gnaphalium sp.* | Cudweed | - |
| *Lactuca serriola* | Prickly Lettuce | FAC |
| *Silybum marianum* | Milk Thistle | UPL |
| *Sonchus asper* | Prickly Sow-thistle | FAC |
| **ARALIACEAE – Ginseng Family** | | |
| *Hedera helix* | English Ivy | UPL |
| **BRASSICACEAE – Mustard Family** | | |
| *Brassica rapa* | Common Mustard | UPL |
| *Brassica nigra* | Black Mustard | UPL |
| **CACTACEAE – Cactus Family** | | |

| | | |
|---|---|---|
| *Opuntia* sp. | Prickly Pear | UPL |
| **CAPRIFOLIACEAE – Honeysuckle Family** | | |
| *Sambucus mexicana* | Blue Elderberry | FAC |
| **CHENOPODIACEAE – Goosefoot Family** | | |
| *Atriplex sp.* | Atriplex | - |
| **CONVOLVULACEAE – Morning Glory Family** | | |
| *Convolvulus arvensis* | Mourning Glory | UPL |
| **CUPRESSACEAE – Cypress Family** | | |
| *Juniperus sp.* | Juniper Bush | UPL |
| **FABACEAE – Legume Family** | | |
| *Acacia sp.* | Mimosa | UPL |
| *Medicago polymorpha* | Burclover | UPL |
| **FAGACEAE – Oak Family** | | |
| *Quercus agrifolia* | Coast Live Oak | UPL |
| **GERANIACEAE – Geranium Family** | | |
| *Erodium moschatum* | White-stem Filaree | UPL |
| **IRIDACEAE – Iris Family** | | |
| *Iris germanica* | Bearded Iris | UPL |
| **JUGLANDACEAE – Walnut Family** | | |
| *Juglans californica* | California Black Walnut | FAC |
| *Juglans regia* | English Walnut | UPL |
| **MALVACEAE – Mallow Family** | | |
| *Malva neglecta* | Dwarf Mallow | UPL |
| *Malva parviflora* | Cheeseweed Mallow | UPL |
| **OLEACEAE – Olive Family** | | |
| *Ligustrum sp.* | Privet | UPL |
| **ONAGRACEAE – Evening Primrose Family** | | |
| *Epilobium brachycarpum* | Annual Fireweed | UPL |
| **OXALIDACEAE – Oxalis Family** | | |
| *Oxalis pes-caprae* | Bermuda buttercup | UPL |
| **PINACEAE – Pine Family** | | |
| *Picea sp.* | Spruce Tree | UPL |
| *Pinus radiata* | Monterey Pine | UPL |
| *Pseudotsuga menziesii* | Douglas-fir | UPL |
| **PLANTAGINACEAE – Plantago Family** | | |
| *Plantago lanceolata* | English Plantain | FAC |
| **POACEAE - Grass Family** | | |
| *Avena sp.* | Wild Oats | UPL |
| *Bromus diandrus* | Ripgut | UPL |
| *Bromus hordeaceus* | Soft Chess | FACU |
| *Bromus madritensis ssp. rubens* | Red Brome | NI |
| *Cortaderia jubata* | Pampas Grass | UPL |
| *Cynodon dactylon* | Bermuda Grass | FAC |
| *Hordeum murinum* | Foxtail Barley | NI |
| *Lolium multiflorum* | Italian Ryegrass | FAC |

| | | |
|---|---|---|
| *Piptatherum miliaceum* | Smilo Grass | UPL |
| **ROSACEAE – Rose Family** | | |
| *Prunus sp.* | Prunus Tree | UPL |
| *Rosa sp.* | Rose Bush | UPL |
| **SALICACEAE – Willow Family** | | |
| *Populus nigra* var. *italic* | Lombardy Poplar | UPL |
| **SCROPHULARIACEAE – Figwort Family** | | |
| *Veronica persica* | Bird's-eye speedwell | UPL |
| **SIMAROUBACEAE – Simarouba Family** | | |
| *Ailanthus altissima* | Tree of Heaven | FACU |
| **SOLANACEAE – Nightshade Family** | | |
| *Solanum sp.* | Solanum | UPL |
| **VITACEAE – Grape Family** | | |
| *Vitis sp.* | Grape | FACW/NO |
| **ZYGOPHYLLACEAE – Caltrop Family** | | |
| *Tribulus terrestris* | Puncturevine | UPL |

## APPENDIX B: TERRESTRIAL VERTEBRATE SPECIES THAT POTENTIALLY OCCUR ON THE STUDY AREA

The species listed below are those that may reasonably be expected to use the habitats of the study area. The list was not intended to include birds that are vagrants or occasional transients. Its purpose was rather to include those species that may be expected to routinely and predictably use the planning area during some or all of the year. An asterisk denotes a species observed on the project site during the survey conducted on June 16, 2011 and February 14, 2012.

**CLASS: AMPHIBIA**
**ORDER: ANURA (Frogs and Toads)**
**FAMILY: BUFONIDAE (True Toads)**
Western Toad (*Bufo boreas*)
**FAMILY: HYLIDAE (Treefrogs and Relatives)**
*Pacific Treefrog (*Hyla regilla*)

**CLASS: REPTILIA**
**ORDER: SQUAMATA (Lizards and Snakes)**
**SUBORDER: SAURIA (Lizards)**
**FAMILY: PHRYNOSOMATIDAE**
Western Fence Lizard (*Sceloporus occidentalis*)
**FAMILY: SCINCIDAE (Skinks)**
Western Skink (*Eumeces skiltonianus*)
**FAMILY: ANGUIDAE (Alligator Lizards and Relatives)**
Alligator Lizard (*Elgaria multicarinata*)
**SUBORDER: SERPENTES (Snakes)**
**FAMILY: COLUBRIDAE (Colubrids)**
California Kingsnake (*Lampropeltis getula californiae*)
Pacific Gopher Snake (*Pituophis catenifer catenifer*)
Terrestrial Garter Sanke (*Thamnophis elegans*)
**FAMILY: VIPERIDAE**
Pacific Rattlesnake (*Crotalus oreganus*)

**CLASS: AVES**
**ORDER: CICONIIFORMES (Herons, Storks, Ibises, and relatives**)
**FAMILY: CATHARTIDAE (American Vultures)**
*Turkey Vulture (*Cathartes aura*)
**ORDER: FALCONIFORMES (Vultures, Hawks, and Falcons)**
**FAMILY: ACCIPITRIDAE (Hawks, Old World Vultures, and Harriers)**
White-tailed Kite (*Elanus caeruleus*)
Red-tailed Hawk (*Buteo jamaicensis*)
Golden Eagle (*Aquila chrysaetos*)
**FAMILY: FALCONIDAE (Caracaras and Falcons)**
American Kestrel (*Falco sparverius*)
**ORDER: CHARADRIIFORMES (Shorebirds, Gulls, and Relatives)**
**FAMILY: CHARADRIIDAE (Plovers and Relatives)**
Killdeer (*Charadrius vociferous*)
**ORDER: COLUMBIFORMES (Pigeons and Doves)**
**FAMILY: COLUMBIDAE (Pigeons and Doves)**
*Mourning Dove (*Zenaida macroura*)

*Rock Dove (*Columba livia*)

**ORDER: STRIGIFORMES (Owls)**

**FAMILY: STRIGIDAE (Typical Owls)**

Burrowing Owl (*Athene cunicularia*)

**ORDER: APODIFORMES (Swifts and Hummingbirds)**

**FAMILY: TROCHILIDAE (Hummingbirds)**

Anna's Hummingbird (*Calypte anna*)

**ORDER: PASSERIFORMES (Perching Birds)**

**FAMILY: TYRANNIDAE (Tyrant Flycatchers)**

Black Phoebe (*Sayornis nigricans*)
Say's Phoebe (*Sayornis saya*)
Western Kingbird (*Tyrannus verticalis*)

**FAMILY: LANIIDAE (Shrikes)**

Loggerhead Shrike (*Lanius ludovicianus*)

**FAMILY: CORVIDAE (Jays, Magpies, and Crows)**

*Scrub Jay (*Aphelocoma californica*)
Stellar Jay (*Cyanocitta stelleri*)
*American Crow (*Corvus brachyrhynchos*)
Common Raven (*Corvus corax*)

**FAMILY: HIRUNIDAE (Swallows)**

*Barn Swallow (*Hirundo rustica*)
*Cliff Swallow (*Petrochelidon pyrrhonota*).

**FAMILY: TURDIDAE (Thrushes)**

Western Bluebird (*Sialia Mexicana*)
*American Robin (*Turdus migratorius*)

**FAMILY: MIMIDAE (Mockingbirds and Thrashers)**

Northern Mockingbird (*Mimus polyglottos*)

**FAMILY: STURNIDAE (Starlings and Allies)**

*European Starling (*Sturnus vulgaris*)

**FAMILY: EMBERIZIDAE (Emberizines)**

White-crowned Sparrow (*Zonotrichia albicollis*)
Song Sparrow (*Melospiza melodia*)
*California Towhee (*Pipilo crissalis*)
*Dark-eyed Junco (*Junco hyemalis*)

**FAMILY: ICTERIDAE (Blackbirds, Orioles and Allies)**

Red-winged Blackbird (*Agelaius phoeniceus*)
Western Meadowlark (*Sturnella neglecta*)
Brewer's Blackbird (*Euphagus cyanocephalus*)
Brown-headed Cowbird (*Molothrus ater*)

**FAMILY: FRINGILLIDAE (Finches)**

House Finch (*Carpodacus mexicanus*)

**CLASS: MAMMALIA**

**ORDER: LAGOMORPHA (Rabbits, Hares, and Pikas)**

**FAMILY: LEPORIDAE (Rabbits and Hares)**

Desert Cottontail (*Sylvilagus audubonii*)
Black-tailed Jack Rabbit (*Lepus californicus*)

**ORDER: RODENTIA (Squirrels, Rats, Mice, and Relatives)**

**FAMILY: SCIURIDAE (Squirrels, Chipmunks, and Marmots)**

California Ground Squirrel (*Spermophilus beecheyi*)

**FAMILY: GEOMYIDAE (Pocket Gophers)**
Botta's Pocket Gopher (*Thomomys bottae*)
**FAMILY: MURIDAE (Mice, Rats and Voles)**
Deer Mouse (*Peromyscus maniculatus*)
California Meadow Vole (*Microtus californicus*)
**ORDER: CARNIVORA (Carnivores)**
**FAMILY: CANIDAE (Foxes, Wolves, and Relatives)**
Coyote (*Canis latrans*)
Red Fox (*Vulpes vulpes*)
Gray Fox (*Urocyon cinereoargenteus*)
Feral Dog (*Canis familiaris*)
**FAMILY: PROCYONIDAE (Raccoons and Relatives)**
Raccoon (*Procyon lotor*)
**FAMILY: MUSTELIDAE (Weasels and Relatives)**
American Badger (*Taxidea taxus*)
**FAMILY: MEPHITIDAE (Kunks)**
Striped Skunk (*Mephitis mephitis*)
**FAMILY: FELIDAE (Cats)**
Feral Cat (*Felis cattus*)
Cougar (*Puma concolor*)
Bobcat (*Lynx rufus*)
**ORDER: ARTIODACTYLA**
**FAMILY: CERVIDAE (Deer, Elk, and Relatives)**
Black-tailed Deer (*Odocoileus hemionus columbianus*)

# LIVE OAK ASSOCIATES, INC.

an Ecological Consulting Firm

June 5, 2012

Chris Borello
San Sebastian Homes
PO Box 2107
Morgan Hill, CA 95038

**Subject: Arborist Evaluation, 2280 Cochrane Road, Morgan Hill**

Dear Mr. Borello:

On June 1, 2012, Live Oak Associates (LOA) has completed an arborist evaluation on 122 acres of land located southwest of the intersection of Cochrane Road and Coyote Road in the City of Morgan Hill, Santa Clara County, California (APN 728-34-027). The site is bordered by Cochrane Road to the north and east, Half Road and orchard to the southeast, Peet Road to the south, and residences and a Santa Clara Valley Water District facility to the west. The site can be found on the Morgan Hill U.S.G.S. 7.5' quadrangle in Sections 10 and 15 of Township 9 South, Range 3 East. The site is comprised of orchards, fallow field, row crop, a drying lot with sheds, and residences. The site is relatively flat with topography ranging from approximately 400 to 420 feet (122 to 128 meters) National Geodetic Vertical Datum (NGVD).

LOA completed an updated biological evaluation for the site on March 8, 2012. Information gathered during the previous biological study was be used to increase the efficiency of this arborist report. The arborist evaluation is based on the current Morgan Hill Municipal Code Chapter 12.32: Restrictions on Removal of Significant Trees (hereafter referred to as the City of Morgan Hill tree ordinance)(Attachment A). A current Google Earth image, the boundary map prepared by RJA Engineering dated October 31, 2011 (Attachment B), and the site plan provided to LOA (Attachment C) was used to analyze potential tree impacts from the proposed project.

## METHODS

The field inspection was completed on June 1, 2012 by Ms. Wendy Fisher, an arborist certified by the International Society of Arboriculture (Certified Arborist #WE-3872A (exp. 12-31-12)) with the field assistance of LOA ecologist Katrina Krakow. The survey located, identified, and assessed the health and condition of trees located on the 122 acres that fell within the requirements specified by the Morgan Hill tree ordinance. All ordinance-sized trees were tagged using metal tree tags. Any old tags from previous surveys were either reused or folded and nailed in to cover the former tree number. Tree data collected in the field can be found in Attachment D. Each tree falling within the ordinance was GPS'd using a Garmin 60CSs GPS unit, at an accuracy level of approximately 3 meters. The trees were mapped on the Google Earth aerial photograph, as depicted in Attachment E. The numbered locations on the map correspond with the numbers in the right hand column on each field data sheet. Representative photographs from the arborist survey can be found in Attachment F.

## RESULTS

This arborist survey is intended to ensure that the project complies with the local tree ordinance. The City of Morgan Hill has a tree ordinance (Chapter 12.32 of the City's Municipal Code) which seeks to protect all trees having a single stem or trunk with a circumference of forty inches or greater for nonindigenous (nonnative) species (except those in residential zones) and eighteen inches or greater for indigenous (native) species measured at four and one-half feet vertically above the ground or immediately below the lowest branch. All orchard trees are exempt of the ordinance. Indigenous trees are defined by the City as any tree that is native to the Morgan Hill region, including oaks (all types), California bays, madrones, sycamore and alder. The ordinance states that "it is unlawful for any person to cut down, remove, poison or otherwise kill or destroy, or cause to be removed any tree or community of trees on any city or private property without first securing a permit as provided in this chapter; provided, however, that a permit shall not be required for developments which have been reviewed and approved by the planning commission or architectural and site review board and the tree removal conforms with the landscape plans of those developments."

As shown in the table below and in Attachment D, 283 individual trees that fall within the City's tree ordinance were identified within the 122-acre site.

| **Summary of Tree Data, 2080 Cochrane Road, Morgan Hill. June 1, 2012.** | | | | |
|---|---|---|---|---|
| **Species** | **Common Name** | **Native Species** | **Number of Ordinance Trees** | **Number of Ordinance Trees Potentially Impacted** |
| *Populus nigra* var. *italic* | Lombardy Poplar | no | 141 | 0 |
| *Quercus agrifolia* | Coast Live Oak | yes | 110 | 103 |
| *Juglans hindsii* | N. California Black Walnut | yes | 9 | 9 |
| *Juglans regia* | English Walnut | no | 5 | 5 |
| *Ulmus americana* | American Elm | no | 5 | 5 |
| *Quercus lobata* | Valley Oak | yes | 3 | 3 |
| *Olea* sp. | Olive | no | 2 | 2 |
| *Fraxinus uhdei* | Shamel Ash | no | 1 | 1 |
| *Prunus dulcis* | Almond | no | 1 | 0 |
| *Quercus douglasii* | Blue Oak | yes | 1 | 1 |
| *Schinus molle* | Pepper | no | 1 | 1 |
| *Calocedrus deccurrens* | Incense Cedar | yes | 1 | 1 |
| *Pistacia vera* | Pistachio | no | 1 | 1 |
| *Sequoia sempervirens* | Coast Redwood | yes | 1 | 1 |
| *Pinus radiata* | Monterey Pine | yes | 1 | 1 |
| **Total** | **Fifteen** | **Seven** | **283** | **134** |

Of the 15 species of trees identified on the site, seven species are native to California. Of these native trees, only the three species of oak (*Quercus* sp.) were not planted, but grew naturally on the site as part of the native landscape. The majority of the native oak trees are clustered along the site's northwestern boundary. The remaining four native tree species (N. California black walnut (*Juglans hindsii*), incense cedar (*Calocedrus decurrens*), coast redwood (*Sequoia sempervirens*), and Monterey pine (*Pinus radiata*)) were planted as part of landscaping around the existing residences located on the site.

The majority of the trees were non-native Lombardy poplar (*Populus nigra* var. *italic*) that had been planted in a linear strip along the sites' western and northwestern boundaries. The remaining nonnative species had been planted around the residences and the perimeter of the orchard and included English walnut (*Juglans regia*), American elm (*Ulmus americana*), olive (*Olea* sp.), shamel ash (*Fraxinus uhdei*), almond (*Prunus dulcis*), pepper (*Schinus molle*), and pistachio (*Pistacia vera*).

## DISCUSSION

Many of the trees protected by the City ordinance will not be adversely affected by the proposed project. For example, it is not anticipated that any of the Lombardy poplar trees will be removed as a part of the proposed project, based on review of the site plan and email correspondence with Chris Borrello (project developer). These trees will continue to thrive and provide an effective screen from the neighboring residences and roads. Furthermore, seven of the twenty-five trees protected by the ordinance that were identified by *Moki Smith Profession Tree Care* in the tree survey that was included in Appendix E of the administrative draft EIR for the project will be protected (*Admin. Draft EIR, Cochrane-Borello Residential Development Project, April 2012*). Six of these protected trees are coast live oaks and one is an almond. Implementation of the tree protection mitigation measures outlined in Section 3.5.3.3 of the administrative Draft EIR will ensure that all trees intended for preservation will truly be protected during and after project construction. A tree protection plan completed by a certified arborist to the satisfaction of the City arborist is one of the criteria outlined in the tree protection mitigation measures.

Native coast live oak trees located on the site were all in fair to excellent shape and should be considered a significant resource on the property. California's oak woodland habitat is declining due to cutting for wood, agricultural and urban development, flood control, and management practices leading to low tree regeneration. Although this plant community is not in immediate danger of extirpation, concern for this habitat has increased over the last several years in the scientific community and resource agencies. This concern has become exacerbated because of Sudden Oak Death (SOD), caused by a fungus-like pathogen *Phytophthora ramorum,* which leads to lethal trunk infections in susceptible species. SOD infected woodlands have been identified in Santa Clara County, occurring west of the site along the Santa Clara County-Santa Cruz County border. Nonetheless, cumulative losses of hardwood forest from development in the County are a concern.

Woodland habitats, particularly when they occur within a mosaic of other habitats (e.g., grasslands, chaparral, etc.), support a diverse wildlife community. The loss of woodland habitat on a site represents impacts not just to trees, but also to the wildlife species that rely on them. Considerable scientific research indicates the distribution and abundance of wildlife is adversely affected by the proximity of residential development and paved roads.

Up to 134 trees protected by the City ordinance could be removed or indirectly damaged from the proposed project. The City's typical replacement ratio is 1:1 for significant trees deemed in fair to excellent shape by the arborist (personal communication, Terry Linder, Senior Planner, City of Morgan Hill). It appears that the landscape plan included as Figure 3.2-3 in the administrative draft EIR would accommodate the planting of replacement 134 trees, should this be necessary. However, planting of the nonnative species of oak (*Qerucs rubra, Q. agrifolua,* and *Q. ilex*) that are referenced on the landscape plan should be replaced by native species of oak (*Quercus lobata, Q. agrifolia,* or *Q. kellogii*) in order to fulfill the mitigation requirements.

Conversely, for the project to be in compliance with the measures outlined in the administrative draft EIR (SM BIO-5.1), all native and nonnative ordicance trees removed on the site would need to be replaced at a 3:1 ratio. In this case, 402 trees would need to be planted.

Please do not hesitate to contact me to discuss this arborist evaluation.

Sincerely,

Wendy C. Fisher

Wendy Fisher
Senior Project Manager
Certified Arborist #WE-3872A (exp. 12-31-12)

**Attachment A**
**Morgan Hill Municipal Code Chapter 12.32:**
**Restrictions on Removal of Significant Trees**

**Morgan Hill Municipal Code**

Chapter 12.32 RESTRICTIONS ON REMOVAL OF SIGNIFICANT TREES

Sections:



12.32.010 Council determinations.

The city council finds and declares:

A. The existing and future trees and tree communities located in the city are a valuable and distinctive natural resource. The trees and tree communities of the city augment the economic base through agricultural production, encouragement of tourism and enhancement of the living environment. These resources are a major component of both the highly localized and areawide environment.

B. The following environmental consequences are among those which could result from the indiscriminate removal or destruction of trees and tree communities in the city:

1. Modification of microclimates;
2. Change or elimination of animal habitat, possibly including habitats of endangered species;
3. Change in soil conditions, resulting in modified biological activity and erosion of soils;
4. Creation of increased susceptibility of flood hazards;
5. Increased risk of landslides;
6. Increased cost of construction and maintenance of drainage systems through increased flow and diversion of surface waters;
7. Degradation of the human habitat;
8. Loss of environmental benefits of trees in neighborhoods, such as noise reduction, oxygen replacement, carbon dioxide reduction, interception of particulates and aesthetic qualities;
9. Potential for irreparable wind damage to adjacent trees.

C. The preservation and replacement of significant tree communities on private and public property is necessary to protect the natural beauty of the area, protect property values and prevent undesirable changes in the environment.

D. It is necessary to enact the ordinance codified in this chapter for the reasons stated in this section and to promote the public health, safety, general welfare and prosperity of the city, while respecting and recognizing individual rights to develop, maintain and enjoy private property to the fullest possible extent, consistent with the public interest, convenience and necessity.
(Ord. 535 N.S. § A (part), 1980)

12.32.020 Definitions.
For the purposes of this chapter, the following words shall have the meaning ascribed to them in this section:
A. "City" means the city of Morgan Hill, California, acting by and through its authorized representatives.
B. "Community development director" means the community development director of the city, including his authorized or appointed representatives.
C. "Community of trees" means a group of trees of any size which are ecologically or aesthetically related to each other such that loss of several of them would cause a significant ecological, aesthetic or environmental impact in the immediate area.
D. "Person" means an individual, public agency, including the city and its departments, firms, associations and corporations, and their employees, agents or representatives.
E. "Private property" means all property not owned by the city or any other public agency.
F. "Public property" means all property owned by the city, and any other city, county, city and county, special district or other public agency in the incorporated area of the city.
G. "Tree" means any live woody plant rising above the ground with a single stem or trunk of a circumference of forty inches (approx. 12.7" dia.) or more for nonindigenous species and eighteen inches (approx. 5.7" dia.) or more for indigenous species measured at four and one-half feet vertically above the ground or immediately below the lowest branch, whichever is lower, and having the inherent capacity of naturally producing one main axis continuing to grow more vigorously than the lateral axes. All commercial tree farms, nonindigenous tree species in residential zones and orchards (including individual fruit trees) are exempted from the definition of tree for the purpose of this chapter. Trees of any size within the public right-of-way shall constitute a tree for the purposes of this subsection.
H. Tree, Indigenous. "Indigenous tree" means any tree which is native to the Morgan Hill region. Such trees include, oaks (all types), California Bays, Madrones, Sycamore and Alder.
(Ord. 1055 N.S. § A, 1991; Ord. 535 N.S. § A (part), 1980)

12.32.030 Permit--Required.
It is unlawful for any person to cut down, remove, poison or otherwise kill or destroy, or cause to be removed any tree or community of trees on any city or private property without first securing a permit as provided in this chapter; provided, however, that a permit shall not be required for developments which have been reviewed and approved by the planning commission or community development director and the tree removal conforms with the landscape plans of those developments. A permit shall otherwise be

required for removal of any trees as defined in subsection G of Section 12.32.020 of this chapter.
(Ord. 691 N.S. § A, 1984: Ord. 535 N.S. § A (part), 1980)
(Ord. No. 1935 N.S., § 4(Exh. B), 6-3-2009)

12.32.040 Permit--Application.
Any person desiring to cut down, remove, destroy or cause to be removed any tree regulated in this chapter shall apply to the community development department for a tree cutting permit on forms provided by the department. The application shall be accompanied by such drawings, written material, photographs and other information as are necessary to provide necessary data concerning trees within the affected area and which shall include:
A. The diameter and height of the tree;
B. The type of trees (e.g. coniferous, evergreen hardwood and deciduous hardwood);
C. A map or accurate sketch of location and trees proposed to be cut (show other significant trees, shrubs, buildings or proposed buildings; photographs may be used to show the area);
D. Method for marking the tree proposed to be cut down, removed or destroyed;
E. Description of method to be used in removing the tree;
F. Description of tree planting or replacement program;
G. Reasons for proposing removal of the tree;
H. Address where tree is located;
I. General health of tree to be cut down or removed (all diseased trees are to be inspected by an arborist or tree surgeon documenting extent and nature of disease);
J. Other pertinent information which the community development director may require.
(Ord. 535 N.S. § A (part), 1980)

12.32.050 Permit--Public notice procedures.
Within five days after submission of a completed application, the applicant shall cause a notice of application on a form provided by the community development department to be posted in at least two conspicuous locations clearly visible to the public on or close to the property affected, indicating the date of the application, a brief description thereof, identification of the subject property, the address to which comments may be directed and from which further information may be obtained, and the final date for receipt of comments. No action shall be taken upon any application until the applicant has filed an affidavit that such posting has been done.
(Ord. 535 N.S. § A (part), 1980)

12.32.060 Permit--Review and action.
The community development director shall review the application and, if necessary, inspect the site, and shall determine on the basis of the information provided, the site inspection, and the criteria contained in this chapter whether to grant, grant with conditions, or deny the permit. Such action shall be taken within twenty days after receipt of the affidavit referred to in the preceding section. Upon taking action, the community development director shall provide the applicant with a written statement indicating the action taken, any conditions imposed, and the findings made in support thereof.

(Ord. 535 N.S. § A (part), 1980)

12.32.070 Permit--Approval--Criteria.

The community development director or any other person or body charged with determining whether to grant, conditionally grant or deny a tree cutting permit may approve a permit only if one or more of the following findings are made:

A. The tree:

1. Is diseased;
2. Could adversely affect the general public health and safety,
3. Could cause substantial damage,
4. Is a public nuisance,
5. Is in danger of falling,
6. Is too closely located to existing structures,
7. All practical design alternatives for site layout have been exhausted without being able to design around the tree(s), etc.,
8. Interferes with utility service,
9. Acts as a host for a plant which is parasitic to another species of tree which is in danger of being infested or exterminated by the parasite,
10. Is a substantial fire hazard,
11. Tree removal is necessary for the continuing agricultural use of the property, or
12. Will be replaced by plantings approved by the community development director, unless special conditions indicate otherwise;

B. The required action is necessary:

1. To utilize the property in a manner which is of greater public value than any environmental degradation caused by the action, or
2. To allow reasonable economic or other enjoyment of the property.

(Ord. 535 N.S. § A (part), 1980)

12.32.080 Permit--Approval--Conditions.

In granting any permit as provided in this chapter, the community development director, planning commission or city council may attach reasonable conditions to insure compliance with the intent and purpose of this chapter including, but not limited to:

A. Replacement of trees removed with plantings of trees acceptable to the community development director. In all cases native trees shall be planted to replace native trees removed unless practical reasons preclude this option;

B. Use of measures to effect erosion control, soil and water retention and diversion or control of increased flow of surface waters;

C. Use of measures to insure that the contemplated action will not have adverse environmental effects relating to shade, noise buffers, protection from wind, air pollution and historic features;

D. Posting of a bond to insure maintenance of substitute landscaping pursuant to the requirements of Chapter 18.74 of this code.

(Ord. 535 N.S. § A (part), 1980)

12.32.090 Application constitutes permission to enter property.

Filing of an application for a tree cutting permit shall constitute a grant of permission for city personnel concerned with administering this part to enter the subject permit area during normal working hours from the date of application to the completion of any approved action for the purpose of inspecting the area for compliance with the provisions of this chapter and applicable law.
(Ord. 535 N.S. § A (part), 1980)

12.32.100 Inspection--Notification of violations.
The community development department may cause sufficient inspections to be made of the permit area to assure compliance with the provisions of this chapter and the requirements of any applicable law. Upon completion of any inspection, the permittee shall be given a written notice of any violations observed at the time of inspection for correction thereof.
(Ord. 535 N.S. § A (part), 1980)

12.32.110 Commencement of work--Time limitations.
If work authorized by an approved permit is not commenced within a period of one year from the date of approval, the permit shall be considered void.
(Ord. 535 N.S. § A (part), 1980)

12.32.120 Emergencies.
In case of emergency, caused by the hazardous or dangerous condition of a tree and requiring immediate action for the safety of life or property, such necessary action may be taken to remove the tree or otherwise reduce or eliminate the hazard without complying with the other provisions of this chapter, except that the person responsible for the cutting or removal of the tree shall report such action to the community development director within five working days thereafter.
(Ord. 535 N.S. § A (part), 1980)

12.32.130 Appeal procedures.
The applicant or any other person who is aggrieved by the issuance or nonissuance of the permit or any conditions thereof may appeal in the manner set forth in this section. A statement by the appellant shall be required indicating how the appellant is aggrieved or adversely affected by the decision. At the time the appeal is heard, the planning commission shall rule upon the appellant's standing as an aggrieved party. If the planning commission rules that the appellant is not aggrieved, all further proceedings shall be stayed except that the appellant may appeal the planning commission decision on standing to the city council as provided in this chapter.
A. Permits considered and acted upon by the community development director may be appealed to the planning commission by filing a written notice of appeal with the secretary of the planning commission within ten days of the issuance or denial of the permit. The planning commission shall hear such appeal within thirty days of the date of filing of the written protest. The planning commission shall render a decision on the appeal within fifteen days of public hearing. The community development director shall notify the affected parties of the action as provided for in Section 12.32.050 of this chapter.

B. Permits considered and acted upon by the planning commission may be appealed to the city council by filing a written notice of appeal with the secretary of the planning commission within ten days from the decision of the planning commission. The city council shall hear such appeal within sixty days and render a decision within fifteen days following such hearing. The decision of the city council shall be final. The action taken by the city council shall be reported to the affected parties as provided for in Section 12.32.050 of this chapter.
(Ord. 535 N.S. § A (part), 1980)

12.32.140 Removal or trimming without a permit deemed a misdemeanor.
Any property owner, lessee or his agent or representative who engages in tree cutting or removal or conspires with another to engage in tree cutting or removal without a valid tree cutting permit is guilty of a misdemeanor. In addition, such party shall be liable to the city for a civil penalty in the amount of the cost of replacing the removed tree with a new tree as comparable to the removed tree as is reasonably feasible plus all attorney's fees.
(Ord. 535 N.S. § A (part), 1980)

12.32.150 Violation--Penalty.
Violations of this chapter shall be punished as provided for in Chapter 18.68 of the city's zoning regulations.
(Ord. 535 N.S. § A (part), 1980)

**Attachment B**
**Boundary and Adjoiners**
**San Sebastian Homes**
**Morgan Hill, California**
**October 31, 2011**

**Attachment C**
**Site Plan for San Sebastian Homes Development**
**Cochrane Road, Morgan Hill**


COYOTE CREEK PARK

**Attachment D**
**Tree Data from 2080 Cochrane Road, Morgan Hill**
**Collected by certified arborist Wendy Fisher on June 1, 2012**

| Table 1. Results of the tree surveys for 2280 Cochrane Road, Morgan Hill, California. | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Diameter at 4 1/2' above ground | | | | | | Height |
| Tree No. | Species | <5.7" | 5.7"-12.7" | >12.7" | Native | Ord. Size** | Health** | GPS# Comments |
| ✓ 1 | Populus nigra | | | 16.8 | n | ✓ | high | T1 = 062 |
| ✓ 2 | Populus | | | 13.8 | n | ✓ | med | 063 45' |
| ✓ 3 | Populus | | | 13.9 | n | ✓ | h | 064 50' |
| ✓ 4 | '' | | | 15.5 | n | ✓ | h | 065 50 |
| ✓ 5 | '' | | | 17.5 | n | ✓ | h | 066 55 |
| ✓ 6 | '' | | | 13.1 | n | ✓ | h | 067 55 |
| ✓ 7 | '' | | | 15.1 | n | ✓ | h | 068 55 |
| ✓ 8 | '' | | | 16.5 | n | ✓ | h | 069 60 |
| ✓ 9 | '' | | | 16.1 | n | ✓ | h | 070 60 |
| 10 | '' | | | 15.4 | n | ✓ | h | 071 65 |
| 11 | '' | | | 15.5 | n | ✓ | h | 072 65 |
| 12 | '' | | | 13.7 | n | ✓ | h | 073 65 |
| 13 | '' | | | 15.1 | n | ✓ | h | 074 |
| 14 | '' | | | 15.0 | n | ✓ | h | 075 |
| 15 | '' | | | 12.8 | n | ✓ | h | 076 |
| 16 | '' | | | 14.5 | n | ✓ | h | 077 |
| 17 | '' | | | 16.8 | n | ✓ | h | 078 |
| 18 | '' | | | 18.1 | n | ✓ | h | (078) GPS |
| 19 | '' | | | 15.1 | n | ✓ | h | 079 |
| 20 | '' | | | 16.0 | n | ✓ | h | 080 |
| 21 | '' | | | 19.2 | n | ✓ | h | 081 |
| 22 | '' | | | 18.8 | n | ✓ | m | 082 (083 ✓) |
| 23 | '' | | | 15.5 | n | ✓ | m | 084 |
| 24 | '' | | | 15.8 | n | ✓ | m | 085 |
| 25 | '' | | | 16.0 | n | ✓ | h | 086 |
| | Total | | | | | | | |

Check data and add another tree? to GPS

*Nonnative species: 12.7" = min. diameter for ordinance sized
Native species: 5.7" = min. diameter for ordinance sized

**Health: High (8-10) 80-100% healthy foliage (hf), Medium (5-7) 50-79% hf, Low (2-4) 1-49% hf, Dead = 1

| Table 1. Results of the tree surveys for 2280 Cochrane Road, Morgan Hill, California. | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Diameter at 4 1/2' above ground | | | | | | |
| Tree No. | Species | ~~<5.7"~~ | 5.7"-12.7" | >12.7" | Native | Ord. Size** | Health** | Comments |
| 26 | Populus | | | ≅15 | n | ✓ | h | too dense to measure 087 |
| 27 | " | | | ≅15 | n | ✓ | h | 088 |
| 28 | " | | | ≅16 | n | ✓ | h | 089 |
| 29 | " | | | ≅14.5 | n | ✓ | h | 090 |
| 30 | " | | | ≅15 | n | ✓ | h | 091 |
| 31 | " | | | ≅14 | n | ✓ | l | 092 |
| 32 | " | | | ≅ 14.5 | n | ✓ | l | 093 |
| 33 | " | | | ≅ 18 | n | ✓ | m | 094 |
| 34 | " | | | 15.5 | n | ✓ | h | 095 |
| 35 | " | | | ≅16.5 | no | ✓ | h | 096 |
| 36 | " | | ≅ | 17 | no | ✓ | h | 097 =65 |
| 37 | " | | ≅ | 17 | no | ✓ | h | 098 |
| 38 | " | | ≅ | 16 | no | ✓ | h | 099 |
| 39 | " | | ≅ | 16 | no | ✓ | h | 100 |
| 40 | " | | ≅ | 14 | no | ✓ | h | 101 |
| 41 | " | | = | ≅15 | n | ✓ | h | 102 |
| 42 | " | | | ≅ 14 | n | ✓ | h | 103 |
| 43 | " | | | 13 | n | ✓ | h | 104 |
| 44 | " | | | 14 | n | ✓ | h | 105 |
| 45 | " | | | 14.5 | n | ✓ | h | 106 |
| 46 | " | | | 14.5 | n | ✓ | h | 107 |
| 47 | " | | | 16 | h | ✓ | h | 108 |
| 48 | " | | | ≅ 19" | n | ✓ | h | 109 |
| 49 | " | | | ≅ 17 | n | ✓ | h | 110 |
| 50 | " | | | ≅17 | n | ✓ | h | 111 |
| | Total | | | | | | | 112 |

*Nonnative species: 12.7" = min. diameter for ordinance sized

Native species: 5.7" = min. diameter for ordinance sized

**Health: High (8-10) 80-100% healthy foliage (hf), Medium (5-7) 50-79% hf, Low (2-4) 1-49% hf, Dead = 1

| Table 1. Results of the tree surveys for 2280 Cochrane Road, Morgan Hill, California. | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Diameter at 4 1/2' above ground | | | | | | |
| Tree No. | Species | <5.7" | 5.7"-12.7" | >12.7" | Native | Ord. Size** | Health** | Comments |
| 51 | populus | | | 18" | | ✓ | h | 112 |
| 52 | populus | | | 21" | | ✓ | h | 113 |
| 53 | " | | | 19" | | ✓ | h | 114 |
| 54 | " | | | 15 | | ✓ | h | 115 |
| 55 | CLO | | 12,2 | 12,2 | ✓ | ✓ | h | 116 |
| 56 | CLO | measured | 25,8 | 25,8 | ✓ | ✓ | h | 117 |
| 57 | Populus | | ≥ | 13,5 | | ✓ | h | 118 |
| 58 | Populus | | | 13,5 | | ✓ | h | 119 |
| 59 | " | | | 14,5 | | ✓ | h | 120 |
| 60 | " | | | 14 | | ✓ | h | 121 |
| 61 | " | | | 16 | | ✓ | h | 122 |
| 62 | " | | | 17" | | ✓ | h | 123 |
| 63 | " | | | 18' | | ✓ | h | 124 |
| 64 | " | | | 17.5 | | ✓ | h | 125 |
| 65 | " | | | 17 | | ✓ | h | 126 |
| 66 | " | | | 16 | | ✓ | h | 127 |
| 67 | " | | | 17 | | ✓ | h | 128 |
| 68 | " | | | 19 | | ✓ | h | 129 |
| 69 | " | | | 20 | | ✓ | h | 130 |
| 70 | " | | | 16 | | ✓ | h | 131 |
| 71 | " | | | 14 | | ✓ | h | 132 |
| 72 | " | | | 16 | | ✓ | h | 133 |
| 73 | " | | | 17 | | ✓ | h | 134 |
| 74 | " | | | 18 | | ✓ | h | 135 |
| 75 | " | | | 19 | | ✓ | h | 136 |
| | Total | | | | | | | |

*Nonnative species: 12.7" = min. diameter for ordinance sized
Native species: 5.7" = min. diameter for ordinance sized

**Health: High (8-10) 80-100% healthy foliage (hf), Medium (5-7) 50-79% hf, Low (2-4) 1-49% hf, Dead = 1

76 FR 18

| Table 1. Results of the tree surveys for 2280 Cochrane Road, Morgan Hill, California. | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Diameter at 4 1/2' above ground | | | | | | |
| Tree No. | Species | <5.7" | 5.7"-12.7" | >12.7" | Native | Ord. Size** | Health** | GPS # Comments |
| 76 ~~1~~ | Populus | | | 18 | NO | ✓ | H | 137 |
| 77 ~~2~~ | " | | | 17 | n | ✓ | H | 138 |
| 78 ~~3~~ | " | | | 19 | n | ✓ | H | 139 |
| 79 ~~4~~ | " | | | 22 | n | ✓ | H | 140 |
| 80 ~~5~~ | Populus | | | 19 | n | ✓ | H | 141 |
| 81 ~~6~~ | Populus | | | 21 | n | ✓ | H | 142 |
| 82 ~~7~~ | Populus | | | 20 | n | ✓ | H | 143 |
| 83 ~~8~~ | Populus | | | 17 | n | ✓ | H | 144 |
| 84 ~~9~~ | Populus | | | 26 | n | ✓ | H | 145 |
| 85 ~~10~~ | Populus | | | 13.5 | n | ✓ | H | 146 |
| 86 ~~11~~ | Populus | | | 17 | n | ✓ | H | 147 |
| 87 ~~12~~ | Populus | | | 17 | n | ✓ | H | 148 |
| 88 ~~13~~ | " | | | 18 | n | ✓ | H | 149 |
| 89 ~~14~~ | " | | | 17 | n | ✓ | H | 150 |
| 90 ~~15~~ | " | | | 18 | n | ✓ | H | 151 |
| 91 ~~16~~ | " | | | 17 | n | ✓ | H | 152 |
| 92 ~~17~~ | " | | | 16 | n | ✓ | H | 153 |
| 93 ~~18~~ | " | | | 19 | n | ✓ | H | 154 |
| 94 ~~19~~ | " | | | 19 | n | ✓ | H | 155 |
| 95 ~~20~~ | " | | | 21 | n | ✓ | H | 156 |
| 96 ~~21~~ | " | | | 20 | n | ✓ | H | 157 |
| 97 ~~22~~ | " | | | 14 | n | ✓ | H | 158 |
| 98 ~~23~~ | " | | | 14 | n | ✓ | H | 159 |
| 99 ~~24~~ | " | | | 17 | n | ✓ | H | 160 |
| 100 ~~25~~ | " | | | 17 | h | ✓ | H | 161 |
| | Total | | | | | | | |

*Nonnative species: 12.7" = min. diameter for ordinance sized

Native species: 5.7" = min. diameter for ordinance sized

**Health: High (8-10) 80-100% healthy foliage (hf), Medium (5-7) 50-79% hf, Low (2-4) 1-49% hf, Dead = 1

| | Table 1. Results of the tree surveys for 2280 Cochrane Road, Morgan Hill, California. | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Diameter at 4 1/2' above ground | | | | | | | |
| | Tree No. | Species | <5.7" | 5.7"-12.7" | >12.7" | Native | Ord. Size** | Health** | Comments | |
| 101 | 26 | Populus | | | 17 | | | | 162 | |
| 102 | 27 | " | | | 15 | | | | 163 | |
| 103 | 28 | " | | | 19 | | | | 164 | |
| 104 | 29 | | | | 17 | | | | 165 | |
| 105 | 30 | | | | 14 | | | | 166 | |
| 106 | 31 | CLO | | | 28 | | | | 167 | |
| 107 | 32 | Populus | | | 17 | | | | 168 | |
| 108 | 33 | " | | | 14 | | | | 169 | |
| 109 | 34 | " | | | 23+ | | | | 170 | |
| 110 | 35 | " | | | 21 | | | | 171 | |
| 111 | 36 | " | | | 18 | | | | 172 | |
| 112 | 37 | " | | | 18 | | | | 173 | |
| 113 | 38 | " | | | 19 | | | | 174 | |
| 114 | 39 | " | | | 18 | | | | 175 | |
| 115 | 40 | " | | | 16 | | | | 176 | |
| 116 | 41 | " | | | 15 | | | | 177 | |
| 117 | 42 | " | | | 18 | | | | 178 | |
| 118 | 43 | " | | | 16 | | | | 179 | previous marker |
| 119 | 44 | " | | | 21 | | | | 180 | |
| 120 | 45 | " | | | 18 | | | | 181 | |
| 121 | 46 | CLO | 5.7 | | | Y | ✓ | | 182 | 207 |
| 122 | 47 | VO | | | 43" | Y | ✓ | | 183 | 206 |
| 123 | 48 | CLO | | | 15.5 | Y | ✓ | | 184 | 205 |
| 124 | 49 | CLO | 6.0 | | | Y | ✓ | | 185 | 204 |
| 125 | 50 | CLO | 5.8 | | | | | | 187 | |
| | Total | | | | | | | | | |

Delete pt 186

*Nonnative species: 12.7" = min. diameter for ordinance sized
Native species: 5.7" = min. diameter for ordinance sized

**Health: High (8-10) 80-100% healthy foliage (hf), Medium (5-7) 50-79% hf, Low (2-4) 1-49% hf, Dead = 1

| | Table 1. Results of the tree surveys for 2280 Cochrane Road, Morgan Hill, California. | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Diameter at 4 1/2' above ground | | | | | | | |
| | Tree No. | Species | <5.7" | 5.7"-12.7" | >12.7". | Native | Ord. Size** | Health** | Comments | Old # |
| 126 | 51 | CLO | 6.3 | | | Y | | | 188 | |
| 127 | 52 | CLO | | | 13.2 | Y | | | 189 | 137 |
| 128 | 53 | CLO | | 10.8 | ~~10.8~~ | Y | | | 190 | 136 |
| 129 | 54 | CLO | | 11.9 | ~~11.9~~ | Y | | | 191 | 135 |
| 130 | 55 | CLO | | | 19.0 | Y | | | 192 | 201 |
| 131 | 56 | CLO | | 8.5 | ~~8.5~~ | Y | | | 193 | 200 |
| 132 | 57 | CLO | | | 14.9 | Y | | | 194 | 199 |
| 133 | 58 | CLO | | | 17.1 | Y | | | 195 | 198 |
| 134 | 59 | CLO | | 9.7 | | Y | | | 196 | 196 |
| 135 | 60 | CLO | | | 29.9 | Y | | | 197 | 195 |
| 136 | 61 | CLO | | 9.2 | | Y | | | 198 | 196 |
| 137 | 62 | CLO | 6.0 | | | Y | | | 199 | |
| 138 | 63 | CLO | | | 21.4 | Y | | | 200 | 129 |
| 139 | 64 | CLO | | 13.0 | | Y | | | 201 | 130 |
| 140 161 | 65 | CLO | | 12.2 | | | | | 203 | 161 |
| 141 131 | 66 | CLO | | ≅ 14 | | Y | | | 202 | 131 Did not retag |
| 142 132 | 67 | CLO | | | ≅ 21 | Y | | | 204 | 132 |
| 143 133 | 68 | CLO | ≅ 5.7 | | | Y | | | 205 | 133 |
| 144 134 | 69 | CLO | | | ≅ 26 | Y | | | 206 | 134 PG |
| 145 166 | 70 | CA Bl Walnut | | | 31.4 | Y | | | 207 | 127 |
| 146 167 | 71 | CLO | 7.3 | | | Y | | | 208 | 126 |
| 147 168 | 72 | CLO | | | 24.2 | Y | | | 209 | 157 |
| 148 169 | 73 | CLO | 9.1 | | | Y | | | 210 | 158 |
| 149 170 | 74 | CLO | 11.2 | | | Y | | | 211 | 159 |
| 150 171 | 75 | CLO | | ≅ = | 21 | Y PO | | | 212 | 160 |
| | Total | | | | | | | | | |

Old #

*Nonnative species: 12.7" = min. diameter for ordinance sized
Native species: 5.7" = min. diameter for ordinance sized

**Health: High (8-10) 80-100% healthy foliage (hf), Medium (5-7) 50-79% hf, Low (2-4) 1-49% hf, Dead = 1

#on map

| # on map | | species | diameter | GPS # | Old tag # |
|---|---|---|---|---|---|
| 151 | 172 | CLO | ≅11 PO | 213 | ? |
| 152 | 173 | CLO | ≅17 | 214 | 161 |
| 153 | 174 | CLO | 16.2 | 215 | 163 |
| 154 | 175 | CLO | 10.1 | 216 | 162 |
| 155 | 176 | CLO | 17" | 217 | 164 |
| 156 | 177 | CLO | 10.1 | 218 | 165 |
| 157 | 178 | CLO | 14.2 moved! | 219 | 166 |
| 158 | 179 | CLO | 8.1 | 220 | 167 |
| 159 | 180 | CLO | 16.8 | 221 | 168 |
| 160 | 181 | CLO | 19.5 | 226 ✓ | 169 |
| 161 | 182 | CLO | 11.1 | 222 ✓ | 182 |
| 162 ✓ | 183 | CLO | 12.5 | 223 | = |
| 162 | 184 | CLO | 10.5 | 224 | 171 |
| 163 | 185 | CLO | 19.0 | 225 | 172 |
| 164 | 186 | CLO | 19.0 | 227 | 173 |
| 165 | 187 | CLO | 17.9 | 228 | 174 |
| 166 | 188 | CLO | 12.5 | 229 | 175 |
| 167 | 189 | CLO | 36.9 (5x stem) | 230 | 176 |
| 168 | 190 | CLO | 13.7 (2x) | 231 | 178 |
| 169 | 191 | CLO | 7.0 | 232 | 179 |
| 170 | 192 | CLO | ≅23" | 233 | 180 |
| 171 | 193 | CLO | 5.9 | 234 | |
| 172 | 194 | CLO | ≅10" | 236 | 181 |
| 173 | 195 | CLO | ≅10" | 237 | 183 |
| 174 | 196 | CLO | ≅28" | 238 | 182 |
| 175 | 197 | CLO | ≅8" | 239 | 184 |
| 176 | 198 | CLO | 7.9" | 240 | 185 |
| 177 | 199 | CLO | 6.7 | 241 | 186 |
| 178 | 200 | CLO | 14.1 | 242 | 187 |

| | | Species | diameter | GPS # | Old Tag # | |
|---|---|---|---|---|---|---|
| T179 | 201 | CLO | 27.5 | 243 | 188 | |
| 180 | 202 | CLO | 13.4 | 244 | 189 | |
| 181 | 203 | CLO | 11.1 | 245 | 191 | |
| 182 | 204 | CLO | 12.8 | 246 | 196 | |
| 183 | 205 | CLO | 12.8 | 247 | 192 | |
| 184 | 206 | CLO | 20.4 | 248 | 193 | corner |
| 185 | 207 | CLO | 18.2 | 249 | — | |
| 186 | 208 | CLO | 19.9 | 250 | 155 | |
| 187 | 209 | CLO | 13.2 | 251 | — | |
| 188 | 210 | CLO | 13.1 | 252 | — | |
| 189 | 211 | CLO | 11.7 | 253 | — | |
| 190 | 212 | CLO | 11.7 | 254 | | |
| 191 | 213 | CLO | 18.6 | 255 | 154 | |
| 192 | 214 | CLO | 20.5 | 256 | 153 | |
| 193 | 215 | CLO | 16.4 | 257 | 152 | |
| 194 | 216 | CLO | 9.1 | 258 | — | |
| 195 | 217 | CLO | 23.5 | 259 | 113 | |
| 196 wo… | 218 | CLO | 10.0 sprouter | 260 | — | - out of tags |
| 197 | 219 | CLO | 21 " | 261 | 115 | |
| 198 | 220 | CLO | 19.5 | 262 | 114 | perm marker on tree or old tag if present |
| 199 | 221 | CLO | 18 | 263 | 140 | |
| 200 | 222 | CLO | 18 xskin | 264 | — | |
| 201 | 223 | CLO | 6" | 265 | — | |
| 202 | ~~224~~ | | | | 142 | |
| | 224 | CLO | 12.7 | 266 | ~~14~~ | |
| 203 | 225 | VO | 8.0 | 267 | | |
| 204 | 226 | CLO | 7.1 | 268 | 141 | |
| 205 | 227 | CLO | 6.3 | 269 | — | |
| 206 | 228 | CLO | 8.7 | 270 | — no tag | |
| 207 | 229 | CLO | 21.4 | 271 | | |
| 208 | 230 | | 20.2 | 272 | 144 | |

| Map | | Species | diam | GPS # | Old tag # |
|---|---|---|---|---|---|
| T209 | 231 | CLO | 24.0 | 273 | 148 |
| T210 | 232 | CLO | 15.0 | 274 | 151 |
| T211 | 233 | CA bl. walnut | 22.3 | 275 | 150 |
| T212 | 234 | " | 12.0 | 276 | 149 |
| T213 | 235 | CLO | 18 | 277 | 138 |
| T214 | 236 | CLO | 22" | 278 | 139 |
| T215 | 237 | CA Bl walnut | 8" | 279 | — |
| T216 | 238 | Elm | ≈ 22" | 280 | — |
| T217 | 239 | CLO | ≅ 7" | 281 | 135 |
| T218 | 240 | CLO | ≅ 7" | 282 | 124 |
| T219 | 241 | CLO | ≅ 8" | 283 | — |
| T220 | 242 | CLO | ≅ 12' | 284 | 122 |
| T221 | 243 | CLO | 7" | 285 | 123 |
| T222 | 244 | CLO | 13" | 286 | 121 |
| T223 | 245 | VO | 8.0 | 287 | — |
| 224 | 246 | CLO | 15.8 | 288 | 112 |
| 225 | 247 | CLO | 6.5 | 289 | — |
| 226 | 248 | CLO | 27.3 | 290 | — |
| 227 | 249 | CLO | ≅ 7" | 291 | — |
| 228 | 250 | CLO | 18.2 (2x treehouse) | 292 | — |
| 229 | 251 | CLO | 37.2 | 293 | — |
| 230 | 252 | CLO | 18 | 294 | — |
| 231 | 253 | CLO | 23 | 295 | — |
| 232 | 254 | CLO | 15.5 | 296 | — |
| 233 | 255 | CLO | 17.2 | 297 | — |
| 234 | 256 | almond | 34.8 | 298 | — |
| 235 | 257 | Blue oak | ≅ 16" diam | 299 | — |

| | | | | | |
|---|---|---|---|---|---|
| 263 | 258 | CLO | 70.3 | 300 | no tag |
| 237 | 259 | CLO | 52.7 | 301 | " |
| 238 | 260 | Pepper tree | ≅22" 2x stem | 302 | " |
| 239 | 261 | CA bl. walnut | 10" | 303 | " |
| 240 | 262 | Elm | 16.9 | 304 | " |
| 241 | 263 | Elm | 17.1 | 305 | " |
| 242 | 264 | Incense cedar | 20.2 | 306 | " |
| 243 | 265 | English walnut | 20.2 | 307 | " ← delete GPS 308 |
| 244 | 266 | CA walnut | 16.8 | 309 | " |
| 245 | 267 | " | 13.11 | 310 | " |
| 246 | 268 | olive | 21.7 | 311 | " |
| 247 | 269 | olive | 33.7 | 312 | " |
| | | | | 313 | → delete 313 |
| 248 | 270 | elm | 16.9 | 314 | no tag - residence |
| 249 | 271 | elm | 20.1 | 315 | |
| 250 | 272 | pistachio? | 11.7 | 316 | |
| 251 | 273 | coast redwood | ≅21" | 317 | not tagged residence |
| 252 | 274 | monterey pine | 20.7 | 318 | |
| 253 | 275 | Cal walnut | 12.2 | 319 | |
| 254 | 276 | english walnut | 22+" | 320 | |
| 255 | 277 | Ca walnut | 31.4 | 321 | |
| 256 | 278 | Ash sp. | 23.7 | 322 | |

| | | | | | |
|---|---|---|---|---|---|
| 257 | 279 | Eng walnut | ≅ 17" | 323 | not tagged resid |
| 258 | 280 | Eng walnut | ≅ 20 | 324 | |
| 259 | 281 | Eng walnut | 14.7" | 325 | |
| 260 | 282 | Populus | ≅ 16" | 326 | |
| 261 | 283 | Populus | ≅ 16 | 327 | |
| 262 | 284 | Populus | ≅ 17 | 328 | |
| 263 | 285 | Populus | ≅ 15 | 329 | |
| 264 | 286 | Populus | ≅ 15" | 330 | |
| 265 | 287 | Populus | ≅ 16" | 331 | |
| 266 | 288 | Populus | ≅ 15" | 332 | |
| 267 | 289 | Populus | ≅ 15 | 333 | - out of tags |
| 268 | 290 | Populus | 15 | 334 | |
| 269 | 291 | Populus | ≅ 16 | 335 | |
| 270 | 292 | Populus | ≅ 17 | 336 | |
| 271 | 293 | " | ≅ 18 | 337 | |
| 272 | 294 | " | ≅ 17 | 338 | |
| 273 | 295 | " | ≅ 15 | 339 | |
| 274 | 296 | | ≅ 16 | 340 | |
| 275 | 297 | | 14 | 341 | |
| 276 | 298 | | 14 | 342 | |
| 277 | 299 | | 15 | 343 | |
| 278 | 300 | | 15 | 344 | |
| 279 | 301 | | ≅ 18 | 345 | |
| 280 | 302 | | ≅ 16 | 346 | |
| 281 | 303 | | ≅ 18 | 347 | |

| | | | | |
|---|---|---|---|---|
| 282 | 304 | Populus | = 16 | 348 |
| 283 | 305 | Populus | 16 " | 349 |

**Attachment E**
**Tree Data Mapped on Aerial Photograph**


T25
T43
T24
T60
T40
T19
T108
T93
T56
T9
T3
T16
T118
T120
T2
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T131
T136
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T266
T149
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T271
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T253
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T255
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T254
T236
T241
T245
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T239
T242
T246
T247
T237
Coyote Rd
Walizer Ln
Peet Rd
664 ft
© 2012 Google
Google earth
Imagery Date: 10/31/2011
37°09'36.21" N 121°37'58.12" W elev 423 ft
Eye alt 3446 ft


T57
T49
T45
T42
T51
T46
T43
T47
T40
T36
T41
T33
T30
T31
T28
T25
T27
T23
T24
T22
T21
T20
Half Rd
T19
T17_18
T16
T15
T14
T12
T10
T11
T8
T9
T7
T6
T5
T3
T4
T2
T1
114 ft
© 2012 Google
Google earth
Imagery Date: 10/31/2011
37°09'29.28" N 121°37'47.60" W elev 421 ft
Eye alt 916 ft


T56
T55
T52
T54
T53
T58
T57
T49
T50
T51
T48
T46
T45
T44
T47
T42
T43
T40
T41
T38
T36
T39
T35
T34
T33
T32
29 ft
© 2012 Google
Google earth
Imagery Date: 10/31/2011
37°09'31.08" N 121°37'45.65" W elev 423 ft
Eye alt 550 ft


T93 T91
T95 T96 T92
T88 T90 T85
T86
T82
T83 T84
T78
T77
T75
T56
T79
T80
T76
T74
T71
T73 T72
T62 T60
T67 T61
T59
T58
28 ft
© 2012 Google
Google earth
Imagery Date: 10/31/2011
37°09'32.36" N 121°37'46.11" W elev 426 ft
Eye alt 550 ft


T118
T120
T119
T115
T117
T116
T114
T113
T108
T112
T111
T109
T110
T107
T105
T103
T106
T101
T99
T100
T97
28 ft
© 2012 Google
Google earth
Imagery Date: 10/31/2011
37°09'33.91" N 121°37'46.65" W elev 430 ft
Eye alt 550 ft


T157
T154
T152
T156
T155
T153
T151
T150
T147
T136
T148
T138
T141
T149
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T135
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T223
T133
T125
T122
T220
T143
T126
T144
T124
T222
T132
T129
T121
94 ft
© 2012 Google
Google earth
Imagery Date: 10/31/2011
37°09'36.86" N 121°37'48.06" W elev 440 ft
Eye alt 847 ft


T185
T182
T181
T179
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T184
T183
T180
T176
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T203
T207
T225
T227
T195
T196
T197
T206
T224
T198
T199
T200
T205
T226
T201
91 ft
© 2012 Google
Google earth
Imagery Date: 10/31/2011
37°09'41.14" N 121°37'49.07" W elev 455 ft
Eye alt 838 ft


T186
T187
T188
T189
T190
T191
T192
T193
T194
T195
T196
T197
T198
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T232
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T234
T235
T248
T249
T250
91 ft
© 2012 Google
Google earth
Imagery Date: 10/31/2011
37°09'43.42" N 121°37'51.31" W elev 447 ft
Eye alt 838 ft


T239
T240
T241
T243
T242
T247
T244
T245
T246
T236
T237
T238
281 ft
© 2012 Google
Google earth
Imagery Date: 10/31/2011
37°09'48.58" N 121°38'01.68" W elev 422 ft
Eye alt 1614 ft


T6
T4
T3
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T260
T265
T264
T261
T263
T262
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T271
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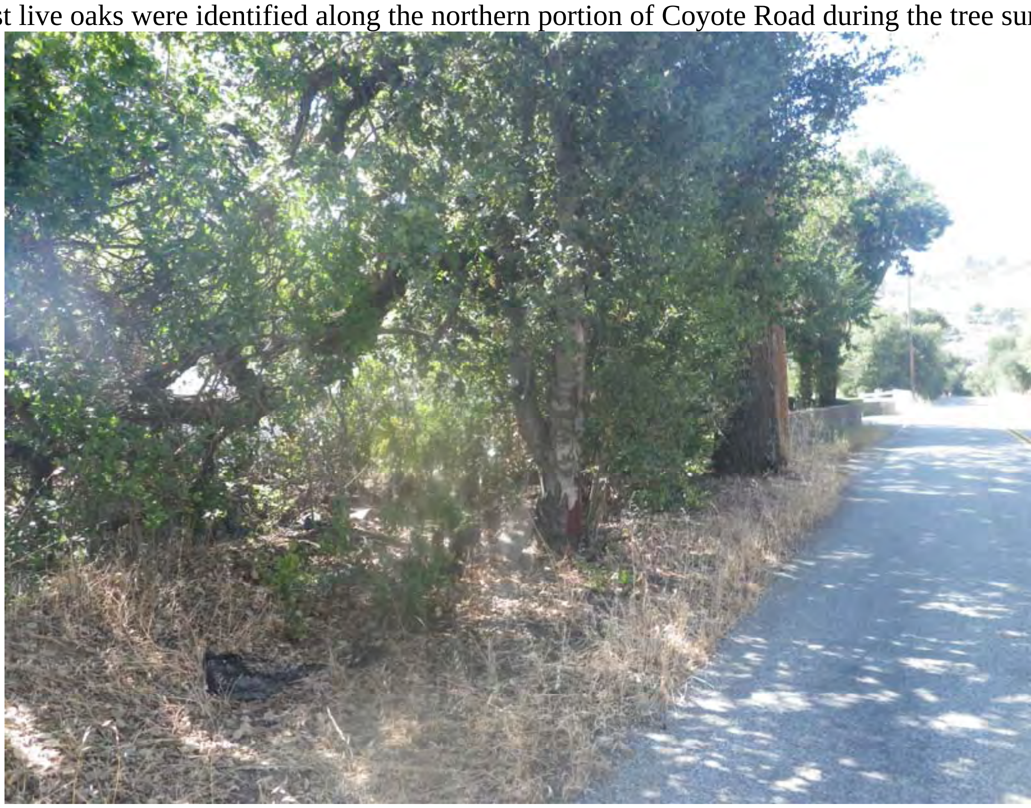
T274
T275
T276
T277
Walizer Ln
T279
T278
T280
T281
T282
T283
342 ft
© 2012 Google
Google earth
Imagery Date: 10/31/2011
37°09'22.82" N 121°37'53.80" W elev 416 ft
Eye alt 1902 ft

**Attachment F**
**Selected Photographs from the Arborist Survey**

**Photograph 1 (above).** Rows of Lombardy poplar trees line Half Road and Coyote Road within the project area. These nonnative trees will be retained and protected. **Photograph 2 (below).** Coast live oaks were identified along the northern portion of Coyote Road during the tree survey.



**Photograph #3 (above).** LOA' recent tree tag was nailed into all ordinance trees (right). The previous tree tags (left) were found on some of the trees and were either reused or folded in place.
**Photograph #4. (below).** A few of the oak trees appeared to have been recently pruned near this building located near the site's northeastern boundary.

**Photograph #5 (above).** One of the large coast live oaks that will be preserved and built around.
**Photograph #6 (below).** A former treehouse was found within this extremely decadent coast live oak located near the sites northern boundary.

Moki Smith Professional Tree Care

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Arborist # WE-6620A
License # 678321

September 20, 2008

Shiela (408) 848-9944

Stanley Borello
17045 Monterey Highway #A
Morgan Hill, CA 95037

Property at: Cochrane X Coyote

As per your request I visited the property shown above in order to make observations and recommendations regarding the health and construction site preservation needs for trees located there.

| 1. | Common Name | Species | D.B.H. | Height | Canopy Spread | Condition |
|---|---|---|---|---|---|---|
| | Live oak | *Quercus agrifolia* | 49" | 60' | 90' | Excellent |

**Observations:**
This is a specimen tree and should be retained.
There is a 2' pocket of decay at root crown.

**Recommendations:**
This tree is very large and should be inspected annually by an ISA Certified Arborist.
Perform root crown excavation, clean out cavity and treat with fungicide.
Prune canopy to reduce overweight limbs, windsail, remove deadwood and perform structural correction as needed. Aerate, fertilize and inoculate with Mycorrhizal root enhancing fungi.
Mulch to 3" depth with organic mulching material to drip line.
Landscaping design should incorporate only drought tolerant species that is compatible with the Oak.
No landscaping material should be planted within the drip line of this tree.
Perform all construction site tree preservation measures.

| 2. | Common Name | Species | D.B.H. | Height | Canopy Spread | Condition |
|---|---|---|---|---|---|---|
| | Live oak | *Quercus agrifolia* | 18" | 50' | 25' | Good |

**Observations:**
This smaller Live oak is subordinate to tree #1 and has grown at a significant lean, phototroped from underneath tree #1.

**Recommendations:**
Remove.

*Stanley Borello*

| 3. Common Name | Species | D.B.H. | Height | Canopy Spread | Condition |
|---|---|---|---|---|---|
| Live oak | *Quercus agrifolia* | 11" - 7" | 30' | 20' | Good |

**Observations:**
It is unclear as to which side of property line this tree is located on.
This tree will likely be impacted by construction on property.

**Recommendations:**
Remove to facilitate construction.
To retain perform all construction site tree preservation measures.

| 4. Common Name | Species | D.B.H. | Height | Canopy Spread | Condition |
|---|---|---|---|---|---|
| Live oak | *Quercus agrifolia* | 7" | 20' | 12' | Good |

**Observations:**
It is unclear as to which side of property line this tree is located on.
This tree will likely be impacted by construction on property.

**Recommendations:**
Remove to facilitate construction.
To retain perform all construction site tree preservation measures.

| 5. Common Name | Species | D.B.H. | Height | Canopy Spread | Condition |
|---|---|---|---|---|---|
| Black walnut | *Juglans nigra* | 17"- 6" | 45' | 30' | Fair |

**Observations:**
It is unclear as to which side of property line this tree is located on.
This tree will likely be impacted by construction on property.

**Recommendations:**
Remove to facilitate construction.
To retain perform all construction site tree preservation measures.

| 6. Common Name | Species | D.B.H. | Height | Canopy Spread | Condition |
|---|---|---|---|---|---|
| Live oak | *Quercus agrifolia* | 32" | 50' | 48' | Good |

**Observations:**
It is unclear as to which side of property line this tree is located on.
This tree will likely be impacted by construction on property.

*Stanley Borello*

**6.**
(continued)
**Recommendations:**
Perform all construction site tree preservation measures.
Any cracked, broken or dead limbs should be removed.
Perform safety inspection during pruning climb.
Aerate, fertilize and inoculate with Mycorrhizal root enhancing fungi.
Mulch to 3" depth with organic mulching material.
Landscaping design should incorporate drought tolerant species that is compatible with the Oak.
No landscaping material should be planted within the drip line of this tree.
Perform all construction site tree preservation measures.

| 7. | Common Name | Species | D.B.H. | Height | Canopy Spread | Condition |
|---|---|---|---|---|---|---|
| | Live oak | *Quercus agrifolia* | 67" | 60' | 90' | Very good-Good |

**Observations:**
This large specimen Live oak is located in the middle of an orchard.
This tree has an old 'tree fort' within the canopy and minor surface root damage from discing.
This tree has a small cavity at root crown and a large cavity revealed by a broken standard limb at approximately 25' height from grade. It is likely that the hollow from the broken limb connects to the hollow at the root crown and present a safety and structural failure hazard.
There is an old pruning wound in a standard limb approximately 26" diameter.

**Recommendations:**
Prune large broken stub to branch bark collar. Prune to reduce weight approximately 20-30% not to exceed 30%.
Any cracked, broken or dead limbs should be removed.
Perform safety inspection during pruning climb. Pruning and inspection should be performed by an ISA Certified Arborist to ensure accurate diagnosis. Mitigation measures should be performed as needed subsequent to inspection for decay within main stem.
Install up to 4 support cables within canopy, placement to be determined upon pruning and inspection.
Aerate, fertilize and inoculate with Mycorrhizal root enhancing fungi.
Mulch to 3" depth with organic mulching material.
Landscaping design should incorporate drought tolerant species that is compatible with the Oak.
No landscaping material should be planted within the drip line of this tree.
Perform all construction site tree preservation measures.

| 8. Common Name | Species | D.B.H. | Height | Canopy Spread | Condition |
|---|---|---|---|---|---|
| Live oak | *Quercus agrifolia* | 22" | 25' | 25' | Fair |

**Observations:**
This tree has included fence wire in the mainstem and may present future structural problems such as girdling. This also presents a personnel safety hazard in the event of the need to remove this tree in the future.

**Recommendations:**
Remove to avoid future safety hazard.

| 9. Common Name | Species | D.B.H. | Height | Canopy Spread | Condition |
|---|---|---|---|---|---|
| Live oak | *Quercus agrifolia* | 27"-8"-18"-6" | 47' | 45' | Fair |

**Observations:**

This tree has a multi leader mainstem and is located near driveway.

**Recommendations:**
Preserve and install box cable system within canopy to provide needed support.
Any cracked, broken or dead limbs should be removed.
Aerate, fertilize and inoculate with Mycorrhizal root enhancing fungi.
Mulch to 3" depth with organic mulching material.
Landscaping design should incorporate drought tolerant species that is compatible with the Oak.
No landscaping material should be planted within the drip line of this tree.
Perform all construction site tree preservation measures.

| 10. Common Name | Species | D.B.H. | Height | Canopy Spread | Condition |
|---|---|---|---|---|---|
| Interior live oak | *Quercus wizlizenii* | 9"- 8" | 20' | 17' | Fair |

**Observations:**
This tree is not significant.
The tree has multi leader main stem.

**Recommendations:**
Remove to facilitate construction.
To retain any cracked, broken or dead limbs should be removed.
Prune to perform structural correction.
Mulch to 3" depth with organic mulching material.
Landscaping design should incorporate drought tolerant species that is compatible with the Oak.
Perform all construction site tree preservation measures.

*Stanley Borello*

| 11. | Common Name | Species | D.B.H. | Height | Canopy Spread | Condition |
|---|---|---|---|---|---|---|
| | American elm | *Ulmus americana* | 17" | 18' | 10' | Fair |

**Observations:**
This ornamental tree is located in the yard and could be retained for landscaping.
This tree has been topped and will need structural correction.

**Recommendations:**
Remove to facilitate construction.
If retained, perform all construction site tree preservation measures.
Prune to perform structural correction.

| 12. | Common Name | Species | D.B.H. | Height | Canopy Spread | Condition |
|---|---|---|---|---|---|---|
| | American elm | *Ulmus americana* | 12" | 18' | 10' | Fair |

**Observations:**
This ornamental tree is located in the yard and could be retained for landscaping.

**Recommendations:**
Remove to facilitate construction.
If retained, perform all construction site tree preservation measures.

| 13. | Common Name | Species | D.B.H. | Height | Canopy Spread | Condition |
|---|---|---|---|---|---|---|
| | Live oak | *Quercus agrifolia* | 34-30-18-32-30" | 50' | 75' | Excellent |

**Observations:**
This large specimen tree has a multi leader main stem.
The multi leader main stem does present a structural failure hazard, therefore the tree could be removed to facilitate construction.

**Recommendations:**
Preserve.
Remove for safety and to facilitate construction.
Mitigate removal by planting one 24" box tree of same species during landscaping.
To retain, any cracked, broken or dead limbs should be removed.
Prune to perform structural correction.
Install cable system within canopy to provide structural stability and avoid failure.
Mulch to 3" depth with organic mulching material.
Landscaping design should incorporate drought tolerant species that is compatible with the Oak.
No landscaping material should be planted within the drip line of this tree.
Perform all construction site tree preservation measures.

*Stanley Borello*

| 14. Common Name | Species | D.B.H. | Height | Canopy Spread | Condition |
|---|---|---|---|---|---|
| Almond | *Prunus sp.* | 22" | 45' | 40' | Good |

**Observations:**
Large tree with multi leader main stem.

**Recommendations:**
Remove to facilitate construction.
Preserve.
To retain, any cracked, broken or dead limbs should be removed.
Prune to perform structural correction.
Mulch to 3" depth with organic mulching material.
Perform all construction site tree preservation measures.

| 15. Common Name | Species | D.B.H. | Height | Canopy Spread | Condition |
|---|---|---|---|---|---|
| Live oak | *Quercus agrifolia* | 14" | 32' | 20' | Fair |

**Observations:**
This tree is a part of a dense grove of California live oak trees.
Some of the smallest ones will need to be removed to remove old farm equipment and debris that they have grown through. This should be done since this equipment will girdle the trees and cause structural compromise.

**Recommendations:**
Remove to facilitate construction.
Mitigate removal by planting two 15 gallon or one 24" box tree of same species during landscaping.
To retain, remove debris from underneath canopy.
Prune to remove cracked, broken or dead limbs to and perform structural correction.
Mulch to 3" depth with organic mulching material.
Perform all construction site tree preservation measures.

| 16. Common Name | Species | D.B.H. | Height | Canopy Spread | Condition |
|---|---|---|---|---|---|
| Valley oak | *Quercus lobata* | 13" | 30' | 20' | Fair |

**Observations:**
This tree is a part of a dense grove of California live oak trees
Some of the smallest ones will need to be removed to remove old farm equipment and debris that they have grown through. This should be done since this equipment will girdle the trees and cause structural compromise.

**Recommendations:**
Remove to facilitate construction.
To retain, remove debris from underneath canopy.
Prune to remove cracked, broken or dead limbs to and perform structural correction.
Mulch to 3" depth with organic mulching material.
Perform all construction site tree preservation measures.

*Stanley Borello*

| 17. | Common Name | Species | D.B.H. | Height | Canopy Spread | Condition |
|---|---|---|---|---|---|---|
| | Valley oak | *Quercus lobata* | 7" | 25' | 15' | Fair |

**Observations:**
This tree is a part of a dense grove of California live oak trees
Some of the smallest ones will need to be removed to remove old farm equipment and debris that they have grown through. This should be done since this equipment will girdle the trees and cause structural compromise.

**Recommendations:**
Remove to facilitate construction.
To retain, remove debris from underneath canopy.
Prune to remove cracked, broken or dead limbs to and perform structural correction.
Mulch to 3" depth with organic mulching material.
Perform all construction site tree preservation measures.

| 18. | Common Name | Species | D.B.H. | Height | Canopy Spread | Condition |
|---|---|---|---|---|---|---|
| | Valley oak | *Quercus lobata* | 10"-8"-7" | 30' | 25' | Fair |

**Observations:**
This tree is a part of a dense grove of California live oak trees
Some of the smallest ones will need to be removed to remove old farm equipment and debris that they have grown through. This should be done since this equipment will girdle the trees and cause structural compromise.

**Recommendations:**
Remove to facilitate construction.
To retain, remove debris from underneath canopy.
Prune to remove cracked, broken or dead limbs to and perform structural correction.
Install cable system within canopy to provide structural support.
Mulch to 3" depth with organic mulching material.
Perform all construction site tree preservation measures.

| 19. | Common Name | Species | D.B.H. | Height | Canopy Spread | Condition |
|---|---|---|---|---|---|---|
| | American elm | *Ulmus americana* | 20" | 18' | 15' | Fair |

**Observations:**
This small ornamental tree is located in the yard and could be retained for landscaping.

**Recommendations:**
Remove to facilitate construction.
To retain, perform all construction site tree preservation measures.

*Stanley Borello*

| 20. | Common Name | Species | D.B.H. | Height | Canopy Spread | Condition |
|---|---|---|---|---|---|---|
| | Live oak | *Quercus agrifolia* | 54"-40"-36" | 55' | 100' | Excellent |

**Observations:**
This tree is a very large and desirable specimen tree.
The multi leader main stem could present structural failure hazard.

**Recommendations:**
Preserve.
Install box cable system within canopy to provide needed support.
Prune to remove cracked, broken or dead limbs, to perform structural correction and lighten canopy 30%.
Pruning and cable installation should be performed by an ISA Certified Arborist to ensure accurate placement.
Aerate, fertilize and inoculate with Mycorrhizal
root enhancing fungi.
Mulch to 3" depth with organic mulching material.
Landscaping design should incorporate drought tolerant species that is compatible with the Oak.
No landscaping material should be planted within the drip line of this tree.
Perform all construction site tree preservation measures.

| 21. | Common Name | Species | D.B.H. | Height | Canopy Spread | Condition |
|---|---|---|---|---|---|---|
| | Live oak | *Quercus agrifolia* | 17" | 47' | 30' | Good |

**Observations:**
This tree has debris around mainstem at base which will girdle the trees and cause structural compromise.

**Recommendations:**
Remove to facilitate construction.
Mitigate removal by planting two 15 gallon or one 24" box tree of same species during landscaping and incorporated into landscape design.
To retain, remove debris from underneath canopy.
Prune to remove cracked, broken or dead limbs to and perform structural correction.
Mulch to 3" depth with organic mulching material.
Perform all construction site tree preservation measures.

| 22. | Common Name | Species | D.B.H. | Height | Canopy Spread | Condition |
|---|---|---|---|---|---|---|
| | California redwood | *Sequoia sempervirens* | 22" | 45' | 15' | Fair |

**Observations:**
This Redwood tree is located in the yard of existing house.
The tree has a dual main stem which should be pruned for structural correction.
There are utility wires extending in 4 directions, care should be taken when pruning.
**Recommendations:**
Remove to facilitate construction.
To retain, prune to remove cracked, broken or dead limbs to and perform structural correction.
Mulch to 3" depth with organic mulching material.
Perform all construction site tree preservation measures.

*Stanley Borello*

| 23. Common Name | Species | D.B.H. | Height | Canopy Spread | Condition |
|---|---|---|---|---|---|
| English walnut | *Juglans regia* | 26" | 50' | 30' | Good |

**Observations:**
This tree could be retained for landscaping.

**Recommendations:**
Remove to facilitate construction.
To retain, prune to remove cracked, broken or dead limbs to and perform structural correction.
Mulch to 3" depth with organic mulching material.
Perform all construction site tree preservation measures.

| 24. Common Name | Species | D.B.H. | Height | Canopy Spread | Condition |
|---|---|---|---|---|---|
| Black walnut | *Juglans nigra* | 18"-16" | 50' | 30' | Poor |

**Observations:**
This tree is large with dual mainstem, but is in poor condition.

**Recommendations:**
**Remove.**

| 25. Common Name | Species | D.B.H. | Height | Canopy Spread | Condition |
|---|---|---|---|---|---|
| Shamel ash | *Fraxinus uhdei* | 22" | 37' | 40' | Good |

**Observations:**
This tree is in Good condition and could be retained for shade and aesthetics in landscaping.

**Recommendations:**
Remove to facilitate construction.
To retain, prune to remove cracked, broken or dead limbs to and perform structural correction.
Perform all construction site tree preservation measures.

All trees within this report have been tagged on the North side of main stem.

Please feel free to call if you have any questions.

Thank you,

Moki Smith

*Stanley Borello*

# ***Construction Site - Tree Preservation***

• Locate structures, grade changes, etc. as far as feasible from the `dripline' area of the tree.

• Avoid root damage through grading, trenching, compaction, etc., at least within an area 1.5 times the `dripline' area of trees. Where root damage cannot be avoided, roots encountered (over 1" diameter) should be exposed approximately 12" beyond the area to be disturbed (towards tree stem), by hand excavation, or with specialized hydraulic or pneumatic
equipment, cut cleanly with hand pruners or power saw, and immediately back-filled with soil. Avoid tearing, or otherwise disturbing that portion of the root(s) to remain.

• Construct a temporary fence as far from the tree stem (trunk) as possible, completely surrounding the tree, and 6-8 feet in height. Post no parking or storage signs outside / on fencing. Do not attach posting to the mainstem of the tree.

**• Do not allow vehicles, equipment, pedestrian traffic; building materials or debris storage; or disposal of toxic <u>or other</u> materials inside of the fenced off area.**

• Avoid pruning immediately before, during, or immediately after construction impact. Perform only that pruning which is unavoidable due to conflicts with proposed development. Aesthetic pruning should not be performed for at least 1-2 years following completion of construction.

• Trees that will be impacted by construction may benefit from fertilization, ideally performed in the fall, and preferably prior to any construction activities, with not more than 6 lbs. of actual nitrogen per 1,000 square feet of accessible `drip line' area or beyond.

• Mulch `rooting' area with an acidic, organic compost or mulch.

• Arrange for periodic (Biannual/Quarterly) inspection of tree's condition, and treatment of damaging conditions (insects, diseases, nutrient deficiencies, etc.) as they occur, or as appropriate.

• Individual trees likely to suffer significant impacts may require specific, more extensive efforts and/or a more detailed specification than those contained within these general guidelines.

*Stanley Borello*

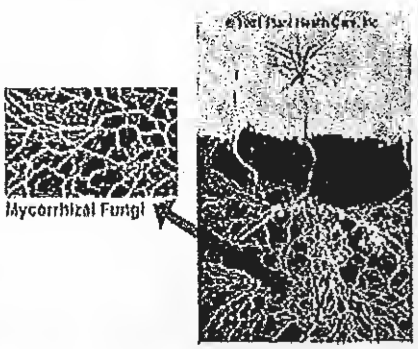
**<u>Mycorrhizal Roots / Enhancing Fungi</u>**

Trees and plants face many natural stresses, such as low soil fertility, drought and temperature extremes. Most plant species have a symbiotic partnership with a unique group of soil organisms called Mycorrhizal fungi. These fungi are considered by plant scientists to be the biological cornerstone of plant life on earth.

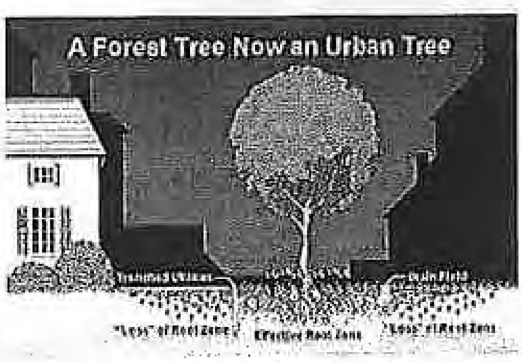
This little known family of beneficial fungi live in and around the roots of 95% of the earth's plant species, serving as a secondary root system, extending themselves far out into the soil. mycorrhizae extract mineral elements and water from soil for their host plant, and live off the plant's sugars. Trees and plants with thriving "Mycorrhizal roots" systems are better able to survive and thrive in stressful man made environments.

In landscape environments, many of which are created from large earth moving projects designed to accommodate park-like office complexes, high density housing, factory buildings, suburban housing developments, large landscape projects, urban construction, highway construction, municipal settings and many others, the soils are virtually void of essential Mycorrhizal fungi and are generally lacking in essential mineral elements. In order, to successfully establish plantings of any kind, from large trees to small shrubs, beneficial Mycorrhizal fungi must be present

Research with specific mycorrhizal fungi on trees has shown improved growth rates up to 300% in stressed and degraded soils and transplant survival rate improvements of over 90%. Increases in root growth of over 1,000 have recently been observed on transplanted trees.

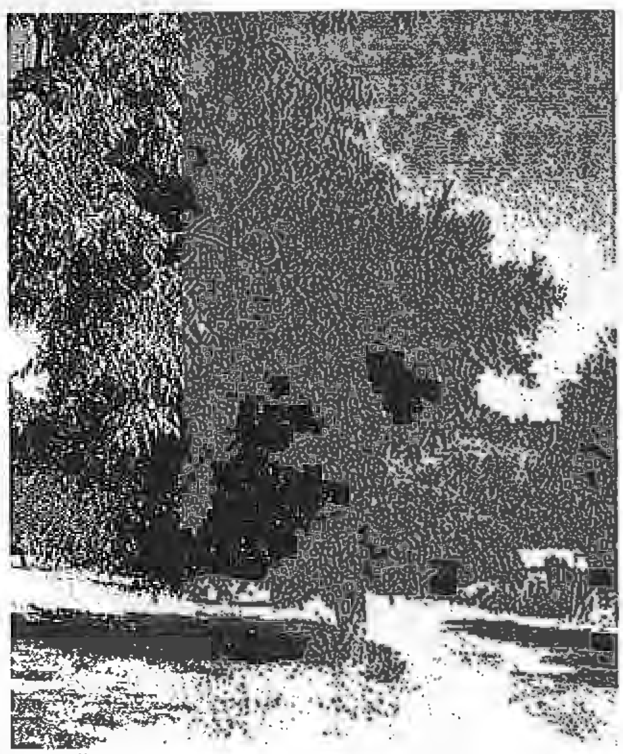






*Stanley Borello*

Trees #1 & 2



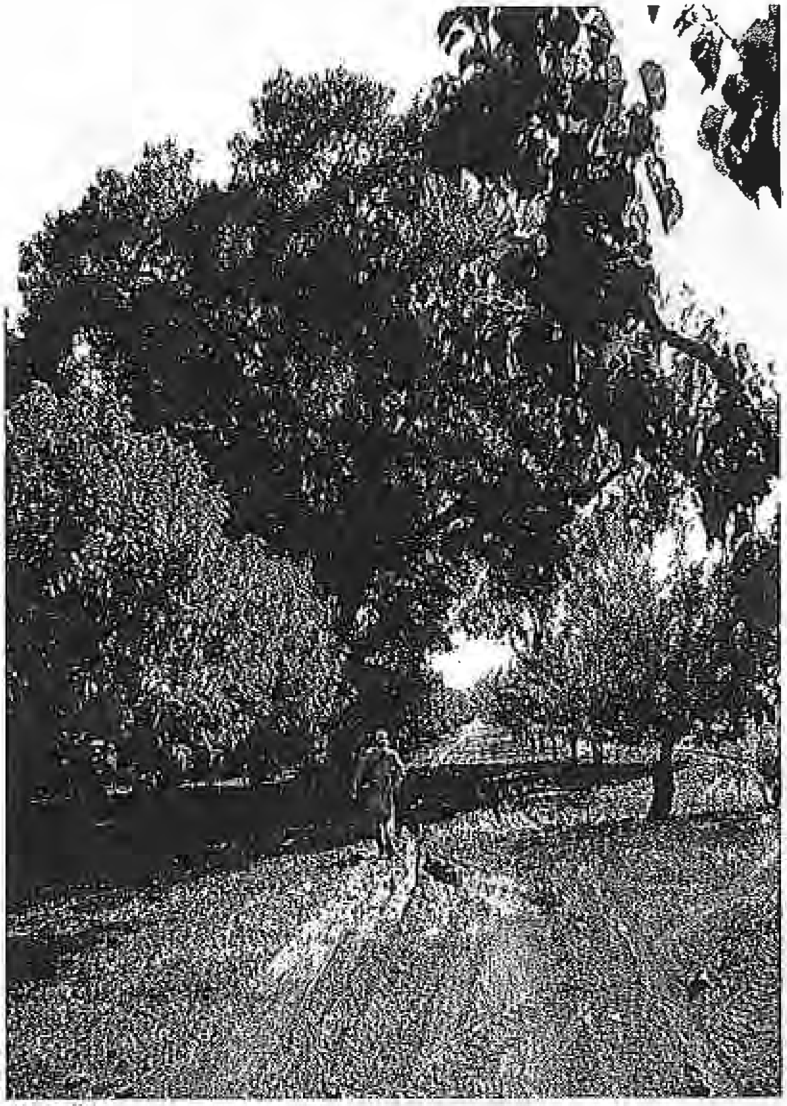
Tree #3

*Stanley Borello*

Tree #4

Trees #5 & 6

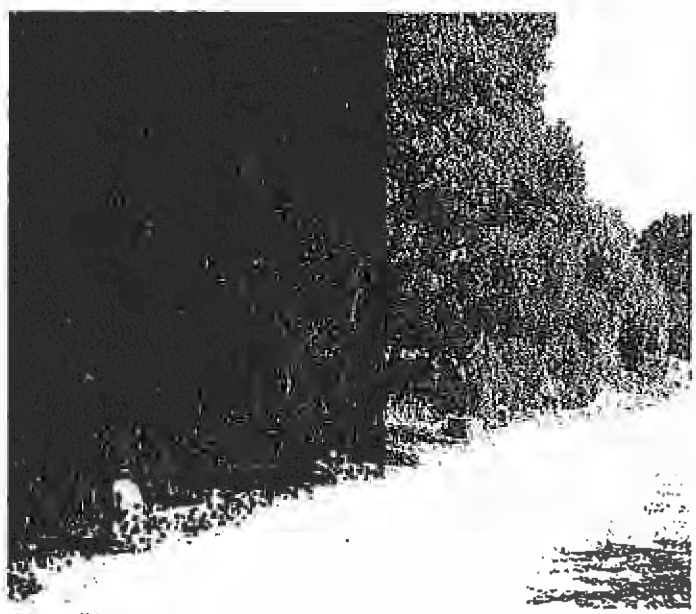
*Stanley Borello*



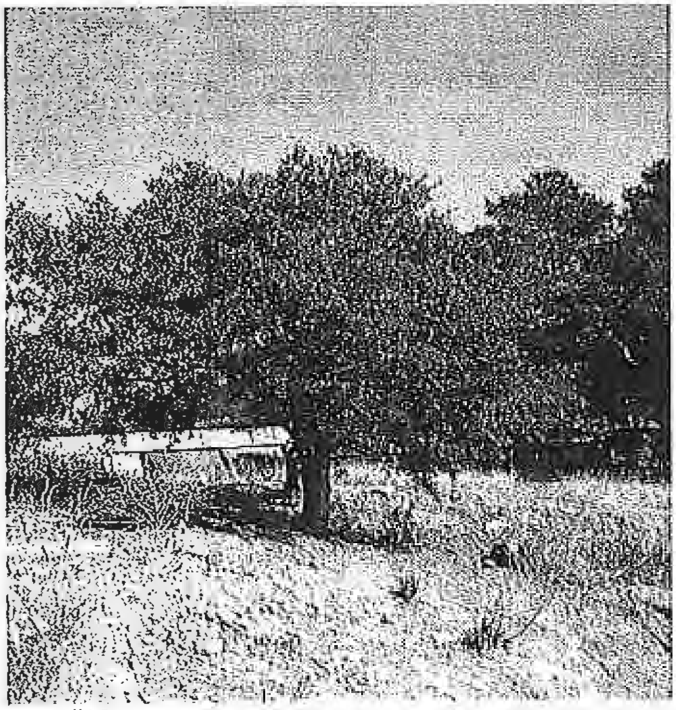
Tree #7

*Stanley Borello*

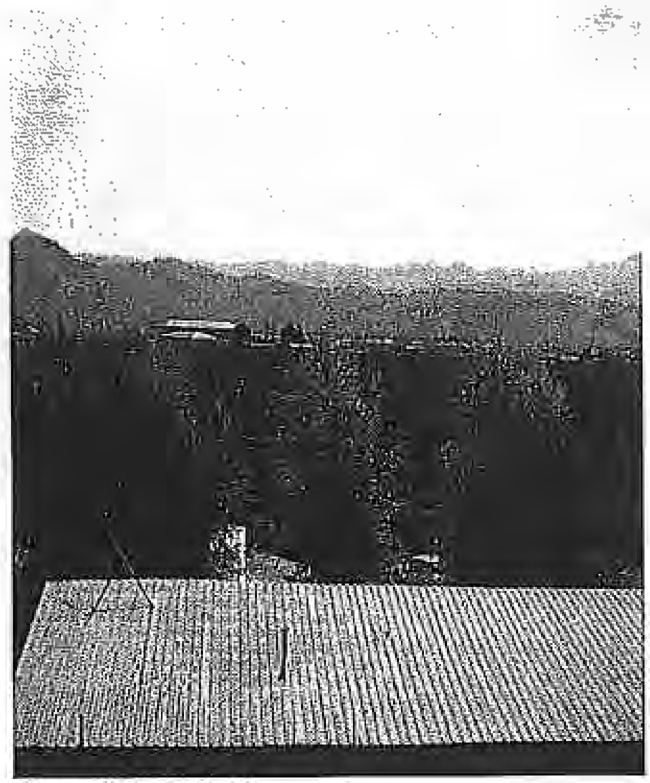
Tree #8



Tree #9



Tree #10

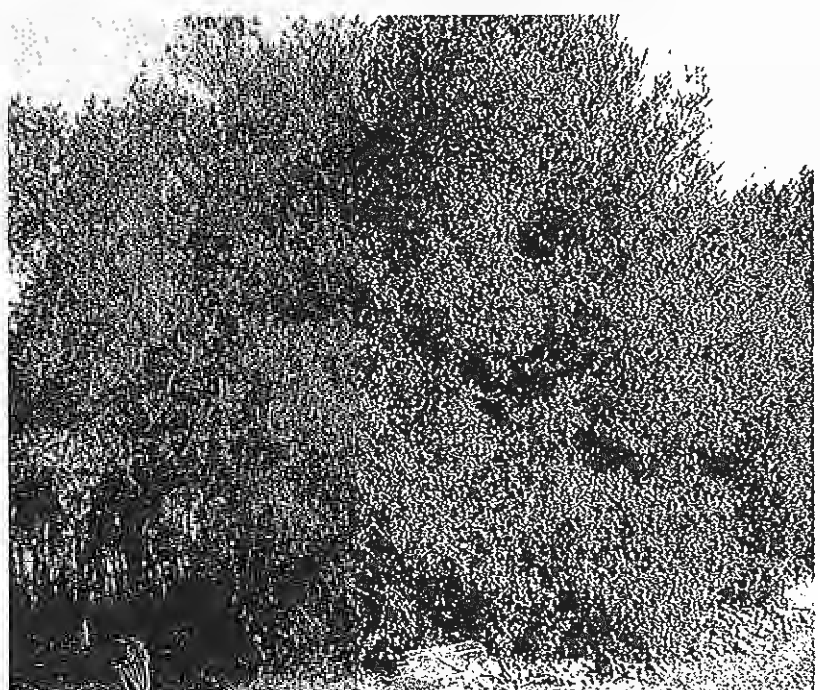


Trees #11, 12 & 19

Tree #13

*Stanley Borello*

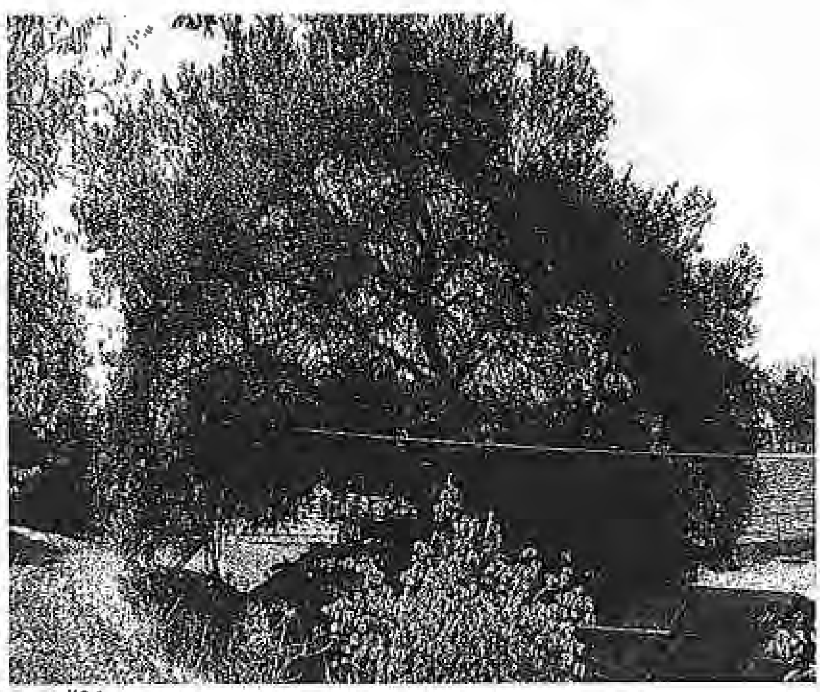
Tree #14



Trees # 15-18

*Stanley Borello*

Tree #20

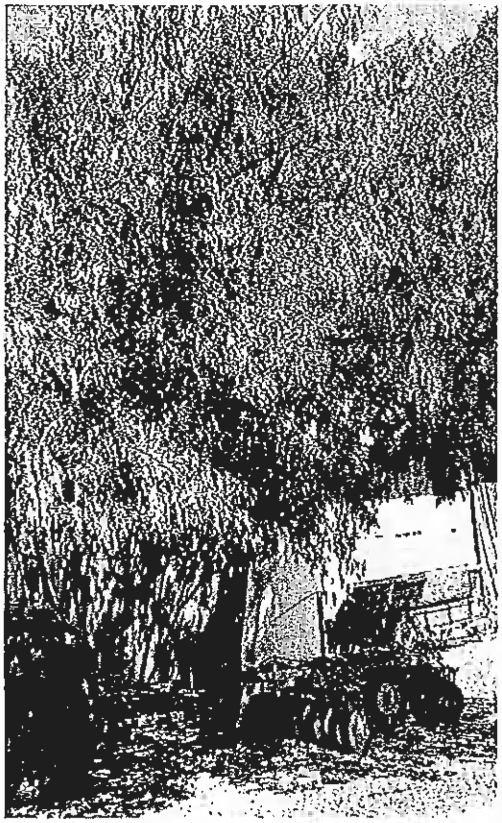


Tree #21

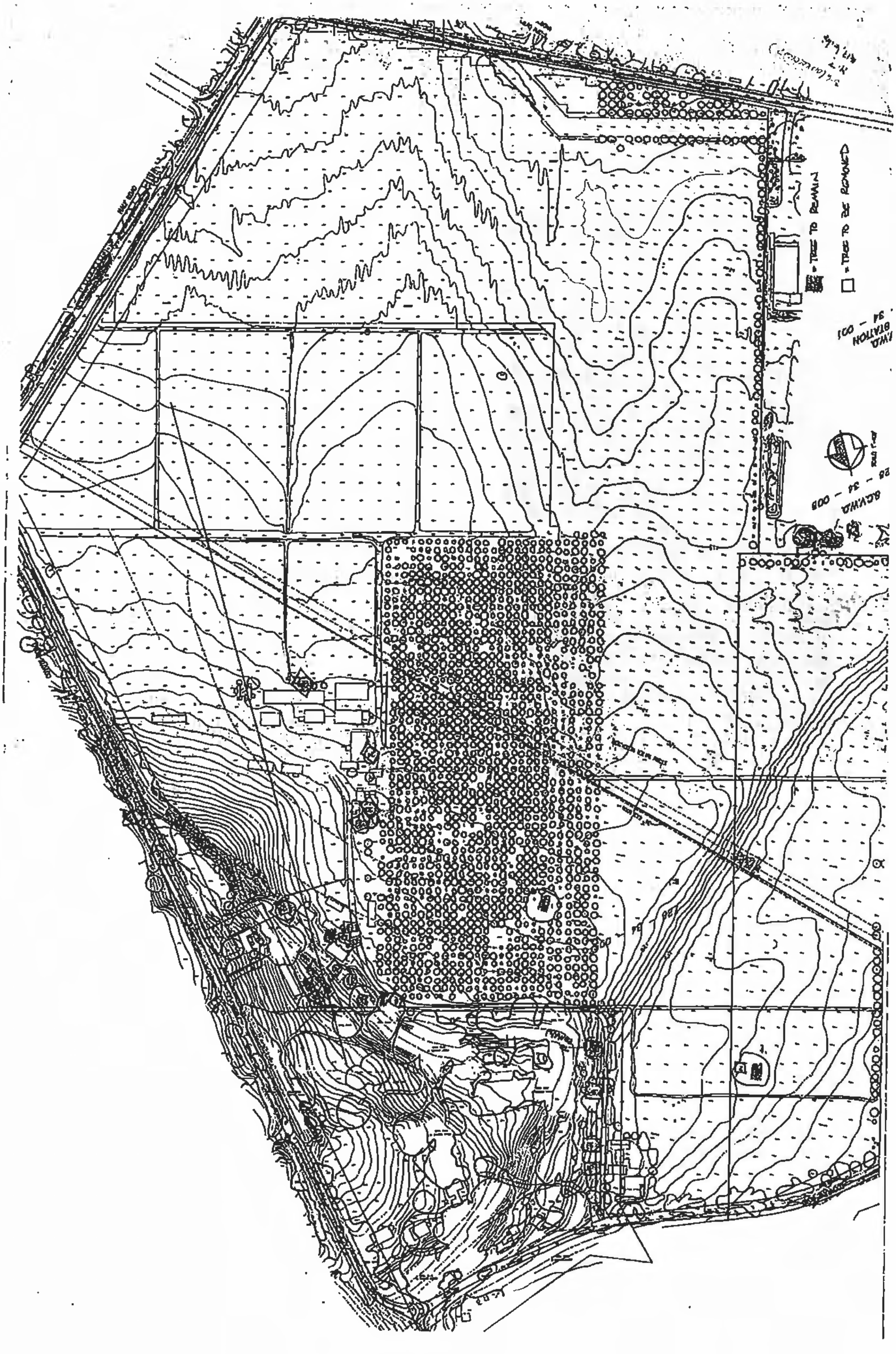
Tree # 22 & 23

Tree # 24

*Stanley Borello*



Tree #25


= TREE TO REMAIN
= TREE TO BE REMOVED

# APPENDIX F

## Construction Emissions Health Risk Assessment, Illingworth & Rodkin

ILLINGWORTH & RODKIN, INC.
Acoustics • Air Quality

505 Petaluma Blvd. South
Petaluma, CA 94952
707-766-7700

July 5, 2012
Revised July 19, 2012

Karli Grigsby
David J. Powers & Associates, Inc.
1871 The Alameda, Suite 200
San Jose, CA 95126

VIA email: kgrigsby@davidjpowers.com

**SUBJECT: Cochrane-Borello Residential Project in Morgan Hill, CA – Construction Emission Health Risk Analysis**

Dear Karli:

This analysis addressed air quality impacts from construction of the proposed project. The project would be located Morgan Hill, California. The project site is bounded by Coyote Rd. and Half Rd. along the eastern boundary, Peet Rd. to the south, Cochrane Rd. to the north. The project would involve the demolition of several existing structures at the site and construction of up to 244 residences. Construction of these residences would occur in 16 phases over an 11 year period, with construction of Phase 1 beginning in 2012. The area surrounding the project site is rural residential and commercial, in addition to several residential developments to the west and southwest of the site.

Screening tables provided by the Bay Area Air Quality management District (BAAQMD) indicate that a project with 250 residential units has the potential for significant health risk impacts out to 300 meters (or almost 1,000 feet). The primary concern is increased cancer risk associated with diesel particulate matter (DPM) emissions from on-site activities. Since existing residences are located within 1,000 feet of the site, a health risk assessment of the project construction activities was conducted that evaluated potential health effects on sensitive receptors from construction emissions of DPM. Anticipated construction schedules and equipment usage projections were used with the California Air Resources Board's emission factor model to compute annual DPM emissions. These data were input to a dispersion model used to predict the off-site DPM concentrations resulting from project construction so that potential increases in lifetime cancer risks could be estimated. Figure 1 shows the project site, emission sources (area sources) used in the air quality dispersion modeling analysis of each construction phase, and sensitive receptor locations where potential health impacts were evaluated.

Construction period diesel exhaust emissions were computed using emission factors from the CARB OFFROAD2007 model for off-road construction equipment and from the EMFAC2011 model for emissions from on-site (water truck) and off-site trucks (haul trucks). The number and types of construction equipment and diesel trucks, along with the anticipated length of their use, for the different phases of construction were based on the site-specific construction activity schedule provided. Construction of the project is anticipated to occur over an 11 year period (2012 – 2022). All of the construction equipment was assumed to have an average age of 7 years during each year of construction. For the initial construction year of 2012 (Phase 1 construction) the average equipment age would be representative of model year 2005, which is representative of EPA Tier 2 equipment.

DPM emissions from haul trucks were modeled for each year of construction of the project. Emissions were calculated using EMFAC2011 emissions for diesel HHDT trucks traveling off-site and on-site. Travel speeds of 35 mph were used in computing emissions while trucks were traveling off-site and 15 mph for trucks traveling on-site. Two haul trucks were included in the analysis. The first, the north haul route, for trucks traveling to construction areas for Phases 1 - 5 and Phases 13 and 14, assumed trucks would travel along Cochrane Rd to the northern entrance of the project site and into the site. The second haul route, south haul route, for trucks traveling to construction areas for Phases 6 - 12 and Phases 15 and 16, assumed trucks would travel along Cochrane Rd then on Peet Rd to the southern entrance of the project site and into the site.

The projected construction schedule and DPM emission calculations are provided in Attachment A.

The U.S. EPA ISCST3 dispersion model was used to predict concentrations of DPM at existing residences in the areas surrounding the project site. The ISCST3 modeling included 24 area sources to represent the on-site construction activities for the different construction phases at the project site. An emission release height of 6 meters (20 feet) was used for each of the area sources. This height includes the anticipated plume rise from equipment exhaust stacks. Emissions were modeled as occurring daily between 7 am - 4 pm for each of the construction years from 2012 through 2022. The truck haul routes were modeled using volume sources to represent the roadway segments with the ISCST3 model. The model used a 5-year data set (2001 – 2005) of hourly meteorological data from the BAAQMD for the San Martin Airport which is located about 5.5 miles south of the project site. Annual DPM concentrations from construction activities were predicted for 2012 through 2022, with the concentrations for each construction year based on the 5-year average concentrations from modeling 5 years of meteorological data. For residential receptors, concentrations were calculated at a receptor height of 1.5 meters or 5 feet.

Increased cancer risks were calculated using the maximum modeled annual concentrations and BAAQMD recommended risk assessment methods for both a child exposure (3rd trimester through 2 years of age) and for an adult exposure. Since the modeling was conducted assuming emissions occurred 365 days per year, the default OEHHA[1] exposure period of 350 days per year was used.

Results of this assessment indicate an incremental residential child cancer risk of 4.5 cancer cases per million, a residential adult incremental cancer risk of 0.3 cancer cases per million. The residential child and adult increased cancer risks are all below the BAAQMD's threshold of 10 excess cancer cases per million. Attachment A includes the emission calculations used for the construction area source modeling and the cancer risk calculations.

Potential non-cancer health effects due to chronic exposure to DPM were also evaluated. The chronic inhalation reference exposure level (REL) for DPM is 5 micrograms per cubic meter ($\mu g/m^3$). The maximum predicted annual DPM concentration from construction activities is 0.042 $\mu g/m^3$, which is much lower than the REL. The Hazard Index (HI), which is the ratio of the annual DPM concentration to the REL, is 0.008. This HI is much lower than the BAAQMD significance criterion of a HI greater than 1.

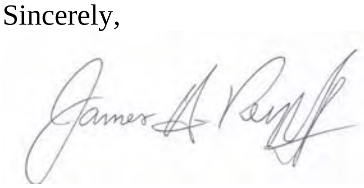
*As a result, the project would have a less than significant impact with respect to community risk caused by construction activities.*

Attachment A includes the modeling inputs, computations and the cancer risk calculations.

* * *

This concludes our assessment of the air quality impacts from this project. If you have any questions or comments, please feel free to contact me at (707) 766-7700 x24. We appreciate the opportunity to assist you.

Sincerely,



James A. Reyff
Project Scientist
*Illingworth & Rodkin*

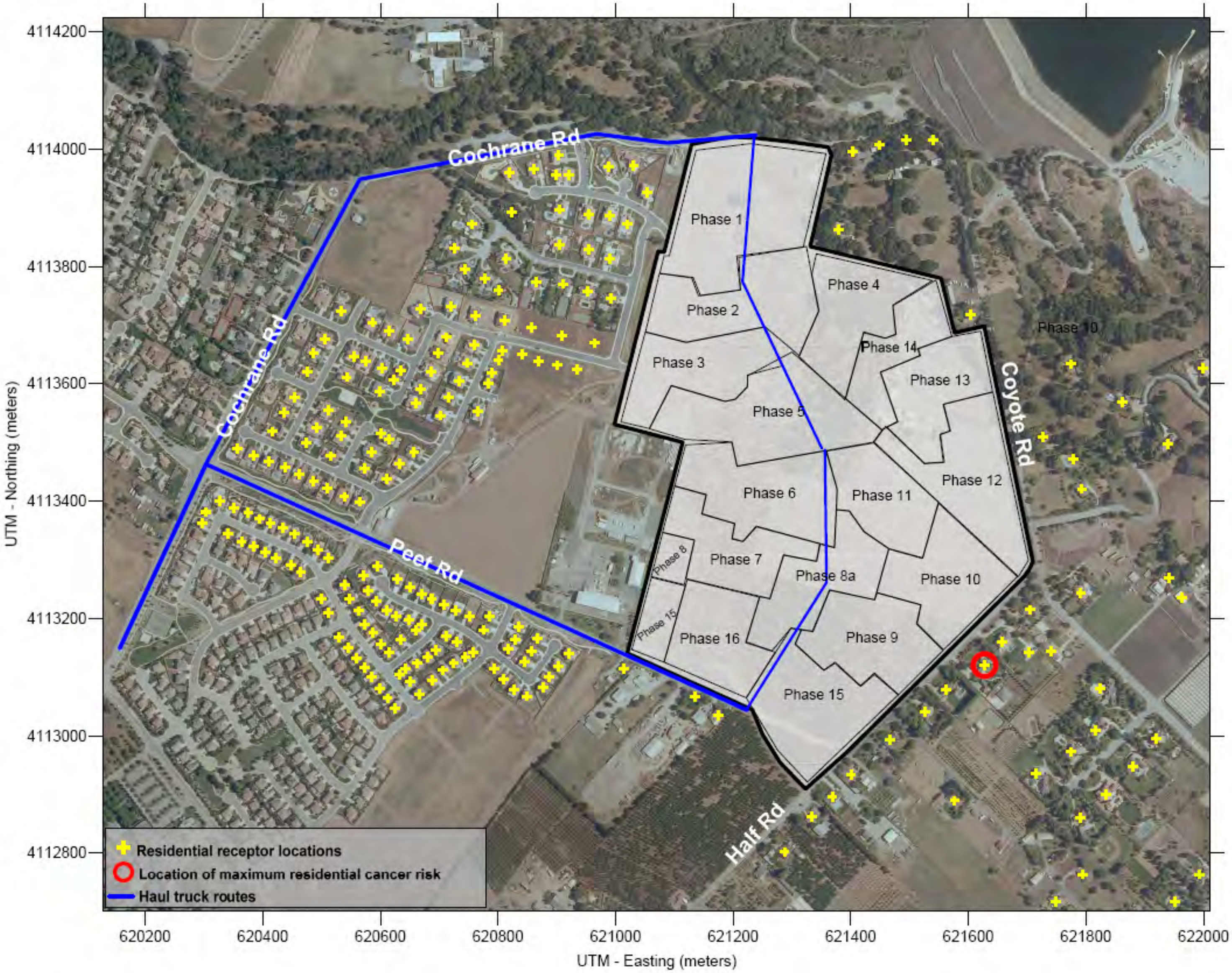
Attachment A: Construction Risk Computations

11-041

[1] OEHHA 2003. Air Toxics Hot Spots Program Risk Assessment Guid*elines, The Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments.* Office of Environmental Health Hazard Assessment. August 2003.

505 Petaluma Blvd. South * Petaluma, CA 94952 * 707-766-7700 * fax 707-766-7790

**Figure 1. Project Site, Modeled Emission Sources, and Sensitive Receptor Locations**



# Attachment A:  Construction Risk Computations

**Construction Equipment Exhaust Emissions**
**San Sebastian, Morgan Hill - 2012 with 2005 Equipment**

**Analysis Year = 2012**

| Item No. | *Off-Road Equipment* Equipment Type | No. Units | Engine Age (years) | Engine Model Year | Daily Hours In Use | Days Per Year | Unit Annual Hours Use | Use Factor | Load Factor | Cumulative Hours Operation Per Unit | Engine (hp) | Level of VDECS Used | Emission Factor (g/hp-hr) NOx | CO | VOC | PM2.5 | SO2 | CO2 | Annual Emissions (lb/yr) NOx | CO | VOC | PM2.5 | SO2 | CO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ***Phase 1 - Construction Activities*** | | | | | | | | | | | | | | | | | | | | | | | | |
| ***Demolition (10/1/2012)*** | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | Excavators | 1 | 7 | 2005 | 7 | 2 | 14 | 1.00 | 0.38 | 3,822 | 168 | 0 | 4.44 | 2.97 | 0.26 | 0.15 | 0.006 | 568.3 | 8.8 | 5.9 | 0.5 | 0.30 | 0.01 | 1120 |
| 2 | Rubber Tired Loaders | 1 | 7 | 2005 | 7 | 2 | 14 | 1.00 | 0.36 | 6,251 | 164 | 0 | 4.59 | 3.15 | 0.32 | 0.18 | 0.006 | 568.3 | 8.4 | 5.7 | 0.6 | 0.32 | 0.01 | 1036 |
| ***Mass Grading/ Excavation (10/15/2012)*** | | | | | | | | | | | | | | | | | | | | | | | | |
| 3 | Excavators | 1 | 7 | 2005 | 7 | 15 | 105 | 1.00 | 0.38 | 3,822 | 168 | 0 | 4.44 | 2.97 | 0.26 | 0.15 | 0.006 | 568.3 | 65.7 | 43.9 | 3.8 | 2.27 | 0.095 | 8398 |
| 4 | Scrapers | 2 | 7 | 2005 | 7 | 15 | 105 | 1.00 | 0.48 | 3,171 | 313 | 0 | 3.95 | 0.98 | 0.18 | 0.10 | 0.006 | 568.3 | 274.8 | 68.0 | 12.5 | 6.61 | 0.388 | 39529 |
| 5 | Rollers | 1 | 7 | 2005 | 7 | 15 | 105 | 1.00 | 0.38 | 2,093 | 95 | 0 | 5.12 | 3.31 | 0.34 | 0.25 | 0.007 | 568.3 | 42.7 | 27.7 | 2.9 | 2.08 | 0.056 | 4749 |
| 6 | Graders | 1 | 7 | 2005 | 7 | 15 | 105 | 1.00 | 0.41 | 4,270 | 174 | 0 | 4.47 | 3.00 | 0.27 | 0.16 | 0.006 | 568.3 | 73.2 | 49.2 | 4.4 | 2.59 | 0.105 | 9309 |
| | Rubber Tired Loaders | 1 | 7 | 2005 | 7 | 15 | 105 | 1.00 | 0.36 | 6,251 | 164 | 0 | 4.59 | 3.15 | 0.32 | 0.18 | 0.006 | 568.3 | 62.8 | 43.0 | 4.4 | 2.42 | 0.087 | 7767 |
| ***Trenching-Utilities (11/1/2012)*** | | | | | | | | | | | | | | | | | | | | | | | | |
| 7 | Tractors/Loaders/Backhoes | 1 | 7 | 2005 | 7 | 40 | 280 | 1.00 | 0.37 | 3,584 | 108 | 0 | 5.23 | 3.44 | 0.38 | 0.27 | 0.007 | 568.3 | 127.9 | 84.1 | 9.4 | 6.70 | 0.163 | 13892 |
| 8 | Excavators | 1 | 7 | 2005 | 7 | 40 | 280 | 1.00 | 0.38 | 3,822 | 168 | 0 | 4.44 | 2.97 | 0.26 | 0.15 | 0.006 | 568.3 | 175.1 | 117.2 | 10.2 | 6.06 | 0.252 | 22396 |
| 9 | Plate Compactors | 1 | 7 | 2005 | 7 | 40 | 280 | 1.00 | 0.29 | 4,200 | 8 | 0 | 4.14 | 3.47 | 0.49 | 0.28 | 0.009 | 568.3 | 5.9 | 4.9 | 0.7 | 0.40 | 0.013 | 805 |
| ***Building - Exterior (11/15/2012)*** | | | | | | | | | | | | | | | | | | | | | | | | |
| 10 | Forklifts | 2 | 7 | 2005 | 7 | 50 | 350 | 1.00 | 0.20 | 4,830 | 125 | 0 | 4.50 | 3.04 | 0.28 | 0.16 | 0.006 | 568.3 | 173.8 | 117.5 | 11.0 | 6.30 | 0.247 | 21926 |
| 11 | Aerial Lifts (electric) | 1 | 7 | 2005 | 7 | 50 | 350 | 1.00 | 0.20 | 1,862 | 60 | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.000 | 0.0 | 0.0 | 0.0 | 0.0 | 0.00 | 0.000 | 0 |
| ***Building - Interior (1/15/2013)*** | | | | | | | | | | | | | | | | | | | | | | | | |
| 12 | Forklifts | 0 | 7 | 2005 | 7 | 50 | 350 | 1.00 | 0.20 | 4,830 | 125 | 0 | 4.50 | 3.04 | 0.28 | 0.16 | 0.006 | 568.3 | 0.0 | 0.0 | 0.0 | 0.00 | 0.000 | 0 |
| ***Fine Grading/Landscaping (2/1/2013)*** | | | | | | | | | | | | | | | | | | | | | | | | |
| 13 | Skid Steer Loaders | 0 | 7 | 2005 | 7 | 30 | 210 | 1.00 | 0.37 | 2,079 | 44 | 0 | 4.88 | 3.63 | 0.51 | 0.33 | 0.007 | 568.3 | 0.0 | 0.0 | 0.0 | 0.00 | 0.000 | 0 |
| ***Paving (4/1/2013)*** | | | | | | | | | | | | | | | | | | | | | | | | |
| 14 | Paving Equipment | 0 | 7 | 2005 | 7 | 2 | 14 | 1.00 | 0.36 | 2,800 | 104 | 0 | 5.17 | 3.37 | 0.36 | 0.26 | 0.007 | 568.3 | 0.0 | 0.0 | 0.0 | 0.00 | 0.000 | 0 |
| 15 | Rollers | 0 | 7 | 2005 | 7 | 2 | 14 | 1.00 | 0.37 | 2,093 | 85 | 0 | 5.12 | 3.31 | 0.34 | 0.25 | 0.007 | 568.3 | 0.0 | 0.0 | 0.0 | 0.00 | 0.000 | 0 |
| 16 | Tractors/Loaders/Backhoes | 0 | 7 | 2005 | 7 | 2 | 14 | 1.00 | 0.37 | 3,584 | 44 | 0 | 5.02 | 4.09 | 0.62 | 0.36 | 0.007 | 568.3 | 0.0 | 0.0 | 0.0 | 0.00 | 0.000 | 0 |
| | **Total Off-Road Equipment** | | | | | | | | | | | | | | | | | | | | | **36.06** | | |
| ***On-Site On-Road Vehicles*** | | **No. Trucks** | | | **Hours/ Day** | **Days/ Year** | **Annual Hours per Truck** | | **Onsite Travel Miles** | | | | | | | **PM2.5 (g/mi)** | | | **NOx** | **CO** | **VOC** | **PM2.5** | **SO2** | **CO2** |
| ***Mass Grading/ Excavation*** | | | | | | | | | | | | | | | | | | | | | | | | |
| | Water Truck | 1 | - | - | 2 | 15 | 30 | - | 300.0 | | - | - | | | | 0.775 | | | | | | 0.51 | | |
| ***Fine Grading/Landscaping*** | | | | | | | | | | | | | | | | | | | | | | | | |
| | Water Truck | 0 | - | - | 2 | 30 | 60 | - | 0.0 | | - | - | | | | 0.775 | | | | | | 0.00 | | |
| | **Total On-Road Vehicles** | | | | | | | | | | | | | | | | | | | | | **0.51** | | |
| **TOTAL On-Site - On and Off Roa** | | - | | | - | - | | - | - | - | - | | - | - | - | - | | | | | | **36.57** | | |

Notes: Cumulative hours operation based on statewide averages
Onsite truck travel speed of 10 mph

**0.0183 tons/year**

| Item No. | EF ID | NOx ZH EF (g/hp-hr) | NOx DR (g/hp-hr$^2$) | NOx Fuel CF | CO ZH EF (g/hp-hr) | CO DR (g/hp-hr$^2$) | CO Fuel CF | ROG ZH EF (g/hp-hr) | ROG DR (g/hp-hr$^2$) | ROG Fuel CF | PM2.5 ZH EF (g/hp-hr) | PM2.5 DR (g/hp-hr$^2$) | PM2.5 Fuel CF | CO2 ZH EF (g/hp-hr) | CO2 DR (g/hp-hr$^2$) | CO2 Fuel CF | SO2 (g/hp-hr) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Emission Factors - Off-Road Compression Ignited Engines** | | | | | | | | | | | | | | | | | |
| ***Demolition (10/1/2012)*** | | | | | | | | | | | | | | | | | |
| 1 | ULSD1752005 | 4.44 | 6.46E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.16 | 2.57E-05 | 1.00 | 0.15 | 1.18E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| 2 | ULSD1752005 | 4.44 | 6.46E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.16 | 2.57E-05 | 1.00 | 0.15 | 1.18E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| ***Mass Grading/ Excavation (10/15/2012)*** | | | | | | | | | | | | | | | | | |
| 3 | ULSD1752005 | 4.44 | 6.46E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.16 | 2.57E-05 | 1.00 | 0.15 | 1.18E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| 4 | ULSD5002005 | 4.00 | 5.30E-05 | 0.95 | 0.92 | 1.82E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.10 | 5.55E-06 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| 5 | ULSD1202005 | 5.22 | 8.40E-05 | 0.95 | 3.14 | 8.33E-05 | 1.00 | 0.28 | 2.92E-05 | 1.00 | 0.27 | 2.12E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.007 |
| 6 | ULSD1752005 | 4.44 | 6.46E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.16 | 2.57E-05 | 1.00 | 0.15 | 1.18E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| | ULSD1752005 | 4.44 | 6.46E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.16 | 2.57E-05 | 1.00 | 0.15 | 1.18E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| ***Trenching-Utilities (11/1/2012)*** | | | | | | | | | | | | | | | | | |
| 7 | ULSD1202005 | 5.22 | 8.40E-05 | 0.95 | 3.14 | 8.33E-05 | 1.00 | 0.28 | 2.92E-05 | 1.00 | 0.27 | 2.12E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.007 |
| 8 | ULSD1752005 | 4.44 | 6.46E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.16 | 2.57E-05 | 1.00 | 0.15 | 1.18E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| 9 | ULSD152005 | 4.37 | 0.00E+00 | 0.95 | 3.47 | 0.00E+00 | 1.00 | 0.49 | 0.00E+00 | 1.00 | 0.35 | 0.00E+00 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.009 |
| ***Building - Exterior (11/15/2012)*** | | | | | | | | | | | | | | | | | |
| 10 | ULSD1752005 | 4.44 | 6.46E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.16 | 2.57E-05 | 1.00 | 0.15 | 1.18E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| 11 | ULSD1202005 | 5.22 | 8.40E-05 | 0.95 | 3.14 | 8.33E-05 | 1.00 | 0.28 | 2.92E-05 | 1.00 | 0.27 | 2.12E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.007 |
| ***Building - Interior (1/15/2013)*** | | | | | | | | | | | | | | | | | |
| 12 | ULSD1752005 | 4.44 | 6.46E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.16 | 2.57E-05 | 1.00 | 0.15 | 1.18E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| ***Fine Grading/Landscaping (2/1/2013)*** | | | | | | | | | | | | | | | | | |
| 13 | ULSD502005 | 4.95 | 9.67E-05 | 0.95 | 3.00 | 3.05E-04 | 1.00 | 0.37 | 6.90E-05 | 1.00 | 0.35 | 2.93E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.007 |
| ***Paving (4/1/2013)*** | | | | | | | | | | | | | | | | | |
| 14 | ULSD1202005 | 5.22 | 8.40E-05 | 0.95 | 3.14 | 8.33E-05 | 1.00 | 0.28 | 2.92E-05 | 1.00 | 0.27 | 2.12E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.007 |
| 15 | ULSD1202005 | 5.22 | 8.40E-05 | 0.95 | 3.14 | 8.33E-05 | 1.00 | 0.28 | 2.92E-05 | 1.00 | 0.27 | 2.12E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.007 |
| 16 | ULSD502005 | 4.95 | 9.67E-05 | 0.95 | 3.00 | 3.05E-04 | 1.00 | 0.37 | 6.90E-05 | 1.00 | 0.35 | 2.93E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.007 |

Notes: ZH EF = Zero hour emission factor
DR = Deterioration rate
ULSD = Ultra low sulfur diesel (15 ppmw sulfur, 0.0015% sulfur)

Refs: CARB OFFROAD2007 model (http://www.arb.ca.gov/msei/offroad/offroad.htm), December, 2006.
Stationary/Off-road engines ARB, "California's Emissions Inventory for Off-Road Large Compression-Ignited (CI) Engines (> 25 HP)" MAC#99-32

**Construction Equipment Exhaust Emissions**
**San Sebastian, Morgan Hill - 2013 with 2006 Equipment**

**Analysis Year = 2013**

| Item No. | *Off-Road Equipment* Equipment Type | No. Units | Engine Age (years) | Engine Model Year | Daily Hours In Use | Days Per Year | Unit Annual Hours Use | Use Factor | Load Factor | Cumulative Hours Operation Per Unit | Engine (hp) | Level of VDECS Used | Emission Factor (g/hp-hr) NOx | CO | VOC | PM2.5 | SO2 | CO2 | Annual Emissions (lb/yr) NOx | CO | VOC | PM2.5 | SO2 | CO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ***Phase 1 - Construction Activities*** | | | | | | | | | | | | | | | | | | | | | | | | |
| ***Demolition (10/1/2012)*** | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | Excavators | 0 | 7 | 2006 | 7 | 2 | 14 | 1.00 | 0.38 | 3,822 | 168 | 0 | 4.44 | 2.97 | 0.26 | 0.15 | 0.006 | 568.3 | 0.0 | 0.0 | 0.0 | 0.00 | 0.00 | 0 |
| 2 | Rubber Tired Loaders | 0 | 7 | 2006 | 7 | 2 | 14 | 1.00 | 0.36 | 6,251 | 164 | 0 | 4.59 | 3.15 | 0.32 | 0.18 | 0.006 | 568.3 | 0.0 | 0.0 | 0.0 | 0.00 | 0.00 | 0 |
| ***Mass Grading/ Excavation (10/15/2012)*** | | | | | | | | | | | | | | | | | | | | | | | | |
| 3 | Excavators | 0 | 7 | 2006 | 7 | 15 | 105 | 1.00 | 0.38 | 3,822 | 168 | 0 | 4.44 | 2.97 | 0.26 | 0.15 | 0.006 | 568.3 | 0.0 | 0.0 | 0.0 | 0.00 | 0.000 | 0 |
| 4 | Scrapers | 0 | 7 | 2006 | 7 | 15 | 105 | 1.00 | 0.48 | 3,171 | 313 | 0 | 2.42 | 0.98 | 0.18 | 0.10 | 0.006 | 568.3 | 0.0 | 0.0 | 0.0 | 0.00 | 0.000 | 0 |
| 5 | Rollers | 0 | 7 | 2006 | 7 | 15 | 105 | 1.00 | 0.38 | 2,093 | 95 | 0 | 4.90 | 3.26 | 0.25 | 0.21 | 0.007 | 568.3 | 0.0 | 0.0 | 0.0 | 0.00 | 0.000 | 0 |
| 6 | Graders | 0 | 7 | 2006 | 7 | 15 | 105 | 1.00 | 0.41 | 4,270 | 174 | 0 | 4.47 | 3.00 | 0.27 | 0.16 | 0.006 | 568.3 | 0.0 | 0.0 | 0.0 | 0.00 | 0.000 | 0 |
| | Rubber Tired Loaders | 0 | 7 | 2006 | 7 | 15 | 105 | 1.00 | 0.36 | 6,251 | 164 | 0 | 4.59 | 3.15 | 0.32 | 0.18 | 0.006 | 568.3 | 0.0 | 0.0 | 0.0 | 0.00 | 0.000 | 0 |
| ***Trenching-Utilities (11/1/2012)*** | | | | | | | | | | | | | | | | | | | | | | | | |
| 7 | Tractors/Loaders/Backhoes | 0 | 7 | 2006 | 7 | 40 | 280 | 1.00 | 0.37 | 3,584 | 108 | 0 | 5.00 | 3.38 | 0.29 | 0.23 | 0.007 | 568.3 | 0.0 | 0.0 | 0.0 | 0.00 | 0.000 | 0 |
| 8 | Excavators | 0 | 7 | 2006 | 7 | 40 | 280 | 1.00 | 0.38 | 3,822 | 168 | 0 | 4.44 | 2.97 | 0.26 | 0.15 | 0.006 | 568.3 | 0.0 | 0.0 | 0.0 | 0.00 | 0.000 | 0 |
| 9 | Plate Compactors | 0 | 7 | 2006 | 7 | 40 | 280 | 1.00 | 0.29 | 4,200 | 8 | 0 | 4.14 | 3.47 | 0.49 | 0.28 | 0.009 | 568.3 | 0.0 | 0.0 | 0.0 | 0.00 | 0.000 | 0 |
| ***Building - Exterior (11/15/2012)*** | | | | | | | | | | | | | | | | | | | | | | | | |
| 10 | Forklifts | 0 | 7 | 2006 | 7 | 50 | 350 | 1.00 | 0.20 | 4,830 | 125 | 0 | 4.50 | 3.04 | 0.28 | 0.16 | 0.006 | 568.3 | 0.0 | 0.0 | 0.0 | 0.00 | 0.000 | 0 |
| 11 | Aerial Lifts (electric) | 0 | 7 | 2006 | 7 | 50 | 350 | 1.00 | 0.20 | 1,862 | 60 | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.000 | 0.0 | 0.0 | 0.0 | 0.0 | 0.00 | 0.000 | 0 |
| ***Building - Interior (1/15/2013)*** | | | | | | | | | | | | | | | | | | | | | | | | |
| 12 | Forklifts | 1 | 7 | 2006 | 7 | 50 | 350 | 1.00 | 0.20 | 4,830 | 125 | 0 | 4.50 | 3.04 | 0.28 | 0.16 | 0.006 | 568.3 | 86.9 | 58.7 | 5.5 | 3.15 | 0.123 | 10963 |
| ***Fine Grading/Landscaping (2/12/2013)*** | | | | | | | | | | | | | | | | | | | | | | | | |
| 13 | Skid Steer Loaders | 1 | 7 | 2006 | 7 | 30 | 210 | 1.00 | 0.37 | 2,079 | 44 | 0 | 4.82 | 3.46 | 0.35 | 0.30 | 0.007 | 568.3 | 36.0 | 25.9 | 2.6 | 2.26 | 0.055 | 4245 |
| ***Paving (4/1/2013)*** | | | | | | | | | | | | | | | | | | | | | | | | |
| 14 | Paving Equipment | 1 | 7 | 2006 | 7 | 2 | 14 | 1.00 | 0.36 | 2,800 | 104 | 0 | 4.95 | 3.32 | 0.27 | 0.22 | 0.007 | 568.3 | 5.7 | 3.8 | 0.3 | 0.25 | 0.008 | 657 |
| 15 | Rollers | 2 | 7 | 2006 | 7 | 2 | 14 | 1.00 | 0.38 | 2,093 | 95 | 0 | 4.90 | 3.26 | 0.25 | 0.21 | 0.007 | 568.3 | 10.9 | 7.3 | 0.5 | 0.46 | 0.015 | 1266 |
| 16 | Tractors/Loaders/Backhoes | 1 | 7 | 2006 | 7 | 2 | 14 | 1.00 | 0.37 | 3,584 | 44 | 0 | 4.96 | 3.90 | 0.44 | 0.34 | 0.007 | 568.3 | 2.5 | 1.9 | 0.2 | 0.17 | 0.004 | 283 |
| ***Phase 2 - Construction Activities*** | | | | | | | | | | | | | | | | | | | | | | | | |
| ***Demolition (4/12/2013)*** | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | Excavators | 1 | 7 | 2006 | 7 | 1 | 7 | 1.00 | 0.38 | 3,822 | 168 | 0 | 4.44 | 2.97 | 0.26 | 0.15 | 0.006 | 568.3 | 4.4 | 2.9 | 0.3 | 0.15 | 0.01 | 560 |
| 2 | Rubber Tired Loaders | 1 | 7 | 2006 | 7 | 1 | 7 | 1.00 | 0.36 | 6,251 | 164 | 0 | 4.59 | 3.15 | 0.32 | 0.18 | 0.006 | 568.3 | 4.2 | 2.9 | 0.3 | 0.16 | 0.01 | 518 |
| ***Mass Grading/ Excavation (4/15/2013)*** | | | | | | | | | | | | | | | | | | | | | | | | |
| 3 | Excavators | 1 | 7 | 2006 | 7 | 10 | 70 | 1.00 | 0.38 | 3,822 | 168 | 0 | 4.44 | 2.97 | 0.26 | 0.15 | 0.006 | 568.3 | 43.8 | 29.3 | 2.5 | 1.52 | 0.063 | 5599 |
| 4 | Scrapers | 2 | 7 | 2006 | 7 | 10 | 70 | 1.00 | 0.48 | 3,171 | 313 | 0 | 2.42 | 0.98 | 0.18 | 0.10 | 0.006 | 568.3 | 112.1 | 45.3 | 8.3 | 4.41 | 0.259 | 26353 |
| 5 | Rollers | 1 | 7 | 2006 | 7 | 10 | 70 | 1.00 | 0.38 | 2,093 | 95 | 0 | 4.90 | 3.26 | 0.25 | 0.21 | 0.007 | 568.3 | 27.3 | 18.2 | 1.4 | 1.15 | 0.037 | 3166 |
| 6 | Graders | 1 | 7 | 2006 | 7 | 10 | 70 | 1.00 | 0.41 | 4,270 | 174 | 0 | 4.47 | 3.00 | 0.27 | 0.16 | 0.006 | 568.3 | 48.8 | 32.8 | 2.9 | 1.73 | 0.070 | 6206 |
| | Rubber Tired Loaders | 1 | 7 | 2006 | 7 | 10 | 70 | 1.00 | 0.36 | 6,251 | 164 | 0 | 4.59 | 3.15 | 0.32 | 0.18 | 0.006 | 568.3 | 41.8 | 28.7 | 2.9 | 1.61 | 0.058 | 5178 |
| ***Trenching-Utilities (5/1/2013)*** | | | | | | | | | | | | | | | | | | | | | | | | |
| 7 | Tractors/Loaders/Backhoes | 1 | 7 | 2006 | 7 | 15 | 105 | 1.00 | 0.37 | 3,584 | 108 | 0 | 5.00 | 3.38 | 0.29 | 0.23 | 0.007 | 568.3 | 45.9 | 31.0 | 2.6 | 2.08 | 0.061 | 5210 |
| 8 | Excavators | 1 | 7 | 2006 | 7 | 15 | 105 | 1.00 | 0.38 | 3,822 | 168 | 0 | 4.44 | 2.97 | 0.26 | 0.15 | 0.006 | 568.3 | 65.7 | 43.9 | 3.8 | 2.27 | 0.095 | 8398 |
| 9 | Plate Compactors | 1 | 7 | 2006 | 7 | 15 | 105 | 1.00 | 0.29 | 4,200 | 8 | 0 | 4.14 | 3.47 | 0.49 | 0.28 | 0.009 | 568.3 | 2.2 | 1.8 | 0.3 | 0.15 | 0.005 | 302 |
| ***Building - Exterior (5/15/2013)*** | | | | | | | | | | | | | | | | | | | | | | | | |
| 10 | Forklifts | 2 | 7 | 2006 | 7 | 50 | 350 | 1.00 | 0.20 | 4,830 | 125 | 0 | 4.50 | 3.04 | 0.28 | 0.16 | 0.006 | 568.3 | 173.8 | 117.5 | 11.0 | 6.30 | 0.247 | 21926 |
| 11 | Aerial Lifts (electric) | 1 | 7 | 2006 | 7 | 50 | 350 | 1.00 | 0.20 | 1,862 | 60 | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.000 | 0.0 | 0.0 | 0.0 | 0.0 | 0.00 | 0.000 | 0 |
| ***Building - Interior ((7/15/2013)*** | | | | | | | | | | | | | | | | | | | | | | | | |
| 12 | Forklifts | 1 | 7 | 2006 | 7 | 50 | 350 | 1.00 | 0.20 | 4,830 | 125 | 0 | 4.50 | 3.04 | 0.28 | 0.16 | 0.006 | 568.3 | 86.9 | 58.7 | 5.5 | 3.15 | 0.123 | 10963 |
| ***Fine Grading/Landscaping 8/1/2013)*** | | | | | | | | | | | | | | | | | | | | | | | | |
| 13 | Skid Steer Loaders | 1 | 7 | 2006 | 7 | 22 | 154 | 1.00 | 0.37 | 2,079 | 44 | 0 | 4.82 | 3.46 | 0.35 | 0.30 | 0.007 | 568.3 | 26.4 | 19.0 | 1.9 | 1.66 | 0.040 | 3113 |
| ***Paving (10/1/2013)*** | | | | | | | | | | | | | | | | | | | | | | | | |
| 14 | Paving Equipment | 1 | 7 | 2006 | 7 | 2 | 14 | 1.00 | 0.36 | 2,800 | 104 | 0 | 4.95 | 3.32 | 0.27 | 0.22 | 0.007 | 568.3 | 5.7 | 3.8 | 0.3 | 0.25 | 0.008 | 657 |
| 15 | Rollers | 2 | 7 | 2006 | 7 | 2 | 14 | 1.00 | 0.37 | 2,093 | 85 | 0 | 4.90 | 3.26 | 0.25 | 0.21 | 0.007 | 568.3 | 9.6 | 6.4 | 0.5 | 0.40 | 0.013 | 1113 |
| 16 | Tractors/Loaders/Backhoes | 1 | 7 | 2006 | 7 | 2 | 14 | 1.00 | 0.37 | 3,584 | 44 | 0 | 4.96 | 3.90 | 0.44 | 0.34 | 0.007 | 568.3 | 2.5 | 1.9 | 0.2 | 0.17 | 0.004 | 283 |
| ***Phase 3 - Construction Activities*** | | | | | | | | | | | | | | | | | | | | | | | | |
| ***Demolition (10/1/2013)*** | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | Excavators | 1 | 7 | 2006 | 1 | 2 | 2 | 1.00 | 0.38 | 3,822 | 168 | 0 | 4.44 | 2.97 | 0.26 | 0.15 | 0.006 | 568.3 | 1.3 | 0.8 | 0.1 | 0.04 | 0.00 | 160 |
| 2 | Rubber Tired Loaders | 1 | 7 | 2006 | 1 | 2 | 2 | 1.00 | 0.36 | 6,251 | 164 | 0 | 4.59 | 3.15 | 0.32 | 0.18 | 0.006 | 568.3 | 1.2 | 0.8 | 0.1 | 0.05 | 0.00 | 148 |
| ***Mass Grading/ Excavation (10/15/2013)*** | | | | | | | | | | | | | | | | | | | | | | | | |
| 3 | Excavators | 1 | 7 | 2006 | 7 | 10 | 70 | 1.00 | 0.38 | 3,822 | 168 | 0 | 4.44 | 2.97 | 0.26 | 0.15 | 0.006 | 568.3 | 43.8 | 29.3 | 2.5 | 1.52 | 0.063 | 5599 |
| 4 | Scrapers | 2 | 7 | 2006 | 7 | 10 | 70 | 1.00 | 0.48 | 3,171 | 313 | 0 | 2.42 | 0.98 | 0.18 | 0.10 | 0.006 | 568.3 | 112.1 | 45.3 | 8.3 | 4.41 | 0.259 | 26353 |
| 5 | Rollers | 1 | 7 | 2006 | 7 | 10 | 70 | 1.00 | 0.38 | 2,093 | 95 | 0 | 4.90 | 3.26 | 0.25 | 0.21 | 0.007 | 568.3 | 27.3 | 18.2 | 1.4 | 1.15 | 0.037 | 3166 |
| 6 | Graders | 1 | 7 | 2006 | 7 | 10 | 70 | 1.00 | 0.41 | 4,270 | 174 | 0 | 4.47 | 3.00 | 0.27 | 0.16 | 0.006 | 568.3 | 48.8 | 32.8 | 2.9 | 1.73 | 0.070 | 6206 |
| | Rubber Tired Loaders | 1 | 7 | 2006 | 7 | 10 | 70 | 1.00 | 0.36 | 6,251 | 164 | 0 | 4.59 | 3.15 | 0.32 | 0.18 | 0.006 | 568.3 | 41.8 | 28.7 | 2.9 | 1.61 | 0.058 | 5178 |
| ***Trenching-Utilities (11/1/2013)*** | | | | | | | | | | | | | | | | | | | | | | | | |
| 7 | Tractors/Loaders/Backhoes | 1 | 7 | 2006 | 7 | 25 | 175 | 1.00 | 0.37 | 3,584 | 108 | 0 | 5.00 | 3.38 | 0.29 | 0.23 | 0.007 | 568.3 | 76.4 | 51.7 | 4.4 | 3.47 | 0.102 | 8683 |
| 8 | Excavators | 1 | 7 | 2006 | 7 | 25 | 175 | 1.00 | 0.38 | 3,822 | 168 | 0 | 4.44 | 2.97 | 0.26 | 0.15 | 0.006 | 568.3 | 109.4 | 73.2 | 6.4 | 3.79 | 0.158 | 13997 |
| 9 | Plate Compactors | 1 | 7 | 2006 | 7 | 25 | 175 | 1.00 | 0.29 | 4,200 | 8 | 0 | 4.14 | 3.47 | 0.49 | 0.28 | 0.009 | 568.3 | 3.7 | 3.1 | 0.4 | 0.25 | 0.008 | 503 |
| ***Building - Exterior (11/15/2013)*** | | | | | | | | | | | | | | | | | | | | | | | | |
| 10 | Forklifts | 2 | 7 | 2006 | 7 | 50 | 350 | 1.00 | 0.20 | 4,830 | 125 | 0 | 4.50 | 3.04 | 0.28 | 0.16 | 0.006 | 568.3 | 173.8 | 117.5 | 11.0 | 6.30 | 0.247 | 21926 |
| 11 | Aerial Lifts (electric) | 1 | 7 | 2006 | 7 | 50 | 350 | 1.00 | 0.20 | 1,862 | 60 | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.000 | 0.0 | 0.0 | 0.0 | 0.0 | 0.00 | 0.000 | 0 |
| ***Building - Interior (1/15/2014)*** | | | | | | | | | | | | | | | | | | | | | | | | |
| 12 | Forklifts | 0 | 7 | 2006 | 7 | 50 | 350 | 1.00 | 0.20 | 4,830 | 125 | 0 | 4.50 | 3.04 | 0.28 | 0.16 | 0.006 | 568.3 | 0.0 | 0.0 | 0.0 | 0.00 | 0.000 | 0 |
| ***Fine Grading/Landscaping (2/1/2014)*** | | | | | | | | | | | | | | | | | | | | | | | | |
| 13 | Skid Steer Loaders | 0 | 7 | 2006 | 7 | 22 | 154 | 1.00 | 0.37 | 2,079 | 44 | 0 | 4.82 | 3.46 | 0.35 | 0.30 | 0.007 | 568.3 | 0.0 | 0.0 | 0.0 | 0.00 | 0.000 | 0 |
| ***Paving (4/1/2014)*** | | | | | | | | | | | | | | | | | | | | | | | | |
| 14 | Paving Equipment | 0 | 7 | 2006 | 7 | 2 | 14 | 1.00 | 0.36 | 2,800 | 104 | 0 | 4.95 | 3.32 | 0.27 | 0.22 | 0.007 | 568.3 | 0.0 | 0.0 | 0.0 | 0.00 | 0.000 | 0 |
| 15 | Rollers | 0 | 7 | 2006 | 7 | 2 | 14 | 1.00 | 0.37 | 2,093 | 85 | 0 | 4.90 | 3.26 | 0.25 | 0.21 | 0.007 | 568.3 | 0.0 | 0.0 | 0.0 | 0.00 | 0.000 | 0 |
| 16 | Tractors/Loaders/Backhoes | 0 | 7 | 2006 | 7 | 2 | 14 | 1.00 | 0.37 | 3,584 | 44 | 0 | 4.96 | 3.90 | 0.44 | 0.34 | 0.007 | 568.3 | 0.0 | 0.0 | 0.0 | 0.00 | 0.000 | 0 |
| | **Total Off-Road Equipment** | | | | | | | | | | | | | | | | | | | | | 57.75 | | |
| | ***On-Site On-Road Vehicles*** | **No. Trucks** | | | **Hours/ Day** | **Days/ Year** | **Annual Hours per Truck** | | **Onsite Travel Miles** | | | | | | | **PM2.5 (g/mi)** | | | **NOx** | **CO** | **VOC** | **PM2.5** | **SO2** | **CO2** |
| ***Mass Grading/ Excavation*** | | | | | | | | | | | | | | | | | | | | | | | | |
| | Water Truck - Phase 2 | 1 | - | - | 2 | 10 | 20 | - | 200.0 | | - | - | | | | 0.775 | | | | | | 0.34 | | |
| | Water Truck - Phase 3 | 1 | - | - | 2 | 10 | 20 | - | 200.0 | | - | - | | | | 0.775 | | | | | | 0.34 | | |
| ***Fine Grading/Landscaping*** | | | | | | | | | | | | | | | | | | | | | | | | |
| | Water Truck - Phase 1 | 1 | - | - | 2 | 30 | 60 | - | 600.0 | | - | - | | | | 0.775 | | | | | | 1.02 | | |
| | Water Truck - Phase 2 | 1 | - | - | 2 | 22 | 44 | - | 440.0 | | - | - | | | | 0.775 | | | | | | 0.75 | | |
| | **Total On-Road Vehicles** | | | | | | | | | | | | | | | | | | | | | **2.46** | | |
| **TOTAL On-Site - On and Off Roa** | | - | | | - | - | | - | - | - | - | | - | - | - | - | | | | | | **60.21** | | |

Notes: Cumulative hours operation based on statewide averages
Onsite truck travel speed of 10 mph

**0.0301 tons/year**

| Item No. | *Emission Factors - Off-Road Compression Ignited Engines* EF ID | NOx ZH EF (g/hp-hr) | NOx DR (g/hp-hr$^2$) | NOx Fuel CF | CO ZH EF (g/hp-hr) | CO DR (g/hp-hr$^2$) | CO Fuel CF | ROG ZH EF (g/hp-hr) | ROG DR (g/hp-hr$^2$) | ROG Fuel CF | PM2.5 ZH EF (g/hp-hr) | PM2.5 DR (g/hp-hr$^2$) | PM2.5 Fuel CF | CO2 ZH EF (g/hp-hr) | CO2 DR (g/hp-hr$^2$) | CO2 Fuel CF | SO2 (g/hp-hr) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ***Demolition (10/1/2012)*** | | | | | | | | | | | | | | | | | |
| 1 | ULSD1752006 | 4.44 | 6.46E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.16 | 2.57E-05 | 1.00 | 0.15 | 1.18E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| 2 | ULSD1752006 | 4.44 | 6.46E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.16 | 2.57E-05 | 1.00 | 0.15 | 1.18E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| ***Mass Grading/ Excavation (10/15/2012)*** | | | | | | | | | | | | | | | | | |
| 3 | ULSD1752006 | 4.44 | 6.46E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.16 | 2.57E-05 | 1.00 | 0.15 | 1.18E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| 4 | ULSD5002006 | 2.45 | 3.18E-05 | 0.95 | 0.92 | 1.82E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.10 | 5.55E-06 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| 5 | ULSD1202006 | 5.01 | 7.45E-05 | 0.95 | 3.09 | 8.21E-05 | 1.00 | 0.19 | 2.71E-05 | 1.00 | 0.22 | 1.76E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.007 |
| 6 | ULSD1752006 | 4.44 | 6.46E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.16 | 2.57E-05 | 1.00 | 0.15 | 1.18E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| | ULSD1752006 | 4.44 | 6.46E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.16 | 2.57E-05 | 1.00 | 0.15 | 1.18E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| ***Trenching-Utilities (11/1/2012)*** | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7 | ULSD1202006 | 5.01 | 7.45E-05 | 0.95 | 3.09 | 8.21E-05 | 1.00 | 0.19 | 2.71E-05 | 1.00 | 0.22 | 1.76E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.007 |
| 8 | ULSD1752006 | 4.44 | 6.46E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.16 | 2.57E-05 | 1.00 | 0.15 | 1.18E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| 9 | ULSD152006 | 4.37 | 0.00E+00 | 0.95 | 3.47 | 0.00E+00 | 1.00 | 0.49 | 0.00E+00 | 1.00 | 0.35 | 0.00E+00 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.009 |
| ***Building - Exterior (11/15/2012)*** | | | | | | | | | | | | | | | | | |
| 10 | ULSD1752006 | 4.44 | 6.46E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.16 | 2.57E-05 | 1.00 | 0.15 | 1.18E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| 11 | ULSD1202006 | 5.01 | 7.45E-05 | 0.95 | 3.09 | 8.21E-05 | 1.00 | 0.19 | 2.71E-05 | 1.00 | 0.22 | 1.76E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.007 |
| ***Building - Interior (1/15/2013)*** | | | | | | | | | | | | | | | | | |
| 12 | ULSD1752006 | 4.44 | 6.46E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.16 | 2.57E-05 | 1.00 | 0.15 | 1.18E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| ***Fine Grading/Landscaping (2/12/2013)*** | | | | | | | | | | | | | | | | | |
| 13 | ULSD502006 | 4.88 | 9.83E-05 | 0.95 | 2.86 | 2.90E-04 | 1.00 | 0.24 | 5.45E-05 | 1.00 | 0.32 | 2.72E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.007 |
| ***Paving (4/1/2013)*** | | | | | | | | | | | | | | | | | |
| 14 | ULSD1202006 | 5.01 | 7.45E-05 | 0.95 | 3.09 | 8.21E-05 | 1.00 | 0.19 | 2.71E-05 | 1.00 | 0.22 | 1.76E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.007 |
| 15 | ULSD1202006 | 5.01 | 7.45E-05 | 0.95 | 3.09 | 8.21E-05 | 1.00 | 0.19 | 2.71E-05 | 1.00 | 0.22 | 1.76E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.007 |
| 16 | ULSD502006 | 4.88 | 9.83E-05 | 0.95 | 2.86 | 2.90E-04 | 1.00 | 0.24 | 5.45E-05 | 1.00 | 0.32 | 2.72E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.007 |
| | | | | | | | | | | | | | | | | | |
| ***Demolition (4/12/2013)*** | | | | | | | | | | | | | | | | | |
| 1 | ULSD1752006 | 4.44 | 6.46E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.16 | 2.57E-05 | 1.00 | 0.15 | 1.18E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| 2 | ULSD1752006 | 4.44 | 6.46E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.16 | 2.57E-05 | 1.00 | 0.15 | 1.18E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| ***Mass Grading/ Excavation (4/15/2013)*** | | | | | | | | | | | | | | | | | |
| 3 | ULSD1752006 | 4.44 | 6.46E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.16 | 2.57E-05 | 1.00 | 0.15 | 1.18E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| 4 | ULSD5002006 | 2.45 | 3.18E-05 | 0.95 | 0.92 | 1.82E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.10 | 5.55E-06 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| 5 | ULSD1202006 | 5.01 | 7.45E-05 | 0.95 | 3.09 | 8.21E-05 | 1.00 | 0.19 | 2.71E-05 | 1.00 | 0.22 | 1.76E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.007 |
| 6 | ULSD1752006 | 4.44 | 6.46E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.16 | 2.57E-05 | 1.00 | 0.15 | 1.18E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| | ULSD1752006 | 4.44 | 6.46E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.16 | 2.57E-05 | 1.00 | 0.15 | 1.18E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| ***Trenching-Utilities (5/1/2013)*** | | | | | | | | | | | | | | | | | |
| 7 | ULSD1202006 | 5.01 | 7.45E-05 | 0.95 | 3.09 | 8.21E-05 | 1.00 | 0.19 | 2.71E-05 | 1.00 | 0.22 | 1.76E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.007 |
| 8 | ULSD1752006 | 4.44 | 6.46E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.16 | 2.57E-05 | 1.00 | 0.15 | 1.18E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| 9 | ULSD152006 | 4.37 | 0.00E+00 | 0.95 | 3.47 | 0.00E+00 | 1.00 | 0.49 | 0.00E+00 | 1.00 | 0.35 | 0.00E+00 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.009 |
| ***Building - Exterior (5/15/2013)*** | | | | | | | | | | | | | | | | | |
| 10 | ULSD1752006 | 4.44 | 6.46E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.16 | 2.57E-05 | 1.00 | 0.15 | 1.18E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| 11 | ULSD1202006 | 5.01 | 7.45E-05 | 0.95 | 3.09 | 8.21E-05 | 1.00 | 0.19 | 2.71E-05 | 1.00 | 0.22 | 1.76E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.007 |
| ***Building - Interior ((7/15/2013)*** | | | | | | | | | | | | | | | | | |
| 12 | ULSD1752006 | 4.44 | 6.46E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.16 | 2.57E-05 | 1.00 | 0.15 | 1.18E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| ***Fine Grading/Landscaping 8/1/2013)*** | | | | | | | | | | | | | | | | | |
| 13 | ULSD502006 | 4.88 | 9.83E-05 | 0.95 | 2.86 | 2.90E-04 | 1.00 | 0.24 | 5.45E-05 | 1.00 | 0.32 | 2.72E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.007 |
| ***Paving (10/1/2013)*** | | | | | | | | | | | | | | | | | |
| 14 | ULSD1202006 | 5.01 | 7.45E-05 | 0.95 | 3.09 | 8.21E-05 | 1.00 | 0.19 | 2.71E-05 | 1.00 | 0.22 | 1.76E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.007 |
| 15 | ULSD1202006 | 5.01 | 7.45E-05 | 0.95 | 3.09 | 8.21E-05 | 1.00 | 0.19 | 2.71E-05 | 1.00 | 0.22 | 1.76E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.007 |
| 16 | ULSD502006 | 4.88 | 9.83E-05 | 0.95 | 2.86 | 2.90E-04 | 1.00 | 0.24 | 5.45E-05 | 1.00 | 0.32 | 2.72E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.007 |
| | | | | | | | | | | | | | | | | | |
| ***Demolition (10/1/2013)*** | | | | | | | | | | | | | | | | | |
| 1 | ULSD1752006 | 4.44 | 6.46E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.16 | 2.57E-05 | 1.00 | 0.15 | 1.18E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| 2 | ULSD1752006 | 4.44 | 6.46E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.16 | 2.57E-05 | 1.00 | 0.15 | 1.18E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| ***Mass Grading/ Excavation (10/15/2013)*** | | | | | | | | | | | | | | | | | |
| 3 | ULSD1752006 | 4.44 | 6.46E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.16 | 2.57E-05 | 1.00 | 0.15 | 1.18E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| 4 | ULSD5002006 | 2.45 | 3.18E-05 | 0.95 | 0.92 | 1.82E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.10 | 5.55E-06 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| 5 | ULSD1202006 | 5.01 | 7.45E-05 | 0.95 | 3.09 | 8.21E-05 | 1.00 | 0.19 | 2.71E-05 | 1.00 | 0.22 | 1.76E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.007 |
| 6 | ULSD1752006 | 4.44 | 6.46E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.16 | 2.57E-05 | 1.00 | 0.15 | 1.18E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| | ULSD1752006 | 4.44 | 6.46E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.16 | 2.57E-05 | 1.00 | 0.15 | 1.18E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| ***Trenching-Utilities (11/1/2013)*** | | | | | | | | | | | | | | | | | |
| 7 | ULSD1202006 | 5.01 | 7.45E-05 | 0.95 | 3.09 | 8.21E-05 | 1.00 | 0.19 | 2.71E-05 | 1.00 | 0.22 | 1.76E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.007 |
| 8 | ULSD1752006 | 4.44 | 6.46E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.16 | 2.57E-05 | 1.00 | 0.15 | 1.18E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| 9 | ULSD152006 | 4.37 | 0.00E+00 | 0.95 | 3.47 | 0.00E+00 | 1.00 | 0.49 | 0.00E+00 | 1.00 | 0.35 | 0.00E+00 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.009 |
| ***Building - Exterior (11/15/2013)*** | | | | | | | | | | | | | | | | | |
| 10 | ULSD1752006 | 4.44 | 6.46E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.16 | 2.57E-05 | 1.00 | 0.15 | 1.18E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| 11 | ULSD1202006 | 5.01 | 7.45E-05 | 0.95 | 3.09 | 8.21E-05 | 1.00 | 0.19 | 2.71E-05 | 1.00 | 0.22 | 1.76E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.007 |
| ***Building - Interior (1/15/2014)*** | | | | | | | | | | | | | | | | | |
| 12 | ULSD1752006 | 4.44 | 6.46E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.16 | 2.57E-05 | 1.00 | 0.15 | 1.18E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| ***Fine Grading/Landscaping (2/1/2014)*** | | | | | | | | | | | | | | | | | |
| 13 | ULSD502006 | 4.88 | 9.83E-05 | 0.95 | 2.86 | 2.90E-04 | 1.00 | 0.24 | 5.45E-05 | 1.00 | 0.32 | 2.72E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.007 |
| ***Paving (4/1/2014)*** | | | | | | | | | | | | | | | | | |
| 14 | ULSD1202006 | 5.01 | 7.45E-05 | 0.95 | 3.09 | 8.21E-05 | 1.00 | 0.19 | 2.71E-05 | 1.00 | 0.22 | 1.76E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.007 |
| 15 | ULSD1202006 | 5.01 | 7.45E-05 | 0.95 | 3.09 | 8.21E-05 | 1.00 | 0.19 | 2.71E-05 | 1.00 | 0.22 | 1.76E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.007 |
| 16 | ULSD502006 | 4.88 | 9.83E-05 | 0.95 | 2.86 | 2.90E-04 | 1.00 | 0.24 | 5.45E-05 | 1.00 | 0.32 | 2.72E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.007 |
| | | | | | | | | | | | | | | | | | |

Notes: ZH EF = Zero hour emission factor

DR = Deterioration rate

ULSD = Ultra low sulfur diesel (15 ppmw sulfur, 0.0015% sulfur)

Refs: CARB OFFROAD2007 model (http://www.arb.ca.gov/msei/offroad/offroad.htm), December, 2006.

Stationary/Off-road engines ARB, "California's Emissions Inventory for Off-Road Large Compression-Ignited (CI) Engines (> 25 HP)" MAC#99-32

**Construction Equipment Exhaust Emissions**
**San Sebastian, Morgan Hill - 2014 with 2007 Equipment**

**Analysis Year = 2014**

| Item No. | Off-Road Equipment / Equipment Type | No. Units | Engine Age (years) | Engine Model Year | Daily Hours In Use | Days Per Year | Unit Annual Hours Use | Use Factor | Load Factor | Cumulative Hours Operation Per Unit | Engine (hp) | Level of VDECS Used | Emission Factor (g/hp-hr) NOx | CO | VOC | PM2.5 | SO2 | CO2 | Annual Emissions (lb/yr) NOx | CO | VOC | PM2.5 | SO2 | CO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | ***Phase 3 - Construction Activities*** | | | | | | | | | | | | | | | | | | | | | | | |
| | ***Demolition (10/1/2013)*** | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | Excavators | 0 | 7 | 2007 | 7 | 1 | 7 | 1.00 | 0.38 | 3,822 | 168 | 0 | 2.44 | 2.97 | 0.20 | 0.13 | 0.006 | 568.3 | 0.0 | 0.0 | 0.0 | 0.00 | 0.00 | 0 |
| 2 | Rubber Tired Loaders | 0 | 7 | 2007 | 7 | 1 | 7 | 1.00 | 0.36 | 6,251 | 164 | 0 | 2.51 | 3.15 | 0.26 | 0.15 | 0.006 | 568.3 | 0.0 | 0.0 | 0.0 | 0.00 | 0.00 | 0 |
| | ***Mass Grading/ Excavation (10/15/2013)*** | | | | | | | | | | | | | | | | | | | | | | | |
| 3 | Excavators | 0 | 7 | 2007 | 7 | 10 | 70 | 1.00 | 0.38 | 3,822 | 168 | 0 | 2.44 | 2.97 | 0.20 | 0.13 | 0.006 | 568.3 | 0.0 | 0.0 | 0.0 | 0.00 | 0.000 | 0 |
| 4 | Scrapers | 0 | 7 | 2007 | 7 | 10 | 70 | 1.00 | 0.48 | 3,171 | 313 | 0 | 2.42 | 0.98 | 0.18 | 0.10 | 0.006 | 568.3 | 0.0 | 0.0 | 0.0 | 0.00 | 0.000 | 0 |
| 5 | Rollers | 0 | 7 | 2007 | 7 | 10 | 70 | 1.00 | 0.38 | 2,093 | 95 | 0 | 4.90 | 3.26 | 0.25 | 0.21 | 0.007 | 568.3 | 0.0 | 0.0 | 0.0 | 0.00 | 0.000 | 0 |
| 6 | Graders | 0 | 7 | 2007 | 7 | 10 | 70 | 1.00 | 0.41 | 4,270 | 174 | 0 | 2.45 | 3.00 | 0.21 | 0.14 | 0.006 | 568.3 | 0.0 | 0.0 | 0.0 | 0.00 | 0.000 | 0 |
| | Rubber Tired Loaders | 0 | 7 | 2007 | 7 | 10 | 70 | 1.00 | 0.36 | 6,251 | 164 | 0 | 2.51 | 3.15 | 0.26 | 0.15 | 0.006 | 568.3 | 0.0 | 0.0 | 0.0 | 0.00 | 0.000 | 0 |
| | ***Trenching-Utilities (11/1/2013)*** | | | | | | | | | | | | | | | | | | | | | | | |
| 7 | Tractors/Loaders/Backhoes | 0 | 7 | 2007 | 7 | 25 | 175 | 1.00 | 0.37 | 3,584 | 108 | 0 | 5.00 | 3.38 | 0.29 | 0.23 | 0.007 | 568.3 | 0.0 | 0.0 | 0.0 | 0.00 | 0.000 | 0 |
| 8 | Excavators | 0 | 7 | 2007 | 7 | 25 | 175 | 1.00 | 0.38 | 3,822 | 168 | 0 | 2.44 | 2.97 | 0.20 | 0.13 | 0.006 | 568.3 | 0.0 | 0.0 | 0.0 | 0.00 | 0.000 | 0 |
| 9 | Plate Compactors | 0 | 7 | 2007 | 7 | 25 | 175 | 1.00 | 0.29 | 4,200 | 8 | 0 | 4.14 | 3.47 | 0.49 | 0.28 | 0.009 | 568.3 | 0.0 | 0.0 | 0.0 | 0.00 | 0.000 | 0 |
| | ***Building - Exterior (11/15/2013)*** | | | | | | | | | | | | | | | | | | | | | | | |
| 10 | Forklifts | 0 | 7 | 2007 | 7 | 50 | 350 | 1.00 | 0.20 | 4,830 | 125 | 0 | 2.47 | 3.04 | 0.22 | 0.14 | 0.006 | 568.3 | 0.0 | 0.0 | 0.0 | 0.00 | 0.000 | 0 |
| 11 | Aerial Lifts (electric) | 0 | 7 | 2007 | 7 | 50 | 350 | 1.00 | 0.20 | 1,862 | 60 | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.000 | 0.0 | 0.0 | 0.0 | 0.0 | 0.00 | 0.000 | 0 |
| | ***Building - Interior (1/15/2014)*** | | | | | | | | | | | | | | | | | | | | | | | |
| 12 | Forklifts | 1 | 7 | 2007 | 7 | 50 | 350 | 1.00 | 0.20 | 4,830 | 125 | 0 | 2.47 | 3.04 | 0.22 | 0.14 | 0.006 | 568.3 | 47.6 | 58.7 | 4.3 | 2.73 | 0.123 | 10963 |
| | ***Fine Grading/Landscaping (2/12/2014)*** | | | | | | | | | | | | | | | | | | | | | | | |
| 13 | Skid Steer Loaders | 1 | 7 | 2007 | 7 | 22 | 154 | 1.00 | 0.37 | 2,079 | 44 | 0 | 4.82 | 3.46 | 0.35 | 0.30 | 0.007 | 568.3 | 26.4 | 19.0 | 1.9 | 1.66 | 0.040 | 3113 |
| | ***Paving (4/1/2014)*** | | | | | | | | | | | | | | | | | | | | | | | |
| 14 | Paving Equipment | 1 | 7 | 2007 | 7 | 2 | 14 | 1.00 | 0.36 | 2,800 | 104 | 0 | 4.95 | 3.32 | 0.27 | 0.22 | 0.007 | 568.3 | 5.7 | 3.8 | 0.3 | 0.25 | 0.008 | 657 |
| 15 | Rollers | 2 | 7 | 2007 | 7 | 2 | 14 | 1.00 | 0.38 | 2,093 | 95 | 0 | 4.90 | 3.26 | 0.25 | 0.21 | 0.007 | 568.3 | 10.9 | 7.3 | 0.5 | 0.46 | 0.015 | 1266 |
| 16 | Tractors/Loaders/Backhoes | 1 | 7 | 2007 | 7 | 2 | 14 | 1.00 | 0.37 | 3,584 | 44 | 0 | 4.96 | 3.90 | 0.44 | 0.34 | 0.007 | 568.3 | 2.5 | 1.9 | 0.2 | 0.17 | 0.004 | 283 |
| | ***Phase 4 - Construction Activities*** | | | | | | | | | | | | | | | | | | | | | | | |
| | ***Demolition (4/1/2014)*** | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | Excavators | 1 | 7 | 2007 | 7 | 2 | 14 | 1.00 | 0.38 | 3,822 | 168 | 0 | 2.44 | 2.97 | 0.20 | 0.13 | 0.006 | 568.3 | 4.8 | 5.9 | 0.4 | 0.26 | 0.01 | 1120 |
| 2 | Rubber Tired Loaders | 1 | 7 | 2007 | 7 | 2 | 14 | 1.00 | 0.36 | 6,251 | 164 | 0 | 2.51 | 3.15 | 0.26 | 0.15 | 0.006 | 568.3 | 4.6 | 5.7 | 0.5 | 0.28 | 0.01 | 1036 |
| | ***Mass Grading/ Excavation (4/15/2014)*** | | | | | | | | | | | | | | | | | | | | | | | |
| 3 | Excavators | 1 | 7 | 2007 | 7 | 10 | 70 | 1.00 | 0.38 | 3,822 | 168 | 0 | 2.44 | 2.97 | 0.20 | 0.13 | 0.006 | 568.3 | 24.0 | 29.3 | 1.9 | 1.32 | 0.063 | 5599 |
| 4 | Scrapers | 2 | 7 | 2007 | 7 | 10 | 70 | 1.00 | 0.48 | 3,171 | 313 | 0 | 2.42 | 0.98 | 0.18 | 0.10 | 0.006 | 568.3 | 112.1 | 45.3 | 8.3 | 4.41 | 0.259 | 26353 |
| 5 | Rollers | 1 | 7 | 2007 | 7 | 10 | 70 | 1.00 | 0.38 | 2,093 | 95 | 0 | 4.90 | 3.26 | 0.25 | 0.21 | 0.007 | 568.3 | 27.3 | 18.2 | 1.4 | 1.15 | 0.037 | 3166 |
| 6 | Graders | 1 | 7 | 2007 | 7 | 10 | 70 | 1.00 | 0.41 | 4,270 | 174 | 0 | 2.45 | 3.00 | 0.21 | 0.14 | 0.006 | 568.3 | 26.8 | 32.8 | 2.3 | 1.50 | 0.070 | 6206 |
| | Rubber Tired Loaders | 1 | 7 | 2007 | 7 | 10 | 70 | 1.00 | 0.36 | 6,251 | 164 | 0 | 2.51 | 3.15 | 0.26 | 0.15 | 0.006 | 568.3 | 22.9 | 28.7 | 2.3 | 1.39 | 0.058 | 5178 |
| | ***Trenching-Utilities (5/1/2014)*** | | | | | | | | | | | | | | | | | | | | | | | |
| 7 | Tractors/Loaders/Backhoes | 1 | 7 | 2007 | 7 | 25 | 175 | 1.00 | 0.37 | 3,584 | 108 | 0 | 5.00 | 3.38 | 0.29 | 0.23 | 0.007 | 568.3 | 76.4 | 51.7 | 4.4 | 3.47 | 0.102 | 8683 |
| 8 | Excavators | 1 | 7 | 2007 | 7 | 25 | 175 | 1.00 | 0.38 | 3,822 | 168 | 0 | 2.44 | 2.97 | 0.20 | 0.13 | 0.006 | 568.3 | 60.1 | 73.2 | 4.8 | 3.29 | 0.158 | 13997 |
| 9 | Plate Compactors | 1 | 7 | 2007 | 7 | 25 | 175 | 1.00 | 0.29 | 4,200 | 8 | 0 | 4.14 | 3.47 | 0.49 | 0.28 | 0.009 | 568.3 | 3.7 | 3.1 | 0.4 | 0.25 | 0.008 | 503 |
| | ***Building - Exterior (5/15/2014)*** | | | | | | | | | | | | | | | | | | | | | | | |
| 10 | Forklifts | 2 | 7 | 2007 | 7 | 50 | 350 | 1.00 | 0.20 | 4,830 | 125 | 0 | 2.47 | 3.04 | 0.22 | 0.14 | 0.006 | 568.3 | 95.3 | 117.5 | 8.5 | 5.47 | 0.247 | 21926 |
| 11 | Aerial Lifts (electric) | 1 | 7 | 2007 | 7 | 50 | 350 | 1.00 | 0.20 | 1,862 | 60 | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.000 | 0.0 | 0.0 | 0.0 | 0.0 | 0.00 | 0.000 | 0 |
| | ***Building - Interior ((7/15/2014)*** | | | | | | | | | | | | | | | | | | | | | | | |
| 12 | Forklifts | 1 | 7 | 2007 | 7 | 50 | 350 | 1.00 | 0.20 | 4,830 | 125 | 0 | 2.47 | 3.04 | 0.22 | 0.14 | 0.006 | 568.3 | 47.6 | 58.7 | 4.3 | 2.73 | 0.123 | 10963 |
| | ***Fine Grading/Landscaping 8/1/2014)*** | | | | | | | | | | | | | | | | | | | | | | | |
| 13 | Skid Steer Loaders | 1 | 7 | 2007 | 7 | 22 | 154 | 1.00 | 0.37 | 2,079 | 44 | 0 | 4.82 | 3.46 | 0.35 | 0.30 | 0.007 | 568.3 | 26.4 | 19.0 | 1.9 | 1.66 | 0.040 | 3113 |
| | ***Paving (10/1/2014)*** | | | | | | | | | | | | | | | | | | | | | | | |
| 14 | Paving Equipment | 1 | 7 | 2007 | 7 | 2 | 14 | 1.00 | 0.36 | 2,800 | 104 | 0 | 4.95 | 3.32 | 0.27 | 0.22 | 0.007 | 568.3 | 5.7 | 3.8 | 0.3 | 0.25 | 0.008 | 657 |
| 15 | Rollers | 2 | 7 | 2007 | 7 | 2 | 14 | 1.00 | 0.37 | 2,093 | 85 | 0 | 4.90 | 3.26 | 0.25 | 0.21 | 0.007 | 568.3 | 9.6 | 6.4 | 0.5 | 0.40 | 0.013 | 1113 |
| 16 | Tractors/Loaders/Backhoes | 1 | 7 | 2007 | 7 | 2 | 14 | 1.00 | 0.37 | 3,584 | 44 | 0 | 4.96 | 3.90 | 0.44 | 0.34 | 0.007 | 568.3 | 2.5 | 1.9 | 0.2 | 0.17 | 0.004 | 283 |
| | ***Phase 5 - Construction Activities*** | | | | | | | | | | | | | | | | | | | | | | | |
| | ***Demolition (10/1/2014)*** | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | Excavators | 1 | 7 | 2007 | 7 | 1 | 7 | 1.00 | 0.38 | 3,822 | 168 | 0 | 2.44 | 2.97 | 0.20 | 0.13 | 0.006 | 568.3 | 2.4 | 2.9 | 0.2 | 0.13 | 0.01 | 560 |
| 2 | Rubber Tired Loaders | 1 | 7 | 2007 | 7 | 1 | 7 | 1.00 | 0.36 | 6,251 | 164 | 0 | 2.51 | 3.15 | 0.26 | 0.15 | 0.006 | 568.3 | 2.3 | 2.9 | 0.2 | 0.14 | 0.01 | 518 |
| | ***Mass Grading/ Excavation (10/15/2014)*** | | | | | | | | | | | | | | | | | | | | | | | |
| 3 | Excavators | 1 | 7 | 2007 | 7 | 10 | 70 | 1.00 | 0.38 | 3,822 | 168 | 0 | 2.44 | 2.97 | 0.20 | 0.13 | 0.006 | 568.3 | 24.0 | 29.3 | 1.9 | 1.32 | 0.063 | 5599 |
| 4 | Scrapers | 2 | 7 | 2007 | 7 | 10 | 70 | 1.00 | 0.48 | 3,171 | 313 | 0 | 2.42 | 0.98 | 0.18 | 0.10 | 0.006 | 568.3 | 112.1 | 45.3 | 8.3 | 4.41 | 0.259 | 26353 |
| 5 | Rollers | 1 | 7 | 2007 | 7 | 10 | 70 | 1.00 | 0.38 | 2,093 | 95 | 0 | 4.90 | 3.26 | 0.25 | 0.21 | 0.007 | 568.3 | 27.3 | 18.2 | 1.4 | 1.15 | 0.037 | 3166 |
| 6 | Graders | 1 | 7 | 2007 | 7 | 10 | 70 | 1.00 | 0.41 | 4,270 | 174 | 0 | 2.45 | 3.00 | 0.21 | 0.14 | 0.006 | 568.3 | 26.8 | 32.8 | 2.3 | 1.50 | 0.070 | 6206 |
| | Rubber Tired Loaders | 1 | 7 | 2007 | 7 | 10 | 70 | 1.00 | 0.36 | 6,251 | 164 | 0 | 2.51 | 3.15 | 0.26 | 0.15 | 0.006 | 568.3 | 22.9 | 28.7 | 2.3 | 1.39 | 0.058 | 5178 |
| | ***Trenching-Utilities (11/1/2014)*** | | | | | | | | | | | | | | | | | | | | | | | |
| 7 | Tractors/Loaders/Backhoes | 1 | 7 | 2007 | 7 | 30 | 210 | 1.00 | 0.37 | 3,584 | 108 | 0 | 5.00 | 3.38 | 0.29 | 0.23 | 0.007 | 568.3 | 91.7 | 62.0 | 5.3 | 4.16 | 0.122 | 10419 |
| 8 | Excavators | 1 | 7 | 2007 | 7 | 30 | 210 | 1.00 | 0.38 | 3,822 | 168 | 0 | 2.44 | 2.97 | 0.20 | 0.13 | 0.006 | 568.3 | 72.1 | 87.9 | 5.8 | 3.95 | 0.189 | 16797 |
| 9 | Plate Compactors | 1 | 7 | 2007 | 7 | 30 | 210 | 1.00 | 0.29 | 4,200 | 8 | 0 | 4.14 | 3.47 | 0.49 | 0.28 | 0.009 | 568.3 | 4.4 | 3.7 | 0.5 | 0.30 | 0.009 | 603 |
| | ***Building - Exterior (11/15/2014)*** | | | | | | | | | | | | | | | | | | | | | | | |
| 10 | Forklifts | 2 | 7 | 2007 | 7 | 50 | 350 | 1.00 | 0.20 | 4,830 | 125 | 0 | 2.47 | 3.04 | 0.22 | 0.14 | 0.006 | 568.3 | 95.3 | 117.5 | 8.5 | 5.47 | 0.247 | 21926 |
| 11 | Aerial Lifts (electric) | 1 | 7 | 2007 | 7 | 50 | 350 | 1.00 | 0.20 | 1,862 | 60 | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.000 | 0.0 | 0.0 | 0.0 | 0.0 | 0.00 | 0.000 | 0 |
| | ***Building - Interior (1/15/2015)*** | | | | | | | | | | | | | | | | | | | | | | | |
| 12 | Forklifts | 0 | 7 | 2007 | 7 | 50 | 350 | 1.00 | 0.20 | 4,830 | 125 | 0 | 2.47 | 3.04 | 0.22 | 0.14 | 0.006 | 568.3 | 0.0 | 0.0 | 0.0 | 0.00 | 0.000 | 0 |
| | ***Fine Grading/Landscaping (2/1/2015)*** | | | | | | | | | | | | | | | | | | | | | | | |
| 13 | Skid Steer Loaders | 0 | 7 | 2007 | 7 | 23 | 161 | 1.00 | 0.37 | 2,079 | 44 | 0 | 4.82 | 3.46 | 0.35 | 0.30 | 0.007 | 568.3 | 0.0 | 0.0 | 0.0 | 0.00 | 0.000 | 0 |
| | ***Paving (4/1/2015)*** | | | | | | | | | | | | | | | | | | | | | | | |
| 14 | Paving Equipment | 0 | 7 | 2007 | 7 | 2 | 14 | 1.00 | 0.36 | 2,800 | 104 | 0 | 4.95 | 3.32 | 0.27 | 0.22 | 0.007 | 568.3 | 0.0 | 0.0 | 0.0 | 0.00 | 0.000 | 0 |
| 15 | Rollers | 0 | 7 | 2007 | 7 | 2 | 14 | 1.00 | 0.37 | 2,093 | 85 | 0 | 4.90 | 3.26 | 0.25 | 0.21 | 0.007 | 568.3 | 0.0 | 0.0 | 0.0 | 0.00 | 0.000 | 0 |
| 16 | Tractors/Loaders/Backhoes | 0 | 7 | 2007 | 7 | 2 | 14 | 1.00 | 0.37 | 3,584 | 44 | 0 | 4.96 | 3.90 | 0.44 | 0.34 | 0.007 | 568.3 | 0.0 | 0.0 | 0.0 | 0.00 | 0.000 | 0 |
| | **Total Off-Road Equipment** | | | | | | | | | | | | | | | | | | | | | **57.17** | | |
| | ***On-Site On-Road Vehicles*** | **No. Trucks** | | | **Hours/ Day** | **Days/ Year** | **Annual Hours per Truck** | | **Onsite Travel Miles** | | | | | | | **PM2.5 (g/mi)** | | | **NOx** | **CO** | **VOC** | **PM2.5** | **SO2** | **CO2** |
| | ***Mass Grading/ Excavation*** | | | | | | | | | | | | | | | | | | | | | | | |
| | Water Truck - Phase 4 | 1 | - | - | 2 | 10 | 20 | - | 200.0 | | - | - | | | | 0.3511 | | | | | | 0.15 | | |
| | Water Truck - Phase 5 | 1 | - | - | 2 | 10 | 20 | - | 200.0 | | - | - | | | | 0.3511 | | | | | | 0.15 | | |
| | ***Fine Grading/Landscaping*** | | | | | | | | | | | | | | | | | | | | | | | |
| | Water Truck Phases 3 | 1 | - | - | 2 | 22 | 44 | - | 440.0 | | - | - | | | | 0.3511 | | | | | | 0.34 | | |
| | Water Truck Phases 4 | 1 | - | - | 2 | 22 | 44 | - | 440.0 | | - | - | | | | 0.3511 | | | | | | 0.34 | | |
| | **Total On-Road Vehicles** | | | | | | | | | | | | | | | | | | | | | **0.99** | | |
| | **TOTAL On-Site - On and Off Roa** | - | | | - | - | | - | - | - | - | | - | - | - | - | | | | | | **58.2** | | |

Notes: Cumulative hours operation based on statewide averages
Onsite truck travel speed of 10 mph

**0.0291 tons/year**

| Item No. | Emission Factors - Off-Road Compression Ignited Engines / EF ID | NOx ZH EF (g/hp-hr) | NOx DR (g/hp-hr$^2$) | NOx Fuel CF | CO ZH EF (g/hp-hr) | CO DR (g/hp-hr$^2$) | CO Fuel CF | ROG ZH EF (g/hp-hr) | ROG DR (g/hp-hr$^2$) | ROG Fuel CF | PM2.5 ZH EF (g/hp-hr) | PM2.5 DR (g/hp-hr$^2$) | PM2.5 Fuel CF | CO2 ZH EF (g/hp-hr) | CO2 DR (g/hp-hr$^2$) | CO2 Fuel CF | SO2 (g/hp-hr) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | ***Demolition (10/1/2013)*** | | | | | | | | | | | | | | | | |
| 1 | ULSD1752007 | 2.45 | 3.20E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.13 | 1.00E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| 2 | ULSD1752007 | 2.45 | 3.20E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.13 | 1.00E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| | ***Mass Grading/ Excavation (10/15/2013)*** | | | | | | | | | | | | | | | | |
| 3 | ULSD1752007 | 2.45 | 3.20E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.13 | 1.00E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| 4 | ULSD5002007 | 2.45 | 3.18E-05 | 0.95 | 0.92 | 1.82E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.10 | 5.55E-06 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| 5 | ULSD1202007 | 5.01 | 7.45E-05 | 0.95 | 3.09 | 8.21E-05 | 1.00 | 0.19 | 2.71E-05 | 1.00 | 0.22 | 1.76E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.007 |
| 6 | ULSD1752007 | 2.45 | 3.20E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.13 | 1.00E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| | ULSD1752007 | 2.45 | 3.20E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.13 | 1.00E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.006 |

| | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ***Trenching-Utilities (11/1/2013)*** | | | | | | | | | | | | | | | | | |
| 7 | ULSD1202007 | 5.01 | 7.45E-05 | 0.95 | 3.09 | 8.21E-05 | 1.00 | 0.19 | 2.71E-05 | 1.00 | 0.22 | 1.76E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.007 |
| 8 | ULSD1752007 | 2.45 | 3.20E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.13 | 1.00E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| 9 | ULSD152007 | 4.37 | 0.00E+00 | 0.95 | 3.47 | 0.00E+00 | 1.00 | 0.49 | 0.00E+00 | 1.00 | 0.35 | 0.00E+00 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.009 |
| ***Building - Exterior (11/15/2013)*** | | | | | | | | | | | | | | | | | |
| 10 | ULSD1752007 | 2.45 | 3.20E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.13 | 1.00E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| 11 | ULSD1202007 | 5.01 | 7.45E-05 | 0.95 | 3.09 | 8.21E-05 | 1.00 | 0.19 | 2.71E-05 | 1.00 | 0.22 | 1.76E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.007 |
| ***Building - Interior (1/15/2014)*** | | | | | | | | | | | | | | | | | |
| 12 | ULSD1752007 | 2.45 | 3.20E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.13 | 1.00E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| ***Fine Grading/Landscaping (2/12/2014)*** | | | | | | | | | | | | | | | | | |
| 13 | ULSD502007 | 4.88 | 9.83E-05 | 0.95 | 2.86 | 2.90E-04 | 1.00 | 0.24 | 5.45E-05 | 1.00 | 0.32 | 2.72E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.007 |
| ***Paving (4/1/2014)*** | | | | | | | | | | | | | | | | | |
| 14 | ULSD1202007 | 5.01 | 7.45E-05 | 0.95 | 3.09 | 8.21E-05 | 1.00 | 0.19 | 2.71E-05 | 1.00 | 0.22 | 1.76E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.007 |
| 15 | ULSD1202007 | 5.01 | 7.45E-05 | 0.95 | 3.09 | 8.21E-05 | 1.00 | 0.19 | 2.71E-05 | 1.00 | 0.22 | 1.76E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.007 |
| 16 | ULSD502007 | 4.88 | 9.83E-05 | 0.95 | 2.86 | 2.90E-04 | 1.00 | 0.24 | 5.45E-05 | 1.00 | 0.32 | 2.72E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.007 |
| ***Demolition (4/1/2014)*** | | | | | | | | | | | | | | | | | |
| 1 | ULSD1752007 | 2.45 | 3.20E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.13 | 1.00E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| 2 | ULSD1752007 | 2.45 | 3.20E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.13 | 1.00E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| ***Mass Grading/ Excavation (4/15/2014)*** | | | | | | | | | | | | | | | | | |
| 3 | ULSD1752007 | 2.45 | 3.20E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.13 | 1.00E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| 4 | ULSD5002007 | 2.45 | 3.18E-05 | 0.95 | 0.92 | 1.82E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.10 | 5.55E-06 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| 5 | ULSD1202007 | 5.01 | 7.45E-05 | 0.95 | 3.09 | 8.21E-05 | 1.00 | 0.19 | 2.71E-05 | 1.00 | 0.22 | 1.76E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.007 |
| 6 | ULSD1752007 | 2.45 | 3.20E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.13 | 1.00E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| | ULSD1752007 | 2.45 | 3.20E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.13 | 1.00E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| ***Trenching-Utilities (5/1/2014)*** | | | | | | | | | | | | | | | | | |
| 7 | ULSD1202007 | 5.01 | 7.45E-05 | 0.95 | 3.09 | 8.21E-05 | 1.00 | 0.19 | 2.71E-05 | 1.00 | 0.22 | 1.76E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.007 |
| 8 | ULSD1752007 | 2.45 | 3.20E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.13 | 1.00E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| 9 | ULSD152007 | 4.37 | 0.00E+00 | 0.95 | 3.47 | 0.00E+00 | 1.00 | 0.49 | 0.00E+00 | 1.00 | 0.35 | 0.00E+00 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.009 |
| ***Building - Exterior (5/15/2014)*** | | | | | | | | | | | | | | | | | |
| 10 | ULSD1752007 | 2.45 | 3.20E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.13 | 1.00E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| 11 | ULSD1202007 | 5.01 | 7.45E-05 | 0.95 | 3.09 | 8.21E-05 | 1.00 | 0.19 | 2.71E-05 | 1.00 | 0.22 | 1.76E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.007 |
| ***Building - Interior ((7/15/2014)*** | | | | | | | | | | | | | | | | | |
| 12 | ULSD1752007 | 2.45 | 3.20E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.13 | 1.00E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| ***Fine Grading/Landscaping 8/1/2014)*** | | | | | | | | | | | | | | | | | |
| 13 | ULSD502007 | 4.88 | 9.83E-05 | 0.95 | 2.86 | 2.90E-04 | 1.00 | 0.24 | 5.45E-05 | 1.00 | 0.32 | 2.72E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.007 |
| ***Paving (10/1/2014)*** | | | | | | | | | | | | | | | | | |
| 14 | ULSD1202007 | 5.01 | 7.45E-05 | 0.95 | 3.09 | 8.21E-05 | 1.00 | 0.19 | 2.71E-05 | 1.00 | 0.22 | 1.76E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.007 |
| 15 | ULSD1202007 | 5.01 | 7.45E-05 | 0.95 | 3.09 | 8.21E-05 | 1.00 | 0.19 | 2.71E-05 | 1.00 | 0.22 | 1.76E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.007 |
| 16 | ULSD502007 | 4.88 | 9.83E-05 | 0.95 | 2.86 | 2.90E-04 | 1.00 | 0.24 | 5.45E-05 | 1.00 | 0.32 | 2.72E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.007 |
| ***Demolition (10/1/2014)*** | | | | | | | | | | | | | | | | | |
| 1 | ULSD1752007 | 2.45 | 3.20E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.13 | 1.00E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| 2 | ULSD1752007 | 2.45 | 3.20E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.13 | 1.00E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| ***Mass Grading/ Excavation (10/15/2014)*** | | | | | | | | | | | | | | | | | |
| 3 | ULSD1752007 | 2.45 | 3.20E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.13 | 1.00E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| 4 | ULSD5002007 | 2.45 | 3.18E-05 | 0.95 | 0.92 | 1.82E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.10 | 5.55E-06 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| 5 | ULSD1202007 | 5.01 | 7.45E-05 | 0.95 | 3.09 | 8.21E-05 | 1.00 | 0.19 | 2.71E-05 | 1.00 | 0.22 | 1.76E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.007 |
| 6 | ULSD1752007 | 2.45 | 3.20E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.13 | 1.00E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| | ULSD1752007 | 2.45 | 3.20E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.13 | 1.00E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| ***Trenching-Utilities (11/1/2014)*** | | | | | | | | | | | | | | | | | |
| 7 | ULSD1202007 | 5.01 | 7.45E-05 | 0.95 | 3.09 | 8.21E-05 | 1.00 | 0.19 | 2.71E-05 | 1.00 | 0.22 | 1.76E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.007 |
| 8 | ULSD1752007 | 2.45 | 3.20E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.13 | 1.00E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| 9 | ULSD152007 | 4.37 | 0.00E+00 | 0.95 | 3.47 | 0.00E+00 | 1.00 | 0.49 | 0.00E+00 | 1.00 | 0.35 | 0.00E+00 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.009 |
| ***Building - Exterior (11/15/2014)*** | | | | | | | | | | | | | | | | | |
| 10 | ULSD1752007 | 2.45 | 3.20E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.13 | 1.00E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| 11 | ULSD1202007 | 5.01 | 7.45E-05 | 0.95 | 3.09 | 8.21E-05 | 1.00 | 0.19 | 2.71E-05 | 1.00 | 0.22 | 1.76E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.007 |
| ***Building - Interior (1/15/2015)*** | | | | | | | | | | | | | | | | | |
| 12 | ULSD1752007 | 2.45 | 3.20E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.13 | 1.00E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| ***Fine Grading/Landscaping (2/1/2015)*** | | | | | | | | | | | | | | | | | |
| 13 | ULSD502007 | 4.88 | 9.83E-05 | 0.95 | 2.86 | 2.90E-04 | 1.00 | 0.24 | 5.45E-05 | 1.00 | 0.32 | 2.72E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.007 |
| ***Paving (4/1/2015)*** | | | | | | | | | | | | | | | | | |
| 14 | ULSD1202007 | 5.01 | 7.45E-05 | 0.95 | 3.09 | 8.21E-05 | 1.00 | 0.19 | 2.71E-05 | 1.00 | 0.22 | 1.76E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.007 |
| 15 | ULSD1202007 | 5.01 | 7.45E-05 | 0.95 | 3.09 | 8.21E-05 | 1.00 | 0.19 | 2.71E-05 | 1.00 | 0.22 | 1.76E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.007 |
| 16 | ULSD502007 | 4.88 | 9.83E-05 | 0.95 | 2.86 | 2.90E-04 | 1.00 | 0.24 | 5.45E-05 | 1.00 | 0.32 | 2.72E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.007 |

Notes: ZH EF = Zero hour emission factor
DR = Deterioration rate
ULSD = Ultra low sulfur diesel (15 ppmw sulfur, 0.0015% sulfur)

Refs: CARB OFFFROAD2007 model (http://www.arb.ca.gov/msei/offroad/offroad.htm), December, 2006.
Stationary/Off-road engines ARB, "California's Emissions Inventory for Off-Road Large Compression-Ignited (CI) Engines (> 25 HP)" MAC#99-32

**Construction Equipment Exhaust Emissions**
**San Sebastian, Morgan Hill - 2015 with 2008 Equipment**

**Analysis Year = 2015**

| Item No. | Off-Road Equipment / Equipment Type | No. Units | Engine Age (years) | Engine Model Year | Daily Hours In Use | Days Per Year | Unit Annual Hours Use | Use Factor | Load Factor | Cumulative Hours Operation Per Unit | Engine (hp) | Level of VDECS Used | Emission Factor (g/hp-hr) NOx | CO | VOC | PM2.5 | SO2 | CO2 | Annual Emissions (lb/yr) NOx | CO | VOC | PM2.5 | SO2 | CO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ***Phase 5 - Construction Activities*** | | | | | | | | | | | | | | | | | | | | | | | | |
| ***Demolition (10/1/2014)*** | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | Excavators | 0 | 7 | 2008 | 7 | 1 | 7 | 1.00 | 0.38 | 3,822 | 168 | 0 | 2.44 | 2.97 | 0.20 | 0.13 | 0.006 | 568.3 | 0.0 | 0.0 | 0.0 | 0.00 | 0.00 | 0 |
| 2 | Rubber Tired Loaders | 0 | 7 | 2008 | 7 | 1 | 7 | 1.00 | 0.36 | 6,251 | 164 | 0 | 2.51 | 3.15 | 0.26 | 0.15 | 0.006 | 568.3 | 0.0 | 0.0 | 0.0 | 0.00 | 0.00 | 0 |
| ***Mass Grading/ Excavation (10/15/2014)*** | | | | | | | | | | | | | | | | | | | | | | | | |
| 3 | Excavators | 0 | 7 | 2008 | 7 | 10 | 70 | 1.00 | 0.38 | 3,822 | 168 | 0 | 2.44 | 2.97 | 0.20 | 0.13 | 0.006 | 568.3 | 0.0 | 0.0 | 0.0 | 0.00 | 0.000 | 0 |
| 4 | Scrapers | 0 | 7 | 2008 | 7 | 10 | 70 | 1.00 | 0.48 | 3,171 | 313 | 0 | 2.42 | 0.98 | 0.18 | 0.10 | 0.006 | 568.3 | 0.0 | 0.0 | 0.0 | 0.00 | 0.000 | 0 |
| 5 | Rollers | 0 | 7 | 2008 | 7 | 10 | 70 | 1.00 | 0.38 | 2,093 | 95 | 0 | 2.82 | 3.22 | 0.15 | 0.16 | 0.007 | 568.3 | 0.0 | 0.0 | 0.0 | 0.00 | 0.000 | 0 |
| 6 | Graders | 0 | 7 | 2008 | 7 | 10 | 70 | 1.00 | 0.41 | 4,270 | 174 | 0 | 2.45 | 3.00 | 0.21 | 0.14 | 0.006 | 568.3 | 0.0 | 0.0 | 0.0 | 0.00 | 0.000 | 0 |
| | Rubber Tired Loaders | 0 | 7 | 2008 | 7 | 10 | 70 | 1.00 | 0.36 | 6,251 | 164 | 0 | 2.51 | 3.15 | 0.26 | 0.15 | 0.006 | 568.3 | 0.0 | 0.0 | 0.0 | 0.00 | 0.000 | 0 |
| ***Trenching-Utilities (11/1/2014)*** | | | | | | | | | | | | | | | | | | | | | | | | |
| 7 | Tractors/Loaders/Backhoes | 0 | 7 | 2008 | 7 | 30 | 210 | 1.00 | 0.37 | 3,584 | 108 | 0 | 2.87 | 3.34 | 0.19 | 0.17 | 0.007 | 568.3 | 0.0 | 0.0 | 0.0 | 0.00 | 0.000 | 0 |
| 8 | Excavators | 0 | 7 | 2008 | 7 | 30 | 210 | 1.00 | 0.38 | 3,822 | 168 | 0 | 2.44 | 2.97 | 0.20 | 0.13 | 0.006 | 568.3 | 0.0 | 0.0 | 0.0 | 0.00 | 0.000 | 0 |
| 9 | Plate Compactors | 0 | 7 | 2008 | 7 | 30 | 210 | 1.00 | 0.29 | 4,200 | 8 | 0 | 4.14 | 3.47 | 0.49 | 0.14 | 0.009 | 568.3 | 0.0 | 0.0 | 0.0 | 0.00 | 0.000 | 0 |
| ***Building - Exterior (11/15/2014)*** | | | | | | | | | | | | | | | | | | | | | | | | |
| 10 | Forklifts | 0 | 7 | 2008 | 7 | 50 | 350 | 1.00 | 0.20 | 4,830 | 125 | 0 | 2.47 | 3.04 | 0.22 | 0.14 | 0.006 | 568.3 | 0.0 | 0.0 | 0.0 | 0.00 | 0.000 | 0 |
| 11 | Aerial Lifts (electric) | 0 | 7 | 2008 | 7 | 50 | 350 | 1.00 | 0.20 | 1,862 | 60 | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.000 | 0.0 | 0.0 | 0.0 | 0.0 | 0.00 | 0.000 | 0 |
| ***Building - Interior (1/15/2015)*** | | | | | | | | | | | | | | | | | | | | | | | | |
| 12 | Forklifts | 1 | 7 | 2008 | 7 | 50 | 350 | 1.00 | 0.20 | 4,830 | 125 | 0 | 2.47 | 3.04 | 0.22 | 0.14 | 0.006 | 568.3 | 47.6 | 58.7 | 4.3 | 2.73 | 0.123 | 10963 |
| ***Fine Grading/Landscaping (2/1/2015)*** | | | | | | | | | | | | | | | | | | | | | | | | |
| 13 | Skid Steer Loaders | 1 | 7 | 2008 | 7 | 23 | 161 | 1.00 | 0.37 | 2,079 | 44 | 0 | 4.75 | 3.29 | 0.18 | 0.14 | 0.007 | 568.3 | 27.2 | 18.9 | 1.0 | 0.79 | 0.042 | 3254 |
| ***Paving (4/1/2015)*** | | | | | | | | | | | | | | | | | | | | | | | | |
| 14 | Paving Equipment | 1 | 7 | 2008 | 7 | 2 | 14 | 1.00 | 0.36 | 2,800 | 104 | 0 | 2.84 | 3.28 | 0.17 | 0.17 | 0.007 | 568.3 | 3.3 | 3.8 | 0.2 | 0.19 | 0.008 | 657 |
| 15 | Rollers | 2 | 7 | 2008 | 7 | 2 | 14 | 1.00 | 0.38 | 2,093 | 95 | 0 | 2.82 | 3.22 | 0.15 | 0.16 | 0.007 | 568.3 | 6.3 | 7.2 | 0.3 | 0.36 | 0.015 | 1266 |
| 16 | Tractors/Loaders/Backhoes | 1 | 7 | 2008 | 7 | 2 | 14 | 1.00 | 0.37 | 3,584 | 44 | 0 | 4.89 | 3.71 | 0.24 | 0.15 | 0.007 | 568.3 | 2.4 | 1.8 | 0.1 | 0.08 | 0.004 | 283 |
| ***Phase 6 - Construction Activities*** | | | | | | | | | | | | | | | | | | | | | | | | |
| ***Demolition (4/1/2015)*** | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | Excavators | 1 | 7 | 2008 | 7 | 1 | 7 | 1.00 | 0.38 | 3,822 | 168 | 0 | 2.44 | 2.97 | 0.20 | 0.13 | 0.006 | 568.3 | 2.4 | 2.9 | 0.2 | 0.13 | 0.01 | 560 |
| 2 | Rubber Tired Loaders | 1 | 7 | 2008 | 7 | 1 | 7 | 1.00 | 0.36 | 6,251 | 164 | 0 | 2.51 | 3.15 | 0.26 | 0.15 | 0.006 | 568.3 | 2.3 | 2.9 | 0.2 | 0.14 | 0.01 | 518 |
| ***Mass Grading/ Excavation (4/15/2015)*** | | | | | | | | | | | | | | | | | | | | | | | | |
| 3 | Excavators | 1 | 7 | 2008 | 7 | 10 | 70 | 1.00 | 0.38 | 3,822 | 168 | 0 | 2.44 | 2.97 | 0.20 | 0.13 | 0.006 | 568.3 | 24.0 | 29.3 | 1.9 | 1.32 | 0.063 | 5599 |
| 4 | Scrapers | 2 | 7 | 2008 | 7 | 10 | 70 | 1.00 | 0.48 | 3,171 | 313 | 0 | 2.42 | 0.98 | 0.18 | 0.10 | 0.006 | 568.3 | 112.1 | 45.3 | 8.3 | 4.41 | 0.259 | 26353 |
| 5 | Rollers | 1 | 7 | 2008 | 7 | 10 | 70 | 1.00 | 0.38 | 2,093 | 95 | 0 | 2.82 | 3.22 | 0.15 | 0.16 | 0.007 | 568.3 | 15.7 | 17.9 | 0.8 | 0.90 | 0.037 | 3166 |
| 6 | Graders | 1 | 7 | 2008 | 7 | 10 | 70 | 1.00 | 0.41 | 4,270 | 174 | 0 | 2.45 | 3.00 | 0.21 | 0.14 | 0.006 | 568.3 | 26.8 | 32.8 | 2.3 | 1.50 | 0.070 | 6206 |
| | Rubber Tired Loaders | 1 | 7 | 2008 | 7 | 10 | 70 | 1.00 | 0.36 | 6,251 | 164 | 0 | 2.51 | 3.15 | 0.26 | 0.15 | 0.006 | 568.3 | 22.9 | 28.7 | 2.3 | 1.39 | 0.058 | 5178 |
| ***Trenching-Utilities (5/1/2015)*** | | | | | | | | | | | | | | | | | | | | | | | | |
| 7 | Tractors/Loaders/Backhoes | 1 | 7 | 2008 | 7 | 40 | 280 | 1.00 | 0.37 | 3,584 | 108 | 0 | 2.87 | 3.34 | 0.19 | 0.17 | 0.007 | 568.3 | 70.1 | 81.7 | 4.6 | 4.20 | 0.163 | 13892 |
| 8 | Excavators | 1 | 7 | 2008 | 7 | 40 | 280 | 1.00 | 0.38 | 3,822 | 168 | 0 | 2.44 | 2.97 | 0.20 | 0.13 | 0.006 | 568.3 | 96.1 | 117.2 | 7.7 | 5.27 | 0.252 | 22396 |
| 9 | Plate Compactors | 1 | 7 | 2008 | 7 | 40 | 280 | 1.00 | 0.29 | 4,200 | 8 | 0 | 4.14 | 3.47 | 0.49 | 0.14 | 0.009 | 568.3 | 5.9 | 4.9 | 0.7 | 0.20 | 0.013 | 805 |
| ***Building - Exterior (5/15/2015)*** | | | | | | | | | | | | | | | | | | | | | | | | |
| 10 | Forklifts | 2 | 7 | 2008 | 7 | 50 | 350 | 1.00 | 0.20 | 4,830 | 125 | 0 | 2.47 | 3.04 | 0.22 | 0.14 | 0.006 | 568.3 | 95.3 | 117.5 | 8.5 | 5.47 | 0.247 | 21926 |
| 11 | Aerial Lifts (electric) | 1 | 7 | 2008 | 7 | 50 | 350 | 1.00 | 0.20 | 1,862 | 60 | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.000 | 0.0 | 0.0 | 0.0 | 0.0 | 0.00 | 0.000 | 0 |
| ***Building - Interior ((7/15/2015)*** | | | | | | | | | | | | | | | | | | | | | | | | |
| 12 | Forklifts | 1 | 7 | 2008 | 7 | 50 | 350 | 1.00 | 0.20 | 4,830 | 125 | 0 | 2.47 | 3.04 | 0.22 | 0.14 | 0.006 | 568.3 | 47.6 | 58.7 | 4.3 | 2.73 | 0.123 | 10963 |
| ***Fine Grading/Landscaping 8/1/2015)*** | | | | | | | | | | | | | | | | | | | | | | | | |
| 13 | Skid Steer Loaders | 1 | 7 | 2008 | 7 | 30 | 210 | 1.00 | 0.37 | 2,079 | 44 | 0 | 4.75 | 3.29 | 0.18 | 0.14 | 0.007 | 568.3 | 35.5 | 24.6 | 1.4 | 1.03 | 0.055 | 4245 |
| ***Paving (10/1/2015)*** | | | | | | | | | | | | | | | | | | | | | | | | |
| 14 | Paving Equipment | 1 | 7 | 2008 | 7 | 2 | 14 | 1.00 | 0.36 | 2,800 | 104 | 0 | 2.84 | 3.28 | 0.17 | 0.17 | 0.007 | 568.3 | 3.3 | 3.8 | 0.2 | 0.19 | 0.008 | 657 |
| 15 | Rollers | 2 | 7 | 2008 | 7 | 2 | 14 | 1.00 | 0.37 | 2,093 | 85 | 0 | 2.82 | 3.22 | 0.15 | 0.16 | 0.007 | 568.3 | 5.5 | 6.3 | 0.3 | 0.32 | 0.013 | 1113 |
| 16 | Tractors/Loaders/Backhoes | 1 | 7 | 2008 | 7 | 2 | 14 | 1.00 | 0.37 | 3,584 | 44 | 0 | 4.89 | 3.71 | 0.24 | 0.15 | 0.007 | 568.3 | 2.4 | 1.8 | 0.1 | 0.08 | 0.004 | 283 |
| ***Phase 7 - Construction Activities*** | | | | | | | | | | | | | | | | | | | | | | | | |
| ***Demolition (10/1/2015)*** | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | Excavators | 1 | 7 | 2008 | 7 | 1 | 7 | 1.00 | 0.38 | 3,822 | 168 | 0 | 2.44 | 2.97 | 0.20 | 0.13 | 0.006 | 568.3 | 2.4 | 2.9 | 0.2 | 0.13 | 0.01 | 560 |
| 2 | Rubber Tired Loaders | 1 | 7 | 2008 | 7 | 1 | 7 | 1.00 | 0.36 | 6,251 | 164 | 0 | 2.51 | 3.15 | 0.26 | 0.15 | 0.006 | 568.3 | 2.3 | 2.9 | 0.2 | 0.14 | 0.01 | 518 |
| ***Mass Grading/ Excavation (10/15/2015)*** | | | | | | | | | | | | | | | | | | | | | | | | |
| 3 | Excavators | 1 | 7 | 2008 | 7 | 10 | 70 | 1.00 | 0.38 | 3,822 | 168 | 0 | 2.44 | 2.97 | 0.20 | 0.13 | 0.006 | 568.3 | 24.0 | 29.3 | 1.9 | 1.32 | 0.063 | 5599 |
| 4 | Scrapers | 2 | 7 | 2008 | 7 | 10 | 70 | 1.00 | 0.48 | 3,171 | 313 | 0 | 2.42 | 0.98 | 0.18 | 0.10 | 0.006 | 568.3 | 112.1 | 45.3 | 8.3 | 4.41 | 0.259 | 26353 |
| 5 | Rollers | 1 | 7 | 2008 | 7 | 10 | 70 | 1.00 | 0.38 | 2,093 | 95 | 0 | 2.82 | 3.22 | 0.15 | 0.16 | 0.007 | 568.3 | 15.7 | 17.9 | 0.8 | 0.90 | 0.037 | 3166 |
| 6 | Graders | 1 | 7 | 2008 | 7 | 10 | 70 | 1.00 | 0.41 | 4,270 | 174 | 0 | 2.45 | 3.00 | 0.21 | 0.14 | 0.006 | 568.3 | 26.8 | 32.8 | 2.3 | 1.50 | 0.070 | 6206 |
| | Rubber Tired Loaders | 1 | 7 | 2008 | 7 | 10 | 70 | 1.00 | 0.36 | 6,251 | 164 | 0 | 2.51 | 3.15 | 0.26 | 0.15 | 0.006 | 568.3 | 22.9 | 28.7 | 2.3 | 1.39 | 0.058 | 5178 |
| ***Trenching-Utilities (11/1/2015)*** | | | | | | | | | | | | | | | | | | | | | | | | |
| 7 | Tractors/Loaders/Backhoes | 1 | 7 | 2008 | 7 | 40 | 280 | 1.00 | 0.37 | 3,584 | 108 | 0 | 2.87 | 3.34 | 0.19 | 0.17 | 0.007 | 568.3 | 70.1 | 81.7 | 4.6 | 4.20 | 0.163 | 13892 |
| 8 | Excavators | 1 | 7 | 2008 | 7 | 40 | 280 | 1.00 | 0.38 | 3,822 | 168 | 0 | 2.44 | 2.97 | 0.20 | 0.13 | 0.006 | 568.3 | 96.1 | 117.2 | 7.7 | 5.27 | 0.252 | 22396 |
| 9 | Plate Compactors | 1 | 7 | 2008 | 7 | 40 | 280 | 1.00 | 0.29 | 4,200 | 8 | 0 | 4.14 | 3.47 | 0.49 | 0.14 | 0.009 | 568.3 | 5.9 | 4.9 | 0.7 | 0.20 | 0.013 | 805 |
| ***Building - Exterior (11/15/2015)*** | | | | | | | | | | | | | | | | | | | | | | | | |
| 10 | Forklifts | 2 | 7 | 2008 | 7 | 50 | 350 | 1.00 | 0.20 | 4,830 | 125 | 0 | 2.47 | 3.04 | 0.22 | 0.14 | 0.006 | 568.3 | 95.3 | 117.5 | 8.5 | 5.47 | 0.247 | 21926 |
| 11 | Aerial Lifts (electric) | 1 | 7 | 2008 | 7 | 50 | 350 | 1.00 | 0.20 | 1,862 | 60 | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.000 | 0.0 | 0.0 | 0.0 | 0.0 | 0.00 | 0.000 | 0 |
| ***Building - Interior (1/15/2016)*** | | | | | | | | | | | | | | | | | | | | | | | | |
| 12 | Forklifts | 0 | 7 | 2008 | 7 | 50 | 350 | 1.00 | 0.20 | 4,830 | 125 | 0 | 2.47 | 3.04 | 0.22 | 0.14 | 0.006 | 568.3 | 0.0 | 0.0 | 0.0 | 0.00 | 0.000 | 0 |
| ***Fine Grading/Landscaping (2/1/2016)*** | | | | | | | | | | | | | | | | | | | | | | | | |
| 13 | Skid Steer Loaders | 0 | 7 | 2008 | 7 | 25 | 175 | 1.00 | 0.37 | 2,079 | 44 | 0 | 4.75 | 3.29 | 0.18 | 0.14 | 0.007 | 568.3 | 0.0 | 0.0 | 0.0 | 0.00 | 0.000 | 0 |
| ***Paving (4/1/2016)*** | | | | | | | | | | | | | | | | | | | | | | | | |
| 14 | Paving Equipment | 0 | 7 | 2008 | 7 | 2 | 14 | 1.00 | 0.36 | 2,800 | 104 | 0 | 2.84 | 3.28 | 0.17 | 0.17 | 0.007 | 568.3 | 0.0 | 0.0 | 0.0 | 0.00 | 0.000 | 0 |
| 15 | Rollers | 0 | 7 | 2008 | 7 | 2 | 14 | 1.00 | 0.37 | 2,093 | 85 | 0 | 2.82 | 3.22 | 0.15 | 0.16 | 0.007 | 568.3 | 0.0 | 0.0 | 0.0 | 0.00 | 0.000 | 0 |
| 16 | Tractors/Loaders/Backhoes | 0 | 7 | 2008 | 7 | 2 | 14 | 1.00 | 0.37 | 3,584 | 44 | 0 | 4.89 | 3.71 | 0.24 | 0.15 | 0.007 | 568.3 | 0.0 | 0.0 | 0.0 | 0.00 | 0.000 | 0 |
| | **Total Off-Road Equipment** | | | | | | | | | | | | | | | | | | | | | **58.33** | | |
| | ***On-Site On-Road Vehicles*** | **No. Trucks** | | | **Hours/ Day** | **Days/ Year** | **Annual Hours per Truck** | | **Onsite Travel Miles** | | | | | | | **PM2.5 (g/mi)** | | | **NOx** | **CO** | **VOC** | **PM2.5** | **SO2** | **CO2** |
| ***Mass Grading/ Excavation*** | | | | | | | | | | | | | | | | | | | | | | | | |
| | Water Truck - Phase 6 | 1 | - | - | 2 | 10 | 20 | - | 200.0 | | - | - | | | | 0.2253 | | | | | | 0.10 | | |
| | Water Truck - Phase 7 | 1 | - | - | 2 | 10 | 20 | - | 200.0 | | - | - | | | | 0.2253 | | | | | | 0.10 | | |
| ***Fine Grading/Landscaping*** | | | | | | | | | | | | | | | | | | | | | | | | |
| | Water Truck Phases 5 | 1 | - | - | 2 | 23 | 46 | - | 460.0 | | - | - | | | | 0.2253 | | | | | | 0.23 | | |
| | Water Truck Phases 6 | 1 | - | - | 2 | 30 | 60 | - | 600.0 | | - | - | | | | 0.2253 | | | | | | 0.30 | | |
| | **Total On-Road Vehicles** | | | | | | | | | | | | | | | | | | | | | **0.73** | | |
| **TOTAL On-Site - On and Off Roa** | | - | | | - | - | | - | - | - | - | | - | - | - | - | | | | | | **59.05** | | |

Notes: Cumulative hours operation based on statewide averages
Onsite truck travel speed of 10 mph

**0.0295 tons/year**

| Item No. | EF ID | NOx ZH EF (g/hp-hr) | NOx DR (g/hp-$hr^2$) | NOx Fuel CF | CO ZH EF (g/hp-hr) | CO DR (g/hp-$hr^2$) | CO Fuel CF | ROG ZH EF (g/hp-hr) | ROG DR (g/hp-$hr^2$) | ROG Fuel CF | PM2.5 ZH EF (g/hp-hr) | PM2.5 DR (g/hp-$hr^2$) | PM2.5 Fuel CF | CO2 ZH EF (g/hp-hr) | CO2 DR (g/hp-$hr^2$) | CO2 Fuel CF | SO2 (g/hp-hr) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Emission Factors - Off-Road Compression Ignited Engines** | | | | | | | | | | | | | | | | | |
| ***Demolition (10/1/2014)*** | | | | | | | | | | | | | | | | | |
| 1 | ULSD1752008 | 2.45 | 3.20E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.13 | 1.00E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| 2 | ULSD1752008 | 2.45 | 3.20E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.13 | 1.00E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| ***Mass Grading/ Excavation (10/15/2014)*** | | | | | | | | | | | | | | | | | |
| 3 | ULSD1752008 | 2.45 | 3.20E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.13 | 1.00E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| 4 | ULSD5002008 | 2.45 | 3.18E-05 | 0.95 | 0.92 | 1.82E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.10 | 5.55E-06 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| 5 | ULSD1202008 | 2.89 | 3.80E-05 | 0.95 | 3.05 | 8.10E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.18 | 8.58E-06 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.007 |
| 6 | ULSD1752008 | 2.45 | 3.20E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.13 | 1.00E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| | ULSD1752008 | 2.45 | 3.20E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.13 | 1.00E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.006 |

| | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ***Trenching-Utilities (11/1/2014)*** | | | | | | | | | | | | | | | | | |
| 7 | ULSD1202008 | 2.89 | 3.80E-05 | 0.95 | 3.05 | 8.10E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.18 | 8.58E-06 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.007 |
| 8 | ULSD1752008 | 2.45 | 3.20E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.13 | 1.00E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| 9 | ULSD152008 | 4.37 | 0.00E+00 | 0.95 | 3.47 | 0.00E+00 | 1.00 | 0.49 | 0.00E+00 | 1.00 | 0.17 | 0.00E+00 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.009 |
| ***Building - Exterior (11/15/2014)*** | | | | | | | | | | | | | | | | | |
| 10 | ULSD1752008 | 2.45 | 3.20E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.13 | 1.00E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| 11 | ULSD1202008 | 2.89 | 3.80E-05 | 0.95 | 3.05 | 8.10E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.18 | 8.58E-06 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.007 |
| ***Building - Interior (1/15/2015)*** | | | | | | | | | | | | | | | | | |
| 12 | ULSD1752008 | 2.45 | 3.20E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.13 | 1.00E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| ***Fine Grading/Landscaping (2/1/2015)*** | | | | | | | | | | | | | | | | | |
| 13 | ULSD502008 | 4.80 | 1.00E-04 | 0.95 | 2.72 | 2.76E-04 | 1.00 | 0.10 | 4.00E-05 | 1.00 | 0.15 | 1.20E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.007 |
| ***Paving (4/1/2015)*** | | | | | | | | | | | | | | | | | |
| 14 | ULSD1202008 | 2.89 | 3.80E-05 | 0.95 | 3.05 | 8.10E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.18 | 8.58E-06 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.007 |
| 15 | ULSD1202008 | 2.89 | 3.80E-05 | 0.95 | 3.05 | 8.10E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.18 | 8.58E-06 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.007 |
| 16 | ULSD502008 | 4.80 | 1.00E-04 | 0.95 | 2.72 | 2.76E-04 | 1.00 | 0.10 | 4.00E-05 | 1.00 | 0.15 | 1.20E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.007 |
| | | | | | | | | | | | | | | | | | |
| ***Demolition (4/1/2015)*** | | | | | | | | | | | | | | | | | |
| 1 | ULSD1752008 | 2.45 | 3.20E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.13 | 1.00E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| 2 | ULSD1752008 | 2.45 | 3.20E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.13 | 1.00E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| ***Mass Grading/ Excavation (4/15/2015)*** | | | | | | | | | | | | | | | | | |
| 3 | ULSD1752008 | 2.45 | 3.20E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.13 | 1.00E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| 4 | ULSD5002008 | 2.45 | 3.18E-05 | 0.95 | 0.92 | 1.82E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.10 | 5.55E-06 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| 5 | ULSD1202008 | 2.89 | 3.80E-05 | 0.95 | 3.05 | 8.10E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.18 | 8.58E-06 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.007 |
| 6 | ULSD1752008 | 2.45 | 3.20E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.13 | 1.00E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| | ULSD1752008 | 2.45 | 3.20E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.13 | 1.00E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| ***Trenching-Utilities (5/1/2015)*** | | | | | | | | | | | | | | | | | |
| 7 | ULSD1202008 | 2.89 | 3.80E-05 | 0.95 | 3.05 | 8.10E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.18 | 8.58E-06 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.007 |
| 8 | ULSD1752008 | 2.45 | 3.20E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.13 | 1.00E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| 9 | ULSD152008 | 4.37 | 0.00E+00 | 0.95 | 3.47 | 0.00E+00 | 1.00 | 0.49 | 0.00E+00 | 1.00 | 0.17 | 0.00E+00 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.009 |
| ***Building - Exterior (5/15/2015)*** | | | | | | | | | | | | | | | | | |
| 10 | ULSD1752008 | 2.45 | 3.20E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.13 | 1.00E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| 11 | ULSD1202008 | 2.89 | 3.80E-05 | 0.95 | 3.05 | 8.10E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.18 | 8.58E-06 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.007 |
| ***Building - Interior ((7/15/2015)*** | | | | | | | | | | | | | | | | | |
| 12 | ULSD1752008 | 2.45 | 3.20E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.13 | 1.00E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| ***Fine Grading/Landscaping 8/1/2015)*** | | | | | | | | | | | | | | | | | |
| 13 | ULSD502008 | 4.80 | 1.00E-04 | 0.95 | 2.72 | 2.76E-04 | 1.00 | 0.10 | 4.00E-05 | 1.00 | 0.15 | 1.20E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.007 |
| ***Paving (10/1/2015)*** | | | | | | | | | | | | | | | | | |
| 14 | ULSD1202008 | 2.89 | 3.80E-05 | 0.95 | 3.05 | 8.10E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.18 | 8.58E-06 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.007 |
| 15 | ULSD1202008 | 2.89 | 3.80E-05 | 0.95 | 3.05 | 8.10E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.18 | 8.58E-06 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.007 |
| 16 | ULSD502008 | 4.80 | 1.00E-04 | 0.95 | 2.72 | 2.76E-04 | 1.00 | 0.10 | 4.00E-05 | 1.00 | 0.15 | 1.20E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.007 |
| | | | | | | | | | | | | | | | | | |
| ***Demolition (10/1/2015)*** | | | | | | | | | | | | | | | | | |
| 1 | ULSD1752008 | 2.45 | 3.20E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.13 | 1.00E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| 2 | ULSD1752008 | 2.45 | 3.20E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.13 | 1.00E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| ***Mass Grading/ Excavation (10/15/2015)*** | | | | | | | | | | | | | | | | | |
| 3 | ULSD1752008 | 2.45 | 3.20E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.13 | 1.00E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| 4 | ULSD5002008 | 2.45 | 3.18E-05 | 0.95 | 0.92 | 1.82E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.10 | 5.55E-06 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| 5 | ULSD1202008 | 2.89 | 3.80E-05 | 0.95 | 3.05 | 8.10E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.18 | 8.58E-06 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.007 |
| 6 | ULSD1752008 | 2.45 | 3.20E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.13 | 1.00E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| | ULSD1752008 | 2.45 | 3.20E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.13 | 1.00E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| ***Trenching-Utilities (11/1/2015)*** | | | | | | | | | | | | | | | | | |
| 7 | ULSD1202008 | 2.89 | 3.80E-05 | 0.95 | 3.05 | 8.10E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.18 | 8.58E-06 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.007 |
| 8 | ULSD1752008 | 2.45 | 3.20E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.13 | 1.00E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| 9 | ULSD152008 | 4.37 | 0.00E+00 | 0.95 | 3.47 | 0.00E+00 | 1.00 | 0.49 | 0.00E+00 | 1.00 | 0.17 | 0.00E+00 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.009 |
| ***Building - Exterior (11/15/2015)*** | | | | | | | | | | | | | | | | | |
| 10 | ULSD1752008 | 2.45 | 3.20E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.13 | 1.00E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| 11 | ULSD1202008 | 2.89 | 3.80E-05 | 0.95 | 3.05 | 8.10E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.18 | 8.58E-06 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.007 |
| ***Building - Interior (1/15/2016)*** | | | | | | | | | | | | | | | | | |
| 12 | ULSD1752008 | 2.45 | 3.20E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.13 | 1.00E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| ***Fine Grading/Landscaping (2/1/2016)*** | | | | | | | | | | | | | | | | | |
| 13 | ULSD502008 | 4.80 | 1.00E-04 | 0.95 | 2.72 | 2.76E-04 | 1.00 | 0.10 | 4.00E-05 | 1.00 | 0.15 | 1.20E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.007 |
| ***Paving (4/1/2016)*** | | | | | | | | | | | | | | | | | |
| 14 | ULSD1202008 | 2.89 | 3.80E-05 | 0.95 | 3.05 | 8.10E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.18 | 8.58E-06 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.007 |
| 15 | ULSD1202008 | 2.89 | 3.80E-05 | 0.95 | 3.05 | 8.10E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.18 | 8.58E-06 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.007 |
| 16 | ULSD502008 | 4.80 | 1.00E-04 | 0.95 | 2.72 | 2.76E-04 | 1.00 | 0.10 | 4.00E-05 | 1.00 | 0.15 | 1.20E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.007 |

Notes: ZH EF = Zero hour emission factor
DR = Deterioration rate
ULSD = Ultra low sulfur diesel (15 ppmw sulfur, 0.0015% sulfur)

Refs: CARB OFFFROAD2007 model (http://www.arb.ca.gov/msei/offroad/offroad.htm), December, 2006.
Stationary/Off-road engines ARB, "California's Emissions Inventory for Off-Road Large Compression-Ignited (CI) Engines (> 25 HP)" MAC#99-32

**Construction Equipment Exhaust Emissions**
**San Sebastian, Morgan Hill - 2016 with 2009 Equipment**

Analysis Year = 2016

| Item No. | Off-Road Equipment Equipment Type | No. Units | Engine Age (years) | Engine Model Year | Daily Hours In Use | Days Per Year | Unit Annual Hours Use | Use Factor | Load Factor | Cumulative Hours Operation Per Unit | Engine (hp) | Level of VDECS Used | Emission Factor (g/hp-hr) NOx | CO | VOC | PM2.5 | SO2 | CO2 | Annual Emissions (lb/yr) NOx | CO | VOC | PM2.5 | SO2 | CO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ***Phase 7 - Construction Activities*** | | | | | | | | | | | | | | | | | | | | | | | | |
| *Demolition (10/1/2015)* | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | Excavators | 0 | 7 | 2009 | 7 | 1 | 7 | 1.00 | 0.38 | 3,822 | 168 | 0 | 2.44 | 2.97 | 0.20 | 0.13 | 0.006 | 568.3 | 0.0 | 0.0 | 0.0 | 0.00 | 0.00 | 0 |
| 2 | Rubber Tired Loaders | 0 | 7 | 2009 | 7 | 1 | 7 | 1.00 | 0.36 | 6,251 | 164 | 0 | 2.51 | 3.15 | 0.26 | 0.15 | 0.006 | 568.3 | 0.0 | 0.0 | 0.0 | 0.00 | 0.00 | 0 |
| *Mass Grading/ Excavation (10/15/2015)* | | | | | | | | | | | | | | | | | | | | | | | | |
| 3 | Excavators | 0 | 7 | 2009 | 7 | 10 | 70 | 1.00 | 0.38 | 3,822 | 168 | 0 | 2.44 | 2.97 | 0.20 | 0.13 | 0.006 | 568.3 | 0.0 | 0.0 | 0.0 | 0.00 | 0.000 | 0 |
| 4 | Scrapers | 0 | 7 | 2009 | 7 | 10 | 70 | 1.00 | 0.48 | 3,171 | 313 | 0 | 2.42 | 0.98 | 0.18 | 0.10 | 0.006 | 568.3 | 0.0 | 0.0 | 0.0 | 0.00 | 0.000 | 0 |
| 5 | Rollers | 0 | 7 | 2009 | 7 | 10 | 70 | 1.00 | 0.38 | 2,093 | 95 | 0 | 2.82 | 3.22 | 0.15 | 0.16 | 0.007 | 568.3 | 0.0 | 0.0 | 0.0 | 0.00 | 0.000 | 0 |
| 6 | Graders | 0 | 7 | 2009 | 7 | 10 | 70 | 1.00 | 0.41 | 4,270 | 174 | 0 | 2.45 | 3.00 | 0.21 | 0.14 | 0.006 | 568.3 | 0.0 | 0.0 | 0.0 | 0.00 | 0.000 | 0 |
| | Rubber Tired Loaders | 0 | 7 | 2009 | 7 | 10 | 70 | 1.00 | 0.36 | 6,251 | 164 | 0 | 2.51 | 3.15 | 0.26 | 0.15 | 0.006 | 568.3 | 0.0 | 0.0 | 0.0 | 0.00 | 0.000 | 0 |
| *Trenching-Utilities (11/1/2015)* | | | | | | | | | | | | | | | | | | | | | | | | |
| 7 | Tractors/Loaders/Backhoes | 0 | 7 | 2009 | 7 | 40 | 280 | 1.00 | 0.37 | 3,584 | 108 | 0 | 2.87 | 3.34 | 0.19 | 0.17 | 0.007 | 568.3 | 0.0 | 0.0 | 0.0 | 0.00 | 0.000 | 0 |
| 8 | Excavators | 0 | 7 | 2009 | 7 | 40 | 280 | 1.00 | 0.38 | 3,822 | 168 | 0 | 2.44 | 2.97 | 0.20 | 0.13 | 0.006 | 568.3 | 0.0 | 0.0 | 0.0 | 0.00 | 0.000 | 0 |
| 9 | Plate Compactors | 0 | 7 | 2009 | 7 | 40 | 280 | 1.00 | 0.29 | 4,200 | 8 | 0 | 4.14 | 3.47 | 0.49 | 0.14 | 0.009 | 568.3 | 0.0 | 0.0 | 0.0 | 0.00 | 0.000 | 0 |
| *Building - Exterior (11/15/2015)* | | | | | | | | | | | | | | | | | | | | | | | | |
| 10 | Forklifts | 0 | 7 | 2009 | 7 | 50 | 350 | 1.00 | 0.20 | 4,830 | 125 | 0 | 2.47 | 3.04 | 0.22 | 0.14 | 0.006 | 568.3 | 0.0 | 0.0 | 0.0 | 0.00 | 0.000 | 0 |
| 11 | Aerial Lifts (electric) | 0 | 7 | 2009 | 7 | 50 | 350 | 1.00 | 0.20 | 1,862 | 60 | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.000 | 0.0 | 0.0 | 0.0 | 0.0 | 0.00 | 0.000 | 0 |
| *Building - Interior (1/15/2016)* | | | | | | | | | | | | | | | | | | | | | | | | |
| 12 | Forklifts | 1 | 7 | 2009 | 7 | 50 | 350 | 1.00 | 0.20 | 4,830 | 125 | 0 | 2.47 | 3.04 | 0.22 | 0.14 | 0.006 | 568.3 | 47.6 | 58.7 | 4.3 | 2.73 | 0.123 | 10963 |
| *Fine Grading/Landscaping (2/1/2016)* | | | | | | | | | | | | | | | | | | | | | | | | |
| 13 | Skid Steer Loaders | 1 | 7 | 2009 | 7 | 25 | 175 | 1.00 | 0.37 | 2,079 | 44 | 0 | 4.75 | 3.29 | 0.18 | 0.14 | 0.007 | 568.3 | 29.6 | 20.5 | 1.1 | 0.86 | 0.046 | 3537 |
| *Paving (4/1/2016)* | | | | | | | | | | | | | | | | | | | | | | | | |
| 14 | Paving Equipment | 1 | 7 | 2009 | 7 | 2 | 14 | 1.00 | 0.36 | 2,800 | 104 | 0 | 2.84 | 3.28 | 0.17 | 0.17 | 0.007 | 568.3 | 3.3 | 3.8 | 0.2 | 0.19 | 0.008 | 657 |
| 15 | Rollers | 2 | 7 | 2009 | 7 | 2 | 14 | 1.00 | 0.38 | 2,093 | 95 | 0 | 2.82 | 3.22 | 0.15 | 0.16 | 0.007 | 568.3 | 6.3 | 7.2 | 0.3 | 0.36 | 0.015 | 1266 |
| 16 | Tractors/Loaders/Backhoes | 1 | 7 | 2009 | 7 | 2 | 14 | 1.00 | 0.37 | 3,584 | 44 | 0 | 4.89 | 3.71 | 0.24 | 0.15 | 0.007 | 568.3 | 2.4 | 1.8 | 0.1 | 0.08 | 0.004 | 283 |
| ***Phase 8 - Construction Activities*** | | | | | | | | | | | | | | | | | | | | | | | | |
| *Demolition (4/1/2016)* | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | Excavators | 1 | 7 | 2009 | 7 | 1 | 7 | 1.00 | 0.38 | 3,822 | 168 | 0 | 2.44 | 2.97 | 0.20 | 0.13 | 0.006 | 568.3 | 2.4 | 2.9 | 0.2 | 0.13 | 0.01 | 560 |
| 2 | Rubber Tired Loaders | 1 | 7 | 2009 | 7 | 1 | 7 | 1.00 | 0.36 | 6,251 | 164 | 0 | 2.51 | 3.15 | 0.26 | 0.15 | 0.006 | 568.3 | 2.3 | 2.9 | 0.2 | 0.14 | 0.01 | 518 |
| *Mass Grading/ Excavation (4/15/2016)* | | | | | | | | | | | | | | | | | | | | | | | | |
| 3 | Excavators | 1 | 7 | 2009 | 7 | 10 | 70 | 1.00 | 0.38 | 3,822 | 168 | 0 | 2.44 | 2.97 | 0.20 | 0.13 | 0.006 | 568.3 | 24.0 | 29.3 | 1.9 | 1.32 | 0.063 | 5599 |
| 4 | Scrapers | 2 | 7 | 2009 | 7 | 10 | 70 | 1.00 | 0.48 | 3,171 | 313 | 0 | 2.42 | 0.98 | 0.18 | 0.10 | 0.006 | 568.3 | 112.1 | 45.3 | 8.3 | 4.41 | 0.259 | 26353 |
| 5 | Rollers | 1 | 7 | 2009 | 7 | 10 | 70 | 1.00 | 0.38 | 2,093 | 95 | 0 | 2.82 | 3.22 | 0.15 | 0.16 | 0.007 | 568.3 | 15.7 | 17.9 | 0.8 | 0.90 | 0.037 | 3166 |
| 6 | Graders | 1 | 7 | 2009 | 7 | 10 | 70 | 1.00 | 0.41 | 4,270 | 174 | 0 | 2.45 | 3.00 | 0.21 | 0.14 | 0.006 | 568.3 | 26.8 | 32.8 | 2.3 | 1.50 | 0.070 | 6206 |
| | Rubber Tired Loaders | 1 | 7 | 2009 | 7 | 10 | 70 | 1.00 | 0.36 | 6,251 | 164 | 0 | 2.51 | 3.15 | 0.26 | 0.15 | 0.006 | 568.3 | 22.9 | 28.7 | 2.3 | 1.39 | 0.058 | 5178 |
| *Trenching-Utilities (5/1/2016)* | | | | | | | | | | | | | | | | | | | | | | | | |
| 7 | Tractors/Loaders/Backhoes | 1 | 7 | 2009 | 7 | 40 | 280 | 1.00 | 0.37 | 3,584 | 108 | 0 | 2.87 | 3.34 | 0.19 | 0.17 | 0.007 | 568.3 | 70.1 | 81.7 | 4.6 | 4.20 | 0.163 | 13892 |
| 8 | Excavators | 1 | 7 | 2009 | 7 | 40 | 280 | 1.00 | 0.38 | 3,822 | 168 | 0 | 2.44 | 2.97 | 0.20 | 0.13 | 0.006 | 568.3 | 96.1 | 117.2 | 7.7 | 5.27 | 0.252 | 22396 |
| 9 | Plate Compactors | 1 | 7 | 2009 | 7 | 40 | 280 | 1.00 | 0.29 | 4,200 | 8 | 0 | 4.14 | 3.47 | 0.49 | 0.14 | 0.009 | 568.3 | 5.9 | 4.9 | 0.7 | 0.20 | 0.013 | 805 |
| *Building - Exterior (5/15/2016)* | | | | | | | | | | | | | | | | | | | | | | | | |
| 10 | Forklifts | 2 | 7 | 2009 | 7 | 50 | 350 | 1.00 | 0.20 | 4,830 | 125 | 0 | 2.47 | 3.04 | 0.22 | 0.14 | 0.006 | 568.3 | 95.3 | 117.5 | 8.5 | 5.47 | 0.247 | 21926 |
| 11 | Aerial Lifts (electric) | 1 | 7 | 2009 | 7 | 50 | 350 | 1.00 | 0.20 | 1,862 | 60 | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.000 | 0.0 | 0.0 | 0.0 | 0.0 | 0.00 | 0.000 | 0 |
| *Building - Interior ((7/15/2016)* | | | | | | | | | | | | | | | | | | | | | | | | |
| 12 | Forklifts | 1 | 7 | 2009 | 7 | 50 | 350 | 1.00 | 0.20 | 4,830 | 125 | 0 | 2.47 | 3.04 | 0.22 | 0.14 | 0.006 | 568.3 | 47.6 | 58.7 | 4.3 | 2.73 | 0.123 | 10963 |
| *Fine Grading/Landscaping 8/1/2016)* | | | | | | | | | | | | | | | | | | | | | | | | |
| 13 | Skid Steer Loaders | 1 | 7 | 2009 | 7 | 25 | 175 | 1.00 | 0.37 | 2,079 | 44 | 0 | 4.75 | 3.29 | 0.18 | 0.14 | 0.007 | 568.3 | 29.6 | 20.5 | 1.1 | 0.86 | 0.046 | 3537 |
| *Paving (10/1/2016)* | | | | | | | | | | | | | | | | | | | | | | | | |
| 14 | Paving Equipment | 1 | 7 | 2009 | 7 | 2 | 14 | 1.00 | 0.36 | 2,800 | 104 | 0 | 2.84 | 3.28 | 0.17 | 0.17 | 0.007 | 568.3 | 3.3 | 3.8 | 0.2 | 0.19 | 0.008 | 657 |
| 15 | Rollers | 2 | 7 | 2009 | 7 | 2 | 14 | 1.00 | 0.37 | 2,093 | 85 | 0 | 2.82 | 3.22 | 0.15 | 0.16 | 0.007 | 568.3 | 5.5 | 6.3 | 0.3 | 0.32 | 0.013 | 1113 |
| 16 | Tractors/Loaders/Backhoes | 1 | 7 | 2009 | 7 | 2 | 14 | 1.00 | 0.37 | 3,584 | 44 | 0 | 4.89 | 3.71 | 0.24 | 0.15 | 0.007 | 568.3 | 2.4 | 1.8 | 0.1 | 0.08 | 0.004 | 283 |
| ***Phase 9 - Construction Activities*** | | | | | | | | | | | | | | | | | | | | | | | | |
| *Demolition (10/1/2016)* | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | Excavators | 1 | 7 | 2009 | 7 | 1 | 7 | 1.00 | 0.38 | 3,822 | 168 | 0 | 2.44 | 2.97 | 0.20 | 0.13 | 0.006 | 568.3 | 2.4 | 2.9 | 0.2 | 0.13 | 0.01 | 560 |
| 2 | Rubber Tired Loaders | 1 | 7 | 2009 | 7 | 1 | 7 | 1.00 | 0.36 | 6,251 | 164 | 0 | 2.51 | 3.15 | 0.26 | 0.15 | 0.006 | 568.3 | 2.3 | 2.9 | 0.2 | 0.14 | 0.01 | 518 |
| *Mass Grading/ Excavation (10/15/2016)* | | | | | | | | | | | | | | | | | | | | | | | | |
| 3 | Excavators | 1 | 7 | 2009 | 7 | 10 | 70 | 1.00 | 0.38 | 3,822 | 168 | 0 | 2.44 | 2.97 | 0.20 | 0.13 | 0.006 | 568.3 | 24.0 | 29.3 | 1.9 | 1.32 | 0.063 | 5599 |
| 4 | Scrapers | 2 | 7 | 2009 | 7 | 10 | 70 | 1.00 | 0.48 | 3,171 | 313 | 0 | 2.42 | 0.98 | 0.18 | 0.10 | 0.006 | 568.3 | 112.1 | 45.3 | 8.3 | 4.41 | 0.259 | 26353 |
| 5 | Rollers | 1 | 7 | 2009 | 7 | 10 | 70 | 1.00 | 0.38 | 2,093 | 95 | 0 | 2.82 | 3.22 | 0.15 | 0.16 | 0.007 | 568.3 | 15.7 | 17.9 | 0.8 | 0.90 | 0.037 | 3166 |
| 6 | Graders | 1 | 7 | 2009 | 7 | 10 | 70 | 1.00 | 0.41 | 4,270 | 174 | 0 | 2.45 | 3.00 | 0.21 | 0.14 | 0.006 | 568.3 | 26.8 | 32.8 | 2.3 | 1.50 | 0.070 | 6206 |
| | Rubber Tired Loaders | 1 | 7 | 2009 | 7 | 10 | 70 | 1.00 | 0.36 | 6,251 | 164 | 0 | 2.51 | 3.15 | 0.26 | 0.15 | 0.006 | 568.3 | 22.9 | 28.7 | 2.3 | 1.39 | 0.058 | 5178 |
| *Trenching-Utilities (11/1/2016)* | | | | | | | | | | | | | | | | | | | | | | | | |
| 7 | Tractors/Loaders/Backhoes | 1 | 7 | 2009 | 7 | 35 | 245 | 1.00 | 0.37 | 3,584 | 108 | 0 | 2.87 | 3.34 | 0.19 | 0.17 | 0.007 | 568.3 | 61.4 | 71.4 | 4.1 | 3.67 | 0.143 | 12156 |
| 8 | Excavators | 1 | 7 | 2009 | 7 | 35 | 245 | 1.00 | 0.38 | 3,822 | 168 | 0 | 2.44 | 2.97 | 0.20 | 0.13 | 0.006 | 568.3 | 84.1 | 102.5 | 6.7 | 4.61 | 0.221 | 19596 |
| 9 | Plate Compactors | 1 | 7 | 2009 | 7 | 35 | 245 | 1.00 | 0.29 | 4,200 | 8 | 0 | 4.14 | 3.47 | 0.49 | 0.14 | 0.009 | 568.3 | 5.1 | 4.3 | 0.6 | 0.17 | 0.011 | 704 |
| *Building - Exterior (11/15/2016)* | | | | | | | | | | | | | | | | | | | | | | | | |
| 10 | Forklifts | 2 | 7 | 2009 | 7 | 50 | 350 | 1.00 | 0.20 | 4,830 | 125 | 0 | 2.47 | 3.04 | 0.22 | 0.14 | 0.006 | 568.3 | 95.3 | 117.5 | 8.5 | 5.47 | 0.247 | 21926 |
| 11 | Aerial Lifts (electric) | 1 | 7 | 2009 | 7 | 50 | 350 | 1.00 | 0.20 | 1,862 | 60 | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.000 | 0.0 | 0.0 | 0.0 | 0.0 | 0.00 | 0.000 | 0 |
| *Building - Interior (1/15/2017)* | | | | | | | | | | | | | | | | | | | | | | | | |
| 12 | Forklifts | 0 | 7 | 2009 | 7 | 50 | 350 | 1.00 | 0.20 | 4,830 | 125 | 0 | 2.47 | 3.04 | 0.22 | 0.14 | 0.006 | 568.3 | 0.0 | 0.0 | 0.0 | 0.00 | 0.000 | 0 |
| *Fine Grading/Landscaping (2/1/2017)* | | | | | | | | | | | | | | | | | | | | | | | | |
| 13 | Skid Steer Loaders | 0 | 7 | 2009 | 7 | 25 | 175 | 1.00 | 0.37 | 2,079 | 44 | 0 | 4.75 | 3.29 | 0.18 | 0.14 | 0.007 | 568.3 | 0.0 | 0.0 | 0.0 | 0.00 | 0.000 | 0 |
| *Paving (4/1/2017)* | | | | | | | | | | | | | | | | | | | | | | | | |
| 14 | Paving Equipment | 0 | 7 | 2009 | 7 | 2 | 14 | 1.00 | 0.36 | 2,800 | 104 | 0 | 2.84 | 3.28 | 0.17 | 0.17 | 0.007 | 568.3 | 0.0 | 0.0 | 0.0 | 0.00 | 0.000 | 0 |
| 15 | Rollers | 0 | 7 | 2009 | 7 | 2 | 14 | 1.00 | 0.37 | 2,093 | 85 | 0 | 2.82 | 3.22 | 0.15 | 0.16 | 0.007 | 568.3 | 0.0 | 0.0 | 0.0 | 0.00 | 0.000 | 0 |
| 16 | Tractors/Loaders/Backhoes | 0 | 7 | 2009 | 7 | 2 | 14 | 1.00 | 0.37 | 3,584 | 44 | 0 | 4.89 | 3.71 | 0.24 | 0.15 | 0.007 | 568.3 | 0.0 | 0.0 | 0.0 | 0.00 | 0.000 | 0 |
| | **Total Off-Road Equipment** | | | | | | | | | | | | | | | | | | | | | **57.02** | | |
| | *On-Site On-Road Vehicles* | No. Trucks | | | Hours/ Day | Days/ Year | Annual Hours per Truck | | Onsite Travel Miles | | | | | | | PM2.5 (g/mi) | | | NOx | CO | VOC | PM2.5 | SO2 | CO2 |
| *Mass Grading/ Excavation* | | | | | | | | | | | | | | | | | | | | | | | | |
| | Water Truck - Phase 8 | 1 | - | - | 2 | 10 | 20 | - | 200.0 | | - | - | | | | 0.1252 | | | | | | 0.06 | | |
| | Water Truck - Phase 9 | 1 | - | - | 2 | 10 | 20 | - | 200.0 | | - | - | | | | 0.1252 | | | | | | 0.06 | | |
| *Fine Grading/Landscaping* | | | | | | | | | | | | | | | | | | | | | | | | |
| | Water Truck Phases 7 | 1 | - | - | 2 | 25 | 50 | - | 500.0 | | - | - | | | | 0.1252 | | | | | | 0.14 | | |
| | Water Truck Phases 8 | 1 | - | - | 2 | 25 | 50 | - | 500.0 | | - | - | | | | 0.1252 | | | | | | 0.14 | | |
| | **Total On-Road Vehicles** | | | | | | | | | | | | | | | | | | | | | **0.39** | | |
| **TOTAL On-Site - On and Off Roa** | | - | | | - | - | | - | - | - | - | | - | - | - | - | | | | | | **57.4** | | |

Notes: Cumulative hours operation based on statewide averages
Onsite truck travel speed of 10 mph

**0.0287 tons/year**

| Emission Factors - Off-Road Compression Ignited Engines | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | NOx | | | CO | | | ROG | | | PM2.5 | | | CO2 | | | SO2 |
| Item No. | EF ID | ZH EF (g/hp-hr) | DR (g/hp-hr$^2$) | Fuel CF | ZH EF (g/hp-hr) | DR (g/hp-hr$^2$) | Fuel CF | ZH EF (g/hp-hr) | DR (g/hp-hr$^2$) | Fuel CF | ZH EF (g/hp-hr) | DR (g/hp-hr$^2$) | Fuel CF | ZH EF (g/hp-hr) | DR (g/hp-hr$^2$) | Fuel CF | (g/hp-hr) |
| *Demolition (10/1/2015)* | | | | | | | | | | | | | | | | | |
| 1 | ULSD1752009 | 2.45 | 3.20E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.13 | 1.00E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| 2 | ULSD1752009 | 2.45 | 3.20E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.13 | 1.00E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| *Mass Grading/ Excavation (10/15/2015)* | | | | | | | | | | | | | | | | | |
| 3 | ULSD1752009 | 2.45 | 3.20E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.13 | 1.00E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| 4 | ULSD5002009 | 2.45 | 3.18E-05 | 0.95 | 0.92 | 1.82E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.10 | 5.55E-06 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| 5 | ULSD1202009 | 2.89 | 3.80E-05 | 0.95 | 3.05 | 8.10E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.18 | 8.58E-06 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.007 |
| 6 | ULSD1752009 | 2.45 | 3.20E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.13 | 1.00E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| | ULSD1752009 | 2.45 | 3.20E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.13 | 1.00E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.006 |

| | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ***Trenching-Utilities (11/1/2015)*** | | | | | | | | | | | | | | | | | |
| 7 | ULSD1202009 | 2.89 | 3.80E-05 | 0.95 | 3.05 | 8.10E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.18 | 8.58E-06 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.007 |
| 8 | ULSD1752009 | 2.45 | 3.20E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.13 | 1.00E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| 9 | ULSD152009 | 4.37 | 0.00E+00 | 0.95 | 3.47 | 0.00E+00 | 1.00 | 0.49 | 0.00E+00 | 1.00 | 0.17 | 0.00E+00 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.009 |
| ***Building - Exterior (11/15/2015)*** | | | | | | | | | | | | | | | | | |
| 10 | ULSD1752009 | 2.45 | 3.20E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.13 | 1.00E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| 11 | ULSD1202009 | 2.89 | 3.80E-05 | 0.95 | 3.05 | 8.10E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.18 | 8.58E-06 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.007 |
| ***Building - Interior (1/15/2016)*** | | | | | | | | | | | | | | | | | |
| 12 | ULSD1752009 | 2.45 | 3.20E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.13 | 1.00E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| ***Fine Grading/Landscaping (2/1/2016)*** | | | | | | | | | | | | | | | | | |
| 13 | ULSD502009 | 4.80 | 1.00E-04 | 0.95 | 2.72 | 2.76E-04 | 1.00 | 0.10 | 4.00E-05 | 1.00 | 0.15 | 1.20E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.007 |
| ***Paving (4/1/2016)*** | | | | | | | | | | | | | | | | | |
| 14 | ULSD1202009 | 2.89 | 3.80E-05 | 0.95 | 3.05 | 8.10E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.18 | 8.58E-06 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.007 |
| 15 | ULSD1202009 | 2.89 | 3.80E-05 | 0.95 | 3.05 | 8.10E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.18 | 8.58E-06 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.007 |
| 16 | ULSD502009 | 4.80 | 1.00E-04 | 0.95 | 2.72 | 2.76E-04 | 1.00 | 0.10 | 4.00E-05 | 1.00 | 0.15 | 1.20E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.007 |
| ***Demolition (4/1/2016)*** | | | | | | | | | | | | | | | | | |
| 1 | ULSD1752009 | 2.45 | 3.20E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.13 | 1.00E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| 2 | ULSD1752009 | 2.45 | 3.20E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.13 | 1.00E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| ***Mass Grading/ Excavation (4/15/2016)*** | | | | | | | | | | | | | | | | | |
| 3 | ULSD1752009 | 2.45 | 3.20E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.13 | 1.00E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| 4 | ULSD5002009 | 2.45 | 3.18E-05 | 0.95 | 0.92 | 1.82E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.10 | 5.55E-06 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| 5 | ULSD1202009 | 2.89 | 3.80E-05 | 0.95 | 3.05 | 8.10E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.18 | 8.58E-06 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.007 |
| 6 | ULSD1752009 | 2.45 | 3.20E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.13 | 1.00E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| | ULSD1752009 | 2.45 | 3.20E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.13 | 1.00E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| ***Trenching-Utilities (5/1/2016)*** | | | | | | | | | | | | | | | | | |
| 7 | ULSD1202009 | 2.89 | 3.80E-05 | 0.95 | 3.05 | 8.10E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.18 | 8.58E-06 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.007 |
| 8 | ULSD1752009 | 2.45 | 3.20E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.13 | 1.00E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| 9 | ULSD152009 | 4.37 | 0.00E+00 | 0.95 | 3.47 | 0.00E+00 | 1.00 | 0.49 | 0.00E+00 | 1.00 | 0.17 | 0.00E+00 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.009 |
| ***Building - Exterior (5/15/2016)*** | | | | | | | | | | | | | | | | | |
| 10 | ULSD1752009 | 2.45 | 3.20E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.13 | 1.00E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| 11 | ULSD1202009 | 2.89 | 3.80E-05 | 0.95 | 3.05 | 8.10E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.18 | 8.58E-06 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.007 |
| ***Building - Interior ((7/15/2016)*** | | | | | | | | | | | | | | | | | |
| 12 | ULSD1752009 | 2.45 | 3.20E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.13 | 1.00E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| ***Fine Grading/Landscaping 8/1/2016)*** | | | | | | | | | | | | | | | | | |
| 13 | ULSD502009 | 4.80 | 1.00E-04 | 0.95 | 2.72 | 2.76E-04 | 1.00 | 0.10 | 4.00E-05 | 1.00 | 0.15 | 1.20E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.007 |
| ***Paving (10/1/2016)*** | | | | | | | | | | | | | | | | | |
| 14 | ULSD1202009 | 2.89 | 3.80E-05 | 0.95 | 3.05 | 8.10E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.18 | 8.58E-06 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.007 |
| 15 | ULSD1202009 | 2.89 | 3.80E-05 | 0.95 | 3.05 | 8.10E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.18 | 8.58E-06 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.007 |
| 16 | ULSD502009 | 4.80 | 1.00E-04 | 0.95 | 2.72 | 2.76E-04 | 1.00 | 0.10 | 4.00E-05 | 1.00 | 0.15 | 1.20E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.007 |
| ***Demolition (10/1/2016)*** | | | | | | | | | | | | | | | | | |
| 1 | ULSD1752009 | 2.45 | 3.20E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.13 | 1.00E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| 2 | ULSD1752009 | 2.45 | 3.20E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.13 | 1.00E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| ***Mass Grading/ Excavation (10/15/2016)*** | | | | | | | | | | | | | | | | | |
| 3 | ULSD1752009 | 2.45 | 3.20E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.13 | 1.00E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| 4 | ULSD5002009 | 2.45 | 3.18E-05 | 0.95 | 0.92 | 1.82E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.10 | 5.55E-06 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| 5 | ULSD1202009 | 2.89 | 3.80E-05 | 0.95 | 3.05 | 8.10E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.18 | 8.58E-06 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.007 |
| 6 | ULSD1752009 | 2.45 | 3.20E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.13 | 1.00E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| | ULSD1752009 | 2.45 | 3.20E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.13 | 1.00E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| ***Trenching-Utilities (11/1/2016)*** | | | | | | | | | | | | | | | | | |
| 7 | ULSD1202009 | 2.89 | 3.80E-05 | 0.95 | 3.05 | 8.10E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.18 | 8.58E-06 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.007 |
| 8 | ULSD1752009 | 2.45 | 3.20E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.13 | 1.00E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| 9 | ULSD152009 | 4.37 | 0.00E+00 | 0.95 | 3.47 | 0.00E+00 | 1.00 | 0.49 | 0.00E+00 | 1.00 | 0.17 | 0.00E+00 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.009 |
| ***Building - Exterior (11/15/2016)*** | | | | | | | | | | | | | | | | | |
| 10 | ULSD1752009 | 2.45 | 3.20E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.13 | 1.00E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| 11 | ULSD1202009 | 2.89 | 3.80E-05 | 0.95 | 3.05 | 8.10E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.18 | 8.58E-06 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.007 |
| ***Building - Interior (1/15/2017)*** | | | | | | | | | | | | | | | | | |
| 12 | ULSD1752009 | 2.45 | 3.20E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.13 | 1.00E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| ***Fine Grading/Landscaping (2/1/2017)*** | | | | | | | | | | | | | | | | | |
| 13 | ULSD502009 | 4.80 | 1.00E-04 | 0.95 | 2.72 | 2.76E-04 | 1.00 | 0.10 | 4.00E-05 | 1.00 | 0.15 | 1.20E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.007 |
| ***Paving (4/1/2017)*** | | | | | | | | | | | | | | | | | |
| 14 | ULSD1202009 | 2.89 | 3.80E-05 | 0.95 | 3.05 | 8.10E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.18 | 8.58E-06 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.007 |
| 15 | ULSD1202009 | 2.89 | 3.80E-05 | 0.95 | 3.05 | 8.10E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.18 | 8.58E-06 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.007 |
| 16 | ULSD502009 | 4.80 | 1.00E-04 | 0.95 | 2.72 | 2.76E-04 | 1.00 | 0.10 | 4.00E-05 | 1.00 | 0.15 | 1.20E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.007 |

Notes: ZH EF = Zero hour emission factor
DR = Deterioration rate
ULSD = Ultra low sulfur diesel (15 ppmw sulfur, 0.0015% sulfur)

Refs: CARB OFFFROAD2007 model (http://www.arb.ca.gov/msei/offroad/offroad.htm), December, 2006.
Stationary/Off-road engines ARB, "California's Emissions Inventory for Off-Road Large Compression-Ignited (CI) Engines (> 25 HP)" MAC#99-32

**Construction Equipment Exhaust Emissions**
**San Sebastian, Morgan Hill - 2017 with 2010 Equipment**

Analysis Year = 2017

| Item No. | Off-Road Equipment / Equipment Type | No. Units | Engine Age (years) | Engine Model Year | Daily Hours In Use | Days Per Year | Unit Annual Hours Use | Use Factor | Load Factor | Cumulative Hours Operation Per Unit | Engine (hp) | Level of VDECS Used | Emission Factor (g/hp-hr) NOx | CO | VOC | PM2.5 | SO2 | CO2 | Annual Emissions (lb/yr) NOx | CO | VOC | PM2.5 | SO2 | CO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ***Phase 9 - Construction Activities*** | | | | | | | | | | | | | | | | | | | | | | | | |
| ***Demolition (10/1/2016)*** | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | Excavators | 0 | 7 | 2010 | 7 | 1 | 7 | 1.00 | 0.38 | 3,822 | 168 | 0 | 2.44 | 2.97 | 0.20 | 0.13 | 0.006 | 568.3 | 0.0 | 0.0 | 0.0 | 0.00 | 0.00 | 0 |
| 2 | Rubber Tired Loaders | 0 | 7 | 2010 | 7 | 1 | 7 | 1.00 | 0.36 | 6,251 | 164 | 0 | 2.51 | 3.15 | 0.26 | 0.15 | 0.006 | 568.3 | 0.0 | 0.0 | 0.0 | 0.00 | 0.00 | 0 |
| ***Mass Grading/ Excavation (10/15/2016)*** | | | | | | | | | | | | | | | | | | | | | | | | |
| 3 | Excavators | 0 | 7 | 2010 | 7 | 10 | 70 | 1.00 | 0.38 | 3,822 | 168 | 0 | 2.44 | 2.97 | 0.20 | 0.13 | 0.006 | 568.3 | 0.0 | 0.0 | 0.0 | 0.00 | 0.000 | 0 |
| 4 | Scrapers | 0 | 7 | 2010 | 7 | 10 | 70 | 1.00 | 0.48 | 3,171 | 313 | 0 | 2.42 | 0.98 | 0.18 | 0.10 | 0.006 | 568.3 | 0.0 | 0.0 | 0.0 | 0.00 | 0.000 | 0 |
| 5 | Rollers | 0 | 7 | 2010 | 7 | 10 | 70 | 1.00 | 0.38 | 2,093 | 95 | 0 | 2.82 | 3.22 | 0.15 | 0.16 | 0.007 | 568.3 | 0.0 | 0.0 | 0.0 | 0.00 | 0.000 | 0 |
| 6 | Graders | 0 | 7 | 2010 | 7 | 10 | 70 | 1.00 | 0.41 | 4,270 | 174 | 0 | 2.45 | 3.00 | 0.21 | 0.14 | 0.006 | 568.3 | 0.0 | 0.0 | 0.0 | 0.00 | 0.000 | 0 |
| | Rubber Tired Loaders | 0 | 7 | 2010 | 7 | 10 | 70 | 1.00 | 0.36 | 6,251 | 164 | 0 | 2.51 | 3.15 | 0.26 | 0.15 | 0.006 | 568.3 | 0.0 | 0.0 | 0.0 | 0.00 | 0.000 | 0 |
| ***Trenching-Utilities (11/1/2016)*** | | | | | | | | | | | | | | | | | | | | | | | | |
| 7 | Tractors/Loaders/Backhoes | 0 | 7 | 2010 | 7 | 35 | 245 | 1.00 | 0.37 | 3,584 | 108 | 0 | 2.87 | 3.34 | 0.19 | 0.17 | 0.007 | 568.3 | 0.0 | 0.0 | 0.0 | 0.00 | 0.000 | 0 |
| 8 | Excavators | 0 | 7 | 2010 | 7 | 35 | 245 | 1.00 | 0.38 | 3,822 | 168 | 0 | 2.44 | 2.97 | 0.20 | 0.13 | 0.006 | 568.3 | 0.0 | 0.0 | 0.0 | 0.00 | 0.000 | 0 |
| 9 | Plate Compactors | 0 | 7 | 2010 | 7 | 35 | 245 | 1.00 | 0.29 | 4,200 | 8 | 0 | 4.14 | 3.47 | 0.49 | 0.14 | 0.009 | 568.3 | 0.0 | 0.0 | 0.0 | 0.00 | 0.000 | 0 |
| ***Building - Exterior (11/15/2016)*** | | | | | | | | | | | | | | | | | | | | | | | | |
| 10 | Forklifts | 0 | 7 | 2010 | 7 | 50 | 350 | 1.00 | 0.20 | 4,830 | 125 | 0 | 2.47 | 3.04 | 0.22 | 0.14 | 0.006 | 568.3 | 0.0 | 0.0 | 0.0 | 0.00 | 0.000 | 0 |
| 11 | Aerial Lifts (electric) | 0 | 7 | 2010 | 7 | 50 | 350 | 1.00 | 0.20 | 1,862 | 60 | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.000 | 0.0 | 0.0 | 0.0 | 0.0 | 0.00 | 0.000 | 0 |
| ***Building - Interior (1/15/2017)*** | | | | | | | | | | | | | | | | | | | | | | | | |
| 12 | Forklifts | 1 | 7 | 2010 | 7 | 50 | 350 | 1.00 | 0.20 | 4,830 | 125 | 0 | 2.47 | 3.04 | 0.22 | 0.14 | 0.006 | 568.3 | 47.6 | 58.7 | 4.3 | 2.73 | 0.123 | 10963 |
| ***Fine Grading/Landscaping (2/1/2017)*** | | | | | | | | | | | | | | | | | | | | | | | | |
| 13 | Skid Steer Loaders | 1 | 7 | 2010 | 7 | 25 | 175 | 1.00 | 0.37 | 2,079 | 44 | 0 | 4.75 | 3.29 | 0.18 | 0.14 | 0.007 | 568.3 | 29.6 | 20.5 | 1.1 | 0.86 | 0.046 | 3537 |
| ***Paving (4/1/2017)*** | | | | | | | | | | | | | | | | | | | | | | | | |
| 14 | Paving Equipment | 1 | 7 | 2010 | 7 | 2 | 14 | 1.00 | 0.36 | 2,800 | 104 | 0 | 2.84 | 3.28 | 0.17 | 0.17 | 0.007 | 568.3 | 3.3 | 3.8 | 0.2 | 0.19 | 0.008 | 657 |
| 15 | Rollers | 2 | 7 | 2010 | 7 | 2 | 14 | 1.00 | 0.38 | 2,093 | 95 | 0 | 2.82 | 3.22 | 0.15 | 0.16 | 0.007 | 568.3 | 6.3 | 7.2 | 0.3 | 0.36 | 0.015 | 1266 |
| 16 | Tractors/Loaders/Backhoes | 1 | 7 | 2010 | 7 | 2 | 14 | 1.00 | 0.37 | 3,584 | 44 | 0 | 4.89 | 3.71 | 0.24 | 0.15 | 0.007 | 568.3 | 2.4 | 1.8 | 0.1 | 0.08 | 0.004 | 283 |
| ***Phase 10 - Construction Activities*** | | | | | | | | | | | | | | | | | | | | | | | | |
| ***Demolition (4/1/2017)*** | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | Excavators | 1 | 7 | 2010 | 7 | 1 | 7 | 1.00 | 0.38 | 3,822 | 168 | 0 | 2.44 | 2.97 | 0.20 | 0.13 | 0.006 | 568.3 | 2.4 | 2.9 | 0.2 | 0.13 | 0.01 | 560 |
| 2 | Rubber Tired Loaders | 1 | 7 | 2010 | 7 | 1 | 7 | 1.00 | 0.36 | 6,251 | 164 | 0 | 2.51 | 3.15 | 0.26 | 0.15 | 0.006 | 568.3 | 2.3 | 2.9 | 0.2 | 0.14 | 0.01 | 518 |
| ***Mass Grading/ Excavation (4/15/2017)*** | | | | | | | | | | | | | | | | | | | | | | | | |
| 3 | Excavators | 1 | 7 | 2010 | 7 | 25 | 175 | 1.00 | 0.38 | 3,822 | 168 | 0 | 2.44 | 2.97 | 0.20 | 0.13 | 0.006 | 568.3 | 60.1 | 73.2 | 4.8 | 3.29 | 0.158 | 13997 |
| 4 | Scrapers | 2 | 7 | 2010 | 7 | 25 | 175 | 1.00 | 0.48 | 3,171 | 313 | 0 | 2.42 | 0.98 | 0.18 | 0.10 | 0.006 | 568.3 | 280.3 | 113.3 | 20.8 | 11.02 | 0.647 | 65882 |
| 5 | Rollers | 1 | 7 | 2010 | 7 | 25 | 175 | 1.00 | 0.38 | 2,093 | 95 | 0 | 2.82 | 3.22 | 0.15 | 0.16 | 0.007 | 568.3 | 39.2 | 44.8 | 2.1 | 2.25 | 0.093 | 7915 |
| 6 | Graders | 1 | 7 | 2010 | 7 | 25 | 175 | 1.00 | 0.41 | 4,270 | 174 | 0 | 2.45 | 3.00 | 0.21 | 0.14 | 0.006 | 568.3 | 66.9 | 82.0 | 5.6 | 3.75 | 0.175 | 15515 |
| | Rubber Tired Loaders | 1 | 7 | 2010 | 7 | 25 | 175 | 1.00 | 0.36 | 6,251 | 164 | 0 | 2.51 | 3.15 | 0.26 | 0.15 | 0.006 | 568.3 | 57.2 | 71.7 | 5.8 | 3.49 | 0.146 | 12945 |
| ***Trenching-Utilities (5/1/2017)*** | | | | | | | | | | | | | | | | | | | | | | | | |
| 7 | Tractors/Loaders/Backhoes | 1 | 7 | 2010 | 7 | 30 | 210 | 1.00 | 0.37 | 3,584 | 108 | 0 | 2.87 | 3.34 | 0.19 | 0.17 | 0.007 | 568.3 | 52.6 | 61.2 | 3.5 | 3.15 | 0.122 | 10419 |
| 8 | Excavators | 1 | 7 | 2010 | 7 | 30 | 210 | 1.00 | 0.38 | 3,822 | 168 | 0 | 2.44 | 2.97 | 0.20 | 0.13 | 0.006 | 568.3 | 72.1 | 87.9 | 5.8 | 3.95 | 0.189 | 16797 |
| 9 | Plate Compactors | 1 | 7 | 2010 | 7 | 30 | 210 | 1.00 | 0.29 | 4,200 | 8 | 0 | 4.14 | 3.47 | 0.49 | 0.14 | 0.009 | 568.3 | 4.4 | 3.7 | 0.5 | 0.15 | 0.009 | 603 |
| ***Building - Exterior (5/15/2017)*** | | | | | | | | | | | | | | | | | | | | | | | | |
| 10 | Forklifts | 2 | 7 | 2010 | 7 | 50 | 350 | 1.00 | 0.20 | 4,830 | 125 | 0 | 2.47 | 3.04 | 0.22 | 0.14 | 0.006 | 568.3 | 95.3 | 117.5 | 8.5 | 5.47 | 0.247 | 21926 |
| 11 | Aerial Lifts (electric) | 1 | 7 | 2010 | 7 | 50 | 350 | 1.00 | 0.20 | 1,862 | 60 | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.000 | 0.0 | 0.0 | 0.0 | 0.0 | 0.00 | 0.000 | 0 |
| ***Building - Interior ((7/15/2017)*** | | | | | | | | | | | | | | | | | | | | | | | | |
| 12 | Forklifts | 1 | 7 | 2010 | 7 | 50 | 350 | 1.00 | 0.20 | 4,830 | 125 | 0 | 2.47 | 3.04 | 0.22 | 0.14 | 0.006 | 568.3 | 47.6 | 58.7 | 4.3 | 2.73 | 0.123 | 10963 |
| ***Fine Grading/Landscaping 8/1/2017)*** | | | | | | | | | | | | | | | | | | | | | | | | |
| 13 | Skid Steer Loaders | 1 | 7 | 2010 | 7 | 30 | 210 | 1.00 | 0.37 | 2,079 | 44 | 0 | 4.75 | 3.29 | 0.18 | 0.14 | 0.007 | 568.3 | 35.5 | 24.6 | 1.4 | 1.03 | 0.055 | 4245 |
| ***Paving (10/1/2017)*** | | | | | | | | | | | | | | | | | | | | | | | | |
| 14 | Paving Equipment | 1 | 7 | 2010 | 7 | 2 | 14 | 1.00 | 0.36 | 2,800 | 104 | 0 | 2.84 | 3.28 | 0.17 | 0.17 | 0.007 | 568.3 | 3.3 | 3.8 | 0.2 | 0.19 | 0.008 | 657 |
| 15 | Rollers | 2 | 7 | 2010 | 7 | 2 | 14 | 1.00 | 0.37 | 2,093 | 85 | 0 | 2.82 | 3.22 | 0.15 | 0.16 | 0.007 | 568.3 | 5.5 | 6.3 | 0.3 | 0.32 | 0.013 | 1113 |
| 16 | Tractors/Loaders/Backhoes | 1 | 7 | 2010 | 7 | 2 | 14 | 1.00 | 0.37 | 3,584 | 44 | 0 | 4.89 | 3.71 | 0.24 | 0.15 | 0.007 | 568.3 | 2.4 | 1.8 | 0.1 | 0.08 | 0.004 | 283 |
| ***Phase 11 - Construction Activities*** | | | | | | | | | | | | | | | | | | | | | | | | |
| ***Demolition (10/1/2017)*** | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | Excavators | 1 | 7 | 2010 | 7 | 1 | 7 | 1.00 | 0.38 | 3,822 | 168 | 0 | 2.44 | 2.97 | 0.20 | 0.13 | 0.006 | 568.3 | 2.4 | 2.9 | 0.2 | 0.13 | 0.01 | 560 |
| 2 | Rubber Tired Loaders | 1 | 7 | 2010 | 7 | 1 | 7 | 1.00 | 0.36 | 6,251 | 164 | 0 | 2.51 | 3.15 | 0.26 | 0.15 | 0.006 | 568.3 | 2.3 | 2.9 | 0.2 | 0.14 | 0.01 | 518 |
| ***Mass Grading/ Excavation (10/15/2017)*** | | | | | | | | | | | | | | | | | | | | | | | | |
| 3 | Excavators | 1 | 7 | 2010 | 7 | 10 | 70 | 1.00 | 0.38 | 3,822 | 168 | 0 | 2.44 | 2.97 | 0.20 | 0.13 | 0.006 | 568.3 | 24.0 | 29.3 | 1.9 | 1.32 | 0.063 | 5599 |
| 4 | Scrapers | 2 | 7 | 2010 | 7 | 10 | 70 | 1.00 | 0.48 | 3,171 | 313 | 0 | 2.42 | 0.98 | 0.18 | 0.10 | 0.006 | 568.3 | 112.1 | 45.3 | 8.3 | 4.41 | 0.259 | 26353 |
| 5 | Rollers | 1 | 7 | 2010 | 7 | 10 | 70 | 1.00 | 0.38 | 2,093 | 95 | 0 | 2.82 | 3.22 | 0.15 | 0.16 | 0.007 | 568.3 | 15.7 | 17.9 | 0.8 | 0.90 | 0.037 | 3166 |
| 6 | Graders | 1 | 7 | 2010 | 7 | 10 | 70 | 1.00 | 0.41 | 4,270 | 174 | 0 | 2.45 | 3.00 | 0.21 | 0.14 | 0.006 | 568.3 | 26.8 | 32.8 | 2.3 | 1.50 | 0.070 | 6206 |
| | Rubber Tired Loaders | 1 | 7 | 2010 | 7 | 10 | 70 | 1.00 | 0.36 | 6,251 | 164 | 0 | 2.51 | 3.15 | 0.26 | 0.15 | 0.006 | 568.3 | 22.9 | 28.7 | 2.3 | 1.39 | 0.058 | 5178 |
| ***Trenching-Utilities (11/1/2017)*** | | | | | | | | | | | | | | | | | | | | | | | | |
| 7 | Tractors/Loaders/Backhoes | 1 | 7 | 2010 | 7 | 40 | 280 | 1.00 | 0.37 | 3,584 | 108 | 0 | 2.87 | 3.34 | 0.19 | 0.17 | 0.007 | 568.3 | 70.1 | 81.7 | 4.6 | 4.20 | 0.163 | 13892 |
| 8 | Excavators | 1 | 7 | 2010 | 7 | 40 | 280 | 1.00 | 0.38 | 3,822 | 168 | 0 | 2.44 | 2.97 | 0.20 | 0.13 | 0.006 | 568.3 | 96.1 | 117.2 | 7.7 | 5.27 | 0.252 | 22396 |
| 9 | Plate Compactors | 1 | 7 | 2010 | 7 | 40 | 280 | 1.00 | 0.29 | 4,200 | 8 | 0 | 4.14 | 3.47 | 0.49 | 0.14 | 0.009 | 568.3 | 5.9 | 4.9 | 0.7 | 0.20 | 0.013 | 805 |
| ***Building - Exterior (11/15/2017)*** | | | | | | | | | | | | | | | | | | | | | | | | |
| 10 | Forklifts | 2 | 7 | 2010 | 7 | 40 | 280 | 1.00 | 0.20 | 4,830 | 125 | 0 | 2.47 | 3.04 | 0.22 | 0.14 | 0.006 | 568.3 | 76.2 | 94.0 | 6.8 | 4.37 | 0.197 | 17541 |
| 11 | Aerial Lifts (electric) | 1 | 7 | 2010 | 7 | 40 | 280 | 1.00 | 0.20 | 1,862 | 60 | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.000 | 0.0 | 0.0 | 0.0 | 0.0 | 0.00 | 0.000 | 0 |
| ***Building - Interior (1/15/2018)*** | | | | | | | | | | | | | | | | | | | | | | | | |
| 12 | Forklifts | 0 | 7 | 2010 | 7 | 40 | 280 | 1.00 | 0.20 | 4,830 | 125 | 0 | 2.47 | 3.04 | 0.22 | 0.14 | 0.006 | 568.3 | 0.0 | 0.0 | 0.0 | 0.00 | 0.000 | 0 |
| ***Fine Grading/Landscaping (2/1/2018)*** | | | | | | | | | | | | | | | | | | | | | | | | |
| 13 | Skid Steer Loaders | 0 | 7 | 2010 | 7 | 30 | 210 | 1.00 | 0.37 | 2,079 | 44 | 0 | 4.75 | 3.29 | 0.18 | 0.14 | 0.007 | 568.3 | 0.0 | 0.0 | 0.0 | 0.00 | 0.000 | 0 |
| ***Paving (4/1/2018)*** | | | | | | | | | | | | | | | | | | | | | | | | |
| 14 | Paving Equipment | 0 | 7 | 2010 | 7 | 2 | 14 | 1.00 | 0.36 | 2,800 | 104 | 0 | 2.84 | 3.28 | 0.17 | 0.17 | 0.007 | 568.3 | 0.0 | 0.0 | 0.0 | 0.00 | 0.000 | 0 |
| 15 | Rollers | 0 | 7 | 2010 | 7 | 2 | 14 | 1.00 | 0.37 | 2,093 | 85 | 0 | 2.82 | 3.22 | 0.15 | 0.16 | 0.007 | 568.3 | 0.0 | 0.0 | 0.0 | 0.00 | 0.000 | 0 |
| 16 | Tractors/Loaders/Backhoes | 0 | 7 | 2010 | 7 | 2 | 14 | 1.00 | 0.37 | 3,584 | 44 | 0 | 4.89 | 3.71 | 0.24 | 0.15 | 0.007 | 568.3 | 0.0 | 0.0 | 0.0 | 0.00 | 0.000 | 0 |
| | **Total Off-Road Equipment** | | | | | | | | | | | | | | | | | | | | | **69.16** | | |
| | ***On-Site On-Road Vehicles*** | **No. Trucks** | | | **Hours/ Day** | **Days/ Year** | **Annual Hours per Truck** | | **Onsite Travel Miles** | | | | | | | **PM2.5 (g/mi)** | | | **NOx** | **CO** | **VOC** | **PM2.5** | **SO2** | **CO2** |
| ***Mass Grading/ Excavation*** | | | | | | | | | | | | | | | | | | | | | | | | |
| | Water Truck - Phase 10 | 1 | - | - | 2 | 25 | 50 | - | 500.0 | | - | - | | | | 0.0975 | | | | | | 0.11 | | |
| | Water Truck - Phase 11 | 1 | - | - | 2 | 10 | 20 | - | 200.0 | | - | - | | | | 0.0975 | | | | | | 0.04 | | |
| ***Fine Grading/Landscaping*** | | | | | | | | | | | | | | | | | | | | | | | | |
| | Water Truck Phases 9 | 1 | - | - | 2 | 25 | 50 | - | 500.0 | | - | - | | | | 0.0975 | | | | | | 0.11 | | |
| | Water Truck Phases 10 | 1 | - | - | 2 | 30 | 60 | - | 600.0 | | - | - | | | | 0.0975 | | | | | | 0.13 | | |
| | **Total On-Road Vehicles** | | | | | | | | | | | | | | | | | | | | | **0.39** | | |
| **TOTAL On-Site - On and Off Roa** | | - | | | - | - | | - | - | - | - | | - | - | - | - | | | | | | **69.6** | | |

Notes: Cumulative hours operation based on statewide averages
Onsite truck travel speed of 10 mph

**0.0348 tons/year**

| Item No. | Emission Factors - Off-Road Compression Ignited Engines / EF ID | NOx ZH EF (g/hp-hr) | NOx DR $(g/hp\text{-}hr^2)$ | NOx Fuel CF | CO ZH EF (g/hp-hr) | CO DR $(g/hp\text{-}hr^2)$ | CO Fuel CF | ROG ZH EF (g/hp-hr) | ROG DR $(g/hp\text{-}hr^2)$ | ROG Fuel CF | PM2.5 ZH EF (g/hp-hr) | PM2.5 DR $(g/hp\text{-}hr^2)$ | PM2.5 Fuel CF | CO2 ZH EF (g/hp-hr) | CO2 DR $(g/hp\text{-}hr^2)$ | CO2 Fuel CF | SO2 (g/hp-hr) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ***Demolition (10/1/2016)*** | | | | | | | | | | | | | | | | | |
| 1 | ULSD1752010 | 2.45 | 3.20E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.13 | 1.00E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| 2 | ULSD1752010 | 2.45 | 3.20E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.13 | 1.00E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| ***Mass Grading/ Excavation (10/15/2016)*** | | | | | | | | | | | | | | | | | |
| 3 | ULSD1752010 | 2.45 | 3.20E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.13 | 1.00E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| 4 | ULSD5002010 | 2.45 | 3.18E-05 | 0.95 | 0.92 | 1.82E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.10 | 5.55E-06 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| 5 | ULSD1202010 | 2.89 | 3.80E-05 | 0.95 | 3.05 | 8.10E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.18 | 8.58E-06 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.007 |
| 6 | ULSD1752010 | 2.45 | 3.20E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.13 | 1.00E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| | ULSD1752010 | 2.45 | 3.20E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.13 | 1.00E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.006 |

| | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ***Trenching-Utilities (11/1/2016)*** | | | | | | | | | | | | | | | | | |
| 7 | ULSD1202010 | 2.89 | 3.80E-05 | 0.95 | 3.05 | 8.10E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.18 | 8.58E-06 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.007 |
| 8 | ULSD1752010 | 2.45 | 3.20E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.13 | 1.00E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| 9 | ULSD152010 | 4.37 | 0.00E+00 | 0.95 | 3.47 | 0.00E+00 | 1.00 | 0.49 | 0.00E+00 | 1.00 | 0.17 | 0.00E+00 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.009 |
| ***Building - Exterior (11/15/2016)*** | | | | | | | | | | | | | | | | | |
| 10 | ULSD1752010 | 2.45 | 3.20E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.13 | 1.00E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| 11 | ULSD1202010 | 2.89 | 3.80E-05 | 0.95 | 3.05 | 8.10E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.18 | 8.58E-06 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.007 |
| ***Building - Interior (1/15/2017)*** | | | | | | | | | | | | | | | | | |
| 12 | ULSD1752010 | 2.45 | 3.20E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.13 | 1.00E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| ***Fine Grading/Landscaping (2/1/2017)*** | | | | | | | | | | | | | | | | | |
| 13 | ULSD502010 | 4.80 | 1.00E-04 | 0.95 | 2.72 | 2.76E-04 | 1.00 | 0.10 | 4.00E-05 | 1.00 | 0.15 | 1.20E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.007 |
| ***Paving (4/1/2017)*** | | | | | | | | | | | | | | | | | |
| 14 | ULSD1202010 | 2.89 | 3.80E-05 | 0.95 | 3.05 | 8.10E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.18 | 8.58E-06 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.007 |
| 15 | ULSD1202010 | 2.89 | 3.80E-05 | 0.95 | 3.05 | 8.10E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.18 | 8.58E-06 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.007 |
| 16 | ULSD502010 | 4.80 | 1.00E-04 | 0.95 | 2.72 | 2.76E-04 | 1.00 | 0.10 | 4.00E-05 | 1.00 | 0.15 | 1.20E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.007 |
| ***Demolition (4/1/2017)*** | | | | | | | | | | | | | | | | | |
| 1 | ULSD1752010 | 2.45 | 3.20E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.13 | 1.00E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| 2 | ULSD1752010 | 2.45 | 3.20E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.13 | 1.00E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| ***Mass Grading/ Excavation (4/15/2017)*** | | | | | | | | | | | | | | | | | |
| 3 | ULSD1752010 | 2.45 | 3.20E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.13 | 1.00E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| 4 | ULSD5002010 | 2.45 | 3.18E-05 | 0.95 | 0.92 | 1.82E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.10 | 5.55E-06 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| 5 | ULSD1202010 | 2.89 | 3.80E-05 | 0.95 | 3.05 | 8.10E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.18 | 8.58E-06 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.007 |
| 6 | ULSD1752010 | 2.45 | 3.20E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.13 | 1.00E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| | ULSD1752010 | 2.45 | 3.20E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.13 | 1.00E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| ***Trenching-Utilities (5/1/2017)*** | | | | | | | | | | | | | | | | | |
| 7 | ULSD1202010 | 2.89 | 3.80E-05 | 0.95 | 3.05 | 8.10E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.18 | 8.58E-06 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.007 |
| 8 | ULSD1752010 | 2.45 | 3.20E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.13 | 1.00E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| 9 | ULSD152010 | 4.37 | 0.00E+00 | 0.95 | 3.47 | 0.00E+00 | 1.00 | 0.49 | 0.00E+00 | 1.00 | 0.17 | 0.00E+00 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.009 |
| ***Building - Exterior (5/15/2017)*** | | | | | | | | | | | | | | | | | |
| 10 | ULSD1752010 | 2.45 | 3.20E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.13 | 1.00E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| 11 | ULSD1202010 | 2.89 | 3.80E-05 | 0.95 | 3.05 | 8.10E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.18 | 8.58E-06 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.007 |
| ***Building - Interior ((7/15/2017)*** | | | | | | | | | | | | | | | | | |
| 12 | ULSD1752010 | 2.45 | 3.20E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.13 | 1.00E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| ***Fine Grading/Landscaping 8/1/2017)*** | | | | | | | | | | | | | | | | | |
| 13 | ULSD502010 | 4.80 | 1.00E-04 | 0.95 | 2.72 | 2.76E-04 | 1.00 | 0.10 | 4.00E-05 | 1.00 | 0.15 | 1.20E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.007 |
| ***Paving (10/1/2017)*** | | | | | | | | | | | | | | | | | |
| 14 | ULSD1202010 | 2.89 | 3.80E-05 | 0.95 | 3.05 | 8.10E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.18 | 8.58E-06 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.007 |
| 15 | ULSD1202010 | 2.89 | 3.80E-05 | 0.95 | 3.05 | 8.10E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.18 | 8.58E-06 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.007 |
| 16 | ULSD502010 | 4.80 | 1.00E-04 | 0.95 | 2.72 | 2.76E-04 | 1.00 | 0.10 | 4.00E-05 | 1.00 | 0.15 | 1.20E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.007 |
| ***Demolition (10/1/2017)*** | | | | | | | | | | | | | | | | | |
| 1 | ULSD1752010 | 2.45 | 3.20E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.13 | 1.00E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| 2 | ULSD1752010 | 2.45 | 3.20E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.13 | 1.00E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| ***Mass Grading/ Excavation (10/15/2017)*** | | | | | | | | | | | | | | | | | |
| 3 | ULSD1752010 | 2.45 | 3.20E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.13 | 1.00E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| 4 | ULSD5002010 | 2.45 | 3.18E-05 | 0.95 | 0.92 | 1.82E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.10 | 5.55E-06 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| 5 | ULSD1202010 | 2.89 | 3.80E-05 | 0.95 | 3.05 | 8.10E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.18 | 8.58E-06 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.007 |
| 6 | ULSD1752010 | 2.45 | 3.20E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.13 | 1.00E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| | ULSD1752010 | 2.45 | 3.20E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.13 | 1.00E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| ***Trenching-Utilities (11/1/2017)*** | | | | | | | | | | | | | | | | | |
| 7 | ULSD1202010 | 2.89 | 3.80E-05 | 0.95 | 3.05 | 8.10E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.18 | 8.58E-06 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.007 |
| 8 | ULSD1752010 | 2.45 | 3.20E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.13 | 1.00E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| 9 | ULSD152010 | 4.37 | 0.00E+00 | 0.95 | 3.47 | 0.00E+00 | 1.00 | 0.49 | 0.00E+00 | 1.00 | 0.17 | 0.00E+00 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.009 |
| ***Building - Exterior (11/15/2017)*** | | | | | | | | | | | | | | | | | |
| 10 | ULSD1752010 | 2.45 | 3.20E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.13 | 1.00E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| 11 | ULSD1202010 | 2.89 | 3.80E-05 | 0.95 | 3.05 | 8.10E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.18 | 8.58E-06 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.007 |
| ***Building - Interior (1/15/2018)*** | | | | | | | | | | | | | | | | | |
| 12 | ULSD1752010 | 2.45 | 3.20E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.13 | 1.00E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| ***Fine Grading/Landscaping (2/1/2018)*** | | | | | | | | | | | | | | | | | |
| 13 | ULSD502010 | 4.80 | 1.00E-04 | 0.95 | 2.72 | 2.76E-04 | 1.00 | 0.10 | 4.00E-05 | 1.00 | 0.15 | 1.20E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.007 |
| ***Paving (4/1/2018)*** | | | | | | | | | | | | | | | | | |
| 14 | ULSD1202010 | 2.89 | 3.80E-05 | 0.95 | 3.05 | 8.10E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.18 | 8.58E-06 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.007 |
| 15 | ULSD1202010 | 2.89 | 3.80E-05 | 0.95 | 3.05 | 8.10E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.18 | 8.58E-06 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.007 |
| 16 | ULSD502010 | 4.80 | 1.00E-04 | 0.95 | 2.72 | 2.76E-04 | 1.00 | 0.10 | 4.00E-05 | 1.00 | 0.15 | 1.20E-05 | 0.80 | 568.30 | 0.00E+00 | 1.00 | 0.007 |

Notes: ZH EF = Zero hour emission factor
DR = Deterioration rate
ULSD = Ultra low sulfur diesel (15 ppmw sulfur, 0.0015% sulfur)

Refs: CARB OFFFROAD2007 model (http://www.arb.ca.gov/msei/offroad/offroad.htm), December, 2006.
Stationary/Off-road engines ARB, "California's Emissions Inventory for Off-Road Large Compression-Ignited (CI) Engines (> 25 HP)" MAC#99-32

**Construction Equipment Exhaust Emissions**
**San Sebastian, Morgan Hill - 2018 with 2011 Equipment**

**Analysis Year = 2018**

| Item No. | Off-Road Equipment / Equipment Type | No. Units | Engine Age (years) | Engine Model Year | Daily Hours In Use | Days Per Year | Unit Annual Hours Use | Use Factor | Load Factor | Cumulative Hours Operation Per Unit | Engine (hp) | Level of VDECS Used | Emission Factor (g/hp-hr) NOx | CO | VOC | PM2.5 | SO2 | CO2 | Annual Emissions (lb/yr) NOx | CO | VOC | PM2.5 | SO2 | CO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ***Phase 11 - Construction Activities*** | | | | | | | | | | | | | | | | | | | | | | | | |
| ***Demolition (10/1/2017)*** | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | Excavators | 0 | 7 | 2011 | 7 | 1 | 7 | 1.00 | 0.38 | 3,822 | 168 | 0 | 2.44 | 2.97 | 0.20 | 0.14 | 0.006 | 568.3 | 0.0 | 0.0 | 0.0 | 0.00 | 0.00 | 0 |
| 2 | Rubber Tired Loaders | 0 | 7 | 2011 | 7 | 1 | 7 | 1.00 | 0.36 | 6,251 | 164 | 0 | 2.51 | 3.15 | 0.26 | 0.16 | 0.006 | 568.3 | 0.0 | 0.0 | 0.0 | 0.00 | 0.00 | 0 |
| ***Mass Grading/ Excavation (10/15/2017)*** | | | | | | | | | | | | | | | | | | | | | | | | |
| 3 | Excavators | 0 | 7 | 2011 | 7 | 10 | 70 | 1.00 | 0.38 | 3,822 | 168 | 0 | 2.44 | 2.97 | 0.20 | 0.14 | 0.006 | 568.3 | 0.0 | 0.0 | 0.0 | 0.00 | 0.000 | 0 |
| 4 | Scrapers | 0 | 7 | 2011 | 7 | 10 | 70 | 1.00 | 0.48 | 3,171 | 313 | 0 | 1.34 | 0.98 | 0.13 | 0.01 | 0.006 | 568.3 | 0.0 | 0.0 | 0.0 | 0.00 | 0.000 | 0 |
| 5 | Rollers | 0 | 7 | 2011 | 7 | 10 | 70 | 1.00 | 0.38 | 2,093 | 95 | 0 | 2.82 | 3.22 | 0.15 | 0.17 | 0.007 | 568.3 | 0.0 | 0.0 | 0.0 | 0.00 | 0.000 | 0 |
| 6 | Graders | 0 | 7 | 2011 | 7 | 10 | 70 | 1.00 | 0.41 | 4,270 | 174 | 0 | 2.45 | 3.00 | 0.21 | 0.15 | 0.006 | 568.3 | 0.0 | 0.0 | 0.0 | 0.00 | 0.000 | 0 |
| | Rubber Tired Loaders | 0 | 7 | 2011 | 7 | 10 | 70 | 1.00 | 0.36 | 6,251 | 164 | 0 | 2.51 | 3.15 | 0.26 | 0.16 | 0.006 | 568.3 | 0.0 | 0.0 | 0.0 | 0.00 | 0.000 | 0 |
| ***Trenching-Utilities (11/1/2017)*** | | | | | | | | | | | | | | | | | | | | | | | | |
| 7 | Tractors/Loaders/Backhoes | 0 | 7 | 2011 | 7 | 40 | 280 | 1.00 | 0.37 | 3,584 | 108 | 0 | 2.87 | 3.34 | 0.19 | 0.18 | 0.007 | 568.3 | 0.0 | 0.0 | 0.0 | 0.00 | 0.000 | 0 |
| 8 | Excavators | 0 | 7 | 2011 | 7 | 40 | 280 | 1.00 | 0.38 | 3,822 | 168 | 0 | 2.44 | 2.97 | 0.20 | 0.14 | 0.006 | 568.3 | 0.0 | 0.0 | 0.0 | 0.00 | 0.000 | 0 |
| 9 | Plate Compactors | 0 | 7 | 2011 | 7 | 40 | 280 | 1.00 | 0.29 | 4,200 | 8 | 0 | 4.14 | 3.47 | 0.49 | 0.15 | 0.009 | 568.3 | 0.0 | 0.0 | 0.0 | 0.00 | 0.000 | 0 |
| ***Building - Exterior (11/15/2017)*** | | | | | | | | | | | | | | | | | | | | | | | | |
| 10 | Forklifts | 0 | 7 | 2011 | 7 | 40 | 280 | 1.00 | 0.20 | 4,830 | 125 | 0 | 2.47 | 3.04 | 0.22 | 0.15 | 0.006 | 568.3 | 0.0 | 0.0 | 0.0 | 0.00 | 0.000 | 0 |
| 11 | Aerial Lifts (electric) | 0 | 7 | 2011 | 7 | 40 | 280 | 1.00 | 0.20 | 1,862 | 60 | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.000 | 0.0 | 0.0 | 0.0 | 0.0 | 0.00 | 0.000 | 0 |
| ***Building - Interior (1/15/2018)*** | | | | | | | | | | | | | | | | | | | | | | | | |
| 12 | Forklifts | 1 | 7 | 2011 | 7 | 40 | 280 | 1.00 | 0.20 | 4,830 | 125 | 0 | 2.47 | 3.04 | 0.22 | 0.15 | 0.006 | 568.3 | 38.1 | 47.0 | 3.4 | 2.33 | 0.099 | 8770 |
| ***Fine Grading/Landscaping (2/1/2018)*** | | | | | | | | | | | | | | | | | | | | | | | | |
| 13 | Skid Steer Loaders | 1 | 7 | 2011 | 7 | 30 | 210 | 1.00 | 0.37 | 2,079 | 44 | 0 | 4.75 | 3.29 | 0.18 | 0.15 | 0.007 | 568.3 | 35.5 | 24.6 | 1.4 | 1.10 | 0.055 | 4245 |
| ***Paving (4/1/2018)*** | | | | | | | | | | | | | | | | | | | | | | | | |
| 14 | Paving Equipment | 1 | 7 | 2011 | 7 | 2 | 14 | 1.00 | 0.36 | 2,800 | 104 | 0 | 2.84 | 3.28 | 0.17 | 0.18 | 0.007 | 568.3 | 3.3 | 3.8 | 0.2 | 0.20 | 0.008 | 657 |
| 15 | Rollers | 2 | 7 | 2011 | 7 | 2 | 14 | 1.00 | 0.38 | 2,093 | 95 | 0 | 2.82 | 3.22 | 0.15 | 0.17 | 0.007 | 568.3 | 6.3 | 7.2 | 0.3 | 0.38 | 0.015 | 1266 |
| 16 | Tractors/Loaders/Backhoes | 1 | 7 | 2011 | 7 | 2 | 14 | 1.00 | 0.37 | 3,584 | 44 | 0 | 4.89 | 3.71 | 0.24 | 0.16 | 0.007 | 568.3 | 2.4 | 1.8 | 0.1 | 0.08 | 0.004 | 283 |
| ***Phase 12 - Construction Activities*** | | | | | | | | | | | | | | | | | | | | | | | | |
| ***Demolition (4/1/2018)*** | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | Excavators | 1 | 7 | 2011 | 7 | 1 | 7 | 1.00 | 0.38 | 3,822 | 168 | 0 | 2.44 | 2.97 | 0.20 | 0.14 | 0.006 | 568.3 | 2.4 | 2.9 | 0.2 | 0.14 | 0.01 | 560 |
| 2 | Rubber Tired Loaders | 1 | 7 | 2011 | 7 | 1 | 7 | 1.00 | 0.36 | 6,251 | 164 | 0 | 2.51 | 3.15 | 0.26 | 0.16 | 0.006 | 568.3 | 2.3 | 2.9 | 0.2 | 0.15 | 0.01 | 518 |
| ***Mass Grading/ Excavation (4/15/2018)*** | | | | | | | | | | | | | | | | | | | | | | | | |
| 3 | Excavators | 1 | 7 | 2011 | 7 | 12 | 84 | 1.00 | 0.38 | 3,822 | 168 | 0 | 2.44 | 2.97 | 0.20 | 0.14 | 0.006 | 568.3 | 28.8 | 35.1 | 2.3 | 1.68 | 0.076 | 6719 |
| 4 | Scrapers | 2 | 7 | 2011 | 7 | 12 | 84 | 1.00 | 0.48 | 3,171 | 313 | 0 | 1.34 | 0.98 | 0.13 | 0.01 | 0.006 | 568.3 | 74.7 | 54.4 | 7.1 | 0.49 | 0.310 | 31623 |
| 5 | Rollers | 1 | 7 | 2011 | 7 | 12 | 84 | 1.00 | 0.38 | 2,093 | 95 | 0 | 2.82 | 3.22 | 0.15 | 0.17 | 0.007 | 568.3 | 18.8 | 21.5 | 1.0 | 1.15 | 0.045 | 3799 |
| 6 | Graders | 1 | 7 | 2011 | 7 | 12 | 84 | 1.00 | 0.41 | 4,270 | 174 | 0 | 2.45 | 3.00 | 0.21 | 0.15 | 0.006 | 568.3 | 32.1 | 39.4 | 2.7 | 1.91 | 0.084 | 7447 |
| | Rubber Tired Loaders | 1 | 7 | 2011 | 7 | 12 | 84 | 1.00 | 0.36 | 6,251 | 164 | 0 | 2.51 | 3.15 | 0.26 | 0.16 | 0.006 | 568.3 | 27.5 | 34.4 | 2.8 | 1.78 | 0.070 | 6214 |
| ***Trenching-Utilities (5/1/2018)*** | | | | | | | | | | | | | | | | | | | | | | | | |
| 7 | Tractors/Loaders/Backhoes | 1 | 7 | 2011 | 7 | 40 | 280 | 1.00 | 0.37 | 3,584 | 108 | 0 | 2.87 | 3.34 | 0.19 | 0.18 | 0.007 | 568.3 | 70.1 | 81.7 | 4.6 | 4.47 | 0.163 | 13892 |
| 8 | Excavators | 1 | 7 | 2011 | 7 | 40 | 280 | 1.00 | 0.38 | 3,822 | 168 | 0 | 2.44 | 2.97 | 0.20 | 0.14 | 0.006 | 568.3 | 96.1 | 117.2 | 7.7 | 5.61 | 0.252 | 22396 |
| 9 | Plate Compactors | 1 | 7 | 2011 | 7 | 40 | 280 | 1.00 | 0.29 | 4,200 | 8 | 0 | 4.14 | 3.47 | 0.49 | 0.15 | 0.009 | 568.3 | 5.9 | 4.9 | 0.7 | 0.21 | 0.013 | 805 |
| ***Building - Exterior (5/15/2018)*** | | | | | | | | | | | | | | | | | | | | | | | | |
| 10 | Forklifts | 2 | 7 | 2011 | 7 | 40 | 280 | 1.00 | 0.20 | 4,830 | 125 | 0 | 2.47 | 3.04 | 0.22 | 0.15 | 0.006 | 568.3 | 76.2 | 94.0 | 6.8 | 4.66 | 0.197 | 17541 |
| 11 | Aerial Lifts (electric) | 1 | 7 | 2011 | 7 | 40 | 280 | 1.00 | 0.20 | 1,862 | 60 | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.000 | 0.0 | 0.0 | 0.0 | 0.0 | 0.00 | 0.000 | 0 |
| ***Building - Interior ((7/15/2018)*** | | | | | | | | | | | | | | | | | | | | | | | | |
| 12 | Forklifts | 1 | 7 | 2011 | 7 | 40 | 280 | 1.00 | 0.20 | 4,830 | 125 | 0 | 2.47 | 3.04 | 0.22 | 0.15 | 0.006 | 568.3 | 38.1 | 47.0 | 3.4 | 2.33 | 0.099 | 8770 |
| ***Fine Grading/Landscaping 8/1/2018)*** | | | | | | | | | | | | | | | | | | | | | | | | |
| 13 | Skid Steer Loaders | 1 | 7 | 2011 | 7 | 30 | 210 | 1.00 | 0.37 | 2,079 | 44 | 0 | 4.75 | 3.29 | 0.18 | 0.15 | 0.007 | 568.3 | 35.5 | 24.6 | 1.4 | 1.10 | 0.055 | 4245 |
| ***Paving (10/1/2018)*** | | | | | | | | | | | | | | | | | | | | | | | | |
| 14 | Paving Equipment | 1 | 7 | 2011 | 7 | 2 | 14 | 1.00 | 0.36 | 2,800 | 104 | 0 | 2.84 | 3.28 | 0.17 | 0.18 | 0.007 | 568.3 | 3.3 | 3.8 | 0.2 | 0.20 | 0.008 | 657 |
| 15 | Rollers | 2 | 7 | 2011 | 7 | 2 | 14 | 1.00 | 0.37 | 2,093 | 85 | 0 | 2.82 | 3.22 | 0.15 | 0.17 | 0.007 | 568.3 | 5.5 | 6.3 | 0.3 | 0.34 | 0.013 | 1113 |
| 16 | Tractors/Loaders/Backhoes | 1 | 7 | 2011 | 7 | 2 | 14 | 1.00 | 0.37 | 3,584 | 44 | 0 | 4.89 | 3.71 | 0.24 | 0.16 | 0.007 | 568.3 | 2.4 | 1.8 | 0.1 | 0.08 | 0.004 | 283 |
| | **Total Off-Road Equipment** | | | | | | | | | | | | | | | | | | | | | **30.40** | | |
| | ***On-Site On-Road Vehicles*** | **No. Trucks** | | | **Hours/ Day** | **Days/ Year** | **Annual Hours per Truck** | | **Onsite Travel Miles** | | | | | | | **PM2.5 (g/mi)** | | | **NOx** | **CO** | **VOC** | **PM2.5** | **SO2** | **CO2** |
| ***Mass Grading/ Excavation*** | | | | | | | | | | | | | | | | | | | | | | | | |
| | Water Truck - Phase 12 | 1 | - | - | 2 | 12 | 24 | - | 240.0 | | - | - | | | | 0.0922 | | | | | | 0.05 | | |
| ***Fine Grading/Landscaping*** | | | | | | | | | | | | | | | | | | | | | | | | |
| | Water Truck Phases 11 | 1 | - | - | 2 | 30 | 60 | - | 600.0 | | - | - | | | | 0.0922 | | | | | | 0.12 | | |
| | Water Truck Phases 12 | 1 | - | - | 2 | 30 | 60 | - | 600.0 | | - | - | | | | 0.0922 | | | | | | 0.12 | | |
| | **Total On-Road Vehicles** | | | | | | | | | | | | | | | | | | | | | **0.29** | | |
| **TOTAL On-Site - On and Off Roa** | | - | | | - | - | | - | - | - | - | | - | - | - | - | | | | | | **30.7** | | |

Notes: Cumulative hours operation based on statewide averages
Onsite truck travel speed of 10 mph

**0.0153 tons/year**

| Item No. | EF ID | NOx ZH EF (g/hp-hr) | NOx DR ($g/hp-hr^2$) | NOx Fuel CF | CO ZH EF (g/hp-hr) | CO DR ($g/hp-hr^2$) | CO Fuel CF | ROG ZH EF (g/hp-hr) | ROG DR ($g/hp-hr^2$) | ROG Fuel CF | PM2.5 ZH EF (g/hp-hr) | PM2.5 DR ($g/hp-hr^2$) | PM2.5 Fuel CF | CO2 ZH EF (g/hp-hr) | CO2 DR ($g/hp-hr^2$) | CO2 Fuel CF | SO2 (g/hp-hr) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Emission Factors - Off-Road Compression Ignited Engines** | | | | | | | | | | | | | | | | | |
| ***Demolition (10/1/2017)*** | | | | | | | | | | | | | | | | | |
| 1 | ULSD1752011 | 2.45 | 3.20E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.13 | 1.00E-05 | 0.85 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| 2 | ULSD1752011 | 2.45 | 3.20E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.13 | 1.00E-05 | 0.85 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| ***Mass Grading/ Excavation (10/15/2017)*** | | | | | | | | | | | | | | | | | |
| 3 | ULSD1752011 | 2.45 | 3.20E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.13 | 1.00E-05 | 0.85 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| 4 | ULSD5002011 | 1.36 | 1.75E-05 | 0.95 | 0.92 | 1.82E-05 | 1.00 | 0.07 | 1.83E-05 | 1.00 | 0.01 | 3.75E-07 | 0.85 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| 5 | ULSD1202011 | 2.89 | 3.80E-05 | 0.95 | 3.05 | 8.10E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.18 | 8.58E-06 | 0.85 | 568.30 | 0.00E+00 | 1.00 | 0.007 |
| 6 | ULSD1752011 | 2.45 | 3.20E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.13 | 1.00E-05 | 0.85 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| | ULSD1752011 | 2.45 | 3.20E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.13 | 1.00E-05 | 0.85 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| ***Trenching-Utilities (11/1/2017)*** | | | | | | | | | | | | | | | | | |
| 7 | ULSD1202011 | 2.89 | 3.80E-05 | 0.95 | 3.05 | 8.10E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.18 | 8.58E-06 | 0.85 | 568.30 | 0.00E+00 | 1.00 | 0.007 |
| 8 | ULSD1752011 | 2.45 | 3.20E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.13 | 1.00E-05 | 0.85 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| 9 | ULSD152011 | 4.37 | 0.00E+00 | 0.95 | 3.47 | 0.00E+00 | 1.00 | 0.49 | 0.00E+00 | 1.00 | 0.17 | 0.00E+00 | 0.85 | 568.30 | 0.00E+00 | 1.00 | 0.009 |
| ***Building - Exterior (11/15/2017)*** | | | | | | | | | | | | | | | | | |
| 10 | ULSD1752011 | 2.45 | 3.20E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.13 | 1.00E-05 | 0.85 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| 11 | ULSD1202011 | 2.89 | 3.80E-05 | 0.95 | 3.05 | 8.10E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.18 | 8.58E-06 | 0.85 | 568.30 | 0.00E+00 | 1.00 | 0.007 |
| ***Building - Interior (1/15/2018)*** | | | | | | | | | | | | | | | | | |
| 12 | ULSD1752011 | 2.45 | 3.20E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.13 | 1.00E-05 | 0.85 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| ***Fine Grading/Landscaping (2/1/2018)*** | | | | | | | | | | | | | | | | | |
| 13 | ULSD502011 | 4.80 | 1.00E-04 | 0.95 | 2.72 | 2.76E-04 | 1.00 | 0.10 | 4.00E-05 | 1.00 | 0.15 | 1.20E-05 | 0.85 | 568.30 | 0.00E+00 | 1.00 | 0.007 |
| ***Paving (4/1/2018)*** | | | | | | | | | | | | | | | | | |
| 14 | ULSD1202011 | 2.89 | 3.80E-05 | 0.95 | 3.05 | 8.10E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.18 | 8.58E-06 | 0.85 | 568.30 | 0.00E+00 | 1.00 | 0.007 |
| 15 | ULSD1202011 | 2.89 | 3.80E-05 | 0.95 | 3.05 | 8.10E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.18 | 8.58E-06 | 0.85 | 568.30 | 0.00E+00 | 1.00 | 0.007 |
| 16 | ULSD502011 | 4.80 | 1.00E-04 | 0.95 | 2.72 | 2.76E-04 | 1.00 | 0.10 | 4.00E-05 | 1.00 | 0.15 | 1.20E-05 | 0.85 | 568.30 | 0.00E+00 | 1.00 | 0.007 |
| ***Demolition (4/1/2018)*** | | | | | | | | | | | | | | | | | |
| 1 | ULSD1752011 | 2.45 | 3.20E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.13 | 1.00E-05 | 0.85 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| 2 | ULSD1752011 | 2.45 | 3.20E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.13 | 1.00E-05 | 0.85 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| ***Mass Grading/ Excavation (4/15/2018)*** | | | | | | | | | | | | | | | | | |
| 3 | ULSD1752011 | 2.45 | 3.20E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.13 | 1.00E-05 | 0.85 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| 4 | ULSD5002011 | 1.36 | 1.75E-05 | 0.95 | 0.92 | 1.82E-05 | 1.00 | 0.07 | 1.83E-05 | 1.00 | 0.01 | 3.75E-07 | 0.85 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| 5 | ULSD1202011 | 2.89 | 3.80E-05 | 0.95 | 3.05 | 8.10E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.18 | 8.58E-06 | 0.85 | 568.30 | 0.00E+00 | 1.00 | 0.007 |
| 6 | ULSD1752011 | 2.45 | 3.20E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.13 | 1.00E-05 | 0.85 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| | ULSD1752011 | 2.45 | 3.20E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.13 | 1.00E-05 | 0.85 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| ***Trenching-Utilities (5/1/2018)*** | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7 | ULSD1202011 | 2.89 | 3.80E-05 | 0.95 | 3.05 | 8.10E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.18 | 8.58E-06 | 0.85 | 568.30 | 0.00E+00 | 1.00 | 0.007 |
| 8 | ULSD1752011 | 2.45 | 3.20E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.13 | 1.00E-05 | 0.85 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| 9 | ULSD152011 | 4.37 | 0.00E+00 | 0.95 | 3.47 | 0.00E+00 | 1.00 | 0.49 | 0.00E+00 | 1.00 | 0.17 | 0.00E+00 | 0.85 | 568.30 | 0.00E+00 | 1.00 | 0.009 |
| ***Building - Exterior (5/15/2018)*** | | | | | | | | | | | | | | | | | |
| 10 | ULSD1752011 | 2.45 | 3.20E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.13 | 1.00E-05 | 0.85 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| 11 | ULSD1202011 | 2.89 | 3.80E-05 | 0.95 | 3.05 | 8.10E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.18 | 8.58E-06 | 0.85 | 568.30 | 0.00E+00 | 1.00 | 0.007 |
| ***Building - Interior ((7/15/2018)*** | | | | | | | | | | | | | | | | | |
| 12 | ULSD1752011 | 2.45 | 3.20E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.13 | 1.00E-05 | 0.85 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| ***Fine Grading/Landscaping 8/1/2018)*** | | | | | | | | | | | | | | | | | |
| 13 | ULSD502011 | 4.80 | 1.00E-04 | 0.95 | 2.72 | 2.76E-04 | 1.00 | 0.10 | 4.00E-05 | 1.00 | 0.15 | 1.20E-05 | 0.85 | 568.30 | 0.00E+00 | 1.00 | 0.007 |
| ***Paving (10/1/2018)*** | | | | | | | | | | | | | | | | | |
| 14 | ULSD1202011 | 2.89 | 3.80E-05 | 0.95 | 3.05 | 8.10E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.18 | 8.58E-06 | 0.85 | 568.30 | 0.00E+00 | 1.00 | 0.007 |
| 15 | ULSD1202011 | 2.89 | 3.80E-05 | 0.95 | 3.05 | 8.10E-05 | 1.00 | 0.10 | 2.50E-05 | 1.00 | 0.18 | 8.58E-06 | 0.85 | 568.30 | 0.00E+00 | 1.00 | 0.007 |
| 16 | ULSD502011 | 4.80 | 1.00E-04 | 0.95 | 2.72 | 2.76E-04 | 1.00 | 0.10 | 4.00E-05 | 1.00 | 0.15 | 1.20E-05 | 0.85 | 568.30 | 0.00E+00 | 1.00 | 0.007 |
| | | | | | | | | | | | | | | | | | |

Notes: ZH EF = Zero hour emission factor
DR = Deterioration rate
ULSD = Ultra low sulfur diesel (15 ppmw sulfur, 0.0015% sulfur)

Refs: CARB OFFFROAD2007 model (http://www.arb.ca.gov/msei/offroad/offroad.htm), December, 2006.
Stationary/Off-road engines ARB, "California's Emissions Inventory for Off-Road Large Compression-Ignited (CI) Engines (> 25 HP)" MAC#99-32

**Construction Equipment Exhaust Emissions**
**San Sebastian, Morgan Hill - 2019 with 2012 Equipment**

**Analysis Year = 2019**

| Item No. | Off-Road Equipment / Equipment Type | No. Units | Engine Age (years) | Engine Model Year | Daily Hours In Use | Days Per Year | Unit Annual Hours Use | Use Factor | Load Factor | Cumulative Hours Operation Per Unit | Engine (hp) | Level of VDECS Used | Emission Factor (g/hp-hr) NOx | CO | VOC | PM2.5 | SO2 | CO2 | Annual Emissions (lb/yr) NOx | CO | VOC | PM2.5 | SO2 | CO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ***Phase 13 - Construction Activities*** | | | | | | | | | | | | | | | | | | | | | | | | |
| ***Demolition (4/1/2019)*** | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | Excavators | 1 | 7 | 2012 | 7 | 5 | 35 | 1.00 | 0.38 | 3,822 | 168 | 0 | 2.26 | 2.97 | 0.17 | 0.01 | 0.006 | 568.3 | 11.1 | 14.6 | 0.9 | 0.05 | 0.03 | 2799 |
| 2 | Rubber Tired Loaders | 1 | 7 | 2012 | 7 | 5 | 35 | 1.00 | 0.36 | 6,251 | 164 | 0 | 2.32 | 3.15 | 0.23 | 0.01 | 0.006 | 568.3 | 10.6 | 14.3 | 1.0 | 0.05 | 0.03 | 2589 |
| ***Mass Grading/ Excavation (4/15/2019)*** | | | | | | | | | | | | | | | | | | | | | | | | |
| 3 | Excavators | 1 | 7 | 2012 | 7 | 10 | 70 | 1.00 | 0.38 | 3,822 | 168 | 0 | 2.26 | 2.97 | 0.17 | 0.01 | 0.006 | 568.3 | 22.2 | 29.3 | 1.7 | 0.09 | 0.063 | 5599 |
| 4 | Scrapers | 2 | 7 | 2012 | 7 | 10 | 70 | 1.00 | 0.48 | 3,171 | 313 | 0 | 1.34 | 0.98 | 0.13 | 0.01 | 0.006 | 568.3 | 62.2 | 45.3 | 5.9 | 0.41 | 0.259 | 26353 |
| 5 | Rollers | 1 | 7 | 2012 | 7 | 10 | 70 | 1.00 | 0.38 | 2,093 | 95 | 0 | 2.47 | 3.22 | 0.14 | 0.06 | 0.007 | 568.3 | 13.7 | 17.9 | 0.8 | 0.35 | 0.037 | 3166 |
| 6 | Graders | 1 | 7 | 2012 | 7 | 10 | 70 | 1.00 | 0.41 | 4,270 | 174 | 0 | 2.27 | 3.00 | 0.18 | 0.01 | 0.006 | 568.3 | 24.8 | 32.8 | 2.0 | 0.11 | 0.070 | 6206 |
| | Rubber Tired Loaders | 1 | 7 | 2012 | 7 | 10 | 70 | 1.00 | 0.36 | 6,251 | 164 | 0 | 2.32 | 3.15 | 0.23 | 0.01 | 0.006 | 568.3 | 21.2 | 28.7 | 2.1 | 0.10 | 0.058 | 5178 |
| ***Trenching-Utilities (5/1/2019)*** | | | | | | | | | | | | | | | | | | | | | | | | |
| 7 | Tractors/Loaders/Backhoes | 1 | 7 | 2012 | 7 | 40 | 280 | 1.00 | 0.37 | 3,584 | 108 | 0 | 2.51 | 3.34 | 0.17 | 0.07 | 0.007 | 568.3 | 61.4 | 81.7 | 4.2 | 1.66 | 0.163 | 13892 |
| 8 | Excavators | 1 | 7 | 2012 | 7 | 40 | 280 | 1.00 | 0.38 | 3,822 | 168 | 0 | 2.26 | 2.97 | 0.17 | 0.01 | 0.006 | 568.3 | 88.9 | 117.2 | 6.8 | 0.37 | 0.252 | 22396 |
| 9 | Plate Compactors | 1 | 7 | 2012 | 7 | 40 | 280 | 1.00 | 0.29 | 4,200 | 8 | 0 | 4.14 | 3.47 | 0.49 | 0.15 | 0.009 | 568.3 | 5.9 | 4.9 | 0.7 | 0.21 | 0.013 | 805 |
| ***Building - Exterior (5/15/2019)*** | | | | | | | | | | | | | | | | | | | | | | | | |
| 10 | Forklifts | 2 | 7 | 2012 | 7 | 40 | 280 | 1.00 | 0.20 | 4,830 | 125 | 0 | 2.28 | 3.04 | 0.19 | 0.01 | 0.006 | 568.3 | 70.5 | 94.0 | 6.0 | 0.31 | 0.197 | 17541 |
| 11 | Aerial Lifts (electric) | 1 | 7 | 2012 | 7 | 40 | 280 | 1.00 | 0.20 | 1,862 | 60 | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.000 | 0.0 | 0.0 | 0.0 | 0.0 | 0.00 | 0.000 | 0 |
| ***Building - Interior ((7/15/2019)*** | | | | | | | | | | | | | | | | | | | | | | | | |
| 12 | Forklifts | 1 | 7 | 2012 | 7 | 40 | 280 | 1.00 | 0.20 | 4,830 | 125 | 0 | 2.28 | 3.04 | 0.19 | 0.01 | 0.006 | 568.3 | 35.2 | 47.0 | 3.0 | 0.15 | 0.099 | 8770 |
| ***Fine Grading/Landscaping 8/1/2019)*** | | | | | | | | | | | | | | | | | | | | | | | | |
| 13 | Skid Steer Loaders | 1 | 7 | 2012 | 7 | 30 | 210 | 1.00 | 0.37 | 2,079 | 44 | 0 | 4.75 | 3.29 | 0.18 | 0.15 | 0.007 | 568.3 | 35.5 | 24.6 | 1.4 | 1.10 | 0.055 | 4245 |
| ***Paving (10/1/2019)*** | | | | | | | | | | | | | | | | | | | | | | | | |
| 14 | Paving Equipment | 1 | 7 | 2012 | 7 | 2 | 14 | 1.00 | 0.36 | 2,800 | 104 | 0 | 2.49 | 3.28 | 0.15 | 0.07 | 0.007 | 568.3 | 2.9 | 3.8 | 0.2 | 0.08 | 0.008 | 657 |
| 15 | Rollers | 2 | 7 | 2012 | 7 | 2 | 14 | 1.00 | 0.37 | 2,093 | 85 | 0 | 2.47 | 3.22 | 0.14 | 0.06 | 0.007 | 568.3 | 4.8 | 6.3 | 0.3 | 0.12 | 0.013 | 1113 |
| 16 | Tractors/Loaders/Backhoes | 1 | 7 | 2012 | 7 | 2 | 14 | 1.00 | 0.37 | 3,584 | 44 | 0 | 4.89 | 3.71 | 0.24 | 0.16 | 0.007 | 568.3 | 2.4 | 1.8 | 0.1 | 0.08 | 0.004 | 283 |
| | **Total Off-Road Equipment** | | | | | | | | | | | | | | | | | | | | | **5.23** | | |
| | ***On-Site On-Road Vehicles*** | **No. Trucks** | | | **Hours/ Day** | **Days/ Year** | **Annual Hours per Truck** | | **Onsite Travel Miles** | | | | | | | **PM2.5 (g/mi)** | | | **NOx** | **CO** | **VOC** | **PM2.5** | **SO2** | **CO2** |
| ***Mass Grading/ Excavation*** | | | | | | | | | | | | | | | | | | | | | | | | |
| | Water Truck - Phase 13 | 1 | - | - | 2 | 10 | 20 | - | 200.0 | | - | - | | | | 0.0873 | | | | | | 0.04 | | |
| ***Fine Grading/Landscaping*** | | | | | | | | | | | | | | | | | | | | | | | | |
| | Water Truck Phases 13 | 1 | - | - | 2 | 30 | 60 | - | 600.0 | | - | - | | | | 0.0873 | | | | | | 0.12 | | |
| | **Total On-Road Vehicles** | | | | | | | | | | | | | | | | | | | | | **0.15** | | |
| **TOTAL On-Site - On and Off Roa** | | - | | | - | - | | - | - | - | - | | - | - | - | - | | | | | | **5.38** | | |

Notes: Cumulative hours operation based on statewide averages
Onsite truck travel speed of 10 mph

**0.0027 tons/year**

| Item No. | EF ID | NOx ZH EF (g/hp-hr) | NOx DR (g/hp-hr$^2$) | NOx Fuel CF | CO ZH EF (g/hp-hr) | CO DR (g/hp-hr$^2$) | CO Fuel CF | ROG ZH EF (g/hp-hr) | ROG DR (g/hp-hr$^2$) | ROG Fuel CF | PM2.5 ZH EF (g/hp-hr) | PM2.5 DR (g/hp-hr$^2$) | PM2.5 Fuel CF | CO2 ZH EF (g/hp-hr) | CO2 DR (g/hp-hr$^2$) | CO2 Fuel CF | SO2 (g/hp-hr) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Emission Factors - Off-Road Compression Ignited Engines** | | | | | | | | | | | | | | | | | |
| ***Demolition (4/1/2019)*** | | | | | | | | | | | | | | | | | |
| 1 | ULSD1752012 | 2.27 | 2.88E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.09 | 2.17E-05 | 1.00 | 0.01 | 5.00E-07 | 0.85 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| 2 | ULSD1752012 | 2.27 | 2.88E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.09 | 2.17E-05 | 1.00 | 0.01 | 5.00E-07 | 0.85 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| ***Mass Grading/ Excavation (4/15/2019)*** | | | | | | | | | | | | | | | | | |
| 3 | ULSD1752012 | 2.27 | 2.88E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.09 | 2.17E-05 | 1.00 | 0.01 | 5.00E-07 | 0.85 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| 4 | ULSD5002012 | 1.36 | 1.75E-05 | 0.95 | 0.92 | 1.82E-05 | 1.00 | 0.07 | 1.83E-05 | 1.00 | 0.01 | 3.75E-07 | 0.85 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| 5 | ULSD1202012 | 2.53 | 3.38E-05 | 0.95 | 3.05 | 8.10E-05 | 1.00 | 0.09 | 2.31E-05 | 1.00 | 0.06 | 4.30E-06 | 0.85 | 568.30 | 0.00E+00 | 1.00 | 0.007 |
| 6 | ULSD1752012 | 2.27 | 2.88E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.09 | 2.17E-05 | 1.00 | 0.01 | 5.00E-07 | 0.85 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| | ULSD1752012 | 2.27 | 2.88E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.09 | 2.17E-05 | 1.00 | 0.01 | 5.00E-07 | 0.85 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| ***Trenching-Utilities (5/1/2019)*** | | | | | | | | | | | | | | | | | |
| 7 | ULSD1202012 | 2.53 | 3.38E-05 | 0.95 | 3.05 | 8.10E-05 | 1.00 | 0.09 | 2.31E-05 | 1.00 | 0.06 | 4.30E-06 | 0.85 | 568.30 | 0.00E+00 | 1.00 | 0.007 |
| 8 | ULSD1752012 | 2.27 | 2.88E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.09 | 2.17E-05 | 1.00 | 0.01 | 5.00E-07 | 0.85 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| 9 | ULSD152012 | 4.37 | 0.00E+00 | 0.95 | 3.47 | 0.00E+00 | 1.00 | 0.49 | 0.00E+00 | 1.00 | 0.17 | 0.00E+00 | 0.85 | 568.30 | 0.00E+00 | 1.00 | 0.009 |
| ***Building - Exterior (5/15/2019)*** | | | | | | | | | | | | | | | | | |
| 10 | ULSD1752012 | 2.27 | 2.88E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.09 | 2.17E-05 | 1.00 | 0.01 | 5.00E-07 | 0.85 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| 11 | ULSD1202012 | 2.53 | 3.38E-05 | 0.95 | 3.05 | 8.10E-05 | 1.00 | 0.09 | 2.31E-05 | 1.00 | 0.06 | 4.30E-06 | 0.85 | 568.30 | 0.00E+00 | 1.00 | 0.007 |
| ***Building - Interior ((7/15/2019)*** | | | | | | | | | | | | | | | | | |
| 12 | ULSD1752012 | 2.27 | 2.88E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.09 | 2.17E-05 | 1.00 | 0.01 | 5.00E-07 | 0.85 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| ***Fine Grading/Landscaping 8/1/2019)*** | | | | | | | | | | | | | | | | | |
| 13 | ULSD502012 | 4.80 | 1.00E-04 | 0.95 | 2.72 | 2.76E-04 | 1.00 | 0.10 | 4.00E-05 | 1.00 | 0.15 | 1.20E-05 | 0.85 | 568.30 | 0.00E+00 | 1.00 | 0.007 |
| ***Paving (10/1/2019)*** | | | | | | | | | | | | | | | | | |
| 14 | ULSD1202012 | 2.53 | 3.38E-05 | 0.95 | 3.05 | 8.10E-05 | 1.00 | 0.09 | 2.31E-05 | 1.00 | 0.06 | 4.30E-06 | 0.85 | 568.30 | 0.00E+00 | 1.00 | 0.007 |
| 15 | ULSD1202012 | 2.53 | 3.38E-05 | 0.95 | 3.05 | 8.10E-05 | 1.00 | 0.09 | 2.31E-05 | 1.00 | 0.06 | 4.30E-06 | 0.85 | 568.30 | 0.00E+00 | 1.00 | 0.007 |
| 16 | ULSD502012 | 4.80 | 1.00E-04 | 0.95 | 2.72 | 2.76E-04 | 1.00 | 0.10 | 4.00E-05 | 1.00 | 0.15 | 1.20E-05 | 0.85 | 568.30 | 0.00E+00 | 1.00 | 0.007 |

Notes: ZH EF = Zero hour emission factor
DR = Deterioration rate
ULSD = Ultra low sulfur diesel (15 ppmw sulfur, 0.0015% sulfur)


Refs: CARB OFFFROAD2007 model (http://www.arb.ca.gov/msei/offroad/offroad.htm), December, 2006.
Stationary/Off-road engines ARB, "California's Emissions Inventory for Off-Road Large Compression-Ignited (CI) Engines (> 25 HP)" MAC#99-32

**Construction Equipment Exhaust Emissions**
**San Sebastian, Morgan Hill - 2020 with 2013 Equipment**

**Analysis Year = 2020**

| Item No. | *Off-Road Equipment* Equipment Type | No. Units | Engine Age (years) | Engine Model Year | Daily Hours In Use | Days Per Year | Unit Annual Hours Use | Use Factor | Load Factor | Cumulative Hours Operation Per Unit | Engine (hp) | Level of VDECS Used | Emission Factor (g/hp-hr) NOx | CO | VOC | PM2.5 | SO2 | CO2 | Annual Emissions (lb/yr) NOx | CO | VOC | PM2.5 | SO2 | CO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ***Phase 14 - Construction Activities*** | | | | | | | | | | | | | | | | | | | | | | | | |
| ***Demolition (4/1/2020)*** | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | Excavators | 1 | 7 | 2013 | 7 | 2 | 14 | 1.00 | 0.38 | 3,822 | 168 | 0 | 2.26 | 2.97 | 0.17 | 0.01 | 0.006 | 568.3 | 4.4 | 5.9 | 0.3 | 0.02 | 0.01 | 1120 |
| 2 | Rubber Tired Loaders | 1 | 7 | 2013 | 7 | 2 | 14 | 1.00 | 0.36 | 6,251 | 164 | 0 | 2.32 | 3.15 | 0.23 | 0.01 | 0.006 | 568.3 | 4.2 | 5.7 | 0.4 | 0.02 | 0.01 | 1036 |
| ***Mass Grading/ Excavation (4/15/2020)*** | | | | | | | | | | | | | | | | | | | | | | | | |
| 3 | Excavators | 1 | 7 | 2013 | 7 | 10 | 70 | 1.00 | 0.38 | 3,822 | 168 | 0 | 2.26 | 2.97 | 0.17 | 0.01 | 0.006 | 568.3 | 22.2 | 29.3 | 1.7 | 0.09 | 0.063 | 5599 |
| 4 | Scrapers | 2 | 7 | 2013 | 7 | 10 | 70 | 1.00 | 0.48 | 3,171 | 313 | 0 | 1.34 | 0.98 | 0.13 | 0.01 | 0.006 | 568.3 | 62.2 | 45.3 | 5.9 | 0.41 | 0.259 | 26353 |
| 5 | Rollers | 1 | 7 | 2013 | 7 | 10 | 70 | 1.00 | 0.38 | 2,093 | 95 | 0 | 2.47 | 3.22 | 0.14 | 0.01 | 0.007 | 568.3 | 13.7 | 17.9 | 0.8 | 0.05 | 0.037 | 3166 |
| 6 | Graders | 1 | 7 | 2013 | 7 | 10 | 70 | 1.00 | 0.41 | 4,270 | 174 | 0 | 2.27 | 3.00 | 0.18 | 0.01 | 0.006 | 568.3 | 24.8 | 32.8 | 2.0 | 0.11 | 0.070 | 6206 |
| | Rubber Tired Loaders | 1 | 7 | 2013 | 7 | 10 | 70 | 1.00 | 0.36 | 6,251 | 164 | 0 | 2.32 | 3.15 | 0.23 | 0.01 | 0.006 | 568.3 | 21.2 | 28.7 | 2.1 | 0.10 | 0.058 | 5178 |
| ***Trenching-Utilities (5/1/2020)*** | | | | | | | | | | | | | | | | | | | | | | | | |
| 7 | Tractors/Loaders/Backhoes | 1 | 7 | 2013 | 7 | 40 | 280 | 1.00 | 0.37 | 3,584 | 108 | 0 | 2.51 | 3.34 | 0.17 | 0.01 | 0.007 | 568.3 | 61.4 | 81.7 | 4.2 | 0.27 | 0.163 | 13892 |
| 8 | Excavators | 1 | 7 | 2013 | 7 | 40 | 280 | 1.00 | 0.38 | 3,822 | 168 | 0 | 2.26 | 2.97 | 0.17 | 0.01 | 0.006 | 568.3 | 88.9 | 117.2 | 6.8 | 0.37 | 0.252 | 22396 |
| 9 | Plate Compactors | 1 | 7 | 2013 | 7 | 40 | 280 | 1.00 | 0.29 | 4,200 | 8 | 0 | 4.14 | 3.47 | 0.49 | 0.15 | 0.009 | 568.3 | 5.9 | 4.9 | 0.7 | 0.21 | 0.013 | 805 |
| ***Building - Exterior (5/15/2020)*** | | | | | | | | | | | | | | | | | | | | | | | | |
| 10 | Forklifts | 2 | 7 | 2013 | 7 | 40 | 280 | 1.00 | 0.20 | 4,830 | 125 | 0 | 2.28 | 3.04 | 0.19 | 0.01 | 0.006 | 568.3 | 70.5 | 94.0 | 6.0 | 0.31 | 0.197 | 17541 |
| 11 | Aerial Lifts (electric) | 1 | 7 | 2013 | 7 | 40 | 280 | 1.00 | 0.20 | 1,862 | 60 | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.000 | 0.0 | 0.0 | 0.0 | 0.0 | 0.00 | 0.000 | 0 |
| ***Building - Interior ((7/15/2020)*** | | | | | | | | | | | | | | | | | | | | | | | | |
| 12 | Forklifts | 1 | 7 | 2013 | 7 | 40 | 280 | 1.00 | 0.20 | 4,830 | 125 | 0 | 2.28 | 3.04 | 0.19 | 0.01 | 0.006 | 568.3 | 35.2 | 47.0 | 3.0 | 0.15 | 0.099 | 8770 |
| ***Fine Grading/Landscaping 8/1/2020)*** | | | | | | | | | | | | | | | | | | | | | | | | |
| 13 | Skid Steer Loaders | 1 | 7 | 2013 | 7 | 30 | 210 | 1.00 | 0.37 | 2,079 | 44 | 0 | 2.87 | 3.29 | 0.18 | 0.01 | 0.007 | 568.3 | 21.4 | 24.6 | 1.4 | 0.07 | 0.055 | 4245 |
| ***Paving (10/1/2020)*** | | | | | | | | | | | | | | | | | | | | | | | | |
| 14 | Paving Equipment | 1 | 7 | 2013 | 7 | 2 | 14 | 1.00 | 0.36 | 2,800 | 104 | 0 | 2.49 | 3.28 | 0.15 | 0.01 | 0.007 | 568.3 | 2.9 | 3.8 | 0.2 | 0.01 | 0.008 | 657 |
| 15 | Rollers | 2 | 7 | 2013 | 7 | 2 | 14 | 1.00 | 0.37 | 2,093 | 85 | 0 | 2.47 | 3.22 | 0.14 | 0.01 | 0.007 | 568.3 | 4.8 | 6.3 | 0.3 | 0.02 | 0.013 | 1113 |
| 16 | Tractors/Loaders/Backhoes | 1 | 7 | 2013 | 7 | 2 | 14 | 1.00 | 0.37 | 3,584 | 44 | 0 | 2.95 | 3.71 | 0.24 | 0.01 | 0.007 | 568.3 | 1.5 | 1.8 | 0.1 | 0.01 | 0.004 | 283 |
| | **Total Off-Road Equipment** | | | | | | | | | | | | | | | | | | | | | **2.22** | | |
| ***On-Site On-Road Vehicles*** | | **No. Trucks** | | | **Hours/ Day** | **Days/ Year** | **Annual Hours per Truck** | | **Onsite Travel Miles** | | | | | | | **PM2.5 (g/mi)** | | | **NOx** | **CO** | **VOC** | **PM2.5** | **SO2** | **CO2** |
| ***Mass Grading/ Excavation*** | | | | | | | | | | | | | | | | | | | | | | | | |
| | Water Truck - Phase 14 | 1 | - | - | 2 | 10 | 20 | - | 200.0 | | - | - | | | | 0.0772 | | | | | | 0.03 | | |
| ***Fine Grading/Landscaping*** | | | | | | | | | | | | | | | | | | | | | | | | |
| | Water Truck Phases 14 | 1 | - | - | 2 | 30 | 60 | - | 600.0 | | - | - | | | | 0.0772 | | | | | | 0.10 | | |
| | **Total On-Road Vehicles** | | | | | | | | | | | | | | | | | | | | | **0.14** | | |
| **TOTAL On-Site - On and Off Roa** | | - | | | - | - | | - | - | - | - | | - | - | - | - | | | | | | **2.36** | | |

Notes: Cumulative hours operation based on statewide averages
Onsite truck travel speed of 10 mph

**0.0012 tons/year**

**Emission Factors - Off-Road Compression Ignited Engines**

| Item No. | EF ID | NOx ZH EF (g/hp-hr) | NOx DR ($g/hp-hr^2$) | NOx Fuel CF | CO ZH EF (g/hp-hr) | CO DR ($g/hp-hr^2$) | CO Fuel CF | ROG ZH EF (g/hp-hr) | ROG DR ($g/hp-hr^2$) | ROG Fuel CF | PM2.5 ZH EF (g/hp-hr) | PM2.5 DR ($g/hp-hr^2$) | PM2.5 Fuel CF | CO2 ZH EF (g/hp-hr) | CO2 DR ($g/hp-hr^2$) | CO2 Fuel CF | SO2 (g/hp-hr) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ***Demolition (4/1/2020)*** | | | | | | | | | | | | | | | | | |
| 1 | ULSD1752013 | 2.27 | 2.88E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.09 | 2.17E-05 | 1.00 | 0.01 | 5.00E-07 | 0.85 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| 2 | ULSD1752013 | 2.27 | 2.88E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.09 | 2.17E-05 | 1.00 | 0.01 | 5.00E-07 | 0.85 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| ***Mass Grading/ Excavation (4/15/2020)*** | | | | | | | | | | | | | | | | | |
| 3 | ULSD1752013 | 2.27 | 2.88E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.09 | 2.17E-05 | 1.00 | 0.01 | 5.00E-07 | 0.85 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| 4 | ULSD5002013 | 1.36 | 1.75E-05 | 0.95 | 0.92 | 1.82E-05 | 1.00 | 0.07 | 1.83E-05 | 1.00 | 0.01 | 3.75E-07 | 0.85 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| 5 | ULSD1202013 | 2.53 | 3.38E-05 | 0.95 | 3.05 | 8.10E-05 | 1.00 | 0.09 | 2.31E-05 | 1.00 | 0.01 | 1.04E-06 | 0.85 | 568.30 | 0.00E+00 | 1.00 | 0.007 |
| 6 | ULSD1752013 | 2.27 | 2.88E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.09 | 2.17E-05 | 1.00 | 0.01 | 5.00E-07 | 0.85 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| | ULSD1752013 | 2.27 | 2.88E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.09 | 2.17E-05 | 1.00 | 0.01 | 5.00E-07 | 0.85 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| ***Trenching-Utilities (5/1/2020)*** | | | | | | | | | | | | | | | | | |
| 7 | ULSD1202013 | 2.53 | 3.38E-05 | 0.95 | 3.05 | 8.10E-05 | 1.00 | 0.09 | 2.31E-05 | 1.00 | 0.01 | 1.04E-06 | 0.85 | 568.30 | 0.00E+00 | 1.00 | 0.007 |
| 8 | ULSD1752013 | 2.27 | 2.88E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.09 | 2.17E-05 | 1.00 | 0.01 | 5.00E-07 | 0.85 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| 9 | ULSD152013 | 4.37 | 0.00E+00 | 0.95 | 3.47 | 0.00E+00 | 1.00 | 0.49 | 0.00E+00 | 1.00 | 0.17 | 0.00E+00 | 0.85 | 568.30 | 0.00E+00 | 1.00 | 0.009 |
| ***Building - Exterior (5/15/2020)*** | | | | | | | | | | | | | | | | | |
| 10 | ULSD1752013 | 2.27 | 2.88E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.09 | 2.17E-05 | 1.00 | 0.01 | 5.00E-07 | 0.85 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| 11 | ULSD1202013 | 2.53 | 3.38E-05 | 0.95 | 3.05 | 8.10E-05 | 1.00 | 0.09 | 2.31E-05 | 1.00 | 0.01 | 1.04E-06 | 0.85 | 568.30 | 0.00E+00 | 1.00 | 0.007 |
| ***Building - Interior ((7/15/2020)*** | | | | | | | | | | | | | | | | | |
| 12 | ULSD1752013 | 2.27 | 2.88E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.09 | 2.17E-05 | 1.00 | 0.01 | 5.00E-07 | 0.85 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| ***Fine Grading/Landscaping 8/1/2020)*** | | | | | | | | | | | | | | | | | |
| 13 | ULSD502013 | 2.90 | 6.00E-05 | 0.95 | 2.72 | 2.76E-04 | 1.00 | 0.10 | 4.00E-05 | 1.00 | 0.01 | 1.20E-06 | 0.85 | 568.30 | 0.00E+00 | 1.00 | 0.007 |
| ***Paving (10/1/2020)*** | | | | | | | | | | | | | | | | | |
| 14 | ULSD1202013 | 2.53 | 3.38E-05 | 0.95 | 3.05 | 8.10E-05 | 1.00 | 0.09 | 2.31E-05 | 1.00 | 0.01 | 1.04E-06 | 0.85 | 568.30 | 0.00E+00 | 1.00 | 0.007 |
| 15 | ULSD1202013 | 2.53 | 3.38E-05 | 0.95 | 3.05 | 8.10E-05 | 1.00 | 0.09 | 2.31E-05 | 1.00 | 0.01 | 1.04E-06 | 0.85 | 568.30 | 0.00E+00 | 1.00 | 0.007 |
| 16 | ULSD502013 | 2.90 | 6.00E-05 | 0.95 | 2.72 | 2.76E-04 | 1.00 | 0.10 | 4.00E-05 | 1.00 | 0.01 | 1.20E-06 | 0.85 | 568.30 | 0.00E+00 | 1.00 | 0.007 |

Notes: ZH EF = Zero hour emission factor
DR = Deterioration rate
ULSD = Ultra low sulfur diesel (15 ppmw sulfur, 0.0015% sulfur)

Refs: CARB OFFFROAD2007 model (http://www.arb.ca.gov/msei/offroad/offroad.htm), December, 2006.
Stationary/Off-road engines ARB, "California's Emissions Inventory for Off-Road Large Compression-Ignited (CI) Engines (> 25 HP)" MAC#99-32

**Construction Equipment Exhaust Emissions**
**San Sebastian, Morgan Hill - 2021 with 2014 Equipment**

**Analysis Year = 2021**

| Item No. | Off-Road Equipment / Equipment Type | No. Units | Engine Age (years) | Engine Model Year | Daily Hours In Use | Days Per Year | Unit Annual Hours Use | Use Factor | Load Factor | Cumulative Hours Operation Per Unit | Engine (hp) | Level of VDECS Used | Emission Factor (g/hp-hr) NOx | CO | VOC | PM2.5 | SO2 | CO2 | Annual Emissions (lb/yr) NOx | CO | VOC | PM2.5 | SO2 | CO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ***Phase 15 - Construction Activities*** | | | | | | | | | | | | | | | | | | | | | | | | |
| ***Demolition (4/1/2021)*** | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | Excavators | 1 | 7 | 2014 | 7 | 2 | 14 | 1.00 | 0.38 | 3,822 | 168 | 0 | 2.26 | 2.97 | 0.17 | 0.01 | 0.006 | 568.3 | 4.4 | 5.9 | 0.3 | 0.02 | 0.01 | 1120 |
| 2 | Rubber Tired Loaders | 1 | 7 | 2014 | 7 | 2 | 14 | 1.00 | 0.36 | 6,251 | 164 | 0 | 2.32 | 3.15 | 0.23 | 0.01 | 0.006 | 568.3 | 4.2 | 5.7 | 0.4 | 0.02 | 0.01 | 1036 |
| ***Mass Grading/ Excavation (4/15/2021)*** | | | | | | | | | | | | | | | | | | | | | | | | |
| 3 | Excavators | 1 | 7 | 2014 | 7 | 10 | 70 | 1.00 | 0.38 | 3,822 | 168 | 0 | 2.26 | 2.97 | 0.17 | 0.01 | 0.006 | 568.3 | 22.2 | 29.3 | 1.7 | 0.09 | 0.063 | 5599 |
| 4 | Scrapers | 2 | 7 | 2014 | 7 | 10 | 70 | 1.00 | 0.48 | 3,171 | 313 | 0 | 0.27 | 0.98 | 0.09 | 0.01 | 0.006 | 568.3 | 12.4 | 45.3 | 4.0 | 0.41 | 0.259 | 26353 |
| 5 | Rollers | 1 | 7 | 2014 | 7 | 10 | 70 | 1.00 | 0.38 | 2,093 | 95 | 0 | 2.47 | 3.22 | 0.14 | 0.01 | 0.007 | 568.3 | 13.7 | 17.9 | 0.8 | 0.05 | 0.037 | 3166 |
| 6 | Graders | 1 | 7 | 2014 | 7 | 10 | 70 | 1.00 | 0.41 | 4,270 | 174 | 0 | 2.27 | 3.00 | 0.18 | 0.01 | 0.006 | 568.3 | 24.8 | 32.8 | 2.0 | 0.11 | 0.070 | 6206 |
| | Rubber Tired Loaders | 1 | 7 | 2014 | 7 | 10 | 70 | 1.00 | 0.36 | 6,251 | 164 | 0 | 2.32 | 3.15 | 0.23 | 0.01 | 0.006 | 568.3 | 21.2 | 28.7 | 2.1 | 0.10 | 0.058 | 5178 |
| ***Trenching-Utilities (5/1/2021)*** | | | | | | | | | | | | | | | | | | | | | | | | |
| 7 | Tractors/Loaders/Backhoes | 1 | 7 | 2014 | 7 | 40 | 280 | 1.00 | 0.37 | 3,584 | 108 | 0 | 2.51 | 3.34 | 0.17 | 0.01 | 0.007 | 568.3 | 61.4 | 81.7 | 4.2 | 0.27 | 0.163 | 13892 |
| 8 | Excavators | 1 | 7 | 2014 | 7 | 40 | 280 | 1.00 | 0.38 | 3,822 | 168 | 0 | 2.26 | 2.97 | 0.17 | 0.01 | 0.006 | 568.3 | 88.9 | 117.2 | 6.8 | 0.37 | 0.252 | 22396 |
| 9 | Plate Compactors | 1 | 7 | 2014 | 7 | 40 | 280 | 1.00 | 0.29 | 4,200 | 8 | 0 | 4.14 | 3.47 | 0.49 | 0.15 | 0.009 | 568.3 | 5.9 | 4.9 | 0.7 | 0.21 | 0.013 | 805 |
| ***Building - Exterior (5/15/2021)*** | | | | | | | | | | | | | | | | | | | | | | | | |
| 10 | Forklifts | 2 | 7 | 2014 | 7 | 40 | 280 | 1.00 | 0.20 | 4,830 | 125 | 0 | 2.28 | 3.04 | 0.19 | 0.01 | 0.006 | 568.3 | 70.5 | 94.0 | 6.0 | 0.31 | 0.197 | 17541 |
| 11 | Aerial Lifts (electric) | 1 | 7 | 2014 | 7 | 40 | 280 | 1.00 | 0.20 | 1,862 | 60 | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.000 | 0.0 | 0.0 | 0.0 | 0.0 | 0.00 | 0.000 | 0 |
| ***Building - Interior ((7/15/2021)*** | | | | | | | | | | | | | | | | | | | | | | | | |
| 12 | Forklifts | 1 | 7 | 2014 | 7 | 40 | 280 | 1.00 | 0.20 | 4,830 | 125 | 0 | 2.28 | 3.04 | 0.19 | 0.01 | 0.006 | 568.3 | 35.2 | 47.0 | 3.0 | 0.15 | 0.099 | 8770 |
| ***Fine Grading/Landscaping 8/1/2021)*** | | | | | | | | | | | | | | | | | | | | | | | | |
| 13 | Skid Steer Loaders | 1 | 7 | 2014 | 7 | 30 | 210 | 1.00 | 0.37 | 2,079 | 44 | 0 | 2.87 | 3.29 | 0.18 | 0.01 | 0.007 | 568.3 | 21.4 | 24.6 | 1.4 | 0.07 | 0.055 | 4245 |
| ***Paving (10/1/2021)*** | | | | | | | | | | | | | | | | | | | | | | | | |
| 14 | Paving Equipment | 1 | 7 | 2014 | 7 | 2 | 14 | 1.00 | 0.36 | 2,800 | 104 | 0 | 2.49 | 3.28 | 0.15 | 0.01 | 0.007 | 568.3 | 2.9 | 3.8 | 0.2 | 0.01 | 0.008 | 657 |
| 15 | Rollers | 2 | 7 | 2014 | 7 | 2 | 14 | 1.00 | 0.37 | 2,093 | 85 | 0 | 2.47 | 3.22 | 0.14 | 0.01 | 0.007 | 568.3 | 4.8 | 6.3 | 0.3 | 0.02 | 0.013 | 1113 |
| 16 | Tractors/Loaders/Backhoes | 1 | 7 | 2014 | 7 | 2 | 14 | 1.00 | 0.37 | 3,584 | 44 | 0 | 2.95 | 3.71 | 0.24 | 0.01 | 0.007 | 568.3 | 1.5 | 1.8 | 0.1 | 0.01 | 0.004 | 283 |
| | **Total Off-Road Equipment** | | | | | | | | | | | | | | | | | | | | | **2.22** | | |
| ***On-Site On-Road Vehicles*** | | **No. Trucks** | | | **Hours/ Day** | **Days/ Year** | **Annual Hours per Truck** | | **Onsite Travel Miles** | | | | | | | **PM2.5 (g/mi)** | | | **NOx** | **CO** | **VOC** | **PM2.5** | **SO2** | **CO2** |
| ***Mass Grading/ Excavation*** | | | | | | | | | | | | | | | | | | | | | | | | |
| | Water Truck - Phase 15 | 1 | - | - | 2 | 10 | 20 | - | 200.0 | | - | - | | | | 0.0702 | | | | | | 0.03 | | |
| ***Fine Grading/Landscaping*** | | | | | | | | | | | | | | | | | | | | | | | | |
| | Water Truck Phases 15 | 1 | - | - | 2 | 30 | 60 | - | 600.0 | | - | - | | | | 0.0702 | | | | | | 0.09 | | |
| | **Total On-Road Vehicles** | | | | | | | | | | | | | | | | | | | | | **0.12** | | |
| **TOTAL On-Site - On and Off Roa** | | **-** | | | **-** | **-** | | **-** | **-** | **-** | **-** | | **-** | **-** | **-** | **-** | | | | | | **2.34** | | |

Notes: Cumulative hours operation based on statewide averages
Onsite truck travel speed of 10 mph

**0.0012 tons/year**

| **Emission Factors - Off-Road Compression Ignited Engines** | | NOx | | | CO | | | ROG | | | PM2.5 | | | CO2 | | | SO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Item No.** | **EF ID** | **ZH EF (g/hp-hr)** | **DR (g/hp-hr$^2$)** | **Fuel CF** | **ZH EF (g/hp-hr)** | **DR (g/hp-hr$^2$)** | **Fuel CF** | **ZH EF (g/hp-hr)** | **DR (g/hp-hr$^2$)** | **Fuel CF** | **ZH EF (g/hp-hr)** | **DR (g/hp-hr$^2$)** | **Fuel CF** | **ZH EF (g/hp-hr)** | **DR (g/hp-hr$^2$)** | **Fuel CF** | **(g/hp-hr)** |
| ***Demolition (4/1/2021)*** | | | | | | | | | | | | | | | | | |
| 1 | ULSD1752014 | 2.27 | 2.88E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.09 | 2.17E-05 | 1.00 | 0.01 | 5.00E-07 | 0.85 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| 2 | ULSD1752014 | 2.27 | 2.88E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.09 | 2.17E-05 | 1.00 | 0.01 | 5.00E-07 | 0.85 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| ***Mass Grading/ Excavation (4/15/2021)*** | | | | | | | | | | | | | | | | | |
| 3 | ULSD1752014 | 2.27 | 2.88E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.09 | 2.17E-05 | 1.00 | 0.01 | 5.00E-07 | 0.85 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| 4 | ULSD5002014 | 0.27 | 3.75E-06 | 0.95 | 0.92 | 1.82E-05 | 1.00 | 0.05 | 1.17E-05 | 1.00 | 0.01 | 3.75E-07 | 0.85 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| 5 | ULSD1202014 | 2.53 | 3.38E-05 | 0.95 | 3.05 | 8.10E-05 | 1.00 | 0.09 | 2.31E-05 | 1.00 | 0.01 | 1.04E-06 | 0.85 | 568.30 | 0.00E+00 | 1.00 | 0.007 |
| 6 | ULSD1752014 | 2.27 | 2.88E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.09 | 2.17E-05 | 1.00 | 0.01 | 5.00E-07 | 0.85 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| | ULSD1752014 | 2.27 | 2.88E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.09 | 2.17E-05 | 1.00 | 0.01 | 5.00E-07 | 0.85 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| ***Trenching-Utilities (5/1/2021)*** | | | | | | | | | | | | | | | | | |
| 7 | ULSD1202014 | 2.53 | 3.38E-05 | 0.95 | 3.05 | 8.10E-05 | 1.00 | 0.09 | 2.31E-05 | 1.00 | 0.01 | 1.04E-06 | 0.85 | 568.30 | 0.00E+00 | 1.00 | 0.007 |
| 8 | ULSD1752014 | 2.27 | 2.88E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.09 | 2.17E-05 | 1.00 | 0.01 | 5.00E-07 | 0.85 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| 9 | ULSD152014 | 4.37 | 0.00E+00 | 0.95 | 3.47 | 0.00E+00 | 1.00 | 0.49 | 0.00E+00 | 1.00 | 0.17 | 0.00E+00 | 0.85 | 568.30 | 0.00E+00 | 1.00 | 0.009 |
| ***Building - Exterior (5/15/2021)*** | | | | | | | | | | | | | | | | | |
| 10 | ULSD1752014 | 2.27 | 2.88E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.09 | 2.17E-05 | 1.00 | 0.01 | 5.00E-07 | 0.85 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| 11 | ULSD1202014 | 2.53 | 3.38E-05 | 0.95 | 3.05 | 8.10E-05 | 1.00 | 0.09 | 2.31E-05 | 1.00 | 0.01 | 1.04E-06 | 0.85 | 568.30 | 0.00E+00 | 1.00 | 0.007 |
| ***Building - Interior ((7/15/2021)*** | | | | | | | | | | | | | | | | | |
| 12 | ULSD1752014 | 2.27 | 2.88E-05 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.09 | 2.17E-05 | 1.00 | 0.01 | 5.00E-07 | 0.85 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| ***Fine Grading/Landscaping 8/1/2021)*** | | | | | | | | | | | | | | | | | |
| 13 | ULSD502014 | 2.90 | 6.00E-05 | 0.95 | 2.72 | 2.76E-04 | 1.00 | 0.10 | 4.00E-05 | 1.00 | 0.01 | 1.20E-06 | 0.85 | 568.30 | 0.00E+00 | 1.00 | 0.007 |
| ***Paving (10/1/2021)*** | | | | | | | | | | | | | | | | | |
| 14 | ULSD1202014 | 2.53 | 3.38E-05 | 0.95 | 3.05 | 8.10E-05 | 1.00 | 0.09 | 2.31E-05 | 1.00 | 0.01 | 1.04E-06 | 0.85 | 568.30 | 0.00E+00 | 1.00 | 0.007 |
| 15 | ULSD1202014 | 2.53 | 3.38E-05 | 0.95 | 3.05 | 8.10E-05 | 1.00 | 0.09 | 2.31E-05 | 1.00 | 0.01 | 1.04E-06 | 0.85 | 568.30 | 0.00E+00 | 1.00 | 0.007 |
| 16 | ULSD502014 | 2.90 | 6.00E-05 | 0.95 | 2.72 | 2.76E-04 | 1.00 | 0.10 | 4.00E-05 | 1.00 | 0.01 | 1.20E-06 | 0.85 | 568.30 | 0.00E+00 | 1.00 | 0.007 |

Notes: ZH EF = Zero hour emission factor
DR = Deterioration rate
ULSD = Ultra low sulfur diesel (15 ppmw sulfur, 0.0015% sulfur)

Refs: CARB OFFFROAD2007 model (http://www.arb.ca.gov/msei/offroad/offroad.htm), December, 2006.
Stationary/Off-road engines ARB, "California's Emissions Inventory for Off-Road Large Compression-Ignited (CI) Engines (> 25 HP)" MAC#99-32

**Construction Equipment Exhaust Emissions**
**San Sebastian, Morgan Hill - 2022 with 2015 Equipment**

**Analysis Year = 2022**

| Item No. | *Off-Road Equipment* Equipment Type | No. Units | Engine Age (years) | Engine Model Year | Daily Hours In Use | Days Per Year | Unit Annual Hours Use | Use Factor | Load Factor | Cumulative Hours Operation Per Unit | Engine (hp) | Level of VDECS Used | Emission Factor (g/hp-hr) NOx | CO | VOC | PM2.5 | SO2 | CO2 | Annual Emissions (lb/yr) NOx | CO | VOC | PM2.5 | SO2 | CO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ***Phase 16 - Construction Activities*** | | | | | | | | | | | | | | | | | | | | | | | | |
| ***Demolition (4/1/2022)*** | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | Excavators | 1 | 7 | 2015 | 7 | 2 | 14 | 1.00 | 0.38 | 3,822 | 168 | 0 | 0.27 | 2.97 | 0.09 | 0.01 | 0.006 | 568.3 | 0.5 | 5.9 | 0.2 | 0.02 | 0.01 | 1120 |
| 2 | Rubber Tired Loaders | 1 | 7 | 2015 | 7 | 2 | 14 | 1.00 | 0.36 | 6,251 | 164 | 0 | 0.28 | 3.15 | 0.12 | 0.01 | 0.006 | 568.3 | 0.5 | 5.7 | 0.2 | 0.02 | 0.01 | 1036 |
| ***Mass Grading/ Excavation (4/15/2022)*** | | | | | | | | | | | | | | | | | | | | | | | | |
| 3 | Excavators | 1 | 7 | 2015 | 7 | 10 | 70 | 1.00 | 0.38 | 3,822 | 168 | 0 | 0.27 | 2.97 | 0.09 | 0.01 | 0.006 | 568.3 | 2.7 | 29.3 | 0.9 | 0.09 | 0.063 | 5599 |
| 4 | Scrapers | 2 | 7 | 2015 | 7 | 10 | 70 | 1.00 | 0.48 | 3,171 | 313 | 0 | 0.27 | 0.98 | 0.09 | 0.01 | 0.006 | 568.3 | 12.4 | 45.3 | 4.0 | 0.41 | 0.259 | 26353 |
| 5 | Rollers | 1 | 7 | 2015 | 7 | 10 | 70 | 1.00 | 0.38 | 2,093 | 95 | 0 | 1.36 | 3.22 | 0.11 | 0.01 | 0.007 | 568.3 | 7.6 | 17.9 | 0.6 | 0.05 | 0.037 | 3166 |
| 6 | Graders | 1 | 7 | 2015 | 7 | 10 | 70 | 1.00 | 0.41 | 4,270 | 174 | 0 | 0.27 | 3.00 | 0.10 | 0.01 | 0.006 | 568.3 | 3.0 | 32.8 | 1.1 | 0.11 | 0.070 | 6206 |
| | Rubber Tired Loaders | 1 | 7 | 2015 | 7 | 10 | 70 | 1.00 | 0.36 | 6,251 | 164 | 0 | 0.28 | 3.15 | 0.12 | 0.01 | 0.006 | 568.3 | 2.5 | 28.7 | 1.1 | 0.10 | 0.058 | 5178 |
| ***Trenching-Utilities (5/1/2022)*** | | | | | | | | | | | | | | | | | | | | | | | | |
| 7 | Tractors/Loaders/Backhoes | 1 | 7 | 2015 | 7 | 40 | 280 | 1.00 | 0.37 | 3,584 | 108 | 0 | 1.39 | 3.34 | 0.13 | 0.01 | 0.007 | 568.3 | 34.0 | 81.7 | 3.2 | 0.27 | 0.163 | 13892 |
| 8 | Excavators | 1 | 7 | 2015 | 7 | 40 | 280 | 1.00 | 0.38 | 3,822 | 168 | 0 | 0.27 | 2.97 | 0.09 | 0.01 | 0.006 | 568.3 | 10.6 | 117.2 | 3.7 | 0.37 | 0.252 | 22396 |
| 9 | Plate Compactors | 1 | 7 | 2015 | 7 | 40 | 280 | 1.00 | 0.29 | 4,200 | 8 | 0 | 4.14 | 3.47 | 0.49 | 0.15 | 0.009 | 568.3 | 5.9 | 4.9 | 0.7 | 0.21 | 0.013 | 805 |
| ***Building - Exterior (5/15/2022)*** | | | | | | | | | | | | | | | | | | | | | | | | |
| 10 | Forklifts | 2 | 7 | 2015 | 7 | 40 | 280 | 1.00 | 0.20 | 4,830 | 125 | 0 | 0.27 | 3.04 | 0.11 | 0.01 | 0.006 | 568.3 | 8.4 | 94.0 | 3.3 | 0.31 | 0.197 | 17541 |
| 11 | Aerial Lifts (electric) | 1 | 7 | 2015 | 7 | 40 | 280 | 1.00 | 0.20 | 1,862 | 60 | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.000 | 0.0 | 0.0 | 0.0 | 0.0 | 0.00 | 0.000 | 0 |
| ***Building - Interior ((7/15/2022)*** | | | | | | | | | | | | | | | | | | | | | | | | |
| 12 | Forklifts | 1 | 7 | 2015 | 7 | 40 | 280 | 1.00 | 0.20 | 4,830 | 125 | 0 | 0.27 | 3.04 | 0.11 | 0.01 | 0.006 | 568.3 | 4.2 | 47.0 | 1.6 | 0.15 | 0.099 | 8770 |
| ***Fine Grading/Landscaping 8/1/2022)*** | | | | | | | | | | | | | | | | | | | | | | | | |
| 13 | Skid Steer Loaders | 1 | 7 | 2015 | 7 | 30 | 210 | 1.00 | 0.37 | 2,079 | 44 | 0 | 2.87 | 3.29 | 0.18 | 0.01 | 0.007 | 568.3 | 21.4 | 24.6 | 1.4 | 0.07 | 0.055 | 4245 |
| ***Paving (10/1/2022)*** | | | | | | | | | | | | | | | | | | | | | | | | |
| 14 | Paving Equipment | 1 | 7 | 2015 | 7 | 2 | 14 | 1.00 | 0.36 | 2,800 | 104 | 0 | 1.38 | 3.28 | 0.12 | 0.01 | 0.007 | 568.3 | 1.6 | 3.8 | 0.1 | 0.01 | 0.008 | 657 |
| 15 | Rollers | 2 | 7 | 2015 | 7 | 2 | 14 | 1.00 | 0.37 | 2,093 | 85 | 0 | 1.36 | 3.22 | 0.11 | 0.01 | 0.007 | 568.3 | 2.7 | 6.3 | 0.2 | 0.02 | 0.013 | 1113 |
| 16 | Tractors/Loaders/Backhoes | 1 | 7 | 2015 | 7 | 2 | 14 | 1.00 | 0.37 | 3,584 | 44 | 0 | 2.95 | 3.71 | 0.24 | 0.01 | 0.007 | 568.3 | 1.5 | 1.8 | 0.1 | 0.01 | 0.004 | 283 |
| | **Total Off-Road Equipment** | | | | | | | | | | | | | | | | | | | | | **2.22** | | |
| ***On-Site On-Road Vehicles*** | | **No. Trucks** | | | **Hours/ Day** | **Days/ Year** | **Annual Hours per Truck** | | **Onsite Travel Miles** | | | | | | | **PM2.5 (g/mi)** | | | **NOx** | **CO** | **VOC** | **PM2.5** | **SO2** | **CO2** |
| ***Mass Grading/ Excavation*** | | | | | | | | | | | | | | | | | | | | | | | | |
| | Water Truck - Phase 16 | 1 | - | - | 2 | 10 | 20 | - | 200.0 | | - | - | | | | 0.0688 | | | | | | 0.03 | | |
| ***Fine Grading/Landscaping*** | | | | | | | | | | | | | | | | | | | | | | | | |
| | Water Truck Phases 16 | 1 | - | - | 2 | 30 | 60 | - | 600.0 | | - | - | | | | 0.0688 | | | | | | 0.09 | | |
| | **Total On-Road Vehicles** | | | | | | | | | | | | | | | | | | | | | **0.12** | | |
| **TOTAL On-Site - On and Off Roa** | | - | | | - | - | | - | - | - | - | | - | - | - | - | | | | | | **2.34** | | |

Notes: Cumulative hours operation based on statewide averages
Onsite truck travel speed of 10 mph

**0.0012 tons/year**

**Emission Factors - Off-Road Compression Ignited Engines**

| Item No. | EF ID | NOx ZH EF (g/hp-hr) | NOx DR $(g/hp-hr^2)$ | NOx Fuel CF | CO ZH EF (g/hp-hr) | CO DR $(g/hp-hr^2)$ | CO Fuel CF | ROG ZH EF (g/hp-hr) | ROG DR $(g/hp-hr^2)$ | ROG Fuel CF | PM2.5 ZH EF (g/hp-hr) | PM2.5 DR $(g/hp-hr^2)$ | PM2.5 Fuel CF | CO2 ZH EF (g/hp-hr) | CO2 DR $(g/hp-hr^2)$ | CO2 Fuel CF | SO2 (g/hp-hr) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ***Demolition (4/1/2022)*** | | | | | | | | | | | | | | | | | |
| 1 | ULSD1752015 | 0.27 | 3.75E-06 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.05 | 1.17E-05 | 1.00 | 0.01 | 5.00E-07 | 0.85 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| 2 | ULSD1752015 | 0.27 | 3.75E-06 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.05 | 1.17E-05 | 1.00 | 0.01 | 5.00E-07 | 0.85 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| ***Mass Grading/ Excavation (4/15/2022)*** | | | | | | | | | | | | | | | | | |
| 3 | ULSD1752015 | 0.27 | 3.75E-06 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.05 | 1.17E-05 | 1.00 | 0.01 | 5.00E-07 | 0.85 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| 4 | ULSD5002015 | 0.27 | 3.75E-06 | 0.95 | 0.92 | 1.82E-05 | 1.00 | 0.05 | 1.17E-05 | 1.00 | 0.01 | 3.75E-07 | 0.85 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| 5 | ULSD1202015 | 1.40 | 1.88E-05 | 0.95 | 3.05 | 8.10E-05 | 1.00 | 0.07 | 1.74E-05 | 1.00 | 0.01 | 1.04E-06 | 0.85 | 568.30 | 0.00E+00 | 1.00 | 0.007 |
| 6 | ULSD1752015 | 0.27 | 3.75E-06 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.05 | 1.17E-05 | 1.00 | 0.01 | 5.00E-07 | 0.85 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| | ULSD1752015 | 0.27 | 3.75E-06 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.05 | 1.17E-05 | 1.00 | 0.01 | 5.00E-07 | 0.85 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| ***Trenching-Utilities (5/1/2022)*** | | | | | | | | | | | | | | | | | |
| 7 | ULSD1202015 | 1.40 | 1.88E-05 | 0.95 | 3.05 | 8.10E-05 | 1.00 | 0.07 | 1.74E-05 | 1.00 | 0.01 | 1.04E-06 | 0.85 | 568.30 | 0.00E+00 | 1.00 | 0.007 |
| 8 | ULSD1752015 | 0.27 | 3.75E-06 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.05 | 1.17E-05 | 1.00 | 0.01 | 5.00E-07 | 0.85 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| 9 | ULSD152015 | 4.37 | 0.00E+00 | 0.95 | 3.47 | 0.00E+00 | 1.00 | 0.49 | 0.00E+00 | 1.00 | 0.17 | 0.00E+00 | 0.85 | 568.30 | 0.00E+00 | 1.00 | 0.009 |
| ***Building - Exterior (5/15/2022)*** | | | | | | | | | | | | | | | | | |
| 10 | ULSD1752015 | 0.27 | 3.75E-06 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.05 | 1.17E-05 | 1.00 | 0.01 | 5.00E-07 | 0.85 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| 11 | ULSD1202015 | 1.40 | 1.88E-05 | 0.95 | 3.05 | 8.10E-05 | 1.00 | 0.07 | 1.74E-05 | 1.00 | 0.01 | 1.04E-06 | 0.85 | 568.30 | 0.00E+00 | 1.00 | 0.007 |
| ***Building - Interior ((7/15/2022)*** | | | | | | | | | | | | | | | | | |
| 12 | ULSD1752015 | 0.27 | 3.75E-06 | 0.95 | 2.70 | 7.14E-05 | 1.00 | 0.05 | 1.17E-05 | 1.00 | 0.01 | 5.00E-07 | 0.85 | 568.30 | 0.00E+00 | 1.00 | 0.006 |
| ***Fine Grading/Landscaping 8/1/2022)*** | | | | | | | | | | | | | | | | | |
| 13 | ULSD502015 | 2.90 | 6.00E-05 | 0.95 | 2.72 | 2.76E-04 | 1.00 | 0.10 | 4.00E-05 | 1.00 | 0.01 | 1.20E-06 | 0.85 | 568.30 | 0.00E+00 | 1.00 | 0.007 |
| ***Paving (10/1/2022)*** | | | | | | | | | | | | | | | | | |
| 14 | ULSD1202015 | 1.40 | 1.88E-05 | 0.95 | 3.05 | 8.10E-05 | 1.00 | 0.07 | 1.74E-05 | 1.00 | 0.01 | 1.04E-06 | 0.85 | 568.30 | 0.00E+00 | 1.00 | 0.007 |
| 15 | ULSD1202015 | 1.40 | 1.88E-05 | 0.95 | 3.05 | 8.10E-05 | 1.00 | 0.07 | 1.74E-05 | 1.00 | 0.01 | 1.04E-06 | 0.85 | 568.30 | 0.00E+00 | 1.00 | 0.007 |
| 16 | ULSD502015 | 2.90 | 6.00E-05 | 0.95 | 2.72 | 2.76E-04 | 1.00 | 0.10 | 4.00E-05 | 1.00 | 0.01 | 1.20E-06 | 0.85 | 568.30 | 0.00E+00 | 1.00 | 0.007 |

Notes: ZH EF = Zero hour emission factor
DR = Deterioration rate
ULSD = Ultra low sulfur diesel (15 ppmw sulfur, 0.0015% sulfur)

Refs: CARB OFFFROAD2007 model (http://www.arb.ca.gov/msei/offroad/offroad.htm), December, 2006.
Stationary/Off-road engines ARB, "California's Emissions Inventory for Off-Road Large Compression-Ignited (CI) Engines (> 25 HP)" MAC#99-32

**San Sebastian Homes - Morgan Hill, CA**
**DPM Emissions from Haul Truck Travel**

| Year/Road Segment | Construction Phase | Import/Export Volume (cy) | Number[a] Truck Trips | Travel Speed (mph) | DPM Emission Factor[b] (g/mi) | Annual Emissions (lb/year) | Hourly[c] Emissions (lb/hr) |
|---|---|---|---|---|---|---|---|
| ***2012*** | 1 | 27,900 | | | | | |
| Cochrane-Cochrane | | | 2,790 | 35 | 0.28239 | 1.71 | 5.19E-04 |
| Site - North | | | 2,790 | 15 | 0.55362 | 1.19 | 3.63E-04 |
| ***2013*** | 2 & 3 | 27,900 | | | | | |
| Cochrane-Cochrane | | | 2,790 | 35 | 0.21991 | 1.33 | 4.04E-04 |
| Site - North | | | 2,790 | 15 | 0.42530 | 0.92 | 2.79E-04 |
| ***2014*** | 4 & 5 | 24,200 | | | | | |
| Cochrane-Cochrane | | | 2,420 | 35 | 0.12477 | 0.65 | 1.99E-04 |
| Site - North | | | 2,420 | 15 | 0.25004 | 0.47 | 1.42E-04 |
| ***2015*** | 6 & 7 | 20,600 | | | | | |
| Cochrane - Peet Rd | | | 2,060 | 35 | 0.08696 | 0.33 | 1.01E-04 |
| Site - South | | | 2,060 | 15 | 0.16286 | 0.22 | 6.74E-05 |
| ***2016*** | 8 & 9 | 25,800 | | | | | |
| Cochrane - Peet Rd | | | 2,580 | 35 | 0.06541 | 0.31 | 9.56E-05 |
| Site - South | | | 2,580 | 15 | 0.09827 | 0.17 | 5.10E-05 |
| ***2017*** | 10 & 11 | 19,000 | | | | | |
| Cochrane - Peet Rd | | | 1,900 | 35 | 0.05742 | 0.20 | 6.18E-05 |
| Site - South | | | 1,900 | 15 | 0.07942 | 0.10 | 3.03E-05 |
| ***2018*** | 12 | 28,900 | | | | | |
| Cochrane - Peet Rd | | | 2,890 | 35 | 0.05676 | 0.31 | 9.29E-05 |
| Site - South | | | 2,890 | 15 | 0.07626 | 0.15 | 4.43E-05 |
| ***2019*** | 13 | 28,900 | | | | | |
| Cochrane-Cochrane | | | 2,890 | 35 | 0.05597 | 0.35 | 1.07E-04 |
| Site - North | | | 2,890 | 15 | 0.07323 | 0.16 | 4.98E-05 |
| ***2020*** | 14 | 19,800 | | | | | |
| Cochrane-Cochrane | | | 1,980 | 35 | 0.05509 | 0.24 | 7.19E-05 |
| Site - North | | | 1,980 | 15 | 0.06729 | 0.10 | 3.13E-05 |
| ***2021*** | 15 | 16,900 | | | | | |
| Cochrane - Peet Rd | | | 1,690 | 35 | 0.05419 | 0.17 | 5.19E-05 |
| Site - South | | | 1,690 | 15 | 0.06308 | 0.07 | 2.14E-05 |
| ***2022*** | 16 | 16,550 | | | | | |
| Cochrane - Peet Rd | | | 1,655 | 35 | 0.05335 | 0.16 | 5.00E-05 |
| Site - South | | | 1,655 | 15 | 0.06194 | 0.07 | 2.06E-05 |

a Truck trips based on 20 cubic yard haul truck capacity
b Emission factors from EMFAC2011 for PM2.5 at listed travel speed.
c Hourly based on modeling 365 days/year for 9 hours per day.

| **Daily Construction Schedule (hr/day) =** | 9 |
|---|---|

| **Road Segment Distances** | **(feet)** | **(mi)** |
|---|---|---|
| Cochrane - Cochrane | 5,185 | 0.98 |
| Site - North | 1,850 | 0.35 |
| Cochrane - Peet Rd | 4,455 | 0.84 |
| Site - South | 1,581 | 0.30 |

| Project Names: San Sebastian Homes | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 2012-2013 | | | | | | | | |
| Qty | Description | HP | Load Factor | Hours/day | Work Days | Total Annual Hours | HP hours | Comments |
| Start Year | 2012 | | | | | | | |
| **Demolition** | | Start Date: | 10/1/2012 | | | | | Hauling volume = 100 cubic yards |
| 1 | Excavator | 168 | 0.38 | 7 | 2 | 14 | 894 | or Demolition volume |
| 1 | Rubber Tire Loader | 164 | 0.36 | 7 | 2 | 14 | 827 | |
| | | | | | | | | |
| **Mass Grading / Excavation** | | Start Date: | 10/15/2012 | | | | | |
| 1 | Excavator | 168 | 0.38 | 7 | 15 | 105 | 6,703 | |
| 1 | Water Truck | 189 | 0.34 | 7 | 15 | 105 | 6,747 | Cut To Fill Volume = Approx_27900 cubic yards |
| 2 | Scraper | 313 | 0.48 | 7 | 15 | 210 | 31,550 | |
| 1 | Rollers | 95 | 0.38 | 7 | 15 | 105 | 3,791 | |
| 1 | Grader | 174 | 0.41 | 7 | 15 | 105 | 7,491 | |
| 1 | Rubber Tire Loader | 164 | 0.36 | 7 | 15 | 105 | 6,199 | |
| | | | | | | | | |
| **Trenching-Utilities (Wet and Dry)** | | Start Date: | 11/1/2012 | | | | | |
| 1 | Tractor/Loader/Backhoe | 108 | 0.37 | 7 | 40 | 280 | 11,189 | |
| 1 | Excavator | 168 | 0.38 | 7 | 40 | 280 | 17,875 | |
| 1 | Plate Compactors | 8 | 0.29 | 7 | 40 | 280 | 650 | |
| | | | | | | | | |
| **Building - Exterior** | | Start Date: | 11/15/2012 | | | | | |
| 2 | Forklift | 125 | 0.2 | 7 | 50 | 700 | 17,500 | Diesel |
| 1 | Aerial Lift | 60 | 0.31 | 7 | 50 | 350 | 6,510 | Electric-Yes |
| | | | | | | | | |
| | | Start Date: | 1/15/2013 | | | | | |
| **Building - Interior** | | | | | | | | |
| 1 | Forklift | 125 | 0.2 | 7 | 50 | 350 | 8,750 | Diesel |
| | | | | | | | | |
| **Fine Grading/Landscaping** | | Start Date: | 2/1/2013 | | | | | |
| 1 | Skid Steer Loader | 44 | 0.37 | 7 | 30 | 210 | 3,419 | |
| 1 | Water Truck | 189 | 0.34 | 7 | 30 | 210 | 13,495 | |
| | | | | | | | | |
| **Paving** | | Start Date: | 4/1/2013 | | | | | |
| 1 | Paving Equipment | 104 | 0.36 | 7 | 2 | 14 | 524 | |
| 2 | Roller | 95 | 0.38 | 7 | 2 | 28 | 1,011 | |
| 1 | Skid Steer Loader | 44 | 0.37 | 7 | 2 | 14 | 228 | |

| Project Names: San Sebastian Homes | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 2013 | | | | | | | | |
| Qty | Description | HP | Load Factor | Hours/day | Work Days | Total Annual Hours | HP hours | Comments |
| Start Year | 2013 | | | | | | | |
| **Demolition** | | Start Date: | 4/1/2013 | | | | | Hauling volume = Less Than 50 cubic yards or Demolition volume |
| 1 | Excavator | 168 | 0.38 | 7 | 1 | 7 | 447 | |
| 1 | Rubber Tire Loader | 164 | 0.36 | 7 | 1 | 7 | 413 | |
| | | | | | | | | |
| **Mass Grading / Excavation** | | Start Date: | 4/15/2013 | | | | | |
| 1 | Excavator | 168 | 0.38 | 7 | 10 | 70 | 4,469 | |
| 1 | Water Truck | 189 | 0.34 | 7 | 10 | 70 | 4,498 | Cut To Fill Volume = Approx_27900 cubic yards |
| 2 | Scraper | 313 | 0.72 | 7 | 10 | 140 | 31,550 | |
| 1 | Rollers | 95 | 0.56 | 7 | 10 | 70 | 3,724 | |
| 1 | Grader | 174 | 0.61 | 7 | 10 | 70 | 7,430 | |
| 1 | Rubber Tire Loader | 164 | 0.36 | 7 | 10 | 70 | 4,133 | |
| | | | | | | | | |
| **Trenching-Utilities (Wet and Dry)** | | Start Date: | 5/1/2013 | | | | | |
| 1 | Tractor/Loader/Backhoe | 108 | 0.37 | 7 | 15 | 105 | 4,196 | |
| 1 | Excavator | 168 | 0.38 | 7 | 15 | 105 | 6,703 | |
| 1 | Plate Compactors | 8 | 0.43 | 7 | 15 | 105 | 361 | |
| | | | | | | | | |
| **Building - Exterior** | | Start Date: | 5/15/2013 | | | | | |
| 2 | Forklift | 125 | 0.2 | 7 | 50 | 700 | 17,500 | Diesel |
| 1 | Aerial Lift | 60 | 0.31 | 7 | 50 | 350 | 6,510 | Electric-Yes |
| | | | | | | | | |
| | | Start Date: | 7/15/2013 | | | | | |
| **Building - Interior** | | | | | | | | |
| 1 | Forklift | 125 | 0.2 | 7 | 50 | 350 | 8,750 | Diesel |
| | | | | | | | | |
| **Fine Grading/Landscaping** | | Start Date: | 8/1/2013 | | | | | |
| 1 | Skid Steer Loader | 44 | 0.37 | 7 | 22 | 154 | 2,507 | |
| 1 | Water Truck | 189 | 0.34 | 7 | 22 | 154 | 9,896 | |
| | | | | | | | | |
| **Paving** | | Start Date: | 10/1/2013 | | | | | |
| 1 | Paving Equipment | 104 | 0.42 | 7 | 2 | 14 | 612 | |
| 2 | Roller | 95 | 0.38 | 7 | 2 | 28 | 1,011 | |
| 1 | Skid Steer Loader | 44 | 0.37 | 7 | 2 | 14 | 228 | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Project Names: San Sebastian Homes** | | | | | | | | |
| 2013-2014 | | | | | | | | |
| **Qty** | **Description** | **HP** | **Load Factor** | **Hours/day** | **Work Days** | **Total Annual Hours** | **HP hours** | **Comments** |
| Start Year | 2013 | | | | | | | |
| **Demolition** | | Start Date: | 10/1/2013 | | | | | Hauling volume = 50 cubic yards |
| 1 | Excavator | 168 | 0.38 | 7 | 1 | 7 | 447 | or Demolition volume |
| 1 | Rubber Tire Loader | 164 | 0.36 | 7 | 1 | 7 | 413 | |
| | | | | | | | | |
| **Mass Grading / Excavation** | | Start Date: | 10/15/2013 | | | | | |
| 1 | Excavator | 168 | 0.38 | 7 | 10 | 70 | 4,469 | |
| 1 | Water Truck | 189 | 0.34 | 7 | 10 | 70 | 4,498 | Cut To Fill Volume = Approx_19500 cubic yards |
| 2 | Scraper | 313 | 0.72 | 7 | 10 | 140 | 31,550 | |
| 1 | Rollers | 95 | 0.56 | 7 | 10 | 70 | 3,724 | |
| 1 | Grader | 174 | 0.61 | 7 | 10 | 70 | 7,430 | |
| 1 | Rubber Tire Loader | 164 | 0.36 | 7 | 10 | 70 | 4,133 | |
| | | | | | | | | |
| **Trenching-Utilities (Wet and Dry)** | | Start Date: | 11/1/2013 | | | | | |
| 1 | Tractor/Loader/Backhoe | 108 | 0.37 | 7 | 25 | 175 | 6,993 | |
| 1 | Excavator | 168 | 0.38 | 7 | 25 | 175 | 11,172 | |
| 1 | Plate Compactors | 8 | 0.43 | 7 | 25 | 175 | 602 | |
| | | | | | | | | |
| **Building - Exterior** | | Start Date: | 11/15/2013 | | | | | |
| 2 | Forklift | 125 | 0.2 | 7 | 50 | 700 | 17,500 | Diesel |
| 1 | Aerial Lift | 60 | 0.31 | 7 | 50 | 350 | 6,510 | Electric-Yes |
| | | | | | | | | |
| | | Start Date: | 1/15/2014 | | | | | |
| **Building - Interior** | | | | | | | | |
| 1 | Forklift | 125 | 0.2 | 7 | 50 | 350 | 8,750 | Diesel |
| | | | | | | | | |
| **Fine Grading/Landscaping** | | Start Date: | 2/1/2014 | | | | | |
| 1 | Skid Steer Loader | 44 | 0.37 | 7 | 22 | 154 | 2,507 | |
| 1 | Water Truck | 189 | 0.34 | 7 | 22 | 154 | 9,896 | |
| | | | | | | | | |
| **Paving** | | Start Date: | 4/1/2014 | | | | | |
| 1 | Paving Equipment | 104 | 0.42 | 7 | 2 | 14 | 612 | |
| 2 | Roller | 95 | 0.38 | 7 | 2 | 28 | 1,011 | |
| 1 | Skid Steer Loader | 44 | 0.37 | 7 | 2 | 14 | 228 | |

| Project Names: San Sebastian Homes | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 2014 | | | | | | | | |
| Qty | Description | HP | Load Factor | Hours/day | Work Days | Total Annual Hours | HP hours | Comments |
| Start Year | 2014 | | | | | | | |
| **Demolition** | | Start Date: | 4/1/2014 | | | | | Hauling volume = 50 cubic yards |
| 1 | Excavator | 168 | 0.38 | 7 | 2 | 14 | 894 | or Demolition volume |
| 1 | Rubber Tire Loader | 164 | 0.36 | 7 | 2 | 14 | 827 | |
| | | | | | | | | |
| **Mass Grading / Excavation** | | Start Date: | 4/15/2014 | | | | | |
| 1 | Excavator | 168 | 0.38 | 7 | 10 | 70 | 4,469 | |
| 1 | Water Truck | 189 | 0.34 | 7 | 10 | 70 | 4,498 | Cut To Fill Volume = Approx_12600 cubic yards |
| 2 | Scraper | 313 | 0.72 | 7 | 10 | 140 | 31,550 | |
| 1 | Rollers | 95 | 0.56 | 7 | 10 | 70 | 3,724 | |
| 1 | Grader | 174 | 0.61 | 7 | 10 | 70 | 7,430 | |
| 1 | Rubber Tire Loader | 164 | 0.36 | 7 | 10 | 70 | 4,133 | |
| | | | | | | | | |
| **Trenching-Utilities (Wet and Dry)** | | Start Date: | 5/1/2014 | | | | | |
| 1 | Tractor/Loader/Backhoe | 108 | 0.37 | 7 | 25 | 175 | 6,993 | |
| 1 | Excavator | 168 | 0.38 | 7 | 25 | 175 | 11,172 | |
| 1 | Plate Compactors | 8 | 0.43 | 7 | 25 | 175 | 602 | |
| | | | | | | | | |
| **Building - Exterior** | | Start Date: | 5/15/2014 | | | | | |
| 2 | Forklift | 125 | 0.2 | 7 | 50 | 700 | 17,500 | Diesel |
| 1 | Aerial Lift | 60 | 0.31 | 7 | 50 | 350 | 6,510 | Electric-Yes |
| | | | | | | | | |
| | | Start Date: | 7/15/2014 | | | | | |
| **Building - Interior** | | | | | | | | |
| 1 | Forklift | 125 | 0.2 | 7 | 50 | 350 | 8,750 | Diesel |
| | | | | | | | | |
| **Fine Grading/Landscaping** | | Start Date: | 8/1/2014 | | | | | |
| 1 | Skid Steer Loader | 44 | 0.37 | 7 | 22 | 154 | 2,507 | |
| 1 | Water Truck | 189 | 0.34 | 7 | 22 | 154 | 9,896 | |
| | | | | | | | | |
| **Paving** | | Start Date: | 10/1/2014 | | | | | |
| 1 | Paving Equipment | 104 | 0.42 | 7 | 2 | 14 | 612 | |
| 2 | Roller | 95 | 0.38 | 7 | 2 | 28 | 1,011 | |
| 1 | Skid Steer Loader | 44 | 0.37 | 7 | 2 | 14 | 228 | |

| Project Names: San Sebastian Homes | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 2014-2015 | | | | | | | | |
| Qty | Description | HP | Load Factor | Hours/day | Work Days | Total Annual Hours | HP hours | Comments |
| Start Year | 2014 | | | | | | | |
| **Demolition** | | Start Date: | 10/1/2014 | | | | | Hauling volume = 50 cubic yards |
| 1 | Excavator | 168 | 0.38 | 7 | 1 | 7 | 447 | or Demolition volume |
| 1 | Rubber Tire Loader | 164 | 0.36 | 7 | 1 | 7 | 413 | |
| | | | | | | | | |
| **Mass Grading / Excavation** | | Start Date: | 10/15/2014 | | | | | |
| 1 | Excavator | 168 | 0.38 | 7 | 10 | 70 | 4,469 | |
| 1 | Water Truck | 189 | 0.34 | 7 | 10 | 70 | 4,498 | Cut To Fill Volume = Approx_11600 cubic yards |
| 2 | Scraper | 313 | 0.72 | 7 | 10 | 140 | 31,550 | |
| 1 | Rollers | 95 | 0.56 | 7 | 10 | 70 | 3,724 | |
| 1 | Grader | 174 | 0.61 | 7 | 10 | 70 | 7,430 | |
| 1 | Rubber Tire Loader | 164 | 0.36 | 7 | 10 | 70 | 4,133 | |
| | | | | | | | | |
| **Trenching-Utilities (Wet and Dry)** | | Start Date: | 11/1/2014 | | | | | |
| 1 | Tractor/Loader/Backhoe | 108 | 0.37 | 7 | 30 | 210 | 8,392 | |
| 1 | Excavator | 168 | 0.38 | 7 | 30 | 210 | 13,406 | |
| 1 | Plate Compactors | 8 | 0.43 | 7 | 30 | 210 | 722 | |
| | | | | | | | | |
| **Building - Exterior** | | Start Date: | 11/15/2014 | | | | | |
| 2 | Forklift | 125 | 0.2 | 7 | 50 | 700 | 17,500 | Diesel |
| 1 | Aerial Lift | 60 | 0.31 | 7 | 50 | 350 | 6,510 | Electric-Yes |
| | | | | | | | | |
| | | Start Date: | 1/15/2015 | | | | | |
| **Building - Interior** | | | | | | | | |
| 1 | Forklift | 125 | 0.2 | 7 | 50 | 350 | 8,750 | Diesel |
| | | | | | | | | |
| **Fine Grading/Landscaping** | | Start Date: | 2/1/2015 | | | | | |
| 1 | Skid Steer Loader | 44 | 0.37 | 7 | 23 | 161 | 2,621 | |
| 1 | Water Truck | 189 | 0.34 | 7 | 23 | 161 | 10,346 | |
| | | | | | | | | |
| **Paving** | | Start Date: | 4/1/2015 | | | | | |
| 1 | Paving Equipment | 104 | 0.42 | 7 | 2 | 14 | 612 | |
| 2 | Roller | 95 | 0.38 | 7 | 2 | 28 | 1,011 | |
| 1 | Skid Steer Loader | 44 | 0.37 | 7 | 2 | 14 | 228 | |

| Project Names: San Sebastian Homes | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 2015 | | | | | | | | |
| Qty | Description | HP | Load Factor | Hours/day | Work Days | Total Annual Hours | HP hours | Comments |
| Start Year | 2015 | | | | | | | |
| **Demolition** | | Start Date: | 4/1/2015 | | | | | Hauling volume = 50 cubic yards |
| 1 | Excavator | 168 | 0.38 | 7 | 1 | 7 | 447 | or Demolition volume |
| 1 | Rubber Tire Loader | 164 | 0.36 | 7 | 1 | 7 | 413 | |
| | | | | | | | | |
| **Mass Grading / Excavation** | | Start Date: | 4/15/2015 | | | | | |
| 1 | Excavator | 168 | 0.38 | 7 | 10 | 70 | 4,469 | |
| 1 | Water Truck | 189 | 0.34 | 7 | 10 | 70 | 4,498 | Cut To Fill Volume = Approx_9800 cubic yards |
| 2 | Scraper | 313 | 0.72 | 7 | 10 | 140 | 31,550 | |
| 1 | Rollers | 95 | 0.56 | 7 | 10 | 70 | 3,724 | |
| 1 | Grader | 174 | 0.61 | 7 | 10 | 70 | 7,430 | |
| 1 | Rubber Tire Loader | 164 | 0.36 | 7 | 10 | 70 | 4,133 | |
| | | | | | | | | |
| **Trenching-Utilities (Wet and Dry)** | | Start Date: | 5/1/2015 | | | | | |
| 1 | Tractor/Loader/Backhoe | 108 | 0.37 | 7 | 40 | 280 | 11,189 | |
| 1 | Excavator | 168 | 0.38 | 7 | 40 | 280 | 17,875 | |
| 1 | Plate Compactors | 8 | 0.43 | 7 | 40 | 280 | 963 | |
| | | | | | | | | |
| **Building - Exterior** | | Start Date: | 5/15/2015 | | | | | |
| 2 | Forklift | 125 | 0.2 | 7 | 50 | 700 | 17,500 | Diesel |
| 1 | Aerial Lift | 60 | 0.31 | 7 | 50 | 350 | 6,510 | Electric-Yes |
| | | | | | | | | |
| | | Start Date: | 7/15/2015 | | | | | |
| **Building - Interior** | | | | | | | | |
| 1 | Forklift | 125 | 0.2 | 7 | 50 | 350 | 8,750 | Diesel |
| | | | | | | | | |
| **Fine Grading/Landscaping** | | Start Date: | 8/1/2015 | | | | | |
| 1 | Skid Steer Loader | 44 | 0.37 | 7 | 30 | 210 | 3,419 | |
| 1 | Water Truck | 189 | 0.34 | 7 | 30 | 210 | 13,495 | |
| | | | | | | | | |
| **Paving** | | Start Date: | 10/1/2015 | | | | | |
| 1 | Paving Equipment | 104 | 0.42 | 7 | 2 | 14 | 612 | |
| 2 | Roller | 95 | 0.38 | 7 | 2 | 28 | 1,011 | |
| 1 | Skid Steer Loader | 44 | 0.37 | 7 | 2 | 14 | 228 | |

| Project Names: San Sebastian Homes | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 2015-2016 | | | | | | | | |
| Qty | Description | HP | Load Factor | Hours/day | Work Days | Total Annual Hours | HP hours | Comments |
| Start Year | 2015 | | | | | | | |
| **Demolition** | | Start Date: | 10/1/2015 | | | | | Hauling volume = 50 cubic yards or Demolition volume |
| 1 | Excavator | 168 | 0.38 | 7 | 1 | 7 | 447 | |
| 1 | Rubber Tire Loader | 164 | 0.36 | 7 | 1 | 7 | 413 | |
| | | | | | | | | |
| **Mass Grading / Excavation** | | Start Date: | 10/15/2015 | | | | | |
| 1 | Excavator | 168 | 0.38 | 7 | 10 | 70 | 4,469 | |
| 1 | Water Truck | 189 | 0.34 | 7 | 10 | 70 | 4,498 | Cut To Fill Volume = Approx_10800 cubic yards |
| 2 | Scraper | 313 | 0.72 | 7 | 10 | 140 | 31,550 | |
| 1 | Rollers | 95 | 0.56 | 7 | 10 | 70 | 3,724 | |
| 1 | Grader | 174 | 0.61 | 7 | 10 | 70 | 7,430 | |
| 1 | Rubber Tire Loader | 164 | 0.36 | 7 | 10 | 70 | 4,133 | |
| | | | | | | | | |
| **Trenching-Utilities (Wet and Dry)** | | Start Date: | 11/1/2015 | | | | | |
| 1 | Tractor/Loader/Backhoe | 108 | 0.37 | 7 | 40 | 280 | 11,189 | |
| 1 | Excavator | 168 | 0.38 | 7 | 40 | 280 | 17,875 | |
| 1 | Plate Compactors | 8 | 0.43 | 7 | 40 | 280 | 963 | |
| | | | | | | | | |
| **Building - Exterior** | | Start Date: | 11/15/2015 | | | | | |
| 2 | Forklift | 125 | 0.2 | 7 | 50 | 700 | 17,500 | Diesel |
| 1 | Aerial Lift | 60 | 0.31 | 7 | 50 | 350 | 6,510 | Electric-Yes |
| | | | | | | | | |
| | | Start Date: | 1/15/2016 | | | | | |
| **Building - Interior** | | | | | | | | |
| 1 | Forklift | 125 | 0.2 | 7 | 50 | 350 | 8,750 | Diesel |
| | | | | | | | | |
| **Fine Grading/Landscaping** | | Start Date: | 2/1/2016 | | | | | |
| 1 | Skid Steer Loader | 44 | 0.37 | 7 | 25 | 175 | 2,849 | |
| 1 | Water Truck | 189 | 0.34 | 7 | 25 | 175 | 11,246 | |
| | | | | | | | | |
| **Paving** | | Start Date: | 4/1/2016 | | | | | |
| 1 | Paving Equipment | 104 | 0.42 | 7 | 2 | 14 | 612 | |
| 2 | Roller | 95 | 0.38 | 7 | 2 | 28 | 1,011 | |
| 1 | Skid Steer Loader | 44 | 0.37 | 7 | 2 | 14 | 228 | |

| Project Names: San Sebastian Homes | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 2016 | | | | | | | | |
| Qty | Description | HP | Load Factor | Hours/day | Work Days | Total Annual Hours | HP hours | Comments |
| Start Year | 2016 | | | | | | | |
| **Demolition** | | Start Date: | 4/1/2016 | | | | | Hauling volume = 50 cubic yards or Demolition volume |
| 1 | Excavator | 168 | 0.38 | 7 | 1 | 7 | 447 | |
| 1 | Rubber Tire Loader | 164 | 0.36 | 7 | 1 | 7 | 413 | |
| | | | | | | | | |
| **Mass Grading / Excavation** | | Start Date: | 4/15/2016 | | | | | |
| 1 | Excavator | 168 | 0.38 | 7 | 10 | 70 | 4,469 | |
| 1 | Water Truck | 189 | 0.34 | 7 | 10 | 70 | 4,498 | Cut To Fill Volume = Approx_14800 cubic yards |
| 2 | Scraper | 313 | 0.72 | 7 | 10 | 140 | 31,550 | |
| 1 | Rollers | 95 | 0.56 | 7 | 10 | 70 | 3,724 | |
| 1 | Grader | 174 | 0.61 | 7 | 10 | 70 | 7,430 | |
| 1 | Rubber Tire Loader | 164 | 0.36 | 7 | 10 | 70 | 4,133 | |
| | | | | | | | | |
| **Trenching-Utilities (Wet and Dry)** | | Start Date: | 5/1/2016 | | | | | |
| 1 | Tractor/Loader/Backhoe | 108 | 0.37 | 7 | 40 | 280 | 11,189 | |
| 1 | Excavator | 168 | 0.38 | 7 | 40 | 280 | 17,875 | |
| 1 | Plate Compactors | 8 | 0.43 | 7 | 40 | 280 | 963 | |
| | | | | | | | | |
| **Building - Exterior** | | Start Date: | 5/15/2016 | | | | | |
| 2 | Forklift | 125 | 0.2 | 7 | 50 | 700 | 17,500 | Diesel |
| 1 | Aerial Lift | 60 | 0.31 | 7 | 50 | 350 | 6,510 | Electric-Yes |
| | | | | | | | | |
| | | Start Date: | 7/15/2016 | | | | | |
| **Building - Interior** | | | | | | | | |
| 1 | Forklift | 125 | 0.2 | 7 | 50 | 350 | 8,750 | Diesel |
| | | | | | | | | |
| **Fine Grading/Landscaping** | | Start Date: | 8/1/2016 | | | | | |
| 1 | Skid Steer Loader | 44 | 0.37 | 7 | 25 | 175 | 2,849 | |
| 1 | Water Truck | 189 | 0.34 | 7 | 25 | 175 | 11,246 | |
| | | | | | | | | |
| **Paving** | | Start Date: | 10/1/2016 | | | | | |
| 1 | Paving Equipment | 104 | 0.42 | 7 | 2 | 14 | 612 | |
| 2 | Roller | 95 | 0.38 | 7 | 2 | 28 | 1,011 | |
| 1 | Skid Steer Loader | 44 | 0.37 | 7 | 2 | 14 | 228 | |

| Project Names: San Sebastian Homes | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 2016-2017 | | | | | | | | |
| Qty | Description | HP | Load Factor | Hours/day | Work Days | Total Annual Hours | HP hours | Comments |
| Start Year | 2016 | | | | | | | |
| **Demolition** | | Start Date: | 10/1/2016 | | | | | Hauling volume = 50 cubic yards or Demolition volume |
| 1 | Excavator | 168 | 0.38 | 7 | 1 | 7 | 447 | |
| 1 | Rubber Tire Loader | 164 | 0.36 | 7 | 1 | 7 | 413 | |
| | | | | | | | | |
| **Mass Grading / Excavation** | | Start Date: | 10/15/2016 | | | | | |
| 1 | Excavator | 168 | 0.38 | 7 | 10 | 70 | 4,469 | |
| 1 | Water Truck | 189 | 0.34 | 7 | 10 | 70 | 4,498 | Cut To Fill Volume = Approx_11000 cubic yards |
| 2 | Scraper | 313 | 0.72 | 7 | 10 | 140 | 31,550 | |
| 1 | Rollers | 95 | 0.56 | 7 | 10 | 70 | 3,724 | |
| 1 | Grader | 174 | 0.61 | 7 | 10 | 70 | 7,430 | |
| 1 | Rubber Tire Loader | 164 | 0.36 | 7 | 10 | 70 | 4,133 | |
| | | | | | | | | |
| **Trenching-Utilities (Wet and Dry)** | | Start Date: | 11/1/2016 | | | | | |
| 1 | Tractor/Loader/Backhoe | 108 | 0.37 | 7 | 35 | 245 | 9,790 | |
| 1 | Excavator | 168 | 0.38 | 7 | 35 | 245 | 15,641 | |
| 1 | Plate Compactors | 8 | 0.43 | 7 | 35 | 245 | 843 | |
| | | | | | | | | |
| **Building - Exterior** | | Start Date: | 11/15/2016 | | | | | |
| 2 | Forklift | 125 | 0.2 | 7 | 50 | 700 | 17,500 | Diesel |
| 1 | Aerial Lift | 60 | 0.31 | 7 | 50 | 350 | 6,510 | Electric-Yes |
| | | | | | | | | |
| | | Start Date: | 1/15/2017 | | | | | |
| **Building - Interior** | | | | | | | | |
| 1 | Forklift | 125 | 0.2 | 7 | 50 | 350 | 8,750 | Diesel |
| | | | | | | | | |
| **Fine Grading/Landscaping** | | Start Date: | 2/1/2017 | | | | | |
| 1 | Skid Steer Loader | 44 | 0.37 | 7 | 25 | 175 | 2,849 | |
| 1 | Water Truck | 189 | 0.34 | 7 | 25 | 175 | 11,246 | |
| | | | | | | | | |
| **Paving** | | Start Date: | 4/1/2017 | | | | | |
| 1 | Paving Equipment | 104 | 0.42 | 7 | 2 | 14 | 612 | |
| 2 | Roller | 95 | 0.38 | 7 | 2 | 28 | 1,011 | |
| 1 | Skid Steer Loader | 44 | 0.37 | 7 | 2 | 14 | 228 | |

| Project Names: San Sebastian Homes | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 2017 | | | | | | | | |
| Qty | Description | HP | Load Factor | Hours/day | Work Days | Total Annual Hours | HP hours | Comments |
| Start Year | 2017 | | | | | | | |
| **Demolition** | | Start Date: | 4/1/2017 | | | | | Hauling volume = 50 cubic yards |
| 1 | Excavator | 168 | 0.38 | 7 | 1 | 7 | 447 | or Demolition volume |
| 1 | Rubber Tire Loader | 164 | 0.36 | 7 | 1 | 7 | 413 | |
| | | | | | | | | |
| **Mass Grading / Excavation** | | Start Date: | 4/15/2017 | | | | | |
| 1 | Excavator | 168 | 0.38 | 7 | 25 | 175 | 11,172 | |
| 1 | Water Truck | 189 | 0.34 | 7 | 25 | 175 | 11,246 | Cut To Fill Volume = Approx_14600 cubic yards |
| 2 | Scraper | 313 | 0.72 | 7 | 25 | 350 | 78,876 | |
| 1 | Rollers | 95 | 0.56 | 7 | 25 | 175 | 9,310 | |
| 1 | Grader | 174 | 0.61 | 7 | 25 | 175 | 18,575 | |
| 1 | Rubber Tire Loader | 164 | 0.36 | 7 | 25 | 175 | 10,332 | |
| | | | | | | | | |
| **Trenching-Utilities (Wet and Dry)** | | Start Date: | 5/1/2017 | | | | | |
| 1 | Tractor/Loader/Backhoe | 108 | 0.37 | 7 | 30 | 210 | 8,392 | |
| 1 | Excavator | 168 | 0.38 | 7 | 30 | 210 | 13,406 | |
| 1 | Plate Compactors | 8 | 0.43 | 7 | 30 | 210 | 722 | |
| | | | | | | | | |
| **Building - Exterior** | | Start Date: | 5/15/2017 | | | | | |
| 2 | Forklift | 125 | 0.2 | 7 | 50 | 700 | 17,500 | Diesel |
| 1 | Aerial Lift | 60 | 0.31 | 7 | 50 | 350 | 6,510 | Electric-Yes |
| | | | | | | | | |
| | | Start Date: | 7/15/2017 | | | | | |
| **Building - Interior** | | | | | | | | |
| 1 | Forklift | 125 | 0.2 | 7 | 50 | 350 | 8,750 | Diesel |
| | | | | | | | | |
| **Fine Grading/Landscaping** | | Start Date: | 8/1/2017 | | | | | |
| 1 | Skid Steer Loader | 44 | 0.37 | 7 | 30 | 210 | 3,419 | |
| 1 | Water Truck | 189 | 0.34 | 7 | 30 | 210 | 13,495 | |
| | | | | | | | | |
| **Paving** | | Start Date: | 10/1/2017 | | | | | |
| 1 | Paving Equipment | 104 | 0.42 | 7 | 2 | 14 | 612 | |
| 2 | Roller | 95 | 0.38 | 7 | 2 | 28 | 1,011 | |
| 1 | Skid Steer Loader | 44 | 0.37 | 7 | 2 | 14 | 228 | |

| Project Names: San Sebastian Homes | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 2017-2018 | | | | | | | | |
| | | | | | | Total | | |
| Qty | Description | HP | Load Factor | Hours/day | Work Days | Annual Hours | HP hours | Comments |
| Start Year | 2017 | | | | | | | |
| **Demolition** | | Start Date: | 10/1/2017 | | | | | Hauling volume = 50 cubic yards |
| 1 | Excavator | 168 | 0.38 | 7 | 1 | 7 | 447 | or Demolition volume |
| 1 | Rubber Tire Loader | 164 | 0.36 | 7 | 1 | 7 | 413 | |
| | | | | | | | | |
| **Mass Grading / Excavation** | | Start Date: | 10/15/2017 | | | | | |
| 1 | Excavator | 168 | 0.38 | 7 | 10 | 70 | 4,469 | |
| 1 | Water Truck | 189 | 0.34 | 7 | 10 | 70 | 4,498 | Cut To Fill Volume = Approx_4400 cubic yards |
| 2 | Scraper | 313 | 0.72 | 7 | 10 | 140 | 31,550 | |
| 1 | Rollers | 95 | 0.56 | 7 | 10 | 70 | 3,724 | |
| 1 | Grader | 174 | 0.61 | 7 | 10 | 70 | 7,430 | |
| 1 | Rubber Tire Loader | 164 | 0.36 | 7 | 10 | 70 | 4,133 | |
| | | | | | | | | |
| **Trenching-Utilities (Wet and Dry)** | | Start Date: | 11/1/2017 | | | | | |
| 1 | Tractor/Loader/Backhoe | 108 | 0.37 | 7 | 40 | 280 | 11,189 | |
| 1 | Excavator | 168 | 0.38 | 7 | 40 | 280 | 17,875 | |
| 1 | Plate Compactors | 8 | 0.43 | 7 | 40 | 280 | 963 | |
| | | | | | | | | |
| **Building - Exterior** | | Start Date: | 11/15/2017 | | | | | |
| 2 | Forklift | 125 | 0.2 | 7 | 40 | 560 | 14,000 | Diesel |
| 1 | Aerial Lift | 60 | 0.31 | 7 | 40 | 280 | 5,208 | Electric-Yes |
| | | | | | | | | |
| | | Start Date: | 1/15/2018 | | | | | |
| **Building - Interior** | | | | | | | | |
| 1 | Forklift | 125 | 0.2 | 7 | 40 | 280 | 7,000 | Diesel |
| | | | | | | | | |
| **Fine Grading/Landscaping** | | Start Date: | 2/1/2018 | | | | | |
| 1 | Skid Steer Loader | 44 | 0.37 | 7 | 30 | 210 | 3,419 | |
| 1 | Water Truck | 189 | 0.34 | 7 | 30 | 210 | 13,495 | |
| | | | | | | | | |
| **Paving** | | Start Date: | 4/1/2018 | | | | | |
| 1 | Paving Equipment | 104 | 0.42 | 7 | 2 | 14 | 612 | |
| 2 | Roller | 95 | 0.38 | 7 | 2 | 28 | 1,011 | |
| 1 | Skid Steer Loader | 44 | 0.37 | 7 | 2 | 14 | 228 | |

| Project Names: San Sebastian Homes | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 2018 | | | | | | | | |
| | | | | | | Total | | |
| Qty | Description | HP | Load Factor | Hours/day | Work Days | Annual Hours | HP hours | Comments |
| Start Year | 2018 | | | | | | | |
| **Demolition** | | Start Date: | 4/1/2018 | | | | | Hauling volume = 50 cubic yards |
| 1 | Excavator | 168 | 0.38 | 7 | 1 | 7 | 447 | or Demolition volume |
| 1 | Rubber Tire Loader | 164 | 0.36 | 7 | 1 | 7 | 413 | |
| | | | | | | | | |
| **Mass Grading / Excavation** | | Start Date: | 4/15/2018 | | | | | |
| 1 | Excavator | 168 | 0.38 | 7 | 12 | 84 | 5,363 | |
| 1 | Water Truck | 189 | 0.34 | 7 | 12 | 84 | 5,398 | Cut To Fill Volume = Approx_28900 cubic yards |
| 2 | Scraper | 313 | 0.72 | 7 | 12 | 168 | 37,860 | |
| 1 | Rollers | 95 | 0.56 | 7 | 12 | 84 | 4,469 | |
| 1 | Grader | 174 | 0.61 | 7 | 12 | 84 | 8,916 | |
| 1 | Rubber Tire Loader | 164 | 0.36 | 7 | 12 | 84 | 4,959 | |
| | | | | | | | | |
| **Trenching-Utilities (Wet and Dry)** | | Start Date: | 5/1/2018 | | | | | |
| 1 | Tractor/Loader/Backhoe | 108 | 0.37 | 7 | 40 | 280 | 11,189 | |
| 1 | Excavator | 168 | 0.38 | 7 | 40 | 280 | 17,875 | |
| 1 | Plate Compactors | 8 | 0.43 | 7 | 40 | 280 | 963 | |
| | | | | | | | | |
| **Building - Exterior** | | Start Date: | 5/15/2018 | | | | | |
| 2 | Forklift | 125 | 0.2 | 7 | 40 | 560 | 14,000 | Diesel |
| 1 | Aerial Lift | 60 | 0.31 | 7 | 40 | 280 | 5,208 | Electric-Yes |
| | | | | | | | | |
| | | Start Date: | 7/15/2018 | | | | | |
| **Building - Interior** | | | | | | | | |
| 1 | Forklift | 125 | 0.2 | 7 | 40 | 280 | 7,000 | Diesel |
| | | | | | | | | |
| **Fine Grading/Landscaping** | | Start Date: | 8/1/2018 | | | | | |
| 1 | Skid Steer Loader | 44 | 0.37 | 7 | 30 | 210 | 3,419 | |
| 1 | Water Truck | 189 | 0.34 | 7 | 30 | 210 | 13,495 | |
| | | | | | | | | |
| **Paving** | | Start Date: | 10/1/2018 | | | | | |
| 1 | Paving Equipment | 104 | 0.42 | 7 | 2 | 14 | 612 | |
| 2 | Roller | 95 | 0.38 | 7 | 2 | 28 | 1,011 | |
| 1 | Skid Steer Loader | 44 | 0.37 | 7 | 2 | 14 | 228 | |

| Project Names: San Sebastian Homes | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 2019 | | | | | | | | |
| Qty | Description | HP | Load Factor | Hours/day | Work Days | Total Annual Hours | HP hours | Comments |
| Start Year | 2019 | | | | | | | |
| **Demolition** | | Start Date: | 4/1/2019 | | | | | Hauling volume = 1000 cubic yards |
| 1 | Excavator | 168 | 0.38 | 7 | 5 | 35 | 2,234 | or Demolition volume |
| 1 | Rubber Tire Loader | 164 | 0.36 | 7 | 5 | 35 | 2,066 | |
| | | | | | | | | |
| **Mass Grading / Excavation** | | Start Date: | 4/15/2019 | | | | | |
| 1 | Excavator | 168 | 0.38 | 7 | 10 | 70 | 4,469 | |
| 1 | Water Truck | 189 | 0.34 | 7 | 10 | 70 | 4,498 | Cut To Fill Volume = Approx_28900 cubic yards |
| 2 | Scraper | 313 | 0.72 | 7 | 10 | 140 | 31,550 | |
| 1 | Rollers | 95 | 0.56 | 7 | 10 | 70 | 3,724 | |
| 1 | Grader | 174 | 0.61 | 7 | 10 | 70 | 7,430 | |
| 1 | Rubber Tire Loader | 164 | 0.36 | 7 | 10 | 70 | 4,133 | |
| | | | | | | | | |
| **Trenching-Utilities (Wet and Dry)** | | Start Date: | 5/1/2019 | | | | | |
| 1 | Tractor/Loader/Backhoe | 108 | 0.37 | 7 | 40 | 280 | 11,189 | |
| 1 | Excavator | 168 | 0.38 | 7 | 40 | 280 | 17,875 | |
| 1 | Plate Compactors | 8 | 0.43 | 7 | 40 | 280 | 963 | |
| | | | | | | | | |
| **Building - Exterior** | | Start Date: | 5/15/2019 | | | | | |
| 2 | Forklift | 125 | 0.2 | 7 | 40 | 560 | 14,000 | Diesel |
| 1 | Aerial Lift | 60 | 0.31 | 7 | 40 | 280 | 5,208 | Electric-Yes |
| | | | | | | | | |
| | | Start Date: | 7/15/2019 | | | | | |
| **Building - Interior** | | | | | | | | |
| 1 | Forklift | 125 | 0.2 | 7 | 40 | 280 | 7,000 | Diesel |
| | | | | | | | | |
| **Fine Grading/Landscaping** | | Start Date: | 8/1/2019 | | | | | |
| 1 | Skid Steer Loader | 44 | 0.37 | 7 | 30 | 210 | 3,419 | |
| 1 | Water Truck | 189 | 0.34 | 7 | 30 | 210 | 13,495 | |
| | | | | | | | | |
| **Paving** | | Start Date: | 10/1/2019 | | | | | |
| 1 | Paving Equipment | 104 | 0.42 | 7 | 2 | 14 | 612 | |
| 2 | Roller | 95 | 0.38 | 7 | 2 | 28 | 1,011 | |
| 1 | Skid Steer Loader | 44 | 0.37 | 7 | 2 | 14 | 228 | |

| Project Names: San Sebastian Homes | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 2020 | | | | | | | | |
| Qty | Description | HP | Load Factor | Hours/day | Work Days | Total Annual Hours | HP hours | Comments |
| Start Year | 2020 | | | | | | | |
| **Demolition** | | Start Date: | 4/1/2020 | | | | | Hauling volume = 100 cubic yards or Demolition volume |
| 1 | Excavator | 168 | 0.38 | 7 | 2 | 14 | 894 | |
| 1 | Rubber Tire Loader | 164 | 0.36 | 7 | 2 | 14 | 827 | |
| | | | | | | | | |
| **Mass Grading / Excavation** | | Start Date: | 4/15/2020 | | | | | |
| 1 | Excavator | 168 | 0.38 | 7 | 10 | 70 | 4,469 | |
| 1 | Water Truck | 189 | 0.34 | 7 | 10 | 70 | 4,498 | Cut To Fill Volume = Approx_19800 cubic yards |
| 2 | Scraper | 313 | 0.72 | 7 | 10 | 140 | 31,550 | |
| 1 | Rollers | 95 | 0.56 | 7 | 10 | 70 | 3,724 | |
| 1 | Grader | 174 | 0.61 | 7 | 10 | 70 | 7,430 | |
| 1 | Rubber Tire Loader | 164 | 0.36 | 7 | 10 | 70 | 4,133 | |
| | | | | | | | | |
| **Trenching-Utilities (Wet and Dry)** | | Start Date: | 5/1/2020 | | | | | |
| 1 | Tractor/Loader/Backhoe | 108 | 0.37 | 7 | 40 | 280 | 11,189 | |
| 1 | Excavator | 168 | 0.38 | 7 | 40 | 280 | 17,875 | |
| 1 | Plate Compactors | 8 | 0.43 | 7 | 40 | 280 | 963 | |
| | | | | | | | | |
| **Building - Exterior** | | Start Date: | 5/15/2020 | | | | | |
| 2 | Forklift | 125 | 0.2 | 7 | 40 | 560 | 14,000 | Diesel |
| 1 | Aerial Lift | 60 | 0.31 | 7 | 40 | 280 | 5,208 | Electric-Yes |
| | | | | | | | | |
| | | Start Date: | 7/15/2020 | | | | | |
| **Building - Interior** | | | | | | | | |
| 1 | Forklift | 125 | 0.2 | 7 | 40 | 280 | 7,000 | Diesel |
| | | | | | | | | |
| **Fine Grading/Landscaping** | | Start Date: | 8/1/2020 | | | | | |
| 1 | Skid Steer Loader | 44 | 0.37 | 7 | 30 | 210 | 3,419 | |
| 1 | Water Truck | 189 | 0.34 | 7 | 30 | 210 | 13,495 | |
| | | | | | | | | |
| **Paving** | | Start Date: | 10/1/2020 | | | | | |
| 1 | Paving Equipment | 104 | 0.42 | 7 | 2 | 14 | 612 | |
| 2 | Roller | 95 | 0.38 | 7 | 2 | 28 | 1,011 | |
| 1 | Skid Steer Loader | 44 | 0.37 | 7 | 2 | 14 | 228 | |

| Project Names: San Sebastian Homes | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 2021 | | | | | | | | |
| Qty | Description | HP | Load Factor | Hours/day | Work Days | Total Annual Hours | HP hours | Comments |
| Start Year | 2021 | | | | | | | |
| **Demolition** | | Start Date: | 4/1/2021 | | | | | Hauling volume = 100 cubic yards |
| 1 | Excavator | 168 | 0.38 | 7 | 2 | 14 | 894 | or Demolition volume |
| 1 | Rubber Tire Loader | 164 | 0.36 | 7 | 2 | 14 | 827 | |
| | | | | | | | | |
| **Mass Grading / Excavation** | | Start Date: | 4/15/2021 | | | | | |
| 1 | Excavator | 168 | 0.38 | 7 | 10 | 70 | 4,469 | |
| 1 | Water Truck | 189 | 0.34 | 7 | 10 | 70 | 4,498 | Cut To Fill Volume = Approx_16900 cubic yards |
| 2 | Scraper | 313 | 0.72 | 7 | 10 | 140 | 31,550 | |
| 1 | Rollers | 95 | 0.56 | 7 | 10 | 70 | 3,724 | |
| 1 | Grader | 174 | 0.61 | 7 | 10 | 70 | 7,430 | |
| 1 | Rubber Tire Loader | 164 | 0.36 | 7 | 10 | 70 | 4,133 | |
| | | | | | | | | |
| **Trenching-Utilities (Wet and Dry)** | | Start Date: | 5/1/2021 | | | | | |
| 1 | Tractor/Loader/Backhoe | 108 | 0.37 | 7 | 40 | 280 | 11,189 | |
| 1 | Excavator | 168 | 0.38 | 7 | 40 | 280 | 17,875 | |
| 1 | Plate Compactors | 8 | 0.43 | 7 | 40 | 280 | 963 | |
| | | | | | | | | |
| **Building - Exterior** | | Start Date: | 5/15/2021 | | | | | |
| 2 | Forklift | 125 | 0.2 | 7 | 40 | 560 | 14,000 | Diesel |
| 1 | Aerial Lift | 60 | 0.31 | 7 | 40 | 280 | 5,208 | Electric-Yes |
| | | | | | | | | |
| | | Start Date: | 7/15/2021 | | | | | |
| **Building - Interior** | | | | | | | | |
| 1 | Forklift | 125 | 0.2 | 7 | 40 | 280 | 7,000 | Diesel |
| | | | | | | | | |
| **Fine Grading/Landscaping** | | Start Date: | 8/1/2021 | | | | | |
| 1 | Skid Steer Loader | 44 | 0.37 | 7 | 30 | 210 | 3,419 | |
| 1 | Water Truck | 189 | 0.34 | 7 | 30 | 210 | 13,495 | |
| | | | | | | | | |
| **Paving** | | Start Date: | 10/1/2021 | | | | | |
| 1 | Paving Equipment | 104 | 0.42 | 7 | 2 | 14 | 612 | |
| 2 | Roller | 95 | 0.38 | 7 | 2 | 28 | 1,011 | |
| 1 | Skid Steer Loader | 44 | 0.37 | 7 | 2 | 14 | 228 | |

| Project Names: San Sebastian Homes | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 2022 | | | | | | | | |
| Qty | Description | HP | Load Factor | Hours/day | Work Days | Total Annual Hours | HP hours | Comments |
| Start Year | 2022 | | | | | | | |
| **Demolition** | | Start Date: | 4/1/2022 | | | | | Hauling volume = 100 cubic yards |
| 1 | Excavator | 168 | 0.38 | 7 | 2 | 14 | 894 | or Demolition volume |
| 1 | Rubber Tire Loader | 164 | 0.36 | 7 | 2 | 14 | 827 | |
| | | | | | | | | |
| **Mass Grading / Excavation** | | Start Date: | 4/15/2022 | | | | | |
| 1 | Excavator | 168 | 0.38 | 7 | 10 | 70 | 4,469 | |
| 1 | Water Truck | 189 | 0.34 | 7 | 10 | 70 | 4,498 | Cut To Fill Volume = Approx_16550 cubic yards |
| 2 | Scraper | 313 | 0.72 | 7 | 10 | 140 | 31,550 | |
| 1 | Rollers | 95 | 0.56 | 7 | 10 | 70 | 3,724 | |
| 1 | Grader | 174 | 0.61 | 7 | 10 | 70 | 7,430 | |
| 1 | Rubber Tire Loader | 164 | 0.36 | 7 | 10 | 70 | 4,133 | |
| | | | | | | | | |
| **Trenching-Utilities (Wet and Dry)** | | Start Date: | 5/1/2022 | | | | | |
| 1 | Tractor/Loader/Backhoe | 108 | 0.37 | 7 | 40 | 280 | 11,189 | |
| 1 | Excavator | 168 | 0.38 | 7 | 40 | 280 | 17,875 | |
| 1 | Plate Compactors | 8 | 0.43 | 7 | 40 | 280 | 963 | |
| | | | | | | | | |
| **Building - Exterior** | | Start Date: | 5/15/2022 | | | | | |
| 2 | Forklift | 125 | 0.2 | 7 | 40 | 560 | 14,000 | Diesel |
| 1 | Aerial Lift | 60 | 0.31 | 7 | 40 | 280 | 5,208 | Electric-Yes |
| | | | | | | | | |
| | | Start Date: | 7/15/2022 | | | | | |
| **Building - Interior** | | | | | | | | |
| 1 | Forklift | 125 | 0.2 | 7 | 40 | 280 | 7,000 | Diesel |
| | | | | | | | | |
| **Fine Grading/Landscaping** | | Start Date: | 8/1/2022 | | | | | |
| 1 | Skid Steer Loader | 44 | 0.37 | 7 | 30 | 210 | 3,419 | |
| 1 | Water Truck | 189 | 0.34 | 7 | 30 | 210 | 13,495 | |
| | | | | | | | | |
| **Paving** | | Start Date: | 10/1/2022 | | | | | |
| 1 | Paving Equipment | 104 | 0.42 | 7 | 2 | 14 | 612 | |
| 2 | Roller | 95 | 0.38 | 7 | 2 | 28 | 1,011 | |
| 1 | Skid Steer Loader | 44 | 0.37 | 7 | 2 | 14 | 228 | |

**San Sebastian Homes - Morgan Hill, CA - Modeling Construction Emissions**
**DPM Emissions From Construction**

**Constructin Modelng Areas and DPM Emissions per Area**

| Year | Phase | Area | Model Area (m2) | Annual Emissions (lb/yr) | Hourly Emissions (lb/hr) | DPM Unit Area Emissions (g/s/m2) |
|---|---|---|---|---|---|---|
| 2012 | 1 | Area 1 | 46,775 | 36.57 | 0.0111 | 3.00E-08 |
| | | | | | | |
| 2013 | 1 | Area 1 | 46,775 | 7.31 | 0.0022 | 6.00E-09 |
| | 2 | Area 1 | 31,546 | 28.25 | 0.0086 | 3.43E-08 |
| | 3 | Area 1 | 24,929 | 24.65 | 0.0075 | 3.79E-08 |
| | | | | | | |
| 2014 | 3 | Area 1 | 24,929 | 5.61 | 0.0017 | 8.63E-09 |
| | 4 | Area 1 | 25,708 | 28.49 | 0.0087 | 4.25E-08 |
| | 5 | Area 1 | 39,973 | 24.07 | 0.0073 | 2.31E-08 |
| | | | | | | |
| 2015 | 5 | Area 1 | 39,973 | 4.38 | 0.0013 | 4.20E-09 |
| | 6 | Area 1 | 32,703 | 29.66 | 0.0090 | 3.48E-08 |
| | 7 | Area 1 | 22,441 | 25.02 | 0.0076 | 4.28E-08 |
| | | | | | | |
| 2016 | 7 | Area 1 | 22,441 | 4.36 | 0.0013 | 7.45E-09 |
| | 8 | Area 1 | 24,559 | 24.83 | 0.0076 | 3.88E-08 |
| | 8 | Area 2 | 4,404 | 4.45 | 0.0014 | 3.88E-08 |
| | 9 | Area 1 | 26,636 | 23.76 | 0.0072 | 3.42E-08 |
| | | | | | | |
| 2017 | 9 | Area 1 | 26,636 | 4.33 | 0.0013 | 6.23E-09 |
| | 10 | Area 1 | 27,782 | 41.36 | 0.0126 | 5.71E-08 |
| | 11 | Area 1 | 22,249 | 23.87 | 0.0073 | 4.11E-08 |
| | | | | | | |
| 2018 | 11 | Area 1 | 22,249 | 4.22 | 0.0013 | 7.27E-09 |
| | 12 | Area 1 | 33,113 | 26.48 | 0.0081 | 3.07E-08 |
| | | | | | | |
| 2019 | 13 | Area 1 | 23,592 | 5.38 | 0.0016 | 8.75E-09 |
| | | | | | | |
| 2020 | 14 | Area 1 | 17,955 | 2.36 | 0.0007 | 5.03E-09 |
| | | | | | | |
| 2021 | 15 | Area 1 | 32,116 | 1.89 | 0.0006 | 2.26E-09 |
| | 15 | Area 1 | 7,731 | 0.45 | 0.0001 | 2.26E-09 |
| | | | | | | |
| 2022 | 16 | Area 1 | 23,161 | 2.36 | 0.0007 | 3.90E-09 |

Notes:

Emissions assumed to be evenly distributed over each construction areas

***Construction Hours for Modeling***

| | | |
|---|---|---|
| Hours/day = | 9 | (7am - 4pm) |
| Days/year = | 365 | |
| Hours/year = | 3285 | |

**San Sebastian Homes - Morgan Hill, CA - Construction Impacts**
**Maximum DPM Cancer Risk Calculations From Construction**
**at Residential Maximum Exposed Individual (MEI) Location**

Cancer Risk (per million) = CPF x Inhalation Dose x 1.0E6

Where: CPF = Cancer potency factor $(mg/kg\text{-}day)^{-1}$

Inhalation Dose = $C_{air}$ x DBR x A x EF x ED x $10^{-6}$ / AT

Where: $C_{air}$ = concentration in air ($\mu g/m^3$)
DBR = daily breathing rate (L/kg body weight-day)
A = Inhalation absorption factor
EF = Exposure frequency (days/year)
ED = Exposure duration (years)
AT = Averaging time period over which exposure is averaged.
$10^{-6}$ = Conversion factor

**Values**

| Parameter | Child | Adult |
|---|---|---|
| CPF = | 1.10E+00 | 1.10E+00 |
| DBR = | 581 | 302 |
| A = | 1 | 1 |
| EF = | 350 | 350 |
| AT = | 25,550 | 25,550 |

**Construction Cancer Risk by Year - Maximum Impact Receptor Location**

| | Exposure | Child - Exposure Information | | | Child | Adult - Exposure Information | | | Adult |
|---|---|---|---|---|---|---|---|---|---|
| | Exposure | | | Exposure | Cancer | Modeled | | Exposure | Cancer |
| | Duration | DPM Conc (ug/m3) | | Adjust | Risk | DPM Conc (ug/m3) | | Adjust | Risk |
| Year | (years) | Year | Annual | Factor | (per million) | Year | Annual | Factor | (per million) |
| 1 | 1 | 2012 | 0.00265 | 0 | 0.00 | 2012 | 0.00265 | 1 | 0.01 |
| 2 | 1 | 2013 | 0.00488 | 0 | 0.00 | 2013 | 0.00488 | 1 | 0.02 |
| 3 | 1 | 2014 | 0.00642 | 0 | 0.00 | 2014 | 0.00642 | 1 | 0.03 |
| 4 | 1 | 2015 | 0.00428 | 0 | 0.00 | 2015 | 0.00428 | 1 | 0.02 |
| 5 | 1 | 2016 | 0.00629 | 10 | 0.55 | 2016 | 0.00629 | 1 | 0.03 |
| 6 | 1 | 2017 | 0.04224 | 10 | 3.70 | 2017 | 0.04224 | 1 | 0.19 |
| 7 | 1 | 2018 | 0.00601 | 4.75 | 0.25 | 2018 | 0.00601 | 1 | 0.03 |
| 8 | 1 | 2019 | 0.00056 | 3 | 0.01 | 2019 | 0.00056 | 1 | 0.00 |
| 9 | 1 | 2020 | 0.00027 | 3 | 0.01 | 2020 | 0.00027 | 1 | 0.00 |
| 10 | 1 | 2021 | 0.00009 | 3 | 0.00 | 2021 | 0.00009 | 1 | 0.00 |
| 11 | 1 | 2022 | 0.00005 | 3 | 0.00 | 2022 | 0.00005 | 1 | 0.00 |
| 12 | 1 | | 0.0000 | 3 | 0.00 | | 0.0000 | 1 | 0.00 |
| 13 | 1 | | 0.0000 | 3 | 0.00 | | 0.0000 | 1 | 0.00 |
| 14 | 1 | | 0.0000 | 3 | 0.00 | | 0.0000 | 1 | 0.00 |
| 15 | 1 | | 0.0000 | 3 | 0.00 | | 0.0000 | 1 | 0.00 |
| 16 | 1 | | 0.0000 | 3 | 0.00 | | 0.0000 | 1 | 0.00 |
| 17 | 1 | | 0.0000 | 3 | 0.00 | | 0.0000 | 1 | 0.00 |
| 18 | 1 | | 0.0000 | 1 | 0.00 | | 0.0000 | 1 | 0.00 |
| .• | .• | .• | .• | .• | .• | .• | .• | .• | .• |
| .• | .• | .• | .• | .• | .• | .• | .• | .• | .• |
| .• | .• | .• | .• | .• | .• | .• | .• | .• | .• |
| 65 | 1 | | 0.0000 | 1 | 0.00 | | 0.0000 | 1 | 0.00 |
| 66 | 1 | | 0.0000 | 1 | 0.00 | | 0.0000 | 1 | 0.00 |
| 67 | 1 | | 0.0000 | 1 | 0.00 | | 0.0000 | 1 | 0.00 |
| 68 | 1 | | 0.0000 | 1 | 0.00 | | 0.0000 | 1 | 0.00 |
| 69 | 1 | | 0.0000 | 1 | 0.00 | | 0.0000 | 1 | 0.00 |
| 70 | 1 | | 0.0000 | 1 | 0.00 | | 0.0000 | 1 | 0.00 |
| **Total Increased Cancer Risk** | | | | | **4.52** | | | | **0.34** |

Note: Maximum cancer risk occurs at residence near the southeast side of construction area (east of Phase 10 construction)

# APPENDIX G

## Greenhouse Gas Emissions Analyses, Illingworth & Rodkin

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March 28, 2012

Kari Grigsby
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VIA email: kgrigsby@davidjpowers.com

**SUBJECT: Cochrane-Borello Single Family Development Project in Morgan Hill, CA – GHG Emissions Analyses**

The purpose of this letter is to address greenhouse gas emissions associated with the proposed Cochrane-Borello Single Family Development Project in Morgan Hill, California. We understand that the project proposes the construction of 244 single-family homes along with up to 88 secondary units. This report addresses climate change environmental checklist questions for compliance with the California Environmental Quality Act. This analysis was conducted following guidance provided by the Bay Area Air Quality Management District (BAAQMD)[1].

**GHG Significance Thresholds**

In 2010, BAAQMD released its updated CEQA Guidelines that contain methodology and thresholds of significance for evaluating greenhouse gas (GHG) emissions from land use type projects. The BAAQMD thresholds were develop specifically for the Bay Area after considering the latest Bay Area GHG inventory and the effects of AB 32 scoping plan measures that would reduce regional emissions. BAAQMD intends to achieve GHG reductions from new land use developments to close the gap between projected regional emissions with AB 32 scoping plan measures and the AB 32 targets. The BAAQMD applies GHG efficiency thresholds to projects with emissions of 1,100 metric tons of CO2e (carbon dioxide equivalency) or greater. Projects that have emissions below 1,100 metric tons of $CO_2e$ per year are considered to have less than significant GHG emissions. The project size, 244 single-family dwelling units plus 88 cottage units, exceeds the screening size listed by BAAQMD as having less than significant GHG emissions. Therefore, a refined analysis that includes modeling of GHG emissions from the project was conducted

**Methodology**

Greenhouse gas (GHG) emissions were computed for the full build out scenario of the proposed project. Specifically, construction emissions were computed for an assumed 1-year construction period with operational emissions in 2020. The URBEMIS2007 model was used to compute annual air pollutant emissions. The URBEMIS2007 input files were then processed with the Bay Area Air Quality

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[1] BAAQMD 2010. BAAQMD CEQA Air Quality Guidelines. June.

Management District's (BAAQMD) new Greenhouse Gas Model (BGM).

Construction Emissions

The URBEMIS2007 model was used to predict construction emissions in the form of $CO_2$. An approximate 1-year construction schedule was assumed in the modeling. Construction phases included the following:

- Fine site grading, utilities, and paving was assumed to last 2 months;
- Trenching was used to address the installation of wet and dry utilities that would last about 1 months;
- Paving was assumed to occur at the same time as trenching. This phase would last one month; and
- Building construction would start when site preparation is completed and last for 10 months.

$CO_2$ emissions associated with construction were assumed to occur in 2012 and 2013. Under this scenario, construction of the project would emit 969 metric tons of $CO_2$. These would be temporary emissions. Neither the City of Morgan Hill nor the BAAQMD have quantified thresholds for construction activities. However, the emissions would be below the lowest threshold adopted by BAAQMD.

Operational Emissions

BAAQMD developed a GHG model referred to as the BAAQMD GHG Model or BGM. BGM is an Excel workbook tool that uses the URBEMIS2007 file to provide GHG emissions in the form of equivalent $CO_2$ emissions or $CO_2e$ in metric tons per year. Unless otherwise noted below, the model defaults for the San Francisco Bay Area were used. BGM provides emissions for transportation, areas sources, electricity consumption, natural gas combustion, electricity usage associated with water usage and wastewater discharge, and solid waste land filling and transport.

*Model Year*

The model uses mobile emission factors from the California Air Resources Board's EMFAC2007 model and adjusts these based on the effect of new regulations to reduce GHG emissions. These regulations include the Pavley Rule that increases fleet efficiency (reducing fuel consumption) and the low carbon fuel standard. This model is sensitive to the year selected, since vehicle emissions have and continue to be reduced due to fuel efficiency standards and low carbon fuels. The Year 2020 was selected, since BAAQMD thresholds are based on meeting the AB32 reduction goals by 2020.

*Traffic*

Project-specific trip generation was used in the analysis, as reported by Fehr & Peers[2]. Since Fehr & Peers computed average daily vehicles miles travelled (VMT), the output from the URBEMIS2007/BGM models were adjusted. The URBEMIS2007 model predicted daily VMT of 27,827 using the trip generation data forecasted by Fehr & Peers. The daily VMT were estimated by Fehr & Peers using the Morgan Hill Travel Demand Forecasting model. Under the 2015 Near-Term Cumulative with Project

[2] Fehr & Peers. 2011. Administrative Draft Transportation Impact Analysis Borello Residential Development. October.

conditions, VMT is projected to increase by approximately 16,730 vehicle miles traveled compared to 2015 Near-Term Cumulative no Project conditions.

The URBEMIS2007 model operational source inputs were adjusted to account for any pedestrian and bicyclist amenities that are existing or will be provided by the project. Bicycle lanes are included on a portion of the collector roadways serving the site. Sidewalks on a portion of either one side or both sides of the streets are provided along the roadways.

*Area Sources (including Natural Gas and Electricity Consumption)*
The proposed project would have to meet 2010 Title 24 standards that are approximately equivalent to LEED Silver certification. The proposed project would commit to scoring 131 Build-It-Green points. Therefore, energy efficiency would be at least 25 percent greater than the model assumed Title 24 standards (prior to the 2005 Title 24 amendments). In addition, the proposed project would include solar panels on at least 50-percent of the single family homes. Adjustments were made either in the BGM model or to the model output for area sources. These include:

- Energy efficiency of the project, as discussed above, was assumed to be 25% greater than pre-2005 Title 24 standards;

- A minimum waste diversion rate of 50%, consistent with the rate currently met in Santa Clara County.

- A minimum of 50% of the homes would include solar power, which are expected to generate 1,163,880 kilowatts hours of electricity per. This electricity generation was input to the BGM model.

- Emissions associated with electricity consumption output by BGM were adjusted to account for Pacific Gas & Electric utility's (PG&E) lower emission rate. BGM uses a Statewide rate of 805 pounds of $CO_2$ per megawatt of electricity produced, while the rate for PG&E is much lower[3]. The PG&E rate was also adjusted to account for increased use of renewable sources. The current renewable portfolio of 13 percent was assumed to increase to 20 percent by 2020[4]. The derived 2020 rate for PG&E was estimated at 526 pounds of $CO_2$ per megawatt of electricity delivered.

*Per Capita Rate*

The per capita rate is the total annual GHG emissions expressed in metric tons divided by the population (i.e., number of residences). The number of persons that would be living at the project was calculated assuming that there would be an average of 3.08 persons per single-family residential unit and 1.54 persons per secondary unit. This average occupancy rate is based on the average persons per household assumed in the Morgan Hill General Plan. This equates to 1,029 new residents.

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[3] CARB, CCAR, ICLEI, and the Climate Registry. 2010. Local Government Operations Protocol For the quantification and reporting of greenhouse gas emissions inventories, Version 1.1 May. *Table G.6 of Appendix G provides PG&E's Utility-Specific Verified Electricity CO2 Emission Factors. The years 2005 through 2007 were averaged.*
[4] 2010. BAAQMD. CEQA Guidelines Update – Thresholds of Significance. June. Page 19 discusses the effect of the renewable portfolio Standard (rules) on PG&E's portfolio.

**GHG Emissions**

Attachment 1 is a table that presents the results of the URBEMIS and BGM model analysis in terms of annual metric tons of equivalent $CO_2$ emissions (MT of $CO_2$e/yr). Assumptions are contained in the technical data provided in Attachment 2. As shown in Table 1 below, the project would exceed the bright-line-thresholds of 1,100 MT of $CO_2$e/yr. Therefore, the rate of project GHG emissions (in terms of annual emissions per person) was compared to the GHG significance threshold of 4.6 MT $CO_2$e/year established by BAAQMD. The project per capita emissions would be 2.78 MT $CO_2$e/year, which would be below the BAAQMD significance threshold.

**Consistency with Adopted Plans to Reduce GHG Emissions**

The project would be subject to new requirements under rule making developed at the State and local level regarding greenhouse gas emissions and be subject to local policies that may affect emissions of greenhouse gases.

* * *

This concludes our assessment of the GHG impacts from this project. If you have any questions or comments, please feel free to contact me at (707) 766-7700 x24. We appreciate the opportunity to assist you.

Sincerely,

James A. Reyff
*Illingworth & Rodkin*

11-041

Attachment 1: Net New GHG Emissions from the Proposed Cochrane-Borello Project
Attachment 2: GHG Emission Computations

## Attachment 1 - Net New GHG Emissions from the Proposed Cochrane-Borello Project

**Project Name:** **Cochrane-Borello Project,Morgan Hill**
**Project Years:** **2020** Rev. 03/20/2012
**Emissions of CO2e in Metric Tons Per Year**

| Source Category | Unmitigated Emissions | Emissions with Project and City Conditions | | Emissions with Converted for PG&E rates adjusted for RPS | Comments |
|---|---|---|---|---|---|
| Transportation: | 3516 | 3334 | | 2004 | Used Fehr & Peers trip rates and adjusted for difference in forecasted VMT. Includes adjustments for sidewalks (single and both sides) and new bicycle lanes. |
| Area Source: | 4 | 4 | | 4 | No adjustments |
| Electricity: | 953 | 396 | | 143 | Includes future 25% rerduction due to more efficent homes and use of solar panels. Adjusted for PG&E rates and 20% RPS |
| Natural Gas: | 858 | 444 | | 444 | Includes future 25% reduction due to more efficent homes and use of tankless water heaters. |
| Water & Wastewater: | 67 | 65 | | 23 | Adjusted for PG&E rates |
| Solid Waste: | 487 | 243 | | 243 | Assumes 50% county waste diversion. |
| **Total:** | | | | **2862** | |
| **New Population** | 244 Single Family units | 3.08 people/unit | 752 | | |
| | 180 Cottage units | 1.54 people/unit | 277 | | |
| | **Emissions per capita** | | | **2.78** | |

Model Adjustments:
1) Used Fehr & Peers trip generation rate and adjusted for VMT forecasts
2) Used PG&E emission rates and adjusted for 2020 Predicted CPUC rate
3) Assumed installation of solar panels (1,163,880 kw-hrs/year)
4) Assumed 25% redcution in energy usage due to Build it Green rating
5) Assumed 50% waste diversion through recycling programs

**Attachment 2: GHG Emission Computations**

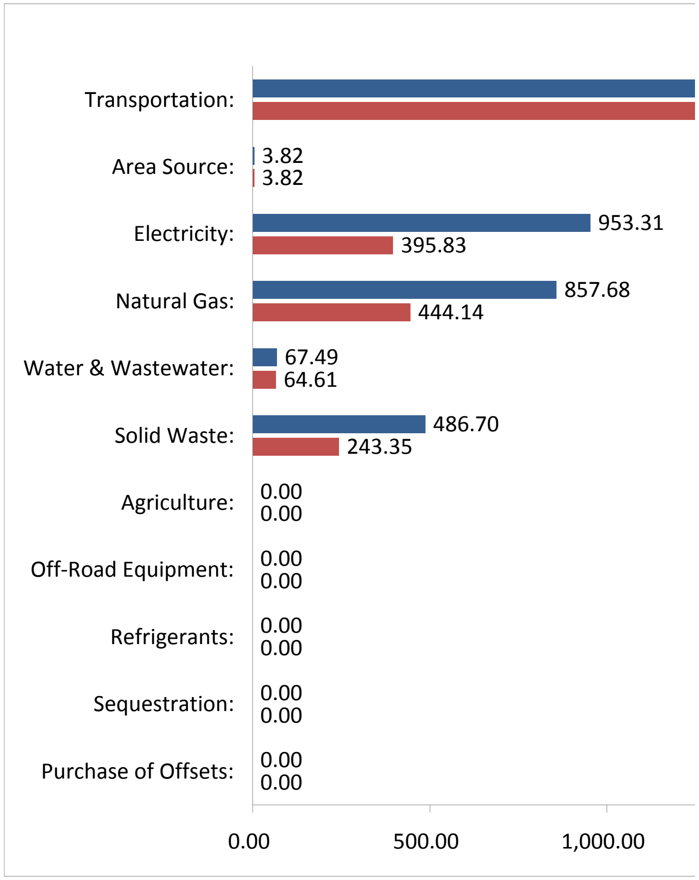
# Summary Results

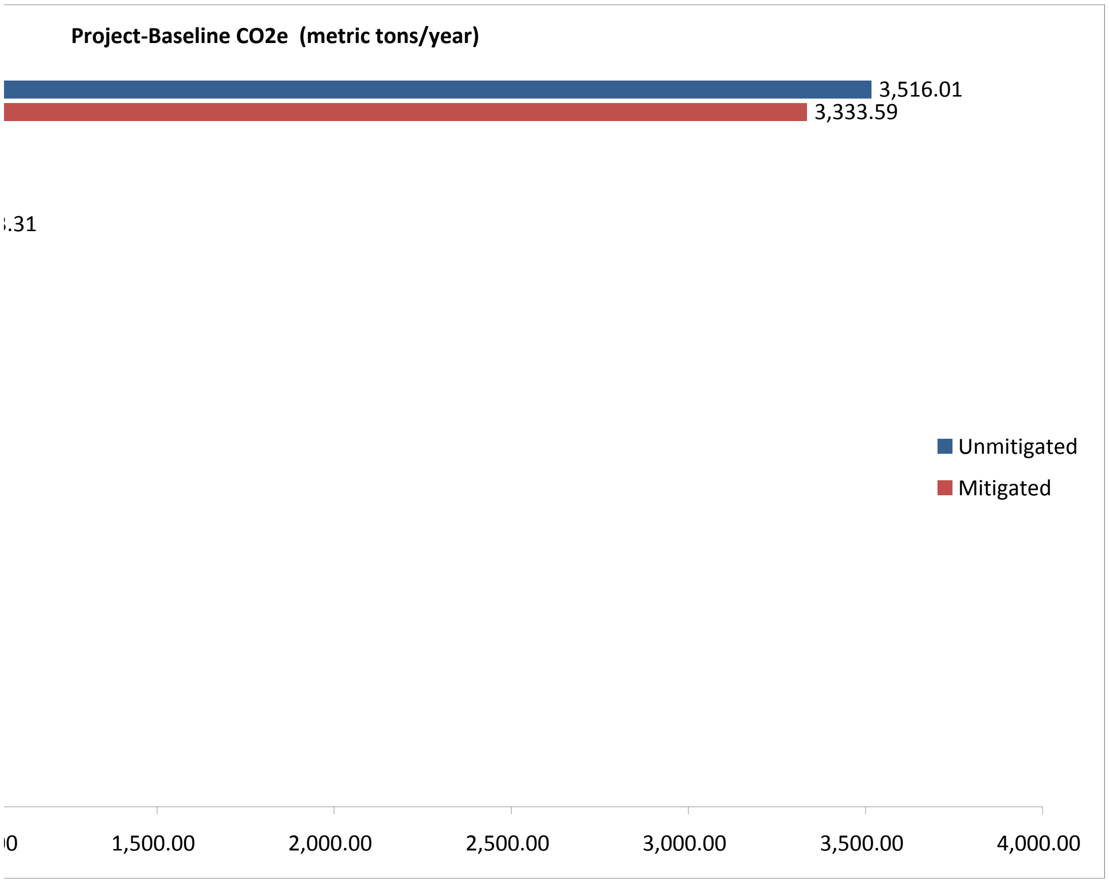
Project Name: Cochrane-Borello Project - updated 2272012
Project and Baseline Years: 2020 N/A

| Results | Unmitigated Project-Baseline CO2e (metric tons/year) | Mitigated Project-Baseline CO2e (metric tons/year) |
|---|---|---|
| Transportation: | 3,516.01 | 3,333.59 |
| Area Source: | 3.82 | 3.82 |
| Electricity: | 953.31 | 395.83 |
| Natural Gas: | 857.68 | 444.14 |
| Water & Wastewater: | 67.49 | |
| Solid Waste: | 486.70 | |
| Agriculture: | 0.00 | |
| Off-Road Equipment: | 0.00 | |
| Refrigerants: | 0.00 | |
| Sequestration: | N/A | |
| Purchase of Offsets: | N/A | |
| Total: | 5,885.01 | |

Attachment 2: GHG Emission Computations

Baseline is currently: **OFF**
Baseline Project Name:
Go to Settings Tab to Turn On Baseline





Project-Baseline CO2e (metric tons/year)
3,516.01
3,333.59
.31
Unmitigated
Mitigated
0
1,500.00
2,000.00
2,500.00
3,000.00
3,500.00
4,000.00

# Detailed Results

| Unmitigated | CO2 (metric tpy) | CH4 (metric tpy) | N2O (metric tpy) | CO2e (metric tpy) | % of Total |
|---|---|---|---|---|---|
| Transportation*: | | | | 3,516.01 | 59.75% |
| Area Source: | 3.06 | 0.00 | 0.00 | 3.82 | 0.06% |
| Electricity: | 951.79 | 0.01 | 0.00 | 953.31 | 16.20% |
| Natural Gas: | 855.49 | 0.08 | 0.00 | 857.68 | 14.57% |
| Water & Wastewater: | 67.38 | 0.00 | 0.00 | 67.49 | 1.15% |
| Solid Waste: | 3.37 | 23.02 | N/A | 486.70 | 8.27% |
| Agriculture: | 0.00 | 0.00 | 0.00 | 0.00 | 0.00% |
| Off-Road Equipment: | 0.00 | 0.00 | 0.00 | 0.00 | 0.00% |
| Refrigerants: | N/A | N/A | N/A | 0.00 | 0.00% |
| Sequestration: | N/A | N/A | N/A | N/A | N/A |
| Purchase of Offsets: | N/A | N/A | N/A | N/A | N/A |
| Total: | | | | 5,885.01 | 100.00% |

* Several adjustments were made to transportation emissions after they have been imported from URBEMIS.
After importing from URBEMIS, CO2 emissions are converted to metric tons and then adjusted to account for the "Pavley"
regulation.  Then, CO2 is converted to CO2e by multiplying by 100/95 to account for the contribution of other GHGs (CH4, N2O, and HFCs [from leaking air condi
Finally, CO2e is adjusted to account for th low carbon fuels rule.

| **Mitigated** | CO2 (metric tpy) | CH4 (metric tpy) | N2O (metric tpy) | CO2e (metric tpy) | % of Total |
|---|---|---|---|---|---|
| Transportation*: | | | | 3,333.59 | 74.32% |
| Area Source: | 3.06 | 0.00 | 0.00 | 3.82 | 0.09% |
| Electricity: | 395.20 | 0.00 | 0.00 | 395.83 | 8.82% |
| Natural Gas: | 443.00 | 0.04 | 0.00 | 444.14 | 9.90% |
| Water & Wastewater: | 64.50 | 0.00 | 0.00 | 64.61 | 1.44% |
| Solid Waste: | 1.68 | 11.51 | N/A | 243.35 | 5.43% |
| Agriculture: | 0.00 | 0.00 | 0.00 | 0.00 | 0.00% |
| Off-Road Equipment: | 0.00 | 0.00 | 0.00 | 0.00 | 0.00% |
| Refrigerants: | N/A | N/A | N/A | 0.00 | 0.00% |
| Sequestration: | N/A | N/A | N/A | 0.00 | 0.00% |
| Purchase of Offsets: | N/A | N/A | N/A | 0.00 | 0.00% |
| Total: | | | | 4,485.34 | 100.00% |

## *Mitigation Measures Selected:*

**Transportation:** Go to the following tab: Transp. Detail Mit for a list of the transportation mitigation measures selected (in URBE

**Electricity:** The following mitigation measure(s) have been selected to reduce electricity emissions.

| | | |
|---|---|---|
| Onsite Renewable Energy Systems - Solar | 1163880 | kwh/year generated |

**Natural Gas:** The following mitigation measure(s) have been selected to reduce natural gas emissions.

| | | |
|---|---|---|
| Tankless Water Heater | 5000 | MMBtu/year Reduced |

**Water and Wastewater:** The following mitigation measure(s) have been selected to reduce water and wastewater emissions.

| | | |
|---|---|---|
| Drought Tolerant Landscaping | 10 | % Reduction Outdoor Use |
| Low Flush Toilets | 2 | % Reduction Indoor Use |

**Solid Waste:** The following mitigation measure has been selected to reduce solid waste related GHG emissions.

| | | |
|---|---|---|
| Reduce Solid Waste by the Following Percentage | 50 | Solid Waste Reduction % |

**Ag:** No existing mitigation measures available.

**Off-Road Equipment:** No existing mitigation measures available.

**Refrigerants:** The following mitigation measure has ben selected to reduce refrigerant emissions:

**Carbon Sequestration:** Project does not include carbon sequestration through tree planting.

**Emission Offsets/Credits:** Project does not include purchase of emission offsets/credits.

| Baseline | CO2 (metric tpy) | CH4 (metric tpy) | N2O (metric tpy) | CO2e (metric tpy) | % of Total |
|---|---|---|---|---|---|
| Transportation*: | | | | 0.00 | N/A |
| Area Source: | 0.00 | 0.00 | 0.00 | 0.00 | N/A |
| Electricity: | 0.00 | 0.00 | 0.00 | 0.00 | N/A |
| Natural Gas: | 0.00 | 0.00 | 0.00 | 0.00 | N/A |
| Water & Wastewater: | 0.00 | 0.00 | 0.00 | 0.00 | N/A |
| Solid Waste: | 0.00 | 0.00 | N/A | 0.00 | N/A |
| Agriculture: | 0.00 | 0.00 | 0.00 | 0.00 | N/A |
| Off-Road Equipment: | 0.00 | 0.00 | 0.00 | 0.00 | N/A |
| Refrigerants: | N/A | N/A | N/A | 0.00 | N/A |
| Sequestration: | N/A | N/A | N/A | N/A | N/A |
| Purchase of Offsets: | N/A | N/A | N/A | N/A | N/A |
| Total: | | | | 0.00 | 0.00% |

tioners]).

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Urbemis 2007 Version 9.2.4

Combined Annual Emissions Reports (Tons/Year)

File Name: Z:\I&R Docs\2011\11-041 Cochrane-Borello - GHG\GHG-BGM files\cochraneREV.urb924

Project Name: Cochrane-Borello Project - updated 2272012

Project Location: Santa Clara County

On-Road Vehicle Emissions Based on: Version : Emfac2007 V2.3 Nov 1 2006

Off-Road Vehicle Emissions Based on: OFFROAD2007

Summary Report:

CONSTRUCTION EMISSION ESTIMATES

| | $CO_2$ |
|---|---|
| 2012 TOTALS (tons/year unmitigated) | 976.94 |
| 2012 TOTALS (tons/year mitigated) | 976.94 |
| Percent Reduction | 0.00 |
| | |
| 2013 TOTALS (tons/year unmitigated) | 283.81 |
| 2013 TOTALS (tons/year mitigated) | 283.81 |
| Percent Reduction | 0.00 |

AREA SOURCE EMISSION ESTIMATES

| | $CO_2$ |
|---|---|
| TOTALS (tons/year, unmitigated) | 1,717.65 |
| TOTALS (tons/year, mitigated) | 1,717.65 |
| Percent Reduction | 0.00 |

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OPERATIONAL (VEHICLE) EMISSION ESTIMATES

| | $CO_2$ |
|---|---|
| TOTALS (tons/year, unmitigated) | 4,646.19 |
| TOTALS (tons/year, mitigated) | 4,405.14 |
| Percent Reduction | 5.19 |

SUM OF AREA SOURCE AND OPERATIONAL EMISSION ESTIMATES

| | $CO_2$ |
|---|---|
| TOTALS (tons/year, unmitigated) | 6,363.84 |
| TOTALS (tons/year, mitigated) | 6,122.79 |
| Percent Reduction | 3.79 |

Construction Unmitigated Detail Report:

CONSTRUCTION EMISSION ESTIMATES Annual Tons Per Year, Unmitigated

$CO_2$

**2/28/2012 10:33:26 AM**

| | |
|---|---|
| 2012 | 976.94 |
| Trenching 04/01/2012-05/01/2012 | 19.98 |
| Trenching Off Road Diesel | 18.86 |
| Trenching Worker Trips | 1.12 |
| Building 05/01/2012-04/01/2013 | 763.82 |
| Building Off Road Diesel | 197.69 |
| Building Vendor Trips | 137.40 |
| Building Worker Trips | 428.73 |
| Fine Grading 05/01/2012-07/01/2012 | 163.81 |
| Fine Grading Dust | 0.00 |
| Fine Grading Off Road Diesel | 158.76 |
| Fine Grading On Road Diesel | 0.00 |
| Fine Grading Worker Trips | 5.04 |
| Asphalt 07/01/2012-08/01/2012 | 29.33 |
| Paving Off-Gas | 0.00 |
| Paving Off Road Diesel | 14.63 |
| Paving On Road Diesel | 13.23 |
| Paving Worker Trips | 1.46 |
| 2013 | 283.81 |
| Building 05/01/2012-04/01/2013 | 283.81 |
| Building Off Road Diesel | 73.43 |
| Building Vendor Trips | 51.04 |
| Building Worker Trips | 159.34 |

**2/28/2012 10:33:26 AM**

Phase Assumptions

Phase: Fine Grading 5/1/2012 - 7/1/2012 - Type Your Description Here

Total Acres Disturbed: 92.58

Maximum Daily Acreage Disturbed: 23.14

Fugitive Dust Level of Detail: Default

20 lbs per acre-day

On Road Truck Travel (VMT): 0

Off-Road Equipment:

1 Excavators (168 hp) operating at a 0.57 load factor for 8 hours per day

1 Graders (174 hp) operating at a 0.61 load factor for 8 hours per day

1 Rubber Tired Dozers (357 hp) operating at a 0.59 load factor for 8 hours per day

2 Scrapers (313 hp) operating at a 0.72 load factor for 8 hours per day

3 Tractors/Loaders/Backhoes (108 hp) operating at a 0.55 load factor for 8 hours per day

1 Water Trucks (189 hp) operating at a 0.5 load factor for 8 hours per day

Phase: Trenching 4/1/2012 - 5/1/2012 - Type Your Description Here

Off-Road Equipment:

2 Excavators (168 hp) operating at a 0.57 load factor for 8 hours per day

1 Other General Industrial Equipment (238 hp) operating at a 0.51 load factor for 8 hours per day

1 Tractors/Loaders/Backhoes (108 hp) operating at a 0.55 load factor for 0 hours per day

Phase: Paving 7/1/2012 - 8/1/2012 - Type Your Description Here

Acres to be Paved: 23.14

Off-Road Equipment:

1 Pavers (100 hp) operating at a 0.62 load factor for 8 hours per day

2 Paving Equipment (104 hp) operating at a 0.53 load factor for 6 hours per day

2 Rollers (95 hp) operating at a 0.56 load factor for 6 hours per day

Phase: Building Construction 5/1/2012 - 4/1/2013 - Type Your Description Here

**2/28/2012 10:33:26 AM**

Off-Road Equipment:

1 Cranes (399 hp) operating at a 0.43 load factor for 7 hours per day

3 Forklifts (145 hp) operating at a 0.3 load factor for 8 hours per day

1 Generator Sets (49 hp) operating at a 0.74 load factor for 8 hours per day

3 Tractors/Loaders/Backhoes (108 hp) operating at a 0.55 load factor for 7 hours per day

1 Welders (45 hp) operating at a 0.45 load factor for 8 hours per day

Construction Mitigated Detail Report:

CONSTRUCTION EMISSION ESTIMATES Annual Tons Per Year, Mitigated

CO2

**2/28/2012 10:33:26 AM**

| | |
|---|---|
| 2012 | 976.94 |
| Trenching 04/01/2012-05/01/2012 | 19.98 |
| Trenching Off Road Diesel | 18.86 |
| Trenching Worker Trips | 1.12 |
| Building 05/01/2012-04/01/2013 | 763.82 |
| Building Off Road Diesel | 197.69 |
| Building Vendor Trips | 137.40 |
| Building Worker Trips | 428.73 |
| Fine Grading 05/01/2012-07/01/2012 | 163.81 |
| Fine Grading Dust | 0.00 |
| Fine Grading Off Road Diesel | 158.76 |
| Fine Grading On Road Diesel | 0.00 |
| Fine Grading Worker Trips | 5.04 |
| Asphalt 07/01/2012-08/01/2012 | 29.33 |
| Paving Off-Gas | 0.00 |
| Paving Off Road Diesel | 14.63 |
| Paving On Road Diesel | 13.23 |
| Paving Worker Trips | 1.46 |
| 2013 | 283.81 |
| Building 05/01/2012-04/01/2013 | 283.81 |
| Building Off Road Diesel | 73.43 |
| Building Vendor Trips | 51.04 |
| Building Worker Trips | 159.34 |

**2/28/2012 10:33:26 AM**

Construction Related Mitigation Measures

The following mitigation measures apply to Phase: Fine Grading 5/1/2012 - 7/1/2012 - Type Your Description Here

For Soil Stablizing Measures, the Apply soil stabilizers to inactive areas mitigation reduces emissions by:

PM10: 84% PM25: 84%

For Soil Stablizing Measures, the Replace ground cover in disturbed areas quickly mitigation reduces emissions by:

PM10: 5% PM25: 5%

For Soil Stablizing Measures, the Water exposed surfaces 2x daily watering mitigation reduces emissions by:

PM10: 55% PM25: 55%

For Soil Stablizing Measures, the Equipment loading/unloading mitigation reduces emissions by:

PM10: 69% PM25: 69%

The following mitigation measures apply to Phase: Trenching 4/1/2012 - 5/1/2012 - Type Your Description Here

For Excavators, the Diesel Particulate Filter (DPF) 1st Tier mitigation reduces emissions by:

PM10: 85% PM25: 85%

For Other General Industrial Equipment, the Diesel Particulate Filter (DPF) 1st Tier mitigation reduces emissions by:

PM10: 85% PM25: 85%

For Tractors/Loaders/Backhoes, the Diesel Particulate Filter (DPF) 1st Tier mitigation reduces emissions by:

PM10: 85% PM25: 85%

The following mitigation measures apply to Phase: Paving 7/1/2012 - 8/1/2012 - Type Your Description Here

For Pavers, the Diesel Particulate Filter (DPF) 1st Tier mitigation reduces emissions by:

PM10: 85% PM25: 85%

For Paving Equipment, the Diesel Particulate Filter (DPF) 1st Tier mitigation reduces emissions by:

PM10: 85% PM25: 85%

For Rollers, the Diesel Particulate Filter (DPF) 1st Tier mitigation reduces emissions by:

PM10: 85% PM25: 85%

The following mitigation measures apply to Phase: Building Construction 5/1/2012 - 4/1/2013 - Type Your Description Here

For Cranes, the Diesel Particulate Filter (DPF) 1st Tier mitigation reduces emissions by:

PM10: 85% PM25: 85%

For Forklifts, the Diesel Particulate Filter (DPF) 1st Tier mitigation reduces emissions by:

PM10: 85% PM25: 85%

**2/28/2012 10:33:26 AM**

For Generator Sets, the Diesel Particulate Filter (DPF) 1st Tier mitigation reduces emissions by:

PM10: 85% PM25: 85%

For Tractors/Loaders/Backhoes, the Diesel Particulate Filter (DPF) 1st Tier mitigation reduces emissions by:

PM10: 85% PM25: 85%

For Welders, the Diesel Particulate Filter (DPF) 1st Tier mitigation reduces emissions by:

PM10: 85% PM25: 85%

Area Source Unmitigated Detail Report:

AREA SOURCE EMISSION ESTIMATES Annual Tons Per Year, Unmitigated

| Source | CO2 |
|---|---|
| Natural Gas | 1,714.28 |
| Hearth | 1.54 |
| Landscape | 1.83 |
| Consumer Products | |
| Architectural Coatings | |
| TOTALS (tons/year, unmitigated) | 1,717.65 |

**2/28/2012 10:33:26 AM**

Area Source Mitigated Detail Report:

AREA SOURCE EMISSION ESTIMATES Annual Tons Per Year, Mitigated

| Source | $CO_2$ |
|---|---|
| Natural Gas | 1,714.28 |
| Hearth | 1.54 |
| Landscape | 1.83 |
| Consumer Products | |
| Architectural Coatings | |
| TOTALS (tons/year, mitigated) | 1,717.65 |

Area Source Mitigation Measures Selected

| Mitigation Description | Percent Reduction |
|---|---|
| Percent of Residential Landscape Equipment that are Electrically Powered and have Electrical Outlets at the the Front and Rear of Residences | 20.00 |
| For Residential Interior Use Low VOC Coating | 10.00 |
| For Residential Exterior Use Low VOC Coating | 10.00 |

Area Source Changes to Defaults

Percent residential using natural gas changed from 60% to 100%

Percent nonresidential using natural gas changed from 100% to 0%

Percentage of residences with wood stoves changed from 35% to 0%

Percentage of residences with wood fireplaces changed from 10% to 0%

Percentage of residences with natural gas fireplaces changed from 55% to 80%

**2/28/2012 10:33:26 AM**

Operational Unmitigated Detail Report:

OPERATIONAL EMISSION ESTIMATES Annual Tons Per Year, Unmitigated

| Source | $CO_2$ |
|---|---|
| Single family housing | 3,371.70 |
| Apartments low rise | 1,274.49 |
| TOTALS (tons/year, unmitigated) | 4,646.19 |

Operational Settings:

Does not include correction for passby trips

Does not include double counting adjustment for internal trips

Analysis Year: 2020  Season: Annual

Emfac: Version  : Emfac2007 V2.3 Nov 1 2006

Summary of Land Uses

| Land Use Type | Acreage | Trip Rate | Unit Type | No. Units | Total Trips | Total VMT |
|---|---|---|---|---|---|---|
| Single family housing | 81.33 | 9.68 | dwelling units | 244.00 | 2,361.92 | 20,193.71 |
| Apartments low rise | 11.25 | 4.96 | dwelling units | 180.00 | 892.80 | 7,633.17 |
| | | | | | 3,254.72 | 27,826.88 |

Vehicle Fleet Mix

| Vehicle Type | Percent Type | Non-Catalyst | Catalyst | Diesel |
|---|---|---|---|---|
| Light Auto | 55.2 | 0.0 | 100.0 | 0.0 |
| Light Truck < 3750 lbs | 11.6 | 0.0 | 99.1 | 0.9 |
| Light Truck 3751-5750 lbs | 20.7 | 0.0 | 100.0 | 0.0 |
| Med Truck 5751-8500 lbs | 6.3 | 0.0 | 100.0 | 0.0 |

**2/28/2012 10:33:26 AM**

Vehicle Fleet Mix

| Vehicle Type | Percent Type | Non-Catalyst | Catalyst | Diesel |
|---|---|---|---|---|
| Lite-Heavy Truck 8501-10,000 lbs | 0.7 | 0.0 | 71.4 | 28.6 |
| Lite-Heavy Truck 10,001-14,000 lbs | 0.6 | 0.0 | 66.7 | 33.3 |
| Med-Heavy Truck 14,001-33,000 lbs | 0.8 | 0.0 | 25.0 | 75.0 |
| Heavy-Heavy Truck 33,001-60,000 lbs | 0.3 | 0.0 | 0.0 | 100.0 |
| Other Bus | 0.1 | 0.0 | 0.0 | 100.0 |
| Urban Bus | 0.0 | 0.0 | 0.0 | 0.0 |
| Motorcycle | 2.9 | 37.9 | 62.1 | 0.0 |
| School Bus | 0.1 | 0.0 | 0.0 | 100.0 |
| Motor Home | 0.7 | 0.0 | 85.7 | 14.3 |

Travel Conditions

| | Residential | | | Commercial | | |
|---|---|---|---|---|---|---|
| | Home-Work | Home-Shop | Home-Other | Commute | Non-Work | Customer |
| Urban Trip Length (miles) | 10.8 | 7.3 | 7.5 | 9.5 | 7.4 | 7.4 |
| Rural Trip Length (miles) | 16.8 | 7.1 | 7.9 | 14.7 | 6.6 | 6.6 |
| Trip speeds (mph) | 35.0 | 35.0 | 35.0 | 35.0 | 35.0 | 35.0 |
| % of Trips - Residential | 32.9 | 18.0 | 49.1 | | | |

% of Trips - Commercial (by land use)

Operational Changes to Defaults

# APPENDIX H

**Fault Exploration Report, ENGEO, Inc.**

**Site Infiltration Analysis, ENGEO, Inc.**

**Geotechnical Exploration Report, ENGEO, Inc.**

# FAULT EXPLORATION REPORT

## THE ESTATES AT SAN SEBASTIAN

MORGAN HILL, CALIFORNIA


Submitted to:
Chris Borello
San Sebastian MH General Partnership
17045 Monterey Highway, Suite D
Morgan Hill, CA 95037

Prepared by:
ENGEO Incorporated

October 20, 2011

Project No.
9301.000.000



*- Expect Excellence -*

ENGEO
INCORPORATED

GEOTECHNICAL
ENVIRONMENTAL
WATER RESOURCES
CONSTRUCTION SERVICES

Project No.
**9301.000.000**

October 20, 2011

Mr. Chris Borello
San Sebastian MH General Partnership
17045 Monterey Highway, Suite D
Morgan Hill, CA 95037

Subject: The Estates at San Sebastian
APN 728-34-027
Morgan Hill, California

**FAULT EXPLORATION REPORT**

Dear Mr. Borello:

This fault exploration report presents our geologic findings and recommendations for The Estates at San Sebastian property in Morgan Hill, California. The purpose of this report was to provide the project design team with geologic hazard clearance for potential fault rupture hazards for project planning.

If you have any questions or comments regarding this report, please call and we will be glad to discuss them with you.

Sincerely,

ENGEO Incorporated

PROFESSIONAL GEOLOGIST
MATTHEW HARRELL
No. 2537
Exp. 4/30/2013
CERTIFIED ENGINEERING GEOLOGIST
STATE OF CALIFORNIA

Matthew R. Harrell, CEG
mrh/rps/cjn:fault

PROFESSIONAL GEOLOGIST
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www.engeo.com

# TABLE OF CONTENTS

# 1.0 INTRODUCTION

## 1.1 PURPOSE AND SCOPE

This report presents the results of our fault exploration and recommendations for the property. This study included a review of geologic literature and maps, geologic reconnaissance of the site, examination of aerial photographs, and preparation of this report. The project planners have worked closely with ENGEO to avoid potential geologic impacts to the extent possible within the framework of the overall project objectives.

The conclusions and recommendations presented in this report are preliminary in nature. This report was prepared for the exclusive use of the San Sebastian MH General Partnership and their design team consultants. In the event that any changes are made in the character, design or layout of the development, ENGEO should review the conclusions and recommendations contained in this report to determine whether modifications to the report and related recommendations are necessary. Other than incorporation into EIR documents, this report may not be quoted or excerpted without the express written consent of ENGEO Incorporated.

## 1.2 PROJECT LOCATION AND DESCRIPTION

The property consists of a single parcel totaling approximately 120 acres bounded to the south by Peet Road and Half Road, to the north and east by Cochrane Road, and to the west by Alicante Drive and St. Katherine Drive in Morgan Hill, California (Figure 1). The property is directly across from Coyote Creek at the base of Anderson Dam along the Coast Range foothills. Residential properties are adjacent to the property to the west.

The property is currently agricultural with numerous existing residential and farm structures, consisting of a mixture of wooden and metal buildings. The current study areas are focused on two portions of the property identified by Santa Clara County Fault Hazards Map as having potential for fault rupture (Figure 5).

The San Sebastian property is generally characterized by open agricultural fields and orchards that slope gently to the west. Current elevations range from a high of about 474 feet above mean sea level (msl) at Cochrane Road in the east corner of the property to a low of about 407 feet above msl at the west extent of the property at Peet Road as depicted on Figure 2.

Currently, the property is used for orchard and other agricultural processing activities. The existing farm improvements are located in the central portion of the property.

## 1.3 PROPOSED PROJECT

The conceptual grading plan prepared by RJA indicates a single-family development with internal street access. The development will be accessible off Peet Road and Cochrane Road to the south and north, respectively.

The grading plan shows cutting and filling up to 10 feet in order to achieve conceptual design grades. This will be accomplished through cut slopes, fill slopes, and potentially construction of retaining walls (single walls and terraced walls) within the property. In addition, four detention basins presumably used as part of the post-construction stormwater management plan are shown on the plan, two each near the project entrances. The basins vary in size with planned volumes of 1.5, 3.0, 4.0, and 7.5 acre-feet and depths of roughly 8 to 10 feet.

We anticipate the homes will be up to two stories of wood-framed construction with light to moderately light building loads. Figure 2 shows the currently proposed development plan.

## 1.4 REGIONAL GEOLOGY

The San Sebastian property is located on the west flank of the Diablo Range foothills of the Coast Range geomorphic province, prominent northwest-trending mountains defining the eastern boundary of Santa Clara Valley.

As depicted on Figure 3, regional geologic mapping by Wentworth (1999) maps the site as underlain by Holocene-age levee deposits (Qhl) at the northwestern portion of the property, consisting of sandy and clayey silt ranging to sandy and silty clay. The northeast corner is mapped as underlain by middle to upper Pleistocene-age Alluvial fan deposits (Qof) consisting of tan to reddish brown gravelly and clayey sand and clayey gravel, grading upwards to sandy clay. The remainder of the site is predominantly upper Pleistocene age Alluvial fan deposits (Qpf) consisting of tan to reddish brown gravel that is clast supported with a clayey and sandy matrix.

The area east of the site is mapped as Pliocene-age Silver Creek Gravels (Tsg), consisting of interbedded conglomerate, sandstone, siltstone, tuffaceous sediment, tuff, and basalt. The contact between the Silver Creek Gravels and the Pleistocene age Alluvial fan deposits as mapped as a fault contact (Figure 3). The mapped fault continues to the north of the site, following the base of the east foothills and is named the Coyote Creek fault by Cooper-Clark (1974).

Additional mapping was prepared by Pacific Geotechnical Engineering (1994) as a part of unpublished geologic mapping completed for the City of Morgan Hill. The site is predominantly mapped as underlain by Quaternary age older alluvium (Qoa) with no specification for age. The northeast corner is mapped as underlain by Quaternary age alluvial fan deposits (Qfd). Immediately north of the fan deposits is additional older alluvium that is possibly a Quaternary-age Terrace deposit (Qoa(Qt?)). Adjacent to the fan deposit to the south is a mapped dormant landslide (Qld). The toe of the landslide is mapped as encroaching onto a small portion of the project as shown on Figure 2. A fault identified as the Range Front Thrust Fault (Coyote Creek fault) is mapped east and north of the site.

### 1.5 PREVIOUS INVESTIGATIONS

The projects were previously investigated by Pacific Geotechnical Engineers (2009). Previous reports for the property are listed in the References. The previous investigations evaluated both fault and landslide hazards, but did not include trenching investigations.

## 2.0 GEOMORPHOLOGY

### 2.1 FAULT MAPPING

#### 2.1.1 State Earthquake Fault Hazard Map

The property is not mapped within a State of California Earthquake Fault Hazard Zone (1982). The Calaveras Fault Zone is mapped east of Anderson Lake as shown on Figure 4.

#### 2.1.2 Santa Clara County Earthquake Fault Rupture Hazard Map

As discussed above, the Coyote Fault is mapped adjacent to the east and north property limits. Santa Clara County has defined a Fault Rupture Hazard Zone along the north and east property boundaries parallel to Cochrane Road with small areas mapped within the project limits as shown on Figures 2 and 5. The subsurface investigation for this project was focused on evaluation of the possible existence of the eastern fault trace.

#### 2.1.3 Regional Geologic Maps and Consultant Studies

Traces of the Coyote Fault have been mapped by Wentworth near the project site as shown on Figure 3, possibly encroaching onto the project limits at the eastern boundary. The fault defines the contact between Pleistocene-age alluvial fan deposits and the Pliocene-age Silver Creek Gravels. The subsurface investigation for this project was focused on evaluation of the possible existence of the eastern fault trace.

#### 2.1.4 United States Geologic Survey Quaternary Fold and Fault Database

The USGS Quaternary Fold and Fault Database (QFFD) is a nationwide GIS-based database that identifies fault locations and classifies faults based on estimated age. In California, the QFFD is jointly maintained by the USGS and the California Geological Survey (CGS). Faults identified onsite and in the vicinity in the QFFD are depicted on Figure 6. The less-than 1,600,000 year-old fault on the eastern portion of the site has no detailed documentation in the QFFD. The subsurface investigation for this project was focused on evaluation of the possible existence of the eastern QFFD fault trace.

# 3.0 SUBSURFACE INVESTIGATION

## 3.1 FAULT TRENCHES

Our subsurface investigation included excavation and logging of two trenches to depths of as much as 6 to 8 feet. The excavation walls were cleaned of smeared materials and logged by our engineering geologists. The log of Trench T-1 is presented in Figure 8. A second trench was attempted at the northern portion of the property adjacent to Cochrane Road; however, loose sands and severe trench wall instability made trenching logging infeasible. According to the current conceptual site plan, development along the northern property edge includes two detention basins. Since the development area for residential use is outside of the Santa Clara County Fault Rupture Hazards Zone in this area, no further excavation activities were attempted and residential use will be restricted to outside of the County Fault Rupture Hazards Zone (Figure 2).

Fault Trench T-1 was situated to evaluate the possible presence of the north-south-trending Coyote Creek Fault trace mapped by Wentworth and to clear the previously described Fault Rupture Hazard Zone for potential fault hazards. Trending S47W, the trench encountered stratified soil horizons over an alluvial fan deposit consisting of clayey coarse sands with gravels and some cobbles, interpreted to be Pleistocene in age. The clay matrix was generally a dark yellowish brown to red-brown. The Pleistocene alluvium was exposed at the base of the trench for the entire length of the trench. Beginning at approximately Station 0+60, the overlying soil horizons were observed to be thinning with the younger soil horizon becoming predominant and thicker. At Station 0+86, the trench was adjusted to trend S88W, perpendicular to the slope face. A soil profile up to 4 feet thick was observed at Station 1+55 continuing to the terminus of the trench at the base of the hill, which is consistent with soil accumulation and indicative of colluvial deposition. The trench was deepened from Station 1+55 to 1+70 an additional 2 feet to expose the alluvium for logging. No features indicative of faulting, such as clay shears or gouge, were observed through the entire length of the trench.

# 4.0 CONCLUSIONS

Based on the results of fault exploration at the site, we found no evidence of faulting in the trench excavated across the location of mapped fault traces on the eastern portion of the property identified by Wentworth (1999), Santa Clara County (2004), and the QFFD. The soil conditions in the areas where these faults are mapped consist of Pleistocene-age alluvial fan deposits overlain by a well-developed soil profile. No features indicative of faulting, such as clay shears or gouge, were observed over the entire length of the trench. We therefore conclude that there are no active faults passing through the area of the site covered by our trench and that the risk of surface fault rupture within the planned development at the site is low. At this time, planning for the northern portion of the site identified as within the Santa Clara County Fault Rupture Hazard Zone includes detention basins. Residential lots are not planned within the Santa Clara County Fault Rupture Hazard Zone along the northern project boundary (Figure 2).

Based on the fault trenching performed along the eastern site boundary and the location of planned residential improvements along the northern project boundary, we conclude that the risk of surface fault rupture within the planned residential lots at the site is low.

The exploratory trenches were backfilled with nominal compactive effort and may experience settlement in the future. Any portions of the trench backfill that are not removed by design cuts should be removed and replaced as engineered fill.

## 5.0 LIMITATIONS AND UNIFORMITY OF CONDITIONS

This report presents preliminary geotechnical recommendations for planning purposes. If changes occur in the nature or design of the project, we should be allowed to review this report and provide additional recommendations, if any. It is the responsibility of the owner to transmit the information and recommendations of this report to the appropriate organizations or people involved in design of the project, including but not limited to developers, owners, buyers, architects, engineers, and designers. The conclusions and recommendations contained in this report are solely professional opinions and are valid for a period of no more than 2 years from the date of report issuance.

We strived to perform our professional services in accordance with generally accepted geotechnical engineering principles and practices currently employed in the area; no warranty is expressed or implied. There are risks of earth movement and property damages inherent in building on or with earth materials. We are unable to eliminate all risks or provide insurance; therefore, we are unable to guarantee or warrant the results of our services.

This report is based upon field and other conditions discovered at the time of report preparation. We developed this report with limited subsurface exploration data. We assumed that our subsurface exploration data is representative of the actual subsurface conditions across the site. Considering possible underground variability of soil, rock, stockpiled material, and groundwater, additional costs may be required to complete the project. We recommend that the owner establish a contingency fund to cover such costs. If unexpected conditions are encountered, notify ENGEO immediately to review these conditions and provide additional and/or modified recommendations, as necessary.

Other than incorporation of all or parts of this report into project EIR documents, this document must not be subject to unauthorized reuse, that is, reusing without written authorization of ENGEO. Such authorization is essential because it requires ENGEO to evaluate the document's applicability given new circumstances, not the least of which is passage of time.

Actual field or other conditions will necessitate clarifications, adjustments, modifications or other changes to ENGEO's documents. Therefore, ENGEO must be engaged to prepare the necessary clarifications, adjustments, modifications or other changes before construction activities commence or further activity proceeds. If ENGEO's scope of services does not include on-site construction observation, or if other persons or entities are retained to provide such services, ENGEO cannot be held responsible for any or all claims arising from or resulting from the performance of such services by other persons or entities, and from any or all claims arising from or resulting from clarifications, adjustments, modifications, discrepancies or other changes necessary to reflect changed field or other conditions.

# REFERENCES

California Division of Mines and Geology, 1982, Revised official map of Alquist-Priolo Earthquake Fault Hazard Zones, Morgan Hill Quadrangle: California Division of Mines and Geology, scale 1:24000.

Santa Clara County, 2002, Geologic Hazard Zones, Fault Rupture Hazard Zones, Sheet 45, February 26, 2002.

United States Geological Survey and the California Geological Survey, 2006, Quaternary fault and fold database for the United States, accessed August 2011, from USGS web site: http//earthquakes.usgs.gov/regional/qfaults/.

United States Geological Survey, 2008, National Elevation Database, 1/9 arc-second digital elevation model and Eros imagery .May, 2008.

2007 Working Group on California Earthquake Probabilities, 2008, The Uniform California Earthquake Rupture Forecast, Version 2 (UCERF 2): U.S. Geological Survey Open-File Report 2007-1437 and California Geological Survey Special Report 203 [http://pubs.usgs.gov/of/2007/1437/].

Wentworth et al, 1999, Preliminary Geologic Map of the San Jose 30 x 60 Minute Quadrangle, California.

# FIGURES






BASE MAP SOURCE: MS STREETS AND TRIPS

| ENGEO Expect Excellence | VICINITY MAP<br>THE ESTATES AT SAN SEBASTIAN<br>MORGAN HILL, CALIFORNIA | PROJECT NO.: 9301.000.000<br>SCALE: AS SHOWN<br>DRAWN BY: DLB CHECKED BY: RPS | FIGURE NO.<br>1 |
|---|---|---|---|

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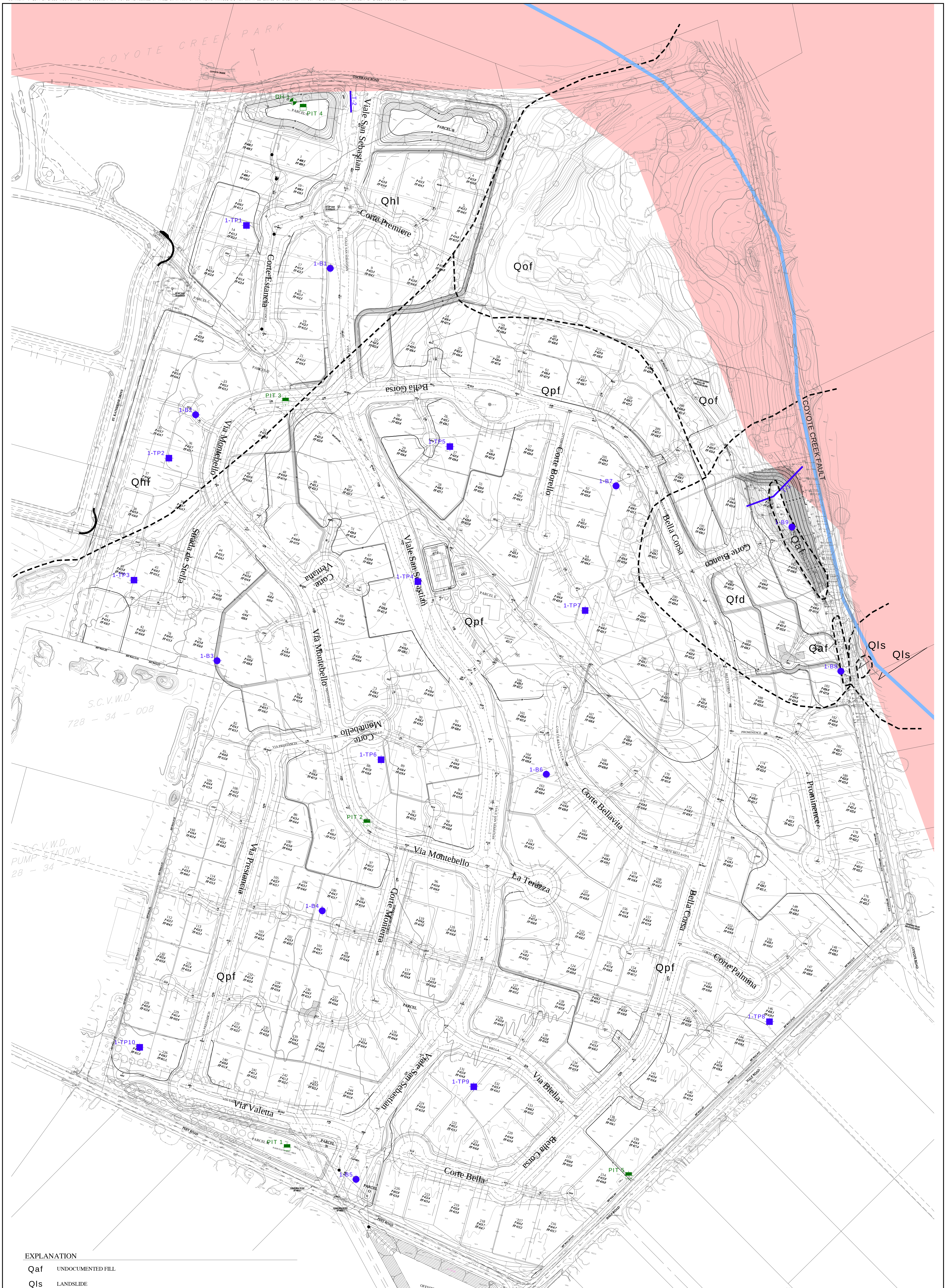


EXPLANATION

| | |
|---|---|
| Qaf | UNDOCUMENTED FILL |
| Qls | LANDSLIDE |
| Qhl | HOLOCENE AGE LEVEE DEPOSITS |
| Qfd | YOUNGER PLEISTOCENE FAN DEPOSITS |
| Qof | OLDER PLEISTOCENE FAN DEPOSITS |
| Qpf | PLEISTOCENE AGE ALLUVIAL DEPOSITS |
| 1-B9 | APPROXIMATE LOCATION OF BORING (ENGEO, 2011) |
| DH-1 | APPROXIMATE LOCATION OF BORING (PACIFIC GEOTECHNICAL ENGINEERS, 2010) |
| 1-TP11 | APPROXIMATE LOCATION OF TEST PIT (ENGEO, 2011) |
| PIT 5 | APPROXIMATE LOCATION OF TEST PIT (PACIFIC GEOTECHNICAL ENGINEERS, 2010) |
| T-2 | APPROXIMATE LOCATION OF FAULT TRENCH (ENGEO, 2011) |
| | QUATERNARY FAULT, YOUNGER THAN 1,600,000 YEARS (U.S. GEOLOGICAL SURVEY, 2006) |
| | FAULT RUPTURE HAZARD ZONES (SANTA CLARA COUNTY, 2002) |

N

0 FEET 120
0 METERS 60

BASE MAP SOURCE: RUGGERI-JENSEN-AZAR, 2011

| | | | |
|---|---|---|---|
| ENGEO Expect Excellence | SITE GEOLOGIC MAP<br>THE ESTATES AT SAN SEBASTIAN<br>MORGAN HILL, CALIFORNIA | PROJECT NO.: 9301.000.000<br>SCALE: AS SHOWN<br>DRAWN BY: DLB CHECKED BY: RPS | FIGURE NO.<br>2 |

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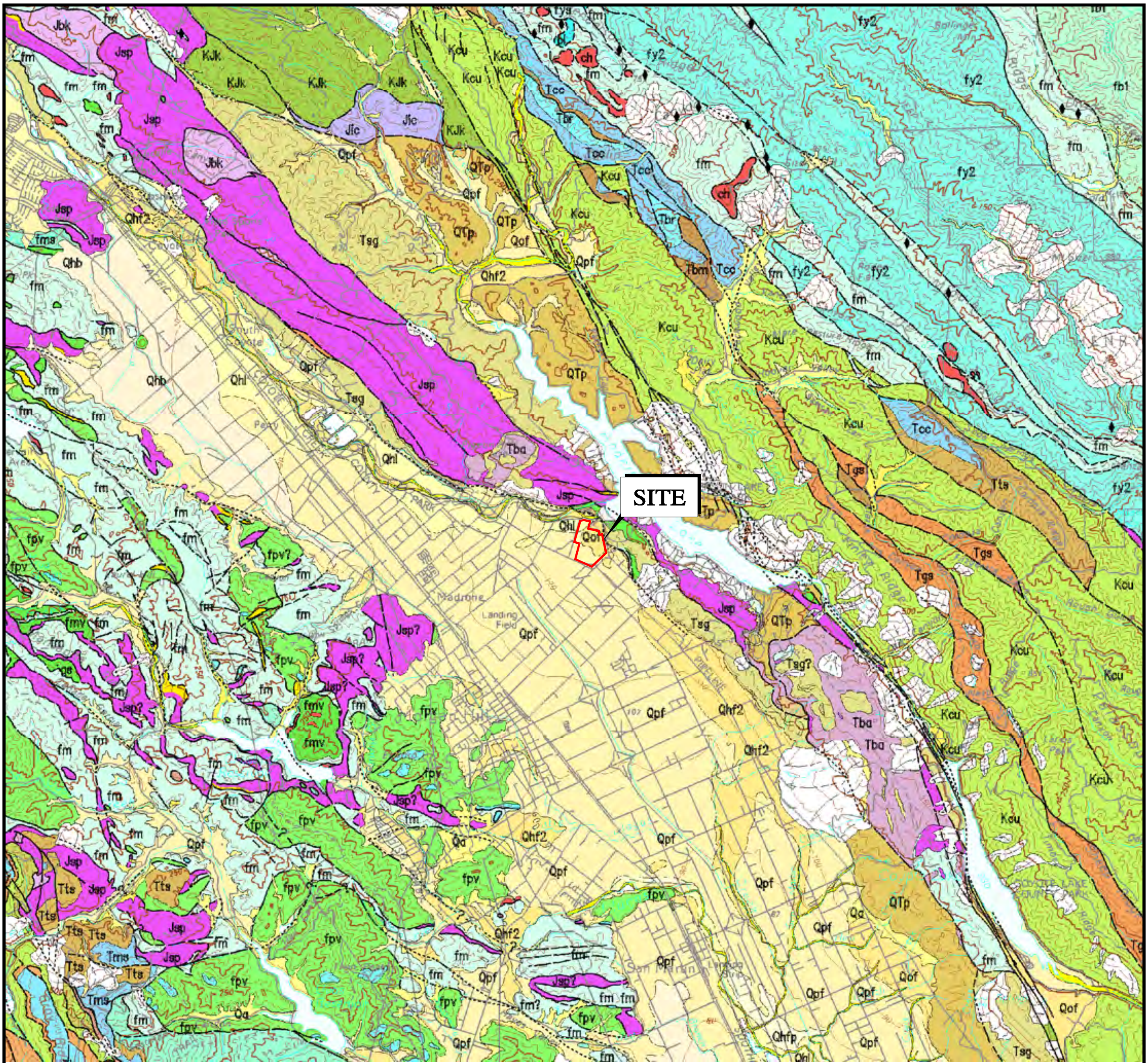


## EXPLANATION

| | |
|---|---|
| Qhl | LEVEE DEPOSITS |
| Qpf | ALLUVIAL FAN DEPOSITS |
| Qof | OLDER ALLUVIAL FAN DEPOSITS |
| Tsg | SILVER CREEK GRAVELS |
| Jsp | SERPENTINIZED HARZBURGITE AND DUNITE |

N

0 MILES 2

0 KILOMETERS 4

*BASE MAP SOURCE: WENTWORTH, 1999*

ENGEO
Expect Excellence

REGIONAL GEOLOGIC MAP
THE ESTATES AT SAN SEBASTIAN
MORGAN HILL, CALIFORNIA

| | | |
|---|---|---|
| PROJECT NO.: 9301.000.000 | | FIGURE NO. 3 |
| SCALE: AS SHOWN | | |
| DRAWN BY: DLB | CHECKED BY: RPS | |

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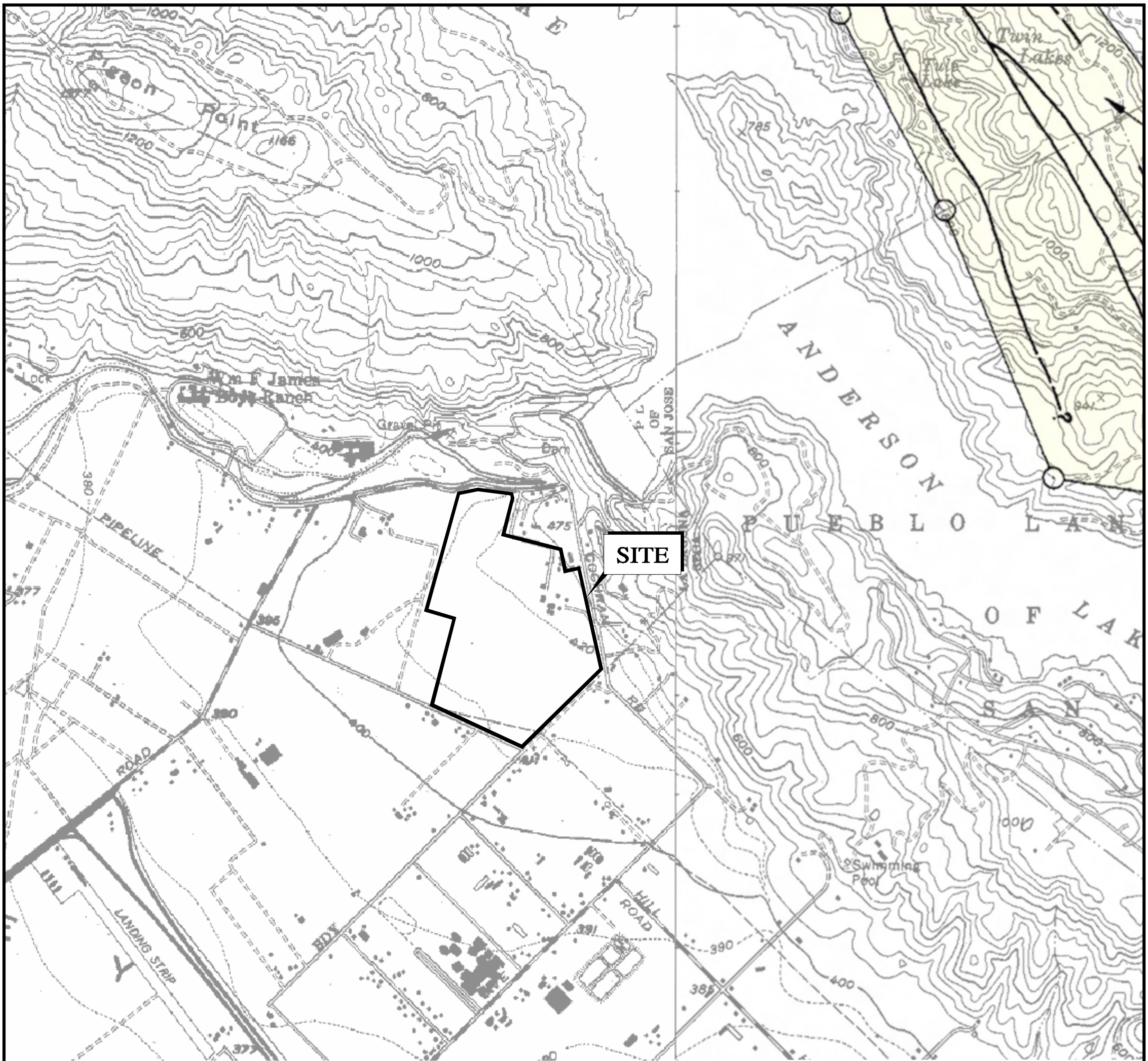


## EXPLANATION

1906 C

FAULTS CONSIDERED TO HAVE BEEN ACTIVE DURING HOLOCENE TIME AND TO HAVE A RELATIVELY HIGH POTENTIAL FOR SURFACE RUPTURE; SOLID LINE WHERE ACCURATELY LOCATED, LONG DASH WHERE APPROXIMATELY LOCATED, SHORT DASH WHERE INFERRED, DOTTED WHERE CONCEALED; QUERY (?) INDICATES ADDITIONAL UNCERTAINTY. EVIDENCE OF HISTORIC OFFSET INDICATED BY YEAR OF EARTHQUAKE-ASSOCIATED EVENT OR C FOR DISPLACEMENT CAUSED BY CREEP OR POSSIBLE CREEP.

SPECIAL STUDIES ZONE BOUNDARIES; DELINEATED AS STRAIGHT-LINE SEGMENTS THAT CONNECT ENCIRCLED TURNING POINTS SO AS TO DEFINE SPECIAL STUDIES ZONE SEGMENTS.

N

0 FEET 2000
0 METERS 1000

BASE MAP SOURCE: CDMG, 1982

| ENGEO — Expect Excellence | EARTHQUAKE FAULT HAZARD MAP<br>THE ESTATES AT SAN SEBASTIAN<br>MORGAN HILL, CALIFORNIA | PROJECT NO.: 9301.000.000<br>SCALE: AS SHOWN<br>DRAWN BY: DLB — CHECKED BY: RPS | FIGURE NO<br>4 |
|---|---|---|---|

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ORIGINAL FIGURE PRINTED IN COLOR


BASE MAP SOURCE: SANTA CLARA COUNTY, 2002

ENGEO
Expect Excellence

FAULT RUPTURE HAZARD ZONES
THE ESTATES AT SAN SEBASTIAN
MORGAN HILL, CALIFORNIA

PROJECT NO.: 9301.000.000
SCALE: AS SHOWN
DRAWN BY: DLB
CHECKED BY: RPS

FIGURE NO
5

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ORIGINAL FIGURE PRINTED IN COLOR


IMAGE BASE SOURCE: GOOGLE EARTH

N

EXPLANATION

QUATERNARY FAULT, YOUNGER THAN 1,600,000 YEARS

0 FEET 2000
0 METERS 1000

SOURCE: U.S. GEOLOGICAL SURVEY AND CALIFORNIA GEOLOGICAL SURVEY, 2006, QUATERNARY FAULT AND FOLD DATABASE FOR THE UNITED STATES, ACCESSED AUGUST 12, 2011, FROM USGS WEB SITE: HTTP//EARTHQUAKES.USGS.GOV/REGIONAL/QFAULTS/

| ENGEO Expect Excellence | QUATERNARY FAULT AND FOLD MAP<br>THE ESTATES AT SAN SEBASTIAN<br>MORGAN HILL, CALIFORNIA | PROJECT NO.: 9301.000.000<br>SCALE: AS SHOWN<br>DRAWN BY: DLB CHECKED BY: RPS | FIGURE NO<br>6 |
|---|---|---|---|

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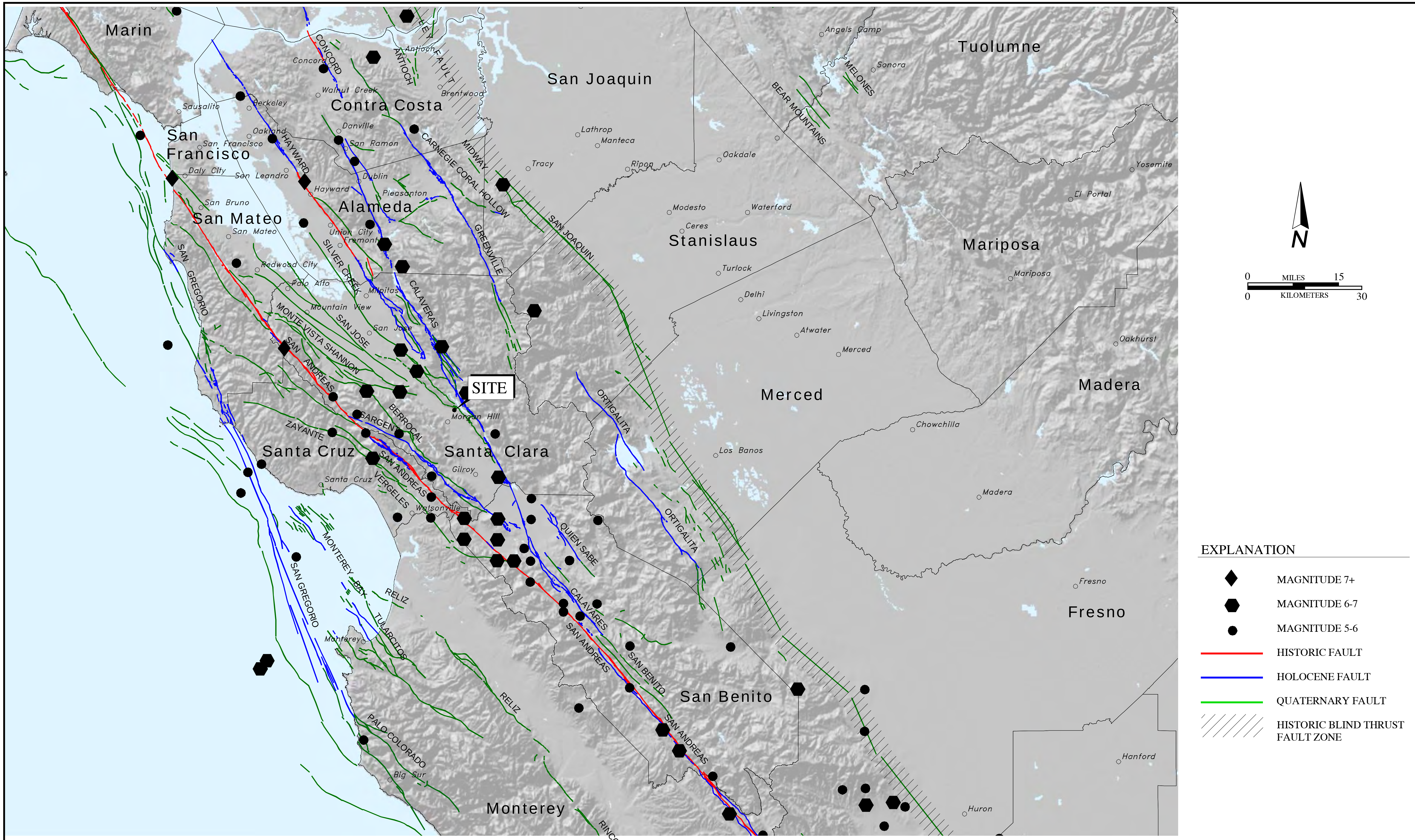


BASE MAP SOURCE:
U.S.G.S. 1-ARC SECOND S.R.T.M. DATABASE
U.S.G.S. QUATERNARY FAULT DATABASE, MARCH, 2006
U.S.G.S. HISTORIC EARTHQUAKE DATABASE (1800-2000)

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REGIONAL FAULTING AND SEISMICITY
THE ESTATES AT SAN SEBASTIAN
MORGAN HILL, CALIFORNIA

| | |
|---|---|
| PROJECT NO.: 9301.000.000 | FIGURE NO |
| SCALE: AS SHOWN | 7 |
| DRAWN BY: DLB | CHECKED BY: RPS |

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EXPLANATION

1 Sandy silty CLAY, gray brown to brown, dry loose, some rootlets, trace gravels.

2 Silty CLAY with sand, brown to dark red-brown, dry to damp, medium stiff.

3 Silty CLAY with sand, dark red-brown, damp, medium stiff, weak blocky pedogenic structure at the base of the unit, stone layer at base of unit consisting of gravels.

4 Silty CLAY with sand, dark yellowish brown, damp, medium stiff, blocky pedogenic structure, trace gravels.

5 Silty CLAY with sand, yellowish brown, moist, stiff, weak vertical pedogenic partings, weak stone layer at base consisting of some gravels.

6 Clayey SAND with silt, yellowish brown, moist, medium dense, some gravel, bioturbadted a base with underlying alluvial fan deposit, weak pedogenic soil structure consisting of vertical partings.

7 Clayey coarse SAND with gravel, dark yellowish brown, moist, medium dense, alluvial fan deposits consisting of imbricated gravels and cobbles, Qfd (after PGE).

8 Clayey coarse SAND with gravel, yellowish brown to red-brown, moist dense, alluvial fan deposits consisting of imbricated gravels and cobbles, Qfd (after PGE).

9 Clayey SAND to sandy CLAY, brown to yellowish brown, moist to dry, loose to soft, FILL.

10 Clayey SAND with gravel, dark red-brown, moist, medium dense.

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FAULT TRENCH T-1 LOG
THE ESTATES AT SAN SEBASTIAN
MORGAN HILL, CALIFORNIA

| | |
|---|---|
| PROJECT NO.: 9301.000.000 | FIGURE NO. 8 |
| SCALE: AS SHOWN | |
| DRAWN BY: DLB | CHECKED BY: RPS |

ORIGINAL FIGURE PRINTED IN COLOR



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ENGEO INCORPORATED

GEOTECHNICAL
ENVIRONMENTAL
WATER RESOURCES
CONSTRUCTION SERVICES

Project No.
**9301.000.000**

September 19, 2011

Mr. Chris Borello
San Sebastian MH General Partnership
17045 Monterey Hwy., Suite D
Morgan Hill, CA 95037

Subject: The Estates at San Sebastian
Morgan Hill, California

**SITE INFILTRATION OPPORTUNITIES**

Dear Mr. Borello:

As requested, this letter briefly summarizes the potential for site infiltration based on percolation testing for your planned residential development in Morgan Hill, California. We utilized the Plasticity Index and grain size distribution test results from our July 2011 field exploration comprising ten test pits and nine borings, as well as in-situ percolation test results previously reported by Pacific Geotechnical (June 22, 2010 and April 27, 2011).

## SITE CONDITIONS

The conceptual grading plan typically shows minor cuts and fills, thus we anticipate that the upper 5 feet of the site will be raised, lowered, or reworked as engineered fill. The existing soil conditions generally comprise a surficial layer (up to 4 feet thick) of sandy silt or sandy clay overlying gravelly sands. The sandy silt or sandy clays were tested to have between 50 and 60 percent passing the No. 200 sieve (fines), while the gravelly sands predominantly contained 15 percent or less passing the No. 200 sieve (fines).

Prior in-situ percolation testing performed in the upper 6 feet of existing grades exhibited variable coefficients of permeability (k) between 0.30 in/hr and 9.78 in/hr at the 6 locations assessed (11 tests performed).

## CONCLUSIONS

Based on the above in-situ and laboratory testing, the site appears to have significant infiltration opportunities to pre-treat or retain stormwater and urban runoff. If you have any questions, please do not hesitate to contact us.

Sincerely,

ENGEO Incorporated

Julia A. Moriarty, GE     Raymond P. Skinner, CEG

# GEOTECHNICAL EXPLORATION

## THE ESTATES AT SAN SEBASTIAN

MORGAN HILL, CALIFORNIA


Submitted to:
Chris Borello
San Sebastian MH General Partnership
17045 Monterey Highway, Suite D
Morgan Hill, CA 95037

Prepared by:
ENGEO Incorporated

December 20, 2011
Revised February 10, 2012

Project No.
9301.000.000



*- Expect Excellence -*

ENGEO
INCORPORATED

GEOTECHNICAL
ENVIRONMENTAL
WATER RESOURCES
CONSTRUCTION SERVICES

Project No.
**9301.000.000**

December 20, 2011
Revised February 10, 2012

Mr. Chris Borello
San Sebastian MH General Partnership
17045 Monterey Highway, Suite D
Morgan Hill, CA 95037

Subject: The Estates at San Sebastian
APN 728-34-027
Morgan Hill, California

**GEOTECHNICAL EXPLORATION**

Dear Mr. Borello:

With your authorization, we completed this geotechnical exploration report for the proposed Estates at San Sebastian project located in Morgan Hill, California. The accompanying geotechnical exploration report presents our field exploration and laboratory testing together with our conclusions and recommendations regarding residential development at the site.

Our findings indicate that the study area is suitable for the proposed residential development provided the recommendations of this report are incorporated into project design and implemented during construction. We are pleased to have been of service to you on this project and are prepared to consult further with you and your design team as the project progresses.

Sincerely

ENGEO Incorporated

Matthew R. Harrell, CEG

Paul C. Guerin, GE

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www.engeo.com

# TABLE OF CONTENTS

## Letter of Transmittal

Page

# 1.0 INTRODUCTION

## 1.1 PURPOSE AND SCOPE

The purpose of this geotechnical report is to provide conclusions and recommendations for the proposed residential development. The scope of our services included a review of available literature, geologic maps and previous geotechnical reports pertinent to the site; additional geologic mapping; performing a supplemental subsurface exploration consisting of nine soil borings and ten test pits; limited laboratory testing of materials sampled during the field exploration; geotechnical data analyses; and report preparation summarizing our recommendations for the proposed site development.

We prepared this report exclusively for San Sebastian MH Group and its design team consultants for use in the EIR, and during land planning and design. ENGEO should review any changes made in the character, design or layout of the development to modify the conclusions and recommendations contained in this report, as necessary.

## 1.2 SITE LOCATION AND DESCRIPTION

The property consists of a single parcel totaling approximately 120 acres plus portions of four additional parcels needed to construct the Peet Road realignment and a planned water quality basin. As a result, the overall site is bounded to the south by Peet Road and Half Road, to the north and east by Cochrane Road, and to the west by Alicante Drive and St. Katherine Drive in Morgan Hill, California (Figure 1). The property is directly across from Coyote Creek at the base of Anderson Dam along the Coast Range foothills. Residential properties are adjacent to the property to the west.

The property is currently agricultural with numerous existing residential and farm structures, consisting of a mixture of wooden and metal buildings. The property is generally characterized by open agricultural fields and orchards, gently sloping to the west. Current elevations range from a high of about 474 feet above mean sea level (msl) at Cochrane Road in the east corner of the property to a low of about 407 feet above msl at the west extent of the property at Peet Road as depicted on Figure 2.

Currently, the property is used for orchard and other agricultural processing activities. The existing farm improvements are located near the eastern and southern edges of the property.

## 1.3 PROPOSED DEVELOPMENT

The conceptual grading plan prepared by RJA indicates a single-family development with internal street access. The development will be accessible off Peet Road and Cochrane Road to the south and north, respectively.

The grading plan shows cutting and filling up to 10 feet in order to achieve conceptual design grades. This will be accomplished through cut slopes, fill slopes and potentially construction of retaining walls (single walls and terraced walls) within the property. In addition, four detention basins presumably used as part of the post-construction stormwater management plan are shown on the plan, two each near the project entrances. The basins vary in size with planned volumes of 1.5, 3.0, 4.0 and 7.5 acre-feet and depths up to roughly 10 feet.

We anticipate the homes will be up to two stories of wood-framed construction with light to moderately light building loads. Figure 2 shows the currently proposed development plan.

### 1.4 PREVIOUS STUDIES

The following discussion summarizes previous studies and field explorations performed at the subject site in 2009 and 2010. Select data reported in past reports were incorporated into our analyses for this study, as deemed appropriate. The approximate locations of the borings and test pits from previous studies are depicted on Figure 2. In addition, select documentation, boring logs, test pit logs and associated laboratory test results are presented in Appendix C.

In August 2009, Pacific Geotechnical Engineering (PGE) conducted a preliminary geotechnical evaluation that included of review of published and unpublished reports and mapping; a review of historic aerial photographs; a site reconnaissance; and preparation of preliminary geotechnical evaluation report summarizing findings and conclusions. No field exploration program was conducted as a part of this study.

PGE (June 2010) conducted a liquefaction evaluation that included an evaluation of physical and engineering properties of the subsurface soils based on one exploratory boring (49 feet deep) situated in the northwest portion of the site; engineering analysis; and preparation of a report summarizing findings and conclusions.

PGE (June 2010) conducted percolation testing that included an evaluation of physical and engineering properties of the subsurface soils based on exploratory test pits; engineering analysis; and preparation of a report summarizing findings and conclusions. The field exploration included excavating six exploratory test pits in the vicinity of proposed detention basins to depths ranging from 4 to 6 feet. The results of the percolation testing are included in Appendix C.

## 2.0 GEOLOGY AND SEISMICITY

### 2.1 SITE SOILS AND GEOLOGY

The property is located on the west flank of the Diablo Range foothills of the Coast Range geomorphic province, prominent northwest-trending mountains defining the eastern boundary of Santa Clara Valley.

As depicted on Figure 3, regional geologic mapping by Wentworth (1999) maps the site as underlain by Holocene age levee deposits (Qhl) at the northwest portion of the property, consisting of sandy and clayey silt ranging to sandy and silty clay. The northeast corner is mapped as underlain by middle to upper Pleistocene age Alluvial fan deposits (Qof) consisting of tan to reddish brown gravelly and clayey sand and clayey gravel, grading upwards to sandy clay. The remainder of the site is predominantly upper Pleistocene age Alluvial fan deposits (Qpf) consisting of tan to reddish brown gravel that is clast supported with a clayey and sandy matrix.

The area east of the site is mapped the Pliocene age Silver Creek Gravels (Tsg), consisting of interbedded conglomerate, sandstone, siltstone, tuffaceous sediment, tuff, and basalt. The contact between the Silver Creek Gravels and the Pleistocene age Alluvial fan deposits as mapped as a fault contact (Figure 3). The mapped fault continues to the north of the site, following the base of the east foothills and is named the Coyote Creek fault by Cooper-Clark (1974).

Additional mapping was prepared by Pacific Geotechnical Engineering (1994) as a part of unpublished geologic mapping completed for the City of Morgan Hill. The site is predominantly mapped as underlain by Quaternary age older alluvium (Qoa) with no specification for age. The northeast corner is mapped as underlain by Quaternary age alluvial fan deposits (Qfd). Immediately north of the fan deposits is additional older alluvium that is possibly a Quaternary age Terrace deposit (Qoa(Qt?)). Adjacent to the fan deposit to the south is a mapped dormant landslide (Qld). The toe of the landslide is mapped as encroaching onto a small portion of the project as shown on Figure 2. A fault identified as the Range Front Thrust Fault (Coyote Creek fault) is mapped east and north of the site.

As part of our study, we performed additional geologic mapping of the project site as presented on Figure 2. A brief discussion of the geologic units and mapped locations follows:

- *Existing Fill* (Qaf) was observed adjacent to Cochrane Road along the east property boundary, where fills in excess of five feet were identified for the steeper slope area identified on Figure 2. Other minor fill of less than 2 feet should be anticipated at existing structures on the property.

- *Levee Deposits* (Qhl) were mapped as underlying the northern portion of the property to a notable break in slope trending southwest.

- *Landslide Deposits (Qls)* were identified at the east property boundary with displacement interpreted to be southwest trending towards the property along the eastern portion of the site at Cochrane Road. Vegetation on the slope, including dense areas of trees, and an existing residential structure, suggests that the accumulation of landslide debris is a gradual process that has occurred over a long period of time.

- *Alluvial Fan Deposits* (Qfd) estimated to be upper Pleistocene in age, were mapped at the eastern portion of the site at a notable break in slope on topographic maps at the base of the foothills to the east.

- *Older Alluvial Fan Deposits* (Qof) estimated to be middle to upper Pleistocenein age, were mapped at the northeast portion of the site at a notable break in slope on topographic maps at the base of the foothills. Interpreted to be older in age than Qfd.

- *Pleistocene Alluvial Fan Deposits* (Qpf) were mapped for the remainder of the site at the gently sloping area to the southwest.

## 2.2 SITE SEISMICITY

The site is not located within a State of California Earthquake Fault Zone (1982), and no known active faults cross the site. The nearest known active[1] fault surface trace is the Calaveras fault mapped about 1.3 miles northeast of the site on the other side of Anderson Lake as shown on Figure 4. Other nearby active faults include the Hayward fault (southeast extension) mapped about 6.3 miles northwest of the site; the Sargent fault mapped about 9.2 miles southwest of the site; the San Andreas fault mapped about 11.7 miles southwest of the site; the Zayante-Vergeles fault mapped about 14.5 miles southwest of the site; the Monte Vista-Shannon fault (Blossom Hill fault) located about 16.0 miles west of the site; the Ortigalita fault mapped about 20.6 miles east of the site; and the San Gregorio fault mapped about 34.1 miles west of the site. The nearest known potentially active fault is the Coyote Fault, discussed further in Section 2.2.1.

Because of the presence of nearby active faults, the region is considered seismically active. Numerous small earthquakes occur every year in the region, and large (>M7) earthquakes have been recorded and can be expected to occur in the future. Figure 8 shows the approximate locations of these faults and significant historic earthquakes recorded within the Greater Bay Area Region.

Ground motions (10 percent probability of being exceeded in 50 years) are expressed as a fraction of the acceleration due to gravity (g). According to ground motions published on the California Geological Survey's Probabilistic Seismic Hazards Mapping website, the local faults are capable of causing a peak ground acceleration (pga) of 0.7 g at the site.

### 2.2.1 Fault Mapping

Mapping completed by others in the region, indicate possible faulting (Coyote Fault) along portions of the northern and eastern edges of the site as shown on Figures 2, 3, and 6. The mapping is described as below and is addressed in a separate Fault Exploration Report completed concurrently with this study.

[1] An active fault is defined by the State Mining and Geology Board as one that has had surface displacement within Holocene time (about the last 11,000 years). The State of California has prepared maps designating zones for special studies that contain these active earthquake faults.

#### 2.2.1.1 Santa Clara County Earthquake Fault Rupture Hazard Map

The potentially active Coyote Fault is mapped just northeast of the site. As a result, Santa Clara County has defined a Fault Rupture Hazard Zone along the north and east property boundaries, as shown on Figure 6. The subsurface investigation described in the Fault Exploration Report focused on evaluation of the possible existence of the eastern fault trace.

#### 2.2.1.2 Regional Geologic Maps and Consultant Studies

Traces of the Coyote Fault have also been mapped by Wentworth as shown on Figure 3, encroaching the project limits at the northeast boundary. The fault defines the contact between Pleistocene age alluvial fan deposits and the Pliocene age Silver Creek Gravels.

#### 2.2.1.3 United States Geologic Survey Quaternary Fold and Fault Database

The USGS Quaternary Fold and Fault Database (QFFD) is a nationwide GIS-based database that identifies fault locations and classifies faults based on estimated age. In California, the QFFD is jointly maintained by the USGS and the California Geological Survey (CGS). The less than 1.6 million year-old fault on the eastern portion of the site has no detailed documentation in the QFFD, but appears to be at the general alignment as Coyote Fault mapped by others.

## 3.0 FIELD EXPLORATION

The field exploration for this study was conducted on July 19 through 21, 2011, and consisted of drilling nine exploratory borings and excavating ten exploratory test pits within the proposed development area of the site. Figure 2 presents the approximate locations of the exploratory borings and test pits. The locations were obtained by taping or pacing from existing features; therefore, they should be considered accurately located only to the degree implied by the method used.

### 3.1 AUGER TEST BORINGS

The test borings were drilled using a track-mounted drill rig equipped with 8-inch-diameter hollow stem augers and 4-inch-diameter solid-flight augers, an automatic-trip safety hammer, and drill rods. The borings ranged in depth between 12½ and 51½ feet below ground surface. ENGEO engineers logged the borings in the field and collected soil samples using either a 2½ inch inside diameter (I.D.) California-type split-spoon sampler fitted with 6-inch-long brass liners or a 2 inch outside diameter (O.D.) Standard Penetration Test split-spoon sampler. The samplers were driven with a 140-pound safety hammer falling a distance of 30 inches employing an automatic trip system.

We recorded the penetration of the samplers into the native materials as the number of blows needed to drive the sampler 18 inches in 6 inch increments. The boring logs record blow count results as the actual number of blows required for the last one foot of penetration; no conversion factors have been applied. We used the field logs to develop the report boring logs, which are presented in Appendix A.

The logs depict subsurface conditions within the borings at the time the exploration was conducted. Subsurface conditions at other locations may differ from conditions occurring at these boring locations. The passage of time may result in altered subsurface conditions. In addition, stratification lines represent the approximate boundaries between soil types, and the transition may be gradual.

## 3.2 TEST PITS

The test pits were excavated to observe and provide additional assessment of the geologic soil conditions in areas of planned development and to supplement our borings. Ten exploratory test pits (1-TP1 through 1-TP10) were excavated to depths of up to 8 feet below grades at the locations shown on Figure 2, using a track-mounted excavator equipped with a 36-inch-wide bucket.

An ENGEO Geologist logged the test pits during excavation for soil classification. The field logs for the test pits were used to develop the report logs, which are located in Appendix A. The logs depict subsurface conditions within the pits for the date of site activities; however, subsurface conditions may vary with time.

Once completed, the pits were backfilled on the day of field exploration activities using nominal compactive effort by the excavator bucket. Excess soil was mounded and track walked to hinder ponding of stormwater. Depending upon the depths of cut in these areas, future grading will require removal and replacement of the non-engineered pit backfill if located within areas to be graded. The test pits could also be as-built surveyed for future reference.

## 3.3 LABORATORY TESTING

Select samples recovered during drilling activities were tested to determine the following soil characteristics:

**TABLE 3.3-1**

| Soil Characteristic | Testing Method | Location of Results |
|---|---|---|
| Natural Unit Weight and Moisture Content | ASTM D-2216 | Appendix A |
| Atterberg Limits | ASTM D-4318 | Appendix B |
| Grain Size Distribution | ASTM D-422 | Appendix B |
| Compaction Test | ASTM D-1557 | Appendix B |
| Direct Shear Strength | ASTM D-3080 | Appendix B |
| Triaxial Compression | ASTM D-4767 | Appendix B |
| Sulfate Content | Caltrans 417 | Appendix B |
| CARB 435, Fibrous Asbestos Content | EPA 600 | Appendix B |

The laboratory test results are shown on the borelogs (Appendix A), with individual test results presented in Appendix B.

### 3.4 SUBSURFACE CONDITIONS

In general, within the proposed development area, the subsurface conditions predominantly consist of disturbed silty sand, silty clays and clayey silts at the surface. Interbedded alluvium consisting of clayey sands, gravelly sands and sandy gravels, medium dense to dense in consistency are predominant across the entire site. Beginning at a depth of approximately 4 to 6 feet, cobbles greater than 8 inches up to boulders (12 inches or greater in diameter) were encountered. Field observations from the test pit excavations estimate that oversize material may be up to 10 to 15 percent by volume.

Five samples of site materials were tested for Plasticity Index (PI) and yielded values of 5, 9, 11, 14 and 22. This is an indication that the soils tested have low to moderate expansion potential.

One sample was tested for fibrous asbestos content; none was detected.

### 3.5 GROUNDWATER

No perched or static groundwater was observed during our exploration activities. Groundwater was encountered at a depth of 39 feet in a boring at the site by PGE in 2010 (Appendix C). It should be recognized that fluctuations in the level of groundwater may occur due to variations in rainfall, irrigation practice and other factors not evident at the time measurements were made.

## 4.0 DISCUSSION AND CONCLUSIONS

The site was evaluated with respect to known geologic hazards common to the greater San Francisco Bay Region. The primary hazards and the risks associated with these hazards with respect to the planned development are discussed in the following sections of this report.

### 4.1 SEISMIC HAZARDS

Potential seismic hazards resulting from a nearby moderate to major earthquake can generally be classified as primary and secondary. The primary effect is ground rupture, also called surface faulting. The common secondary seismic hazards include ground shaking, ground lurching, soil liquefaction, lateral spreading and landsliding. The following sections present a discussion of these hazards as they apply to the site.

Based on topographic and lithologic data, risk from earthquake-induced regional subsidence/uplift, tsunamis and seiches is considered low to negligible at the site.

### 4.1.1 Ground Rupture

The site is not located within a State of California Earthquake Fault Hazard Zone and no known active faults cross the site. As discussed in Section 2.2.1, two portions of the property were identified by Santa Clara County Fault Hazards Map (Figure 6) as having potential for fault rupture along with mapping completed by Wentworth (1999) and the USGS Quaternary Fault Fold Database.

To assess site faulting, a fault exploration was completed by ENGEO concurrent with this study, to evaluate the possible existence of the eastern fault trace. Based on the fault trenching performed along the eastern site boundary and the location of planned residential improvements along the northern project boundary, we conclude that the risk of surface fault rupture within the planned residential lots at the site is low.

### 4.1.2 Ground Shaking

An earthquake of moderate to high magnitude generated within the San Francisco Bay Region could cause considerable ground shaking at the site, similar to that which has occurred in the past. To mitigate the shaking effects, all structures should be designed using sound engineering judgment and the 2007 California Building Code (CBC) requirements, as a minimum. Seismic design provisions of current building codes generally prescribe minimum lateral forces, applied statically to the structure, combined with the gravity forces of dead-and-live loads. The code-prescribed lateral forces are generally considered to be substantially smaller than the comparable forces that would be associated with a major earthquake. Therefore, structures should be able to: (1) resist minor earthquakes without damage, (2) resist moderate earthquakes without structural damage but with some nonstructural damage and (3) resist major earthquakes without collapse but with some structural as well as nonstructural damage.

Conformance to the current building code recommendations does not constitute any kind of guarantee that significant structural damage would not occur in the event of a maximum magnitude earthquake; however, it is reasonable to expect that a well-designed and well-constructed structure will not collapse or cause loss of life in a major earthquake (SEAOC, 1996).

### 4.1.3 Ground Lurching and Lateral Spreading

Lurch cracking and lateral spreading can occur in weaker soils on slopes and adjacent to open channels that are subjected to strong ground shaking during earthquakes. The potential for lurch cracks forming in weaker surface soils can also be reduced by proper site preparation and grading methods. Due to the lack of adjacent open channels, the potential for lurching and lateral spreading is considered low.

### 4.1.4 Liquefaction Potential

Liquefaction is a phenomenon in which saturated cohesionless soils are subject to a temporary loss of shear strength because of pore pressure buildup under the cyclic shear stresses associated with earthquakes. The State of California and County of Santa Clara locate the northwest portion of the site within a liquefaction potential zone (Figures 5 and 7).

An evaluation of liquefaction resistance was performed on the boring data in accordance with procedures originally published in NCEER-97-002 and summarized by the methodology presented by Youd and Idriss (2001), Seed (2003), and Idriss and Boulanger (2008).

Although groundwater was not encountered with the depths explored of 50 feet, according to the study by PGE, groundwater was encountered in their Boring (Boring DH-1) at a depth of 39 feet. As a result, a design groundwater level of 30 feet below existing grade within the area mapped for moderate liquefaction potential was utilized in our analyses, along with a peak ground acceleration of 0.7g. Our analyses indicated that the loose to medium dense sand to silty sand zones below the design groundwater level in Boring 1-B1 (between 45 and 51.5 feet bgs) and 1-B2 (between 31 and 34 feet bgs) may be potentially liquefiable. A printout of our liquefaction analysis is presented in Appendix B.

The depth of liquefiable soils in the two borings is adequately masked by a layer of non-liquefiable soils above; therefore, ground failure (sand boils) is not anticipated.

### 4.1.5 Densification Due to Earthquake Shaking

Densification of granular soils above and below the groundwater level can cause settlement during an earthquake. We reviewed the layers of granular materials encountered at the site (both above and below groundwater levels) and performing applicable analysis to assess the predicted granular soil settlements.

Based on our review, it is our opinion that earthquake-induced settlement due to potential liquefaction of granular soils below a design groundwater level of 30 feet at Borings 1-B1 and 1-B2 could be up to 1½ inches total (¾ inch differential). In addition, up to ½ inch total (¼ inch differential) of earthquake-induced settlement for loose to medium dense sands situated above design groundwater is possible across the site. As a result, the northwest portion of the site mapped as Qhl (Figure 2) should consider up to 2 inches (total) of earthquake-induced settlement, while the rest of the site should consider up to ½ inch (total) of earthquake-induced settlement.

### 4.1.6 Landsliding

Common to the San Francisco Bay area, the risk of instability is greater during major earthquakes than during other time periods. The relatively flat portion of the site, planned for development, does not appear to be subject to seismically induced landsliding; however, the hillside terrain to the east of the development area is impacted by landsliding and slope raveling. As shown on Figure 2, landslides are mapped on the southwest facing slope of the adjacent foothill.

One deep (estimated to be 30 to 50 feet thick) landslide area (Qls) is mapped as shown on Figure 2. This area is outside the planned development footprint and was not readily accessible during our studies. According to PGE, the landslide is dormant and toes out in the Cochrane Road cut slope. Nonetheless, grading on the project side of Cochrane Road should be performed in a manner that does not potentially aggravate the landslide.

## 4.2 SLOPE STABILITY

Generally, slope stability is not a geotechnical concern at the site due to the relatively flat terrain at the site. However, the proposed cut slopes below Cochrane Road have the potential to destabilize the roadway. There are numerous means to address this potential risk including raising grades for the lots below Cochrane Road, remedial grading measures, installing retention structures or a combination thereof.

At this time, we believe the most cost-effective method will be to flatten the slope gradient or reduce the overall graded slope height. This area and the rest of the site will be further assessed during the land planning process and as grading plan preparation progresses. Slope stability analysis will be performed to confirm required factors of safety are maintained. Remedial grading measures will then be shown on the final 40-scale drawings after detailed slope stability analyses have been performed, and documented in a grading and drainage plan review letter.

## 4.3 EXPANSIVE SOILS

An area of concern regarding the geotechnical aspects of the project is the low to moderate expansion potential of the site soils. The clayey soils tested have Plasticity Indices (PI) ranging from 5 to 22. Expansive soils shrink and swell as a result of moisture changes. This can cause heaving and cracking of slabs-on-grade, pavements, and structures founded on shallow foundations. Therefore, construction of improvements near existing grades will need to consider the potential impacts of expansive soils.

Successful construction on expansive soils requires special attention during construction. It is imperative to keep exposed soils moist. It is difficult to remoisturize dry soil (because of its clayey nature) without excavation, moisture conditioning and recompaction.

## 4.4 DIFFERENTIAL FILL THICKNESS

Depending upon the depths of excavations required for removal of existing foundations, underground facilities (tanks, wells, septic) and undocumented fill encroaching under future building pads, a differential fill condition may arise that could adversely impact the performance of the residential foundations. Recommendations to address this potential condition are presented in a subsequent section.

## 4.5 FLOODING/INUNDATION HAZARDS

Anderson Lake Dam is located about 540 feet to the northeast of the study area. Evaluation of the safety of Anderson Lake Dam is within the jurisdiction of the Federal Energy Regulatory Commission (FERC) and California Division of Safety of Dams (DOSD).

Evaluating the risk posed by Anderson Lake is beyond the scope of our services for this project. However, in July 2011 Santa Clara Valley Water District (SCVWD) released a series of technical documents which included slope stability and deformation analysis provided by AMEC-Geomatrix Incorporated (AMEC) related to the stability of Anderson Dam during and after a seismic event. According to the "Executive Summary, Seismic Stability Evaluation Report (SSE-1A), Seismic Stability Evaluation of Anderson Dam, Santa Clara County, California", AMEC concluded that the Anderson Dam embankment will become unstable and an uncontrolled release of reservoir water is possible during or after a $M_w$ 7¼ seismic event (roughly 0.8g) from the Calaveras fault. AMEC recommended a reservoir level restriction remain in use until the development and implementation of remedial measures for the dam occurs to mitigate deformation and improve its seismic performance.

## 4.6 SEISMIC DESIGN CRITERIA

The following sections provide seismic design criteria for the site based on the 2007 California Building Code (CBC) and the Caltrans Seismic Design Criteria, Version 1.4.

### 4.6.1 2009 California Building Code (CBC) Seismic Design Parameters

Based on the subsurface soil conditions encountered and local seismic sources and provided the site is prepared according to the recommendations contained herein, the site may be characterized for design based on 2010 California Building Code using the following information.

**TABLE 4.6.1-1**
CBC Seismic Parameters
Latitude = 37.159667; Longitude = -121.63466

| Coefficient | Value |
|---|---|
| Mapped MCE Spectral Response Acceleration at Short Periods, $S_S$ | 1.50 |
| Mapped MCE Spectral Response Acceleration at a Period of 1 second, $S_1$ | 0.60 |
| Site Class | D |
| Long-period Transition Period, $T_L$ | 12 sec |
| MCE, 5% Damped, Spectral Response Acceleration at Short Periods Adjusted for Site Class Effects, $S_{MS}$ | 1.50 |
| MCE, 5% Damped, Spectral Response Acceleration at a Period of 1 second Adjusted for Site Class Effects, $S_{M1}$ | 0.90 |
| Design, 5% Damped, Spectral Response Acceleration at Short Periods, $S_{DS}$ | 1.00 |
| Design, 5% Damped, Spectral Response Acceleration at a Period of 1 second, $S_{D1}$ | 0.60 |

## 4.7 CORROSIVITY CONSIDERATIONS

An evaluation of possible corrosion impacts to site improvements has been conducted on the site soils. Three sulfate samples were collected of near surface soils, producing test results of 32, 39 and 153 mg/kg. The primary purpose for sulfate (corrosion) testing is to determine if sulfate-resistant concrete is needed for foundation construction. The CBC references the 2008 American Concrete Institute Manual, ACI 318 (Chapter 4, Sections 4.2 and 4.3) for concrete requirements. ACI Tables 4.2.1 and 4.3.1 provide the following sulfate exposure categories and classes and concrete requirements in contact with soil based upon the exposure risk.

**TABLE 4.7-1**
Sulfate Exposure Categories and Classes

| Sulfate Exposure Category S | Exposure Class | Water- Soluble Sulfate in Soil % by Weight | Dissolved Sulfate in Water mg/kg (ppm) |
|---|---|---|---|
| Not Applicable | S0 | $SO_4 < 0.10$ | $SO_4 < 150$ |
| Moderate | S1 | $0.10 \leq SO_4 < 0.20$ | $150 \leq SO_4 \leq 1{,}500$ seawater |
| Severe | S2 | $0.20 \leq SO_4 \leq 2.00$ | $1{,}500 \leq SO_4 \leq 10{,}000$ |
| Very Severe | S3 | $SO_4 > 2.00$ | $SO_4 > 10{,}000$ |

**TABLE 4.7-2**
Requirements for Concrete by Exposure Class

| Exposure Class | Max w/cm | Min f'c (psi) | Cement Type | | | Calcium Chloride Admixture |
|---|---|---|---|---|---|---|
| | | | ASTM C150 | ASTM C595 | ASTM C1157 | |
| S0 | N/A | 2500 | No Type restriction | No Type restriction | No Type restriction | No restriction |
| S1 | 0.5 | 4000 | II†‡ | IP(MS), IS(<70), (MS) | MS | No restriction |
| S2 | 0.45 | 4500 | V‡ | IP(HS), IS(<70), (HS) | HS | Not permitted |
| S3 | 0.45 | 4500 | V + pozzolan or slag§ | IP(HS) + pozzolan or slag or IS(<70) (HS) + pozzolan or slag§ | HS + pozzolan or slag§ | Not permitted |

Notes: † For seawater exposure, other types of portland cements with tricalcium aluminate ($C_3A$) contents up to 10 percent are permitted if the w/cm does not exceed 0.40.

‡ Other available types of cement such as Type III or Type I are permitted in Exposure Classes S1 or S2 if the $C_3A$ contents are less than 8 or 5 percent, respectively.

§ The amount of the specific source of the pozzolan or slag to be used shall not be less than the amount that has been determined by service record to improve sulfate resistance when used in concrete containing Type V cement. Alternatively, the amount of the specific source of the pozzolan or slag to be used shall not be less than the amount tested in accordance with ASTM C1012 and meeting the criteria in ACI 4.5.1.

According to the test results, the onsite soils have a sulfate ion concentration ranging from 32 mg/kg (0.003% by weight) to 153 mg/kg (0.015% by weight). Therefore, based on the test results, the near-surface soils are classified as Sulfate Exposure Class S0. Cement type and water-cement ratio are not specified by the CBC for this range but the minimum concrete strength is specified to be 2,500 psi. We recommend that Type II cement and a concrete mix design that incorporates a maximum water-cement ratio of 0.5 and a minimum compressive strength of 3,000 psi be used in foundation concrete for structures at the project site. It should be noted; however, that the structural engineering design requirements for concrete may result in more stringent concrete specifications.

Testing was not completed for all depths of potential embedment or across the entire site. If requested, we can provide additional testing and/or guidance regarding the exposure risk for sulfates. It is recommended that additional chemical tests be conducted on the subgrade soils after grading of the pads is completed, but prior to building and utility construction. In addition, PG&E may require soil sampling and testing at vault locations to determine if underground vaults are acceptable.

Where critical pipelines and related site improvements are in contact with the on-site soils, a corrosion specialist should be consulted for corrosivity design and protection.

## 4.8 EXISTING FILLS

As shown on Figure 2, existing fills are present on site due to prior onsite improvements and land development, as well as on-site existing driveway and building pad construction. Based upon test pits, site reconnaissance and provided topography, the existing fills appear to be 6 feet or less in thickness. Unless documentation is available to confirm these fills were placed in an engineered fashion, the existing fills should be considered as undocumented and non-engineered.

In addition, the test pits and fault trench by ENGEO and prior consultants contain undocumented fill that is not suitable to support future loads. The depth of the undocumented fills in these excavations is up to 8 feet.

Common mitigation techniques for non-engineered fills, if within or at the margin of the grading limits, include removal and replacement as engineered fill, provided the material is deemed suitable for reuse by the Geotechnical Engineer at the time of grading. We do not anticipate the material will be unsuitable for reuse.

## 4.9 CONCLUSIONS

It is our opinion, based on this exploration and laboratory test results and previous explorations at the site, that the proposed single-family residential development is feasible from a geotechnical standpoint provided the site is prepared in accordance with the recommendations contained herein. The recommendations included in this report, along with other sound engineering practices, should be incorporated in the design and construction of the project.

# 5.0 RECOMMENDATIONS

## 5.1 GRADING

The grading recommendations provided in this report are appropriate for planning purposes for the development area. Development of the grading plans should be coordinated with the Geotechnical Engineer and Engineering Geologist in order to tailor the plans to accommodate known soil and geologic hazards and to improve the overall stability of the site. The final 40-scale grading plans for the project should be reviewed by ENGEO. Detailed locations of keyways, subdrains and subexcavation areas will be outlined on these plans during our review, as applicable.

ENGEO should be notified at least three days prior to grading in order to coordinate its schedule with the grading contractor. Grading operations should meet the requirements of the Guide Contract Specifications included in Appendix D and should be observed and tested by ENGEO's field representative.

Ponding of stormwater must not be allowed at the site except in engineered water collection areas, such as desilting basins or the planned post-construction stormwater basins. If water is allowed to pond on the building pads, additional pad preparation may be required prior to foundation construction. Before the grading is halted by rain, we recommend that positive slopes be provided to carry surface runoff water in a controlled manner.

## 5.2 SELECTION OF MATERIALS

With the exception of construction debris (wood, brick, asphalt, concrete, metal, etc.), trees, organically contaminated materials (soil which contains more than 3 percent organic content by weight), and environmentally impacted soils, we anticipate the site soils are suitable for use as engineered fill. Other materials and debris, including trees with their root balls, should be removed from the project site.

Subject to approval by the Landscape Architect, organically contaminated soil may be stockpiled in approved areas located outside of the grading limits for future placement within landscape areas.

Oversized soil or rock materials (those exceeding two-thirds of the lift thickness or 6 inches in dimension, whichever is less) are anticipated to be encountered during grading. Alluvial cobbles and boulders with a maximum dimension of greater than 6 inches should be removed from the upper two feet of fill within building pads. Below two feet from finished pad grade, the cobble or boulder size placed in the engineered fill should not exceed 12 inches in any dimension. Larger sizes should be broken mechanically by heavy bulldozers rolling on them or by a pneumatic hammer mounted on a backhoe. If this is not desirable, larger cobbles and boulders can be placed in non-structural fills, used for landscaping or removed from site. These materials may be of value to a quarry operator or for landscaping.

Cobbles and boulders should be spread and mixed with finer soil and should not be allowed to nest. Engineered fills consisting of large fragments only are not allowed. The cobbles/boulders should be mixed with fines at a ratio of 1 to 10, or one load of cobbles/boulders to 10 loads of fines.

The Geotechnical Engineer should be informed when import materials are planned for the site. Import materials should be submitted to, and approved by, the Geotechnical Engineer prior to delivery at the site and should conform to the requirements provided in the Guide Contract Specifications (Appendix D).

## 5.3 DEMOLITION AND STRIPPING

Site preparation should commence with removal of site vegetation (trees and shrubs) and structures. Removal of tree roots should anticipate excavations of up to 4 feet below existing grades. Numerous below grade greywater tanks and septic tanks, along with associated leach fields, likely exist within the property boundary and will require permitted removal by a qualified contractor. Following the demolition of existing improvements, site development should include removal of debris, loose soil and soft compressible materials in any location to be graded. Any soft compressible soils should be removed from areas to receive fill or structures, or those areas to serve as borrow. Vegetation and debris should be separately stockpiled from soft compressible material and existing soil fill.

No loose or uncontrolled backfilling of depressions resulting from demolition and stripping or other soil removal should be permitted. Depressions and subexcavations should have their locations and depths as-built prior to backfilling.

## 5.4 EXISTING FILLS

Since evidence of placement as engineered fill is not available, the existing fills, if located within areas to be graded, should be removed to expose non-yielding native materials. According to exploratory locations and review of the existing topography, the depth of undocumented fills is anticipated to be up to 6 feet. Our previous experience with similar projects has found that oversize material (concrete or asphaltic concrete) and vegetation is quite commonly present within undocumented fills; therefore, debris and other deleterious materials would need to be removed to the satisfaction of the Geotechnical Engineer or their field representative.

The soil materials can be reused as engineered fill if deemed suitable and placed in accordance with the Fill Placement section of this report and under the observation and testing of a representative from ENGEO.

No loose or uncontrolled backfilling of depressions resulting from removal of undocumented fill material should be permitted.

## 5.5 EXPANSIVE SOILS

Analysis of the soils at the site displayed a low to moderate expansion potential with a PI range of non-plastic (NP) to 22. Expansive soils shrink and swell as a result of moisture changes. This can cause heaving and cracking of slabs-on-grade, pavements, and structures founded on shallow foundations. Therefore, construction of improvements near existing grades will need to consider the potential impacts of expansive soils.

Successful construction on expansive soils requires special attention during construction. It is imperative to keep exposed soils moist. It is extremely difficult to remoisturize dry soil (because of its clayey nature) without excavation, moisture conditioning and recompaction. Fill placement specifications tailored to the expansive characteristics of the soil are addressed in Section 5.13.

## 5.6 GRADED SLOPES

It is recommended that graded fill slopes less than 20 feet in vertical height be no steeper than 2:1, with slopes with a height of 20 feet or greater be constructed at a slope gradient of 3:1 or flatter. Due to the highly erodible nature of site soils, graded 2:1 cut slopes should not exceed 4 feet in vertical height. Higher cut slopes should be constructed at a slope gradient of 3:1 or flatter or reconstructed as engineered fill slopes. Cut-fill transition slopes should be overexcavated and reconstructed as fill slopes. All fill slopes should be adequately keyed into firm natural materials unaffected by shrinkage cracks.

Planned slopes will be reviewed and analyzed with respect to slope stability as part of future 40-scale grading plan review(s), at which time we will prepare applicable remedial grading plans showing locations of keyways and subdrains to support select slopes.

### 5.6.1 Buttress Toe Keyways

Typical keyways will be required at the toe of fill slopes and reconstructed cut and cut-fill transition slopes. We anticipate that typical keyway designs will consist of minimum 18-foot-wide keyways constructed to a minimum depth of 4 feet, as recommended by the Geotechnical Engineer during grading. Figure 9 provides remedial grading details for keyways.

Actual subsurface mitigation configurations (size and depths) will be shown on the final 40-scale remedial grading plans and after detailed slope stability analyses have been performed, as applicable. Additionally, mitigation measures to stabilize the eastern edge of the development area will be designed and shown on the final 40-scale remedial grading plans. These measures may include geogrid reinforcement placed within the keyway. These remedial measures will be further revised as warranted in the field by an ENGEO representative during grading.

### 5.6.2 Slope Stability

As described in prior sections of this report, the primary areas of concern relating to slope stability at the site lies in the area of Cochrane Road. While the existing offsite landslide appears to pose little risk to the project, the actual level of risk is difficult to quantify. Furthermore, the risk cannot be readily mitigated as the landslide is off property. While we did not encounter evidence that the toe of the landslide extends into the site, we recommend that no cutting occur in the easternmost lots below the landslide as identified by shading on Figure 2.

For the proposed cut slope situated further to the north, there are numerous means to address the potential for slope instability including raising grades for the lots below Cochrane Road, remedial grading measures, installing retention structures or a combination thereof. Figure 9 presents one grading option with guidance for rebuilding the slope. This option carries temporary risk to Cochrane Road while the excavation is open.

## 5.7 SURFICIAL PAD TREATMENT

We recommend that the upper 2 feet of pad subgrade soils be made uniform by subexcavating and replacing as engineered fill. Figure 10 presents general surficial pad treatment details. This requirement will provide a relatively uniform, moisture conditioned state for the foundation subgrade soils. Moisture and compaction recommendations are provided in a subsequent section of this report.

## 5.8 DIFFERENTIAL FILL THICKNESS

Where topography or subexcavation activities create a differential fill thickness across individual building pads, mitigation to achieve a similar fill thickness across the pad is beneficial for the performance of a shallow foundation system. We recommend that a differential fill thickness of up to 5 feet is acceptable across individual building pads. For a differential fill thickness exceeding 5 feet across an individual pad, we recommend performing subexcavation activities to bring this vertical distance to within the 5-foot tolerance and that the material is replaced as engineered fill. As a minimum, the subexcavation area should include the entire structure footprint plus 5 feet beyond the edges of the building footprint. This is shown schematically on Figure 11.

## 5.9 SUBSURFACE DRAINAGE FACILITIES

Subsurface drainage systems should be installed in all keyways, and, where practical, at the base of subexcavated swale areas that are to be filled. The recommended locations of the subdrains will be approximately located on the remedial grading plans used during site grading.

Keyway subdrain systems should be installed at the rear base of the keyway excavations, provided gravity drainage is possible. If not possible, select fill may be needed in keyway backfill until gravity drainage is achievable. Secondary bench subdrains may also be required, depending upon the height of the fill slope and the slope of the underlying native terrain. Positive fall of at least 1 percent to an approved outlet should also be provided for all subdrains.

Subdrain systems should consist of a minimum 6-inch-diameter perforated pipe (SDR 35 or stronger) encased in Caltrans Class 2 permeable material or ¾ inch clean crushed or drain rock wrapped in filter fabric. Typical subdrain details are shown in Figure 12. The subdrain pipe and drainage blanket should meet the requirements contained in Section 2.05, Part I of the Guide Contract Specifications (Appendix D).

Discharge from the subdrains will generally be low but in some instances may be continuous. Subdrains should outlet into the storm drain system or other approved outlets and their locations should be surveyed and documented by the project Civil Engineer for future maintenance. It should be noted that not all sources of seepage were evident during the time of field work because of the intermittent nature of some of these conditions and their dependence on long-term climatic conditions. Furthermore, new sources of seepage may be created by a combination of changed topography, manmade irrigation patterns and potential utility leakage. Since uncontrolled water movements are one of the major causes of detrimental soil movements, it is of utmost importance that a Geotechnical Engineer be advised of any seepage conditions so that remedial action may be initiated, if necessary.

## 5.10 EXISTING UTILITY EASEMENT

Based upon our field exploration and as shown on the plans, existing water line utility and gas transmission easements are present within the site boundaries. Restrictions for excavations and fill placement may limit grading within the easements. From a geotechnical engineering perspective and assuming the existing utilities are no more than 5 feet below existing grades, we recommend that sheet cuts and fills within the existing easements should be limited to avoid potential impact to the existing water and gas transmission lines.

Based upon the final land plan with respect to existing utilities, select engineering controls, such as sheet piles or pin walls, may be required.

## 5.11 FILL PLACEMENT

Once a suitable firm base is achieved for general fill areas, the exposed non-yielding surface should be scarified to a depth of 10 inches, moisture conditioned, and recompacted to provide adequate bonding with the initial lift of fill. Reaching a firm base prior to fill placement will require excavations that extend through soils that have been disturbed by agricultural activities. All fills should be placed in thin lifts, with the lift thickness not to exceed 10 inches or the depth of penetration of the compaction equipment used, whichever is less.

We recommend the following compaction control requirements apply.

Keyway backfill areas:

| | |
|---|---|
| Test Procedures: | ASTM D-1557 |
| Required Moisture Content: | Not less than 2 percentage points above optimum moisture content |
| Minimum Relative Compaction: | Not less than 95 percent |

General fill areas:

| | |
|---|---|
| Test Procedures: | ASTM D-1557 |
| Required Moisture Content: | Not less than 2 percentage points above optimum moisture content for materials with a Plasticity Index (PI) of 12 or less. Not less than 3 percentage points above optimum moisture content for materials with a PI greater than 12. |
| Minimum Relative Compaction: | Not less than 92 percent for materials with a Plasticity Index (PI) of 12 or less. Not less than 90 percent for materials with a PI greater than 12. |

Relative compaction refers to in-place dry density of the fill material expressed as a percentage of the maximum dry density based on ASTM D-1557. Optimum moisture is the moisture content corresponding to the maximum dry density.

## 5.12 MONITORING AND TESTING

It is important that all site preparations for site grading be done under the observation of the Geotechnical Engineer's field representative. The Geotechnical Engineer's field representative should observe all graded area preparation, including demolition and stripping, following the recommendations contained in the Guide Contract Specifications in Appendix D. The final grading plans should be submitted to the Geotechnical Engineer for review.

## 5.13 FOUNDATION DESIGN

Provided that the site is prepared in accordance with the recommendations provided herein, including removal of loose and medium dense existing fills, it is our opinion that a structural mat foundation (post-tensioned or conventionally reinforced) or conventional footings with slab-on-grade floors would be well suited to support the residential structures.

### 5.13.1 Post-tensioned or Conventionally Reinforced Mat Foundation Design

If a post-tensioned mat is desired, based upon the existing soil conditions, and using the 2004 (Third Edition) Post-Tensioning Institute, "Design of Post-Tensioned Slabs-On-Ground" manual to develop our soil parameters, we recommend the following soil criteria.

Center Lift Condition:

Edge Moisture Variation Distance, $e_m$ = 9.0 feet
Differential Soil Movement, $y_m$ = 0.3 inches

Edge Lift Condition:

Edge Moisture Variation Distance, $e_m$ = 5.0 feet
Differential Soil Movement, $y_m$ = 0.6 inches

Based on the anticipated foundation soil conditions, design parameters for conventionally reinforced mat foundations are as follows:

| | |
|---|---|
| Edge Cantilever Span Distance: | 3 feet |
| Interior Span Distance: | 15 feet |

In addition, the mats should be designed to impose a maximum average bearing pressure of 1,200 psf for dead-plus-live loads. Allowable bearing pressures of 1,500 psf can be used for concentrated line or column dead-plus-live loads. These values may be increased by one-third when considering total loads including wind or seismic.

### 5.13.2 Subgrade Treatment for Structural Mat Foundations

The subgrade material under structural mat foundations should be uniform. The pad subgrade should be moisture conditioned to a moisture content of at least 3 percentage points above optimum. The subgrade should be thoroughly soaked and approved by the Geotechnical Engineer prior to placing the reinforcement or tendons. The subgrade should not be allowed to dry prior to concrete placement.

A 2-inch-thick sand cushion (Section 2.03, Part I of Guide Contract Specifications) could be utilized under the mat. In addition, a tough, water vapor retarding membrane (Section 2.05D, Part I of Guide Contract Specifications) should be provided to reduce moisture condensation under the floor coverings. The vapor retarder under the slabs should meet ASTM E 1745 – 97 Class A requirements for water vapor permeance, tensile strength, and puncture resistance. Vapor transmission through the mat foundations can also be reduced by using high strength concrete with a low water-cement ratio.

### 5.13.3 Conventional Footing System

Continuous footings with slab-on-grade floors can also be used. While strip and spread footing foundations can be expected to reduce the cracking and distress that is common to construction, minor cracking and distress should be anticipated in the structures and the slab-on-grade floors.

The following soil design criteria may be used for proposed structures supported by a conventional footing system.

| | |
|---|---|
| Maximum Allowable Bearing Pressure: | 2,500 psf for dead-plus-live loads. This value can be increased by 30 percent to include seismic or wind loads. |

| | |
|---|---|
| Minimum Depth of Footing: | At least 24 inches below lowest adjacent soil subgrade elevation. |
| Minimum Footing Width: | 12 inches. |

Isolated spread footings should be avoided. Footings located closer than 10 feet from the top of a slope should be deepened according to the requirements of the California Building Code.

### 5.13.4 Slab-on-Grade Floor Construction

Provided the building pad subgrade was prepared in accordance with the grading recommendations discussed above, the following preliminary recommendations apply to concrete floor slab construction. In general, this section is only applicable to lots where continuous footing foundations are utilized.

a. Concrete slabs should be at least 5 inches thick. As a minimum, slab reinforcement should consist of No. 4 bars spaced 16 inches on center each way placed in the center of the slab.

b. A layer of sand at least 2 inches thick could be placed directly beneath the slabs for concrete curing purposes (Guide Contract Specifications).

c. A plastic vapor retarder should be installed. The vapor retarder under the slabs should meet ASTM E 1745 – 97 Class A requirements for water vapor permeance, tensile strength, and puncture resistance to reduce moisture transmission through the slab. All joints and penetrations in the vapor retarder should be sealed prior to concrete placement.

d. A layer of compacted clean crushed rock at least 4 inches thick should underlie the vapor retarder to act as a capillary break. Pea gravel, sand, or aggregate base is not a suitable capillary break material.

e. Subgrade materials should be prepared and not allowed to desiccate between grading and the construction of the concrete slabs.

Some minor cracking of slabs-on-grade should be anticipated as a result of concrete shrinkage and the potentially expansive nature of the onsite soils. Frequent control joints should be provided to control the cracking. As a general guideline, control joints can be 5 to 10 feet apart. Added steel or an increased slab or crushed rock/aggregate section would also serve to improve the performance of the slabs.

### 5.13.5 Settlement Design Considerations

For the western portion of the site situated within the area susceptible to liquefaction (those areas mapped as Qhl on Figure 2), the foundation design should consider 2 inches of post-construction settlement due to earthquake-induced densification of sands above and below design groundwater. A differential value of 1 inch may be considered and should be assumed to act between adjacent column supports or over a 40-foot distance.

For the eastern, majority of the site situated outside the area susceptible to liquefaction, the foundation design should consider ½ inch post-construction settlement due to densification of loose and medium dense sands above design groundwater. A differential value of ¼ inch may be considered and should be assumed to act between adjacent column supports or over a 40-foot distance.

## 5.14 SECONDARY SLABS-ON-GRADE

This section provides guidelines for secondary slabs such as exterior walkways, driveways and steps that are not part of the structural building foundations. Secondary slabs-on-grade should be constructed structurally independent of the foundation systems. This allows slab movement to occur with a reduced potential for foundation distress. An expansion joint material should be provided between architectural/structural elements constructed on adjacent secondary and foundation slabs to allow for each element to move independently with little potential for distress to the adjacent element. Where secondary slab-on-grade construction is anticipated, care must be exercised in attaining a near-saturation condition of the subgrade soil before concrete placement.

We recommend that secondary slabs-on-grade have a minimum thickness of 4 inches and be underlain by at least a 4-inch-thick layer of clean, crushed rock or gravel. Although secondary slabs-on-grade should be designed specifically for their intended use and loading requirements, as a minimum requirement, we suggest that slabs-on-grade be provided with frequent control joints and reinforced with No. 3 bars spaced 16 inches on-center each. In our experience, welded wire mesh may not be sufficient to control slab cracking. Some cracking, however, should be expected and can be somewhat controlled through the use of frequent control joints.

## 5.15 RETAINING WALLS

Unrestrained drained retaining walls up to 10 feet in height and constructed on level ground may be designed for active lateral equivalent fluid pressures determined as follows:

**TABLE 5.15-1**

| Backfill Slope Condition (horizontal:vertical) | Active Pressure (pounds per cubic foot) |
|---|---|
| Level | 45 |
| 4:1 | 55 |
| 3:1 | 60 |
| 2:1 | 70 |

If houses or streets are located within 10 feet from the top of nearby retaining walls, surcharge loads associated with buildings and vehicles may need to be incorporated into the design. The Geotechnical Engineer could be contacted to assess and provide surcharge loads. Additionally, to reduce special design and increased construction costs, walls should not be placed on downsloping terrain, rather, we recommend they be placed at the base/toe of slope.

Passive pressures acting on foundations may be assumed as 300 pounds per cubic foot (pcf) provided that the area in front of the retaining wall is level for a distance of at least 10 feet or three times the depth of foundation, whichever is greater. The upper 1 foot of soil should be excluded from passive pressure computations.

The friction factor for sliding resistance may be assumed as 0.35. It is recommended that retaining wall footings be designed using an allowable bearing pressure of 2,500 pounds per square foot (psf) in native firm materials or engineered fill. Appropriate safety factors against overturning and sliding should be incorporated into the design calculations.

All retaining walls should be provided with drainage facilities to prevent the build-up of hydrostatic pressures behind the walls. Wall drainage should consist of a 4-inch-diameter perforated pipe encapsulated in free-draining crushed rock surrounded by synthetic filter fabric or Class 2 permeable material. The width of the drain blanket should be at least 12 inches and the drain blanket should extend to about 1 foot below the pad grades. As an alternative, prefabricated synthetic wall drain panels could be considered if preapproved by the Geotechnical Engineer. The upper one foot of wall backfill should consist of compacted site soil. Drainage should be collected by pipes and directed to an outlet approved by the Civil Engineer.

All backfill should be placed in accordance with the recommendations provided above for engineered fill. Light equipment should be used during backfill compaction to reduce the potential for overstressing of the walls. The foundation plans and structural calculations for the walls should be submitted to ENGEO for review prior to construction.

### 5.16 EXCAVATIONS AND TEMPORARY SHORING SYSTEMS

Excavations, including utility trenches, should be properly excavated and shored, as applicable, to create a stable and safe condition. It is the responsibility of the Contractor to provide such stable, safe trench and construction slope conditions and to follow OSHA safety requirements. Since excavation procedures may be very dangerous, it is also the responsibility of the Contractor to provide a trained “competent person” as defined by OSHA to supervise all excavation operations, ensure that all personnel are working in safe conditions, and have thorough knowledge of OSHA excavation safety requirements.

While not anticipated at this time, recommendations for shoring design can be provided upon request. The contractor should be responsible for the design and construction of all shoring and underpinning systems and the safety of all workers within excavations.

### 5.17 PAVEMENT DESIGN

Based on field explorations and laboratory testing, we estimate that site soil will have a minimum Resistance Value (R-value) of 20. The following preliminary pavement sections have been determined based on an assumed R-value of 20 according to the method contained in Topic 608 of Highway Design Manual by Caltrans.

**TABLE 5.17-1**

| Traffic Index | R-value | A.C. (inches) | A.B. (inches) |
|---|---|---|---|
| 5.0 | 20 | 3.0 | 8.0 |
| 6.0 | 20 | 3.5 | 10.0 |
| 7.0 | 20 | 4.0 | 12.0 |

Notes: AC is asphaltic concrete
AB is aggregate base Class 2 Material with minimum R = 78

The Traffic Index should be determined by the Civil Engineer or appropriate public agency. These sections are for estimating purposes only. Actual sections to be used should be based on R-value tests performed on samples of actual subgrade materials recovered at the time of grading. Pavement construction and all materials should comply with the requirements of the Standard Specifications of the State of California Division of Highways, City of Morgan Hill requirements and the following minimum requirements.

- All pavement subgrades should be scarified to a depth of 12 inches below finished subgrade elevation, moisture conditioned to at least 2 percentage points above optimum moisture content, and compacted to at least 95 percent relative compaction and in accordance with City of Morgan Hill requirements.

- Subgrade soils should be in a stable, non-pumping condition at the time aggregate baserock materials are placed and compacted. Proof-rolling with a heavy wheel-loaded piece of construction equipment should be implemented. Yielding materials should be appropriately mitigated, with suitable mitigation measures developed in coordination with the client, contractor and Geotechnical Engineer.

- Adequate provisions must be made such that the subgrade soils and aggregate baserock materials are not allowed to become saturated.

- Aggregate baserock materials should meet current Caltrans specifications for Class 2 aggregate baserock and should be compacted to at least 95 percent of maximum dry density at a moisture content of at least optimum. Proof-rolling with a heavy wheel-loaded piece of construction equipment should be implemented after placement and compaction of the aggregate base. Yielding materials should be appropriately mitigated, with suitable mitigation measures developed in coordination with the client, contractor and Geotechnical Engineer.

- Asphaltic concrete paving materials should meet current Caltrans specifications.

- All concrete curbs separating pavement and irrigated landscaped areas should extend into the subgrade and below the bottom of adjacent aggregate baserock materials. An undercurb drain could also be considered to help collect and transport subsurface seepage.

## 5.18 DRAINAGE

The lots must be positively graded at all times to provide for rapid removal of surface water runoff away from the foundation systems, and to prevent ponding of water under foundations or seepage toward the foundation systems at any time during or after construction. Ponded water may cause undesirable soil swell and loss of strength. As a minimum requirement, finished grades should have slopes of at least 3 percent within 5 feet from the exterior walls and at right angles to allow surface water to drain positively away from the structures. For paved areas, the slope gradient can be reduced to 2 percent.

All surface water should be collected and discharged into outlets approved by the Civil Engineer. Landscape mounds must not interfere with this requirement. In addition, each lot should drain individually by providing positive drainage or sufficient area drains around the building to remove excessive surface water.

All roof storm water should be collected and directed to downspouts. Storm water from roof downspouts should not be allowed to discharge directly onto the ground surface. Rather, storm water from roof downspouts should be directed to a solid pipe that discharges into the street or to an outlet approved by the Civil Engineer. If this is not acceptable, we recommend downspouts discharge at least 5 feet away from foundations and the minimum gradient within 5 feet from the foundation should be increased from 3 to 5 percent.

The occurrence of surface water infiltrating, ponding, and saturating the foundation soils can cause loss of soil strength and undesirable shrinking/swelling of the foundation soils. If at any time adequate drainage away from the foundation cannot be achieved, then additional measures to hinder saturation of foundation soils must be provided. This may be accomplished by installing a perimeter subdrain system or additional area drains. If utilized, subdrain facilities and surface water collections systems should not be connected together.

## 5.19 REQUIREMENTS FOR LANDSCAPING IRRIGATION

The geotechnical foundation design parameters contained in this report have considered the swelling potential of some of the site soils; however, it is important to recognize that swell in excess of that anticipated is possible under adverse drainage or irrigation conditions. Therefore, planted areas should be avoided immediately adjacent to the buildings. If planting adjacent to a structure is desired, the use of watertight planter boxes with controlled discharge or the use of plants that require very little moisture is recommended.

Sprinkler systems should not be installed where they may cause ponding or saturation of foundation soils within 3 feet from walls. Such ponding or saturation could result in undesirable soil swell, loss of compaction and consequent foundation and slab movements. Irrigation of landscaped areas should be strictly limited to that necessary to sustain vegetation. The Landscape Architect and prospective owners should be informed of the surface drainage and irrigation requirements included in this report.

## 5.20 UTILITIES

It is recommended that utility trench backfilling be done under the observation of a Geotechnical Engineer. Ideally, pipe zone backfill (i.e. material beneath and immediately surrounding the pipe) should consist of native material less than ¾ inch in maximum dimension compacted in accordance with recommendations provided above for engineered fill. Trench zone backfill (i.e. material placed between the pipe zone backfill and the ground surface) should also consist of native soil compacted in accordance with recommendations for engineered fill. Controlled density fill is also suitable for pipe zone and trench zone backfill.

If required by local agencies, where import material is used for pipe zone backfill, we recommend it consist of quarry fines, fine- to medium-grained sand, or a well-graded mixture of sand and gravel and that this material not be used within 2 feet of finish subgrades. This material should be compacted to at least 90 percent relative compaction at a moisture content of not less than optimum.

In general, uniformly graded gravel should not be used for pipe or trench zone backfill due to the potential for migration of soil into the relatively large void spaces present in this type of material and for movement of water along trenches backfilled with this type of material. If uniformly graded gravel is used, we recommend that it be encapsulated in 6-ounce filter fabric. Providing outlet locations into manholes or catch basins for water collected in granular trench backfill should also be considered.

The presence of boulders and cobbles should be considered in buried utility construction at the site. Trenches walls may slough or become irregular as boulders and cobbles are extracted from trenches. Agency or City requirements may limit the use of boulders or cobbles in backfill.

All utility trenches entering building or paved areas should be provided with a plug/seal where the trenches pass under or through the building perimeter or curb lines. For this project, the plug may consist of native soils or imported quarry fines and should extend at least 3 feet into and 3 feet beyond the crossing and should be placed below, around, and above the utility pipe such that it is entirely in contact with the trench walls and pipe. This is to prevent surface water percolation into the import sand or gravel pipe zone backfill under foundations and pavements where such water would remain trapped in a perched condition.

Care should be exercised where utility trenches are located beside foundation areas. Utility trenches constructed parallel to foundations should be located entirely above a plane extending down from the lower edge of the footing at an angle of 45 degrees. Utility companies and Landscape Architects should be made aware of this information.

Utility trenches in areas to be paved should be constructed in accordance with the City of Morgan Hill requirements or approved alternatives. Compaction of backfill by jetting should not be allowed at this site. If there appears to be a conflict between the City or other Agency requirements and the recommendations contained in this report, this should be brought to the Owner's attention for resolution prior to submitting bids.

### 5.21 SITE INFILTRATION OPPORTUNITIES

The conceptual grading plan typically shows minor cuts and fills, thus we anticipate that the upper 5 feet of the site will be raised, lowered, or reworked as engineered fill. The existing soil conditions generally comprise a surficial layer (up to 4 feet thick) of sandy silt or sandy clay overlying gravelly sands. The sandy silt or sandy clays were tested to have between 50 and 60 percent passing the No. 200 sieve (fines), while the gravelly sands predominantly contained 15 percent or less passing the No. 200 sieve (fines).

As provided in Appendix C, prior in-situ percolation testing performed in the upper 6 feet of existing grades exhibited variable coefficients of permeability (k) between 0.30 in/hr and 9.78 in/hr at the 6 locations assessed (11 tests performed).

Based on the above in-situ and laboratory testing, the site appears to have infiltration opportunities to pre-treat or retain stormwater and urban runoff within the proposed water quality basins, as well as internally within bioswales or permeable pavements, if desired.

## 6.0 LIMITATIONS AND UNIFORMITY OF CONDITIONS

This report is issued with the understanding that it is the responsibility of the owner to transmit the information and recommendations of this report to developers, owners, buyers, architects, engineers, and designers for the project so that the necessary steps can be taken by the contractors and subcontractors to carry out such recommendations in the field. The conclusions and recommendations contained in this report are solely professional opinions.

The professional staff of ENGEO Incorporated strives to perform its services in a proper and professional manner with reasonable care and competence but is not infallible. There are risks of earth movement and property damages inherent in land development. We are unable to eliminate all risks or provide insurance; therefore, we are unable to guarantee or warrant the results of our services.

This report is based upon field and other conditions discovered at the time of preparation of ENGEO's report. This document must not be subject to unauthorized reuse that is, reusing without written authorization of ENGEO. Such authorization is essential because it requires ENGEO to evaluate the document's applicability given new circumstances, not the least of which is passage of time. Actual field or other conditions will necessitate clarifications, adjustments, modifications or other changes to ENGEO's documents. Therefore, ENGEO must be engaged to prepare the necessary clarifications, adjustments, modifications or other changes before construction activities commence or further activity proceeds. If ENGEO's scope of services does not include on-study area construction observation, or if other persons or entities are retained to provide such services, ENGEO cannot be held responsible for any or all claims arising from or resulting from the performance of such services by other persons or entities, and from any or all claims arising from or resulting from clarifications, adjustments, modifications, discrepancies or other changes necessary to reflect changed field or other conditions.

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## LIST OF FIGURES



**FIGURES**


BASE MAP SOURCE: MS STREETS AND TRIPS

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VICINITY MAP

THE ESTATES AT SAN SEBASTIAN

MORGAN HILL, CALIFORNIA

| | |
|---|---|
| PROJECT NO.: 9301.000.000 | FIGURE NO. |
| SCALE: AS SHOWN | 1 |
| DRAWN BY: DLB | CHECKED BY: RPS |



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ORIGINAL FIGURE PRINTED IN COLOR


BASE MAP SOURCE: RUGGERI-JENSEN-AZAR, 2011

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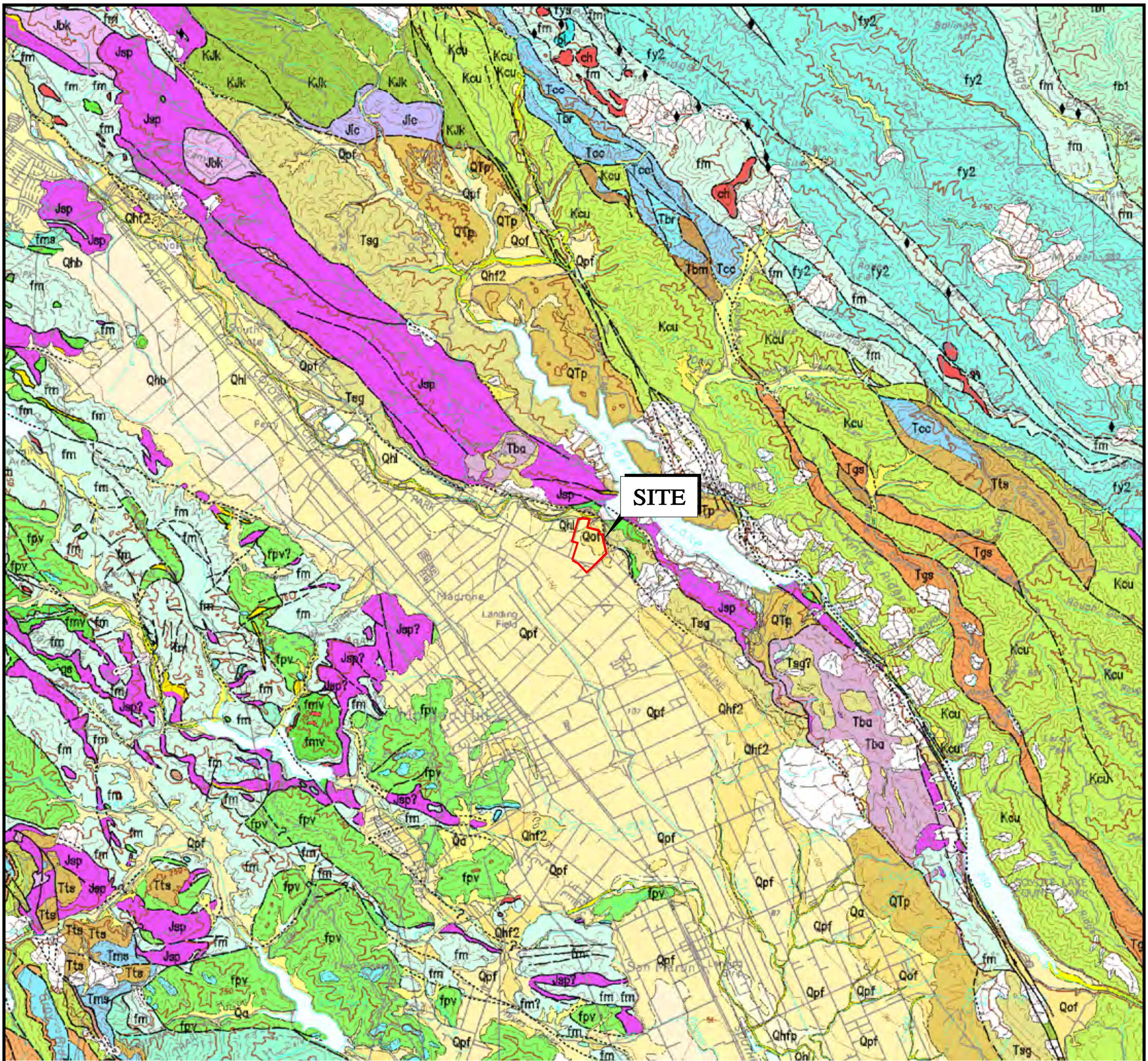
SITE GEOLOGIC MAP
THE ESTATES AT SAN SEBASTIAN
MORGAN HILL, CALIFORNIA

PROJECT NO.: 9301.000.000
SCALE: AS SHOWN
DRAWN BY: DLB
CHECKED BY: RPS
FIGURE NO. 2

ORIGINAL FIGURE PRINTED IN COLOR




## EXPLANATION

| | |
|---|---|
| Qhl | LEVEE DEPOSITS |
| Qpf | ALLUVIAL FAN DEPOSITS |
| Qof | OLDER ALLUVIAL FAN DEPOSITS |
| Tsg | SILVER CREEK GRAVELS |
| Jsp | SERPENTINIZED HARZBURGITE AND DUNITE |
| fmv | BASALTIC VOLCANIC ROCKS |

N

0 MILES 2

0 KILOMETERS 4

*BASE MAP SOURCE: WENTWORTH, 1999*

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REGIONAL GEOLOGIC MAP
THE ESTATES AT SAN SEBASTIAN
MORGAN HILL, CALIFORNIA

PROJECT NO.: 9301.000.000
SCALE: AS SHOWN
DRAWN BY: DLB
CHECKED BY: RPS

FIGURE NO.
3

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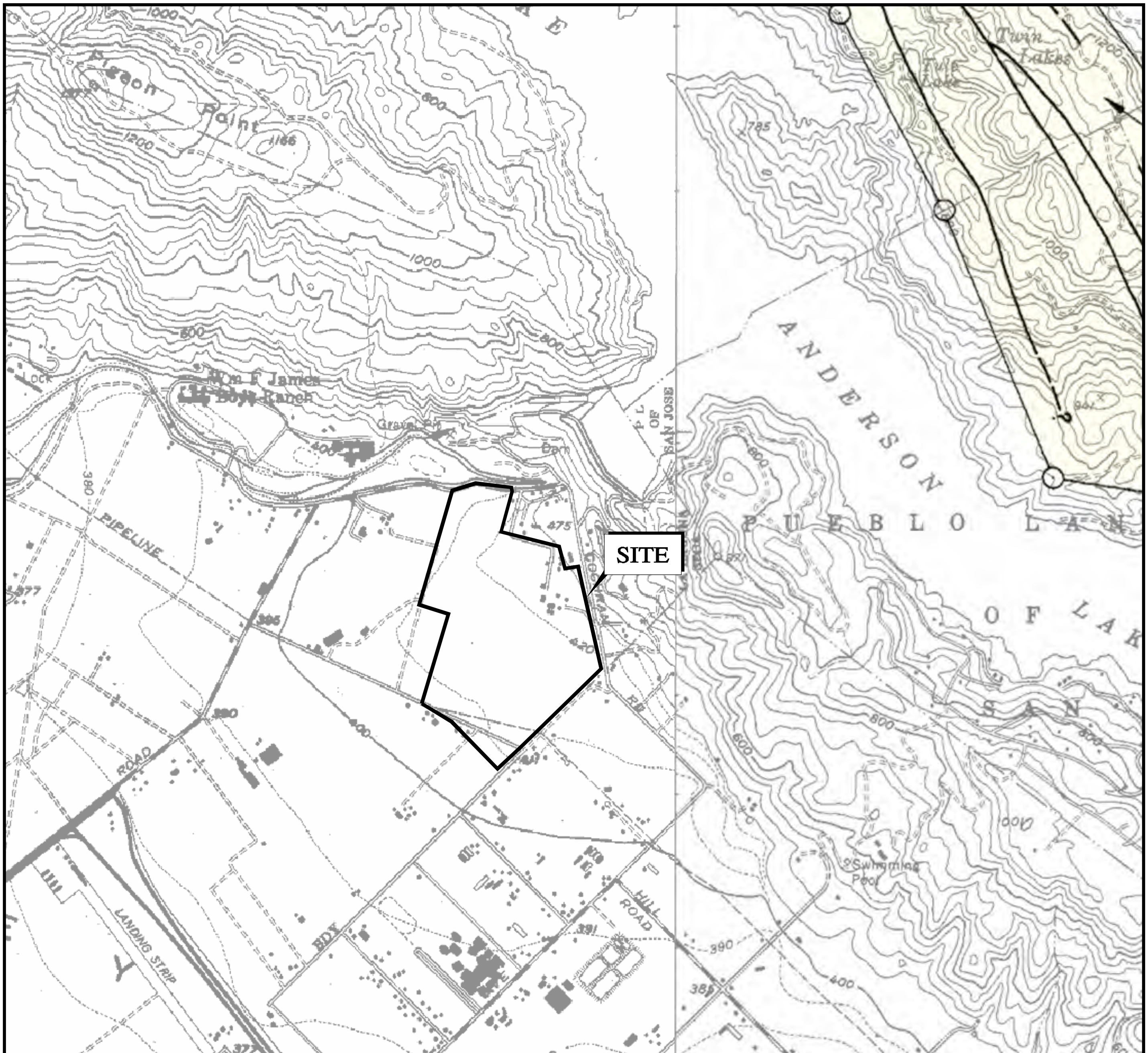
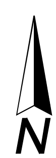



## EXPLANATION

1906 C — FAULTS CONSIDERED TO HAVE BEEN ACTIVE DURING HOLOCENE TIME AND TO HAVE A RELATIVELY HIGH POTENTIAL FOR SURFACE RUPTURE; SOLID LINE WHERE ACCURATELY LOCATED, LONG DASH WHERE APPROXIMATELY LOCATED, SHORT DASH WHERE INFERRED, DOTTED WHERE CONCEALED; QUERY (?) INDICATES ADDITIONAL UNCERTAINTY. EVIDENCE OF HISTORIC OFFSET INDICATED BY YEAR OF EARTHQUAKE-ASSOCIATED EVENT OR C FOR DISPLACEMENT CAUSED BY CREEP OR POSSIBLE CREEP.

SPECIAL STUDIES ZONE BOUNDARIES; DELINEATED AS STRAIGHT-LINE SEGMENTS THAT CONNECT ENCIRCLED TURNING POINTS SO AS TO DEFINE SPECIAL STUDIES ZONE SEGMENTS.




0 FEET 2000
0 METERS 1000

BASE MAP SOURCE: CDMG, 1982

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# EARTHQUAKE FAULT HAZARD MAP

THE ESTATES AT SAN SEBASTIAN

MORGAN HILL, CALIFORNIA

| | |
|---|---|
| PROJECT NO.: 9301.000.000 | FIGURE NO. 4 |
| SCALE: AS SHOWN | |
| DRAWN BY: DLB | CHECKED BY: RPS |

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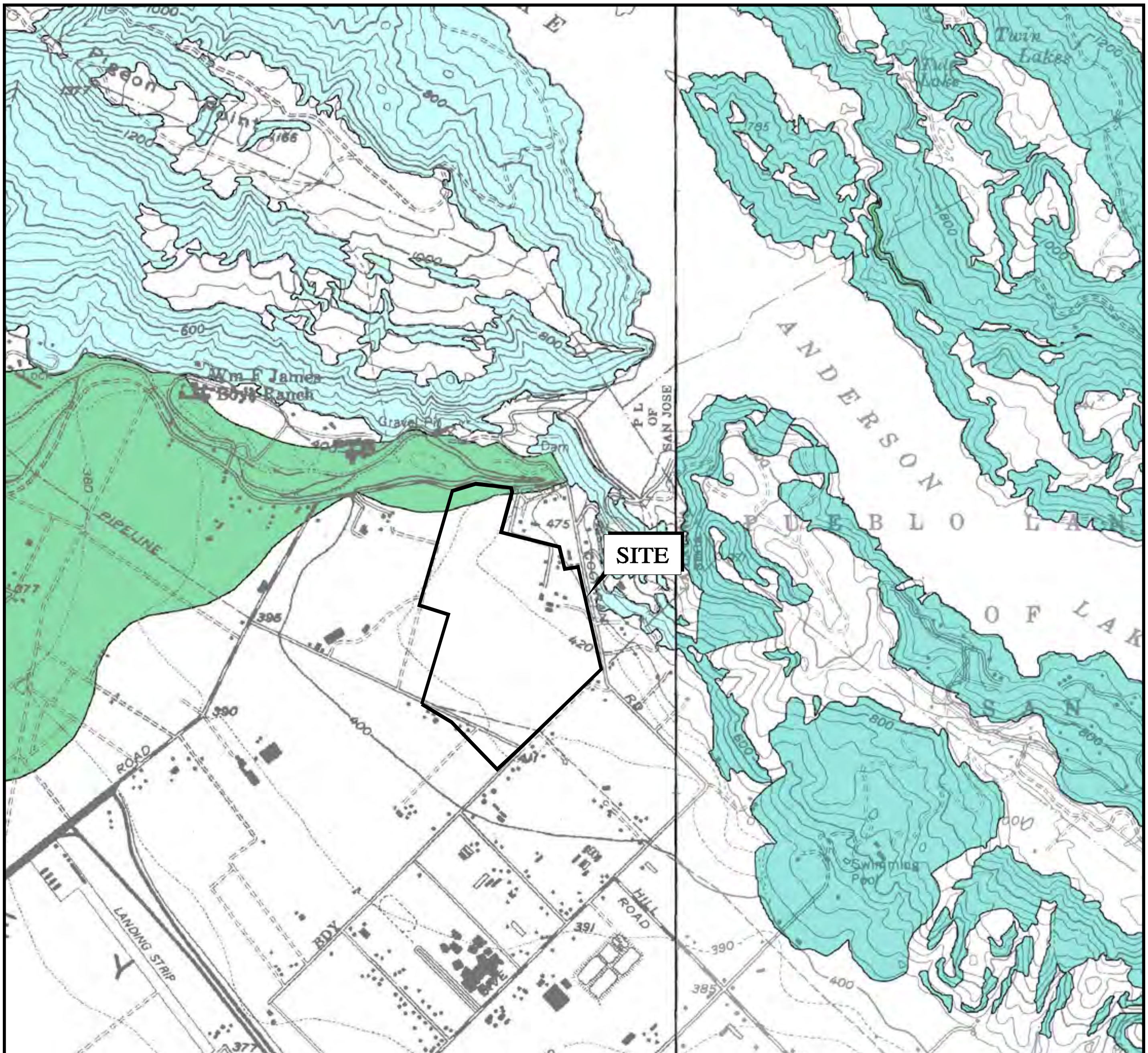


## EXPLANATION

### LIQUEFACTION

AREAS WHERE HISTORIC OCCURRENCE OF LIQUEFACTION, OR LOCAL GEOLOGICAL, GEOTECHNICAL AND GROUNDWATER CONDITIONS INDICATE A POTENTIAL FOR PERMANENT GROUND DISPLACEMENTS SUCH THAT MITIGATION AS DEFINED IN PUBLIC RESOURCES CODE SECTION 2693(c) WOULD BE REQUIRED

### EARTHQUAKE-INDUCED LANDSLIDES

AREAS WHERE PREVIOUS OCCURRENCE OF LANDSLIDE MOVEMENT, OR LOCAL TOPOGRAPHIC, GEOLOGICAL, GEOTECHNICAL AND SUBSURFACE WATER CONDITIONS INDICATE A POTENTIAL FOR PERMANENT GROUND DISPLACEMENTS SUCH THAT MITIGATION AS DEFINED IN PUBLIC RESOURCES CODE SECTION 2693(c) WOULD BE REQUIRED

N

0 FEET 4000
0 METERS 2000

BASE MAP SOURCE: CALIFORNIA DEPARTMENT OF CONSERVATION, CALIFORNIA GEOLOGICAL SURVEY, 2006

| ENGEO Expect Excellence | SEISMIC HAZARD ZONES<br>THE ESTATES AT SAN SEBASTIAN<br>MORGAN HILL, CALIFORNIA | PROJECT NO.: 9301.000.000<br>SCALE: AS SHOWN<br>DRAWN BY: DLB CHECKED BY: RPS | FIGURE NO.<br>5 |
|---|---|---|---|

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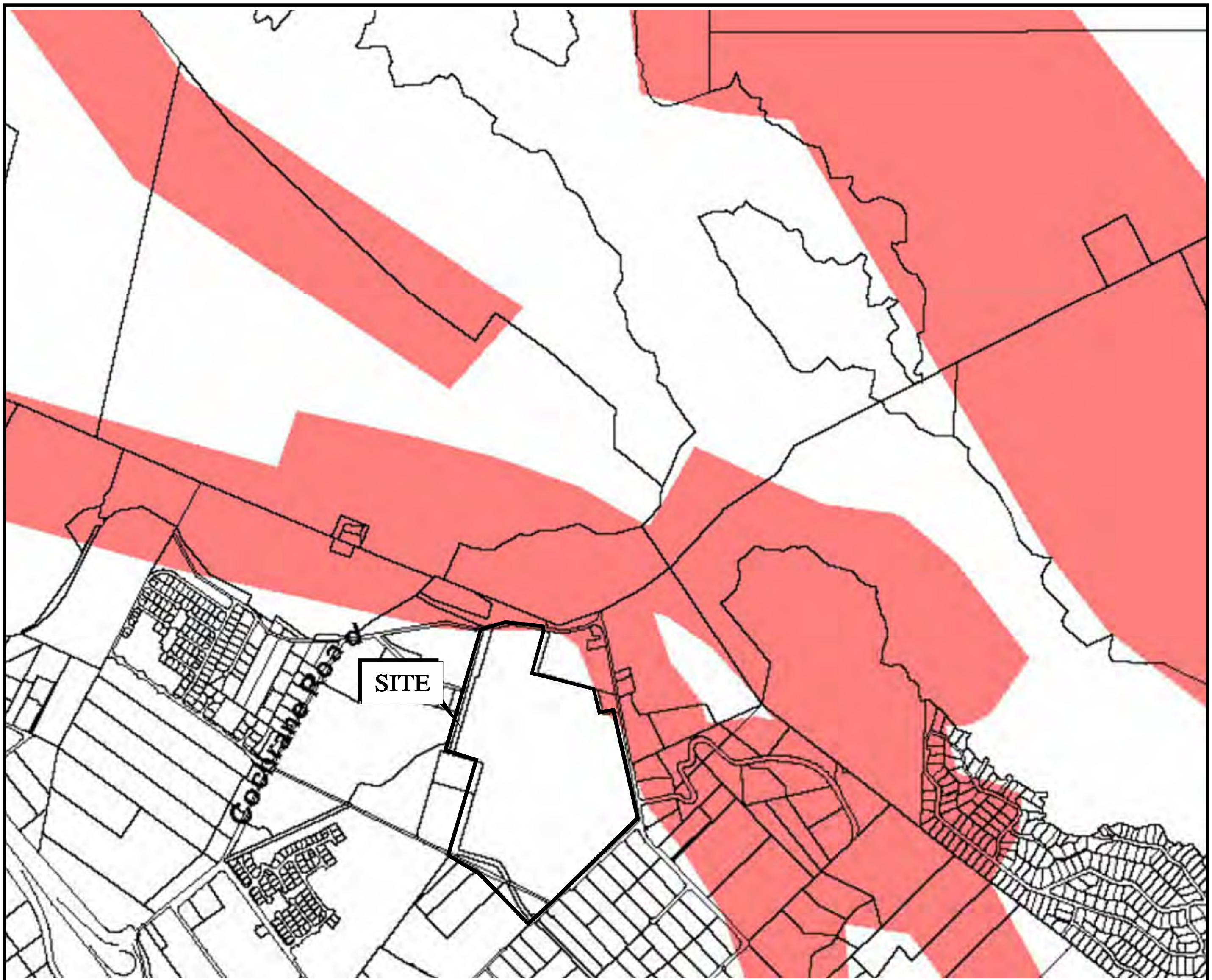
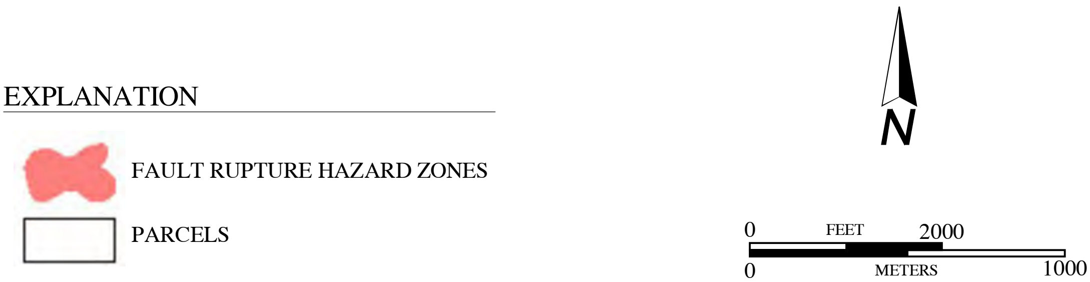



EXPLANATION




BASE MAP SOURCE: SANTA CLARA COUNTY, 2002



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| | | | |
|---|---|---|---|
| FAULT RUPTURE HAZARD ZONES<br>THE ESTATES AT SAN SEBASTIAN<br>MORGAN HILL, CALIFORNIA | PROJECT NO.: 9301.000.000 | | FIGURE NO. 6 |
| | SCALE: AS SHOWN | | |
| | DRAWN BY: DLB | CHECKED BY: RPS | |

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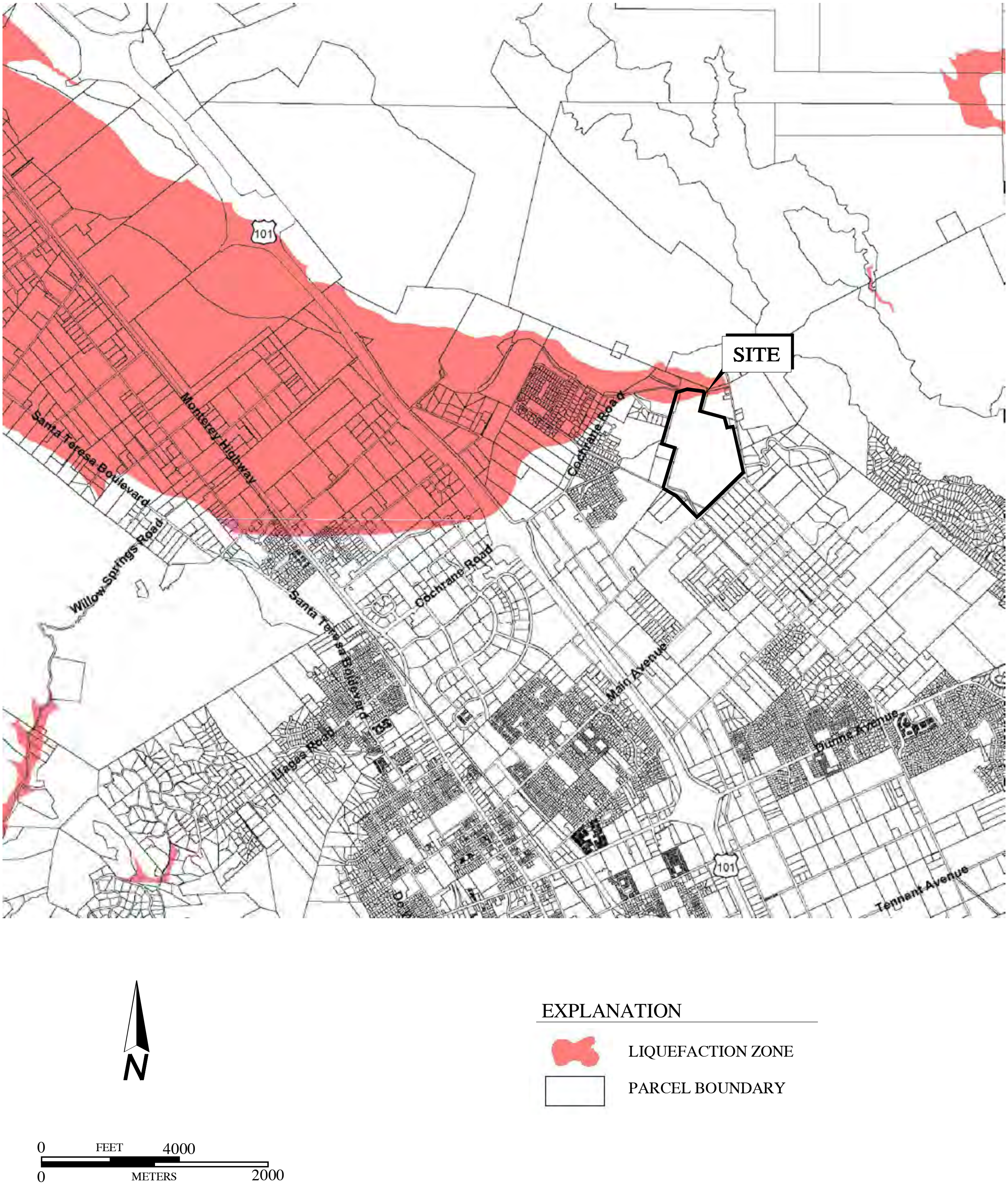


BASE MAP SOURCE: SANTA CLARA COUNTY, 2002

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## LIQUEFACTION HAZARD ZONES

THE ESTATES AT SAN SEBASTIAN

MORGAN HILL, CALIFORNIA

| | | |
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| PROJECT NO.: 9301.000.000 | | FIGURE NO. |
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| DRAWN BY: PC | CHECKED BY: RPS | |

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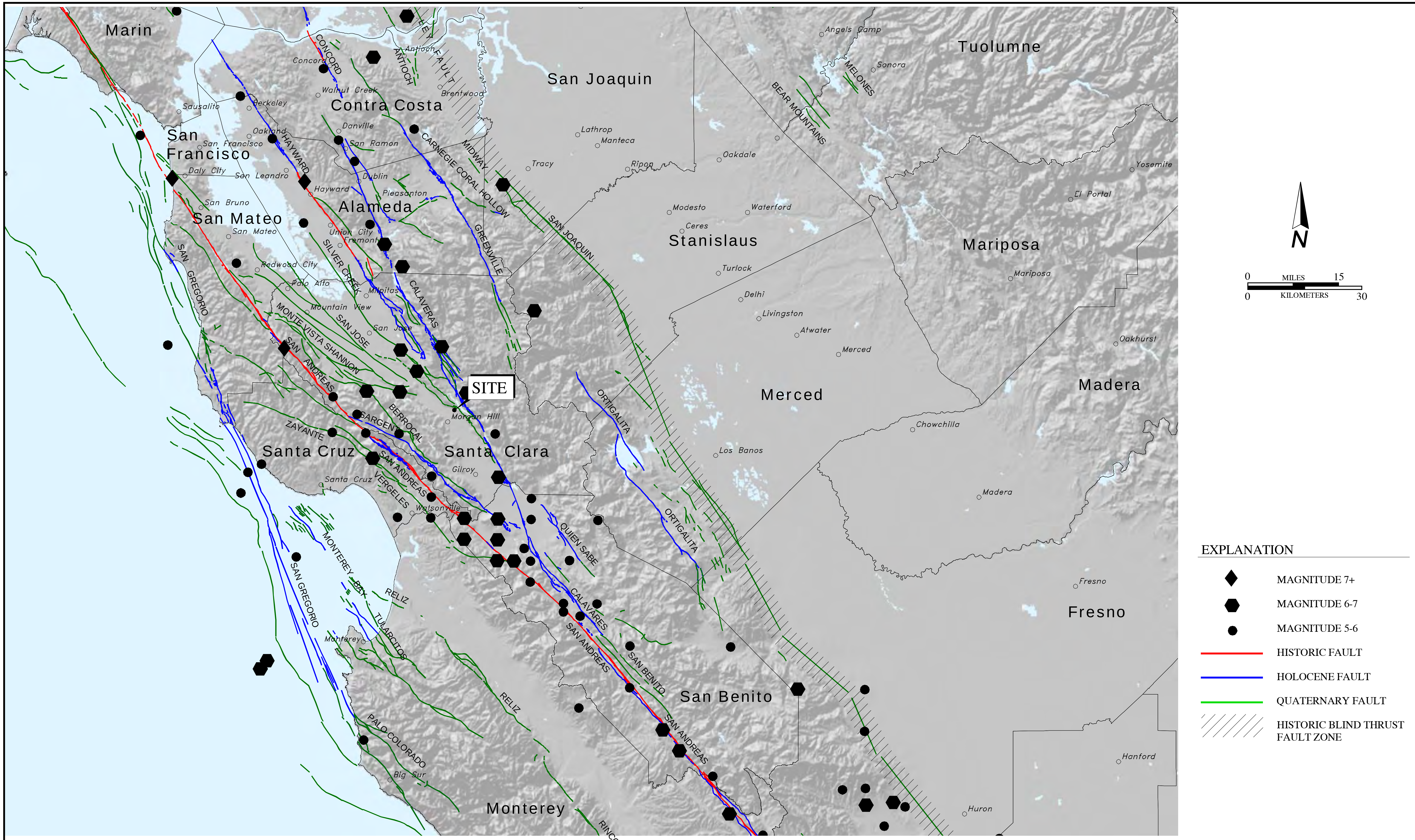


BASE MAP SOURCE:
U.S.G.S. 1-ARC SECOND S.R.T.M. DATABASE
U.S.G.S. QUATERNARY FAULT DATABASE, MARCH, 2006
U.S.G.S. HISTORIC EARTHQUAKE DATABASE (1800-2000)

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REGIONAL FAULTING AND SEISMICITY
THE ESTATES AT SAN SEBASTIAN
MORGAN HILL, CALIFORNIA

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| PROJECT NO.: 9301.000.000 | FIGURE NO |
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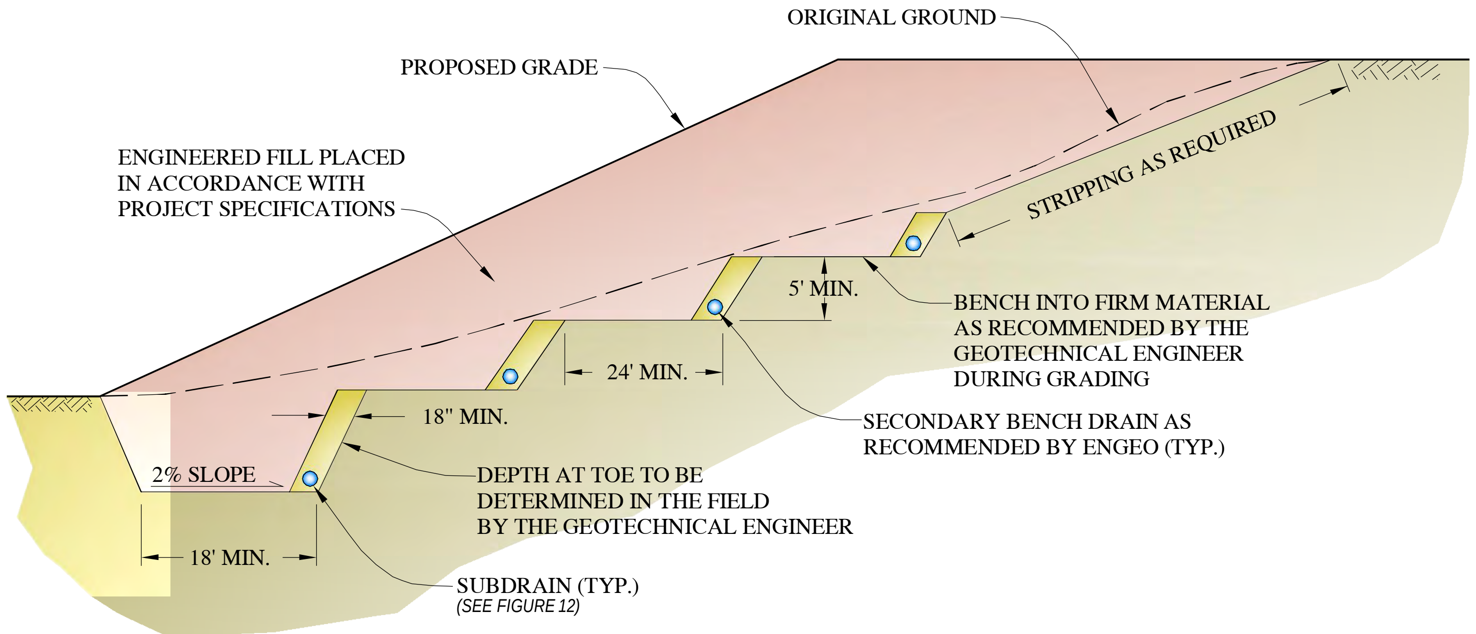
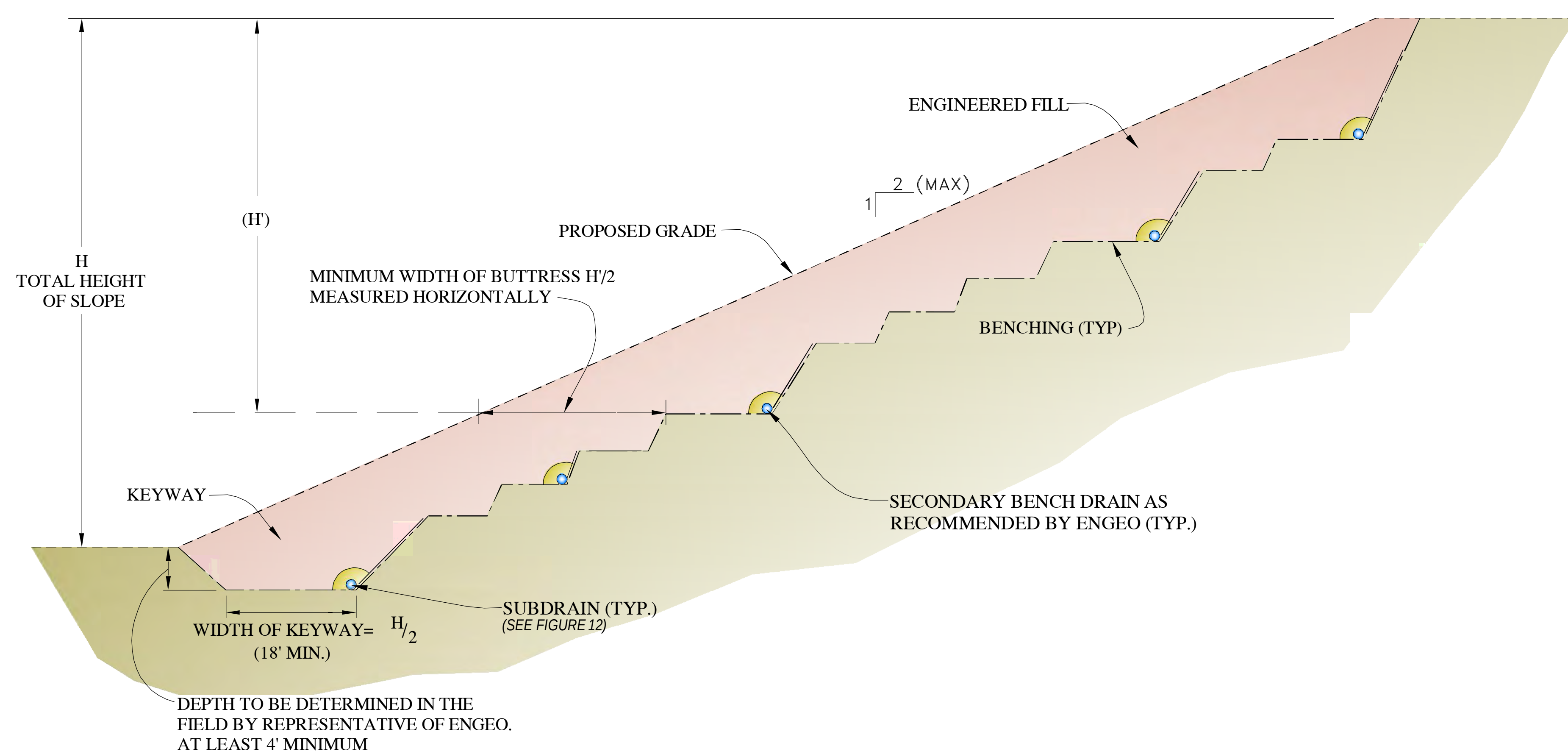



TYPICAL FILL SLOPE TOE KEYWAY




TYPICAL CUT SLOPE REBIUILD DETAIL

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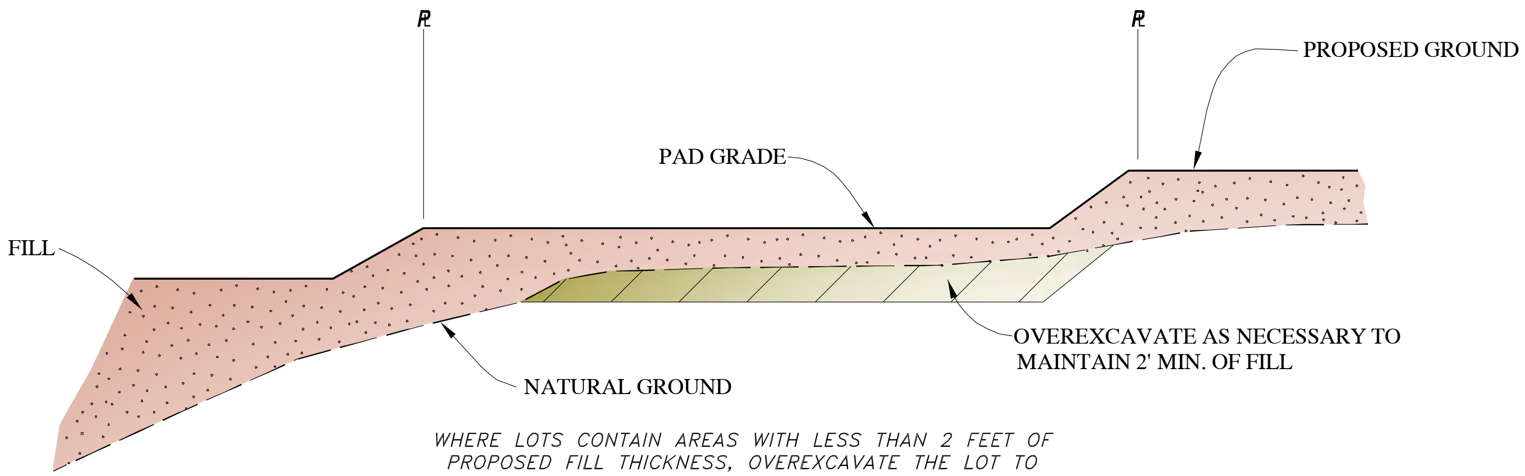
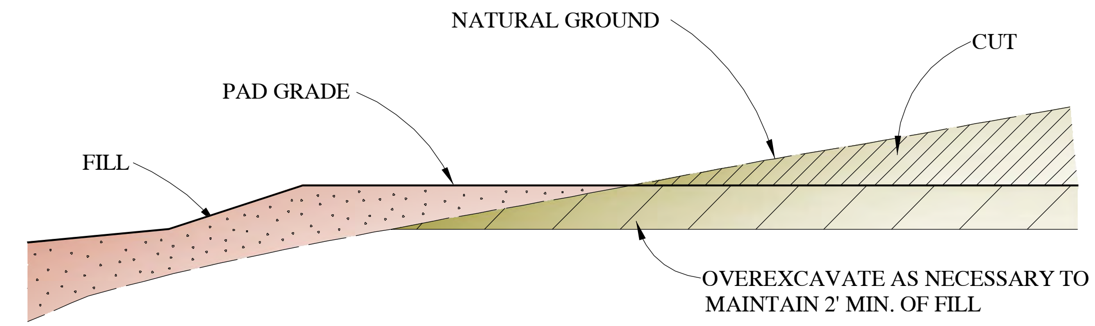
TYPICAL KEYWAY AND SLOPE REBUILD DETAILS
THE ESTATES AT SAN SEBASTIAN
MORGAN HILL, CALIFORNIA

PROJECT NO.: 9301.000.000
SCALE: NO SCALE
DRAWN BY: DLB
CHECKED BY: RPS
FIGURE NO
9



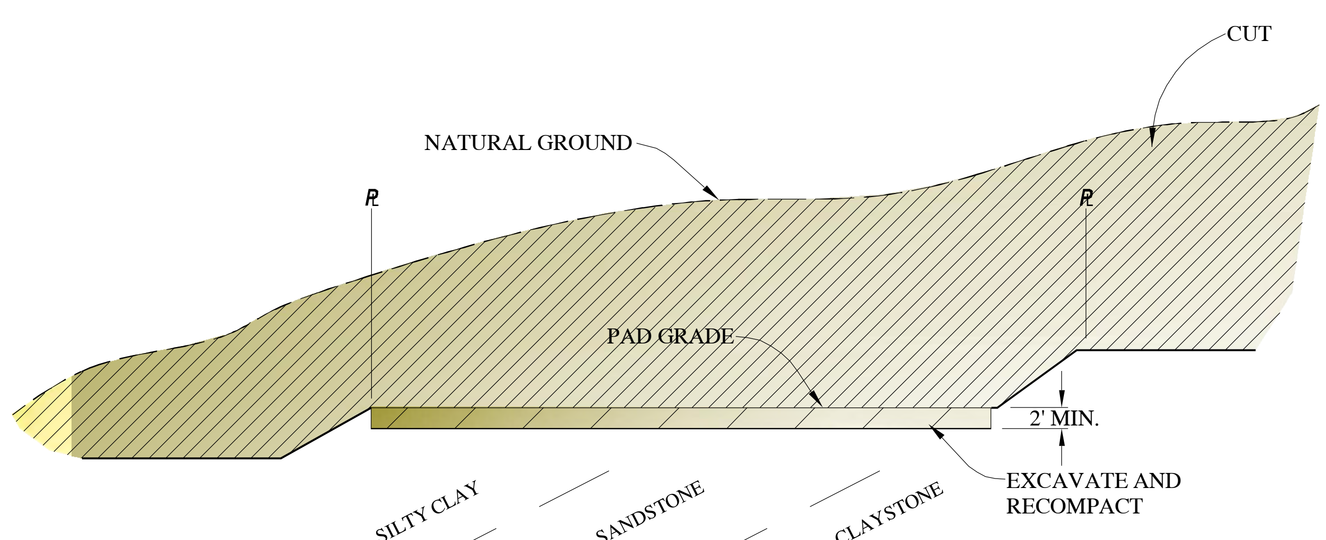

*WHERE LOTS CONTAIN AREAS WITH LESS THAN 2 FEET OF PROPOSED FILL THICKNESS, OVEREXCAVATE THE LOT TO PROVIDE AT LEAST 2 FEET OF ENGINEERED FILL THROUGHOUT*

SHALLOW FILL LOT




*WHERE LOTS ARE PARTIALLY IN FILL, AND PARTIALLY IN CUT, THE CUT PORTION MUST BE OVEREXCAVATED AS SHOWN*

CUT - FILL TRANSITION LOT




*WHERE LOTS ARE COMPLETELY IN CUT, THE UPPER 2' SHOULD BE EXCAVATED AND RECOMPACTED AS SHOWN*

CUT LOT

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SURFICAL PAD TREATMENT
THE ESTATES AT SAN SEBASTIAN
MORGAN HILL, CALIFORNIA

| | |
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| PROJECT NO.: 9301.000.000 | |
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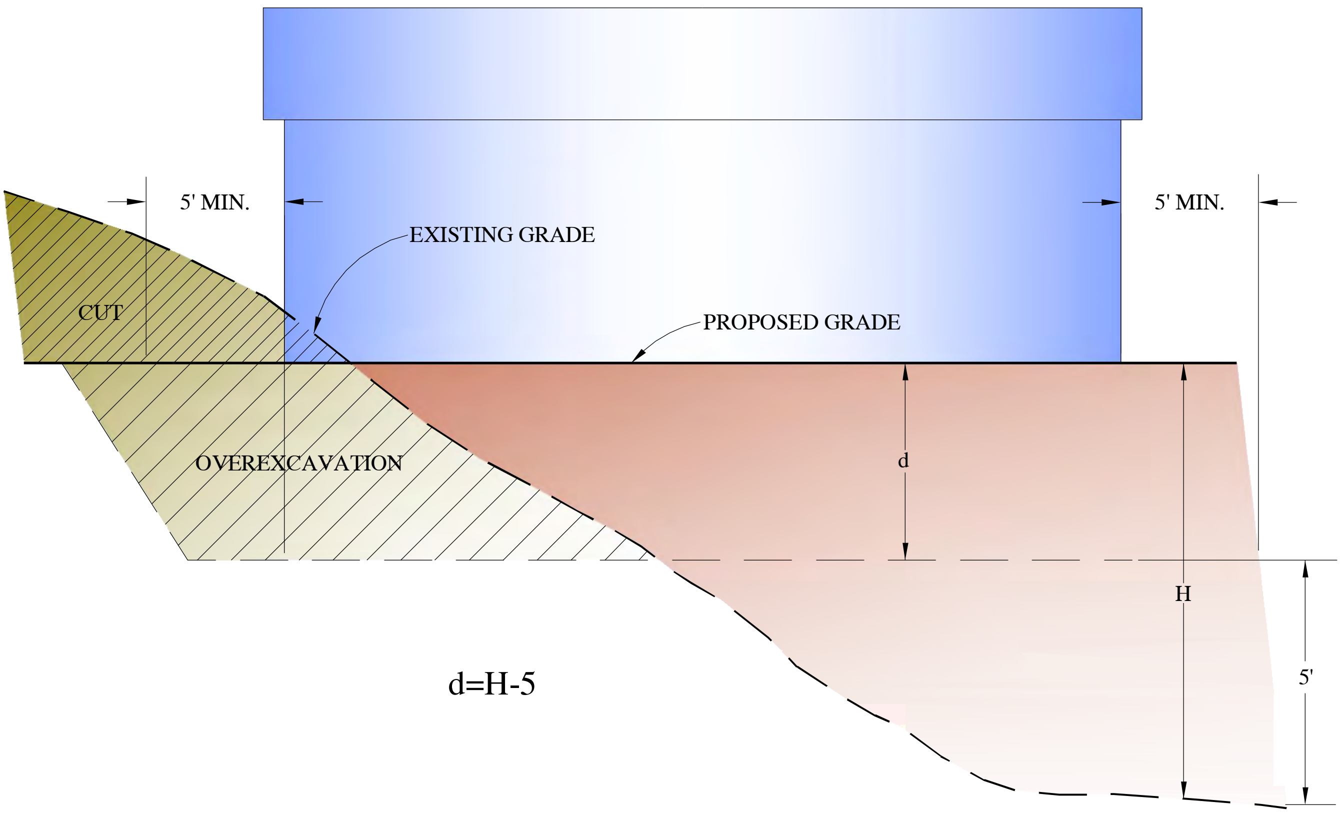
| DRAWN BY: DLB | CHECKED BY: RPS |

FIGURE NO
10




NOTE: ALL DIMENSIONS IN FEET

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**TYPICAL DIFFERENTIAL FILL THICKNESS LOT DETAIL**

THE ESTATES AT SAN SEBASTIAN

MORGAN HILL, CALIFORNIA

| | | |
|---|---|---|
| PROJECT NO.: 9301.000.000 | | FIGURE NO 11 |
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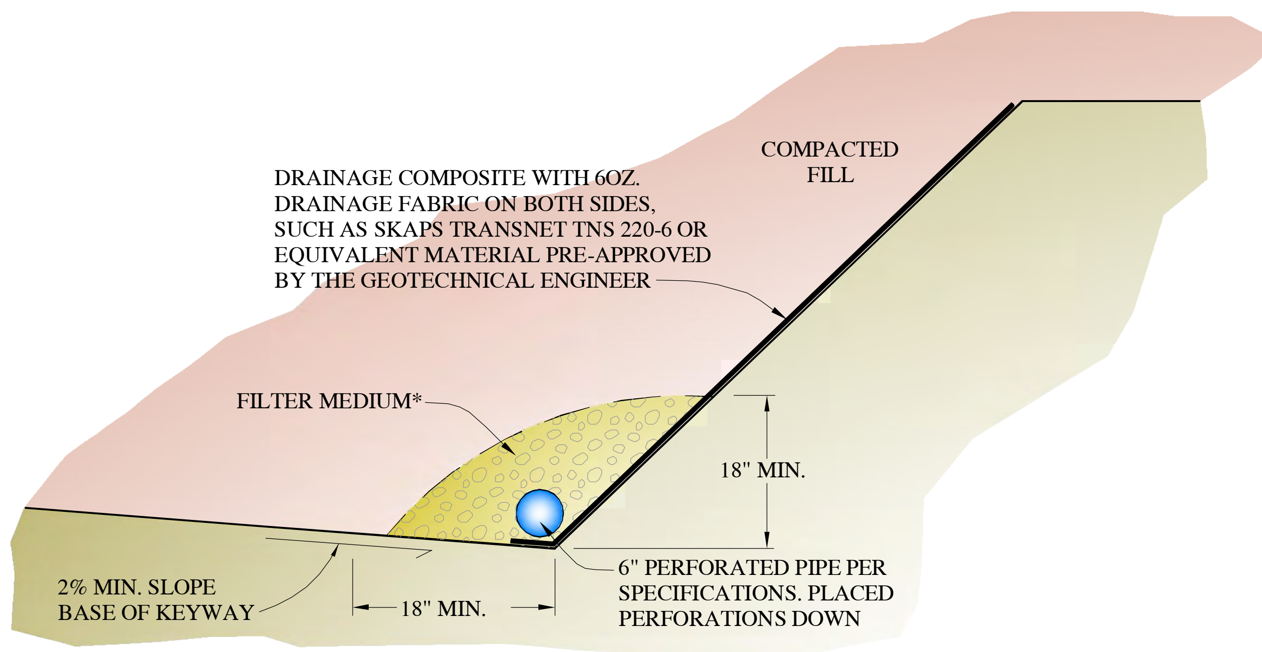
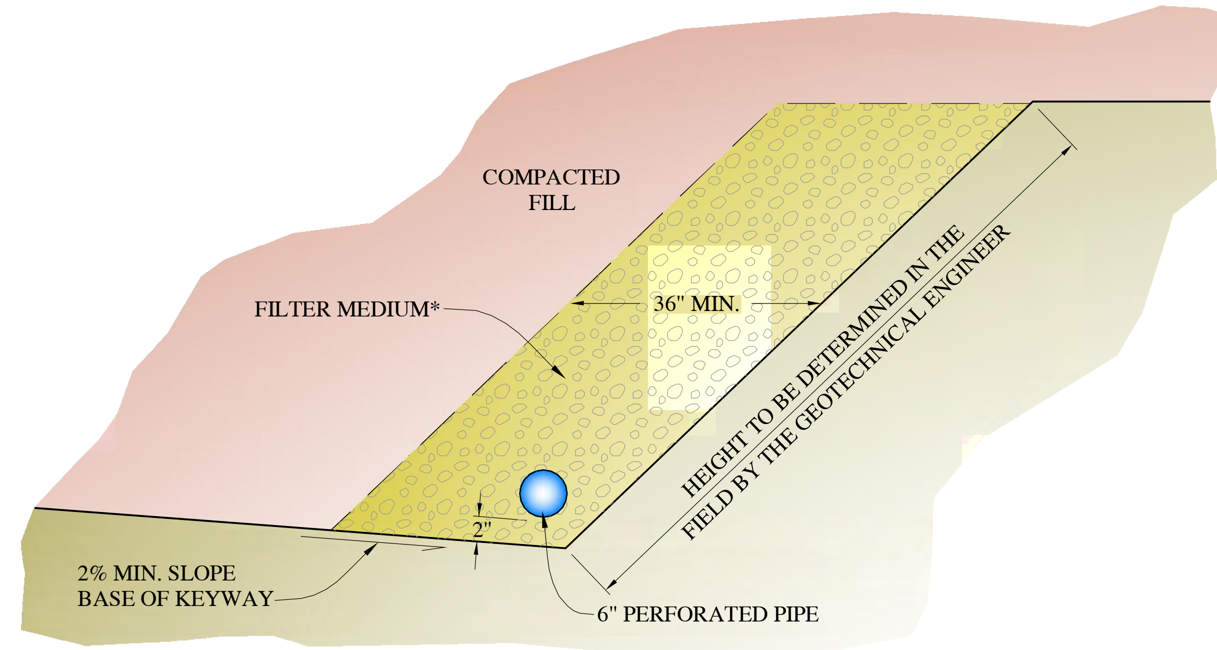



KEYWAY SUBDRAIN - OPTION 1




KEYWAY SUBDRAIN - OPTION 2

*FILTER MEDIUM

ALTERNATIVE A

CLASS 2 PERMEABLE MATERIAL

MATERIAL SHALL CONSIST OF CLEAN, COARSE SAND AND GRAVEL OR CRUSHED STONE, CONFORMING TO THE FOLLOWING GRADING REQUIREMENTS:

| SIEVE SIZE | % PASSING SIEVE |
|---|---|
| 1" | 100 |
| 3/4" | 90–100 |
| 3/8" | 40–100 |
| #4 | 25–40 |
| #8 | 18–33 |
| #30 | 5–15 |
| #50 | 0–7 |
| #200 | 0–3 |

ALTERNATIVE B

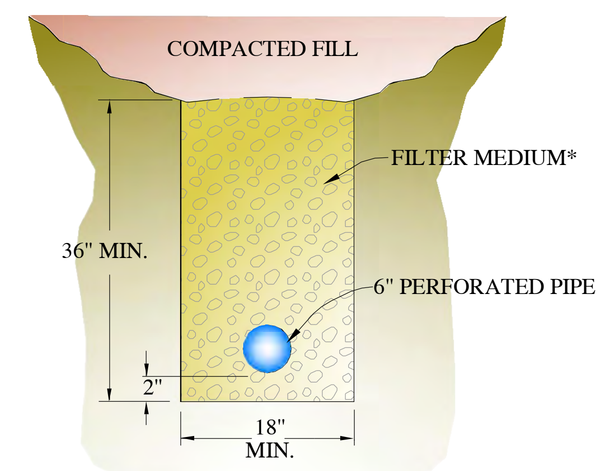
CLEAN CRUSHED ROCK OR GRAVEL WRAPPED IN FILTER FABRIC

ALL FILTER FABRIC SHALL MEET THE FOLLOWING MINIMUM AVERAGE ROLL VALUES UNLESS OTHERWISE SPECIFIED BY ENGEO:

| | |
|---|---|
| GRAB STRENGTH (ASTM D-4632) | 180 lbs |
| MASS PER UNIT AREA (ASTM D-4751) | 6 oz/yd$^2$ |
| APPARENT OPENING SIZE (ASTM D-4751) | 70-100 U.S. STD. SIEVE |
| FLOW RATE (ASTM D-4491) | 80 gal/min/ft |
| PUNCTURE STRENGTH (ASTM D-4833) | 80 lbs |

*NOTES:*

1. *ALL PIPE JOINTS SHALL BE GLUED*
2. *ALL PERFORATED PIPE PLACED PERFORATIONS DOWN*
3. *1% FALL (MINIMUM) ON ALL TRENCHES AND DRAIN LINES (UON)*
4. *SDR 35 PVC PIPE OR APPROVED EQUIVALENT (UON)*




SWALE SUBDRAIN

| ENGEO Expect Excellence | TYPICAL SUBDRAIN DETAILS<br>THE ESTATES AT SAN SEBASTIAN<br>MORGAN HILL, CALIFORNIA | PROJECT NO.: 9301.000.000<br>SCALE: NO SCALE<br>DRAWN BY: PC CHECKED BY: RPS | FIGURE NO.<br>12 |
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ORIGINAL FIGURE PRINTED IN COLOR

# APPENDIX A

Boring Logs
Test Pit Logs

A P P E N D I X A

# KEY TO BORING LOGS

| MAJOR TYPES | | | DESCRIPTION |
|---|---|---|---|
| COARSE-GRAINED SOILS MORE THAN HALF OF MAT'L LARGER THAN #200 SIEVE | GRAVELS MORE THAN HALF COARSE FRACTION IS LARGER THAN NO. 4 SIEVE SIZE | CLEAN GRAVELS WITH LESS THAN 5% FINES | GW - Well graded gravels or gravel-sand mixtures<br>GP - Poorly graded gravels or gravel-sand mixtures |
| | | GRAVELS WITH OVER 12 % FINES | GM - Silty gravels, gravel-sand and silt mixtures<br>GC - Clayey gravels, gravel-sand and clay mixtures |
| | SANDS MORE THAN HALF COARSE FRACTION IS SMALLER THAN NO. 4 SIEVE SIZE | CLEAN SANDS WITH LESS THAN 5% FINES | SW - Well graded sands, or gravelly sand mixtures<br>SP - Poorly graded sands or gravelly sand mixtures |
| | | SANDS WITH OVER 12 % FINES | SM - Silty sand, sand-silt mixtures<br>SC - Clayey sand, sand-clay mixtures |
| FINE-GRAINED SOILS MORE THAN HALF OF MAT'L SMALLER THAN #200 SIEVE | SILTS AND CLAYS LIQUID LIMIT 50 % OR LESS | | ML - Inorganic silt with low to medium plasticity<br>CL - Inorganic clay with low to medium plasticity<br>OL - Low plasticity organic silts and clays |
| | SILTS AND CLAYS LIQUID LIMIT GREATER THAN 50 % | | MH - Elastic silt with high plasticity<br>CH - Fat clay with high plasticity<br>OH - Highly plastic organic silts and clays |
| | HIGHLY ORGANIC SOILS | | PT - Peat and other highly organic soils |

For fine-grained soils with 15 to 29% retained on the #200 sieve, the words "with sand" or "with gravel" (whichever is predominant) are added to the group name.

For fine-grained soil with >30% retained on the #200 sieve, the words "sandy" or "gravelly" (whichever is predominant) are added to the group name.

## GRAIN SIZES

| U.S. STANDARD SERIES SIEVE SIZE | 200 | 40 | 10 | 4 | CLEAR SQUARE SIEVE OPENINGS 3/4 " | 3" | 12" |
|---|---|---|---|---|---|---|---|
| SILTS AND CLAYS | SAND | | | GRAVEL | | COBBLES | BOULDERS |
| | FINE | MEDIUM | COARSE | FINE | COARSE | | |

### RELATIVE DENSITY

| SANDS AND GRAVELS | BLOWS/FOOT (S.P.T.) |
|---|---|
| VERY LOOSE | 0-4 |
| LOOSE | 4-10 |
| MEDIUM DENSE | 10-30 |
| DENSE | 30-50 |
| VERY DENSE | OVER 50 |

### CONSISTENCY

| SILTS AND CLAYS | STRENGTH* |
|---|---|
| VERY SOFT | 0-1/4 |
| SOFT | 1/4-1/2 |
| MEDIUM STIFF | 1/2-1 |
| STIFF | 1-2 |
| VERY STIFF | 2-4 |
| HARD | OVER 4 |

### SAMPLER SYMBOLS

Modified California (3" O.D.) sampler

California (2.5" O.D.) sampler

S.P.T. - Split spoon sampler

Shelby Tube

Continuous Core

Bag Samples

Grab Samples

NR No Recovery

### MOISTURE CONDITION

| | |
|---|---|
| DRY | Dusty, dry to touch |
| MOIST | Damp but no visible water |
| WET | Visible freewater |

### LINE TYPES

______ Solid - Layer Break

– – – – – – Dashed - Gradational or approximate layer break

### GROUND-WATER SYMBOLS

Groundwater level during drilling

Stabilized groundwater level

(S.P.T.) Number of blows of 140 lb. hammer falling 30" to drive a 2-inch O.D. (1-3/8 inch I.D.) sampler

* Unconfined compressive strength in tons/sq. ft., asterisk on log means determined by pocket penetrometer

ENGEO INCORPORATED

# LOG OF BORING 1-BH1

ENGEO INCORPORATED

Geotechnical Exploration
San Sebastian
Morgan Hill, CA
9301.000.000

DATE DRILLED: 7/19/2011
HOLE DEPTH: Approx. 51½ ft.
HOLE DIAMETER: 8.0 in.
SURF ELEV: Approx. 412½ ft.

LOGGED / REVIEWED BY: A. Firmin / JAM
DRILLING CONTRACTOR: Britton Exploration
DRILLING METHOD: Hollow Stem Auger
HAMMER TYPE: 140 lb. Auto Trip

| Depth in Feet | Depth in Meters | DESCRIPTION | Blow Count/Foot | Atterberg Limits: Liquid Limit | Plastic Limit | Plasticity Index | Fines Content (% passing #200 sieve) | Moisture Content (% dry weight) | Dry Unit Weight (pcf) | Unconfined Strength (tsf) *field approx |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Disked soil surface with gravel and cobbles | | | | | | | | |
| | | SANDY LEAN CLAY (CL), brown, stiff, moist, 5-10% fine to coarse gravel, fine- to coarse-grained sand | 21 | 24 | 15 | 9 | 51 | 8.7 | 109.5 | 1.75* |
| | 1 | CLAYEY SAND WITH GRAVEL (SP-SC), brown to dark brown, very dense, moist, mostly subangular fractured cobbles, fine- to coarse-grained sand and gravel | | | | | | | | |
| 5 | | | 51 | | | | 11 | 7.2 | 125.7 | |
| | 2 | Gravelly drilling | | | | | | | | |
| | | GRAVELLY SAND TO GRAVELLY CLAYEY SAND (SP-SC), dark brown, dense, moist, fractured cobbles, fine- to coarse-grained sand and gravel | 46 | | | | | 6.6 | 110.8 | |
| | | Gravelly drilling | | | | | | | | |
| 10 | 3 | GRAVELLY SAND (SP-SM), dark yellowish brown and brown, medium dense, moist, fractured cobbles, <5% clay, fine- to coarse-grained sand and gravel | 23 | | | | 11 | | | |
| | 4 | SANDY GRAVEL (GP), dark brown and dark yellowish brown, very dense, moist, fractured cobbles, <5% clay, fine- to coarse-grained sand and gravel<br>Gravelly drilling (15-20 minutes) | | | | | | | | |
| 15 | | | 76 | | | | | | | |
| | 5 | Gravelly drilling (20-25 minutes) | | | | | | | | |
| 20 | 6 | | 25 | | | | | | | |
| | | CLAYEY SAND WITH GRAVEL (SP-SC), dark yellowish brown, medium dense, moist, fine- to coarse-grained sand and gravel | | | | | | | | |
| | 7 | | | | | | | | | |
| 25 | | | 82 | | | | 11 | 9 | 116 | |

ENGEO INCORPORATED

# LOG OF BORING 1-BH1

Geotechnical Exploration
San Sebastian
Morgan Hill, CA
9301.000.000

DATE DRILLED: 7/19/2011
HOLE DEPTH: Approx. 51½ ft.
HOLE DIAMETER: 8.0 in.
SURF ELEV: Approx. 412½ ft.

LOGGED / REVIEWED BY: A. Firmin / JAM
DRILLING CONTRACTOR: Britton Exploration
DRILLING METHOD: Hollow Stem Auger
HAMMER TYPE: 140 lb. Auto Trip

Depth in Feet: 30, 35, 40, 45, 50

Depth in Meters: 8, 9, 10, 11, 12, 13, 14, 15

| Depth in Feet | Depth in Meters | Sample Type | DESCRIPTION | Log Symbol | Water Level | Blow Count/Foot | Atterberg Limits: Liquid Limit | Atterberg Limits: Plastic Limit | Atterberg Limits: Plasticity Index | Fines Content (% passing #200 sieve) | Moisture Content (% dry weight) | Dry Unit Weight (pcf) | Unconfined Strength (tsf) *field approx |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | GRAVELLY CLAYEY SAND (SP-SC), dark yellowish brown, dense, moist, fine- to coarse-grained sand and gravel | | | 54 | | | | 10 | | | |
| | | | | | | 47 | | | | | | | |
| | | | CLAYEY SAND (SC), dark yellowish brown, dense, moist, 5-10% fine to coarse gravel, interbedded clayey seams | | | 40 | | | | 15 | | | |
| | | | CLAYEY SAND (SC), grayish brown to grayish green, very dense, moist, 5-10% fine to coarse gravel. Sandy clay layer from 40.75 feet to 41.25 feet | | | 82 | | | | | | | |
| | | | CLAYEY SAND (SC), yellowish brown, dense, moist, 5-10% fine- to coarse-grained sand and gravel, moist to wet at bottom of sample | | | 39 | | | | 15 | 16.1 | 115.1 | |

# LOG OF BORING 1-BH1

ENGEO INCORPORATED

Geotechnical Exploration
San Sebastian
Morgan Hill, CA
9301.000.000

DATE DRILLED: 7/19/2011
HOLE DEPTH: Approx. 51½ ft.
HOLE DIAMETER: 8.0 in.
SURF ELEV: Approx. 412½ ft.

LOGGED / REVIEWED BY: A. Firmin / JAM
DRILLING CONTRACTOR: Britton Exploration
DRILLING METHOD: Hollow Stem Auger
HAMMER TYPE: 140 lb. Auto Trip

| Depth in Feet | Depth in Meters | Sample Type | DESCRIPTION | Log Symbol | Water Level | Blow Count/Foot | Atterberg Limits: Liquid Limit | Plastic Limit | Plasticity Index | Fines Content (% passing #200 sieve) | Moisture Content (% dry weight) | Dry Unit Weight (pcf) | Unconfined Strength (tsf) *field approx |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | CLAYEY SAND (SC), dark yellowish brown, medium dense, moist, 5-10% fine to coarse gravel | | | 24 | | | | | | | |
| | | | Bottom of boring at 51.5 feet below existing grade. Groundwater not encountered during drilling. | | | | | | | | | | |

# LOG OF BORING 1-BH2

ENGEO INCORPORATED

Geotechnical Exploration
San Sebastian
Morgan Hill, CA
9301.000.000

DATE DRILLED: 7/19/2011
HOLE DEPTH: Approx. 46½ ft.
HOLE DIAMETER: 8.0 in.
SURF ELEV: Approx. 410½ ft.

LOGGED / REVIEWED BY: A. Firmin / JAM
DRILLING CONTRACTOR: Britton Exploration
DRILLING METHOD: Hollow Stem Auger
HAMMER TYPE: 140 lb. Auto Trip

| Depth in Feet | Depth in Meters | DESCRIPTION | Blow Count/Foot | Atterberg Limits: Liquid Limit | Atterberg Limits: Plastic Limit | Atterberg Limits: Plasticity Index | Fines Content (% passing #200 sieve) | Moisture Content (% dry weight) | Dry Unit Weight (pcf) | Unconfined Strength (tsf) *field approx |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Disked soil surface with gravels and cobbles | | | | | | | | |
| | | SANDY SILT (ML), brown, hard, dry to moist, trace rootlets, 5-10% clay, <5% fine gravel | | | | | | | | |
| | 1 | | 54 | | | | 56 | 5.2 | 110.7 | 4.5+* |
| 5 | | SILTY SAND WITH GRAVEL (SM), dark brown, medium dense to dense, moist, <5% clay, fine- to coarse-grained sand and gravel | | | | | | | | |
| | 2 | | 21 | | | | | 10.4 | 113.9 | |
| | | Gravelly drilling | | | | | | | | |
| | | GRAVELLY SAND TO GRAVELLY SILTY SAND (SP-SM), dark brown to dark yellowish brown, dense, moist, fractured cobbles, fine- to coarse-grained sand and gravel | 36 | | | | | | | |
| 10 | 3 | | | | | | | | | |
| | | Gravelly drilling | | | | | | | | |
| | 4 | SAND TO SILTY SAND WITH GRAVEL (SP-SM), dark brown to dark yellowish brown, very dense, moist, fractured cobbles, fine- to coarse-grained sand and gravel | 56 | | | | 10 | | | |
| 15 | | Gravelly drilling to 16 feet | | | | | | | | |
| | 5 | CLAYEY SAND WITH GRAVEL (SC), dark yellowish brown, dense, moist, fine- to coarse-grained sand and gravel | | | | | | | | |
| | | | 35 | | | | | 11.1 | 115.3 | |
| 20 | 6 | | | | | | | | | |
| | | LEAN CLAY (CL), yellowish brown, stiff, moist, 5-10% fine- to medium-grained sand, interbedded silty sand lenses. Silty sand lense from 24.25 feet to 24.75 feet | | | | | | | | |
| | 7 | | | | | | | | | |
| | | Low PI | 18 | | | | | 20.9 | 106.2 | 1.75* |
| 25 | | | | | | | | | | |

LOG - GEOTECHNICAL 9301.000.000GINTLOGS.GPJ ENGEO INC.GDT 10/24/11

# LOG OF BORING 1-BH2

ENGEO INCORPORATED

Geotechnical Exploration
San Sebastian
Morgan Hill, CA
9301.000.000

DATE DRILLED: 7/19/2011
HOLE DEPTH: Approx. 46½ ft.
HOLE DIAMETER: 8.0 in.
SURF ELEV: Approx. 410½ ft.

LOGGED / REVIEWED BY: A. Firmin / JAM
DRILLING CONTRACTOR: Britton Exploration
DRILLING METHOD: Hollow Stem Auger
HAMMER TYPE: 140 lb. Auto Trip

Depth in Feet: 30, 35, 40, 45
Depth in Meters: 8, 9, 10, 11, 12, 13, 14

| DESCRIPTION | Blow Count/Foot | Atterberg Limits: Liquid Limit | Atterberg Limits: Plastic Limit | Atterberg Limits: Plasticity Index | Fines Content (% passing #200 sieve) | Moisture Content (% dry weight) | Dry Unit Weight (pcf) | Unconfined Strength (tsf) *field approx |
|---|---|---|---|---|---|---|---|---|
| LEAN CLAY (CL), yellowish brown, stiff, moist, 5-10% fine- to medium-grained sand, interbedded silty sand lenses. Silty sand lense from 24.25 feet to 24.75 feet | 13 | | | | | | | |
| LEAN CLAY (CL), yellowish brown, very stiff, moist, 5-10% fine-grained sand, interbedded silty sand lenses<br>Low to medium PI | 23 | | | | | | | 2.5* |
| CLAYEY SAND (SC), dark yellowish brown, dense, moist, 10-15% fine gravel, fine- to coarse-grained sand | 34 | | | | | | | 2.5* |
| LEAN CLAY (CL), yellowish brown, very stiff, moist, 5-10% fine- to medium-grained sand | 20 | | | | 65 | 17.4 | 115.5 | 2.5* |
| SILTY SAND (SP-SM), dark brownish and dark yellowish brown, dense, moist, 10-15% fine- to coarse-grained gravel, fine- to coarse-grained sand | 78 | | | | | 13.6 | 98.4 | |
| | 45 | | | | 10 | | | |

Bottom of boring at 46.5 feet below existing grade.
Groundwater not encountered during drilling.

ENGEO INCORPORATED

# LOG OF BORING 1-BH3

Geotechnical Exploration
San Sebastian
Morgan Hill, CA
9301.000.000

DATE DRILLED: 7/19/2011
HOLE DEPTH: Approx. 15 ft.
HOLE DIAMETER: 8.0 in.
SURF ELEV: Approx. 415½ ft.

LOGGED / REVIEWED BY: A. Firmin / JAM
DRILLING CONTRACTOR: Britton Exploration
DRILLING METHOD: Hollow Stem Auger
HAMMER TYPE: 140 lb. Auto Trip

| Depth in Feet | Depth in Meters | Sample Type | DESCRIPTION | Log Symbol | Water Level | Blow Count/Foot | Atterberg Limits: Liquid Limit | Atterberg Limits: Plastic Limit | Atterberg Limits: Plasticity Index | Fines Content (% passing #200 sieve) | Moisture Content (% dry weight) | Dry Unit Weight (pcf) | Unconfined Strength (tsf) *field approx |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Disked soil surface | | | | | | | | | | |
| | | | GRAVELLY SAND (GP-GC), brown, very dense, moist, fractured cobbles, fine- to coarse-grained sand and gravel | | | 92 | 23 | 18 | 5 | 11 | | | |
| | 1 | | Gravelly drilling | | | | | | | | | | |
| 5 | 2 | | SAND TO CLAYEY SAND WITH GRAVEL (SP-SC), dark brown, medium dense, moist, fractured cobbles, fine- to coarse-grained sand and gravel | | | 24 | | | | | | | |
| 10 | 3 | | CLAYEY SAND WITH GRAVEL (SC), dark yellowish brown, very dense, moist, fine- to coarse-grained sand and gravel | | | 60 | | | | | 7.4 | 120.1 | |
| | 4 | | CLAYEY GRAVELLY SAND (SC) | | | 80 | | | | | 12.4 | 98.8 | |
| 15 | | NR | | | | 50/4" | | | | | | | |
| | | | Bottom of boring at 15 feet below existing grade. Groundwater not encountered during drilling. | | | | | | | | | | |

# LOG OF BORING 1-BH4

ENGEO INCORPORATED

Geotechnical Exploration
San Sebastian
Morgan Hill, CA
9301.000.000

DATE DRILLED: 7/20/2011
HOLE DEPTH: Approx. 13½ ft.
HOLE DIAMETER: 8.0 in.
SURF ELEV: Approx. 410¾ ft.

LOGGED / REVIEWED BY: S. Johns / JAM
DRILLING CONTRACTOR: Britton Exploration
DRILLING METHOD: Hollow Stem Auger
HAMMER TYPE: 140 lb. Auto Trip

| Depth in Feet | Depth in Meters | Sample Type | DESCRIPTION | Log Symbol | Water Level | Blow Count/Foot | Atterberg Limits: Liquid Limit | Atterberg Limits: Plastic Limit | Atterberg Limits: Plasticity Index | Fines Content (% passing #200 sieve) | Moisture Content (% dry weight) | Dry Unit Weight (pcf) | Unconfined Strength (tsf) *field approx |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Topsoil | | | | | | | | | | |
| | 1 | | GRAVELLY CLAYEY SAND (SC), yellowish red mottled with brown, dense, moist, fine- to coarse-grained sand and gravel | | | 35 | 33 | 19 | 14 | 15 | 7.6 | 113.5 | |
| 5 | | | Hard drilling from 5 feet to 8 feet | | | 37 | | | | | 7.9 | 121.4 | |
| | 2 | | GRAVELLY CLAYEY SAND (SC), yellowish red mottled with brown, dense, moist, fine- to coarse-grained sand and gravel | | | | | | | | | | |
| | | | CLAYEY SAND WITH GRAVEL (SC), yellowish red mottled with yellowish brown, dense, moist, fragment of cobble at 9.5 feet, fine- to coarse-grained sand and gravel | | | 46 | | | | 12 | | | |
| 10 | 3 | | Hard drilling from 10 feet to 13 feet | | | | | | | | | | |
| | 4 | | CLAYEY SAND (SC), yellowish red, very dense, moist, 5-10% fine gravel, fine- to coarse-grained sand | | | 55 | | | | | | | |
| | | | Bottom of boring at 13.5 feet below existing grade. Groundwater not encountered during drilling. | | | | | | | | | | |

# LOG OF BORING 1-BH5

ENGEO INCORPORATED

Geotechnical Exploration
San Sebastian
Morgan Hill, CA
9301.000.000

DATE DRILLED: 7/20/2011
HOLE DEPTH: Approx. 20 ft.
HOLE DIAMETER: 8.0 in.
SURF ELEV: Approx. 408½ ft.

LOGGED / REVIEWED BY: S. Johns / JAM
DRILLING CONTRACTOR: Britton Exploration
DRILLING METHOD: Hollow Stem Auger
HAMMER TYPE: 140 lb. Auto Trip

| Sample Type | DESCRIPTION | Blow Count/Foot | Liquid Limit (Atterberg Limits) | Plastic Limit (Atterberg Limits) | Plasticity Index (Atterberg Limits) | Fines Content (% passing #200 sieve) | Moisture Content (% dry weight) | Dry Unit Weight (pcf) | Unconfined Strength (tsf) *field approx |
|---|---|---|---|---|---|---|---|---|---|
| | Topsoil | | | | | | | | |
| | GRAVELLY CLAYEY SAND (SC), dark yellowish brown, medium dense, moist, one 2-inch gravel at 2.5 feet, fine- to coarse-grained sand and gravel | 20 | | | | 19 | 7.5 | 117 | |
| | GRAVELLY CLAYEY SAND (SC), yellowish red mottled with light yellowish brown, dense, moist, fractured cobble at 6.5 feet, fine- to coarse-grained sand and gravel<br>7 feet to 7.5 feet grades to clayey and with gravel (5-10%) | 31 | | | | | | | |
| | Hard drilling from 9 feet to 12 feet | | | | | | | | |
| NR | CLAYEY SAND WITH GRAVEL (SC), dark yellowish brown mottled with yellowish red, dense, moist, fine- to coarse-grained sand and gravel | 67 | | | | | | | |
| | | 38 | | | | | 13.1 | 115.1 | |
| | Hard drilling from 14 feet to 16 feet | | | | | | | | |
| | GRAVELLY CLAYEY SAND (SP-SM), dark yellowish brown, very dense, moist, fragment of cobble at 18.5 feet, fine- to coarse-grained sand and gravel | 92 | | | | 11 | 7.6 | 132.3 | |
| | | 30 | | | | | | | |
| | Bottom of boring at 20 feet below existing grade.<br>Groundwater not encountered during drilling. | | | | | | | | |

# LOG OF BORING 1-BH6

ENGEO INCORPORATED

Geotechnical Exploration
San Sebastian
Morgan Hill, CA
9301.000.000

DATE DRILLED: 7/20/2011
HOLE DEPTH: Approx. 16½ ft.
HOLE DIAMETER: 8.0 in.
SURF ELEV: Approx. 418½ ft.

LOGGED / REVIEWED BY: S. Johns / JAM
DRILLING CONTRACTOR: Britton Exploration
DRILLING METHOD: Hollow Stem Auger
HAMMER TYPE: 140 lb. Auto Trip

| Depth in Feet | Depth in Meters | Sample Type | DESCRIPTION | Log Symbol | Water Level | Blow Count/Foot | Atterberg Limits: Liquid Limit | Atterberg Limits: Plastic Limit | Atterberg Limits: Plasticity Index | Fines Content (% passing #200 sieve) | Moisture Content (% dry weight) | Dry Unit Weight (pcf) | Unconfined Strength (tsf) *field approx |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Topsoil | | | | | | | | | | |
| | | | GRAVELLY CLAYEY SAND (SC), yellowish red mottled with yellowish brown, medium dense, moist, fine- to coarse-grained sand and gravel | | | 25 | | | | 20 | | | |
| | 1 | | Hard drilling from 4 feet to 4.5 feet | | | | | | | | | | |
| 5 | 2 | | | | | | | | | | | | |
| | | | GRAVELLY CLAYEY SAND (SC), reddish brown mottled with yellowish brown, dense, moist, fine- to coarse-grained sand and gravel | | | 48 | | | | | 8.9 | 119.9 | |
| | | | Hard drilling from 9 feet to 10 feet | | | | | | | | | | |
| 10 | 3 | | | | | | | | | | | | |
| | | | CLAYEY SAND (SC), yellowish red mottled with light yellowish brown, dense, moist, <5% fine gravel, fine- to coarse-grained sand | | | | | | | | | | |
| | 4 | | CLAYEY GRAVEL WITH SAND (GC), yellowish red with pale yellowish gray, dense, moist, fine- to coarse-grained sand, coarse gravel (fragments of cobble) | | | 45 | | | | | | | |
| | | | Hard drilling from 13 feet to 15 feet | | | | | | | | | | |
| 15 | 5 | | GRAVELLY CLAYEY SAND (SC), yellowish red mottled with dark yellowish brown, dense, moist, fine- to coarse-grained sand and gravel | | | 34 | | | | | | | |
| | | | Bottom of boring at 16.5 feet below existing grade. Groundwater not encountered during drilling. | | | | | | | | | | |

LOG - GEOTECHNICAL 9301.000.000GINTLOGS.GPJ ENGEO INC.GDT 10/24/11

# LOG OF BORING 1-BH7

ENGEO INCORPORATED

Geotechnical Exploration
San Sebastian
Morgan Hill, CA
9301.000.000

DATE DRILLED: 7/20/2011
HOLE DEPTH: Approx. 18 ft.
HOLE DIAMETER: 8.0 in.
SURF ELEV: Approx. 424¾ ft.

LOGGED / REVIEWED BY: S. Johns / JAM
DRILLING CONTRACTOR: Britton Exploration
DRILLING METHOD: Hollow Stem Auger
HAMMER TYPE: 140 lb. Auto Trip

| Depth in Feet | Depth in Meters | DESCRIPTION | Blow Count/Foot | Atterberg Limits: Liquid Limit | Atterberg Limits: Plastic Limit | Atterberg Limits: Plasticity Index | Fines Content (% passing #200 sieve) | Moisture Content (% dry weight) | Dry Unit Weight (pcf) | Unconfined Strength (tsf) *field approx |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Dirt parking stall | | | | | | | | |
| | | CLAYEY SAND (SC), dark yellowish brown mottled with yellowish red, medium dense, moist, fine- to coarse-grained sand | 14 | | | | | | | |
| | 1 | | | | | | | | | |
| 5 | | | | | | | | | | |
| | 2 | POORLY GRADED SAND WITH GRAVEL (SC), yellowish red mottled with dark brown, dense, moist, fine- to coarse-grained sand, 5-10% fine gravel | 30 | | | | 13 | | | |
| | | CLAYEY SAND WITH GRAVEL (SC), yellowish red mottled with grayish green, dense, moist, fine- to coarse-grained sand, 5-10% fine to coarse gravel | 37 | | | | | | | |
| 10 | 3 | Hard drilling from 9 feet to 11 feet | | | | | | | | |
| | | GRAVELLY CLAYEY SAND (SC), dark yellowish brown mottled with yellowish red, very dense, moist, fine- to coarse-grained sand and gravel | 58 | | | | | 8.3 | 124.5 | |
| | 4 | | | | | | | | | |
| 15 | | Hard drilling from 15 feet to 17 feet | | | | | | | | |
| | 5 | | | | | | | | | |
| | | No recovery at 17 feet. Gravel (fragments of cobble) | | | | | | | | |
| | | Bottom of boring at 18 feet below existing grade. Groundwater not encountered during drilling. | | | | | | | | |

# LOG OF BORING 1-BH8

ENGEO INCORPORATED

Geotechnical Exploration
San Sebastian
Morgan Hill, CA
9301.000.000

DATE DRILLED: 7/20/2011
HOLE DEPTH: Approx. 12½ ft.
HOLE DIAMETER: 8.0 in.
SURF ELEV: Approx. 419 ft.

LOGGED / REVIEWED BY: S. Johns / JAM
DRILLING CONTRACTOR: Britton Exploration
DRILLING METHOD: Hollow Stem Auger
HAMMER TYPE: 140 lb. Auto Trip

| Depth in Feet | Depth in Meters | Sample Type | DESCRIPTION | Log Symbol | Water Level | Blow Count/Foot | Atterberg Limits: Liquid Limit | Atterberg Limits: Plastic Limit | Atterberg Limits: Plasticity Index | Fines Content (% passing #200 sieve) | Moisture Content (% dry weight) | Dry Unit Weight (pcf) | Unconfined Strength (tsf) *field approx |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Topsoil | | | | | | | | | | |
| | | | SANDY CLAY (CL), yellowish brown, medium dense, dry, fine- to coarse-grained sand | | | 28 | | | | 60 | 9.5 | | |
| | | | Grades to gravelly clayey sand. Moist fine to coarse gravel. | | | | | | | | | | |
| | 1 | | CLAYEY SAND WITH GRAVEL (SC), light yellowish brown, dense, moist, fine- to coarse-grained sand and gravel | | | 29 | | | | | | | |
| 5 | | | | | | 63 | | | | | 7.3 | | |
| | 2 | | | | | 44 | | | | | | | |
| | | | Hard drilling | | | 85 | | | | 14 | 5.2 | | |
| | | | | | | 62 | | | | | | | |
| 10 | 3 | | Hard drilling | | | 72 | | | | | | | |
| | | | | | | 53 | | | | | | | |
| | | | Bottom of boring at 12.5 feet below existing grade. Groundwater not encountered during drilling. | | | | | | | | | | |

# LOG OF BORING 1-BH9

ENGEO INCORPORATED

Geotechnical Exploration
San Sebastian
Morgan Hill, CA
9301.000.000

DATE DRILLED: 7/20/2011
HOLE DEPTH: Approx. 39½ ft.
HOLE DIAMETER: 8.0 in.
SURF ELEV: Approx. 464 ft.

LOGGED / REVIEWED BY: S. Johns / JAM
DRILLING CONTRACTOR: Britton Exploration
DRILLING METHOD: Hollow Stem Auger
HAMMER TYPE: 140 lb. Auto Trip

| Depth in Feet | Depth in Meters | Sample Type | DESCRIPTION | Log Symbol | Water Level | Blow Count/Foot | Atterberg Limits: Liquid Limit | Atterberg Limits: Plastic Limit | Atterberg Limits: Plasticity Index | Fines Content (% passing #200 sieve) | Moisture Content (% dry weight) | Dry Unit Weight (pcf) | Unconfined Strength (tsf) *field approx |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Topsoil | | | | | | | | | | |
| | | NR | Hard drilling | | | 50 | | | | | | | |
| | 1 | | | | | | | | | | | | |
| 5 | | | CLAYEY SAND (SC), dark yellowish brown, medium dense, moist, fine- to coarse-grained sand. FILL | | | 21 | | | | | | | |
| | 2 | | | | | | | | | | | | |
| | 3 | | | | | | | | | | | | |
| 10 | | | GRAVELLY CLAYEY SAND (SC), yellowish red mottled with light yellowish brown, medium dense, moist, fine- to coarse-grained sand and gravel | | | 26 | | | | 20 | 9.7 | 98.7 | |
| | | | | | | 22 | | | | | | | |
| | 4 | | Hard drilling at 15 feet | | | | | | | | | | |
| 15 | | | | | | 88 | | | | | 14.8 | 105.6 | |
| | 5 | | Hard drilling from 16 feet to 18 feet | | | | | | | | | | |
| | 6 | | | | | | | | | | | | |
| 20 | | | CLAYEY SAND WITH GRAVEL (SC), light yellowish brown, very dense, moist | | | 84 | | | | | | | |
| | | | | | | 41 | | | | | | | |
| | 7 | | Hard drilling from 23 feet to 24 feet | | | | | | | | | | |
| 25 | | | | | | | | | | | | | |

# LOG OF BORING 1-BH9

ENGEO INCORPORATED

Geotechnical Exploration
San Sebastian
Morgan Hill, CA
9301.000.000

DATE DRILLED: 7/20/2011
HOLE DEPTH: Approx. 39½ ft.
HOLE DIAMETER: 8.0 in.
SURF ELEV: Approx. 464 ft.

LOGGED / REVIEWED BY: S. Johns / JAM
DRILLING CONTRACTOR: Britton Exploration
DRILLING METHOD: Hollow Stem Auger
HAMMER TYPE: 140 lb. Auto Trip

| Depth in Feet | Depth in Meters | Sample Type | DESCRIPTION | Log Symbol | Water Level | Blow Count/Foot | Atterberg Limits: Liquid Limit | Atterberg Limits: Plastic Limit | Atterberg Limits: Plasticity Index | Fines Content (% passing #200 sieve) | Moisture Content (% dry weight) | Dry Unit Weight (pcf) | Unconfined Strength (tsf) *field approx |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 8 | | GRAVELLY CLAYEY SAND (SC), light yellowish brown with grayish green, dense, moist, trace fine-grained sand and gravel (fmv) | | | 45 | | | | | | | |
| | | | | | | 41 | | | | | | | |
| 30 | 9 | | Greenish blue mottled with yellowish brown (fmv) | | | 38 | | | | | | | |
| | 10 | | | | | 22 | | | | | | | |
| 35 | 11 | | CLAYSTONE Vertical shear (Jsp) | | | | | | | | | | |
| | 12 | | | | | 20 | | | | | | | |
| | | | Bottom of boring at 39.5 feet below existing grade. Groundwater not encountered during drilling. | | | | | | | | | | |

LOG - GEOTECHNICAL 9301.000.000GINTLOGS.GPJ ENGEO INC.GDT 10/24/11

| ENGEO INCORPORATED | | TEST PIT LOGS |
|---|---|---|
| The Estates at San Sebastian<br>Morgan Hill, California<br>9301.000.000 | | Logged By: Matthew R. Harrell<br>Logged Date: July 19, 2011 |
| Test Pit Number | Depth (feet) | Description |
| 1-TP1 | 0 – 1.5 | Silty SAND with gravel, gray brown, dry, loose, trace cobbles |
| | 1.5 – 2.75 | Sandy GRAVEL, dark yellowish brown, moist, to damp, medium dense, gravel approximately 60% by volume, cobbles (8 to 12 inches) approximately 3% by volume. |
| | 2.75 – 4 | Silty SAND with gravel, yellowish brown, moist, medium dense, some cobbles. |
| | 4 - 5 | Sandy clayey GRAVEL, yellowish brown, moist, medium dense, cobbles (8 to 12 inches) approximately 5 to 10% by volume. |
| | | Bottom of test pit at 5 feet. No groundwater encountered. |
| 1-TP2 | 0 - 1 | Clayey SILT with sand, gray brown, dry, soft/loose, trace coarse gravel. |
| | 1 – 2.25 | Sandy CLAY/SILT, dark yellowish brown, damp to dry, medium stiff, massive – no pedogenic structure. |
| | 2.25 - 8 | Gravelly SAND with clay, dark yellowish brown, moist, medium dense, coarse gravels, trace cobbles, wet at 6 feet. |
| | | Bottom of test pit at 8 feet. No groundwater encountered. |
| 1-TP3 | 0 – 1.25 | Sandy SILT with gravel, grayish brown to yellowish brown, dry, loose/soft. |
| | 1.25 - 8 | Sandy GRAVEL with clay, dark yellowish brown, damp grading to moist, medium dense, trace cobbles (8 to 12 inches) approximately 3% by volume, coarse gravel (2 to 3 inches) approximately 50% by volume, grades to sandy gravel at approximately 6 feet, wet at 7 feet. |
| | | Bottom of test pit at 8 feet. No groundwater encountered. |

| Test Pit Number | Depth (feet) | Description |
|---|---|---|
| 1-TP4 | 0 – 1 | Sandy silty CLAY, dark grayish brown to dark yellowish brown, moist, soft/loose. |
| | 1 – 3 | Sandy SILT, dark yellowish brown, moist, medium stiff, trace gravel. |
| | 3 – 7 | Clayey SAND with gravel, dark yellowish brown, moist, medium dense, interbedded clean sand lenses, increased cobbles (3 to 12 inches) at 6 feet, very moist at 5 feet. |
| | | Bottom of test pit at 7 feet. No groundwater encountered. |
| 1-TP5 | 0 – 1 | Sandy silty CLAY, dark grayish brown to dark yellowish brown, dry, soft/loose, trace gravel and cobbles. |
| | 1 – 2 | Sandy SILT with clay, dark yellowish brown, moist, medium stiff. |
| | 2 – 7 | Clayey coarse SAND with gravel and cobbles, dark yellowish brown, moist, medium dense, cobbles (6 to 10 inches) approximately 5 to 10% by volume. |
| | | Bottom of test pit at 7 feet. No groundwater encountered. |
| 1-TP6 | 0 – 0.5 | Sandy silty CLAY, grayish brown, dry, soft/loose. |
| | 0.5 – 2 | Sandy clayey SILT, dark grayish brown to dark yellowish brown, moist, medium stiff. |
| | 2 – 3.5 | Sandy SILT with clay, dark yellowish brown, very moist, medium stiff. |
| | 3.5 – 7 | Gravelly SAND with clay, grayish brown to dark yellowish brown, moist to very moist, medium dense, some cobbles (3 to 10 inches), cobble layer (12 inches) at 6 feet. |
| | | Bottom of test pit at 7 feet. No groundwater encountered. |
| 1-TP7 | 0 – 0.5 | Sandy silty CLAY, grayish brown, dry, soft/loose. |
| | 0.5 – 2 | Sandy silty CLAY, brown to grayish brown, damp to moist, medium stiff. |
| | 2 – 4 | Clayey SAND with gravel, dark yellowish brown, moist, medium dense, trace cobbles (3 to 8 inches). |
| | 4 – 5.5 | Gravelly SAND with clay, dark yellowish brown, moist, medium dense, some cobbles (6 to 10 inches) approximately 10% by volume. |
| | | Bottom of test pit at 5.5 feet. No groundwater encountered. |

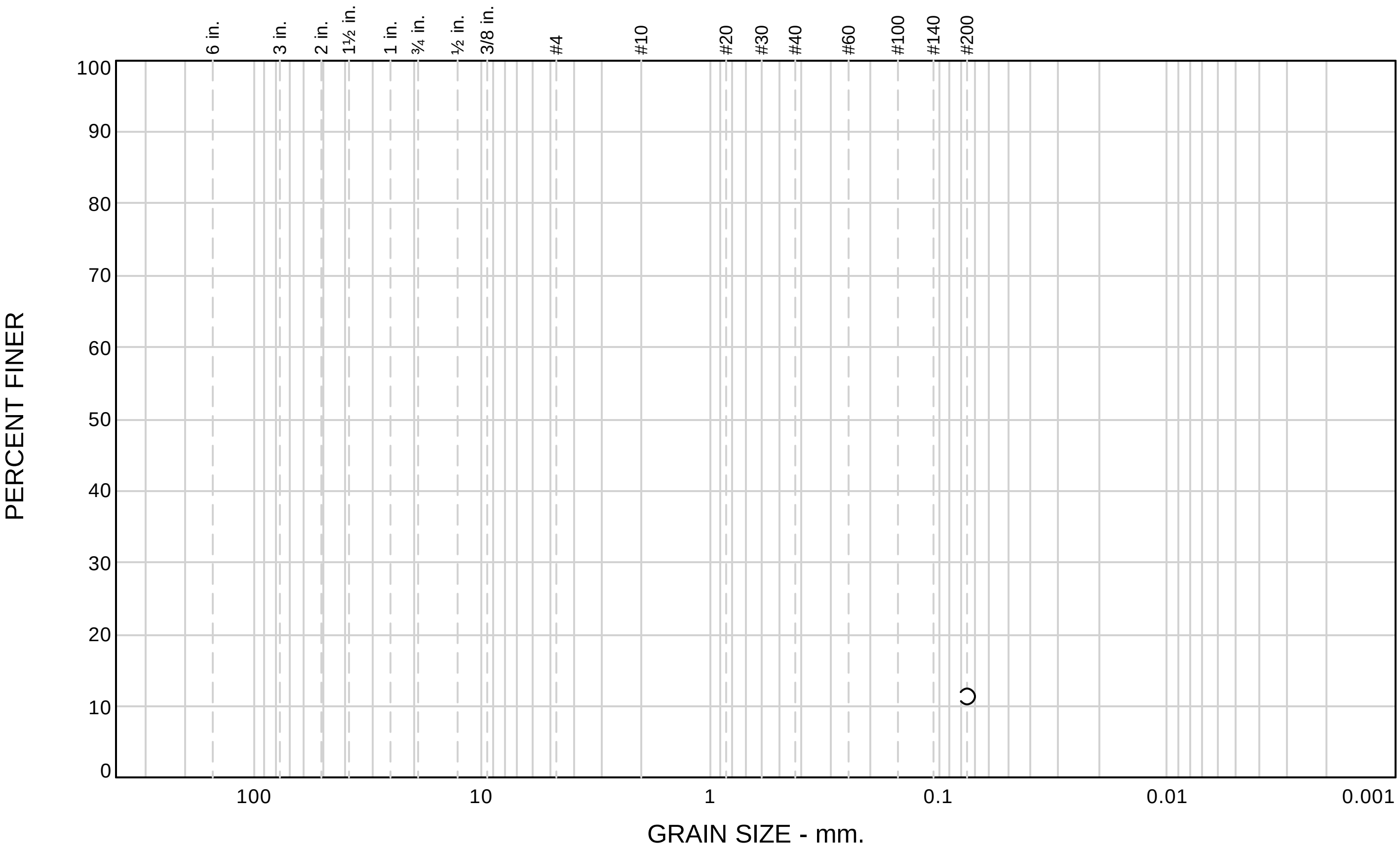
| Test Pit Number | Depth (feet) | Description |
|---|---|---|
| 1-TP8 | 0 – 0.75<br><br>0.75 – 4 | Sandy SILT/CLAY, dark yellowish brown, dry, soft/loose, trace gravel.<br><br>Clayey SAND with gravel, dark yellowish brown, damp to moist, medium dense, some cobbles (3 to 8 inches) at approximately 10 to 20% by volume.<br><br>Bottom of test pit at 4 feet.  No groundwater encountered. |
| 1-TP9 | 0 – 1.25<br><br>1.25 – 3.5 | Sandy SILT/CLAY, dark brown, dry, soft/loose.<br><br>Clayey SAND with gravel, dark yellowish brown, moist, medium dense, trace to some cobbles (3 to 8 inches).<br><br>Bottom of test pit at 3.5 feet.  No groundwater encountered. |
| 1-TP10 | 0 – 0.75<br><br>0.75 – 6 | Sandy silty CLAY, yellowish brown, dry, soft/loose, some gravels and cobbles.<br><br>Gravelly SAND with clay, yellowish brown, moist, medium dense, some cobbles (3 to 10 inches) approximately 10 to 20% by volume.<br><br>Bottom of test pit at 6 feet.  No groundwater encountered. |

## APPENDIX B

Laboratory Test Data

APPENDIX B

# Particle Size Distribution Report




| % Cobbles | % Gravel | | % Sand | | | % Fines | |
|---|---|---|---|---|---|---|---|
| | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| | | | | | | 11.4 | |

| SIEVE SIZE | PERCENT FINER | SPEC.* PERCENT | PASS? (X=NO) |
|---|---|---|---|
| #200 | 11.4 | | |

* (no specification provided)

**Soil Description**

See exploration logs.

**Atterberg Limits**

PL= LL= PI=

**Coefficients**

$D_{90}$= $D_{85}$= $D_{60}$=
$D_{50}$= $D_{30}$= $D_{15}$=
$D_{10}$= $C_u$= $C_c$=

**Classification**

USCS= AASHTO=

**Remarks**

**Sample Number:** 1-BH1 @ 5-5.5 **Depth:** 5-5.5 feet

**Date:** 08/17/11

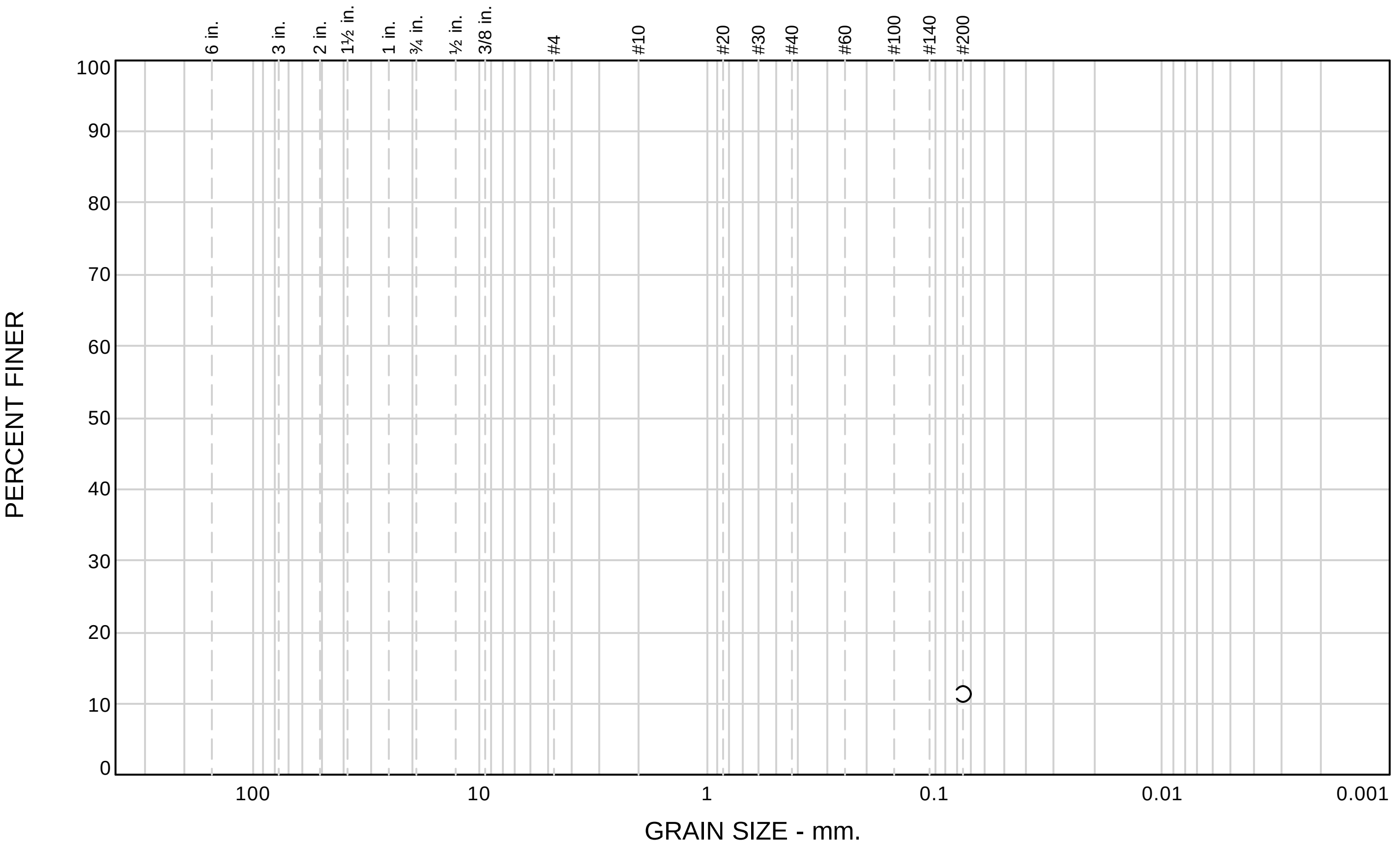
ENGEO INCORPORATED

**Client:** San Sebastian MH General Partnership
**Project:** San Sebastian - Morgan Hill, CA

**Project No:** 9301.000.000

**Tested By:** GC **Checked By:** DS

# Particle Size Distribution Report




| % Cobbles | % Gravel | | % Sand | | | % Fines | |
|---|---|---|---|---|---|---|---|
| | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| | | | | | | 11.4 | |

| SIEVE SIZE | PERCENT FINER | SPEC.* PERCENT | PASS? (X=NO) |
|---|---|---|---|
| #200 | 11.4 | | |

* (no specification provided)

**Soil Description**

See exploration logs.

**Atterberg Limits**

PL= LL= PI=

**Coefficients**

$D_{90}$= $D_{85}$= $D_{60}$=
$D_{50}$= $D_{30}$= $D_{15}$=
$D_{10}$= $C_u$= $C_c$=

**Classification**

USCS= AASHTO=

**Remarks**

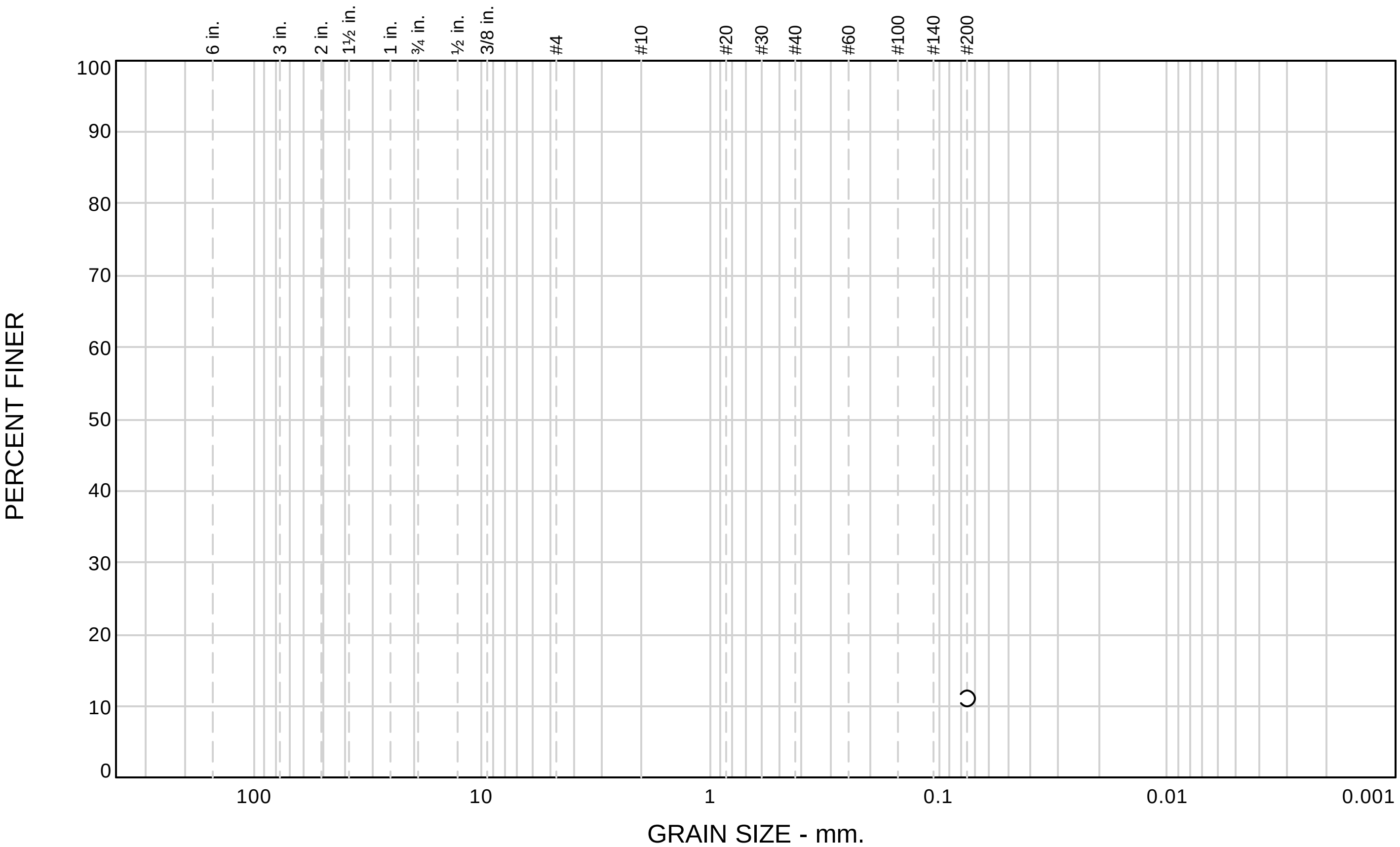
**Sample Number:** 1-BH1 @ 10-11.5 **Depth:** 10-11.5 feet **Date:** 08/17/11

ENGEO INCORPORATED

**Client:** San Sebastian MH General Partnership
**Project:** San Sebastian - Morgan Hill, CA
**Project No:** 9301.000.000

**Tested By:** GC **Checked By:** DS

# Particle Size Distribution Report




| % Cobbles | % Gravel | | % Sand | | | % Fines | |
|---|---|---|---|---|---|---|---|
| | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| | | | | | | 11.2 | |

| SIEVE SIZE | PERCENT FINER | SPEC.* PERCENT | PASS? (X=NO) |
|---|---|---|---|
| #200 | 11.2 | | |

* (no specification provided)

**Soil Description**

See exploration logs.

**Atterberg Limits**

PL= LL= PI=

**Coefficients**

$D_{90}$= $D_{85}$= $D_{60}$=
$D_{50}$= $D_{30}$= $D_{15}$=
$D_{10}$= $C_u$= $C_c$=

**Classification**

USCS= AASHTO=

**Remarks**

**Sample Number:** 1-BH1 @ 24.5-25 **Depth:** 24.5-25 feet

**Date:** 08/17/11

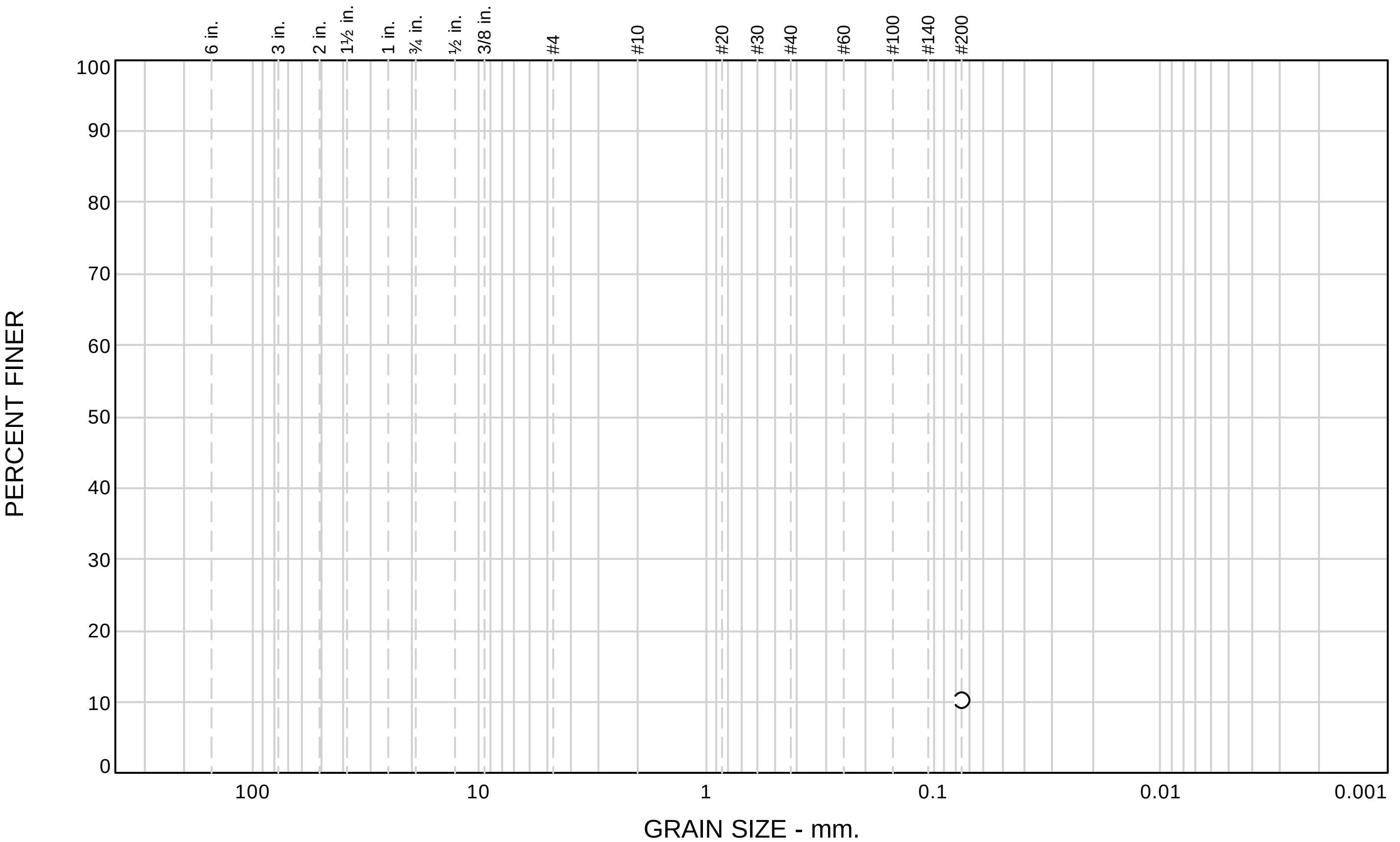
ENGEO INCORPORATED

**Client:** San Sebastian MH General Partnership
**Project:** San Sebastian - Morgan Hill, CA

**Project No:** 9301.000.000

**Tested By:** GC **Checked By:** DS

# Particle Size Distribution Report




| % Cobbles | % Gravel | | % Sand | | | % Fines | |
|---|---|---|---|---|---|---|---|
| | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| | | | | | | 10.2 | |

| SIEVE SIZE | PERCENT FINER | SPEC.* PERCENT | PASS? (X=NO) |
|---|---|---|---|
| #200 | 10.2 | | |

* (no specification provided)

**Soil Description**

See exploration logs.

**Atterberg Limits**

PL= LL= PI=

**Coefficients**

$D_{90}$= $D_{85}$= $D_{60}$=
$D_{50}$= $D_{30}$= $D_{15}$=
$D_{10}$= $C_u$= $C_c$=

**Classification**

USCS= AASHTO=

**Remarks**

**Sample Number:** 1-BH1 @ 30-30.5 **Depth:** 30-30.5 feet

**Date:** 08/17/11

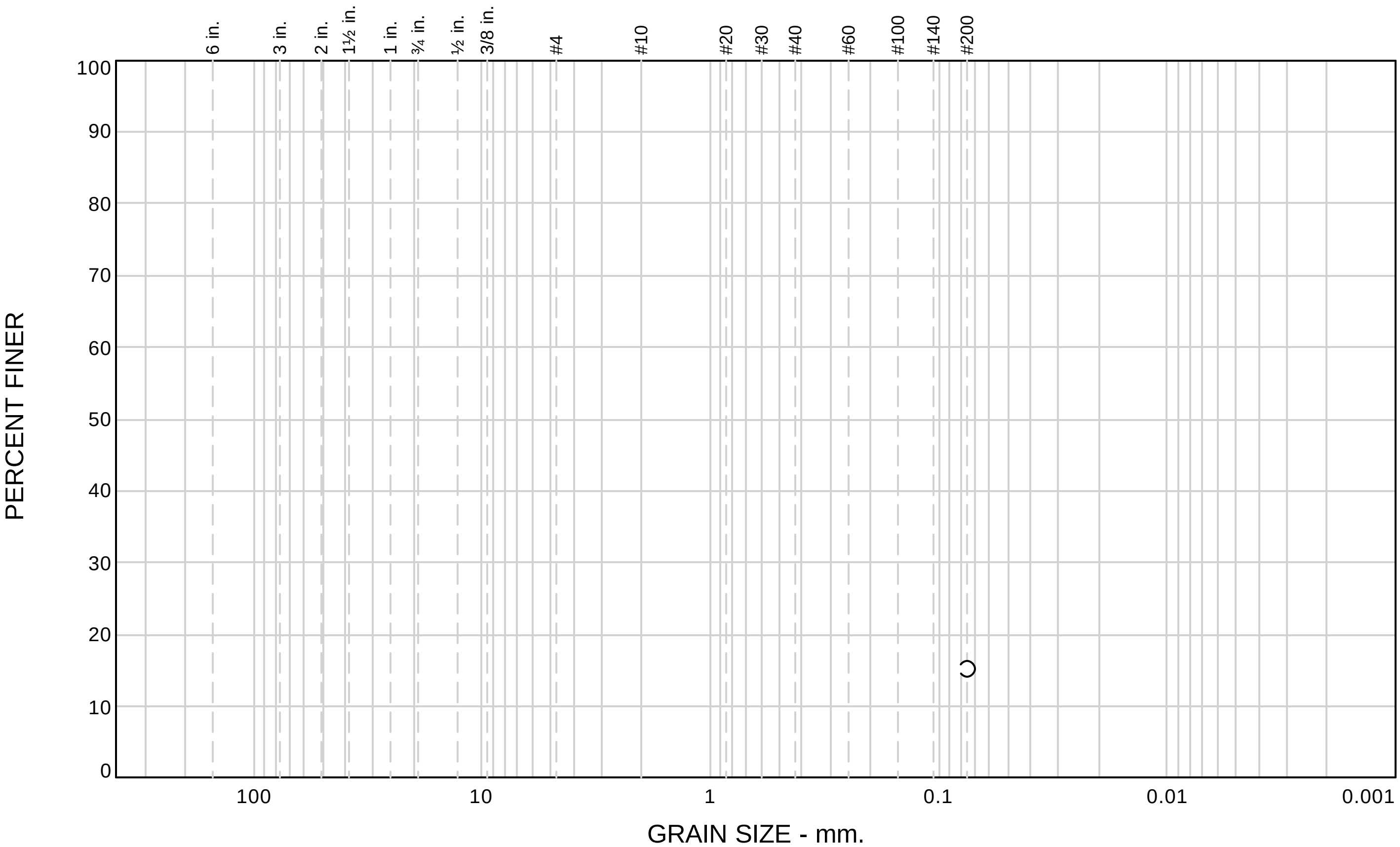
ENGEO INCORPORATED

**Client:** San Sebastian MH General Partnership
**Project:** San Sebastian - Morgan Hill, CA

**Project No:** 9301.000.000

**Tested By:** GC **Checked By:** DS

# Particle Size Distribution Report




| % Cobbles | % Gravel | | % Sand | | | % Fines | |
|---|---|---|---|---|---|---|---|
| | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| | | | | | | 15.2 | |

| SIEVE SIZE | PERCENT FINER | SPEC.* PERCENT | PASS? (X=NO) |
|---|---|---|---|
| #200 | 15.2 | | |

* (no specification provided)

**Soil Description**

See exploration logs.

**Atterberg Limits**

PL= LL= PI=

**Coefficients**

$D_{90}$= $D_{85}$= $D_{60}$=
$D_{50}$= $D_{30}$= $D_{15}$=
$D_{10}$= $C_u$= $C_c$=

**Classification**

USCS= AASHTO=

**Remarks**

**Sample Number:** 1-BH1 @ 35-36.5 **Depth:** 35-36.5 feet

**Date:** 08/17/11

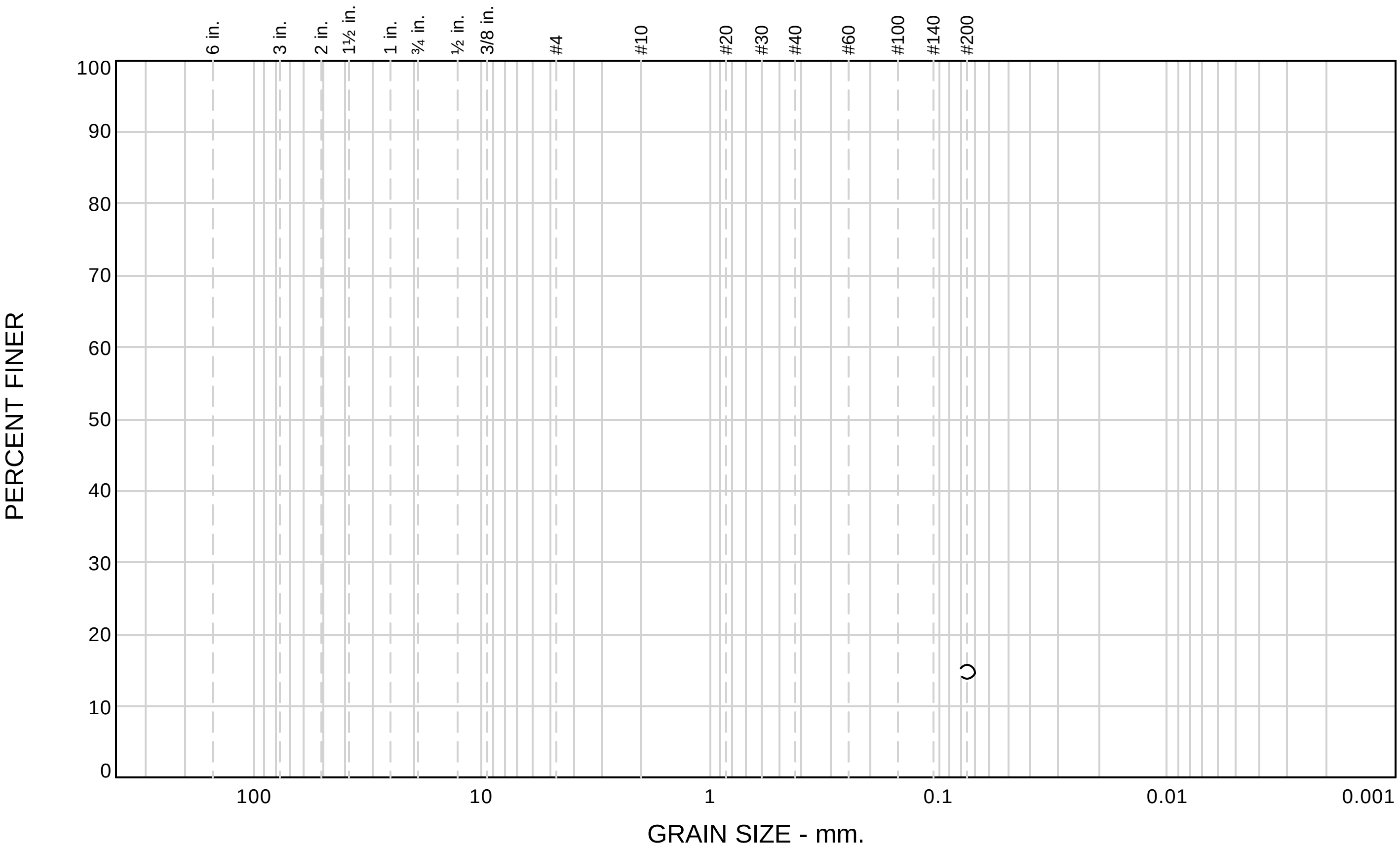
ENGEO INCORPORATED

**Client:** San Sebastian MH General Partnership
**Project:** San Sebastian - Morgan Hill, CA

**Project No:** 9301.000.000

**Tested By:** GC **Checked By:** DS

# Particle Size Distribution Report




| % Cobbles | % Gravel | | % Sand | | | % Fines | |
|---|---|---|---|---|---|---|---|
| | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| | | | | | | 14.8 | |

| SIEVE SIZE | PERCENT FINER | SPEC.* PERCENT | PASS? (X=NO) |
|---|---|---|---|
| #200 | 14.8 | | |

* (no specification provided)

**Soil Description**

See exploration logs.

**Atterberg Limits**

PL= LL= PI=

**Coefficients**

$D_{90}$= $D_{85}$= $D_{60}$=
$D_{50}$= $D_{30}$= $D_{15}$=
$D_{10}$= $C_u$= $C_c$=

**Classification**

USCS= AASHTO=

**Remarks**

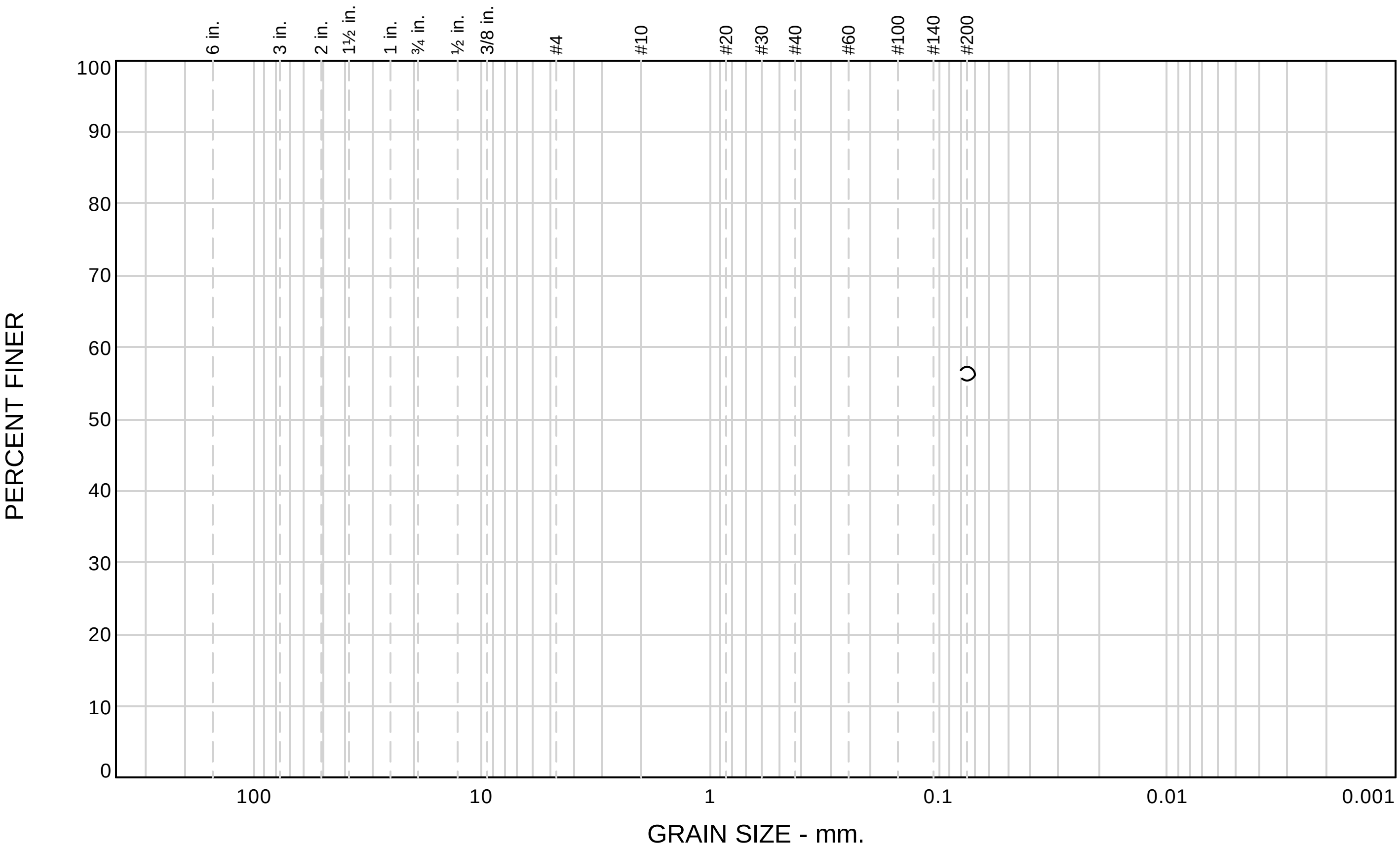
**Sample Number:** 1-BH1 @ 45.5-46 **Depth:** 45.5-46 feet **Date:** 08/17/11

ENGEO INCORPORATED

**Client:** San Sebastian MH General Partnership
**Project:** San Sebastian - Morgan Hill, CA
**Project No:** 9301.000.000

**Tested By:** GC **Checked By:** DS

# Particle Size Distribution Report




| % Cobbles | % Gravel | | % Sand | | | % Fines | |
|---|---|---|---|---|---|---|---|
| | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| | | | | | | 56.3 | |

| SIEVE SIZE | PERCENT FINER | SPEC.* PERCENT | PASS? (X=NO) |
|---|---|---|---|
| #200 | 56.3 | | |

* (no specification provided)

**Soil Description**

See exploration logs.

**Atterberg Limits**

PL= LL= PI=

**Coefficients**

$D_{90}$= $D_{85}$= $D_{60}$=
$D_{50}$= $D_{30}$= $D_{15}$=
$D_{10}$= $C_u$= $C_c$=

**Classification**

USCS= AASHTO=

**Remarks**

**Sample Number:** 1-BH2 @ 2.5-3 **Depth:** 2.5-3 feet

**Date:** 08/17/11

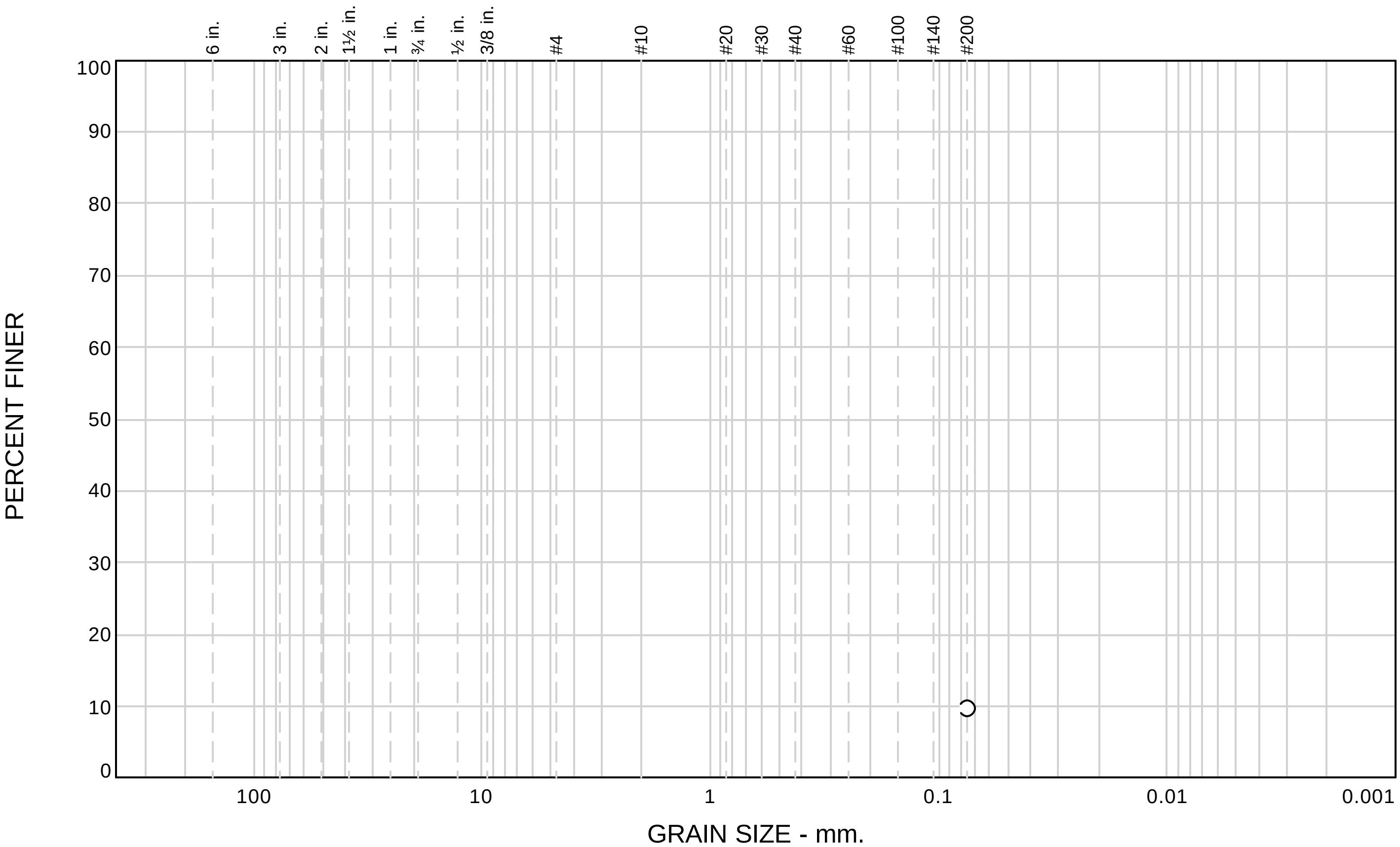
ENGEO INCORPORATED

**Client:** San Sebastian MH General Partnership
**Project:** San Sebastian - Morgan Hill, CA

**Project No:** 9301.000.000

**Tested By:** GC **Checked By:** DS

# Particle Size Distribution Report




| % Cobbles | % Gravel | | % Sand | | | % Fines | |
|---|---|---|---|---|---|---|---|
| | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| | | | | | | 9.7 | |

| SIEVE SIZE | PERCENT FINER | SPEC.* PERCENT | PASS? (X=NO) |
|---|---|---|---|
| #200 | 9.7 | | |

* (no specification provided)

**Soil Description**

See exploration logs.

**Atterberg Limits**

PL= LL= PI=

**Coefficients**

$D_{90}$= $D_{85}$= $D_{60}$=
$D_{50}$= $D_{30}$= $D_{15}$=
$D_{10}$= $C_u$= $C_c$=

**Classification**

USCS= AASHTO=

**Remarks**

**Sample Number:** 1-BH2 @ 13-14.5 **Depth:** 13-14.5 feet

**Date:** 08/17/11

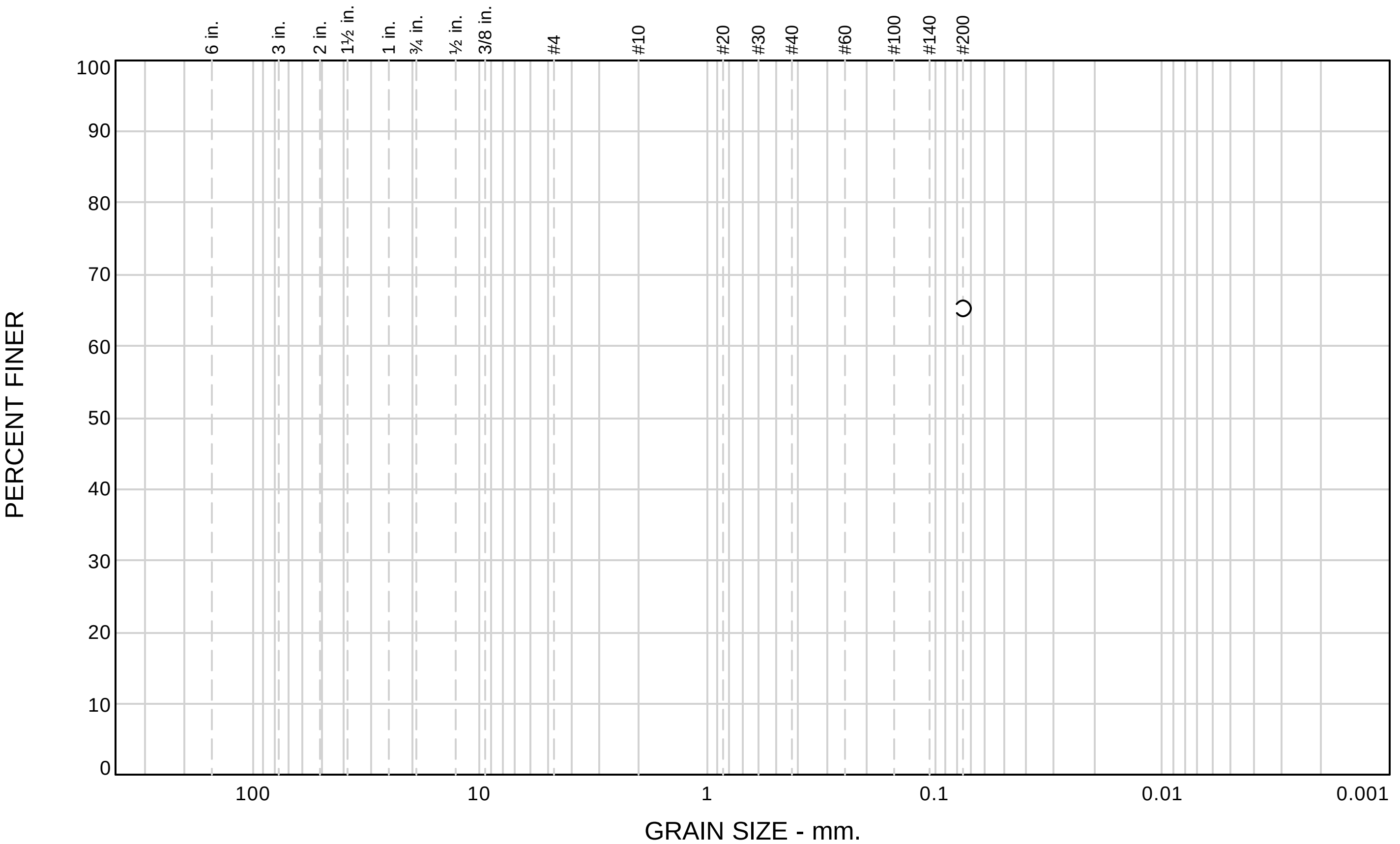
ENGEO INCORPORATED

**Client:** San Sebastian MH General Partnership
**Project:** San Sebastian - Morgan Hill, CA

**Project No:** 9301.000.000

**Tested By:** GC **Checked By:** DS

# Particle Size Distribution Report




| % Cobbles | % Gravel | | % Sand | | | % Fines | |
|---|---|---|---|---|---|---|---|
| | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| | | | | | | 65.3 | |

| SIEVE SIZE | PERCENT FINER | SPEC.* PERCENT | PASS? (X=NO) |
|---|---|---|---|
| #200 | 65.3 | | |

* (no specification provided)

**Soil Description**

See exploration logs.

**Atterberg Limits**

PL= LL= PI=

**Coefficients**

$D_{90}$= $D_{85}$= $D_{60}$=
$D_{50}$= $D_{30}$= $D_{15}$=
$D_{10}$= $C_u$= $C_c$=

**Classification**

USCS= AASHTO=

**Remarks**

**Sample Number:** 1-BH2 @ 38.5-39 **Depth:** 38.5-39 feet

**Date:** 08/17/11

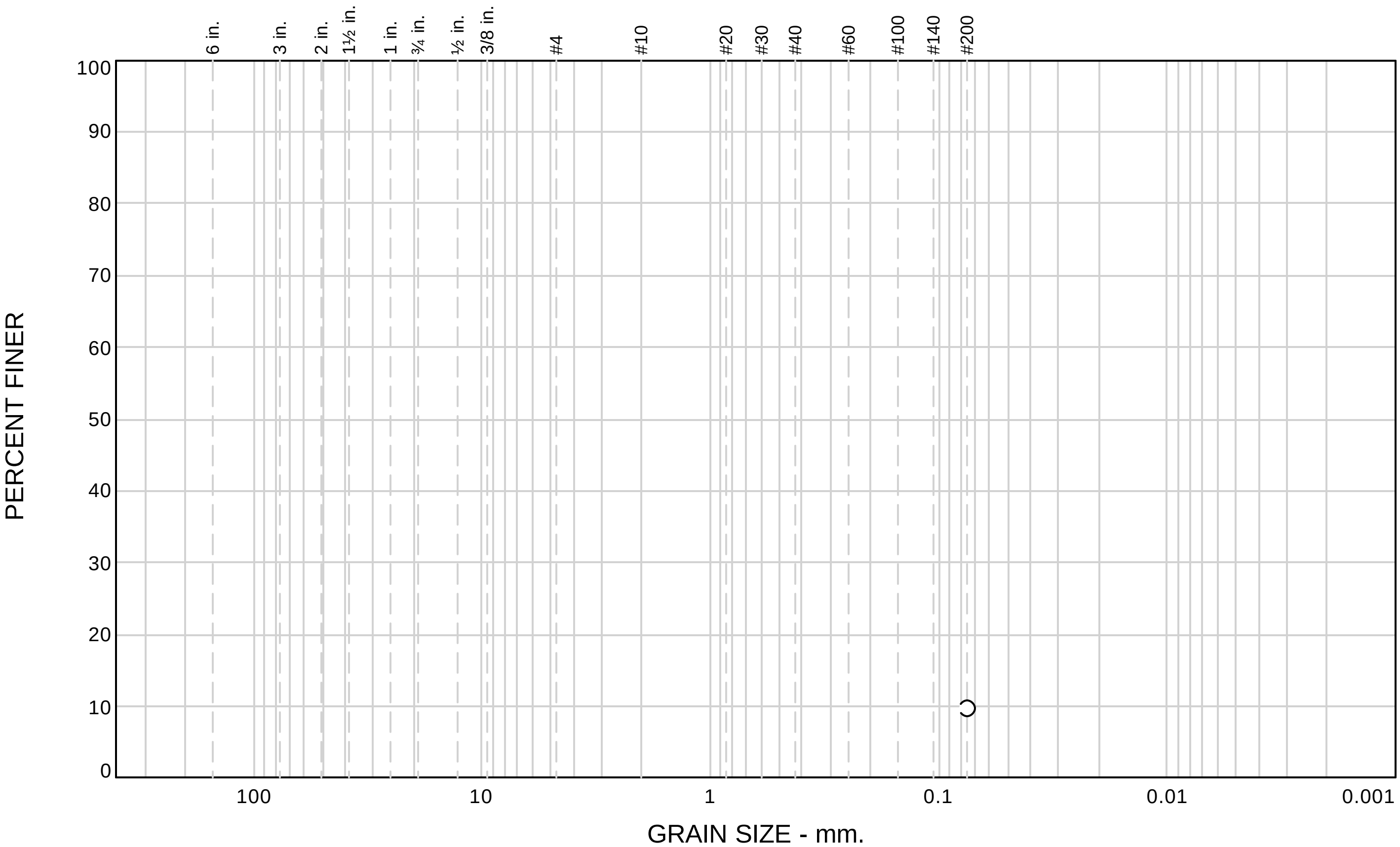
ENGEO INCORPORATED

**Client:** San Sebastian MH General Partnership
**Project:** San Sebastian - Morgan Hill, CA

**Project No:** 9301.000.000

**Tested By:** GC **Checked By:** DS

# Particle Size Distribution Report




| % Cobbles | % Gravel | | % Sand | | | % Fines | |
|---|---|---|---|---|---|---|---|
| | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| | | | | | | 9.8 | |

| SIEVE SIZE | PERCENT FINER | SPEC.* PERCENT | PASS? (X=NO) |
|---|---|---|---|
| #200 | 9.8 | | |

* (no specification provided)

**Soil Description**

See exploration logs.

**Atterberg Limits**

PL= LL= PI=

**Coefficients**

$D_{90}$= $D_{85}$= $D_{60}$=
$D_{50}$= $D_{30}$= $D_{15}$=
$D_{10}$= $C_u$= $C_c$=

**Classification**

USCS= AASHTO=

**Remarks**

**Sample Number:** 1-BH2 @ 45-46.5 **Depth:** 45-46.5 feet **Date:** 08/17/11

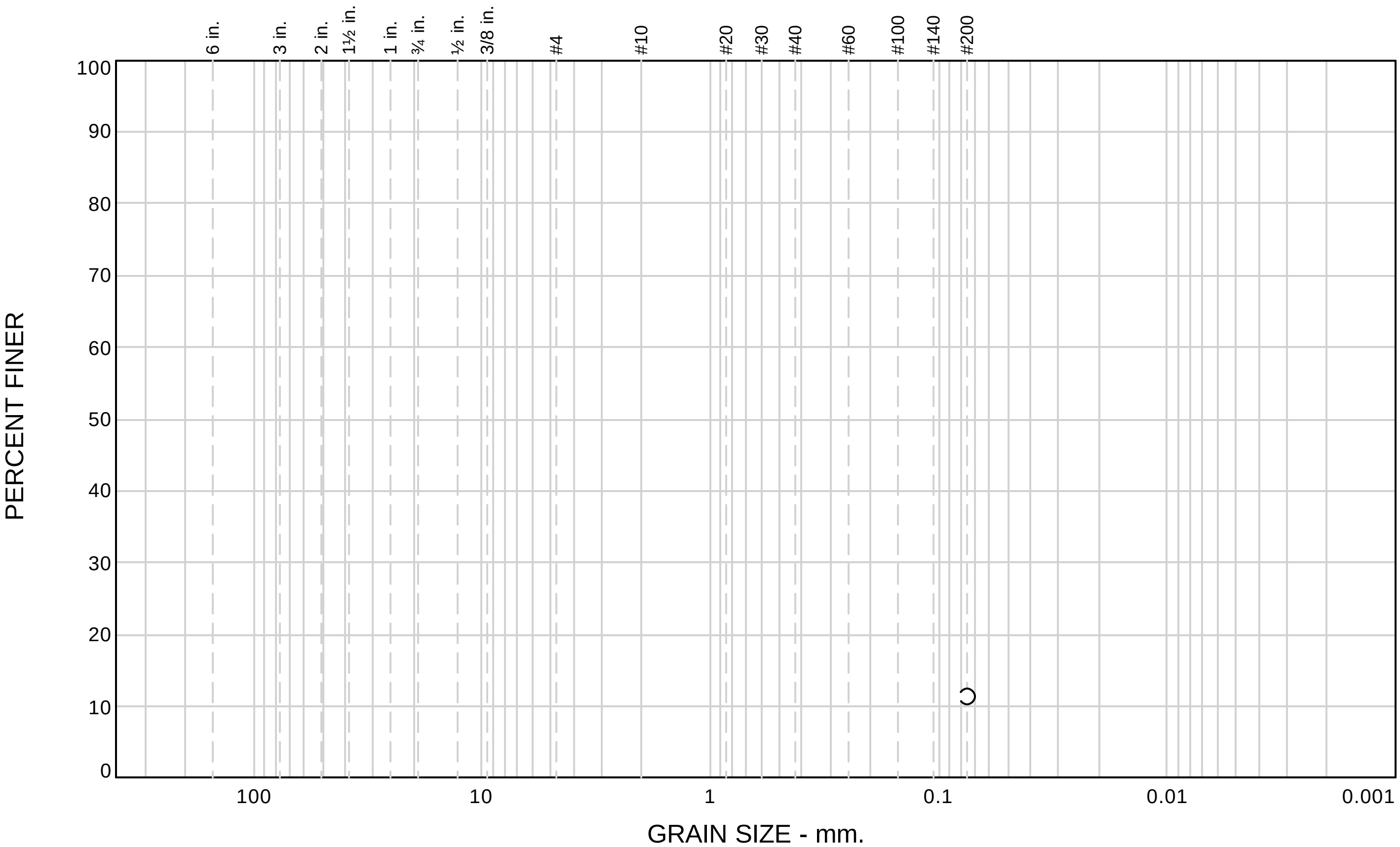
ENGEO INCORPORATED

**Client:** San Sebastian MH General Partnership
**Project:** San Sebastian - Morgan Hill, CA

**Project No:** 9301.000.000

**Tested By:** GC **Checked By:** DS

# Particle Size Distribution Report




| % Cobbles | % Gravel | | % Sand | | | % Fines | |
|---|---|---|---|---|---|---|---|
| | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| | | | | | | 11.4 | |

| SIEVE SIZE | PERCENT FINER | SPEC.* PERCENT | PASS? (X=NO) |
|---|---|---|---|
| #200 | 11.4 | | |

* (no specification provided)

**Soil Description**

See exploration logs.

**Atterberg Limits**

PL= LL= PI=

**Coefficients**

$D_{90}$= $D_{85}$= $D_{60}$=
$D_{50}$= $D_{30}$= $D_{15}$=
$D_{10}$= $C_u$= $C_c$=

**Classification**

USCS= AASHTO=

**Remarks**

**Sample Number:** 1-BH3 @ 2.5-3 **Depth:** 2.5-3 feet

**Date:** 08/17/11

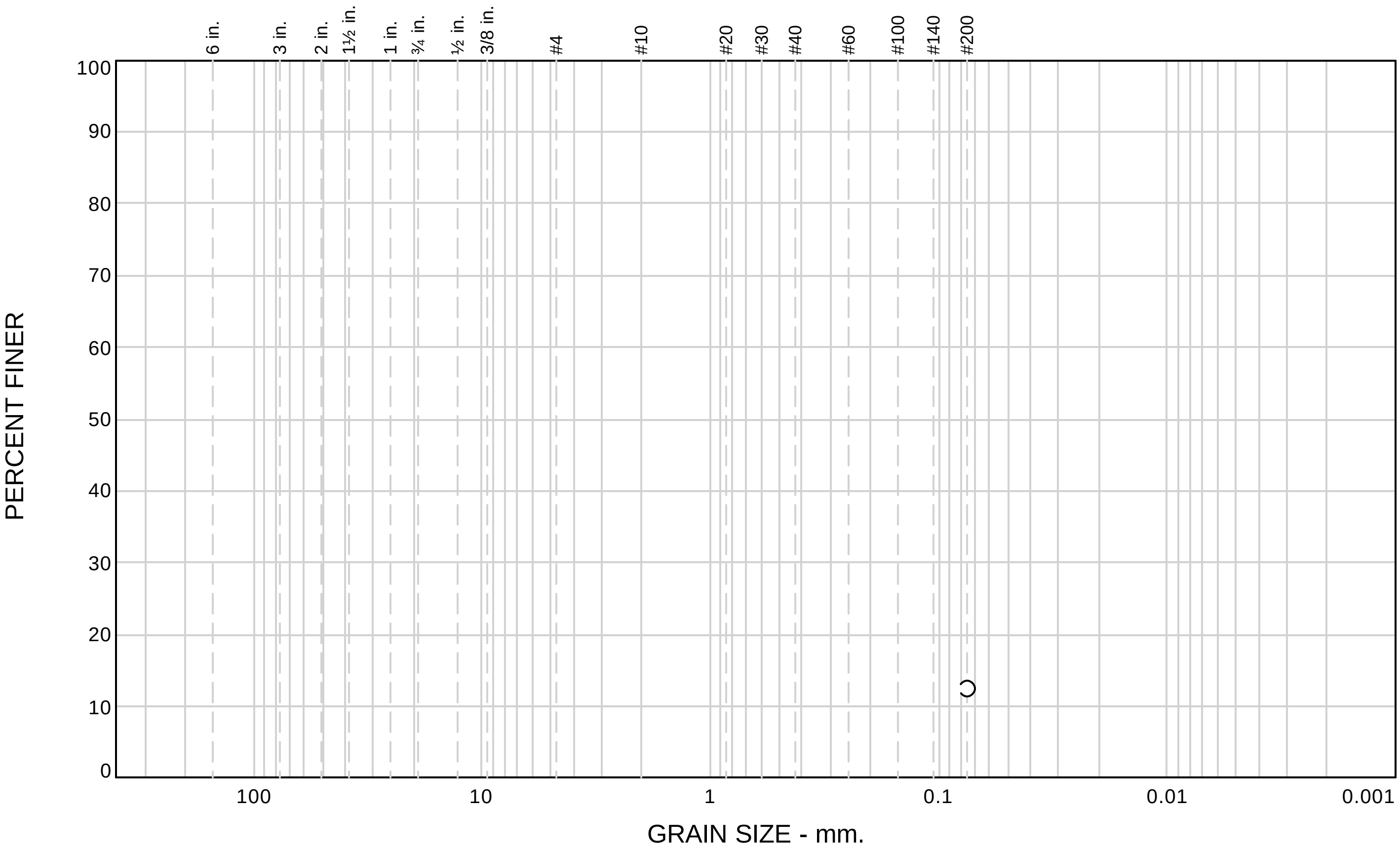
ENGEO INCORPORATED

**Client:** San Sebastian MH General Partnership
**Project:** San Sebastian - Morgan Hill, CA

**Project No:** 9301.000.000

**Tested By:** GC **Checked By:** DS

# Particle Size Distribution Report




| % Cobbles | % Gravel | | % Sand | | | % Fines | |
|---|---|---|---|---|---|---|---|
| | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| | | | | | | 12.4 | |

| SIEVE SIZE | PERCENT FINER | SPEC.* PERCENT | PASS? (X=NO) |
|---|---|---|---|
| #200 | 12.4 | | |

* (no specification provided)

**Soil Description**

See exploration logs.

**Atterberg Limits**

PL= LL= PI=

**Coefficients**

$D_{90}$= $D_{85}$= $D_{60}$=
$D_{50}$= $D_{30}$= $D_{15}$=
$D_{10}$= $C_u$= $C_c$=

**Classification**

USCS= AASHTO=

**Remarks**

**Sample Number:** 1-BH4 @ 9-9.5 **Depth:** 9-9.5 feet

**Date:** 08/17/11

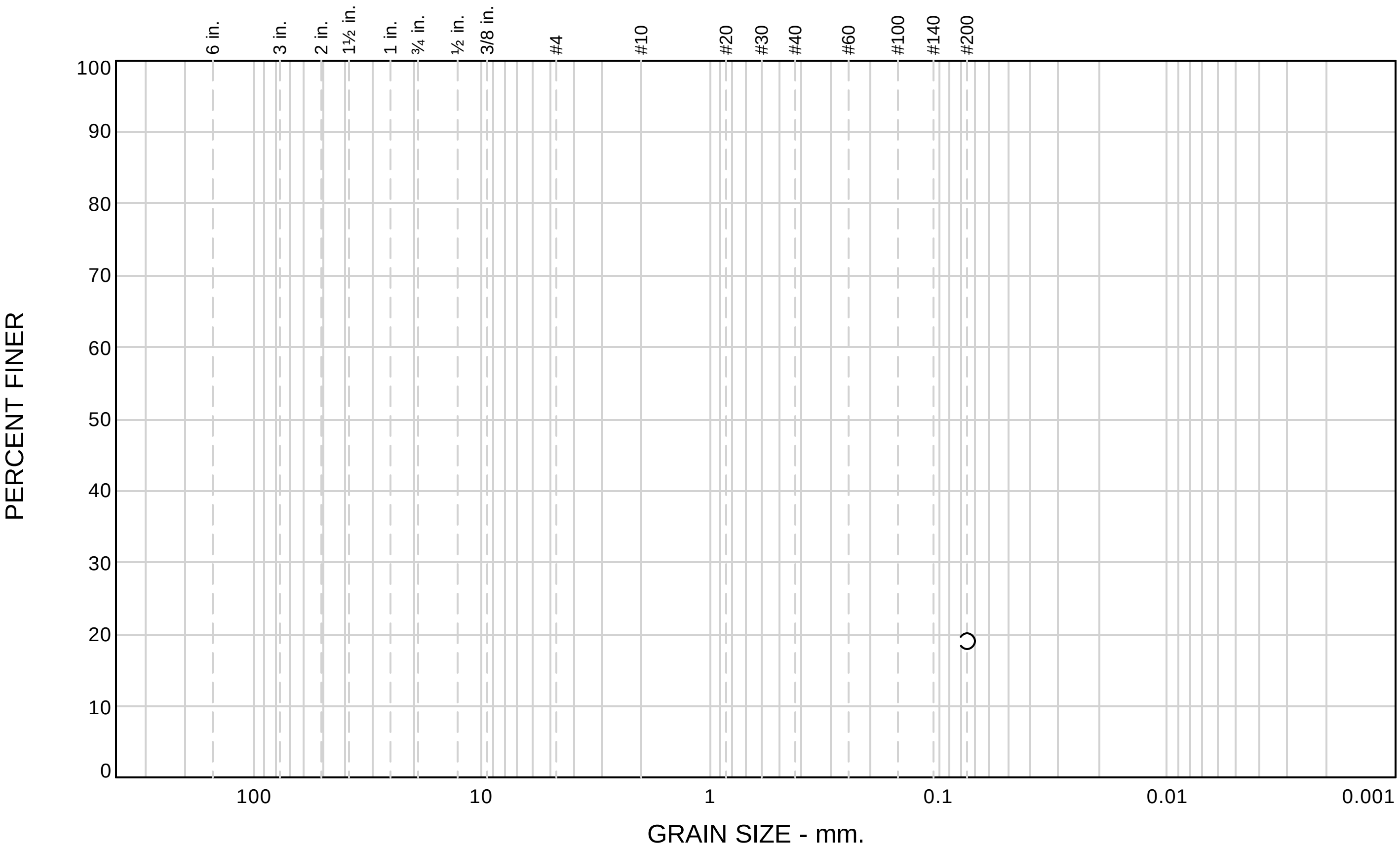
ENGEO INCORPORATED

**Client:** San Sebastian MH General Partnership
**Project:** San Sebastian - Morgan Hill, CA

**Project No:** 9301.000.000

**Tested By:** GC **Checked By:** DS

# Particle Size Distribution Report




| % Cobbles | % Gravel | | % Sand | | | % Fines | |
|---|---|---|---|---|---|---|---|
| | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| | | | | | | 19.2 | |

| SIEVE SIZE | PERCENT FINER | SPEC.* PERCENT | PASS? (X=NO) |
|---|---|---|---|
| #200 | 19.2 | | |

* (no specification provided)

**Soil Description**

See exploration logs.

**Atterberg Limits**

PL= LL= PI=

**Coefficients**

$D_{90}$= $D_{85}$= $D_{60}$=
$D_{50}$= $D_{30}$= $D_{15}$=
$D_{10}$= $C_u$= $C_c$=

**Classification**

USCS= AASHTO=

**Remarks**

**Sample Number:** 1-BH5 @ 2-2.5 **Depth:** 2-2.5 feet

**Date:** 08/17/11

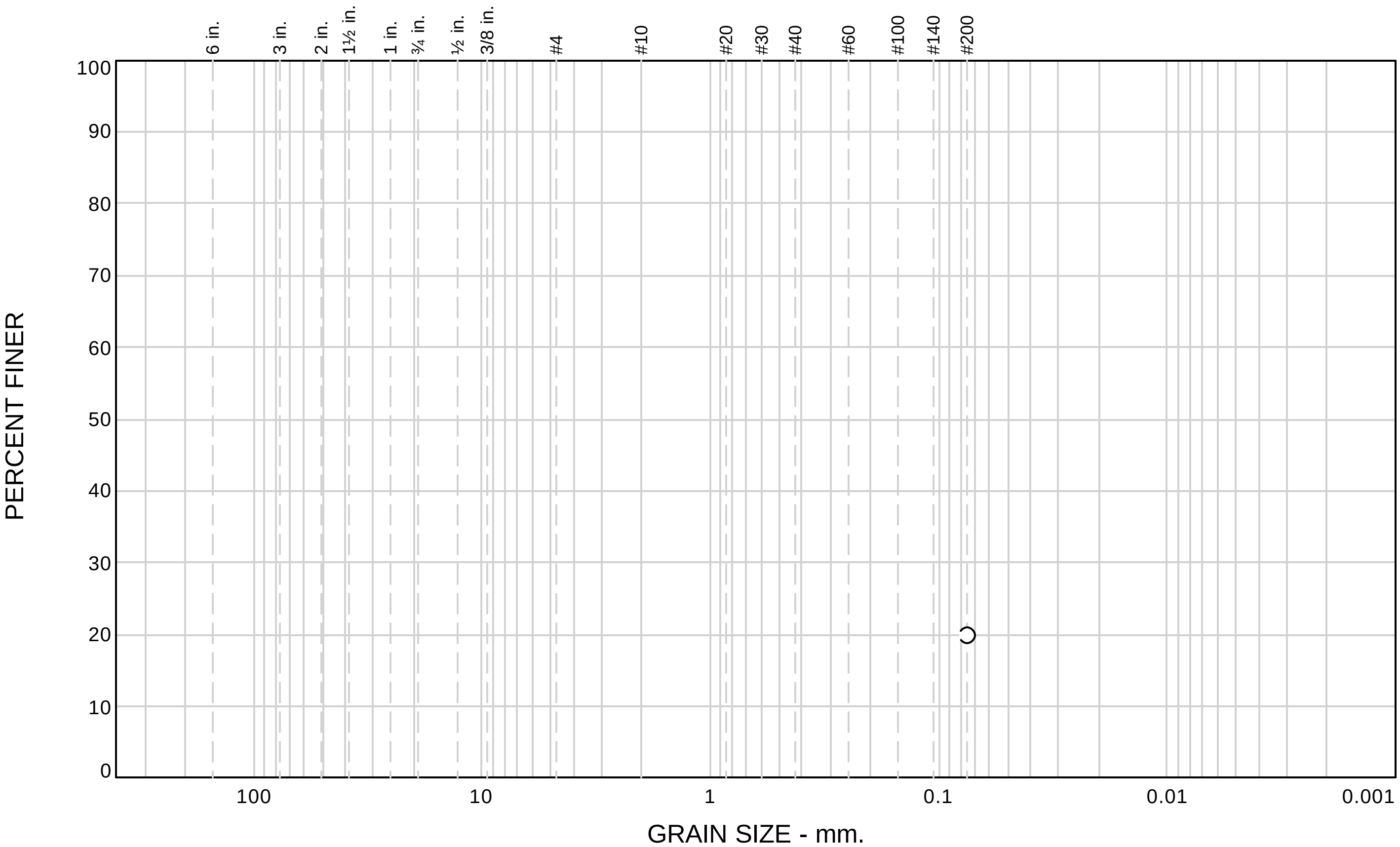
ENGEO INCORPORATED

**Client:** San Sebastian MH General Partnership
**Project:** San Sebastian - Morgan Hill, CA

**Project No:** 9301.000.000

**Tested By:** GC **Checked By:** DS

# Particle Size Distribution Report




| % Cobbles | % Gravel | | % Sand | | | % Fines | |
|---|---|---|---|---|---|---|---|
| | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| | | | | | | 19.8 | |

| SIEVE SIZE | PERCENT FINER | SPEC.* PERCENT | PASS? (X=NO) |
|---|---|---|---|
| #200 | 19.8 | | |

* (no specification provided)

**Soil Description**

See exploration logs.

**Atterberg Limits**

PL= LL= PI=

**Coefficients**

$D_{90}$= $D_{85}$= $D_{60}$=
$D_{50}$= $D_{30}$= $D_{15}$=
$D_{10}$= $C_u$= $C_c$=

**Classification**

USCS= AASHTO=

**Remarks**

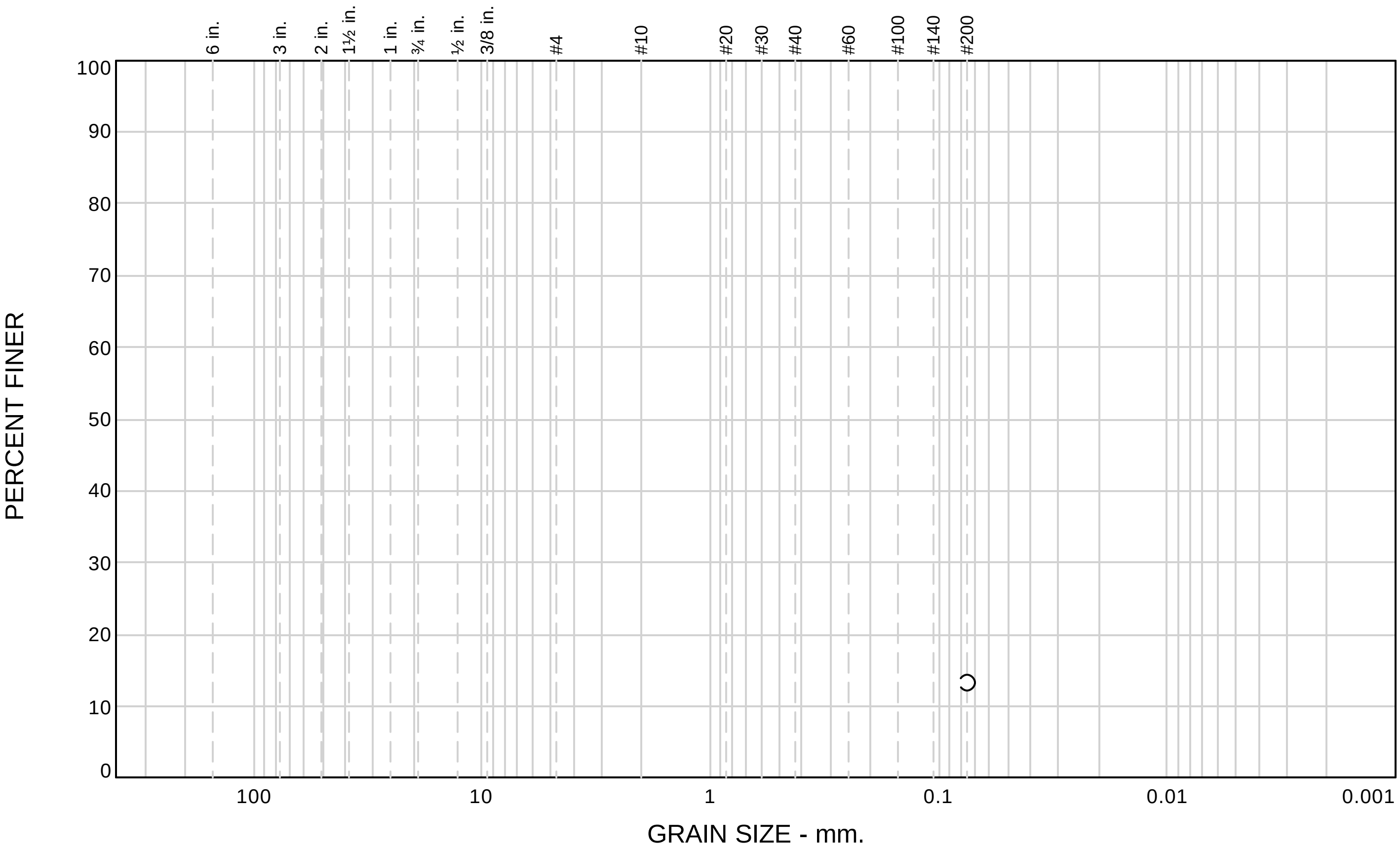
**Sample Number:** 1-BH6 @ 3-3.5 **Depth:** 3-3.5 feet **Date:** 08/17/11

ENGEO INCORPORATED

**Client:** San Sebastian MH General Partnership
**Project:** San Sebastian - Morgan Hill, CA
**Project No:** 9301.000.000

**Tested By:** GC **Checked By:** DS

# Particle Size Distribution Report




| % Cobbles | % Gravel | | % Sand | | | % Fines | |
|---|---|---|---|---|---|---|---|
| | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| | | | | | | 13.3 | |

| SIEVE SIZE | PERCENT FINER | SPEC.* PERCENT | PASS? (X=NO) |
|---|---|---|---|
| #200 | 13.3 | | |

* (no specification provided)

**Soil Description**

See exploration logs.

**Atterberg Limits**

PL= LL= PI=

**Coefficients**

$D_{90}$= $D_{85}$= $D_{60}$=
$D_{50}$= $D_{30}$= $D_{15}$=
$D_{10}$= $C_u$= $C_c$=

**Classification**

USCS= AASHTO=

**Remarks**

**Sample Number:** 1-BH7 @ 7.5-9 **Depth:** 7.5-9 feet

**Date:** 08/17/11

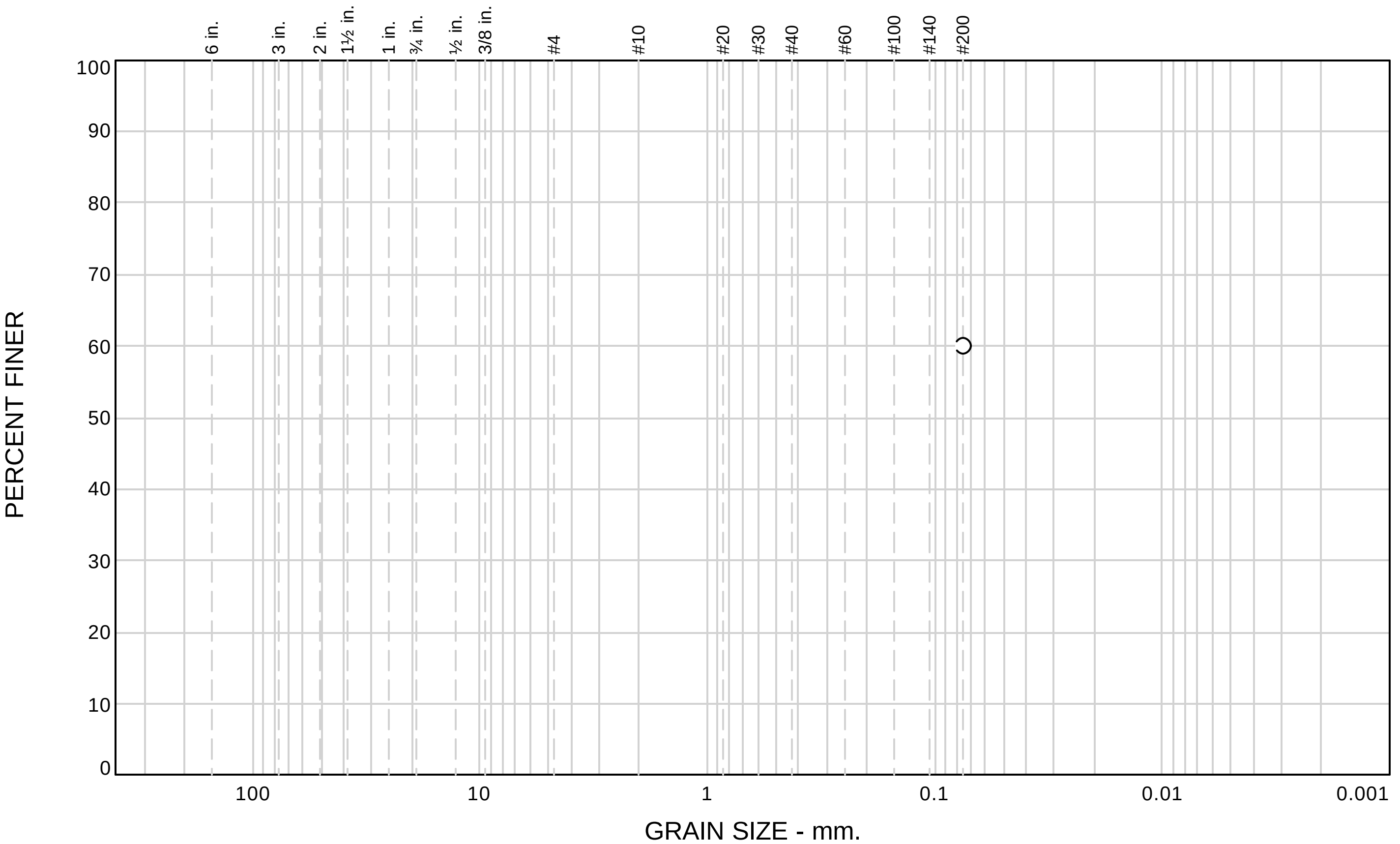
ENGEO INCORPORATED

**Client:** San Sebastian MH General Partnership
**Project:** San Sebastian - Morgan Hill, CA

**Project No:** 9301.000.000

**Tested By:** GC **Checked By:** DS

# Particle Size Distribution Report




| % Cobbles | % Gravel | | % Sand | | | % Fines | |
|---|---|---|---|---|---|---|---|
| | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| | | | | | | 60.1 | |

| SIEVE SIZE | PERCENT FINER | SPEC.* PERCENT | PASS? (X=NO) |
|---|---|---|---|
| #200 | 60.1 | | |

* (no specification provided)

**Soil Description**

See exploration logs.

**Atterberg Limits**

PL= LL= PI=

**Coefficients**

$D_{90}$= $D_{85}$= $D_{60}$=
$D_{50}$= $D_{30}$= $D_{15}$=
$D_{10}$= $C_u$= $C_c$=

**Classification**

USCS= AASHTO=

**Remarks**

**Sample Number:** 1-BH8 @ 2-2.5 **Depth:** 2-2.5 feet **Date:** 08/17/11

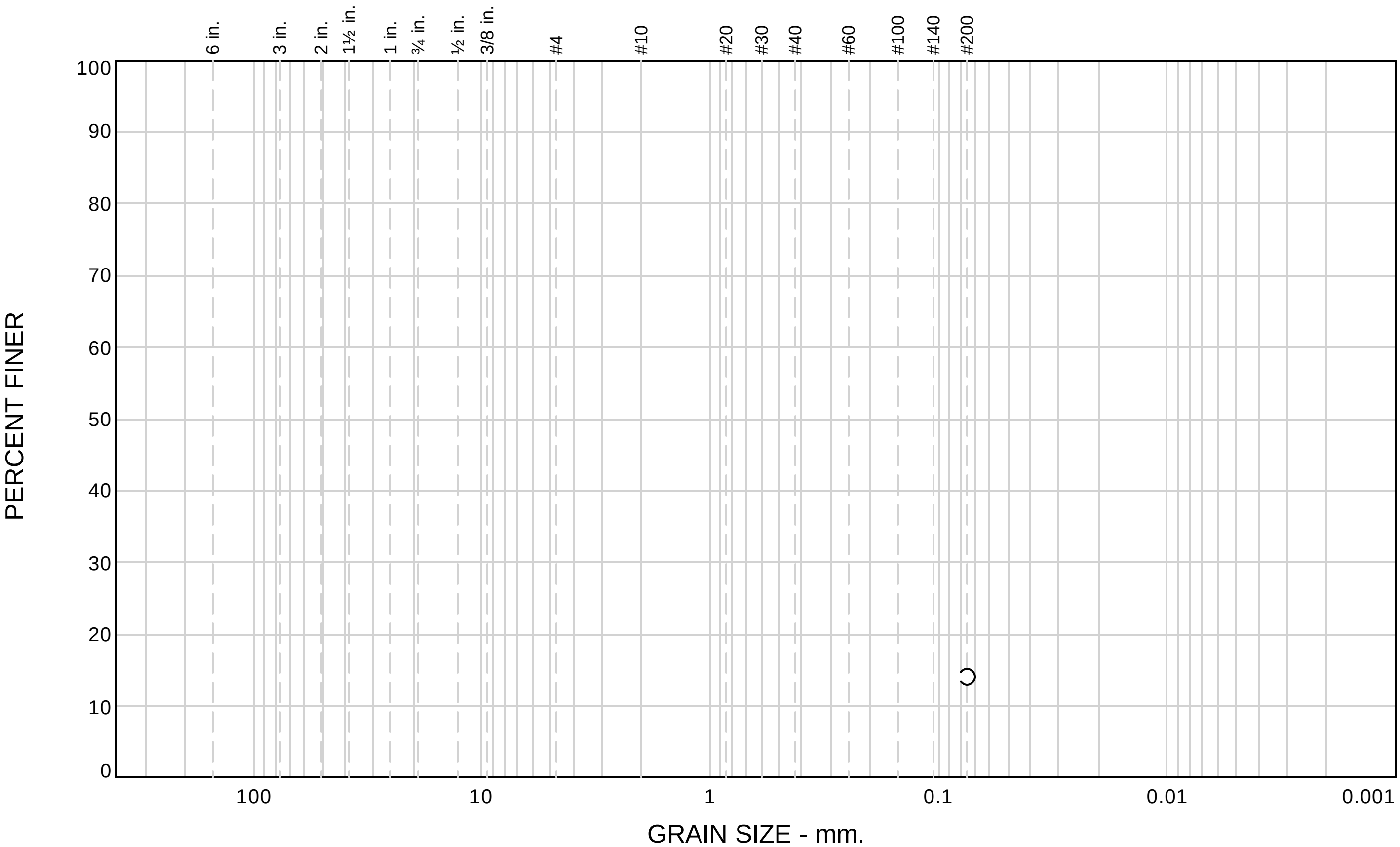
ENGEO INCORPORATED

**Client:** San Sebastian MH General Partnership
**Project:** San Sebastian - Morgan Hill, CA

**Project No:** 9301.000.000

**Tested By:** GC **Checked By:** DS

# Particle Size Distribution Report




| % Cobbles | % Gravel | | % Sand | | | % Fines | |
|---|---|---|---|---|---|---|---|
| | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| | | | | | | 14.2 | |

| SIEVE SIZE | PERCENT FINER | SPEC.* PERCENT | PASS? (X=NO) |
|---|---|---|---|
| #200 | 14.2 | | |

* (no specification provided)

**Soil Description**

See exploration logs.

**Atterberg Limits**

PL= LL= PI=

**Coefficients**

$D_{90}$= $D_{85}$= $D_{60}$=
$D_{50}$= $D_{30}$= $D_{15}$=
$D_{10}$= $C_u$= $C_c$=

**Classification**

USCS= AASHTO=

**Remarks**

**Sample Number:** 1-BH8 @ 10.5-11 **Depth:** 10.5-11 feet **Date:** 08/17/11

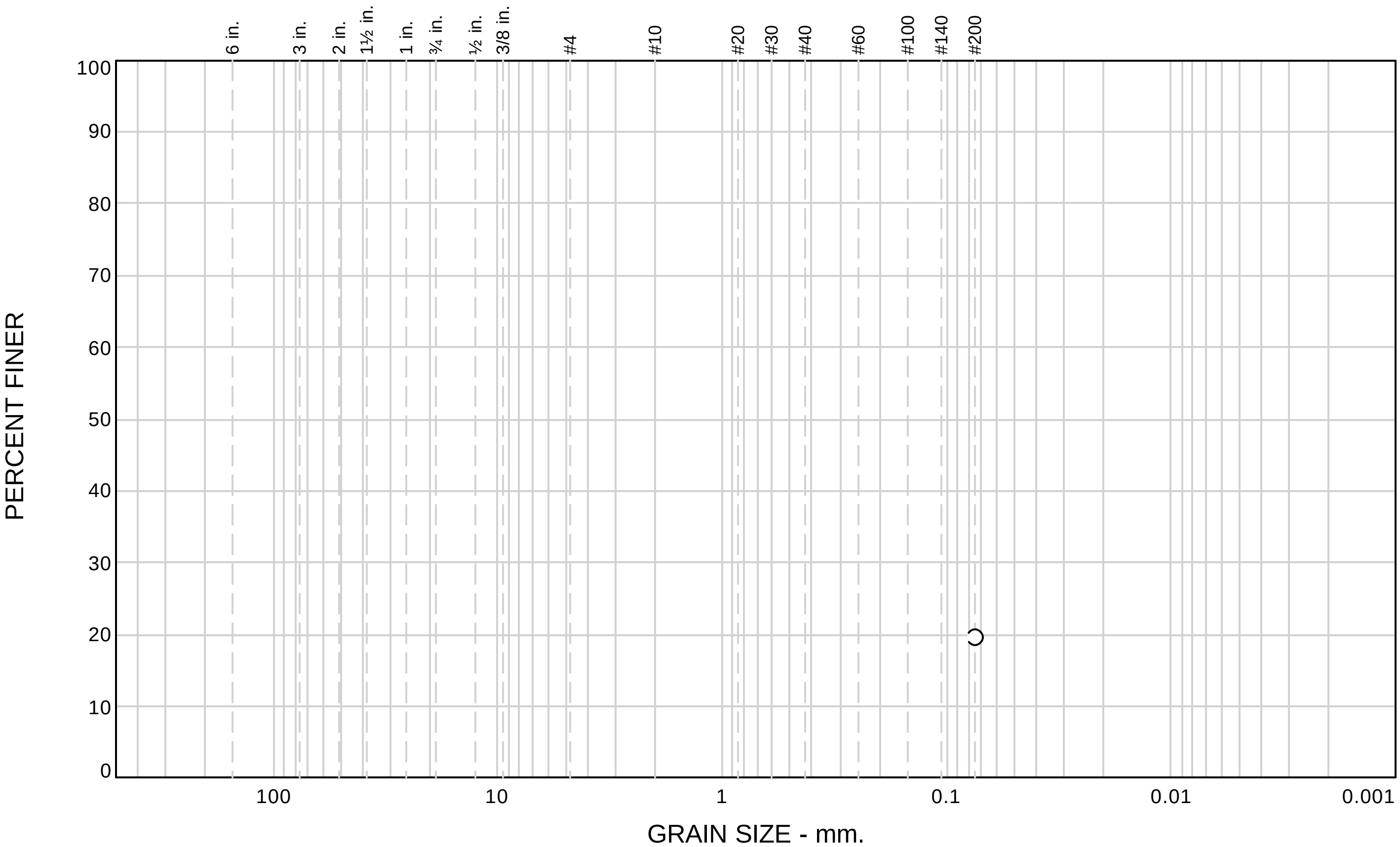
ENGEO INCORPORATED

**Client:** San Sebastian MH General Partnership
**Project:** San Sebastian - Morgan Hill, CA

**Project No:** 9301.000.000

**Tested By:** GC **Checked By:** DS

# Particle Size Distribution Report




| % +3" | % Gravel | | % Sand | | | % Fines | |
|---|---|---|---|---|---|---|---|
| | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| | | | | | | 19.6 | |

| SIEVE SIZE | PERCENT FINER | SPEC.* PERCENT | PASS? (X=NO) |
|---|---|---|---|
| #200 | 19.6 | | |

* (no specification provided)

**Soil Description**

See exploration logs.

**Atterberg Limits**

PL= LL= PI=

**Coefficients**

$D_{90}$= $D_{85}$= $D_{60}$=
$D_{50}$= $D_{30}$= $D_{15}$=
$D_{10}$= $C_u$= $C_c$=

**Classification**

USCS= AASHTO=

**Remarks**

**Sample Number:** 1-BH9 @ 11-11.5 **Depth:** 11-11.5 feet

**Date:** 08/24/11

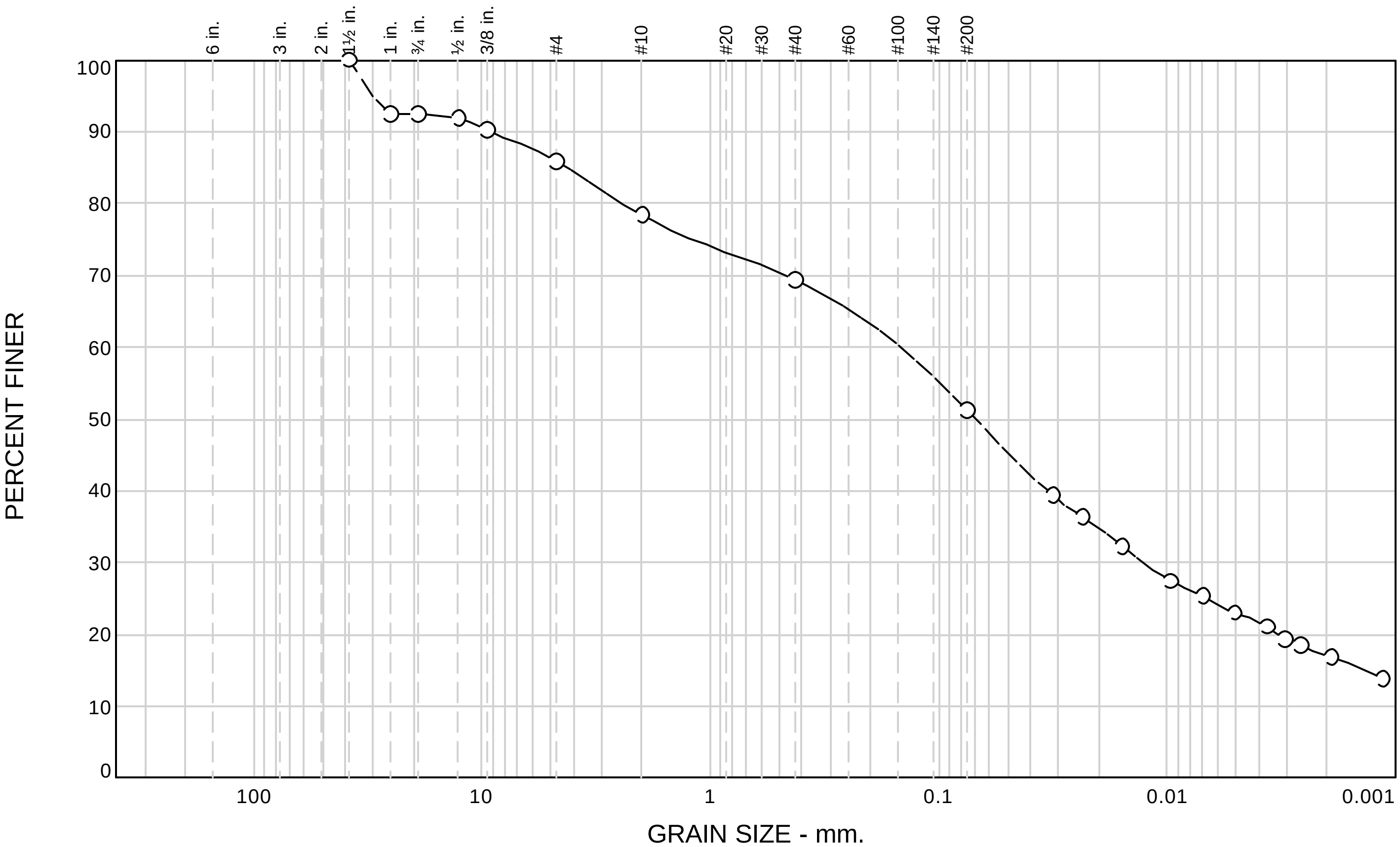
ENGEO INCORPORATED

**Client:** San Sebastian MH General Partership
**Project:** San Sebastian - Morgan Hill, CA

**Project No:** 9301.000.000

**Tested By:** GC **Checked By:** DS

# Particle Size Distribution Report




| % Cobbles | % Gravel | | % Sand | | | % Fines | |
|---|---|---|---|---|---|---|---|
| | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| 0.0 | 7.5 | 6.6 | 7.5 | 9.0 | 18.1 | 28.3 | 23.0 |

| SIEVE SIZE | PERCENT FINER | SPEC.* PERCENT | PASS? (X=NO) |
|---|---|---|---|
| 1-1/2 | 100.0 | | |
| 1 | 92.5 | | |
| 3/4 | 92.5 | | |
| 1/2 | 91.9 | | |
| 3/8 | 90.2 | | |
| #4 | 85.9 | | |
| #10 | 78.4 | | |
| #40 | 69.4 | | |
| #200 | 51.3 | | |
| 0.0317 mm. | 39.4 | | |
| 0.0235 mm. | 36.4 | | |
| 0.0158 mm. | 32.2 | | |
| 0.0097 mm. | 27.5 | | |
| 0.0070 mm. | 25.4 | | |
| 0.0051 mm. | 23.1 | | |
| 0.0037 mm. | 21.1 | | |
| 0.0031 mm. | 19.5 | | |
| 0.0026 mm. | 18.4 | | |
| 0.0019 mm. | 16.9 | | |
| 0.0011 mm. | 13.9 | | |

* (no specification provided)

**Soil Description**

See exploration logs.

**Atterberg Limits**

PL= 15 LL= 24 PI= 9

**Coefficients**

$D_{90}$= 9.2466 $D_{85}$= 4.2099 $D_{60}$= 0.1481
$D_{50}$= 0.0686 $D_{30}$= 0.0128 $D_{15}$= 0.0014
$D_{10}$= $C_u$= $C_c$=

**Classification**

USCS= CL AASHTO= A-4(2)

**Remarks**

**Sample Number:** 1-BH1 @ 2-2.5 **Depth:** 2-2.5 feet

**Date:** 08/17/11

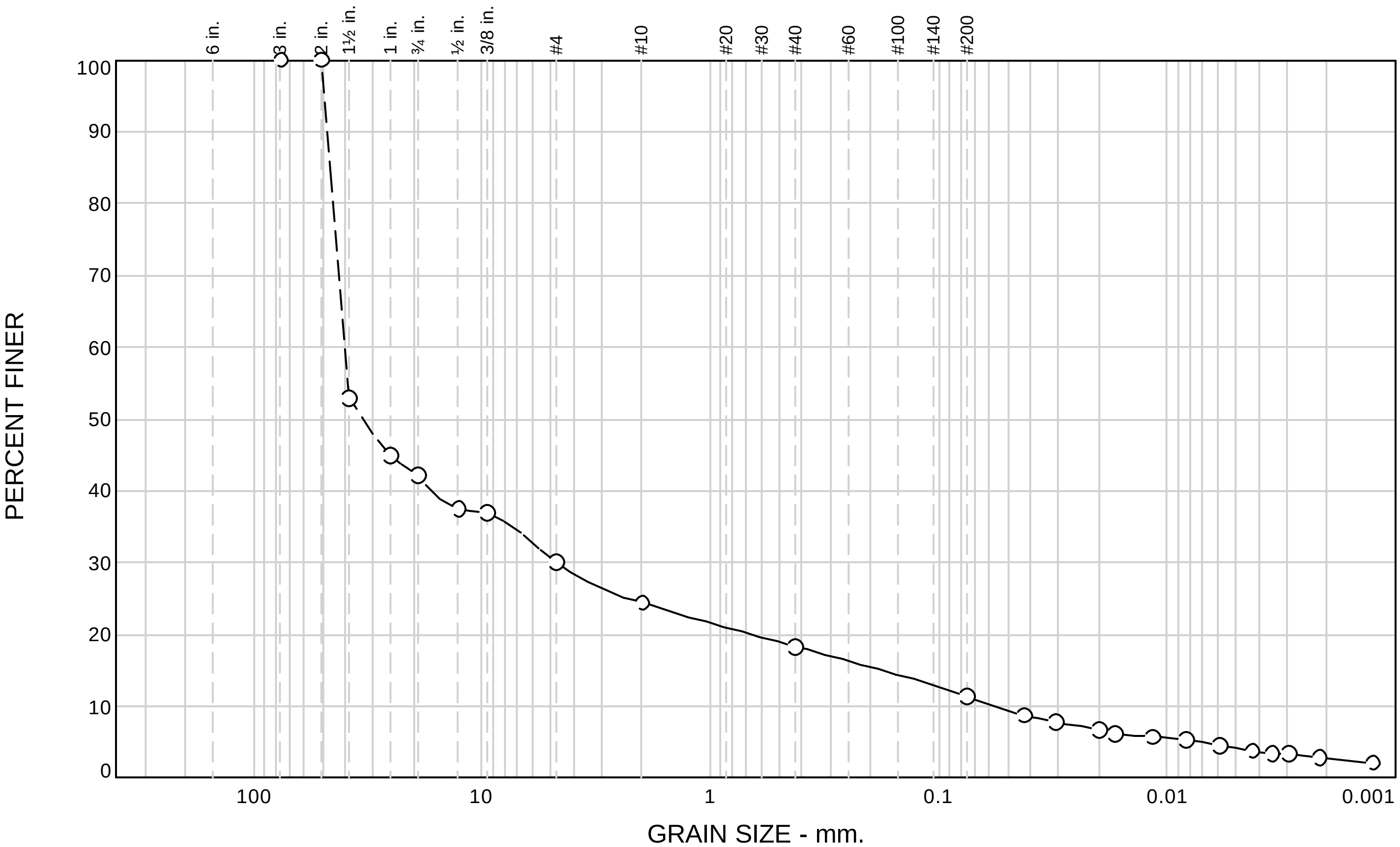
ENGEO INCORPORATED

**Client:** San Sebastian MH General Partership
**Project:** San Sebastian - Morgan Hill, CA

**Project No:** 9301.000.000

**Tested By:** GC **Checked By:** DS

# Particle Size Distribution Report




| % Cobbles | % Gravel | | % Sand | | | % Fines | |
|---|---|---|---|---|---|---|---|
| | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| 0.0 | 57.9 | 12.0 | 5.6 | 6.2 | 6.9 | 7.3 | 4.1 |

| SIEVE SIZE | PERCENT FINER | SPEC.* PERCENT | PASS? (X=NO) |
|---|---|---|---|
| 3 | 100.0 | | |
| 2 | 100.0 | | |
| 1-1/2 | 53.0 | | |
| 1 | 44.9 | | |
| 3/4 | 42.1 | | |
| 1/2 | 37.5 | | |
| 3/8 | 36.9 | | |
| #4 | 30.1 | | |
| #10 | 24.5 | | |
| #40 | 18.3 | | |
| #200 | 11.4 | | |
| 0.0425 mm. | 8.8 | | |
| 0.0307 mm. | 7.8 | | |
| 0.0198 mm. | 6.8 | | |
| 0.0170 mm. | 6.1 | | |
| 0.0116 mm. | 5.8 | | |
| 0.0083 mm. | 5.4 | | |
| 0.0059 mm. | 4.5 | | |
| 0.0042 mm. | 3.8 | | |
| 0.0035 mm. | 3.4 | | |
| 0.0030 mm. | 3.3 | | |
| 0.0022 mm. | 2.8 | | |
| 0.0013 mm. | 2.2 | | |

* (no specification provided)

## Soil Description

See exploration logs.

## Atterberg Limits

PL= 18 LL= 23 PI= 5

## Coefficients

$D_{90}$= 47.4295 $D_{85}$= 46.0742 $D_{60}$= 40.0354
$D_{50}$= 33.6469 $D_{30}$= 4.7109 $D_{15}$= 0.1745
$D_{10}$= 0.0564 $C_u$= 710.40 $C_c$= 9.84

## Classification

USCS= GP-GC AASHTO= A-1-a

## Remarks

**Sample Number:** 1-BH3 @ 2.5-3 **Depth:** 2.5-3 feet

**Date:** 08/17/11

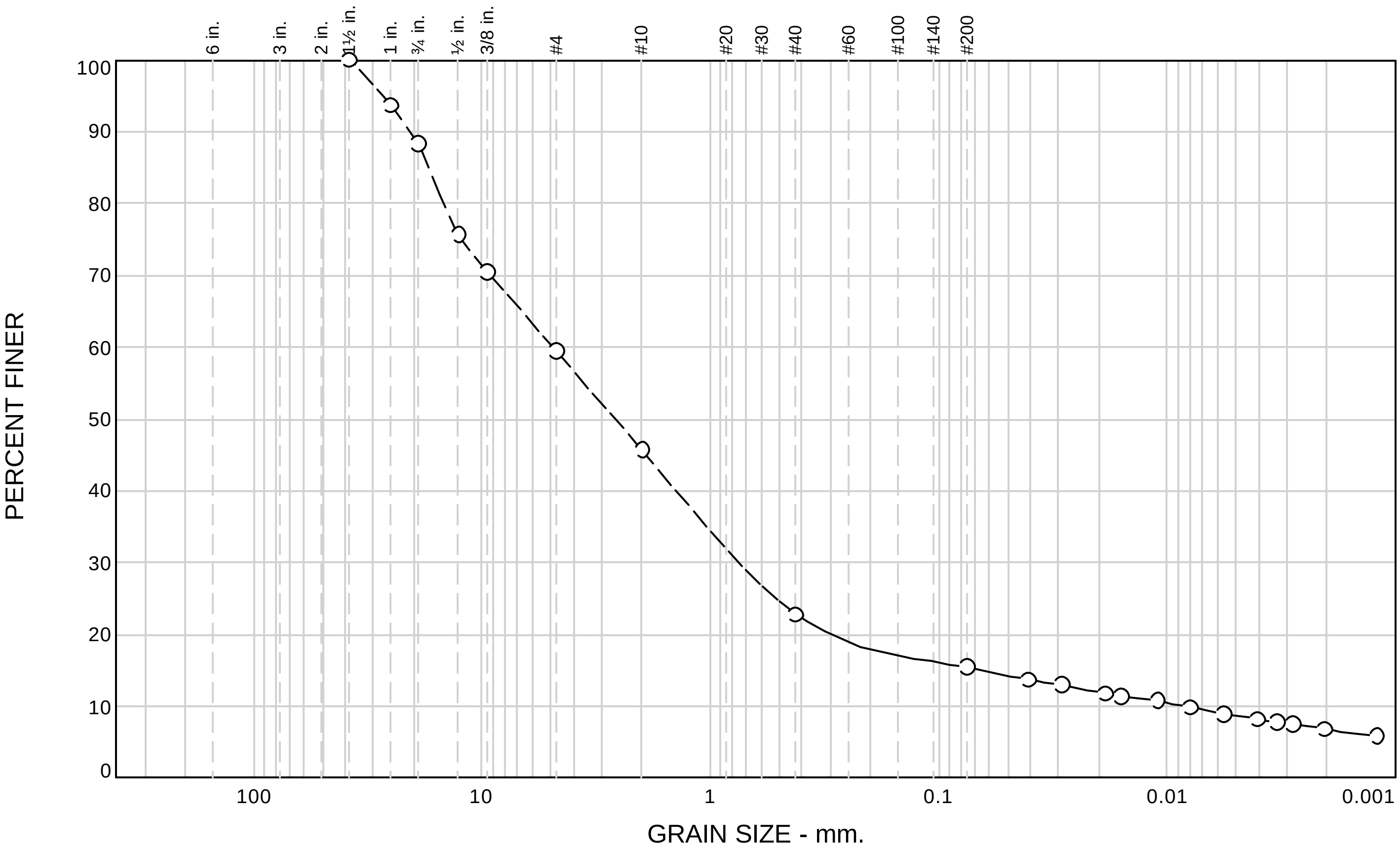
ENGEO INCORPORATED

**Client:** San Sebastian MH General Partership
**Project:** San Sebastian - Morgan Hill, CA

**Project No:** 9301.000.000

**Tested By:** GC **Checked By:** DS

# Particle Size Distribution Report




| % Cobbles | % Gravel | | % Sand | | | % Fines | |
|---|---|---|---|---|---|---|---|
| | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| 0.0 | 11.6 | 29.0 | 13.7 | 22.9 | 7.4 | 6.7 | 8.7 |

| SIEVE SIZE | PERCENT FINER | SPEC.* PERCENT | PASS? (X=NO) |
|---|---|---|---|
| 1-1/2 | 100.0 | | |
| 1 | 93.7 | | |
| 3/4 | 88.4 | | |
| 1/2 | 75.8 | | |
| 3/8 | 70.5 | | |
| #4 | 59.4 | | |
| #10 | 45.7 | | |
| #40 | 22.8 | | |
| #200 | 15.4 | | |
| 0.0407 mm. | 13.7 | | |
| 0.0291 mm. | 13.1 | | |
| 0.0188 mm. | 11.8 | | |
| 0.0160 mm. | 11.5 | | |
| 0.0110 mm. | 10.8 | | |
| 0.0079 mm. | 9.9 | | |
| 0.0057 mm. | 9.0 | | |
| 0.0041 mm. | 8.2 | | |
| 0.0033 mm. | 7.9 | | |
| 0.0028 mm. | 7.6 | | |
| 0.0021 mm. | 6.9 | | |
| 0.0012 mm. | 6.0 | | |

* (no specification provided)

**Soil Description**

See exploration logs.

**Atterberg Limits**

PL= 19 LL= 33 PI= 14

**Coefficients**

$D_{90}$= 20.4069 $D_{85}$= 16.9803 $D_{60}$= 4.9171
$D_{50}$= 2.6100 $D_{30}$= 0.7561 $D_{15}$= 0.0640
$D_{10}$= 0.0082 $C_u$= 598.98 $C_c$= 14.16

**Classification**

USCS= SC AASHTO= A-2-6(0)

**Remarks**

**Sample Number:** 1-BH4 @ 3-3.5 **Depth:** 3-3.5 feet

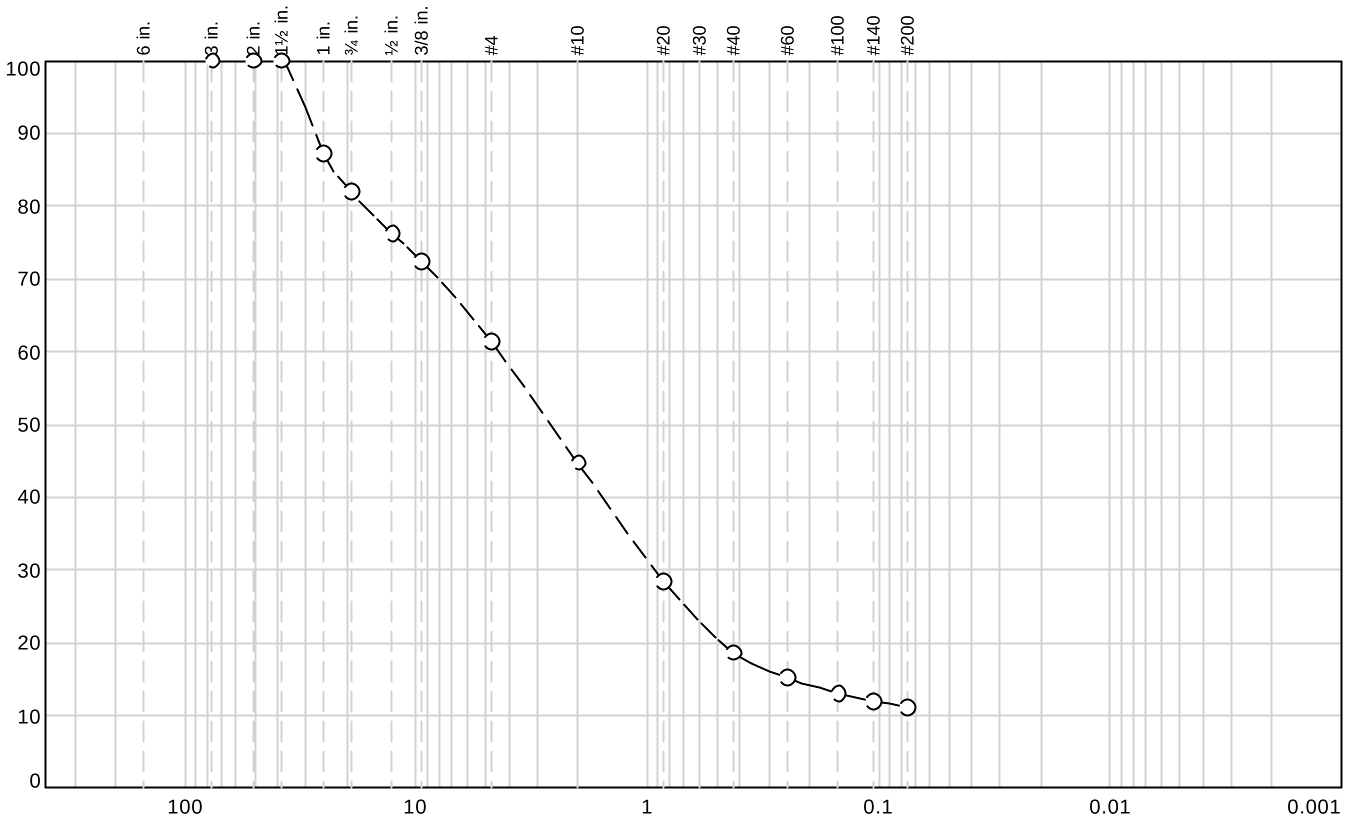
**Date:** 08/17/11

ENGEO INCORPORATED

**Client:** San Sebastian MH General Partership
**Project:** San Sebastian - Morgan Hill, CA
**Project No:** 9301.000.000

**Tested By:** GC **Checked By:** DS

# Particle Size Distribution Report




| % Cobbles | % Gravel | | % Sand | | | % Fines | |
|---|---|---|---|---|---|---|---|
| | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| 0.0 | 18.1 | 20.5 | 16.6 | 26.1 | 7.6 | 11.1 | |

| SIEVE SIZE | PERCENT FINER | SPEC.* PERCENT | PASS? (X=NO) |
|---|---|---|---|
| 3 | 100.0 | | |
| 2 | 100.0 | | |
| 1-1/2 | 100.0 | | |
| 1 | 87.3 | | |
| 3/4 | 81.9 | | |
| 1/2 | 76.2 | | |
| 3/8 | 72.4 | | |
| #4 | 61.4 | | |
| #10 | 44.8 | | |
| #20 | 28.5 | | |
| #40 | 18.7 | | |
| #60 | 15.2 | | |
| #100 | 13.1 | | |
| #140 | 12.0 | | |
| #200 | 11.1 | | |

* (no specification provided)

**Soil Description**

See exploration logs.

**Atterberg Limits**

PL= LL= PI=

**Coefficients**

$D_{90}$= 27.6440 $D_{85}$= 23.1217 $D_{60}$= 4.4037
$D_{50}$= 2.6073 $D_{30}$= 0.9248 $D_{15}$= 0.2390
$D_{10}$= $C_u$= $C_c$=

**Classification**

USCS= AASHTO=

**Remarks**

**Sample Number:** 1-BH5 @ 18-18.5 **Depth:** 18-18.5 feet

**Date:** 08/17/11

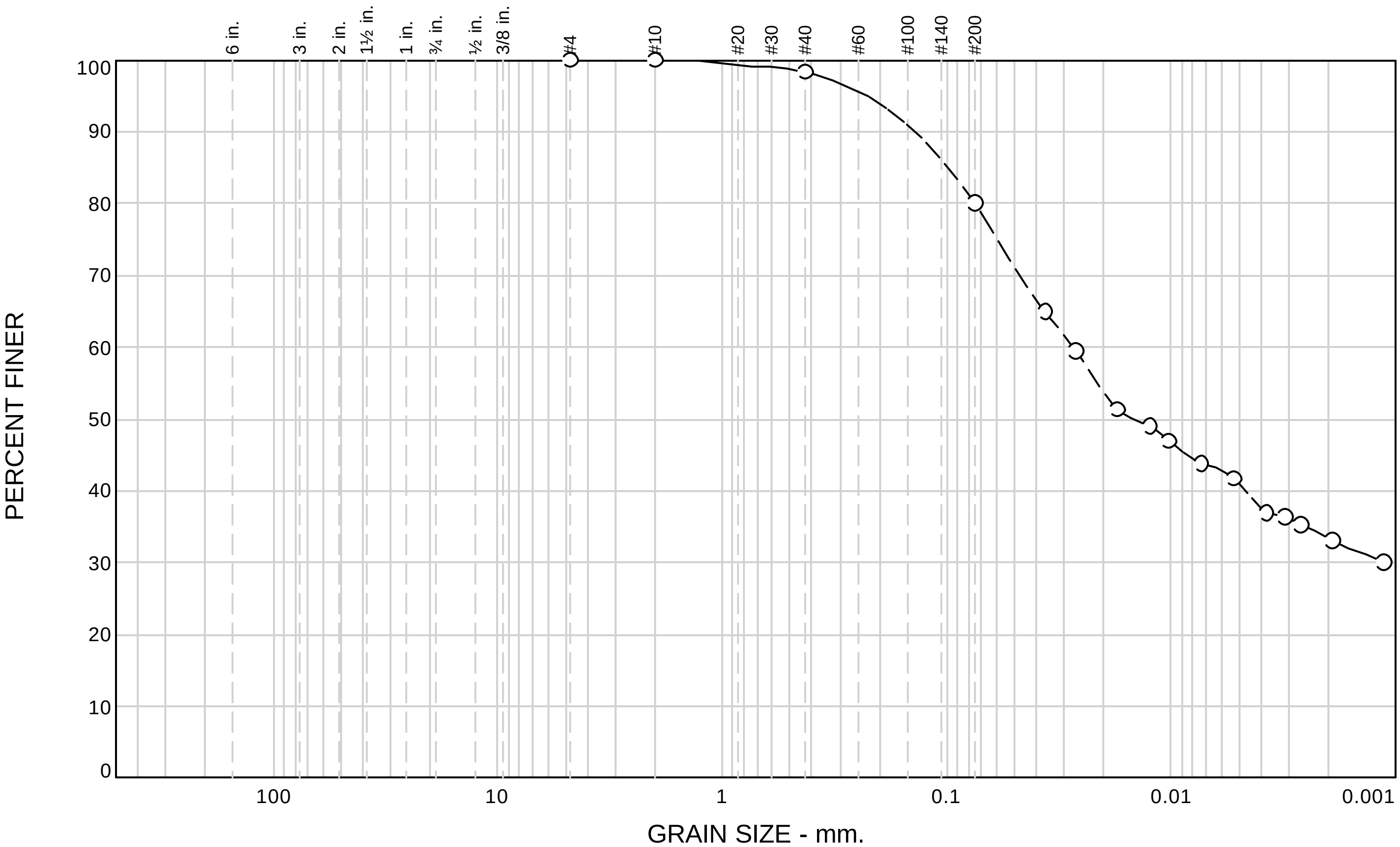
ENGEO INCORPORATED

**Client:** San Sebastian MH General Partnership
**Project:** San Sebastian - Morgan Hill, CA

**Project No:** 9301.000.000

**Tested By:** GC **Checked By:** DS

# Particle Size Distribution Report




| % +3" | % Gravel | | % Sand | | | % Fines | |
|---|---|---|---|---|---|---|---|
| | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| 0.0 | 0.0 | 0.0 | 0.0 | 1.7 | 18.2 | 39.0 | 41.1 |

| SIEVE SIZE | PERCENT FINER | SPEC.* PERCENT | PASS? (X=NO) |
|---|---|---|---|
| #4 | 100.0 | | |
| #10 | 100.0 | | |
| #40 | 98.3 | | |
| #200 | 80.1 | | |
| 0.0366 mm. | 65.0 | | |
| 0.0266 mm. | 59.5 | | |
| 0.0175 mm. | 51.3 | | |
| 0.0125 mm. | 49.1 | | |
| 0.0103 mm. | 47.0 | | |
| 0.0074 mm. | 43.9 | | |
| 0.0053 mm. | 41.8 | | |
| 0.0038 mm. | 37.0 | | |
| 0.0031 mm. | 36.3 | | |
| 0.0026 mm. | 35.4 | | |
| 0.0019 mm. | 33.1 | | |
| 0.0011 mm. | 30.0 | | |

* (no specification provided)

**Soil Description**

See exploration logs.

**Atterberg Limits**

PL= 17 LL= 39 PI= 22

**Coefficients**

$D_{90}$= 0.1394 $D_{85}$= 0.0984 $D_{60}$= 0.0273
$D_{50}$= 0.0147 $D_{30}$= $D_{15}$=
$D_{10}$= $C_u$= $C_c$=

**Classification**

USCS= CL AASHTO= A-6(17)

**Remarks**

Specific gravity = 2.905

**Sample Number:** 1-BH7 @ 2-2.5 **Depth:** 2-2.5 feet

**Date:** 08/24/11

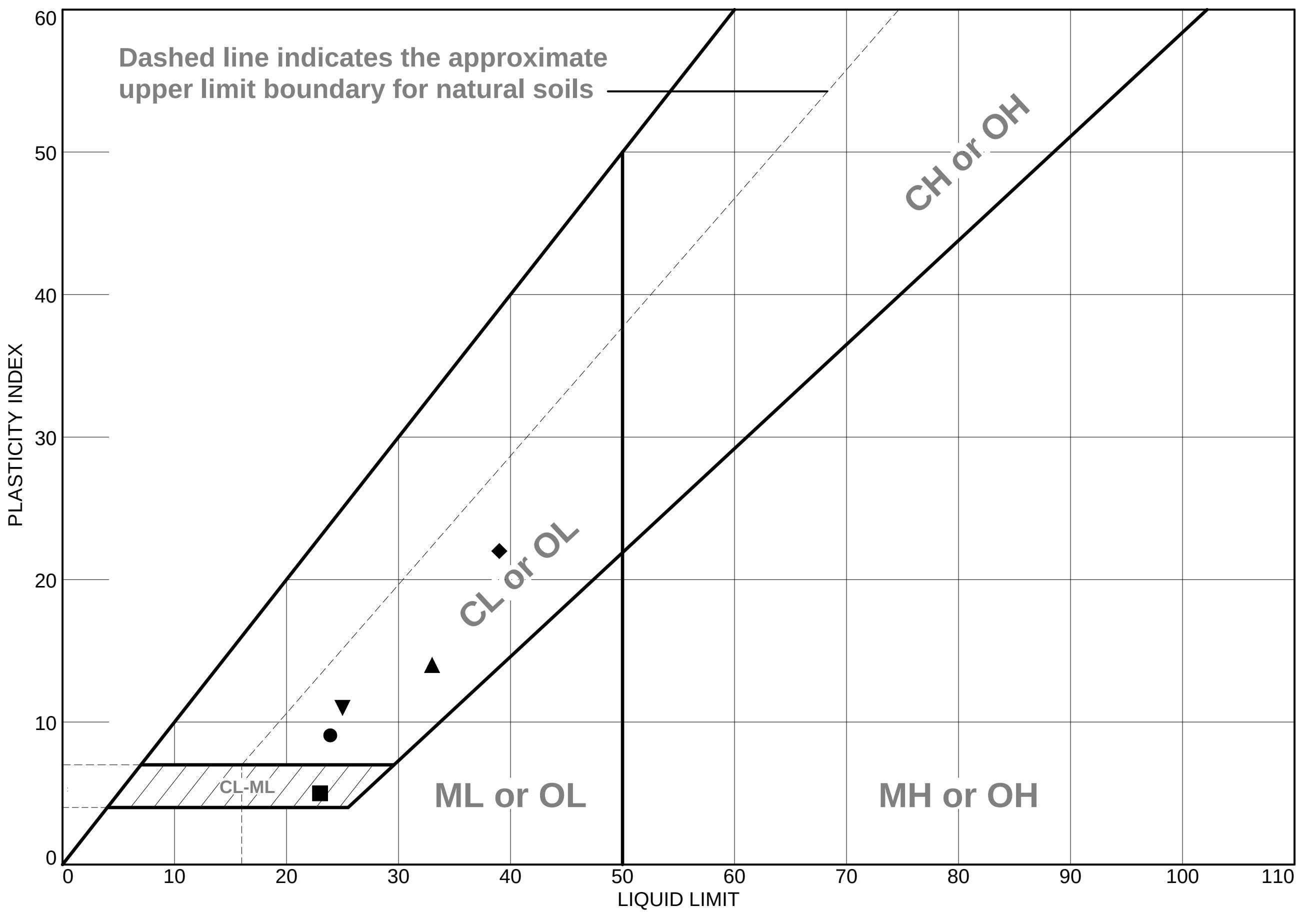
ENGEO INCORPORATED

**Client:** San Sebastian MH General Partership
**Project:** San Sebastian - Morgan Hill, CA

**Project No:** 9301.000.000

**Tested By:** GC **Checked By:** DS

# LIQUID AND PLASTIC LIMITS TEST REPORT




| | MATERIAL DESCRIPTION | LL | PL | PI | %<#40 | %<#200 | USCS |
|---|---|---|---|---|---|---|---|
| ● | See exploration logs. | 24 | 15 | 9 | 69.4 | 51.3 | CL |
| ■ | See exploration logs. | 23 | 18 | 5 | 18.3 | 11.4 | GP-GC |
| ▲ | See exploration logs. | 33 | 19 | 14 | 22.8 | 15.4 | SC |
| ◆ | See exploration logs. | 39 | 17 | 22 | 98.3 | 80.1 | CL |
| ▼ | See exploration logs. | 25 | 14 | 11 | 86.9 | 59.8 | CL |

**Project No.** 9301.000.000 **Client:** San Sebastian MH General Partership

**Project:** San Sebastian - Morgan Hill, CA

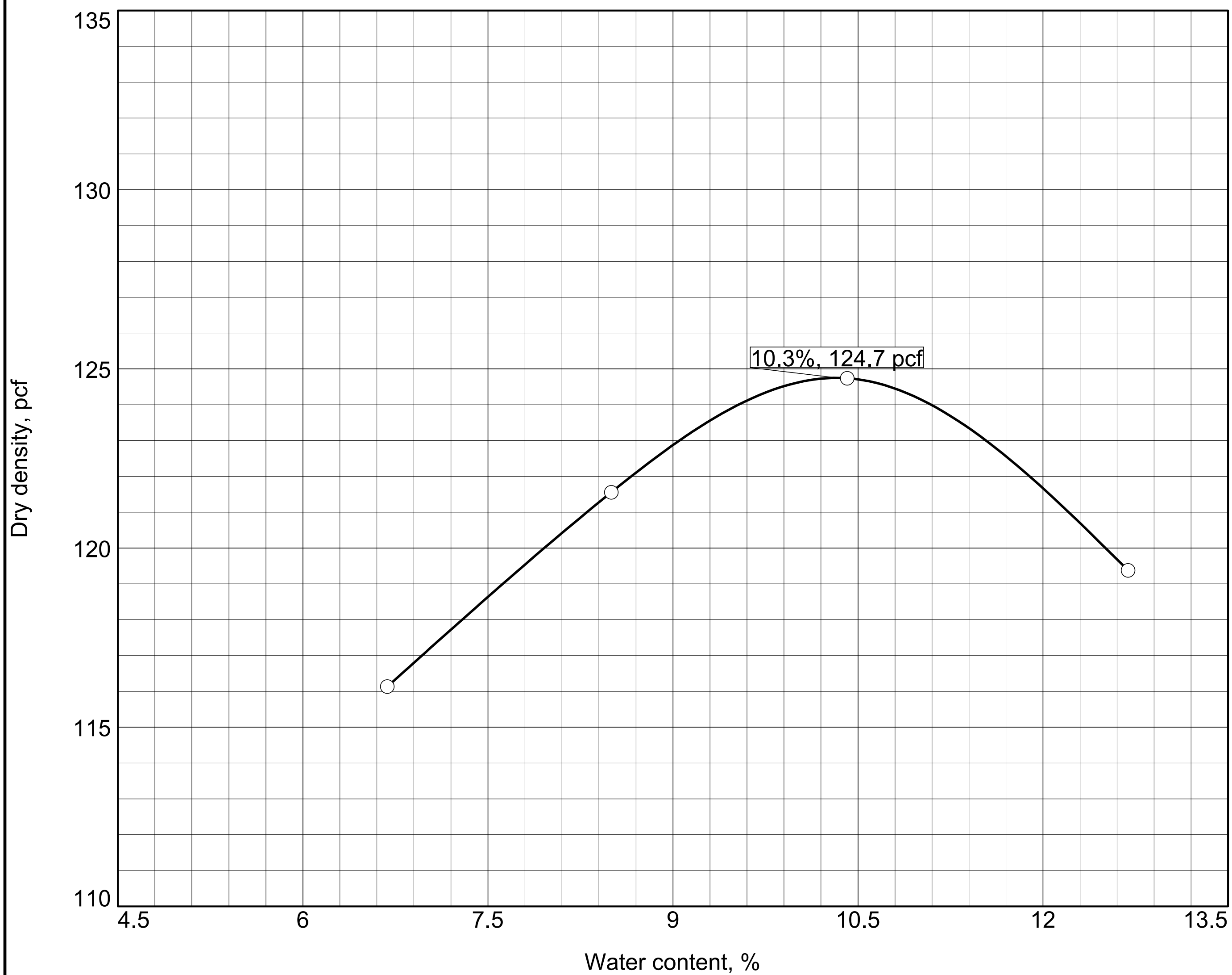
●**Depth:** 2-2.5 feet **Sample Number:** 1-BH1 @ 2-2.5
■**Depth:** 2.5-3 feet **Sample Number:** 1-BH3 @ 2.5-3
▲**Depth:** 3-3.5 feet **Sample Number:** 1-BH4 @ 3-3.5
◆**Depth:** 2-2.5 feet **Sample Number:** 1-BH7 @ 2-2.5
▼**Depth:** 2-3 feet **Sample Number:** 1-TP4 @ 2-3

ENGEO INCORPORATED

**Remarks:**

**Tested By:** ○ GC □ GC △ GC ◇ GC ▽ DS **Checked By:** DS

# COMPACTION TEST REPORT For Curve No. TP-4




Test specification: ASTM D 1557-07 Method A Modified

| Elev/ Depth | Classification | | Nat. Moist. | Sp.G. | LL | PI | % > #4 | % < No.200 |
|---|---|---|---|---|---|---|---|---|
| | USCS | AASHTO | | | | | | |
| 2-3 ft. | CL | A-6(4) | | 2.536 | 25 | 11 | 0.0 | 65.8 |

| TEST RESULTS | MATERIAL DESCRIPTION |
|---|---|
| Maximum dry density = 124.7 pcf<br>Optimum moisture = 10.3 % | See exploration logs. |

**Project No.** 9301.000.000 **Client:** San Sebastian MH General Partnership

**Project:** The Estates at San Sebastian. Morgan Hill, CA.

**Date:** 08/12/11

○ **Depth:** 2-3 ft. **Sample Number:** TP-4

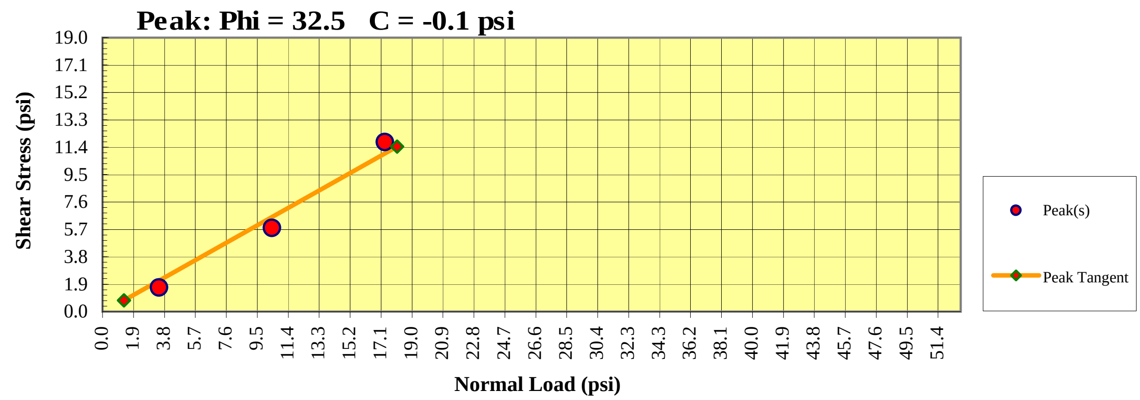
ENGEO INCORPORATED

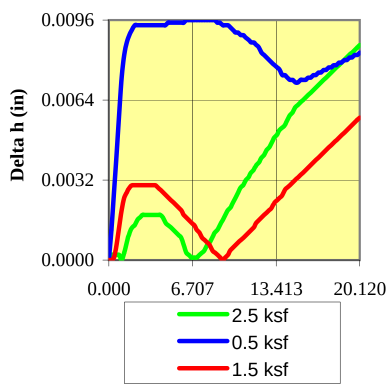
**Remarks:**

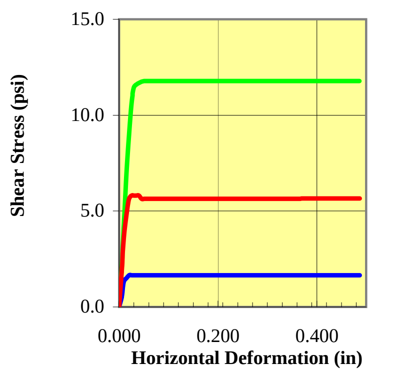
**Figure**

**Tested By:** DS **Checked By:** GC

## Direct Shear Test (ASTM D3080)




| Initial | Specimen 2.5 ksf | 0.5 ksf | 1.5 ksf | |
|---|---|---|---|---|
| **Moisture (%)** | 12.30 | 12.30 | 12.30 | |
| **Density (pcf)** | 114.79 | 114.79 | 114.71 | |
| **Void Ratio** | 0.378 | 0.378 | 0.379 | |
| **Saturation (%)** | 82.43 | 82.45 | 82.22 | |
| **Diameter (in)** | 2.420 | 2.420 | 2.420 | |
| **Height (in)** | 1.000 | 1.000 | 1.000 | |
| | | | | |

| Final | 2.5 ksf | 0.5 ksf | 1.5 ksf | |
|---|---|---|---|---|
| **Moisture (%)** | 15.53 | 15.56 | 16.14 | |
| **Density (pcf)** | 112.49 | 116.43 | 115.68 | |
| **Void Ratio** | 0.406 | 0.359 | 0.368 | |
| **Saturation (%)** | 95.52 | 100.00 | 100.00 | |
| **Diameter (in)** | 2.420 | 2.420 | 2.420 | |
| **Height (in)** | 1.004 | 1.005 | 1.000 | |
| **Normal Stress (psi)** | 17.4 | 3.5 | 10.4 | |
| **Peak Stress (psi)** | 11.8 | 1.7 | 5.8 | |
| **Residual Stress (psi)** | | | | |
| **Strain (%)** | 20.112 | 20.116 | 20.120 | |
| **Rate (in/min)** | | | | |
| | | | | |

| Project Date | |
|---|---|
| **Date** | 8.12.11 |

| | | | | | |
|---|---|---|---|---|---|
| **Project:** | The Estates at San Sebastian | N/A | N/A | N/A | N/A |
| **Location:** | Morgan Hill, California | | | | |
| **Project Number:** | 9301.000.000 | | | | |
| **Boring Number** | TP-4 | | | | |
| **Sample Number:** | TP-4@2-3' | | | | |
| **Depth:** | 2.0 to 3.0 ft. | | | | |
| **Sample Type:** | Remolded | Failure Photographs | | | |
| **Description:** | See exploration logs | | | | |
| **Test Type:** | Direct Shear | | | | |
| **Remarks:** | Samples were remolded to 92% compaction at 2% over optimum moisture content. Max Density; 124.7 pcf, Optimum Moisture Content; 10.3% | | | | |

Tested By: D. Seibold | Date: 8.17.11
Checked By: J. Fippin | Date: 8.17.11

## ENGEO Incorporated

### Consolidated Undrained Triaxial Test (ASTM D4767)

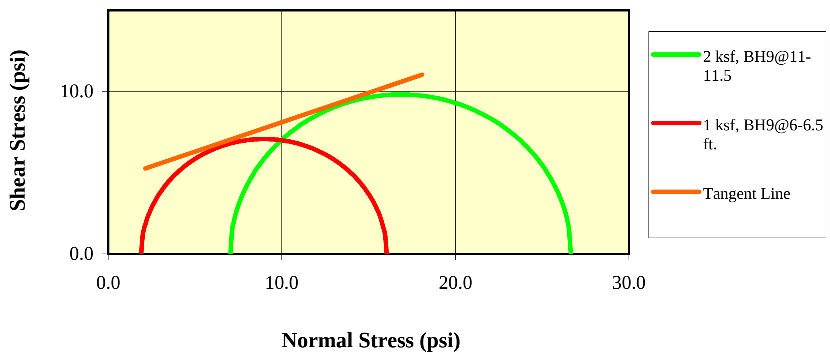
Date: 8.22.11

Checked By: J. Fippin

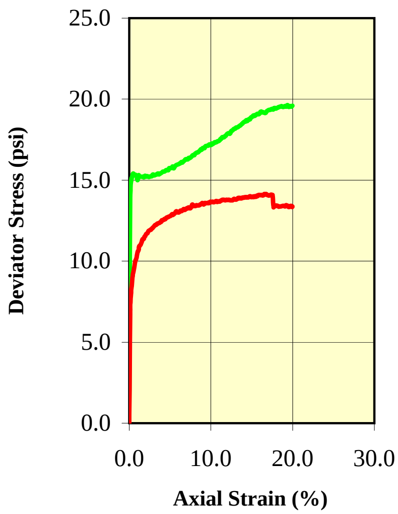
Date: 8.22.11

Tested By: D. Seibold

**Effective Stress at Maximum Deviator Stress Criterion**




**Deviator Stress Vs. Axial Strain**




| | Specimen | | | |
|---|---|---|---|---|
| **Initial** | **2 ksf** | | **1 ksf** | |
| **Water Content (%)** | 11.3 | | 10.8 | |
| **Dry Density (pcf)** | 111.4 | | 104.9 | |
| **Saturation (%)** | 61.69 | | 49.48 | |
| **Void Ratio** | 0.454 | | 0.281 | |
| **Diameter (in)** | 2.420 | | 2.420 | |
| **Height (in)** | 5.000 | | 5.510 | |
| **Specific Gravity** | 2.65 | | 2.65 | |
| **Liquid Limit** | 0 | | 0 | |
| **Plastic Limit** | 0 | | 0 | |
| **After Consolidation** | **2 ksf** | | **1 ksf** | |
| **B-Value** | 0.98 | | 0.98 | |
| **Water Content (%)** | 15.7 | | 21.0 | |
| **Dry Density (pcf)** | 127.26 | | 106.56 | |
| **Saturation (%)** | 100.00 | | 100.00 | |
| **Void Ratio** | 0.300 | | 0.553 | |
| **Effective Stress (psi)** | 14.3 | | 4.6 | |
| **Back Press. (psi)** | 49.6 | | 40.5 | |
| **Rate of Strain** | 0.00075 | | 0.00075 | |

| **Maximum Deviator Stress Criterion** | |
|---|---|
| **C (psi)** | 4.8 |
| **C' (psi)** | 4.5 |
| **Ø (deg)** | 12.5 |
| **Ø' (deg)** | 19.9 |

| **After Shear** | **2 ksf** | | **1 ksf** | |
|---|---|---|---|---|
| **σ'1 at Failure (psi)** | 26.67 | | 16.04 | |
| **σ'3 at Failure (psi)** | 7.04 | | 1.90 | |
| | | | | |
| | | | | |

| | |
|---|---|
| **Project:** | The Estates at San Sebastian |
| **Location:** | Morgan Hill, California |
| **Project Number:** | 9301.000.000 |
| **Boring Number:** | Various |
| **Sample Number:** | Various |
| **Depth:** | Various |
| **Sample Type:** | Undisturbed |
| **Description:** | See exploration logs |
| **Test Type** | Consolidated Undrained |
| **Remarks** | |

| N/A | N/A | N/A | N/A |
|---|---|---|---|
| Failure Photographs | | | |

**ENGEO Incorporated**

**Consolidated Undrained Triaxial Test (ASTM D4767)**

Date:

Checked By:

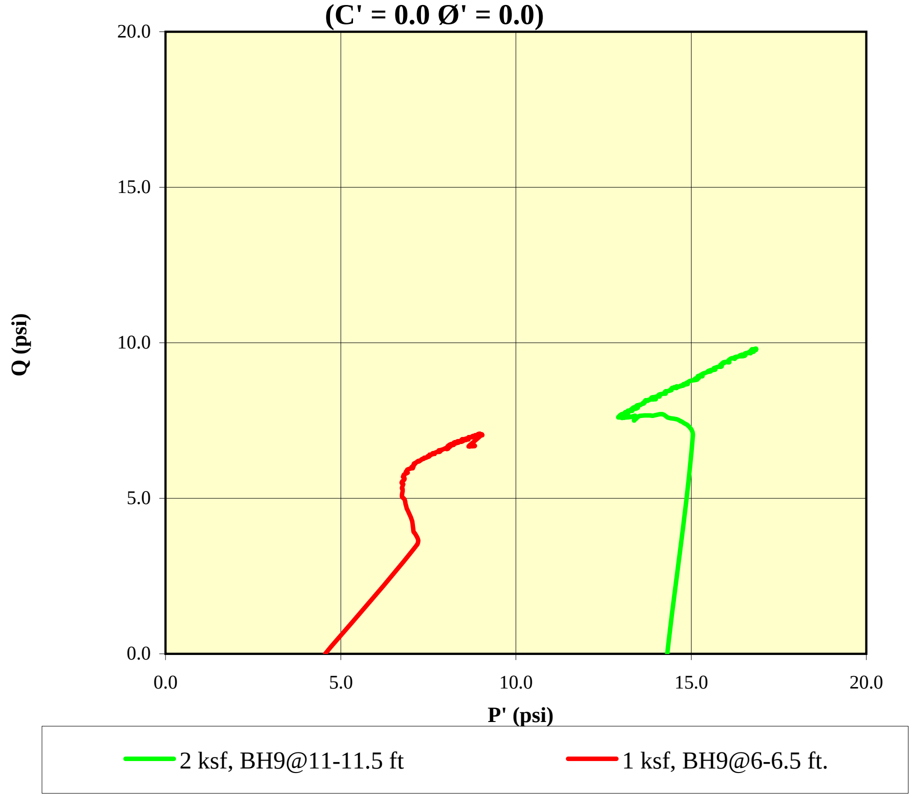
Date: 8.22.11

D. Seibold

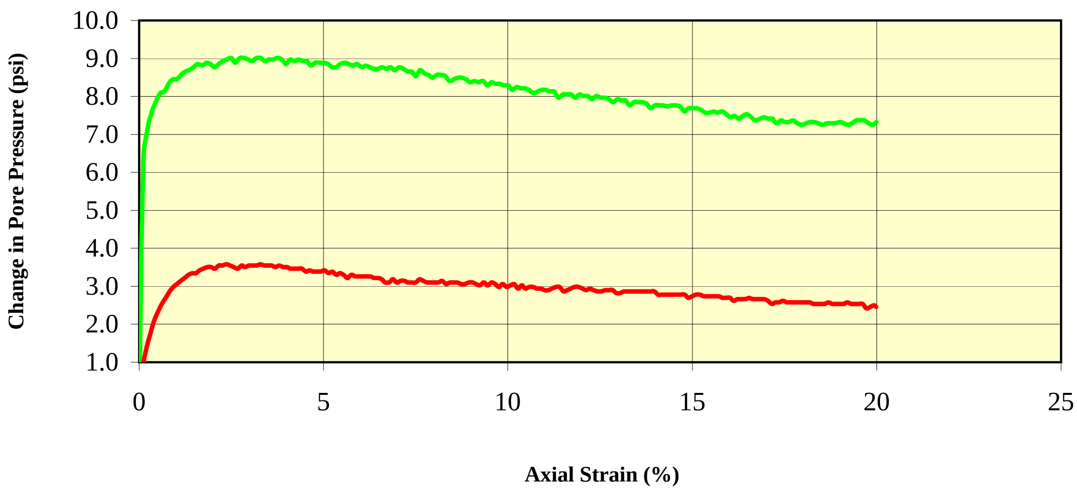
Tested By:

**Stress Paths (Effective)**

**(C' = 0.0 Ø' = 0.0)**




**Change in Pore Pressure vs. Axial Strain**



# *EN* GEO Incorporated

## SULFATE TEST RESULTS

### CALTRANS Test Method 417

Project Name: San Sebastian - Morgan Hill, CA Project Number: 9301.000.000

Tested By: GC Date: August 17, 2011

| Sample Number | Sample Location | Matrix | Water Soluble Sulfate ($SO_4$) in Soil | |
|---|---|---|---|---|
| | | | mg/kg | % by Weight |
| 1 | 1-BH2 @ 2.5-3 | soil | 39 | 0.004 |
| 2 | 1-BH4 @ 2.5-3 | soil | 32 | 0.003 |
| 3 | 1-BH6 @ 2.5-3 | soil | 153 | 0.015 |
| | | | | |

EMSL Analytical, Inc
2235 Polvorosa Ave , Suite 230, San Leandro, CA 94577
Phone: (510) 895-3675 Fax: (510) 895-3680 Email: sanleandrolab@emsl.com

Attn: **Matthew Harrell**
**Engeo, Inc.**
**2010 Crow Canyon Place**
**Suite 250**
**San Ramon, CA 94583**

Fax: (925) 866-0199 Phone: (925) 866-9000
Project: **9301.000.000 Phase 001 / Estates at San Sebastian**

Customer ID: ENGE25
Customer PO: 9301.000.000
Received: 08/11/11 11:00 AM
EMSL Order: 091109016

EMSL Proj:
Analysis Date: 8/18/2011

# Test Report: PLM Analysis of Bulk Samples for Asbestos via EPA 600/R-93/116 Method with CARB 435 Prep (Milling). Level B for 0.1% Target Analytical Sensitivity

| | | | Non-Asbestos | | | | Asbestos | |
|---|---|---|---|---|---|---|---|---|
| **Sample** | **Description** | **Appearance** | **%** | **Fibrous** | **%** | **Non-Fibrous** | **%** | **Type** |
| 1-B9@20.5<br>*091109016-0001* | | Brown<br>Non-Fibrous<br>Homogeneous | | | 100.00% | Non-fibrous (other) | | **None Detected** |

Initial report from 08/18/2011 11:31:33

Analyst(s)
*Rui Cindy Geng (1)*

Baojia Ke, Laboratory Manager
or other approved signatory

# The Estates at San Sebastian - Liquefaction Evaluation

## Youd 2001, Seed 2003, I&B 2008 Methods

## Input

Yellow cells are calculated

Green cells require user input - reference respective papers for details
Corrdction factors on "Driving Force" and "Resisting Force" sheets require user input

| Water Table depth at time of Exploration | Water Table depth at time of Liquefaction | amax/g | Mw | $V_{s*40'}$ |
|---|---|---|---|---|
| 30 | 30 | 0.70 | 7 | 1200 |

* $V_{S40}$ = Avg shear wave velocity in upper 40 feet expressed in ft/s

| | | | | | At time of Exploration | | At time of Liquefaction | |
|---|---|---|---|---|---|---|---|---|
| Boring Designation | Depth [ft] | Soil Type | $N_m$ [Blows/ft] | FC | Total Stress [psf] | Effective Stress [psf] | Total Stress [psf] | Effective Stress [psf] |
| B1 | 30 | SP-SC | 47 | 10 | 3750 | 3750 | 3750 | 3750 |
| B1 | 35 | SC | 40 | 15 | 4375 | 4063 | 4375 | 4063 |
| B1 | 40 | SC | 50 | 15 | 5000 | 4376 | 5000 | 4376 |
| B1 | 45 | SC | 23 | 15 | 5625 | 4689 | 5625 | 4689 |
| B1 | 50 | SC | 24 | 15 | 6250 | 5002 | 6250 | 5002 |
| B2 | 31 | SC | 20 | 15 | 3875 | 3812.6 | 3875 | 3812.6 |
| B2 | 42 | SP-SM | 45 | 10 | 5250 | 4501.2 | 5250 | 4501.2 |

$N_m$ = Measured SPT Blow Count

## YOUD 2001 Methodology Results

| Boring Designation | Depth | CRR | CSR | FS |
|---|---|---|---|---|
| B1 | 30 | TDL | 0.42 | TDL |
| B1 | 35 | TDL | 0.44 | TDL |
| B1 | 40 | TDL | 0.44 | TDL |
| B1 | 45 | 0.33 | 0.44 | 0.76 |
| B1 | 50 | 0.33 | 0.43 | 0.79 |
| B2 | 31 | 0.31 | 0.42 | 0.72 |
| B2 | 42 | TDL | 0.44 | TDL |

TDL = Too Dense to Liquefy based on blowcount criteria

## SEED 2003 Methodology Results

| | | | CSR | | | Calculated FS | | |
|---|---|---|---|---|---|---|---|---|
| Boring Designation | Depth | CRR | mean rd | rd + sigma | rd - sigma | mean rd | rd + sigma | rd - sigma |
| B1 | 30 | 1.25 | 0.46 | 0.52 | 0.40 | FS>2.5 | 2.38 | FS>2.5 |
| B1 | 35 | 0.69 | 0.51 | 0.58 | 0.43 | 1.36 | 1.19 | 1.60 |
| B1 | 40 | 1.31 | 0.55 | 0.64 | 0.46 | 2.39 | 2.05 | FS>2.5 |
| B1 | 45 | 0.17 | 0.62 | 0.73 | 0.52 | 0.27 | 0.23 | 0.32 |
| B1 | 50 | 0.17 | 0.66 | 0.77 | 0.55 | 0.25 | 0.22 | 0.30 |
| B2 | 31 | 0.16 | 0.50 | 0.57 | 0.43 | 0.32 | 0.28 | 0.37 |
| B2 | 42 | 0.79 | 0.56 | 0.65 | 0.47 | 1.40 | 1.21 | 1.68 |

THC = CRR capped at 4, in high seismicity cases, verify

## Idriss & Boulanger 2008 Methodology Results

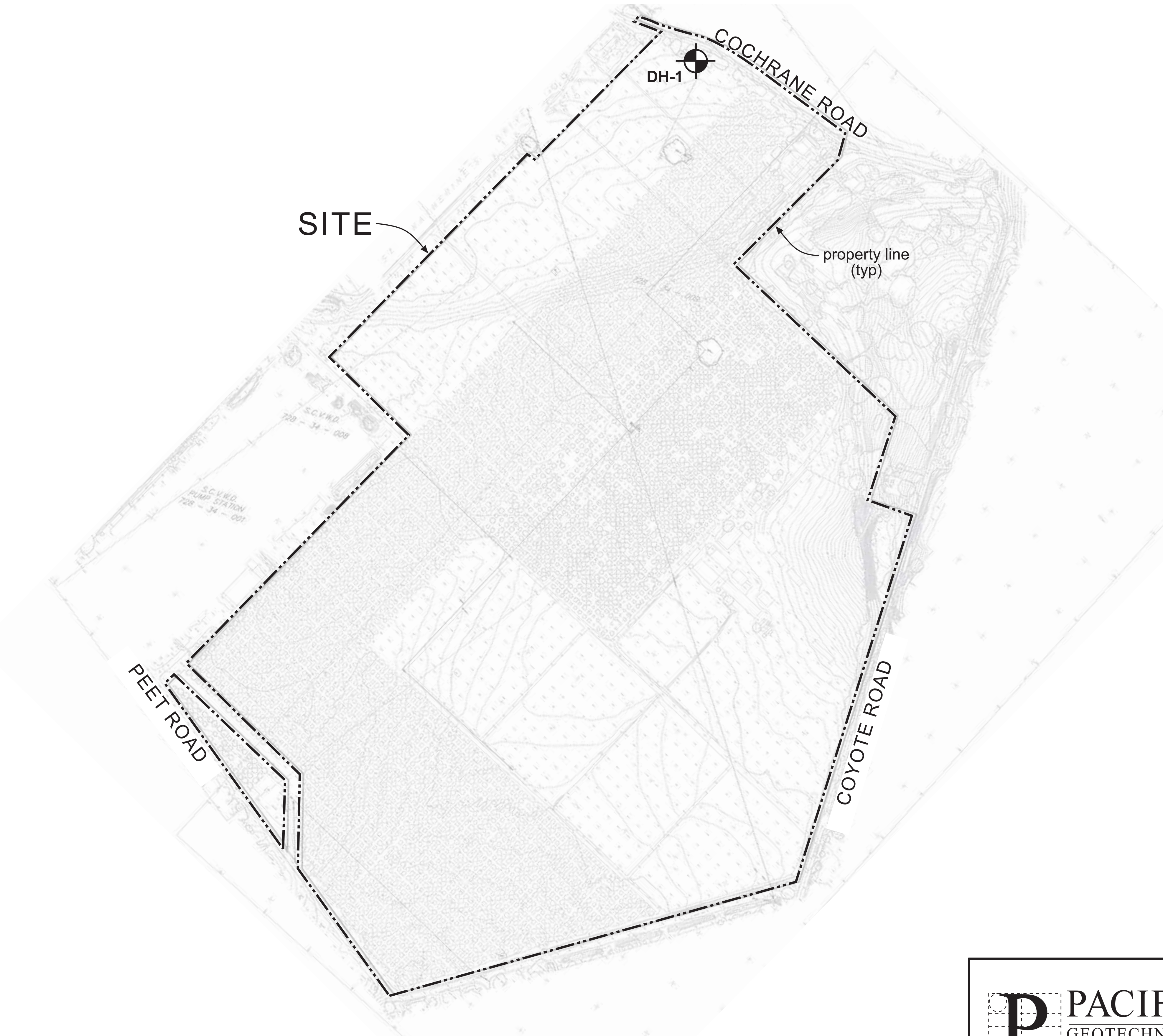
| Boring Designation | Depth | CRR | CSR | FS |
|---|---|---|---|---|
| B1 | 30 | THC | 0.42 | THC |
| B1 | 35 | THC | 0.45 | THC |
| B1 | 40 | THC | 0.34 | THC |
| B1 | 45 | 0.30 | 0.43 | 0.70 |
| B1 | 50 | 0.31 | 0.44 | 0.71 |
| B2 | 31 | 0.26 | 0.38 | 0.68 |
| B2 | 42 | THC | 0.49 | THC |

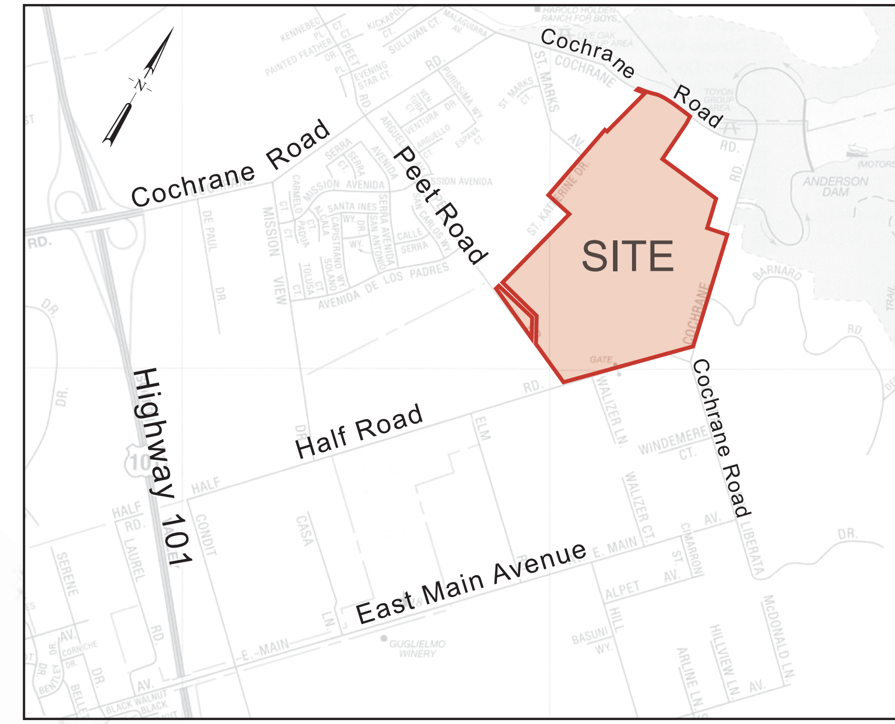
THC = CRR capped at 4, in high seismicity cases, verify

**APPENDIX C**

Percolation Test Results, Boring Logs, Test Pit Logs and Laboratory Test Data (by others)

APPENDIX C




VICINITY MAP - no scale

**EXPLANATION**

DH-1 Exploratory drill hole

0 400 ft

**BASE:** Pdf file titled "Layout - Borello Model," received electonically.

| PACIFIC GEOTECHNICAL ENGINEERING | DATE JUNE 2010 | SAN SEBASTIAN DEVELOPMENT LIQUEFACTION EVALUATION<br>COCHRANE ROAD MORGAN HILL, CALIFORNIA | FIGURE 1<br>PROJECT 2304E |
|---|---|---|---|

# LIQUEFACTION EVALUATION

Project Name: San Sebastian
Project #: 2304E
Date: 6/15/2010

INPUT CELLS IN RED

| Boring | Sand Depth Interval (feet) | | | Unit Weight (pcf) $\gamma$ | Depth at sampling (feet) | Ground water depth at time of sampling (feet) | $\sigma_o$ (psf) | $\sigma_o'$ for sampler correction (psf) | $\sigma_o'$ for CSReq analysis (psf) | N field | Sampler | Hammer Type | N corrected for sampler | N corrected for hammer | Depth Correction $C_N$ | Rod Length Correction | $(N_1)_{60}$ | Fines Content | $(N_1)_{60CS}$ | $r_d$ | Cyclic Shear Stress Ratio From Earthquake $CSR_{eq}$ | CSR Needed to Cause Liquef $CSR_l$ (from figure) | $CSR_l$ with Mag Correct | Factor of Safety F/S |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DH-1 | 18.0 | to | 22.0 | 125.0 | 19.0 | 39.0 | 2500 | 2375 | 2375 | 26 | spt | MD | 1.00 | 1.16 | 0.92 | 0.85 | 24 | 13 | 26 | 0.95 | 0.46 | 0.48 | 0.58 | 1.24 |
| DH-1 | 22.0 | to | 27.0 | 125.0 | 24.0 | 39.0 | 3063 | 3000 | 3000 | 28 | spt | MD | 1.00 | 1.16 | 0.82 | 0.95 | 25 | 18 | 30 | 0.94 | 0.44 | nl | ind | ind |
| DH-1 | 32.0 | to | 36.0 | 125.0 | 34.0 | 39.0 | 4250 | 4250 | 4000 | 32 | spt | MD | 1.00 | 1.16 | 0.69 | 0.95 | 24 | 14 | 27 | 0.90 | 0.44 | nl | ind | ind |

Projected Earthquake Conditions

$a_{max}$ = 0.71 in g's
GWater Depth = 30 feet
Predominant EQ = 7.0
Mag Correction = 1.2

Conditions at time of exploratory sampling

GWater Depth (min) = 40 feet
GWater Depth (max) = 40 feet

NOTE: Use the following for sampler designations

spt = Standard Penetration Sampler
MC = Modified California (2.0" liners)
DM = Dames & Moore Sampler (2.5" liners)

NOTE: Use the following hammer types
MD = CME or Mobile wire winch
CS = Cathead with safety hammer
CD = Cathead with donut hammer

NOTE: For layers determined to be nonliquefiable, the Factor of Safety may be indeterminant
nl = nonliquefiable
Ind = indeterminant

For high levels of design ground motion, factors of safety may be indeterminant. For example, if $(N_1)_{60}$ = 21, M = 7.5 and fines content = 35%, liquefaction strengths cannot be accurately defined due to the vertical asymptote on the empirical strength curve

# APPENDIX A
# KEYS TO SOIL CLASSIFICATION
# AND
# DRILL HOLE LOG

| DATE: 5/27/2010 | LOG OF EXPLORATORY DRILL HOLE | DH- 1 |
|---|---|---|

**PROJECT NAME:** Borello Subdivision **PROJECT NUMBER:** 2304 E

**DRILL RIG:** Mobile B56, 140# downhole hammer with wire winch **LOGGED BY:** CSS

**HOLE DIAMETER:** 8" hollow stem auger **HOLE ELEVATION:** -----

**SAMPLER:**
D = 3" OD, 2½" ID Split-spoon
X = 2½" OD, 2" ID Split-spoon
I = Standard Penetrometer (2" OD SPT)
S = Slough in sample

**GROUND WATER DEPTH:** **Initial:** 39' **Final:** 40'

| DESCRIPTION OF EARTH MATERIALS<br>Drilled in irrigated, plowed field 40 feet from road | SOIL TYPE | DEPTH (ft) | SAMPLE | BLOWS PER FOOT | POCKET PEN (tsf) | % PASSING #200 SIEVE | LIQUID LIMIT | WATER CONTENT | PLASTICITY INDEX | DRY DENSITY (pcf) | FAILURE STRAIN (%) | UNCONFINED COMPRESSIVE STRENGTH (psf) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **ALLUVIUM: CLAY with SAND:** Very dark brown (10YR 2/2); moist; stiff; 10 to 20% fine sand, minor medium to coarse sand; with fine to coarse gravel and cobbles; sand and gravel are mostly subrounded; upper 12 inches tilled | CI | 1 | S D D | 28 | | | | 19 | | 107 | | |
| | GC/ SC | 2 | | | | | | | | | | |
| **CLAYEY GRAVEL with SAND to CLAYEY SAND with GRAVEL:** Dark brown (10YR 3/3); dry to moist; medium dense; 20 to 25% clayey fines; 10 to 40% fine to coarse mostly subrounded sand; with fine to coarse mostly subrounded gravel and cobbles; drills gravellly at 6 feet, cobble size clast | | 3 | | | | | | | | | | |
| | | 4 | | | | | | | | | | |
| | | 5 | S D | 50/6" | | | | 4 | | | | |
| | | 6 | | | | | | | | | | |
| | | 7 | | | | | | | | | | |
| | | 8 | | | | | | | | | | |
| | | 9 | I | 50/3" | | | | | | | | |
| | | 10 | | | | | | | | | | |
| | | 11 | | | | | | | | | | |
| | | 12 | | | | | | | | | | |
| | | 13 | | | | | | | | | | |
| | | 14 | S I I | 54 | | | | 6 | | | | |
| | | 15 | | | | | | | | | | |
| | | 16 | | | | | | | | | | |
| | | 17 | | | | | | | | | | |
| | | 18 | | | | | | | | | | |
| some intervals of **CLAYEY SAND with GRAVEL** | | 19 | S I I | 26 | | 13 | | 11 | | | | |
| | | 20 | | | | | | | | | | |

| DATE: 5/27/2010 | LOG OF EXPLORATORY DRILL HOLE | DH- 1 |
|---|---|---|

**PROJECT NAME:** Borello Subdivision  **PROJECT NUMBER:** 2304 E

**DRILL RIG:** Mobile B56, 140# downhole hammer with wire winch  **LOGGED BY:** CSS

**HOLE DIAMETER:** 8" hollow stem auger  **HOLE ELEVATION:** -----

**SAMPLER:**
D = 3" OD, 2½" ID Split-spoon
X = 2½" OD, 2" ID Split-spoon
I = Standard Penetrometer (2" OD SPT)
S = Slough in sample

**GROUND WATER DEPTH:** Initial: 39' Final: 40'

| DESCRIPTION OF EARTH MATERIALS | SOIL TYPE | DEPTH (ft) | SAMPLE | BLOWS PER FOOT | POCKET PEN (tsf) | % PASSING #200 SIEVE | LIQUID LIMIT | WATER CONTENT | PLASTICITY INDEX | DRY DENSITY (pcf) | FAILURE STRAIN (%) | UNCONFINED COMPRESSIVE STRENGTH (psf) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CLAYEY GRAVEL with SAND to CLAYEY SAND with GRAVEL:** (continued) | GC/ SC | | | | | | | | | | | |
| | | 21 | | | | | | | | | | |
| | | 22 | | | | | | | | | | |
| | | 23 | | | | | | | | | | |
| moisture increases at 24 feet | | 24 | S I I | 28 | | 18 | | 15 | | | | |
| | | 25 | | | | | | | | | | |
| | | 26 | | | | | | | | | | |
| | | 27 | | | | | | | | | | |
| | | 28 | | | | | | | | | | |
| wet; drills smooth; no recovery | | 29 | S I I | 41 | | | | | | | | |
| | | 30 | | | | | | | | | | |
| | | 31 | | | | | | | | | | |
| | | 32 | | | | | | | | | | |
| | | 33 | | | | | | | | | | |
| drills rough | | 34 | S I I | 32 | | 14 | | 12 | | | | |
| | | 35 | | | | | | | | | | |
| | | 36 | | | | | | | | | | |
| | | 37 | | | | | | | | | | |
| | | 38 | | | | | | | | | | |
| groundwater | | 39 | S I | 50/1" | | | | | | | | |
| | | 40 | | | | | | | | | | |

| DATE: 5/27/2010 | LOG OF EXPLORATORY DRILL HOLE | DH- 1 |
|---|---|---|

**PROJECT NAME:** Borello Subdivision **PROJECT NUMBER:** 2304 E

**DRILL RIG:** Mobile B56, 140# downhole hammer with wire winch **LOGGED BY:** CSS

**HOLE DIAMETER:** 8" hollow stem auger **HOLE ELEVATION:** -----

**SAMPLER:**
D = 3" OD, 2½" ID Split-spoon
X = 2½" OD, 2" ID Split-spoon
I = Standard Penetrometer (2" OD SPT)
S = Slough in sample

**GROUND WATER DEPTH:** Initial: 39' Final: 40'

| DESCRIPTION OF EARTH MATERIALS | SOIL TYPE | DEPTH (ft) | SAMPLE | BLOWS PER FOOT | POCKET PEN (tsf) | % PASSING #200 SIEVE | LIQUID LIMIT | WATER CONTENT | PLASTICITY INDEX | DRY DENSITY (pcf) | FAILURE STRAIN (%) | UNCONFINED COMPRESSIVE STRENGTH (psf) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CLAYEY GRAVEL with SAND to CLAYEY SAND with GRAVEL:** (continued) | GC/SC | 41 | | | | | | | | | | |
| | | 42 | | | | | | | | | | |
| | | 43 | | | | | | | | | | |
| fine to coarse mostly subrounded sand; minor gravel | | 44 | S | | | | | | | | | |
| | | 45 | I I | 36 | | | | | | | | |
| | | 46 | | | | | | | | | | |
| | | 47 | | | | | | | | | | |
| | | 48 | | | | | | | | | | |
| | | 49 | I | 50/6" | | | | | | | | |
| **BOTTOM OF HOLE = 49 Feet** Groundwater Encountered at 39 feet | | 50 | | | | | | | | | | |
| | | 51 | | | | | | | | | | |
| | | 52 | | | | | | | | | | |
| | | 53 | | | | | | | | | | |
| | | 54 | | | | | | | | | | |
| | | 55 | | | | | | | | | | |
| | | 56 | | | | | | | | | | |
| | | 57 | | | | | | | | | | |
| | | 58 | | | | | | | | | | |
| | | 59 | | | | | | | | | | |
| | | 60 | | | | | | | | | | |

PACIFIC
GEOTECHNICAL
ENGINEERING

16055-D Caputo Drive, Morgan Hill, CA 95037
(408) 778-2818 ▪ FAX (408) 779-6879
info@pacific-geotechnical.com

June 22, 2010
Project 2304-1E

Mr. Chris Borello
South County Realty
17045 Monterey Street, Suite A
Morgan Hill, CA 95037

SUBJECT: **Percolation Testing**
Proposed San Sebastian Subdivision
122 Acres off of Cochran Road
Morgan Hill, California

Dear Mr. Borello:

As you requested, we have performed percolation testing at the site of the San Sebastian Subdivision to be located on the south side of Cochran Avenue in Morgan Hill, California.

## PROJECT DESCRIPTION

The irregular-shaped site is bounded by Cochrane Road on the north and east, Half Road on the southeast, and Peet Road on the southwest. The proposed development would consist of construction of an approximately 245-lot residential subdivision with associated improvements.

Grading plans are currently being developed by the project civil engineers, Ruggeri-Jensen-Azar & Associates (RJA). As part of the drainage design, we understand RJA is contemplating incorporating a number of detention basins into the design. We also understand the site grades surrounding the areas of the proposed detention basins will be within 1 to 2 feet of the existing grades and that the planned depth of the basins will be in the range of 3 to 8 feet below the existing grades.

## PURPOSE AND SCOPE OF INVESTIGATION

The objective of this percolation is to explore and evaluate some engineering design properties of on-site soil in the area of the proposed detention basins. For this investigation, we completed the following work to formulate geotechnical parameters for design:

1) Reconnaissance of the site to observe surface conditions, evaluate site access, and mark locations of our percolation test pits.

2) Coordinate with underground utilities and with RJA for location of underground utilities.

3) Review of in-house geotechnical information pertaining to the site.

4) Prepare and perform percolation testing in five test pits at the detention basin locations to obtain a measure of the permeability.

5) Engineering analysis of the field and laboratory data to formulate conclusions and recommendations for the project.

6) Preparation of this report summarizing our findings, conclusions and recommendations.

## USDA SOIL SURVEY

As part of our literature review, we reviewed the Santa Clara County Soil Survey for information pertinent to evaluation of the site soil permeability. Soils maps prepared by the USDA indicate that soils are generally relatively coarse, with major soil units including:

- Arbuckle gravelly loam (0 to 2% slopes) – lower (southern) part of alluvial fan, low plasticity
- Garretson gravelly loam (0 to 5% slopes) – east edge of property, near hillslopes (reflects hillslope derivation), low plasticity to non-plastic
- Keefers clay loam (0 to 2% slopes) – upper (northeastern) part of alluvial fan, low plasticity
- Pleasanton loam (0 to 2% slopes) – lower (southern) part of alluvial fan, and younger Coyote Ck alluvium, low to medium plasticity
- Pleasanton gravelly loam (2 to 9% slopes) – NE-SW strip at transition between older and younger alluvium, low to medium plasticity

The permeability of the soil units in the area of the proposed detention basins as referenced by the USDA are provided in the following table:

| Test Pit | USDA Soil Type* | Layer Depth (inches) | Permeability (inches per hour)* | Permeability (cm per sec) |
|---|---|---|---|---|
| 1 | Arbuckle gravelly loam, ArA | 0 – 40<br>40 – 60 | 0.63 – 2.00<br>2.00 – 6.30 | $0.44 – 1.41\times10^{-3}$<br>$1.41 – 4.44\times10^{-3}$ |
| 2 | Keefers clay Loam, KeA | 0 – 23<br>23 – 38<br>38 – 60 | 0.20 – 0.63<br>0.06 – 0.20<br>0.06 – 0.20 | $1.41 – 4.44\times10^{-4}$<br>$0.42 – 1.41\times10^{-4}$<br>$0.42 – 1.41\times10^{-4}$ |
| 3 | Pleasanton gravelly Loam, PpC | 0 – 60 | 0.20 – 0.63 | $1.41 – 4.44\times10^{-4}$ |
| 4 | Garretson loam, GaA | 0 – 40<br>40 – 60 | 0.63 – 2.00<br>>20.0 | $0.44 – 1.41\times10^{-3}$<br>$> 1.41\times10^{-2}$ |
| 5 | Pleasanton loam, PoA | 0 – 60 | 0.20 – 0.63 | $1.41 – 4.44\times10^{-4}$ |

* Soils Survey of Eastern Santa Clara Area, California, 1974, published by the U.S. Department of Agriculture, Soil Conservation Service

## PERCOLATION TESTING

For measurement of permeability, we chose to run percolation tests, which included excavating test pits at each of the 5 proposed detention basin locations, allowing us to view the soil exposed in the area of the proposed basins. Two percolation tests were run in each of the test pits at different depths, generally one at approximately 2 feet and one at approximately 5 feet below the ground surface. Their approximate locations of the test pits are shown on our Site Plan, Figure 1.

The soil conditions encountered in the test pits were somewhat variable, but may be broadly characterized by horizontal layers including an upper sandy clay layer that extends to between 2 and 3 feet below the ground surface underlain by clayey gravel. For a more detailed description of the soils encountered in our test pits, refer to the test pit logs appended to this report.

In all, ten percolation tests were conducted. Each test hole was excavated approximately 12 inches deep and 12 inches in diameter. A 4-inch diameter perforated PVC pipe was centered in the hole and extended from the bottom of the hole to above the top of the hole. Drain rock was placed around the pipe in the bottom of the hole. The holes were presoaked the day before testing by filling the test holes to the top of each hole. On the day of testing, each pipe was filled with water. Measurements were taken over time as the water percolated into the underlying native soils. The table below presents hole depths, a coefficient of permeability derived from average rate of water loss, and recommended minimum depth of detention basin. The minimum basin depth is primarily based on the depth of transition from the more clayey surficial soil to a more granular soil, where this transition exists.

## CONCLUSIONS AND RECOMMENDATIONS

Based on the percolation test results reported above, we recommend the proposed detention ponds be designed using the coefficients of permeability, **k**, in the following table.

| Percolation Test Number | Depth of Test Below Exiting Ground Surface (feet) | Coefficient of Permeability (inches per hour) | Coefficient of Permeability (cm per sec) | Recommended Minimum Depth of Detention Basin (feet) |
|---|---|---|---|---|
| 1A<br>1B | 1.4<br>5.3 | 0.75<br>7.93 | $5.3x10^{-4}$<br>$5.6x10^{-3}$ | 3 |
| 2A<br>2B | 2.0<br>5.0 | 0.30<br>9.78 | $2.1x10^{-4}$<br>$6.9x10^{-3}$ | 3 |
| 3A<br>3B | 1.4<br>5.0 | 1.06<br>1.56 | $7.5x10^{-4}$<br>$1.1x10^{-3}$ | 3.5 |
| 4A<br>4B | 2.2<br>4.0 | 2.27<br>0.75 | $1.6x10^{-3}$<br>$5.3x10^{-4}$ | 4.5 |
| 5A<br>5B | 2.2<br>5.8 | 0.45<br>0.75 | $3.2x10^{-4}$<br>$5.3x10^{-4}$ | 5 |

We did not evaluate the fluctuation in the groundwater table below the site. It should be noted that groundwater depth is subject to seasonal fluctuations depending on rainfall, local irrigation or similar factors. Variations in the groundwater level will effect the ability of the detention system to absorb water into the native groundwater regime.

We recommend that the base of the detention systems extend into the sand layer noted above to provide better water infiltration than would be provided by the overlying clayey soil. If subexcavation below detention system design grade is required to reach sand material, the excavation should be backfilled with clean crushed rock compacted to at least 90 percent relative compaction. Relative compaction is defined as the in-place dry density of the compacted soil divided by the laboratory maximum dry density as determined by ASTM Test Method D1557, latest edition, expressed as a percentage. We should review the detention basin designs when they become available.

## LIMITATIONS

In preparing the findings and professional opinions presented in this report, we have endeavored to follow generally accepted principles and practices of the engineering geologic and geotechnical engineering professions in the area and at the time our services were performed. No warranty, express or implied, is provided.

The conclusions and recommendations contained in this report are based, in part, on information that has been provided to us. In the event that the general development concept or general location and type of structures are modified, our conclusions and recommendations shall not be considered valid unless we are retained to review such changes and to make any necessary additions or changes to our recommendations.

Subsurface exploration is necessarily confined to selected locations and conditions may, and often do, vary between these locations. Should conditions different from those described in this report be encountered during project development, PGE should be consulted to review the conditions and determine whether our recommendations are still valid. Additional exploration, testing, and analysis may be required for such evaluation.

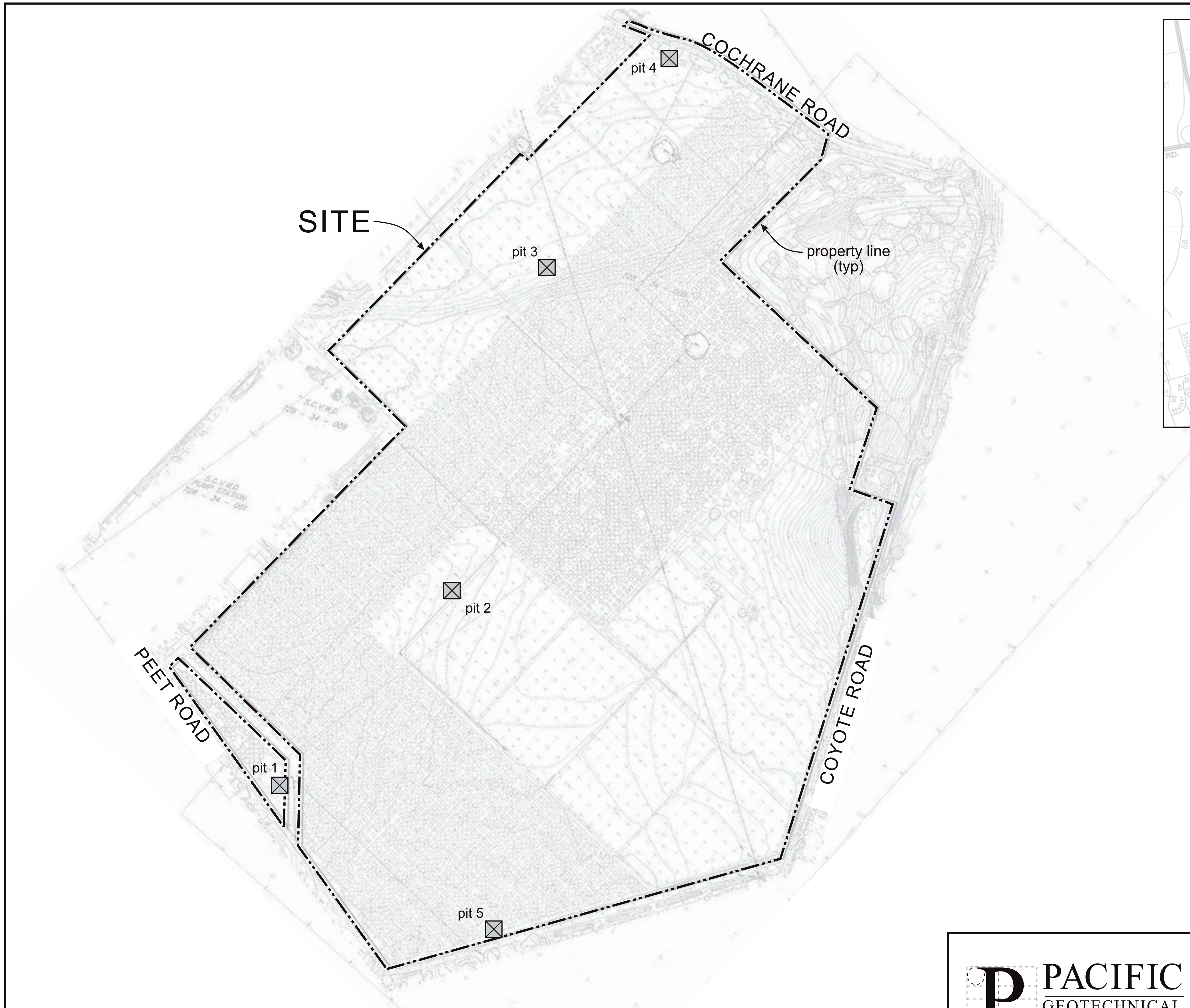
The findings, conclusions and recommendations presented in this report are applicable only to the specific project development on this specific site. These data should not be used for other projects, sites or purposes unless they are reviewed by PGE or a qualified geotechnical professional.

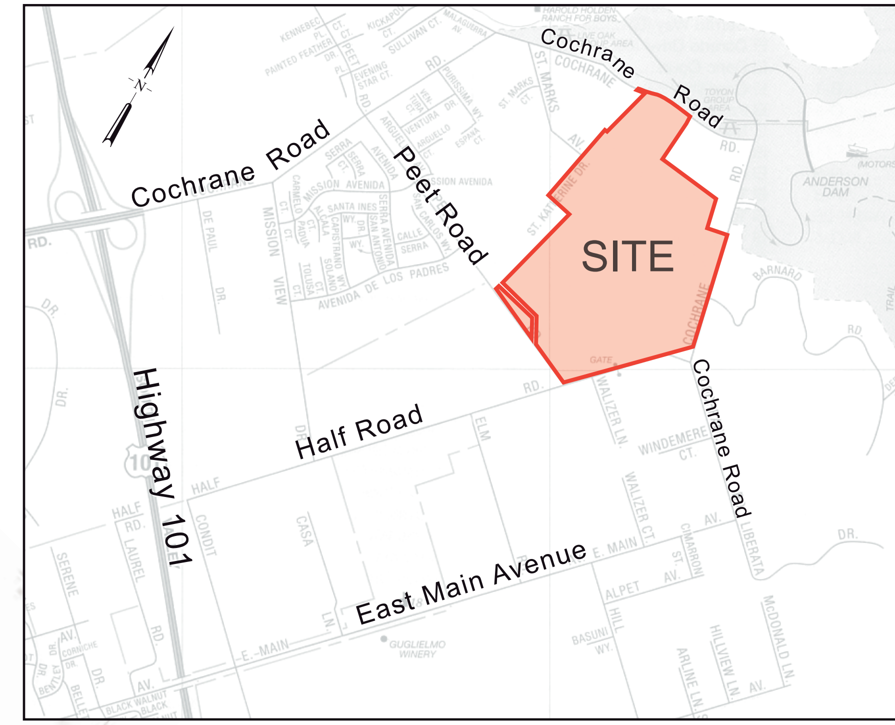
Report prepared by,

PACIFIC GEOTECHNICAL ENGINEERING


Daniel J. Peluso
GE 2367

Attachments:
- Figure 1 – Site Plan
- Test Pit Logs 1 - 5




VICINITY MAP - no scale

**EXPLANATION**

pit 5 ☒ Percolation test pit

0 400 ft

| PACIFIC GEOTECHNICAL ENGINEERING | DATE<br>JUNE<br>2010 | SAN SEBASTIAN DEVELOPMENT<br>PERCOLATION TESTING<br><br>COCHRANE ROAD<br>MORGAN HILL, CALIFORNIA | FIGURE<br>1<br><br>PROJECT<br>2304-1E |
|---|---|---|---|

**BASE:** Pdf file titled "Layout - Borello Model," received electonically.

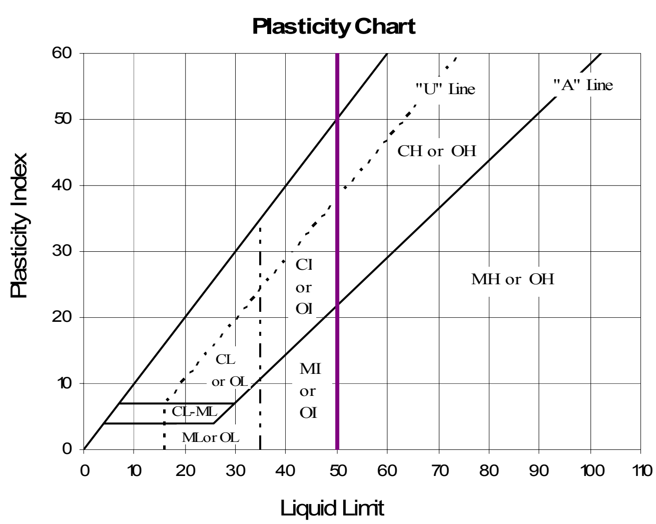
## KEY TO SOIL CLASSIFICATION - FINE GRAINED SOILS
### (50% OR MORE IS SMALLER THAN NO. 200 SIEVE SIZE)
**(modified from ASTM D2487 to include fine grained soils with intermediate plasticity)**

| MAJOR DIVISIONS | | | GROUP SYMBOLS | GROUP NAMES |
|---|---|---|---|---|
| SILTS AND CLAYS (Liquid Limit less than 35) Low Plasticity | Inorganic | PI < 4 or plots below “A” line | ML | Silt, Silt with Sand or Gravel, Sandy or Gravelly Silt, Sandy or Gravelly Silt with Sand or Gravel |
| | Inorganic | PI > 7 or plots on or above “A” line | CL | Lean Clay, Lean Clay with Sand or Gravel, Sandy or Gravelly Lean Clay, Sandy or Gravelly Lean Clay with Sand or Gravel |
| | Inorganic | PI between 4 and 7 | CL-ML | Silty Clay, Silty Clay with Sand or Gravel, Sandy or Gravelly Silty Clay, Sandy or Gravelly Silty Clay with Sand or Gravel |
| | Organic | See footnote 3 | OL | Organic Silt (below “A” Line) or Organic Clay (on or above “A” Line) (1,2) |
| SILTS AND CLAYS (35 ≤ Liquid Limit < 50) Intermediate Plasticity | Inorganic | PI < 4 or plots below “A” line | MI | Silt, Silt with Sand or Gravel, Sandy or Gravelly Silt, Sandy or Gravelly Silt with Sand or Gravel |
| | Inorganic | PI > 7 or plots on or above “A” line | CI | Clay, Clay with Sand or Gravel, Sandy or Gravelly Clay, Sandy or Gravelly Clay with Sand or Gravel |
| | Organic | See footnote 3 | OI | Organic Silt (below “A” Line) or Organic Clay (on or above “A” Line) (1,2) |
| SILTS AND CLAYS (Liquid Limit 50 or greater) High Plasticity | Inorganic | PI plots below “A” line | MH | Elastic Silt, Elastic Silt with Sand or Gravel, Sandy or Gravelly Elastic Silt, Sandy or Gravelly Elastic Silt with Sand or Gravel |
| | Inorganic | PI plots on or above “A” line | CH | Fat Clay, Fat Clay with Sand or Gravel, Sandy or Gravelly Fat Clay, Sandy or Gravelly Fat Clay with Sand or Gravel |
| | Organic | See note 3 below | OH | Organic Silt (below “A” Line) or Organic Clay (on or above “A” Line) (1,2) |

1. If soil contains 15% to 29% plus No. 200 material, include “with sand” or “with gravel” to group name, whichever is predominant.
2. If soil contains ≥30% plus No. 200 material, include “sandy” or “gravelly” to group name, whichever is predominant. If soil contains ≥15% of sand or gravel sized material, add “with sand” or “with gravel” to group name.
3. Ratio of liquid limit of oven dried sample to liquid limit of not dried sample is less than 0.75.

| CONSISTENCY | UNCONFINED SHEAR STRENGTH (KSF) | STANDARD PENETRATION (BLOWS/FOOT) |
|---|---|---|
| VERY SOFT | < 0.25 | < 2 |
| SOFT | 0.25 – 0.5 | 2 – 4 |
| FIRM | 0.5 – 1.0 | 5 – 8 |
| STIFF | 1.0 – 2.0 | 9 – 15 |
| VERY STIFF | 2.0 – 4.0 | 16 – 30 |
| HARD | > 4.0 | > 30 |

| MOISTURE | CRITERIA |
|---|---|
| Dry | Absence of moisture, dusty, dry to the touch |
| Moist | Damp, but no visible water |
| Wet | Visible free water, usually soil is below the water table |




**PACIFIC GEOTECHNICAL ENGINEERING**

## KEY TO SOIL CLASSIFICATION – COARSE GRAINED SOILS
### (MORE THAN 50% IS LARGER THAN NO. 200 SIEVE SIZE)
**(modified from ASTM D2487 to include fines with intermediate plasticity)**

| MAJOR DIVISIONS | | | GROUP SYMBOLS | GROUP NAMES[1] |
|---|---|---|---|---|
| **GRAVELS** (more than 50% of coarse fraction is larger than No. 4 sieve size) | Gravels with less than 5% fines | $Cu \geq 4$ and $1 \leq Cc \leq 3$ | GW | Well Graded Gravel, Well Graded Gravel with Sand |
| | | $Cu < 4$ and/or $1 > Cc > 3$ | GP | Poorly Graded Gravel, Poorly Graded Gravel with Sand |
| | Gravels with 5% to 12% fines | ML, MI or MH fines | GW-GM | Well Graded Gravel with Silt, Well Graded Gravel with Silt and Sand |
| | | | GP-GM | Poorly Graded Gravel with Silt, Poorly Graded Gravel with Silt and Sand |
| | | CL, CI or CH fines | GW-GC | Well Graded Gravel with Clay, Well Graded Gravel with Clay and Sand |
| | | | GP-GC | Poorly Graded Gravel with Clay, Poorly Graded Gravel with Clay and Sand |
| | Gravels with more than 12% fines | ML, MI or MH fines | GM | Silty Gravel, Silty Gravel with Sand |
| | | CL, CI or CH fines | GC | Clayey Gravel, Clayey Gravel with Sand |
| | | CL-ML fines | GC-GM | Silty Clayey Gravel; Silty, Clayey Gravel with Sand |
| **SANDS** (50% or more of coarse fraction is smaller than No. 4 sieve size) | Sands with less than 5% fines | $Cu \geq 6$ and $1 \leq Cc \leq 3$ | SW | Well Graded Sand, Well Graded Sand with Gravel |
| | | $Cu < 6$ and/or $1 > Cc > 3$ | SP | Poorly Graded Sand, Poorly Graded Sand with Gravel |
| | Sands with 5% to 12% fines | ML, MI or MH fines | SW-SM | Well Graded Sand with Silt, Well Graded Sand with Silt and Gravel |
| | | | SP-SM | Poorly Graded Sand with Silt, Poorly Graded Sand with Silt and Gravel |
| | | CL, CI or CH fines | SW-SC | Well Graded Sand with Clay, Well Graded Sand with Clay and Gravel |
| | | | SP-SC | Poorly Graded Sand with Clay, Poorly Graded Sand with Clay and Gravel |
| | Sands with more than 12% fines | ML, MI or MH fines | SM | Silty Sand, Silty Sand with Gravel |
| | | CL, CI or CH fines | SC | Clayey Sand, Clayey Sand with Gravel |
| | | CL-ML fines | SC-SM | Silty, Clayey Sand; Silty, Clayey Sand with Gravel |

**US STANDARD SIEVES** 3 Inch ¾ Inch No. 4 No. 10 No. 40 No. 200

| | | | | | | |
|---|---|---|---|---|---|---|
| | COARSE | FINE | COARSE | MEDIUM | FINE | |
| COBBLES & BOULDERS | GRAVELS | | SANDS | | | SILTS AND CLAYS |

| RELATIVE DENSITY (SANDS AND GRAVELS) | STANDARD PENETRATION (BLOWS/FOOT) |
|---|---|
| Very Loose | 0 - 4 |
| Loose | 5 – 10 |
| Medium Dense | 11 – 30 |
| Dense | 31 - 50 |
| Very Dense | 50+ |

1. Add "with sand" to group name if material contains 15% or greater of sand-sized particle. Add "with gravel" to group name if material contains 15% or greater of gravel-sized particle.

| MOISTURE CRITERI | A |
|---|---|
| Dry | Absence of moisture, dusty, dry to the touch |
| Moist | Damp, but no visible water |
| Wet | Visible free water, usually soi is below the water table |

**PACIFIC GEOTECHNICAL ENGINEERING**

| DATE: 6/2/2010 | LOG OF TEST PIT | Pit 1 |
|---|---|---|

**PROJECT NAME:** San Sebastian Subdivision **PROJECT NUMBER:** 2304 1E

**DRILL RIG:** Backhoe **LOGGED BY:** JF

**HOLE DIAMETER:** **HOLE ELEVATION:** -----

**SAMPLER:**
D = 3" OD, 2½" ID Split-spoon
X = 2½" OD, 2" ID Split-spoon
I = Standard Penetrometer (2" OD SPT)
S = Slough in sample

**GROUND WATER DEPTH:** **Initial:** --- **Final:** ---

| DESCRIPTION OF EARTH MATERIALS | SOIL TYPE | DEPTH (ft) | SAMPLE | BLOWS PER FOOT | POCKET PEN (tsf) | % PASSING #200 SIEVE | LIQUID LIMIT | WATER CONTENT | PLASTICITY INDEX | DRY DENSITY (pcf) | FAILURE STRAIN (%) | UNCONFINED COMPRESSIVE STRENGTH (psf) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **LEAN CLAY with SAND:** Brown to olive brown; moist; stiff to very stiff; trace coarse gravel; fine sand; upper ½ foot plowed | CL | 1 | | | | | | | | | | |
| | | 2 | | | | | | | | | | |
| **CLAYEY GRAVEL:** Brown to gray brown; moist; medium dense; coarse gravel to rounded cobbles with minor small boulders; matrix supported; well graded; poorly stratified; local weak stratification of sand/gravel lenses; clayey matrix | GC | 3 | | | | | | | | | | |
| | | 4 | | | | | | | | | | |
| | | 5 | | | | | | | | | | |
| **BOTTOM OF HOLE = 5.3 Feet**<br>No Groundwater Encountered | | 6 | | | | | | | | | | |
| | | 7 | | | | | | | | | | |
| | | 8 | | | | | | | | | | |
| | | 9 | | | | | | | | | | |
| | | 10 | | | | | | | | | | |
| | | 11 | | | | | | | | | | |
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| | | 16 | | | | | | | | | | |
| | | 17 | | | | | | | | | | |
| | | 18 | | | | | | | | | | |
| | | 19 | | | | | | | | | | |
| | | 20 | | | | | | | | | | |

| DATE: 6/2/2010 | LOG OF TEST PIT | Pit 2 |
|---|---|---|

PROJECT NAME: San Sebastian Subdivision — PROJECT NUMBER: 2304 1E

DRILL RIG: Backhoe — LOGGED BY: JF

HOLE DIAMETER: — HOLE ELEVATION: -----

SAMPLER:
D = 3" OD, 2½" ID Split-spoon
X = 2½" OD, 2" ID Split-spoon
I = Standard Penetrometer (2" OD SPT)
S = Slough in sample

GROUND WATER DEPTH: Initial: --- Final: ---

| DESCRIPTION OF EARTH MATERIALS | SOIL TYPE | DEPTH (ft) | SAMPLE | BLOWS PER FOOT | POCKET PEN (tsf) | % PASSING #200 SIEVE | LIQUID LIMIT | WATER CONTENT | PLASTICITY INDEX | DRY DENSITY (pcf) | FAILURE STRAIN (%) | UNCONFINED COMPRESSIVE STRENGTH (psf) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **SANDY LEAN CLAY:** Olive brown; moist; stiff; fine sand fraction; trace coarse gravel and cobbles at base of unit | CL | 1 | | | | | | | | | | |
| | | 2 | | | | | | | | | | |
| **CLAYEY GRAVEL with SAND:** Light brown to reddish brown; moist; dense; matrix supported; poorly graded; rounded fine to coarse gravel with cobbles and trace of boulders | GC | 3 | | | | | | | | | | |
| | SP | 4 | | | | | | | | | | |
| **POORLY GRADED SAND with GRAVEL:** Brown to reddish brown; moist; medium dense; coarse-grained rounded sand, gravel and pebbles; minor cobbles to 6 inches; locally well graded | | 5 | | | | | | | | | | |
| | | 6 | | | | | | | | | | |
| **BOTTOM OF HOLE = 6 Feet** No Groundwater Encountered | | 7 | | | | | | | | | | |
| | | 8 | | | | | | | | | | |
| | | 9 | | | | | | | | | | |
| | | 10 | | | | | | | | | | |
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| | | 19 | | | | | | | | | | |
| | | 20 | | | | | | | | | | |

| DATE: 6/2/2010 | LOG OF TEST PIT | Pit 3 |
|---|---|---|

**PROJECT NAME:** San Sebastian Subdivision  **PROJECT NUMBER:** 2304 1E

**DRILL RIG:** Backhoe  **LOGGED BY:** JF

**HOLE DIAMETER:**  **HOLE ELEVATION:** -----

**SAMPLER:**
D = 3" OD, 2½" ID Split-spoon
X = 2½" OD, 2" ID Split-spoon
I = Standard Penetrometer (2" OD SPT)
S = Slough in sample

**GROUND WATER DEPTH:** Initial: --- Final: ---

| DESCRIPTION OF EARTH MATERIALS | SOIL TYPE | DEPTH (ft) | SAMPLE | BLOWS PER FOOT | POCKET PEN (tsf) | % PASSING #200 SIEVE | LIQUID LIMIT | WATER CONTENT | PLASTICITY INDEX | DRY DENSITY (pcf) | FAILURE STRAIN (%) | UNCONFINED COMPRESSIVE STRENGTH (psf) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **LEAN CLAY with SAND:** Dark brown to brown; moist; stiff to very stiff; trace gravel; | CL | 1 | | | | | | | | | | |
| **SANDY LEAN CLAY:** Medium brown; moist; stiff; with fine gravel | CL | 2 | | | | | | | | | | |
| **CLAYEY GRAVEL with SAND:** Medium brown; moist; dense; mostly subrounded to rounded coarse gravel and cobbles with a trace of boulders | GC | 3 | | | | | | | | | | |
| | | 4 | | | | | | | | | | |
| | | 5 | | | | | | | | | | |
| **BOTTOM OF HOLE = 5 Feet**<br>No Groundwater Encountered | | 6 | | | | | | | | | | |
| | | 7 | | | | | | | | | | |
| | | 8 | | | | | | | | | | |
| | | 9 | | | | | | | | | | |
| | | 10 | | | | | | | | | | |
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| | | 20 | | | | | | | | | | |

| DATE: 6/2/2010 | LOG OF TEST PIT | Pit 4 |
|---|---|---|

**PROJECT NAME:** San Sebastian Subdivision **PROJECT NUMBER:** 2304 1E

**DRILL RIG:** Backhoe **LOGGED BY:** JF

**HOLE DIAMETER:** **HOLE ELEVATION:** -----

**SAMPLER:**
D = 3" OD, 2½" ID Split-spoon
X = 2½" OD, 2" ID Split-spoon
I = Standard Penetrometer (2" OD SPT)
S = Slough in sample

**GROUND WATER DEPTH:** **Initial:** --- **Final:** ---

| DESCRIPTION OF EARTH MATERIALS | SOIL TYPE | DEPTH (ft) | SAMPLE | BLOWS PER FOOT | POCKET PEN (tsf) | % PASSING #200 SIEVE | LIQUID LIMIT | WATER CONTENT | PLASTICITY INDEX | DRY DENSITY (pcf) | FAILURE STRAIN (%) | UNCONFINED COMPRESSIVE STRENGTH (psf) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **SANDY LEAN CLAY:** Olive brown; moist; firm to stiff; very silty; upper 6 inches plowed over 6 inches blocky soil | CL | 1 | | | | | | | | | | |
| | | 2 | | | | | | | | | | |
| | | 3 | | | | | | | | | | |
| **CLAYEY GRAVEL with SAND:** Olive gray; moist; medium dense; coarse rounded gravel and cobbles to 1 foot in diameter | GC | 4 | | | | | | | | | | |
| | | 5 | | | | | | | | | | |
| **BOTTOM OF HOLE = 4 Feet** No Groundwater Encountered | | 6 | | | | | | | | | | |
| | | 7 | | | | | | | | | | |
| | | 8 | | | | | | | | | | |
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| | | 20 | | | | | | | | | | |

**DATE:** 6/2/2010

# LOG OF TEST PIT

**Pit 5**

**PROJECT NAME:** San Sebastian Subdivision

**PROJECT NUMBER:** 2304 1E

**DRILL RIG:** Backhoe

**LOGGED BY:** JF

**HOLE DIAMETER:**

**HOLE ELEVATION:** -----

**SAMPLER:**
D = 3" OD, 2½" ID Split-spoon
X = 2½" OD, 2" ID Split-spoon
I = Standard Penetrometer (2" OD SPT)
S = Slough in sample

**GROUND WATER DEPTH:** Initial: --- Final: ---

| DESCRIPTION OF EARTH MATERIALS | SOIL TYPE | DEPTH (ft) | SAMPLE | BLOWS PER FOOT | POCKET PEN (tsf) | % PASSING #200 SIEVE | LIQUID LIMIT | WATER CONTENT | PLASTICITY INDEX | DRY DENSITY (pcf) | FAILURE STRAIN (%) | UNCONFINED COMPRESSIVE STRENGTH (psf) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **LEAN CLAY with SAND:** Light brown to yellowish brown; dry to moist; stiff to very stiff; trace fine to coarse gravel | CL | 1 | | | | | | | | | | |
| light yellowish brown; increased sand content | | 2 | | | | | | | | | | |
| | | 3 | | | | | | | | | | |
| as above, less sand; well developed peds; reddish brown to dark yellowish brown; very stiff; thin ,fine sand and gravel lense at 5 feet (4 to 5 inches thick) | | 4 | | | | | | | | | | |
| | | 5 | | | | | | | | | | |
| **BOTTOM OF HOLE = 5.8 Feet** No Groundwater Encountered | | 6 | | | | | | | | | | |
| | | 7 | | | | | | | | | | |
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PACIFIC
GEOTECHNICAL
ENGINEERING

16055-D Caputo Drive, Morgan Hill, CA 95037
(408) 778-2818 ▪ FAX (408) 779-6879
info@pacific-geotechnical.com

April 27, 2011
Project 2011.0078

Mr. Chris Borello
South County Realty
17045 Monterey Highway, Suite D
Morgan Hill, CA 95037

SUBJECT: **Supplemental Field Percolation Testing**
Proposed San Sebastian Subdivision, 122 Acres on Cochrane Road,
Morgan Hill, California

Dear Mr. Borello:

This letter presents the results of one percolation test performed by our staff at the subject property. The test location was in the northern portion of the property near Cochrane Road. The objective of the test was to measure soil permeability as it relates to the feasibility of percolation of storm water runoff into the soils in that area.

Our test was performed in a test pit excavated by your representative, to a depth of about 6 feet below ground surface. Materials exposed in the test pit consist of clayey sand with gravel to a depth of about 3½ feet, underlain by clayey gravel with sand and cobbles to the bottom of the test pit at approximately 6 feet.

A test hole was hand excavated by our staff at the bottom of the test pit, to a diameter of about 20 inches and a depth of about 1 foot below the bottom of the test pit. A 4-inch diameter perforated pipe was placed in the center of the test hole and pea gravel was placed in the test hole around the pipe. The hole was then pre-soaked the day before testing. On the day of the testing, the pipe was first filled with water to the top of the test hole. Measurements were taken over time as the water level dropped in the pipe. After water has disappeared in the pipe, additional water was added to bring the water level back to the top of the test hole and additional measurements were taken over time.

Our analysis of the collected data suggests a coefficient of permeability (k) of 4.5 inches per hour may be considered. This k value pertains only to the location and depth of the test performed.

In preparing our findings and professional opinions, we have endeavored to follow generally accepted principles and practices of the engineering geologic and geotechnical engineering professions in the area and at the time our services were performed. No warranty, express or implied, is provided.

Sincerely,
**PACIFIC GEOTECHNICAL ENGINEERING**

Chalerm Sae Liang

Chalerm (Beeson) Liang
Principal Geotechnical Engineer

REGISTERED PROFESSIONAL ENGINEER
CHALERM S. LIANG
GE 2031
EXP. 9-30-2011
GEOTECHNICAL
STATE OF CALIFORNIA

**APPENDIX D**

Guide Contract Specifications

APPENDIX D

# GUIDE CONTRACT SPECIFICATIONS

## PART I - EARTHWORK

PREFACE

These specifications are intended as a guide for the earthwork performed at the subject development project. If there is a conflict between these specifications (including the recommendations of the geotechnical report) and agency or code requirements, it should be brought to the attention of ENGEO and Owner prior to contract bidding.

PART 1 - GENERAL

1.01 WORK COVERED

A. Grading, excavating, filling and backfilling, including trenching and backfilling for utilities as necessary to complete the Project as indicated on the Drawings.

B. Subsurface drainage as indicated on the Drawings.

1.02 CODES AND STANDARDS

A. Excavating, trenching, filling, backfilling, and grading work shall meet the applicable requirements of the Uniform Building Code and the standards and ordinances of state and local governing authorities.

1.03 SUBSURFACE SOIL CONDITIONS

A. The Owners' Geotechnical Exploration report is available for inspection by bidder or Contractor. The Contractor shall refer to the findings and recommendations of the Geotechnical Exploration report in planning and executing his work.

1.04 DEFINITIONS

A. Fill: All soil, rock, or soil-rock materials placed to raise the grades of the site or to backfill excavations.

B. Backfill: All soil, rock or soil-rock material used to fill excavations and trenches.

C. On-Site Material: Soil and/or rock material which is obtained from the site.

D. Imported Material: Soil and/or rock material which is brought to the site from off-site areas.

E. Select Material: On-site and/or imported material which is approved by ENGEO as a specific-purpose fill.

F. Engineered Fill: Fill upon which ENGEO has made sufficient observations and tests to confirm that the fill has been placed and compacted in accordance with specifications and requirements.

G. Degree of Compaction or Relative Compaction: The ratio, expressed as a percentage, of the in-place dry density of the fill and backfill material as compacted in the field to the maximum dry density of the same material as determined by ASTM D-1557 or California 216 compaction test method.

H. Optimum Moisture: Water content, percentage by dry weight, corresponding to the maximum dry density as determined by ASTM D-1557.

I. ENGEO: The project geotechnical engineering consulting firm, its employees or its designated representatives.

J. Drawings: All documents, approved for construction, which describe the Work.

1.05 OBSERVATION AND TESTING

A. All site preparation, cutting and shaping, excavating, filling, and backfilling shall be carried out under the observation of ENGEO, employed and paid for by the Owners. ENGEO will perform appropriate field and laboratory tests to evaluate the suitability of fill material, the proper moisture content for compaction, and the degree of compaction achieved. Any fill that does not meet the specification requirements shall be removed and/or reworked until the requirements are satisfied.

B. Cutting and shaping, excavating, conditioning, filling, and compacting procedures require approval of ENGEO as they are performed. Any work found unsatisfactory or any work disturbed by subsequent operations before approval is granted shall be corrected in an approved manner as recommended by ENGEO.

C. Tests for compaction will be made in accordance with test procedures outlined in ASTM D-1557, as applicable. Field testing of soils or compacted fill shall conform with the applicable requirements of ASTM D-2922.

D. All authorized observation and testing will be paid for by the Owners.

1.06 SITE CONDITIONS

A. Excavating, filling, backfilling, and grading work shall not be performed during unfavorable weather conditions. When the work is interrupted by rain, excavating, filling, backfilling, and grading work shall not be resumed until the site and soil conditions are suitable.

B. Contractor shall take the necessary measures to prevent erosion of freshly filled, backfilled, and graded areas until such time as permanent drainage and erosion control measures have been installed.

PART 2 - PRODUCTS

2.01 GENERAL

A. Contractor shall furnish all materials, tools, equipment, facilities, and services as required for performing the required excavating, filling, backfilling, and grading work, and trenching and backfilling for utilities.

2.02 SOIL MATERIALS

A. Fill

1. Material to be used for engineered fill and backfill shall be free from organic matter and other deleterious substances, and of such quality that it will compact thoroughly without excessive voids when watered and rolled. Excavated on-site material will be considered suitable for engineered fill and backfill if it contains no more than 3 percent organic matter, is free of debris and other deleterious substances and conforms to the requirements specified above. Rocks of maximum dimension in excess of two-thirds of the lift thickness shall be removed from any fill material to the satisfaction of ENGEO.

2. Excavated earth material which is suitable for engineered fill or backfill, as determined by ENGEO, shall be conditioned for reuse and properly stockpiled as required for later filling and backfilling operations. Conditioning shall consist of spreading material in layers not to exceed 8 inches and raking free of debris and rubble. Rocks and aggregate exceeding the allowed largest dimension, and deleterious material shall be removed from the site and disposed off site in a legal manner.

3. ENGEO shall be immediately notified if potential hazardous materials or suspect soils exhibiting staining or odor are encountered. Work activities shall be discontinued within the area of potentially hazardous materials. ENGEO environmental personnel will conduct an assessment of the suspect hazardous material to determine the appropriate response and mitigation. Regulatory agencies may also be contacted to request concurrence and

oversight. *ENGEO will rely on the Owner, or a designated Owner's representative, to make necessary notices to the appropriate regulatory agencies. The Owner may request ENGEO's assistance in notifying regulatory agencies, provided ENGEO receives Owner's written authorization to expand its scope of services.*

4. ENGEO shall be notified at least 48 hours prior to the start of filling and backfilling operations so that it may evaluate samples of the material intended for use as fill and backfill. All materials to be used for filling and backfilling require the approval of ENGEO.

B. Import Material: Where conditions require the importation of fill material, the material shall be an inert, nonexpansive soil or soil-rock material free of organic matter and meeting the following requirements unless otherwise approved by ENGEO.

| | | |
|---|---|---|
| Gradation (ASTM D-421): | Sieve Size | Percent Passing |
| | 2-inch | 100 |
| | #200 | 15 - 70 |
| Plasticity (ASTM D-4318): | Liquid Limit | Plasticity Index |
| | < 30 | < 12 |
| Swell Potential (ASTM D-4546B): (at optimum moisture) | Percent Heave | Swell Pressure |
| | < 2 percent | < 300 psf |
| Resistance Value (ASTM D-2844): | Minimum 25 | |
| Organic Content (ASTM D-2974): | Less than 2 percent | |

A sample of the proposed import material should be submitted to ENGEO for evaluation prior to delivery at the site.

2.03 SAND

A. Sand for sand cushion under slabs and for bedding of pipe in utility trenches shall be a clean and graded, washed sand, free from clay or organic material, suitable for the intended purpose with 90 to 100 percent passing a No. 4 U.S. Standard Sieve, not more than 5 percent passing a No. 200 U.S. Standard Sieve, and generally conforming to ASTM C33 for fine aggregate.

2.04 AGGREGATE DRAINAGE FILL

A. Aggregate drainage fill under concrete slabs and paving shall consist of broken stone, crushed or uncrushed gravel, clean quarry waste, or a combination thereof. The aggregate shall be free from fines, vegetable matter, loam, volcanic tuff, and other deleterious substances. It shall be of such quality that the absorption of water in a saturated surface dry condition does not exceed 3 percent of the oven dry weight of the samples.

B. Aggregate drainage fill shall be of such size that the percentage composition by dry weight as determined by laboratory sieves (U. S. Series) will conform to the following grading:

| Sieve Size | Percentage Passing Sieve |
|---|---|
| 1½-inches | 100 |
| 1-inch | 90 - 100 |
| #4 | 0 - 5 |

2.05 SUBDRAINS

A. Perforated subdrain pipe of the required diameter shall be installed as shown on the drawings. The pipe(s) shall also conform to these specifications unless otherwise specified by ENGEO in the field.

Subdrain pipe shall be manufactured in accordance with one of the following requirements:

Design depths less than 30 feet

- Perforated ABS Solid Wall SDR 35 (ASTM D-2751)
- Perforated PVC Solid Wall SDR 35 (ASTM D-3034)
- Perforated PVC A-2000 (ASTM F949)
- Perforated Corrugated HDPE double-wall (AASHTO M-252 or M-294, Caltrans Type S, 50 psi minimum stiffness)

Design depths less than 50 feet

- Perforated PVC SDR 23.5 Solid Wall (ASTM D-3034)
- Perforated Sch. 40 PVC Solid Wall (ASTM-1785)
- Perforated ABS SDR 23.5 Solid Wall (ASTM D-2751)
- Perforated ABS DWV/Sch. 40 (ASTM D-2661 and D-1527)
- Perforated Corrugated HDPE double-wall (AASHTO M-252 or M-294, Caltrans Type S, 70 psi minimum stiffness)

Design depths less than 70 feet

- Perforated ABS Solid Wall SDR 15.3 (ASTM D-2751)
- Perforated Sch. 80 PVC (ASTM D-1785)
- Perforated Corrugated Aluminum (ASTM B-745)

B. Permeable Material (Class 2): Class 2 permeable material for filling trenches under, around, and over subdrains, behind building and retaining walls, and for pervious blankets shall consist of clean, coarse sand and gravel or crushed stone, conforming to the following grading requirements:

| Sieve Size | Percentage Passing Sieve |
|---|---|
| 1-inch | 100 |
| ¾-inch | 90 - 100 |
| ⅜-inch | 40 - 100 |
| #4 | 25 - 40 |
| #8 | 18 - 33 |
| #30 | 5 - 15 |
| #50 | 0 - 7 |
| #200 | 0 - 3 |

C. Filter Fabric: All filter fabric shall meet the following Minimum Average Roll Values unless otherwise specified by ENGEO.

Grab Strength (ASTM D-4632)..........................................180 lbs
Mass Per Unit Area (ASTM D-4751)................................6 oz/yd$^2$
Apparent Opening Size (ASTM D-4751)...........................70-100 U.S. Std. Sieve
Flow Rate (ASTM D-4491)................................................80 gal/min/ft$^2$
Puncture Strength (ASTM D-4833) ..................................80 lbs

D. Vapor Retarder: Vapor Retarders shall consist of PVC, LDPE or HDPE impermeable sheeting at least 10 mils thick.

2.06 PERMEABLE MATERIAL (Class 1; Type A)

A. Class 1 permeable material to be used in conjunction with filter fabric for backfilling of subdrain excavations shall conform to the following grading requirements:

| Sieve Size | Percentage Passing Sieve |
|---|---|
| ¾-inch | 100 |
| ½-inch | 95 - 100 |
| ⅜-inch | 70 - 100 |
| #4 | 0 - 55 |
| #8 | 0 - 10 |

#200 0 - 3

PART 3 - EXECUTION

3.01 STAKING AND GRADES

A. Contractor shall lay out all his work, establish all necessary markers, bench marks, grading stakes, and other stakes as required to achieve design grades.

3.02 EXISTING UTILITIES

A. Contractor shall verify the location and depth (elevation) of all existing utilities and services before performing any excavation work.

3.03 EXCAVATION

A. Contractor shall perform excavating as indicated and required for concrete footings, drilled piers, foundations, floor slabs, concrete walks, and site leveling and grading, and provide shoring, bracing, underpinning, cribbing, pumping, and planking as required. The bottoms of excavations shall be firm undisturbed earth, clean and free from loose material, debris, and foreign matter.

B. Excavations shall be kept free from water at all times. Adequate dewatering equipment shall be maintained at the site to handle emergency situations until concrete or backfill is placed.

C. Unauthorized excavations for footings shall be filled with concrete to required elevations, unless other methods of filling are authorized by ENGEO.

D. Excavated earth material which is suitable for engineered fill or backfill, as determined by ENGEO, shall be conditioned for reuse and properly stockpiled for later filling and backfilling operations as specified under Section 2.02, "Soil Materials."

E. Abandoned sewers, piping, and other utilities encountered during excavating shall be removed and the resulting excavations shall be backfilled with engineered fill as required by ENGEO.

F. Any active utility lines encountered shall be reported immediately to the Owner's Representative and authorities involved. The Owner and proper authorities shall be permitted free access to take the measures deemed necessary to repair, relocate, or remove the obstruction as determined by the responsible authority or Owner's Representative.

3.04 SUBGRADE PREPARATION

A. All brush and other rubbish, as well as trees and root systems not marked for saving, shall be removed from the site and legally disposed of.

B. Any existing structures, foundations, underground storage tanks, or debris must be removed from the site prior to any building, grading, or fill operations. Septic tanks, including all drain fields and other lines, if encountered, must be totally removed. The resulting depressions shall be properly prepared and filled to the satisfaction of ENGEO.

C. Vegetation and organic topsoil shall be removed from the surface upon which the fill is to be placed and either removed and legally disposed of or stockpiled for later use in approved landscape areas. The surface shall then be scarified to a depth of at least eight inches until the surface is free from ruts, hummocks, or other uneven features which would tend to prevent uniform compaction by the equipment to be used.

D. After the foundation for the fill has been cleared and scarified, it shall be made uniform and free from large clods. The proper moisture content must be obtained by adding water or aerating. The foundation for the fill shall be compacted at the proper moisture content to a relative compaction as specified herein.

3.05 ENGINEERED FILL

A. Select Material: Fill material shall be "Select" or "Imported Material" as previously specified.

B. Placing and Compacting: Engineered fill shall be constructed by approved and accepted methods. Fill material shall be spread in uniform lifts not exceeding 8 inches in uncompacted thickness. Each layer shall be spread evenly, and thoroughly blade-mixed to obtain uniformity of material. Fill material which does not contain sufficient moisture as specified by ENGEO shall be sprinkled with water; if it contains excess moisture it shall be aerated or blended with drier material to achieve the proper water content. Select material and water shall then be thoroughly mixed before being compacted.

C. Unless otherwise specified in the Geotechnical Exploration report, each layer of spread select material shall be compacted to at least 90 percent relative compaction at a moisture content of at least three percentage points above the optimum moisture content. Minimum compaction in all keyways shall be a minimum of 95 percent with a minimum moisture content of at least 1 percentage point above optimum.

D. Unless otherwise specified in the Geotechnical Exploration report or otherwise required by the local authorities, the upper 6 inches of engineered fill in areas to receive pavement shall be compacted to at least 95 percent relative compaction with a minimum moisture content of at least 3 percentage points above optimum.

E. Testing and Observation of Fill: The work shall consist of field observation and testing to determine that each layer has been compacted to the required density and that the required moisture is being obtained. Any layer or portion of a layer that does not attain the compaction required shall be reworked until the required density is obtained.

F. Compaction: Compaction shall be by sheepsfoot rollers, multiple-wheel steel or pneumatic-tired rollers or other types of acceptable compaction equipment. Rollers shall be of such design that they will be able to compact the fill to the specified compaction. Rolling shall be accomplished while the fill material is within the specified moisture content range. Rolling of each layer must be continuous so that the required compaction may be obtained uniformly throughout each layer.

G. Fill slopes shall be constructed by overfilling the design slopes and later cutting back the slopes to the design grades. No loose soil will be permitted on the faces of the finished slopes.

H. Strippings and topsoil shall be stockpiled as approved by Owner, then placed in accordance with ENGEO's recommendations to a minimum thickness of 6 inches and a maximum thickness of 12 inches over exposed open space cut slopes which are 3:1 or flatter, and track walked to the satisfaction of ENGEO.

I. Final Prepared Subgrade: Finish blading and smoothing shall be performed as necessary to produce the required density, with a uniform surface, smooth and true to grade.

3.06 BACKFILLING

A. Backfill shall not be placed against footings, building walls, or other structures until approved by ENGEO.

B. Backfill material shall be Select Material as specified for engineered fill.

C. Backfill shall be placed in 6-inch layers, leveled, rammed, and tamped in place. Each layer shall be compacted with suitable compaction equipment to 90 percent relative compaction at a moisture content of at least 3 percent above optimum.

3.07 TRENCHING AND BACKFILLING FOR UTILITIES

A. Trenching:

1. Trenching shall include the removal of material and obstructions, the installation and removal of sheeting and bracing and the control of water as necessary to provide the required utilities and services.

2. Trenches shall be excavated to the lines, grades, and dimensions indicated on the Drawings. Maximum allowable trench width shall be the outside diameter of the pipe plus 24 inches, inclusive of any trench bracing.

3. When the trench bottom is a soft or unstable material as determined by ENGEO, it shall be made firm and solid by removing said unstable material to a sufficient depth and replacing it with on-site material compacted to 90 percent minimum relative compaction.

4. Where water is encountered in the trench, the contractor must provide materials necessary to drain the water and stabilize the bed.

B. Backfilling:

1. Trenches must be backfilled within 2 days of excavation to minimize desiccation.

2. Bedding material shall be sand and shall not extend more than 6 inches above any utility lines.

3. Backfill material shall be select material.

4. Trenches shall be backfilled as indicated or required and compacted with suitable equipment to 90 percent minimum relative compaction at the required moisture content.

3.08 SUBDRAINS

A. Trenches for subdrain pipe shall be excavated to a minimum width equal to the outside diameter of the pipe plus at least 12 inches and to a depth of approximately 2 inches below the grade established for the invert of the pipe, or as indicated on the Drawings.

B. The space below the pipe invert shall be filled with a layer of Class 2 permeable material, upon which the pipe shall be laid with perforations down. Sections shall be joined as recommended by the pipe manufacturer.

C. Rocks, bricks, broken concrete, or other hard material shall not be used to give intermediate support to pipes. Large stones or other hard objects shall not be left in contact with the pipes.

D. Excavations for subdrains shall be filled as required to fill voids and prevent settlement without damaging the subdrain pipe. Alternatively, excavations for subdrains may be filled with Class 1 permeable material (as defined in Section 2.06) wrapped in Filter Fabric (as defined in Section 2.05).

3.09 AGGREGATE DRAINAGE FILL

A. ENGEO shall approve finished subgrades before aggregate drainage fill is installed.

B. Pipes, drains, conduits, and any other mechanical or electrical installations shall be in place before any aggregate drainage fill is placed. Backfill at walls to elevation of drainage fill shall be in place and compacted.

C. Aggregate drainage fill under slabs and concrete paving shall be the minimum uniform thickness after compaction of dimensions indicated on Drawings. Where not indicated, minimum thickness after compaction shall be 4 inches.

D. Aggregate drainage fill shall be rolled to form a well-compacted bed.

E. The finished aggregate drainage fill must be observed and approved by ENGEO before proceeding with any subsequent construction over the compacted base or fill.

3.10 SAND CUSHION

A. A sand cushion shall be placed over the vapor retarder membrane under concrete slabs on grade. Sand cushion shall be placed in uniform thickness as indicated on the Drawings. Where not indicated, the thickness shall be 2 inches.

3.11 FINISH GRADING

A. All areas must be finish graded to elevations and grades indicated on the Drawings. In areas to receive topsoil and landscape planting, finish grading shall be performed to a uniform 6 inches below the grades and elevations indicated on the Drawings, and brought to final grade with topsoil.

3.12 DISPOSAL OF WASTE MATERIALS

A. Excess earth materials and debris shall be removed from the site and disposed of in a legal manner. Location of dump site and length of haul are the Contractor's responsibility.

## PART II - GEOGRID SOIL REINFORCEMENT

1. DESCRIPTION:

   Work shall consist of furnishing geogrid soil reinforcement for use in construction of reinforced soil slopes and retention systems.

2. GEOGRID MATERIAL:

   2.1 The specific geogrid material shall be preapproved by ENGEO.

   2.2 The geogrid shall be a regular network of integrally connected polymer tensile elements with aperture geometry sufficient to permit significant mechanical interlock with the surrounding soil or rock. The geogrid structure shall be dimensionally stable and able to retain its geometry under construction stresses and shall have high resistance to damage during construction, to ultraviolet degradation, and to all forms of chemical and biological degradation encountered in the soil being reinforced.

   2.3 The geogrids shall have an Allowable Strength ($T_a$) and Pullout Resistance, for the soil type(s) indicated, as listed in Table I.

   2.4 Certifications: The Contractor shall submit a manufacturer's certification that the geogrids supplied meet the respective index criteria set when geogrid was approved by ENGEO, measured in full accordance with all test methods and standards specified. In case of dispute over validity of values, the Contractor will supply test data from an ENGEO-approved laboratory to support the certified values submitted.

3. CONSTRUCTION:

   3.1 Delivery, Storage, and Handling: Contractor shall check the geogrid upon delivery to ensure that the proper material has been received. During all periods of shipment and storage, the geogrid shall be protected from temperatures greater than 140 °F, mud, dirt, dust, and debris. Manufacturer's recommendations in regard to protection from direct sunlight must also be followed. At the time of installation, the geogrid will be rejected if it has defects, tears, punctures, flaws, deterioration, or damage incurred during manufacture, transportation, or storage. If approved by ENGEO, torn or punctured sections may be repaired by placing a patch over the damaged area. Any geogrid damaged during storage or installation shall be replaced by the Contractor at no additional cost to the owner.

3.2 On-Site Representative: Geogrid material suppliers shall provide a qualified and experienced representative on site at the initiation of the project, for a minimum of three days, to assist the Contractor and ENGEO personnel at the start of construction. If there is more than one slope on a project, this criterion will apply to construction of the initial slope only. The representative shall also be available on an as-needed basis, as requested by ENGEO, during construction of the remaining slope(s).

3.3 Geogrid reinforcement may be joined with mechanical connections or overlaps as recommended and approved by the Manufacturer. Joints shall not be placed within 6 feet of the slope face, within 4 feet below top of slope, nor horizontally or vertically adjacent to another joint.

3.4 Geogrid Placement: The geogrid reinforcement shall be installed in accordance with the manufacturer's recommendations. The geogrid reinforcement shall be placed within the layers of the compacted soil as shown on the plans or as directed.

The geogrid reinforcement shall be placed in continuous longitudinal strips in the direction of main reinforcement. However, if the Contractor is unable to complete a required length with a single continuous length of geogrid, a joint may be made with the Manufacturer's approval. Only one joint per length of geogrid shall be allowed. This joint shall be made for the full width of the strip by using a similar material with similar strength. Joints in geogrid reinforcement shall be pulled and held taut during fill placement.

Adjacent strips, in the case of 100 percent coverage in plan view, need not be overlapped. The minimum horizontal coverage is 50 percent, with horizontal spacings between reinforcement no greater than 40 inches. Horizontal coverage of less than 100 percent shall not be allowed unless specifically detailed in the construction drawings.

Adjacent rolls of geogrid reinforcement shall be overlapped or mechanically connected where exposed in a wrap around face system, as applicable.

The Contractor may place only that amount of geogrid reinforcement required for immediately pending work to prevent undue damage. After a layer of geogrid reinforcement has been placed, the next succeeding layer of soil shall be placed and compacted as appropriate. After the specified soil layer has been placed, the next geogrid reinforcement layer shall be installed. The process shall be repeated for each subsequent layer of geogrid reinforcement and soil.

Geogrid reinforcement shall be placed to lay flat and pulled tight prior to backfilling. After a layer of geogrid reinforcement has been placed, suitable means, such as pins or small piles of soil, shall be used to hold the geogrid reinforcement in position until the subsequent soil layer can be placed.

Under no circumstances shall a track-type vehicle be allowed on the geogrid reinforcement before at least six inches of soil have been placed. Turning of tracked vehicles should be kept to a minimum to prevent tracks from displacing the fill and the geogrid reinforcement. If approved by the Manufacturer, rubber-tired equipment may pass over the geosynthetic reinforcement at slow speeds, less than 10 mph. Sudden braking and sharp turning shall be avoided.

During construction, the surface of the fill should be kept approximately horizontal. Geogrid reinforcement shall be placed directly on the compacted horizontal fill surface. Geogrid reinforcements are to be placed within three inches of the design elevations and extend the length as shown on the elevation view unless otherwise directed by ENGEO. Correct orientation of the geogrid reinforcement shall be verified by ENGEO.

**Table I**
**Allowable Geogrid Strength**
**With Various Soil Types**
**For Geosynthetic Reinforcement In**
**Mechanically Stabilized Earth Slopes**

(Geogrid Pullout Resistance and Allowable Strengths vary with reinforced backfill used due to soil anchorage and site damage factors. Guidelines are provided below.)

| SOIL TYPE | MINIMUM ALLOWABLE STRENGTH, $T_a$ (lb/ft)* | | |
|---|---|---|---|
| | GEOGRID Type I | GEOGRID Type II | GEOGRID Type III |
| A. Gravels, sandy gravels, and gravel-sand-silt mixtures (GW, GP, GC, GM & SP)** | 2400 | 4800 | 7200 |
| B. Well graded sands, gravelly sands, and sand-silt mixtures (SW & SM)** | 2000 | 4000 | 6000 |
| C. Silts, very fine sands, clayey sands and clayey silts (SC & ML)** | 1000 | 2000 | 3000 |
| D. Gravelly clays, sandy clays, silty clays, and lean clays (CL)** | 1600 | 3200 | 4800 |

* All partial Factors of Safety for reduction of design strength are included in listed values. Additional factors of safety may be required to further reduce these design strengths based on site conditions.

** Unified Soil Classifications.

# PART III - GEOTEXTILE SOIL REINFORCEMENT

1. DESCRIPTION:

   Work shall consist of furnishing geotextile soil reinforcement for use in construction of reinforced soil slopes.

2. GEOTEXTILE MATERIAL:

   2.1 The specific geotextile material and supplier shall be preapproved by ENGEO.

   2.2 The geotextile shall have a high tensile modulus and shall have high resistance to damage during construction, to ultraviolet degradation, and to all forms of chemical and biological degradation encountered in the soil being reinforced.

   2.3 The geotextiles shall have an Allowable Strength ($T_a$) and Pullout Resistance, for the soil type(s) indicated as listed in Table II.

   2.4 Certification: The Contractor shall submit a manufacturer's certification that the geotextiles supplied meet the respective index criteria set when geotextile was approved by ENGEO, measured in full accordance with all test methods and standards specified. In case of dispute over validity of values, the Contractor will supply the data from an ENGEO-approved laboratory to support the certified values submitted.

3. CONSTRUCTION:

   3.1 Delivery, Storage and Handling: Contractor shall check the geotextile upon delivery to ensure that the proper material has been received. During all periods of shipment and storage, the geotextile shall be protected from temperatures greater than 140 °F, mud, dirt, dust, and debris. Manufacturer's recommendations in regard to protection from direct sunlight must also be followed. At the time of installation, the geotextile will be rejected if it has defects, tears, punctures, flaws, deterioration, or damage incurred during manufacture, transportation, or storage. If approved by ENGEO, torn or punctured sections may be repaired by placing a patch over the damaged area. Any geotextile damaged during storage or installation shall be replaced by the Contractor at no additional cost to the owner.

   3.2 On-Site Representative: Geotextile material suppliers shall provide a qualified and experienced representative on site at the initiation of the project, for a minimum of three days, to assist the Contractor and ENGEO personnel at the start of construction. If there is more than one slope on a project, this criterion will apply to construction of the initial slope only. The representative shall also be available on an as-needed basis, as requested by ENGEO, during construction of the remaining slope(s).

3.3 Geotextile Placement: The geotextile reinforcement shall be installed in accordance with the manufacturer's recommendations. The geotextile reinforcement shall be placed within the layers of the compacted soil as shown on the plans or as directed.

The geotextile reinforcement shall be placed in continuous longitudinal strips in the direction of main reinforcement. Joints shall not be used with geotextiles.

Adjacent strips, in the case of 100 percent coverage in plan view, need not be overlapped. The minimum horizontal coverage is 50 percent, with horizontal spacings between reinforcement no greater than 40 inches. Horizontal coverage of less than 100 percent shall not be allowed unless specifically detailed in the construction drawings.

Adjacent rolls of geotextile reinforcement shall be overlapped or mechanically connected where exposed in a wrap around face system, as applicable.

The Contractor may place only that amount of geotextile reinforcement required for immediately pending work to prevent undue damage. After a layer of geotextile reinforcement has been placed, the succeeding layer of soil shall be placed and compacted as appropriate. After the specified soil layer has been placed, the next geotextile reinforcement layer shall be installed. The process shall be repeated for each subsequent layer of geotextile reinforcement and soil.

Geosynthetic reinforcement shall be placed to lay flat and be pulled tight prior to backfilling. After a layer of geotextile reinforcement has been placed, suitable means, such as pins or small piles of soil, shall be used to hold the geotextile reinforcement in position until the subsequent soil layer can be placed.

Under no circumstances shall a track-type vehicle be allowed on the geotextile reinforcement before at least six inches of soil has been placed. Turning of tracked vehicles should be kept to a minimum to prevent tracks from displacing the fill and the geotextile reinforcement. If approved by the Manufacturer, rubber-tired equipment may pass over the geotextile reinforcement as slow speeds, less than 10 mph. Sudden braking and sharp turning shall be avoided.

During construction, the surface of the fill should be kept approximately horizontal. Geotextile reinforcement shall be placed directly on the compacted horizontal fill surface. Geotextile reinforcements are to be placed within three inches of the design elevations and extend the length as shown on the elevation view unless otherwise directed by ENGEO. Correct orientation of the geotextile reinforcement shall be verified by ENGEO.

**Table II**
**Allowable Geotextile Strength**
**With Various Soil Types**
**For Geosynthetic Reinforcement In**
**Mechanically Stabilized Earth Slopes**

(Geotextile Pullout Resistance and Allowable Strengths vary with reinforced backfill used due to soil anchorage and site damage factors. Guidelines are provided below.)

| SOIL TYPE | MINIMUM ALLOWABLE STRENGTH, $T_a$ (lb/ft)* | | |
|---|---|---|---|
| | GEOTEXTILE Type I | GEOTEXTILE Type II | GEOTEXTILE Type III |
| A. Gravels, sandy gravels, and gravel-sand-silt mixtures (GW, GP, GC, GM & SP)** | 2400 | 4800 | 7200 |
| B. Well graded sands, gravelly sands, and sand-silt mixtures (SW & SM)** | 2000 | 4000 | 6000 |
| C. Silts, very fine sands, clayey sands and clayey silts (SC & ML)** | 1000 | 2000 | 3000 |
| D. Gravelly clays, sandy clays, silty clays, and lean clays (CL)** | 1600 | 3200 | 4800 |

* All partial Factors of Safety for reduction of design strength are included in listed values. Additional factors of safety may be required to further reduce these design strengths based on site conditions.

** Unified Soil Classifications.

## PART IV - EROSION CONTROL MAT OR BLANKET

1. DESCRIPTION:

   Work shall consist of furnishing and placing a synthetic erosion control mat and/or degradable erosion control blanket for slope face protection and lining of runoff channels.

2. EROSION CONTROL MATERIALS:

   2.1 The specific erosion control material and supplier shall be pre-approved by ENGEO.

   2.2 Certification: The Contractor shall submit a manufacturer's certification that the erosion mat/blanket supplied meets the criteria specified when the material was approved by ENGEO. The manufacturer's certification shall include a submittal package of documented test results that confirm the property values. In case of a dispute over validity of values, the Contractor will supply property test data from an ENGEO-approved laboratory, to support the certified values submitted. Minimum average roll values, per ASTM D 4759, shall be used for conformance determinations.

3. CONSTRUCTION:

   3.1 Delivery, Storage, and Handling: Contractor shall check the erosion control material upon delivery to ensure that the proper material has been received. During all periods of shipment and storage, the erosion mat shall be protected from temperatures greater than 140 °F, mud, dirt, and debris. Manufacturer's recommendations in regard to protection from direct sunlight must also be followed. At the time of installation, the erosion mat/blanket shall be rejected if it has defects, tears, punctures, flaws, deterioration, or damage incurred during manufacture, transportation, or storage. If approved by ENGEO, torn or punctured sections may be removed by cutting OUT a section of the mat. The remaining ends should be overlapped and secured with ground anchors. Any erosion mat/blanket damaged during storage or installation shall be replaced by the Contractor at no additional cost to the Owner.

   3.2 On-Site Representative: Erosion control material suppliers shall provide a qualified and experienced representative on site, for a minimum of one day, to assist the Contractor and ENGEO personnel at the start of construction. If there is more than one slope on a project, this criteria will apply to construction of the initial slope only. The representative shall be available on an as-needed basis, as requested by ENGEO, during construction of the remaining slope(s).

3.3 Placement: The erosion control material shall be placed and anchored on a smooth graded, firm surface approved by the Engineer. Anchoring terminal ends of the erosion control material shall be accomplished through use of key trenches. The material in the trenches shall be anchored to the soil on maximum 1½ foot centers. Topsoil, if required by construction drawings, placed over final grade prior to installation of the erosion control material shall be limited to a depth not exceeding 3 inches.

3.4 Erosion control material shall be anchored, overlapped, and otherwise constructed to ensure performance until vegetation is well established. Anchors shall be as designated on the construction drawings, with a minimum of 12 inches length, and shall be spaced as designated on the construction drawings, with a maximum spacing of 4 feet.

3.5 Soil Filling: If noted on the construction drawings, the erosion control mat shall be filled with a fine grained topsoil, as recommended by the manufacturer. Soil shall be lightly raked or brushed on/into the mat to fill the mat voids or to a maximum depth of 1 inch.

PART V - GEOSYNTHETIC DRAINAGE COMPOSITE

1. DESCRIPTION:

   Work shall consist of furnishing and placing a geosynthetic drainage system as a subsurface drainage medium for reinforced soil slopes.

2. DRAINAGE COMPOSITE MATERIALS:

   2.1 The specific drainage composite material and supplier shall be preapproved by ENGEO.

   2.2 The drain shall be of composite construction consisting of a supporting structure or drainage core material surrounded by a geotextile. The geotextile shall encapsulate the drainage core and prevent random soil intrusion into the drainage structure. The drainage core material shall consist of a three dimensional polymeric material with a structure that permits flow along the core laterally. The core structure shall also be constructed to permit flow regardless of the water inlet surface. The drainage core shall provide support to the geotextile. The fabric shall meet the minimum property requirements for filter fabric listed in Section 2.05C of the Guide Earthwork Specifications.

   2.3 A geotextile flap shall be provided along all drainage core edges. This flap shall be of sufficient width for sealing the geotextile to the adjacent drainage structure edge to prevent soil intrusion into the structure during and after installation. The geotextile shall cover the full length of the core.

   2.4 The geocomposite core shall be furnished with an approved method of constructing and connecting with outlet pipes or weepholes as shown on the plans. Any fittings shall allow entry of water from the core but prevent intrusion of backfill material into the core material.

   2.5 Certification and Acceptance: The Contractor shall submit a manufacturer's certification that the geosynthetic drainage composite meets the design properties and respective index criteria measured in full accordance with all test methods and standards specified. The manufacturer's certification shall include a submittal package of documented test results that confirm the design values. In case of dispute over validity of design values, the Contractor will supply design property test data from an ENGEO-approved laboratory, to support the certified values submitted. Minimum average roll values, per ASTM D 4759, shall be used for determining conformance.

3. CONSTRUCTION:

   3.1 Delivery, Storage, and Handling: Contractor shall check the geosynthetic drainage composite upon delivery to ensure that the proper material has been received. During all periods of shipment and storage, the geosynthetic drainage composite shall be protected from temperatures greater than 140 °F, mud, dirt, and debris. Manufacturer's recommendations in regards to protection from direct sunlight must also be followed. At the time of installation, the geosynthetic drainage composite shall be rejected if it has defects, tears, punctures, flaws, deterioration, or damage incurred during manufacture, transportation, or storage. If approved by ENGEO, torn or punctured sections may be removed or repaired. Any geosynthetic drainage composite damaged during storage or installation shall be replaced by the Contractor at no additional cost to the Owner.

3.2 On-Site Representative: Geosynthetic drainage composite material suppliers shall provide a qualified and experienced representative on site, for a minimum of one half day, to assist the Contractor and ENGEO personnel at the start of construction with directions on the use of drainage composite. If there is more than one application on a project, this criterion will apply to construction of the initial application only. The representative shall also be available on an as-needed basis, as requested by ENGEO, during construction of the remaining applications.

3.3 Placement: The soil surface against which the geosynthetic drainage composite is to be placed shall be free of debris and inordinate irregularities that will prevent intimate contact between the soil surface and the drain.

3.4 Seams: Edge seams shall be formed by utilizing the flap of the geotextile extending from the geocomposite's edge and lapping over the top of the fabric of the adjacent course. The fabric flap shall be securely fastened to the adjacent fabric by means of plastic tape or non-water-soluble construction adhesive, as recommended by the supplier. Where vertical splices are necessary at the end of a geocomposite roll or panel, an 8-inch-wide continuous strip of geotextile may be placed, centering over the seam and continuously fastened on both sides with plastic tape or non-water-soluble construction adhesive. As an alternative, rolls of geocomposite drain material may be joined together by turning back the fabric at the roll edges and interlocking the cuspidations approximately 2 inches. For overlapping in this manner, the fabric shall be lapped and tightly taped beyond the seam with tape or adhesive. Interlocking of the core shall always be made with the upstream edge on top in the direction of water flow. To prevent soil intrusion, all exposed edges of the geocomposite drainage core edge must be covered. Alternatively, a 12-inch-wide strip of fabric may be utilized in the same manner, fastening it to the exposed fabric 8 inches in from the edge and folding the remaining flap over the core edge.

3.5 Soil Fill Placement: Structural backfill shall be placed immediately over the geocomposite drain. Care shall be taken during the backfill operation not to damage the geotextile surface of the drain. Care shall also be taken to avoid excessive settlement of the backfill material. The geocomposite drain, once installed, shall not be exposed for more than seven days prior to backfilling.