3.8 PALEONTOLOGICAL RESOURCES

3.8.1 AFFECTED ENVIRONMENT

Paleontological resources (fossils) are the remains or traces of prehistoric animals and plants. This section assesses the potential that earth-moving activities associated with development at the project site could adversely affect scientifically important fossil remains. The analysis presented in this section conforms to Society of Vertebrate Paleontology criteria.

PHYSIOGRAPHIC ENVIRONMENT

As discussed in Section 3.7, "Geology, Soils, and Mineral Resources," the project site is located on the southeastern side of the Sacramento Valley. The Sacramento Valley and the San Joaquin Valley comprise the Great Valley of California. The Great Valley geomorphic province is located between the Sierra Nevada geomorphic province on the east and the Coast Range geomorphic province on the west.

The Great Valley is composed of thousands of feet of sedimentary deposits that have undergone periods of subsidence and uplift over millions of years. During the Jurassic and Cretaceous periods of the Mesozoic era, the Great Valley existed in the form of an ancient ocean. By the end of the Mesozoic era, the northern portion of the Great Valley began to fill with sediment as tectonic forces caused uplift of the basin. By the time of the Miocene epoch, approximately 24 million years ago, sediments deposited in the Sacramento Valley were mostly of terrestrial origin.

Most of the surface of the Great Valley is covered with Recent (Holocene, i.e., 10,000 years Before Present [B.P.] to present day) and Pleistocene (i.e., 10,000–1,800,000 years B.P.) alluvium. This alluvium is composed of sediments from the Sierra Nevada to the east and the Coast Range to the west that were carried by water and deposited on the valley floor. Siltstone, claystone, and sandstone are the primary types of sedimentary deposits.

The project area is located entirely within Sacramento County and within the U.S. Geological Survey (USGS) Buffalo Creek 7.5-Minute Quadrangle (mapped at 1:24,000 scale).

REGIONAL GEOLOGIC SETTING

Geologic history and conditions are relevant to the evaluation of paleontological resources because they influence the type of fossils that may be found (i.e., aquatic vs. terrestrial organisms) and the probability that any prehistoric remains would be subject to fossilization rather than normal decay. The depositional history of the Sacramento Valley during the late Quaternary included several cycles related to fluctuations in regional and global climate that caused alternating periods of deposition followed by periods of subsidence and erosion. Thus, the Sacramento Valley during the Pleistocene consisted of stages of wetlands and floodplain creation as tidewaters rose in the valley from the west, areas of erosion when tidewaters receded, and alluvial fan deposition from streams emanating from the adjacent mountain ranges (Atwater 1982).

LOCAL GEOLOGIC SETTING

Wagner et al. (1987) and Bartow and Helley (1979) have mapped approximately 70% of the project site as mine and dredge tailings (t), and the remainder as the Pliocene-age (approximately 5 million years B.P.) Laguna Formation (Tl). The Laguna Formation consists of reddish to yellowish brown silt to sandy silt and clay with minor lenticular gravel beds that was deposited on broad floodplains by meandering, slow-moving streams. These sedimentary deposits are of granitic Sierra Nevada basement complex origin, and were laid down before the last upthrust and tilting of the Sierra Nevada. Olmsted and Davis (1961) indicated that the Laguna Formation probably extends downward no more than 500 feet in the project site area before metamorphosed igneous basement rocks are encountered. Gravel deposits associated with the Laguna Formation (called the Arroyo Seco gravel by

Olmsted and Davis [1961]) "contain abundant cobbles of quartz and metamorphic rocks in a red silty or sandy matrix," and locally may be more than 50 feet thick. It is these gravel deposits, along an ancient channel of the American River, that were dredged for gold at the project site.

A small portion of the remaining project site, on both sides immediately adjacent to Morrison Creek, contains Holocene-age surficial deposits (Qu), underlain by the Laguna Formation.

PALEONTOLOGICAL RESOURCE INVENTORY METHODS

A stratigraphic inventory and paleontological resource inventory were completed to develop a baseline paleontological resource inventory of the project site and surrounding area by rock unit, and to assess the potential paleontological productivity of each rock unit. Research methods included a review of published and unpublished literature and a cursory field survey. These tasks complied with Society of Vertebrate Paleontology (1995) guidelines.

Stratigraphic Inventory

Geologic maps and reports covering the geology of the project site and surrounding study area were reviewed to determine the exposed rock units and to delineate their respective distributions in the project study area.

Paleontological Resource Inventory

Published and unpublished geological and paleontological literature was reviewed to document the number and locations of previously recorded fossil sites from rock units exposed in and near the project site and the surrounding region, as well as the types of fossil remains each rock unit has produced. The literature review was supplemented by an archival search conducted at the University of California Museum of Paleontology (UCMP) in Berkeley, California, on February 25, 2005.

Field Survey

A field reconnaissance was conducted on July 29, 2004, to document the presence of any previously unrecorded fossil sites and of strata that might contain fossil remains. The ground surface was generally covered with native vegetation and was not visible. Approximately 70% of the project site was covered with piles of cobbles deposited as a result of dredger gold mining operations. No exposures of potentially fossiliferous strata were observed in the areas surveyed.

PALEONTOLOGICAL RESOURCE ASSESSMENT CRITERIA

The potential paleontological importance of the project site can be assessed by identifying the paleontological importance of exposed rock units within the project site. Because the aerial distribution of a rock unit can be easily delineated on a topographic map, this method is conducive to delineating parts of the project site that are of higher and lower sensitivity for paleontological resources.

A paleontologically important rock unit is one that has a high rating for potential paleontological productivity and is known to have produced unique, scientifically important fossils. The potential paleontological productivity rating of a rock unit exposed at the project site refers to the abundance and densities of fossil specimens and/or previously recorded fossil sites in exposures of the unit in or near the project site. If exposures of a specific rock unit at the project site yield fossils, they are most likely to yield fossil remains representing particular species in quantities or densities similar to those previously recorded from the unit near the project site.

An individual vertebrate fossil specimen may be considered unique or significant if it is identifiable and well preserved, and it meets at least one of the following criteria:

- is a type specimen (i.e., the individual from which a species or subspecies has been described);
- is a member of a rare species;
- is a species that is part of a diverse assemblage,
- is a skeletal element different from, or a specimen more complete than, those now available for its species; or
- is a complete specimen.

For example, identifiable vertebrate marine and terrestrial fossils are generally considered scientifically important because they are relatively rare. The value or importance of different fossil groups varies, depending on the age and depositional environment of the rock unit that contains the fossils, their rarity, the extent to which they have already been identified and documented, and the ability to recover similar materials under more controlled conditions (such as for a research project). Marine invertebrates are generally common, the fossil record is well developed and well documented, and they would generally not be considered a unique paleontological resource.

The following tasks were completed to establish the paleontological importance of each rock unit exposed at or near the project site:

- The potential paleontological productivity of each rock unit was assessed, based on the density of fossil remains previously documented within the rock unit.

- The potential for a rock unit exposed at the project site to contain a unique paleontological resource was considered.

RESOURCE INVENTORY RESULTS

Stratigraphic Inventory

Regional and local surficial geologic mapping and correlation of the various geologic units in the vicinity of the project site has been provided at a scale of 1:250,000 by Wagner et al. (1987) and at a scale of 1:62,500 by Bartow and Helley (1979).

Paleontological Resource Inventory and Assessment by Rock Unit

Vertebrate mammalian fossils have proved helpful in determining the relative age of alluvial fan sedimentary deposits (Louderback 1951, Savage 1951, Albright 2000). Mammalian inhabitants of the Pleistocene alluvial fan and floodplain included mammoths, horses, mastodons, camels, ground sloths, and pronghorns.

The Pleistocene epoch, known as the “great ice age,” began approximately 1.8 million years ago. Surveys of late Cenozoic land mammal fossils in northern California have been provided by Hay (1927), Stirton (1939), Savage (1951), Lundelius et al. (1983), and Jefferson (1991a, 1991b). On the basis of his survey of vertebrate fauna from the nonmarine late Cenozoic deposits of the San Francisco Bay region, Savage (1951) concluded that two major divisions of Pleistocene-age fossils could be recognized: the Irvingtonian (older Pleistocene fauna) and the Rancholabrean (younger Pleistocene and Holocene fauna). These two divisions of Quaternary Cenozoic vertebrate fossils are widely recognized today in the field of paleontology. The age of the later Pleistocene, Rancholabrean fauna was based on the presence of bison and on the presence of many mammalian species that are inhabitants of the same area today. In addition to bison, larger land mammals identified as part of the Rancholabrean fauna include mammoths, mastodons, camels, horses, and ground sloths.

Laguna Formation

During the Pliocene epoch (approximately 5 million to 1.8 million years B.P.), sediments of which are represented by the Laguna Formation at the project site, there was an enormous spread of grasslands and savannas and, in general, there were more large mammals in the Pliocene than there are today. One of the better known deposits of Pliocene fossils in California has been found within the San Timoteo Badlands in Riverside County.

Albright (2000) described 42 fossil taxa recovered during a study of the badlands, where he showed that small mammals can be effectively used to correlate biostratigraphy where radioisotopic dates are unobtainable. Other California Pliocene vertebrate fossil localities such as the Kettleman Hills and the Coso Range Wilderness include many of the same species found in Pleistocene deposits, including ground sloths, pronghorns, horses, camels, and mastodonts (Shultz 1937, Woodring et al. 1940). A search of published literature uncovered only one reference to a Pliocene-age vertebrate fossil specimen from the Laguna Formation in Northern California: Stirton (1939) refers to a Pliocene-age fossil specimen of a horse tooth found in clayey silt, probably of the Laguna Formation although not definitely identified as such, in a well near the town of Galt, Sacramento County.

Dredge Tailings

According to information provided by the project applicant(s), the piles of dredge tailings deposited at the project site as a result of gold mining activities extend up to 80 feet deep below the ground surface. Because of the nature of dredge mining activities, any fossil specimens that may have been preserved in the underlying Laguna Formation soils would have been destroyed at the time of the mining operations, and thus the existing dredge tailings would not be expected to contain fossils.

Holocene Alluvium

By definition, to be considered a fossil, a specimen must be more than 10,000 years old. Because sediments surrounding Morrison Creek are less than 10,000 years old, these sediments would not contain paleontological resources.

Records Search

Results of a paleontological records search at the UCMP (2005) indicated no recorded fossil sites within a 5-mile radius of the project site. Although the UCMP database indicates several officially recorded vertebrate fossils from six locations in Sacramento County, all have yielded Rancholabrean fossils from the Pleistocene-age (approximately 1.8 million years B.P.) Riverbank Formation. In addition, fossils were recovered from construction activities at Arco Arena (Hilton et al. 2000) and during Sacramento Municipal Utility District trenching activities in Elk Grove (Kolber 2004), which also yielded Rancholabrean fossils from the Riverbank Formation.

3.8.2 REGULATORY FRAMEWORK

FEDERAL PLANS, POLICIES, REGULATIONS, AND LAWS

There are no federal plans, policies, regulations, and laws related to paleontological resources that apply to the proposed project or alternatives under consideration.

STATE PLANS, POLICIES, REGULATIONS, AND LAWS

No state or local agencies have specific jurisdiction over paleontological resources on private lands. No state agency requires a paleontological collecting permit to allow for the recovery of fossil remains discovered as a result of construction-related earthmoving on state or private land at a project site.

REGIONAL AND LOCAL PLANS, POLICIES, REGULATIONS, AND LAWS

There are no regional and local plans, policies, regulations, or laws related to paleontological resources that apply to the proposed project or alternatives under consideration.

SOCIETY OF VERTEBRATE PALEONTOLOGY GUIDELINES

The Society of Vertebrate Paleontology (1995, 1996), a national scientific organization of professional vertebrate paleontologists, has established standard guidelines that outline acceptable professional practices in the conduct of paleontological resource assessments and surveys, monitoring and mitigation, data and fossil recovery, sampling procedures, specimen preparation, analysis, and curation. Most practicing professional paleontologists in the nation adhere to the Society of Vertebrate Paleontology assessment, mitigation, and monitoring requirements, as specifically spelled out in its standard guidelines.

3.8.3 ENVIRONMENTAL CONSEQUENCES

THRESHOLDS OF SIGNIFICANCE

Based on Appendix G of the State CEQA Guidelines, viewed in light of the Society of Vertebrate Paleontology guidelines described below, significant adverse environmental impacts on paleontological resources would result if the proposed project or alternatives under consideration would directly or indirectly destroy a unique paleontological resource or site. For the purposes of this DEIR/DEIS, a unique resource or site is one that is considered significant under the following Society of Vertebrate Paleontology criteria.

As described above under "Paleontological Resource Assessment Criteria," an individual vertebrate fossil specimen may be considered unique or significant if it is identifiable and well preserved, and it meets at least one of the following criteria:

- is a type specimen (i.e., the individual from which a species or subspecies has been described);
- is a member of a rare species;
- is a species that is part of a diverse assemblage;
- is a skeletal element different from, or a specimen more complete than, those now available for its species; or
- is a complete specimen.

The value or importance of different fossil groups varies depending on the age and depositional environment of the rock unit that contains the fossils, their rarity, the extent to which they have already been identified and documented, and the ability to recover similar materials under more controlled conditions (such as for a research project). Marine invertebrates are generally common; the fossil record is well developed and well documented, and they would generally not be considered a unique paleontological resource. Identifiable vertebrate marine and terrestrial fossils are generally considered scientifically important because they are relatively rare.

ANALYSIS METHODOLOGY

In its standard guidelines for assessment and mitigation of adverse impacts on paleontological resources, the Society of Vertebrate Paleontology (1995) established three categories of sensitivity for paleontological resources: high, low, and undetermined. Areas where fossils have been previously found are considered to have a high sensitivity and a high potential to produce fossils. In areas of high sensitivity that are likely to yield unique paleontological resources, full-time monitoring is typically recommended during any project-related ground disturbance. Areas that are not sedimentary in origin and that have not been known to produce fossils in the past typically are considered to have low sensitivity and monitoring is usually not needed during project construction. Areas that have not had any previous paleontological resource surveys or fossil finds are considered to be of undetermined sensitivity until surveys and mapping are performed to determine their sensitivity. After reconnaissance surveys, observation of exposed cuts, and possibly subsurface testing, a qualified paleontologist can determine whether the area should be categorized as having high or low sensitivity. In keeping with the significance criteria of the Society of Vertebrate Paleontology (1995), all vertebrate fossils are generally categorized as being of potentially significant scientific value.

The significance of potential adverse impacts on paleontological resources under CEQA, resulting from project-related activities at the project site, was determined using the criteria discussed above.

IMPACT ANALYSIS

Program Level Impacts and Mitigation Measures

Effects that would occur under each alternative development scenario are identified as follows: PP (Proposed Project), HD (High Density), IM (Impact Minimization), NF (No Federal Action), and NP (No Project). The impacts for each alternative are compared relative to the PP at the end of each impact conclusion (i.e., similar, greater, or lesser).

IMPACT 3.8-1	Potential Disturbance of Previously Unknown Paleontological Resources During Earthmoving Activities. *Construction activities could disturb previously unknown paleontological resources at the project site.*

PP, HD, IM, NF

Sediments referable to the Laguna Formation are generally devoid of significant vertebrate fossils, and no previously recorded fossil sites from this formation are known from either the project site or the surrounding area. Furthermore, approximately 70% of the project site is covered with piles of dredge tailings, extending between 80 and 120 feet below the ground surface. Because of the nature of mining operations, this area would not contain fossils. Therefore, it is not likely that unique paleontological resources would be found in local sediments. Thus, geologic units at the project site may be considered to have a low paleontological sensitivity, and a **direct, less-than-significant** impact on previously unknown paleontological resources would result from construction activities associated with the project. **No indirect** impact would result. ***[Similar]***

NP

Under the No Project Alternative, mining activities at the project site, which are not part of the Rio del Oro project, would continue under existing Conditional Use Permits—one originally issued by the County, and the other issued by the City—and possibly under one or more future individual Implementation Permits expected to be issued by the City. Mining activities would be limited to the piles of existing dredge tailings, which would not contain paleontological resources.

Because the project would not be implemented under the No Project Alternative, no development-related construction activities would occur; thus, **no direct** or **indirect** impacts would occur. ***[Lesser]***

Mitigation Measure: No mitigation measures are required.

Project Level (Phase 1) Impacts and Mitigation Measures

IMPACT 3.8-2	Potential Disturbance of Previously Unknown Paleontological Resources During Earthmoving Activities. *Construction activities within the Phase 1 development area could disturb previously unknown paleontological resources.*

Impacts would be the same under Phase 1 as under the program (entire project site) level analysis for all alternatives. Refer to Impact 3.8-1 for further discussion of this impact.

Cumulative Impacts

Generally, the discovery of fossils, and the subsequent opportunity for data collection and study, is a rare event that results from excavation and grading activities associated with development. The probability of encountering fossils on any project site depends primarily on the type of rock formation underlying the site. As described above, the project site is located within a rock formation that is not likely to yield significant paleontological resources, and thus project implementation would not contribute cumulatively to any regional loss of resources. Development projects are separate events that occur in various locations and are approved and implemented on a case-by-case basis. Because of the generally low probability that development projects would encounter paleontological resources, implementation of the related projects and other development within the region is not considered to result in significant cumulative impacts on paleontological resources; therefore, the project would not contribute to a cumulatively considerable impact.

3.8.4 RESIDUAL SIGNIFICANT IMPACTS

All impacts associated with paleontological resources are considered less than significant. Therefore, there are no residual significant impacts.