4.7 – Geology and Soils

This section of discusses the geologic and soil conditions of the Redevelopment Project Area and identifies the potential environmental impacts and development constraints if the proposed project were implemented. This analysis is based on a review of the United States Department of Agriculture (USDA) Soil Survey of Sacramento County and publications by the California Department of Conservation, California Geological Survey (formerly the Division of Mines and Geology) and the Division of Oil, Gas, and Geothermal Resources.

4.7.1 ENVIRONMENTAL SETTING

REGIONAL GEOLOGIC SETTING

The Project Area is located within the Great Valley geomorphic province of California. The geology of the Great Valley (Valley) is characterized by thick, Jurassic through Holocene aged sedimentary deposits. The California Geological Survey (CGS) and the United States Geological Survey (USGS) have mapped a large portion of the Valley as being underlain by Quaternary-aged Riverbank formation. The Riverbank formation represents alluvial fans, or fan-shaped areas of sediment carried by a watercourse. These geological deposits are generally composed of alluvial gravel, sand, and silt derived from the western slopes of the Sierra Nevada Range. The Valley province is bounded by the Klamath and Cascade mountain ranges to the north, the Sierra Nevada Mountains to the east, and the California Coast Mountain Range to the west. The Valley is generally considered to be an elongated sedimentary trough, approximately 450 miles long and 50 miles wide, which has been filled by a thick sequence of Jurassic to Holocene continental and marine sediments. The Valley province is further divided into four geomorphic subunits: the Delta, River Floodplain, Alluvial Floodplain, and Low Foothills. Surface elevations within the Great Valley generally range from several feet below mean sea level (msl) to more than 1,000 feet above mean sea level (msl). The major topographical feature in the Sacramento Valley is the Sutter Buttes (a volcanic remnant), which rises approximately 1,980 feet above the surrounding valley floor.

The geological formations underlying the majority of the Project Area consist of low floodplains, which are generally found along the American River in the area. The vicinity of the Project Area includes natural levees, alluvial plains, and many smaller channels along the river corridor. Bar and channel topography is evident on the low floodplains adjacent to the river corridors.

SOIL CONDITIONS AND TOPOGRAPHY

The majority of the soils in the Project Area are the result of alluvial deposits, or river deposits on various geomorphic surfaces. The USDA Soil Conservation Service produces maps classifying soil groups based on physical, hydrologic, and chemical properties. According to the *USDA Soil Survey of Sacramento County* (Soil Survey), the Project Area contains 12 separate soil types as described in **Table 4.7-1,** below, and illustrated in **Figure 4.7-1**. **Table 4.7-1** also identifies the approximate acres within the Project Area per soil type, as well as characteristics related to topography and permeability.

TABLE 4.7-1
SOIL TYPES WITHIN THE REDEVELOPMENT PROJECT AREA

Map Unit Name	Total Approximate Acres	Slopes	Subsoil Permeability (inches/hour)	Water Holding Capacity	Erosion Potential	Runoff
(102) Americanos-Urban land complex	627.45	0 to 2%	60+	High	Slight	Slow
(164) Kimball silt loam	4.51	0 to 2%	60+	Moderate	Slight	Slow
(166) Kimball-Urban land complex	85.24	0 to 2%	60+	Moderate	Slight	Slow
(181) Natomas loam	24.20	0 to 2%	60+	Very high	Slight	Slow
(190) PITS	7.47	1 to 8%	--	--	--	--
(204) Rossmoor-Fine sandy loam	96.17	0 to 2%	60+	High	Slight	Slow
(205) Rossmoor-Urban land complex	132.67	0 to 2%	60+	High	Slight	Slow
(219) San Joaquin-Urban land complex	142.64	0 to 2%	23 to 40	Low	Slight	Slow
(227) Urban Land	244.49	--	--	--	--	--
(228) Urban land-Natomas	931.23	0 to 2%	60+	Very high	Slight	Slow
(245) Xerothents, Dredge tailings	10.45	2 to 50%	60+	Very low to low	Slight to none	Very slow to slow
(246) Xerorthents, Dredge tailings-Urban land complex	181.30	0 to 2%	60+	Very low to low	Slight	Very slow

Source: Soil Survey of Sacramento County, California, 1993

In general, the topography of the Project Area is characterized by flat to gently rolling terrain. Elevations within the Project Area range from approximately 30 feet near the American River to nearly 115 feet in the eastern portions of the Project Area. Slopes within the Project Area generally range from 0% to 5%.

In terms of soil characteristics, surface runoff, soil erosion, and expansive soils can create potential problems for engineering designs and land use activities. Erosion can affect all land uses, and substantial runoff can erode land and adversely affect water quality. Expansive soil properties can affect pavement and building foundation designs. The majority of the Project Area consists of soils characterized by slight to moderate erosion potential, and very low to medium runoff rates. The expansive shrink-swell potential of the Project Area soils range from low to high, with the majority of the soils having low to moderate shrink-swell potential. Expansive soils are discussed further under Section 4.7.3, Impacts and Mitigation Measures.

SEISMIC HAZARDS

Faults

Earthquakes are generally expressed in terms of *intensity* and *magnitude*. Intensity is based on the observed effects of ground shaking on people, buildings, and natural features. An earthquake's intensity varies from region to region, depending on the location of the observer with respect to the earthquake epicenter. **Table 4.7-2** provides a description and a comparison of *intensity* and *magnitude*.

TABLE 4.7-2
MAGNITUDE AND INTENSITY COMPARISON

Magnitude	Typical Maximum Modified Mercalli Intensity
1.0 to 3.0	I
3.0 to 3.9	II - III
4.0 to 4.9	IV – V
5.0 to 5.9	VI – VII
6.0 to 6.9	VII - IX
7.0 and higher	VIII or higher

Source: USGS, 2006

The *intensity* scale consists of a series of certain key responses such as people awakening, movement of furniture, damage to chimneys, and finally--total destruction. The Modified Mercalli (MM) Intensity Scale is used in the United States to evaluate earthquake movements. The MM scale is composed of 12 increasing levels of intensity designated by Roman numerals. The levels range from imperceptible shaking to catastrophic destruction. The MM does not have a mathematical basis; instead, it is an arbitrary ranking based on observed effects. The lower numbers of the intensity scale generally deal with the manner in which the earthquake is felt by people. The higher numbers of the scale are based on observed structural damage. **Table 4.7-3** describes the typical effects observed at locations near the epicenter of earthquakes of different magnitudes.

TABLE 4.7-3
TYPICAL EFFECTS OF EARTHQUAKE ACTIVITY

Typical Maximum Modified Mercalli Intensity	Typical Effects of Earthquake Activity*
I	Not felt except by a very few under especially favorable conditions.
II	Felt only by a few persons at rest, especially on upper floors of buildings.
III	Felt quite noticeably by persons indoors, especially on upper floors of buildings. Many people do not recognize it as an earthquake. Standing motor cars may rock slightly. Vibrations similar to the passing of a truck.
IV	Felt indoors by many, outdoors by few during the day. At night, some awakened. Dishes, windows, doors disturbed; walls make cracking sound. Sensation like heavy truck striking building. Standing motor cars rocked noticeably
V	Felt by nearly everyone; many awakened. Some dishes, windows broken. Unstable objects overturned. Pendulum clocks may stop.
VI	Felt by all, many frightened. Some heavy furniture moved; a few instances of fallen plaster. Damage slight.
VII	Damage negligible in buildings of good design and construction; slight to moderate in well-built ordinary structures; considerable damage in poorly built or badly designed structures; some chimneys broken.
VIII.	Damage slight in specially designed structures; considerable damage in ordinary substantial buildings with partial collapse. Damage great in poorly built structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture overturned.

Typical Maximum Modified Mercalli Intensity	Typical Effects of Earthquake Activity*
IX	Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb. Damage great in substantial buildings, with partial collapse. Buildings shifted off foundations.
X	Some well-built wooden structures destroyed; most masonry and frame structures destroyed with foundations. Rails bent.
XI	Few, if any (masonry) structures remain standing. Bridges destroyed. Rails bent greatly.
XII	Damage total. Lines of sight and level are distorted. Objects thrown into the air.

Source: USGS, 2006
*Notes: *Abbreviated Modified Mercalli Intensity Scale.*

By comparison, an earthquake's *magnitude* is related to the amount of seismic energy released at the hypocenter of the earthquake. *Magnitude* is based on the amplitude of the earthquake waves recorded on instruments, which have a common calibration. The magnitude or strength of earth movement associated with seismic activity is typically quantified using the Richter scale. This scale is a measure of the strength of an earthquake or strain energy released by it, as determined by seismographic observations. This is a logarithmic value originally defined by Charles Richter (1935). An increase of one unit of magnitude (for example, from 4.6 to 5.6) represents a 10-fold increase in wave amplitude on a seismogram, or approximately a 30-fold increase in the energy released. In other words, a magnitude 6.7 earthquake releases over 900 times (30 times 30) the energy of a 4.7 earthquake.

The California Geological Survey (CGS) identifies low, medium, and high severity zones within the state of California. Because the Project Area is located within Seismic Zone III, a zone of moderate risk for seismic shaking, the probable maximum intensity of an earthquake could be rated as high as VII on the Modified Mercalli Scale and could result in minor structural damage and marginal human safety related hazards.

In accordance with the severity zones, the CGS also defines the following:

- *Fault* – a fracture or zone of closely associated fractures along which rocks on one side have been displaced with respect to those on the other side;
- *Fault Zone* – a zone of related faults, which commonly are braided, and sub parallel, but may be branching and divergent. A fault zone has a significant width (with respect to the scale at which the fault is being considered, portrayed, or investigated), ranging from a few feet to several miles;
- *Potentially Active Fault* – a fault that showed evidence of surface displacement during Quaternary time (last 1.6 million years). The purpose of this designation indicates the evaluation of possible zonation. No longer used;
- *Sufficiently Active Fault* – a fault that has evidence of Holocene (10,000 years) surface displacement along one or more of its segments or branches; and,
- *Well-Defined Fault* – a fault whose trace is clearly detectable by a trained geologist as a physical feature at or just below the ground surface. The geologist should be able to locate the fault in the field with sufficient precision and confidence to indicate that the required site-specific investigations would meet with some success.

"Sufficiently Active Faults" and "Well Defined Faults" are the two criteria used by the State of California in order to determine if a fault should be zoned under the Alquist-Priolo Act, further discussed in Section 4.7.2, Regulatory Framework. No known active faults or Alquist-Priolo earthquake hazard zones (formerly known as special study zones) occur in Sacramento County. However, there are active fault zones just outside of the County and several inactive subsurface faults are identified in the Delta region. There are also pre-quaternary fault zones located near the Rancho Cordova Planning Area. **Table 4.7-4**, below, lists the fault zones within the region, and their approximate location to the Project Area.

TABLE 4.7-4
PROXIMITY OF FAULT ZONES TO THE REDEVELOPMENT PROJECT AREA

Fault	Activity	Location
Midland	Some activity in 1897; however, no appreciable movement in the last 24 to 36 million years	35 miles west of the Project Area
Bear Mountain	1.6 million years	24 miles northeast of the Project Area
Great Valley	Currently active	58 miles west of the Project Area
Melones	More than 2 million years	30 miles east of the Project Area
Dunnigan Hills or Zamora	10,000 years	38 miles northwest of the Project Area
Green Valley	Portions active within the past 200 years	54 miles southwest of the Project Area
Hunting Creek	Not reported	66 miles west of the Project Area
Healdsburg-Rodgers Creek	Not reported	56 miles southwest of the Project Area
West Napa	Not reported	49 miles southwest of the Project Area
Greenville	Portions active within the past 200 years	53 miles southwest of the Project Area
Calaveras	Portions active within the past 200 years	60 miles southwest of the Project Area
Las Positas	Portions active within the past 200 years	65 miles south of the Project Area

Source: USGS, 2006; California Geological Survey, 2006

The Midland fault and the Bear Mountain fault zones, considered the faults of greatest concern in Sacramento County due to their location and size, are older than 1.6 million years old. The Midland fault zone is considered to be a deep pre-Oligocene subsurface feature extending nearly 50 miles along the west side of the Sacramento Valley. Subsurface data indicate that there has been no appreciable movement on the Midland fault in the last 24 to 36 million years, and no evidence of surface expression has been found.

The Bear Mountain fault zone is the nearest fault to the Project Area, the closest segment being approximately 24 miles northeast of the Project Area. The Bear Mountain fault is the westerly-

most fault within the Foothills fault zone, which consists of numerous northwesterly trending faults along the western edge of the Sierra Nevada range.

The width of the Great Valley fault zone extends from the eastern flanks of the Coast Ranges as far easterly as Dunnigan. This zone of potential faulting may be connected to the Vacaville-Winters earthquakes of 1892 and the Coalinga earthquake of 1983. Earthquake activity within the Great Valley fault zone often occurs on "blind thrusts", in reference to their lack of surface expression and the direction of fault offset.

Secondary Hazards

Tectonic activity can produce a variety of secondary hazards affecting structures and/or adversely affecting human safety. The most common secondary seismic hazards result from ground shaking, liquefaction, and the settlement of underlying soils.

Ground Shaking

Ground shaking is the motion that occurs as energy is released during fault related activity and is considered the most damaging of all seismic activities. In the developed and more populated portions of the Project Area, the greatest geologic potential for loss of life and property damage is the result of ground shaking from a nearby earthquake. The degree of damage depends on many interrelated factors. Among these factors are the Richter Magnitude, focal depth, distance from the causative fault, source mechanism, duration of shaking, high rock accelerations, type of surficial deposits or bedrock, degree of consolidation of surficial deposits, presence of high groundwater, topography, and design, type, and quality of building construction.

The risk of damage to manmade structures may be caused by primary ("P") waves or secondary ("S") waves as the ground oscillates back and forth, or side-to-side, and as the P or S waves travel through the earth's subsurface layers in response to a seismic event. The Project Area is considered a relatively moderate ground shaking zone due to the distance of active faults.

Liquefaction Potential

Liquefaction is the process in which water is combined with unconsolidated soils, generally from ground motion and pressure, which causes the soils to behave like quicksand. Liquefaction potential is determined from a variety of factors, including: soil type, soil density, depth to the groundwater table, and the duration and intensity of ground shaking. Liquefaction is most likely to occur in deposits of water saturated alluvium or areas of considerable artificial fill. In addition, the depth to the groundwater table and aquifer system is generally greater than 20 feet. Therefore, the potential for liquefaction is considered low.

The potential for other secondary hazards (i.e., ground lurching, differential settlement, or lateral spreading) occurring during or after seismic events in the Project Area is also considered to be low due to the distance of active faults.

Subsidence

Subsidence is the gradual settling or sinking of surface soil deposits with little or no horizontal motion. Sacramento County is affected by five causes of land subsidence: 1) compaction of unconsolidated soils from earthquakes; 2) compaction by heavy structures; 3) erosion of peat soils; 4) peat oxidation; and 5) groundwater withdrawal. Minor land subsidence was observed

and recorded in the County between 1912 and the mid-1960's for all groundwater basins underlying the County. However, subsidence did not exceed 0.40-feet during this time frame. Due to the soils characteristics within the Project Area, the likeliness of subsidence is considered very low.

Historical Seismic Activity

As indicated previously, no known active faults or Alquist-Priolo earthquake hazard zones occur in Sacramento County. Accurate seismic activity records for Sacramento County have been kept for the past 150 years, which indicate that significant regional seismic activity was recorded in 1869, 1892, 1954, and 1966. Records indicate that the 1869, 1954, and 1966 events were centered in western Nevada and did not result in ground shaking or structural damage in the Sacramento area.

In 1892, an earthquake measuring VI on the Modified Mercalli Scale occurred in the Vacaville and Winters areas and resulted in structural damage in downtown Sacramento, including, but not limited to: toppled chimneys, cracked plaster, and moderate masonry damage on several buildings. Other than the 1892 earthquake, no seismic activity of significant magnitude has occurred in Sacramento County resulting in structural damage or human related injuries or deaths.

Mineral Resources

Historic mineral production in the region has included construction aggregate, kaolin clay, common clay, pumice, and gold. Construction aggregate consists of sand, gravel, and crushed stone. Existing mineral extraction activities that occur in and around the Project Area primarily consist of fine sand and course gravel construction aggregates, as well as clay. Additional mineral resources include gold. Construction aggregates come from two different sources: hardbed rock sources and river channel (alluvial) sources. Generally, sand, gravel, and clay are used as fill and for the construction of highways and roads, streets, urban and suburban development, canals, aqueducts, and pond linings, among other uses.

While mining operations within portions of the City of Rancho Cordova and areas to the east of the City are ongoing, no mining is underway in the Project Area. The vast majority of the Project Area consists of residential and commercial development, precluding the opportunity or possibility for mining operations.

The Surface Mining and Reclamation Act (SMARA) directs the State Geologist to identify and map the non-fuel mineral resources of the State in order to show where economically significant mineral deposits occur and where they are likely to occur based upon the best available scientific data. As such, the California Geological Survey and the State Mining and Geology Board are the State agencies responsible for the classification and designation of areas containing, or potentially containing, significant mineral resources. Areas known as Mineral Resource Zones (MRZs) are classified on the basis of geologic factors, without regard to existing land use and land ownership. The primary objective of the process is to provide local agencies with information on the location, need, and importance of minerals within their respective jurisdictions. The areas are categorized into four general classifications (MRZ-1 through MRZ-4) and are defined as follows:

MRZ-1 Areas where adequate information indicates that no significant mineral deposits are present, or where it is judged that little likelihood exists for their presence.

MRZ-2 Areas where adequate information indicates that significant mineral deposits are present, or where it is judged that a high likelihood for their presence exists.

MRZ-3 Areas containing mineral deposits, the significance of which cannot be evaluated from available data.

MRZ-4 Areas where available data is inadequate for assignment to any other MRZ.

Of the four, the MRZ-2 classification is recognized in land use planning because the likelihood for occurrence of significant mineral deposits is high, and the classification may be a factor in the discovery and development of mineral deposits that would tend to be economically beneficial to society. The Project Area is composed of MRZ-2, MRZ-3, and MRZ-4 classifications. As indicated in **Figure 4.7-2**, nearly two-thirds of the Project Area is located in the MRZ-2 zone, generally located south of Folsom Boulevard. No mining operations are currently underway in the Project Area, though several mining operations are being conducted south of the Project Area near Mather Airport.

4.7.2 REGULATORY FRAMEWORK

STATE

California Geological Survey

The Alquist-Priolo Earthquake Fault Zoning Act of 1972 (prior to January 1, 1994 known as the Alquist-Priolo Special Studies Zones Act – CCR, Title 14, Section 3600) sets forth the policies and criteria of the State of California in regards to building within active fault zones. The Alquist-Priolo Earthquake Fault Zoning Act outlines cities and counties' responsibilities in prohibiting the location of developments and structures for human occupancy across the trace of active faults. The policies and criteria are limited to potential hazards resulting from surface faulting or fault creep within Earthquake Fault Zones delineated on maps officially issued by the State Geologist.

Surface Mining and Reclamation Act of 1975

The California Department of Conservation Reclamation Surface Mining and Reclamation Act of 1975 (§ 2710), also known as SMARA, provides a comprehensive surface mining and reclamation policy that permits the continued mining of minerals as well as the protection and subsequent beneficial use of the mined and reclaimed land. The purpose of the act is to ensure that adverse environmental effects are prevented or minimized and that mined lands are reclaimed to a usable condition and readily adaptable for alternative land uses. The production and conservation of minerals are encouraged, while giving consideration to values relating to recreation, wildlife, range and forage, as well as aesthetic enjoyment. Residual hazards to the public health and safety are eliminated. These goals are achieved through land use planning by allowing a jurisdiction to balance the economic benefits of resource reclamation with the need to provide other land uses.

Public Resources Code Section 2762 directs that if a use is proposed that might threaten the potential recovery of minerals from an area that has been classified MRZ-2, the City must specify its reasons for permitting the use, provide public notice of these reasons, and forward a copy of the statement of reasons to the State Geologist and the State Mining and Geology Board.

California Building Standards Code

The purpose of the Uniform Building Code (UBC) is to provide minimum standards to preserve the public peace, health, and safety by regulating the design, construction, quality of materials, certain equipment, location, grading, use, occupancy, and maintenance of all buildings and structures. Standards address foundation design and shear wall strength, among others.

The State of California provides minimum standards for building design through the California Building Standards Code (California Code of Regulations, Title 24). The CBC applies to building design and construction in the state and is based on the federal Uniform Building Code (UBC). The CBC modified UBC regulations for specific conditions found in California, including seismic risks, and included a large number of more detailed and/or more restrictive regulations.

LOCAL

City of Rancho Cordova General Plan

The City of Rancho Cordova is in the process of preparing its first General Plan. On May 16, 2005 the City of Rancho Cordova adopted Resolution No. 57-2005 that establishes the City's interim policies and diagrams associated with the development of its new General Plan are to used to guide land use and circulation within the City until adoption of the proposed General Plan. The proposed General Plan includes provisions related to geology, soils, and mineral resources. Section 4.1 of this EIR includes more information on the Rancho Cordova General Plan.

City of Rancho Cordova Erosion Control Ordinance

Upon incorporation, the City of Rancho Cordova adopted the Sacramento County Department of Water Resources (DWR) Grading and Erosion Control Ordinance (Chapter 16.44 of the existing County code), which establishes administrative procedures, a minimum standard of review, and implementation and enforcement procedures for controlling erosion, sedimentation, and other pollutant runoff from new development projects. The ordinance also addresses grading, filling, land excavation, construction activities, and drainage as they relate to a particular project. The ordinance applies to any development project resulting in the excavation of 350 cubic yards of soil or more.

4.7.3 IMPACTS AND MITIGATION MEASURES

THRESHOLDS OF SIGNIFICANCE

A project's geologic and soil impacts are considered significant if project implementation would result in any of the following:

1) 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 or other substantial evidence of a known fault. Refer to Division of Mines and Geology Special Publication 42;

    ii. Strong seismic ground shaking;

iii. Seismic-related ground failure, including liquefaction;

iv. Landslides;

2) Result in substantial soil erosion or the loss of topsoil;

3) 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;

4) Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial risks to life or property; or,

5) 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.[1]

A project's mineral resources impacts are considered significant if project implementation would result in any of the following:

1) Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state; or,

2) Result in the loss of availability of a locally important mineral resource recovery site delineated on a local general plan, specific plan, or other land use plan.

METHODOLOGY

The following impact analysis is based on a review of published information, surveys, and reports regarding regional geology, soils, and mineral resources. Information was obtained from private and governmental agencies and Internet web sites, including: the USDA Natural Resources Conservation Service, the California Geological Survey, and the United States Geological Survey.

4.7.3 IMPACTS AND MITIGATION MEASURES

SEISMIC EVENTS

Impact 4.7.1 Implementation of the proposed project could place structures and development in areas of seismic sensitivity. This is considered a **less than significant** impact.

The Project Area, as with virtually all sites within the State of California, is subject to minor ground shaking and potential secondary hazards (i.e., liquefaction and subsidence) as a result of earthquakes. The Project Area is in Seismic Zone III, a moderate risk area for seismic events. Due to the distance between the Project Area and known faults, the primary seismic hazard

[1] This issue is not addressed further in this document because the use of septic tanks or alternative wastewater disposal systems is not allowed within the Project Area. Additionally, the Project Area is current served by an existing sewer system (see Section 4.11 of this EIR). This issue was addressed in the Initial Study for the Redevelopment Plan and was found to be less than significant in that document.

associated with the Project Area is minor ground shaking. Minor ground shaking can result in partial collapse of buildings, and extensive damage in poorly built or sub-standard structures.

As previously discussed, Sacramento County is not located within an Alquist-Priolo earthquake hazard zone and there are no known active faults occurring within the County. The Midland fault and the Bear Mountain fault zones are considered the faults of greatest concern in Sacramento County; however, these faults are mapped as pre-Quaternary (older than 1.6 million years) and late-Quaternary (activity within the last 700,000 years) and are located at least 24 miles from the Project Area boundaries. As such, future seismic events associated with these fault systems are not anticipated to adversely affect the Project Area, and ground rupture due to faulting is unlikely.

Based upon the seismologic and geologic conditions within the Project Area and the surrounding vicinity, significant damage or risk due to earthquake activity is unlikely. As the City of Rancho Cordova adopted the 2001 edition of the California Building Standards Code (CBSC), the design of all proposed structures would be in conformance with the CBSC Seismic Zone 3 building standards, which are designed to provide structural stability in seismic events. This would ensure that significant damage to structures would not occur from ground shaking during seismic events resulting from movement on any of the faults or fault systems discussed within this EIR.

The potential for soil liquefaction due to earthquakes and ground shaking is considered minimal due to the depth to groundwater beneath the Project Area and the nature of on-site soils underlying the Project Area. Liquefaction is the process in which water is combined with unconsolidated soils as a result of seismic activities involving ground motions and pressure. As indicated in **Table 4.7-1**, the majority of the soil units underlying the Project Area generally have low to moderate water holding capacities. The soil groups within the Project Area that exhibit high water capacity characteristics are the Americanos-Urban land complex, Natomas loam, Rossmoor-Fine sandy loam, Rossmoor-Urban land complex, and Urban land-Natomas. The Americanos and Rossmoor soil groups are associated with existing urban land uses. Compliance with the UBC standards would avoid any potential development constraints associated with these loam soil groups.

Potential risk factors for seismic ground shaking and secondary seismic effects such as liquefaction and subsidence exist within the Project Area. Future redevelopment activities would be required to adhere to California Building Standards Code requirements for construction within Seismic Zone 3. Consistency with CBSC requirements would ensure that the proposed project would result in **less than significant** impacts due to seismic events.

Mitigation Measures

None required.

Soil Erosion

Impact 4.7.2 Implementation of the proposed project could result in substantial construction and site preparation activities. These activities increase soil erosion, wind and water erosion, and siltation of local drainages during construction, excavation and grading activities. This is considered to be a **potentially significant** impact.

While the Redevelopment Plan does not propose any actual construction or improvement of any structures, such activities would occur as a result of implementation of the Plan. Grading and site preparation activities associated with redevelopment could remove topsoil, disturbing and potentially exposing the underlying soils to erosion from a variety of sources, including wind and water. In addition, such activities generally involve the use of water, which may further erode the topsoil as the water moves across the ground. However, the vast majority of the Project Area is already developed and any redevelopment would only cause temporary impacts to soils within each particular project area. Redevelopment of previously developed parcels would impact previously impervious areas and would not result in large areas of previously open ground being resurfaced with impervious materials.

Any development involving clearing, grading, or excavation that causes soil disturbance on one or more acres; or any project involving less than one acre that is part of a larger development plan and includes clearing, grading, or excavation, is subject to coverage under the State's National Pollutant Discharge Elimination System (NPDES) General Construction Storm Water Permit. Project applicants for future construction projects initiated after implementation of the proposed project are required to prepare and comply with an approved Storm Water Pollution Prevention Plan (SWPPP).

As previously discussed, the City adopted the Sacramento County Department of Water Resources (DWR) Grading and Erosion Control Ordinance (Chapter 16.44 of the existing County Code), which establishes administrative procedures, minimum standards of review, and implementation and enforcement procedures for controlling erosion, sedimentation, and other pollutant runoff from new development projects. The ordinance also addresses grading, filling, land excavation, construction activities, and drainage as they relate to a particular project site or development project. The ordinance applies to any new or redevelopment project resulting in the excavation of 350 cubic yards of soil or more. The ordinance also ensures compliance with the NPDES General Construction Storm Water Permit, which is issued by the California Regional Water Quality Control Board (RWQCB). The City of Rancho Cordova is a permittee on a joint NPDES municipal stormwater permit (No. CAS082597), which regulates waste discharge requirements for construction within the Project Area. Adherence to the NPDES permit would avoid potential erosion impacts from construction initiated as a result of the Redevelopment Plan (see Section 4.8 of this EIR).

Mitigation Measures

The following mitigation measures will be adopted by the City Council in connection with the adoption of the Redevelopment Plan as measures that will apply to all development in the Project Area until the proposed General Plan is adopted:

MM 4.7.2a Prior to approval any public or private development project, the Agency will require that subsequent projects under the Redevelopment Plan specify urban runoff control strategies and requirements, consistent with the City's urban runoff management program and other applicable requirements (e.g., City's NPDES Permit) for development and identify sites where retention and treatment are warranted.

MM 4.7.2b The Agency shall ensure that roads and structures are designed, built, and landscaped so as to minimize erosion during and after construction.

MM 4.7.2c The Agency shall require future public or private development projects to identify and implement best management practices to prevent erosion and protect water quality on construction sites.

Implementation of the above mitigation measures as well as existing City development standards and its NPDES permit would ensure that the proposed project's soil erosion related impacts would be **less than significant**.

Soil Stability

Impact 4.7.3 Implementation of the proposed project may facilitate development in areas with unstable soils. This is considered a **potentially significant** impact.

The majority of the soils in the Project Area are characterized as having low to moderate shrink/swell potential. Soils with moderate shrink/swell potential tend to expand during wet seasons and shrink during dry seasons. In addition, soils with moderate shrink/swell potential generally have low plasticity, which affects a soil type's expansion potential. Portions of the Project Area could contain layers of highly expansive soils dispersed throughout the area, which could pose development constraints. Structures or improvements constructed as a part of redevelopment activities in the Project Area that are located on expansive soils could suffer severe damage from the expansion.

The CBSC includes common engineering practices requiring special design and construction methods that reduce or eliminate potential expansive soil related impacts. Compliance with CBSC regulations ensures the adequate design and construction of building foundations to resist soil movement. In addition, the CBSC also contains drainage related requirements in order to control surface drainage and reduce seasonal fluctuations in soil moisture content.

Geotechnical reports are a tool used by public agencies and developers to identify specific site conditions and to develop design and construction recommendations for infrastructure improvements, and commercial and residential development projects. Geotechnical reports generally contain a summary of all subsurface exploration data, including: a subsurface soil profile, exploration logs, laboratory or on site test results, and groundwater information. The reports also interpret and analyze the subsurface data, recommend specific engineering design elements, provide a discussion of conditions for the solution of anticipated problems, and recommend special geotechnical provisions.

Mitigation Measures

The following mitigation measure will be adopted by the City Council in connection with the adoption of the Redevelopment Plan as measures that will apply to all development in the Project Area until the proposed General Plan is adopted:

MM 4.7.3 The Agency shall require that a geotechnical report or other appropriate analysis is conducted to determine the soil characteristics and associated development constraints for applicable projects under the Redevelopment Plan, and impose the necessary measures for geologically sensitive areas. This would include necessary measures to address expansive soil conditions.

Implementation of the above mitigation measure would ensure that the expansive or unstable soil related impacts due to implementation of the proposed project are **less than significant**.

Mining Impacts

Impact 4.7.4 Implementation of the proposed project would not include the extraction of minerals and aggregate, nor the reclamation of mined areas. These activities increase erosion and impact local drainages and groundwater supplies, as well as scenic views. This is considered to cause **no impact**.

As previously discussed, mining activities are regulated by the Surface Mining and Reclamation Act (Public Resources Code Section 2710). Performance standards for mine reclamation are set forth in Section 3700 et seq. of Title 14 of the California Code of Regulations. These regulations generally address soil erosion control and drainage, resoiling and revegetation, backfilling, regrading, slope inclination and stabilization, and recontouring. Additionally, there are no known aggregate, mineral, or fuel (oil and gas) mining operations within the Project Area, and as mining of such resources would be infeasible due to the fact that the Project Area is already developed, no mining is likely to occur within the Project Area. Due to the above factors, implementation of the proposed project would result in **no impact** due to mining.

Mitigation Measures

None required.

Mineral Resources

Impact 4.7.4 Implementation of the proposed project could result in the loss of availability of aggregate resources, which are locally important due to their use by the construction community in development of the area. This would be a **less than significant** impact.

Approximately two-thirds of the Project Area is designated MRZ-2 by the California Geological Survey and the State Mining and Geology Board. A MRZ-2 classification identifies areas in which significant mineral deposits are known to exist. Any development of the portions of the Project Area that are identified as MRZ-2 could result in preventing mineral resources located in those areas from being mined. While a MRZ-2 classification identifies areas of potential resources, no evidence of any regionally or locally important mineral resources, except for some construction-grade aggregates, exists within the Project Area. Those portions of the Project Area that are designated MRZ-2 were not designated at any time on a mineral resource overlay by the County of Sacramento. Those portions of the Project Area that contained aggregate resources were mined previously in the process of original development of the City.

The southern portion of the Project Area that is identified as MRZ-2 consists entirely of existing residential, commercial, and industrial development. This development was initiated prior to or shortly following incorporation of the City of Rancho Cordova. Therefore, the entire Project Area has already been development, precluding the mining of such resources. The Redevelopment Plan would not cause any additional resources to become unavailable. Therefore, implementation of the proposed project would have a **less than significant** impact on the availability of any mineral resources.

Mitigation Measures

None required.

4.7.4 CUMULATIVE SETTING, IMPACTS, AND MITIGATION MEASURES

CUMULATIVE SETTING

Site-specific topography, soil conditions, and surrounding development generally determine geotechnical and soil related impacts, which are not considered cumulative in nature. However, surficial deposits, namely erosion and sediment deposition, can be cumulative in nature, depending on the type and the amount of development proposed in a given geographical area. Further, land uses that contribute to the prevention of mining mineral resources recovery can contribute to cumulative impacts of the loss of such resource access. Development pressures in the region are resulting in the consideration of the conversion of mineral resource and mining sites to urban uses (e.g., City of Rocklin has converted aggregate mining areas along Highway 65 in Placer County to urban development over the past 10 years) The cumulative setting for soil erosion and mineral resources consists of existing, planned and proposed land use conditions in the region including the City of Rancho Cordova General Plan Planning Area and adjacent communities such as the City of Folsom, City of Elk Grove, the County of Sacramento, and the City of Sacramento.

Factors relating to seismic events and potential impacts due to such events are typically site-specific and not contingent on adjacent areas or the characteristics of development and land use in adjacent areas. Therefore, seismic impacts are not considered to be cumulative in nature and will not be discussed in this section.

Cumulative Soils Impacts

Impact 4.7.5 Implementation of the proposed project, together with past, present, and reasonably foreseeable future projects in the area, could result in a cumulatively significant impact due to soil stability and erosion. This is considered a **less than cumulatively considerable** impact.

Construction constraints are based on specific sites within a proposed development, and each site's soil characteristics and topography. There are currently several large-scale developments in the general area, which include, but are not limited to: the Sunridge Specific Plan, Rio Del Oro, the Suncreek Specific Plan, and Mather East. The City of Rancho Cordova General Plan Land Use Map includes various commercial and industrial developments. As previously discussed, all new development and redevelopment within the Redevelopment Project Area must comply with the CBC, which the City of Rancho Cordova adopted upon incorporation. Individual development projects must submit a geotechnical report, which contains construction and design guidelines and site-specific recommendations to reduce potential geologic and soil related hazards. Additionally, any new development disturbing one acre of land or more is subject to a National Pollutant Discharge Elimination System (NPDES) General Construction Storm Water Permit, and all applicants are required to prepare and comply with an approved Storm Water Pollution Prevention Plan (SWPPP) that serves to reduce soil erosion related impacts. The above requirements would also apply to mining operations. Adherence to the City's Grading and Erosion Control Ordinance, the requirements of the City's NPDES permit, and mitigation identified above would ensure that the proposed project would not conflict with attainment of water quality standards. Therefore, the proposed project's incremental contribution to cumulative soils impacts would be **less than cumulatively considerable**.

Mitigation Measures

None required.

Cumulative Mineral Resources Impacts

Impact 4.7.6 Implementation of the proposed project, together with past, present, and probable future projects in the area, could result in a cumulatively significant loss of mineral resources in the region. The proposed project's incremental contribution to the loss of mineral resources would be **less than cumulatively considerable**.

As noted under Impact 4.7.4, implementation of the proposed project would not result in the significant loss of land areas identified and known to contain important mineral resources. Those portions of the Project Area that are located on land identified as MRZ-2 have already been developed; therefore, redevelopment of the area that may be initiated after implementation of the Redevelopment Plan would not create additional barriers to mining than those that already exist. Due to this fact, the project's incremental contribution to cumulative mineral resources impacts would be **less than cumulatively considerable**.

Mitigation Measures

None required.

REFERENCES

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United States Department of Agriculture. Soil Conservation Service. April 1993. *Soil Survey of Sacramento County, California*.

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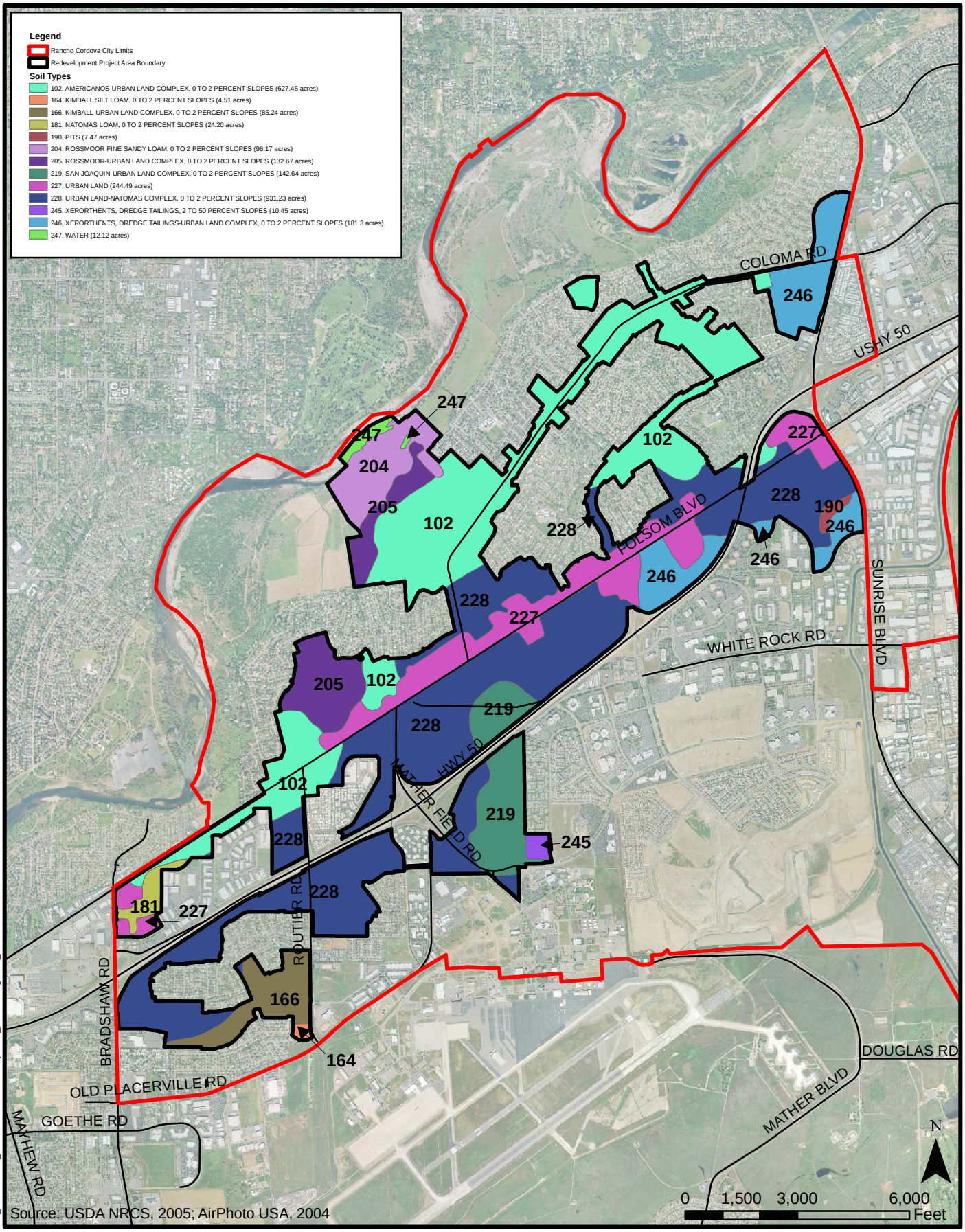

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Figure 4.7-1
Soil Types
Within the Redevelopment Project Area

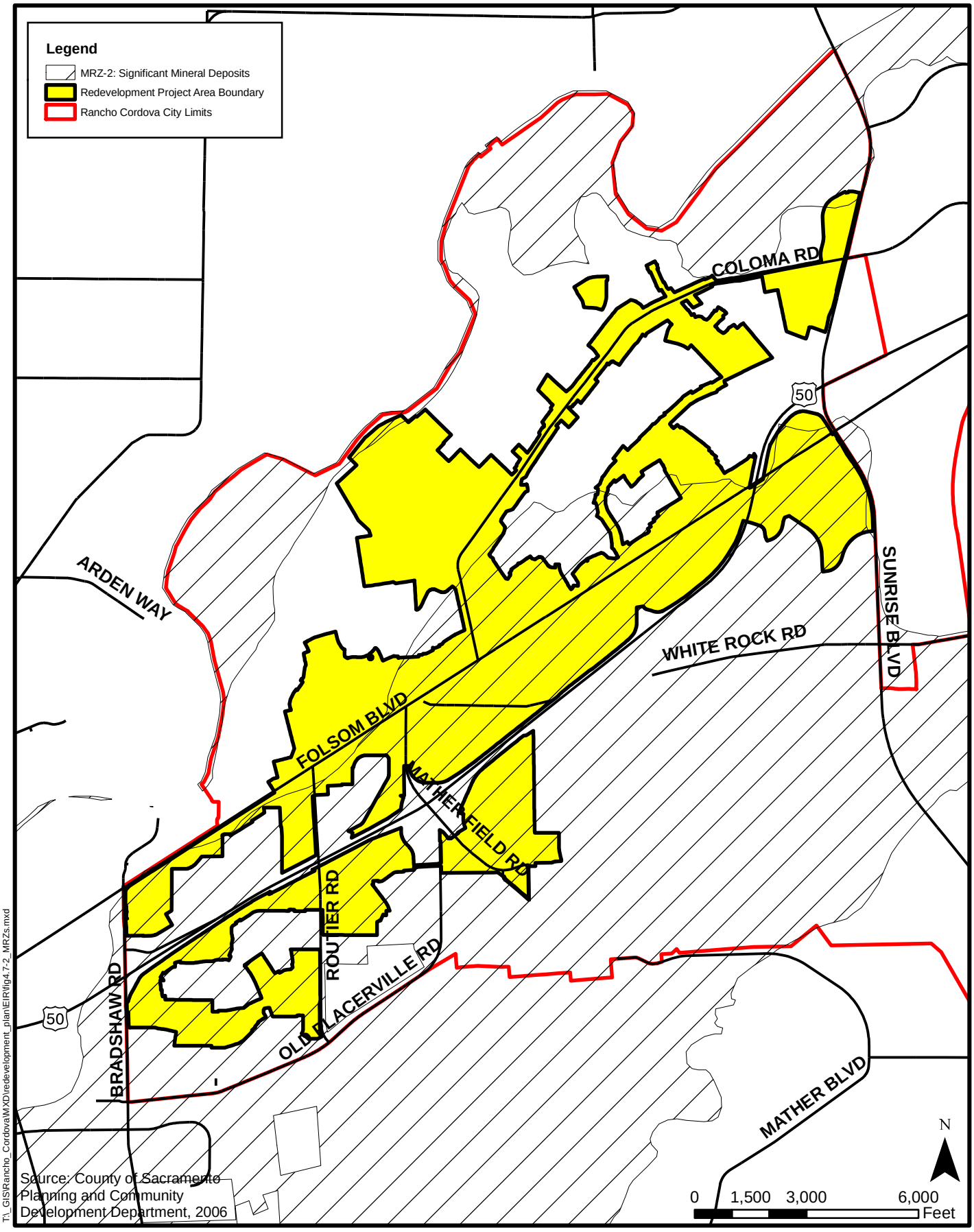

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Figure 4.7-2
Mineral Resource Zones
Within the Redevelopment Project Area