This section was prepared by RMC Water and Environment.

3B.7 GEOLOGY, SOILS, AND PALEONTOLOGICAL RESOURCES – WATER

3B.7.1 AFFECTED ENVIRONMENT

Similar to other resource sections, the description of the affected environment is focused on Zone 4 of the "Water" Study Area where existing geology and/or soil conditions could influence the design of physical underground and above-ground improvements. No physical improvements are proposed within Zones 1, 2, and 3, and, therefore, detail discussion for this area was determined unnecessary to support the impact analysis.

TOPOGRAPHY

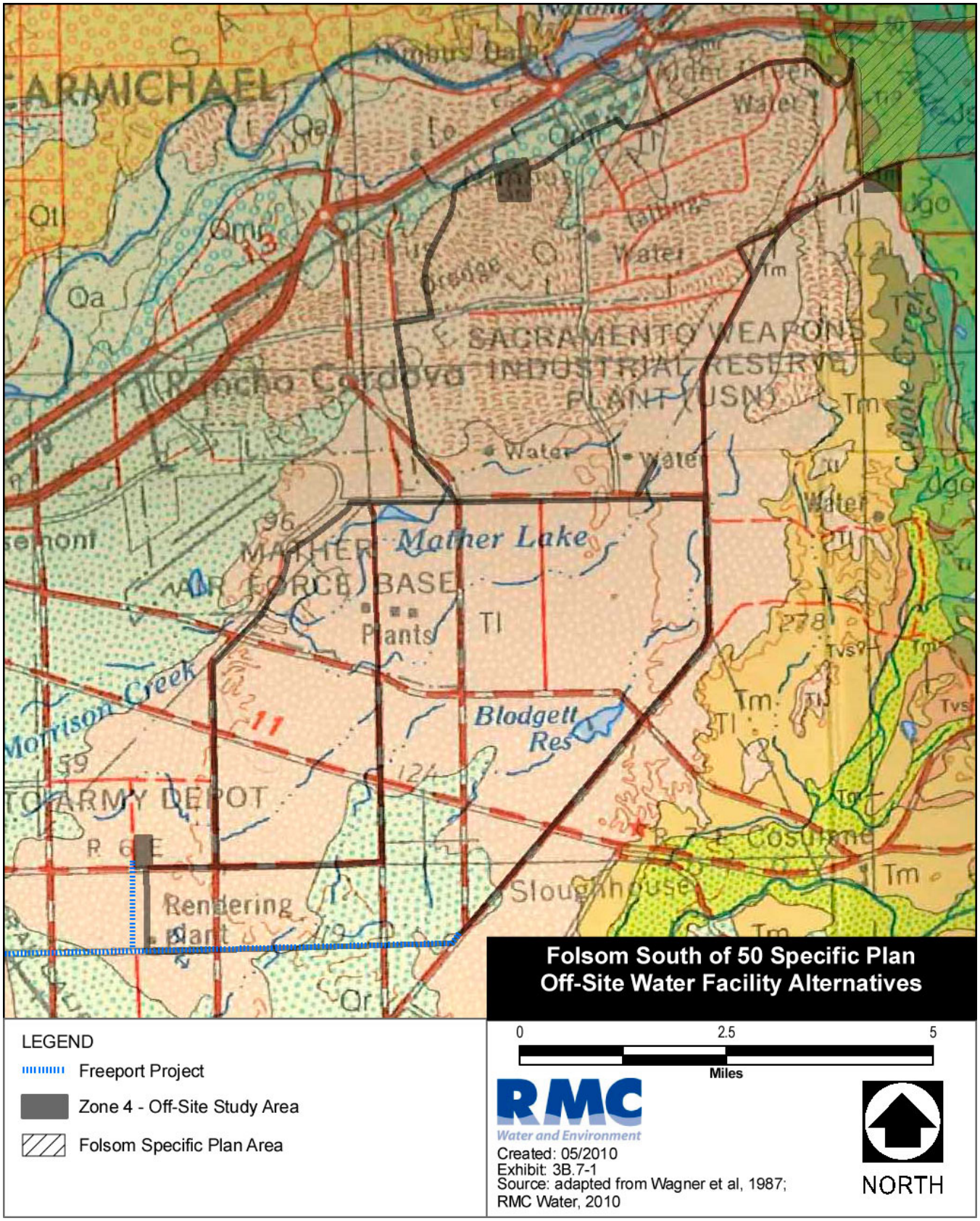
The topography within Zone 4 of the Off-site Water Facilities Study Area grades from the southeast to the northwest towards the Sacramento-San Joaquin Delta (Delta). Maximum elevations within the Zone 4 reach approximately 330 feet mean sea level (msl) on the eastern extent of the Off-site Water Facilities Study Area near the intersection of White Rock and Prairie City Roads. Topographic elevations then transition gently to the west reaching a minimum elevation of approximately 15 feet msl along the Sacramento River. This gentle transition results in a total topographical change of approximately 300 feet.

REGIONAL GEOLOGY

The "Water" Study Area is located in the central portion of the Great Valley geomorphic province of California. The Great Valley lies between the Sierra Nevada Mountain Range to the east and the California Coast Ranges to the west. The geologic formations of the Great Valley are typified by thick sequences of sedimentary materials of Jurassic through Holocene age. The California Geological Survey (CGS) and U.S. Geological Survey (USGS) have mapped portions of Zone 4 of the "Water" Study Area as being underlain by younger alluvium (consisting of flood basin deposits, dredge tailings and Holocene stream channel deposits), older alluvium, such as the Laguna Formation, and Miocene/Pliocene volcanics (DWR, 2004b). These geologic formations are illustrated in Exhibit 3B.7-1. A generalized cross-section of these geologic formations is provided in Exhibit 3B.17-2 of Section 3B.17, "Groundwater Resources – Water."

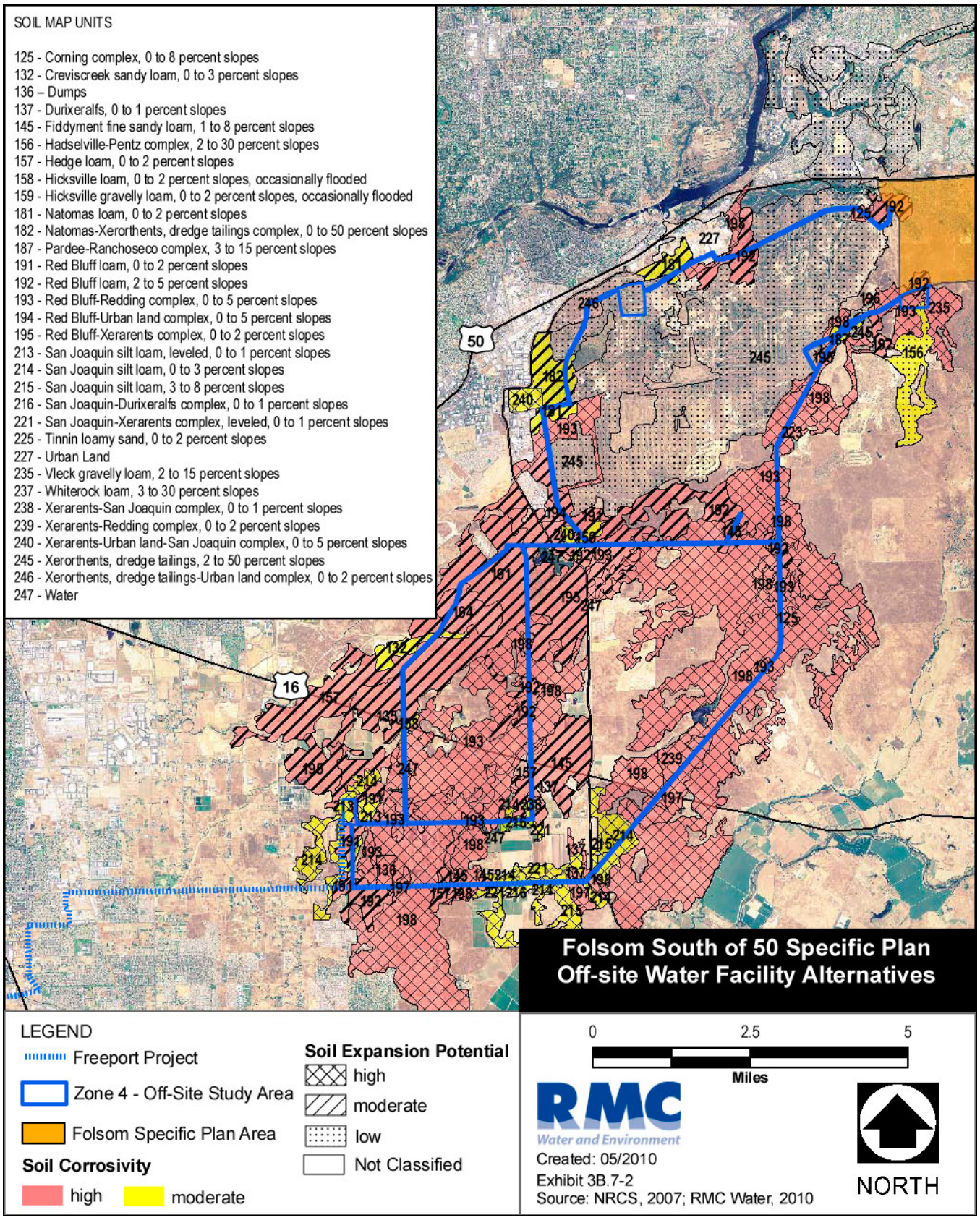
Holocene-aged flood basin and stream channel deposits occur along the western margin of Sacramento County and along the channels of active streams within Zone 4 of the "Water" Study Area. Stream channel deposits consist primarily of unconsolidated silt, fine- to medium-grained sand, and gravel. These recently deposited alluvial materials overlay a layer of loosely to moderately compacted sand, silt, and gravel deposited in alluvial fans during the Pliocene and Pleistocene is present. This older alluvium consists of the Riverbank Formation, which is widely exposed at the surface in areas to the west of Zone 4 of the "Water" Study Area. The older Laguna Formation consisting of consolidated alluvial gravel, sand, and silt underlies much of the Zone 4 between Eagles Nest Road and the Sierra Nevada foothills further east (Wagner et al, 1987). The thickness of the older alluvium is estimated to range between 100 to 650 feet (DWR, 2004b). Within the vicinity of White Rock Road, the Laguna Formation is overlain by extensive deposits of mine and dredge tailings consisting of small to large-sized rock fragments.

The eastern edge of Zone 4 extends into the lower foothills of the Sierra Nevada, which is marked by a transition from the alluvial materials associated with the Laguna Formation to older surface lithologies. Areas along Prairie City Road and to the south are underlain by the Miocene-aged, Mehrten Formation, and Eocene-aged, Ione Formations. Further east, the Jurassic-aged, Gopher Ridge Volcanics and Salt Springs Slate Formations, are expressed at the surface. (Wagner et al, 1981.) These four geologic formations underlie western portions of the Folsom SPA and are described in more detail in the Section 3A.7, "Geology, Soils, Minerals, and Paleontological Resources – Land."



Geologic Formations within Zone 4 of the Off-site Water Facilities Study Area

Exhibit 3B.7-1



Soil Limitations within Zone 4 of the Off-site Water Facilities Study Area

Exhibit 3B.7-2

REGIONAL FAULTING AND SEISMICITY

The "Water" Study Area is situated 40–60 miles away from faults that have been zoned as "active" by the California Division of Mines and Geology (CDMG). Refer to Table 3A.7-1 for a discussion of these faults.

Areas bordering the Central Valley region to the east and west contain both active and potentially active faults; however, the Sacramento Valley has historically experienced a very-low level of seismic activity. The procedures and limitations for design of structures in accordance with the California Building Code (CBC) consider seismic zoning, site characteristics, occupancy, configuration, structural system, and height.

The CGS has determined the probability of earthquake occurrences and their associated peak ground accelerations throughout the State of California. The probabilistic seismic hazard assessment determines the earthquake hazard that geologists and seismologists agree could occur in California. It is probabilistic in the sense that the analysis takes into consideration the uncertainties in the size and location of earthquakes and the resulting ground motions that can affect a particular site. The probabilistic seismic hazard assessment maps are typically expressed in terms of probability of exceeding a certain ground motion. Current maps produced by the CGS are based on 10% exceedance in 50 years. This probability level allows engineers to design buildings for larger ground motions than those that geologists and seismologists think will occur during a 50-year interval. These levels of ground-shaking are used primarily for formulating building codes and for designing buildings. The maps can also be used for estimating potential economic losses and preparing for emergency response (Peterson, et. al, 1999). The peak ground acceleration based on a 10% exceedance in 50 years within the region could range between 0.10 g to 0.20 g (Peterson, et. al, 1999).

SOIL RESOURCES

Soil resources found across portions of Zone 4 of the "Water" Study Area are generally associated with one of two geomorphic surfaces: low-lying, late Pleistocene–age terraces that are often referred to as alluvial plains or old alluvial fans; and intermediate terraces of mid-Pleistocene age (NRCS 1993). These surfaces are formed in primarily fine grained, fluvial and glacial alluvium derived from mixed rock sources, including granite in most areas (NRCS 1993). Zones of sedimentary and metamorphic rocks are also mixed with the granitic rocks. Exhibit 3B.7-2 illustrates the soil mapping units identified by NRCS for Zone 4 of the "Water" Study Area.

Portions of Zone 4 of the "Water" Study Area also consist of terrace despots that are dominated by the well-drained soils (e.g., Red Bluff series) and are comprised of gravelly alluvium derived from fluvial and glacial sources laid down by an ancestral channel of the American River (NRCS 1993). These areas to the south of the American River and within the northern sections of Zone 4 of the "Water" Study Area form part of an intermediate terrace remnant associated with channel deposits; however, most of the soils of this terrace were removed by gold-dredging activities. Large linear rows of tailings now line these areas north of Douglas Road and east of Sunrise Boulevard.

Certain soil formations, particularly the Redding series, contain an accumulation of fine grained materials (e.g., clays) at depth that contribute to the formation of a claypan layer, which is generally impervious to water penetration. These surface conditions facilitate the capture and retention of water during winter and spring rains leading to perched groundwater conditions. Where depressions occur on these soils, rainwater tends to pond, ultimately forming vernal pools and swales. These soil types are extensive throughout the southern and eastern portions of Zone 4.

GEOLOGIC AND SOIL-RELATED HAZARDS

Fault Rupture

Surface rupture is an actual cracking or breaking of the ground along a fault during an earthquake. Structures built over an active fault can be torn apart if the ground ruptures. Surface ground rupture along faults is generally limited to a linear zone a few yards wide. No faults mapped under the Alquist-Priolo Earthquake Fault Zone Act (Alquist-Priolo Act) are within the "Water" Study Area (Hart 1997), nor is there evidence of known active faults within the County. Therefore, surface rupture due to faulting in Zone 4 of the "Water" Study Area is not expected to occur and, therefore, hazards related to rupture along a known earthquake fault are considered negligible.

Liquefaction

Liquefaction is the sudden temporary loss of shear strength in saturated, loose to medium dense, granular sediments subjected to ground shaking. It generally occurs when seismically induced ground shaking causes pore water pressure to increase to a point equal to the overburden pressure. Liquefaction can cause foundation failure of buildings and other facilities due to the reduction of foundation bearing strength.

Areas at risk due to the effects of liquefaction are typified by a high groundwater table and underlying loose to medium-dense, granular sediments, particularly younger alluvium and artificial fill. Within the County, two possible liquefaction areas exist: City of Sacramento's downtown area and the Delta area, which are approximately 20 and 47 miles from the Off-site Water Facilities Study Area, respectively (Sacramento County 1993). Because Zone 4 of the "Water" Study Area is not located within the vicinity of these areas, the risks of liquefaction occurring during a seismic event is considered low.

Slope Instability and Landslides

The landslide potential for native and engineered slopes depends on the gradient, localized geology and soils, amount of rainfall, amount of excavation, and seismic activity. Only a narrow strip along the County's eastern boundary, from the Placer County line to the Cosumnes River, is considered to have landslide potential at specific locations (Sacramento County 1993). These landslide areas are approximately three to four miles east of the Off-site Water Facilities Study Area and, therefore, would present minimal hazards to the Off-site Water Facilities Study Area.

Total and Differential Settlement

Settlement can occur both uniformly and differentially (i.e., where adjoining areas settle at different rates). Typically, areas underlain by artificial fills, unconsolidated alluvial sediments, and slope wash, and areas with improperly engineered construction fills are susceptible to this type of settlement. Settlement of the ground surface can be accelerated and accentuated by earthquakes. During an earthquake, settlement can occur as a result of the relatively rapid compaction and settling of subsurface materials (particularly loose, non-compacted, and variable sandy sediments) due to the rearrangement of soil particles during prolonged ground shaking. Given the extensive development within Zone 4 of the "Water" Study Area, transitions between compacted and non-compacted surfaces could present implications for pipeline structures and is discussed further in the impact analysis.

Subsidence

Subsidence of the land surface resulting from compaction of underlying formations affected by head (groundwater level) decline is a well-documented concern throughout much of the Central Valley. During a typical pumping season, changes in land surface elevation can be observed as a result of both elastic and inelastic subsidence in the underlying basin. Elastic subsidence results from the reduction of pore fluid pressures in the aquifer, and typically rebounds when pumping ceases or when groundwater is otherwise recharged resulting in increased pore fluid

pressure. Inelastic subsidence occurs when pore fluid pressures decline to the point that fine-grained sediments such as clays consolidate, resulting in permanent compaction and reduced ability to store water in that portion of the aquifer. Other side effects may include damaged levees, canals, or pipes.

While some land surface subsidence is known to have occurred as a result of groundwater extraction west of the Sacramento River, the extent of subsidence east of the Sacramento River has been minimal (Central Sacramento County Groundwater Management Plan [CSCGMP] 2006). Historical benchmark elevation data for the period from 1912 through the late 1960s to evaluate land subsidence in north Sacramento County. From 1947 to 1969, the magnitude of land subsidence measured at benchmarks north of the American River ranged from 0.13 feet to 0.32 feet, with a general decrease in subsidence in a northeastward direction (CSCGMP 2006). This decrease was determined to be consistent with the geology of the area whereby formations along the eastern side of the Sacramento Valley are older than those on the western side and are subject to a greater degree of pre-consolidation, making them less susceptible to subsidence. Based on these findings and the consolidated nature of the alluvial formations underlying Zone 4, hazards to the Off-site Water Facility Alternatives as they related to subsidence are expected to be low.

Volcanic Hazards

The "Water" Study Area is located approximately 165 miles from Lassen Peak and approximately 100 miles from Mono Lake/Long Valley volcanic areas. Therefore, the risk to the "Water" Study Area from volcanic hazards is extremely low. For this reason, this issue is not discussed further in this EIR/EIS.

Expansive/Corrosive Soils

Expansive soils are largely comprised of clays, which greatly increase in volume when water is absorbed and shrink when dried. This movement may result in the cracking of foundations for above-ground, paved roads, and concrete slabs. Clayey and silty clay soils occur throughout Zone 4 of the "Water" Study Area and have a high to very-high expansion potential. These clayey materials are generally comprised within one or more soil horizons within the upper five feet of the soil profile. Aggregate and sands associated with the dredge tailings generally exhibit a low expansion potential. As shown in Exhibit 3B.7-2, expansive soil materials are extensive throughout Zone 4 of the "Water" Study Area.

Corrosive Soils can damage underground utilities including pipelines and cables, and can weaken roadway structures. Soils within Zone 4 of the "Water" Study Area are classified as moderately to highly corrosive to concrete and steel (NRCS 1993). Exhibit 3B.7-2 illustrates the locations where soils have been determined to be moderately to highly corrosive to uncoated steel.

Naturally Occurring Asbestos

Naturally occurring asbestos (NOA) has been identified in proximity to the Bear Mountain Fault Zone within El Dorado County (Wagner et al. 1981, Churchill et al. 2000). The closest outcrop of these asbestos-bearing rocks to the "Water" Study Area is located more than four miles east (Wagner et al. 1981, Churchill et al. 2000). Based on this distant proximity, hazards related to naturally-occurring asbestos are not applicable to the Off-site Water Facility Alternatives and not discussed further in this section.

PALEONTOLOGICAL RESOURCES

The closest recorded paleontological resource to the "Water" Study Area is approximately 8 miles to the north near the City of Roseville (Sacramento County 2008a). Vertebrate fossils have been documented from nine different locations within the County, encompassing several hundred specimens, and all within the Riverbank Formation (University of California Museum of Paleontology, UCMP 2009). The Riverbank formation extends into the southern end of Zone 4, near Gerber and Florin Roads (see Exhibit 3B.7-1). Because of the large number of vertebrate fossils that have been recovered from the Riverbank Formation from the County and throughout the

Central Valley, this formation is considered to have high sensitivity under criteria established by the Society of Vertebrate Paleontology (1995).

The Pliocene-aged Laguna Formation, which underlies much of Zone 4 east of Excelsior Road, includes only one reference to a vertebrate fossil specimen in Northern California (City Rancho Cordova 2006), which was discovered in a well near the City of Galt. Based on these findings, the Laguna Formation has a generally low probability of containing paleontological resources. Other geologic formations occurring at the surface within Zone 4 include mine/dredge tailings and Holocene alluvium along local drainage features. 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 (City of Rancho Cordova 2006). Since sediments surrounding local drainage features, including Morrison Creek, are less than 11,000 years old, and by definition, to be considered a fossil, a specimen must be more than 11,000 years old, and these sediments would not contain paleontological resources.

As provided in Section 3A.7, "Geology, Soils, Minerals, and Paleontological Resources – Land," because of the way in which the rocks formed within the Salt Springs Slate, Copper Hill Volcanics, and Gopher Canyon Volcanics, it is unlikely that they would contain vertebrate fossils or fossil plant assemblages. However, as provided in Section 3A.7.1, vertebrate fossils have been recovered from both the Mehrten and Ione Formations. Given potential for encountering paleontological resources within the Riverbank, Mehrten, and Ione Formations this issue is evaluated in this EIR/EIS.

3B.7.2 REGULATORY FRAMEWORK

FEDERAL PLANS, POLICIES, REGULATIONS AND LAWS

The following Federal plans, policies, regulations, and laws related to geology, soils, and seismicity are relevant to the Off-site Water Facilities alternatives, and are described in detail in Section 3A.7, "Geology, Soils, Minerals, and Paleontological Resources – Land:"

- Earthquake Hazards Reduction Act

There are no Federal plans, policies, regulations, and laws related to paleontological resources that apply to the Off-site Water Facility Alternatives under consideration.

STATE PLANS, POLICIES, REGULATIONS AND LAWS

The following state plans, policies, regulations, and laws related to geology, soils, and seismicity are relevant to the Off-site Water Facilities alternatives, and are described in detail in Section 3A.7, "Geology, Soils, Minerals, and Paleontological Resources – Land:"

- Alquist-Priolo Geologic Hazards Zone Act (Alquist-Priolo Act)
- Seismic Hazards Mapping Act
- National Pollutant Discharge Elimination System Permit
- California Building Standards Code

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

The following local and regional plans, policies, regulations, and laws related to geology, soils, and seismicity are relevant to the Off-site Water Facilities alternatives, and are described in detail in Section 3A.7, "Geology, Soils, Minerals, and Paleontological Resources – Land:"

- Sacramento County General Plan
- Sacramento County Grading Ordinance (adopted by City of Rancho Cordova)
- Professional Paleontological Standards

Rancho Cordova General Plan

Applicable policies of the City of Rancho Cordova's General Plan relating to geology, soils, and mineral resources are provided below.

- **Policy S.1.1:** Maintain acceptable levels of risk of injury, death, and property damage resulting from reasonably foreseeable safety hazards in Rancho Cordova.

- **Policy S.3.2:** Ensure that new structures are protected from damage caused by geologic and/or soil conditions to the greatest extent feasible.

3B.7.3 ENVIRONMENTAL CONSEQUENCES AND MITIGATION MEASURES

THRESHOLDS OF SIGNIFICANCE

The thresholds for determining the significance of impacts for this analysis are based on the environmental checklist in Appendix G of the State CEQA Guidelines. These thresholds also encompass the factors taken into account under NEPA to determine the significance of an action in terms of its context and the intensity of its impacts. For the purposes of this analysis, an impact related to local geologic and/or soil conditions would be considered significant if the Off-site Water Facilities would:

- expose people or structures to potential substantial adverse effects, including the risk of loss, injury or death involving:

    i. rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault (Refer to CDMG Special Publication 42),

    ii. strong seismic ground shaking,

    iii. seismic-related ground failure, including liquefaction, or

    iv. landslides.

- result in substantial soil erosion or the loss of topsoil;

- be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction or collapse;

- be located on expansive soil, as defined in Table 18-1-B of the UBC (2000), creating substantial risks to life or property; or

- have soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems where sewers are not available for the disposal of wastewater.

Based on the environmental checklist in Appendix G of the State CEQA Guidelines, a project would have a significant impact on paleontological resources if it would directly or indirectly destroy a unique paleontological resource or site. A "unique paleontological resource or site" is one that is considered significant under the professional paleontological standards described below.

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

- a type specimen (i.e., the individual from which a species or subspecies has been described);
- a member of a rare species;
- a species that is part of a diverse assemblage (i.e., a site where more than one fossil has been discovered) wherein other species are also identifiable, and important information regarding life history of individuals can be drawn;
- a skeletal element different from, or a specimen more complete than, those now available for its species; or
- a complete specimen (i.e., all or substantially all of the entire skeleton is present).

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

This analysis evaluates the potential for Off-site Water Facility Alternatives (described in Chapter 2, "Alternatives") to interact with the localized geologic conditions to produce conditions that will exceed the applied significance criteria as identified below.

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. 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. 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-level 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.

ISSUES NOT DISCUSSED FURTHER IN THIS EIR/EIS

Alquit-Priolo Fault Zones—The Off-site Water Facilities Study Area would not cross any mapped fault traces or delineated fault ruptures zones according to the most recent Alquist-Priolo Earthquake Fault Zoning Maps issued

by the State Geologist. For this reason, the Off-site Water Facilities would not expose people or structures to potential substantial adverse effects as they relate to fault rupture. Therefore, this issue is not discussed further in this EIR/EIS.

Landslides—As described in the setting section, the Off-site Water Facilities Study Area is characterized by level to undulating topography and does not contain slopes in excess of 10 percent. In this context, the potential for a landslide to occur as a result of activities proposed in Chapter 2, "Alternatives" is remote and no impact is expected. Therefore, this issue is not discussed further in this EIR/EIS.

Septic Tanks—The Off-site Water Facilities would not include the use of septic tanks or alternative waste water disposal systems. During construction portable toilets and water treatment units would be used. Development of up to 44 rural residential units could be constructed on 80-acre parcels within the SPA under the No Project Alternative. Under the No Project Alternative, construction of on-site septic tanks could be required. This issue is analyzed in Section 3A.7, "Geology, Soils, Minerals, and Paleontological Resources – Land". Therefore, this issue is not discussed further in this section.

IMPACT ANALYSIS

Impacts that would occur under each of the Off-site Water Facility Alternatives are identified as follows:

NCP (No USACE Permit Alternative)

PA (Proposed Off-site Water Facility Alternative)

1 (Off-site Water Facility Alternative 1 – Raw Water Conveyance – Gerber/Grant Line Road Alignment and White Rock WTP)

1A (Off-site Water Facility Alternative 1A Raw Water Conveyance – Gerber/Grant Line Road Alignment Variation and White Rock WTP)

2 (Off-site Water Facility Alternative 2 Treated Water Conveyance – Douglas Road Alignment and Vineyard SWTP)

2A (Off-site Water Facility Alternative 2A Treated Water Conveyance – Excelsior Road Alignment Variation and Vineyard SWTP)

2B (Off-site Water Facility Alternative 2B Treated Water Conveyance – North Douglas Tanks Variation and Vineyard SWTP)

3 (Off-site Water Facility Alternative 3 Raw Water Conveyance – Excelsior Road Alignment and White Rock WTP)

3A (Off-site Water Facility Alternative 3A Raw Water Conveyance – Excelsior Road Alignment Variation and White Rock WTP)

4 (Off-site Water Facility Alternative 4 Raw Water Conveyance – Easton Valley Parkway Alignment and Folsom Boulevard WTP)

4A (Off-site Water Facility Alternative 4A Raw Water Conveyance – Easton Valley Parkway Alignment Variation and Folsom Boulevard WTP).

The impacts for each alternative are compared relative to the PA at the end of each impact conclusion (i.e., similar, greater, lesser).

IMPACT 3B.7-1 Possible Risks to People and Structures Caused by Strong Seismic Ground Shaking. *Zone 4 of the "Water" Study Area is located in an area of generally low seismic activity; however, structures constructed as part of the Off-site Water Facility Alternatives could be subject to seismic ground shaking from an earthquake along active faults in the Sierra Nevada.*

NCP, PA 1, 1A, 3, 3A, 4, and 4A

As described in the affected environment section, the localized geologic conditions characterizing Zone 4 of the "Water" Study Area are not conducive to hazards associated with rupture of an active fault or slope failure. For this reason, this discussion places emphasis on those hazards that relate to ground motion resulting from a seismic event and potential secondary effects based on the geologic conditions present within Zone 4 of the "Water" Study Area.

The Sacramento Valley has historically experienced very low seismic activity. Therefore, there is a low probability for disruption of water supply service through a pipeline breakage or damage to the WTP. Seismic design consistent with current professional engineering and industry standards would be used in construction for resistance to strong ground motion, especially for lateral forces.

However, without site-specific geotechnical information and interpretation, the City is unable to accurately pinpoint if and where these types of techniques would be required. As a result, this **direct** impact is considered **potentially significant**. **No indirect** impacts would occur. ***[Similar]***

Mitigation Measure 3B.7-1a: Prepare Geotechnical Report(s) for the Off-site Water Facilities and Implement Required Measures.

Facility design for all Off-site Water Facility components shall comply with the site-specific design recommendations as provided by a licensed geotechnical or civil engineer to be retained by the City. The final geotechnical and/or civil engineering report shall address and make recommendations on the following:

- site preparation;
- soil bearing capacity;
- appropriate sources and types of fill;
- potential need for soil amendments;
- road, pavement, and parking areas;
- structural foundations, including retaining-wall design;
- grading practices;
- soil corrosion of concrete and steel;
- erosion/winterization;
- seismic ground shaking;
- liquefaction; and
- expansive/unstable soils.

In addition to the recommendations for the conditions listed above, the geotechnical investigation shall include subsurface testing of soil and groundwater conditions, and shall determine appropriate foundation designs that are consistent with the version of the CBC that is applicable at the time building and grading permits are applied for. All recommendations contained in the final geotechnical engineering report shall be implemented by the City.

Implementation: City of Folsom Utilities Department

Timing: Prior to completion of engineering plans for all Off-site Water Facilities

Enforcement:

1. For all project-related improvements that would be located within the City of Folsom: City of Folsom Community Development Department.

2. For the off-site water facilities within Unincorporated Sacramento County or the City of Rancho Cordova: Sacramento County Planning and Community Development Department or City of Rancho Cordova Planning Department.

Mitigation Measure 3B.7-1b: Incorporate Pipeline Failure Contingency Measures Into Final Pipeline Design.

Isolation valves or similar devices shall be incorporated into all pipeline facilities to prevent substantial losses of surface water in the event of pipeline rupture, as recommended by a licensed geotechnical or civil engineer. The specifications of the isolation valves shall conform to the CBC and American Water Works Association standards.

Implementation: City of Folsom Utilities Department

Timing: Prior to completion of engineering plans for all Off-site Water Facilities

Enforcement:

1. For all project-related improvements that would be located within the City of Folsom: City of Folsom Community Development Department.

2. For the off-site water facilities within Unincorporated Sacramento County or the City of Rancho Cordova: Sacramento County Planning and Community Development Department or City of Rancho Cordova Planning Department.

2, 2A, and 2B

Under the Off-site Water Facility Alternatives 2, 2A, and 2B, a new WTP would not be constructed and therefore, issues related to potential geologic hazards and the potential effects on the WTP would not be applicable. However, these alternatives would still involve the construction of a treated-water conveyance pipeline that, if damaged during a seismic event, could disrupt potable water service. As a result, this **direct** impact is considered **potentially significant**. **No indirect** impacts would occur. ***[Lesser]***

Mitigation Measure: Implement Mitigation Measures 3B.7-1a and 3B.7-1b.

With the implementation of the above mitigation, potential impacts from strong seismic ground-shaking would be reduced to a **less-than-significant** level through the implementation of recommendations made by a licensed geotechnical engineer in compliance with the CBC prepared as part of a formal geotechnical investigation.

IMPACT 3B.7-2 Construction-Related Erosion. *Construction activities during implementation of the Off-site Water Facility Alternatives would involve grading and movement of earth in soils subject to wind and water erosion hazard.*

NCP, PA, 1, 1A, 2, 2A, 2B, 3, 3A, 4, and 4A

Construction of the various Off-site Water Facility components would expose bare soil to precipitation and wind erosion, thereby potentially resulting in increased sedimentation of local waterways. Ground-disturbing activities, including removal of vegetation, could cause increased water runoff rates and concentrated flows, thereby potentially leading to accelerated erosion. In agricultural areas, this could result in measurable losses to soil productivity. In addition, because construction would occur in close proximity to local waterways, such effects to water quality and aquatic habitat could be considerable if proper erosion control measures are not implemented. Dewatering operations used during pipeline installation and the installation of sub-grade structures associated

with the WTP or storage tanks also carries the potential for increased sedimentation of local waterways. Therefore, this **direct** impact is considered **potentially significant**. **No indirect** impacts would occur. ***[Similar]***

Mitigation Measure: Implement Mitigation Measures 3B.9-1a, 3B.9-1b, 3B.9-1c, 3B.9-3a, and 3B.9-3b.

Implementation: City of Folsom Utilities Department

Timing: Prior to start of construction

Enforcement:
1. For all project-related improvements that would be located within the City of Folsom: City of Folsom Community Development Department.
2. For the off-site water facilities within Unincorporated Sacramento County or the City of Rancho Cordova: Sacramento County Planning and Community Development Department or City of Rancho Cordova Planning Department.

With implementation of the mitigation measures listed above, erosion from construction activities related to the off-site water facilities would be reduced to a **less-than-significant** level because a SWPPP would be prepared and BMPs would be implemented to reduce erosion along the pipeline alignment, and a drainage plan would be prepared and implemented to reduce erosion at the WTP.

IMPACT 3B.7-3 Unstable Geologic Conditions. *The Off-site Water Facility Alternatives could be located on a geologic unit or soil that is unstable, or that could become unstable as a result of the Off-site Water Facilities.*

NCP, PA, 1, 1A, 2, 2A, 2B, 3, 3A, 4, and 4A

Based on the discussions provided for geologic hazards within the setting description, the primary concerns related to local geologic conditions is related to settlement and differential settlement. Settlement could potentially occur from the placement of new static loads with possibly half of the settlement taking place during construction or shortly thereafter. Differential settlement could occur between foundation blocks or slabs due to variability in underlying soil conditions. Total and differential settlement could therefore damage proposed foundations, structures, and pipelines. Additionally, although unlikely, regional subsidence could cause potential damage or rupture to the buried pipelines and other associated structures designed with minimal tolerance for settlement. Therefore, these **direct** and **indirect impacts** is considered **potentially significant**. ***[similar]***

Mitigation Measure: Implement Mitigation Measures 3B.7-1a and 3B.7-1b.

With implementation of the mitigation measures listed above, geologic hazards in terms of total and differential settlement would be reduced to a less-than-significant level, because a licensed geotechnical or soils engineer would investigate the site-specific soil conditions and design the facilities to withstand settlement in accordance with the CBC.

IMPACT 3B.7-4 Exposure to Potential Hazards from Problematic Soils. *The Off-site Water Facility Alternatives could encounter expansive or corrosive soils thereby subjecting related structures to potential risk of failure.*

NCP, PA, 1, 1A, 2, 2A, 2B, 3, 3A, 4, and 4A

As provided in Exhibit 3B.7-2, soils within Zone 4 generally exhibit a moderate to high potential for shrink-swell. Unless properly mitigated, shrink-swell soils could exert additional pressure on buried pipelines producing shrinkage cracks that would allow water infiltration and compromise the integrity of backfill material. Depending on the depth of the buried pipeline, soil expansion or contraction could lead to undue lateral pipeline stress and

stress of structural joints. Over time, lateral stresses could lead to pipeline rupture or leaks in the coupling joints. Likewise, structural facilities, including the WT and pump station, could be subjected to hazards from expansive soils is constructed directly on expansive soil materials. This **direct** impact would be a **potentially significant**. **No indirect** impacts would occur. ***[Similar]***

As illustrated in Exhibit 3B.7-2 soil materials encountered within Zone 4 of the Off-site Water Facilities Study Area exhibit a moderate to high potential for corrosion to uncoated steel. Corrosive soil materials could lead to pipe corrosion, potentially resulting in pipe failure and localized surface flooding of water or localized settlement of surface soils in the location of the failure. Therefore, this **direct** impact is considered **potentially significant**. **No indirect** impacts would occur. ***[Similar]***

Mitigation Measure: Implement Mitigation Measure 3B.7-1a.

Mitigation Measure 3B.7-4: Implement Corrosion Protection Measures.

As determined appropriate by a licensed geotechnical or civil engineer, the City shall ensure that all underground metallic fittings, appurtenances, and piping include a cathodic protection system to protect these facilities from corrosion.

Implementation: City of Folsom Utilities Department

Timing: Prior to completion of engineering plans for all Off-site Water Facilities

Enforcement:

1. For all project-related improvements that would be located within the City of Folsom: City of Folsom Community Development Department.

2. For the off-site water facilities within Unincorporated Sacramento County or the City of Rancho Cordova: Sacramento County Planning and Community Development Department or City of Rancho Cordova Planning Department.

With implementation of the mitigation measure listed above, soil-related hazards in terms of expansive and corrosive soils would be reduced to a **less-than-significant** level because a licensed geotechnical or soils engineer would investigate the site-specific soil conditions and design the facilities to withstand expansive soil pressures and soil corrosivity.

IMPACT 3B.7-5 Possible Damage of or Destruction to of Previously Unknown Unique Paleontological Resources during Construction-Related Activities. *Construction of the Off-site Water Facility Alternatives could directly or indirectly destroy a unique paleontological resource or site.*

NCP, PA, 1, 1A, 2, 2A, 2B, 3, 3A, 4, and 4A

Fossil remains of vertebrates that existed during the Pleistocene have been encountered during excavation activities within the Riverbank, Mehrten, and Ione geologic formations, as shown in Exhibit 3B.7-1 underlie the southern and northeastern portions of Zone 4 of the Off-site Water Facilities Study Area. The remaining portions of Zone 4 are generally underlain by the Laguna Formation, mine/dredge tailings, or Holocene-aged channel deposits. As provided in the discussion of the affected environment, these formations are generally devoid of significant vertebrate fossils, and no previously recorded fossil sites from this formation are known from either Zone 4 or the surrounding area (City of Rancho Cordova 2006). Furthermore, the conveyance pipeline would be constructed within existing roadways or along the shoulder and, therefore, has a low likelihood for disturbing native ground surfaces.

Nevertheless, each of the Off-site Water Facility Alternatives along one or more portions of each respective alignment has the potential to encounter the sensitive geologic formations identified above. The conveyance alignment for the Proposed Off-site Water Facility Alternative and Offsite Water Facility Alternatives 1 and 1A, would traverse cross-county east of Gerber Road, which as shown in Exhibit 3B.7-1, is underlain by the Riverbank Formation. In addition, all the conveyance alignments would traverse areas in the vicinity of Prairie City Road, which are underlain by the Mehrten and Ione Formations, thereby creating the potential for encountering paleontological resources during construction-related excavation/trenching.

Since fossils have been discovered within the Mehrten, Ione, and Riverbank Formations throughout the Central Valley, these formations are considered paleontologically sensitive. As a result, the potential for encountering and potentially damaging or destroying unique paleontological resources during construction activities within these sensitive geologic formations is considered a **potentially significant direct** impact. **No indirect** impacts would occur. ***[Similar]***

Mitigation Measure 3B.7-5: Conduct Construction Personnel Education, Stop Work if Paleontological Resources are Discovered, Assess the Significance of the Find, and Prepare and Implement a Recovery Plan as Required.

To minimize potential adverse impacts on previously unknown potentially unique, scientifically important paleontological resources, the City shall implement appropriate measures during construction of the Offsite Water Facility improvements. These measures shall be required for construction activities at the following locations: (1) Grant Line Road, south of SR 16; (2) Florin road, east of Excelsior Road; (3) Gerber Road, east of Excelsior Road; (4) White Rock Road, east of Prairie City Road; and (5) Prairie City Road and shall include:

- Before the start of any earthmoving activities for any project phase in the Riverbank Formation, the project applicant(s) shall retain a qualified paleontologist or archaeologist to train all construction personnel involved with earthmoving activities, including the site superintendent, regarding the possibility of encountering fossils, the appearance and types of fossils likely to be seen during construction, and proper notification procedures should fossils be encountered.

- If paleontological resources are discovered during earthmoving activities, the construction crew shall immediately cease work in the vicinity of the find and notify Sacramento County Planning and Community Development Department. The project applicant(s) shall retain a qualified paleontologist to evaluate the resource and prepare a recovery plan in accordance with Society of Vertebrate Paleontology guidelines (1996). The recovery plan may include, but is not limited to, a field survey, construction monitoring, sampling and data recovery procedures, museum storage coordination for any specimen recovered, and a report of findings. Recommendations in the recovery plan that are determined by the County to be necessary and feasible shall be implemented before construction activities can resume at the site where the paleontological resources were discovered.

Implementation: City of Folsom Utilities Department

Timing: During earthmoving activities in the Roverbank, Ione, and Mehrten Formations as shown in Wagner et al, 1981.

Enforcement:
1. For all project-related improvements that would be located within the City of Folsom: City of Folsom Community Development Department.

2. For the off-site water facilities within Unincorporated Sacramento County or the City of Rancho Cordova: Sacramento County Planning and Community Development Department or City of Rancho Cordova Planning Department.

Implementation of Mitigation Measure 3B.7-5 would reduce potentially significant impacts related to damage or destruction of unique paleontological resources within the Riverbank Formation to a less-than-significant level because construction workers would be alerted to the possibility of encountering paleontological resources, and in the event that resources were encountered, and fossil specimens would be recovered and recorded and would undergo appropriate curation.

3B.7.4 RESIDUAL SIGNIFICANT IMPACTS

With implementation of Mitigation Measures 3B.7-1a, 3B.7-1b, 3B.9-1a, 3B.9-1b, and 3B.9-1c, 3B.7-4, and 3B.7-5, impacts related to strong seismic ground-shaking, construction-related erosion, soil hazards related to settlement and corrosion, and the potential for encountering previously undiscovered paleontological resources would be reduced to less-than-significant levels. Based on these circumstances, the Off-site Water Facility Alternatives would not result in residual significant and unavoidable impacts related to geology, soils, or paleontological resources.