

Section 3.8 Geology, Soils, and Seismicity

Introduction

This section generally evaluates the effects of the alternatives analyzed in this Supplemental DEIS with regard to geology, soils and seismicity. The information in this section relies upon and updates information from the prior 2005 FEIR and 2007 SEIR analysis from the geotechnical report prepared in 2002 by Parikh Consultants. A copy of the geotechnical report is available for review at VTA offices upon request. A summary of this information can also be found in the Capitol Expressway Corridor Background Report. Figure 3.8-1 displays the geologic and seismic features present in the study area.

Environmental Consequences

APPROACH AND METHODS

The effects of the proposed alternatives on geology, soils, and seismicity were assessed based on a review of relevant publications, a reconnaissance-level survey, and the findings of the geotechnical report prepared in 2002 (Parikh Consultants 2002).

EFFECTS AND MITIGATION MEASURES

No-Build Alternative

The No-Build Alternative is not anticipated to result in any impacts related to geology, soils or seismicity.

Light Rail Alternative

These geology, soils, and seismicity effects are also discussed in Section 3.18 *Construction*.

Impact: Surface Fault Rupture

As described above, transportation improvements under the Light Rail Alternative would be located in the vicinity of the active Hayward fault. The risk of surface rupture in the corridor is greatest in the narrow strip of land immediately adjacent to an active fault. However, no portion of the Light Rail Alternative alignment actually traverses the fault. Therefore, no adverse effects related to rupture of a known active earthquake fault would result from implementation of this alternative.

No adverse effects. No mitigation required.

Impact: Ground Shaking

The Light Rail Alternative proposes aerial structures extending north of Capitol Avenue to south of Story Road and an elevated crossing of Tully Road, as well as a two-level station in the median of Story Road. These structures would be located in an area of strong seismic ground shaking. Strong seismic ground shaking could result in structural failures and could increase the risk of structural loss, injury, or death. The potential for strong ground shaking is considered to be moderate to high. Implementation of the following mitigation measure would minimize this adverse effect.

Mitigation: GEO-1 – Incorporate Caltrans Seismic Design Criteria

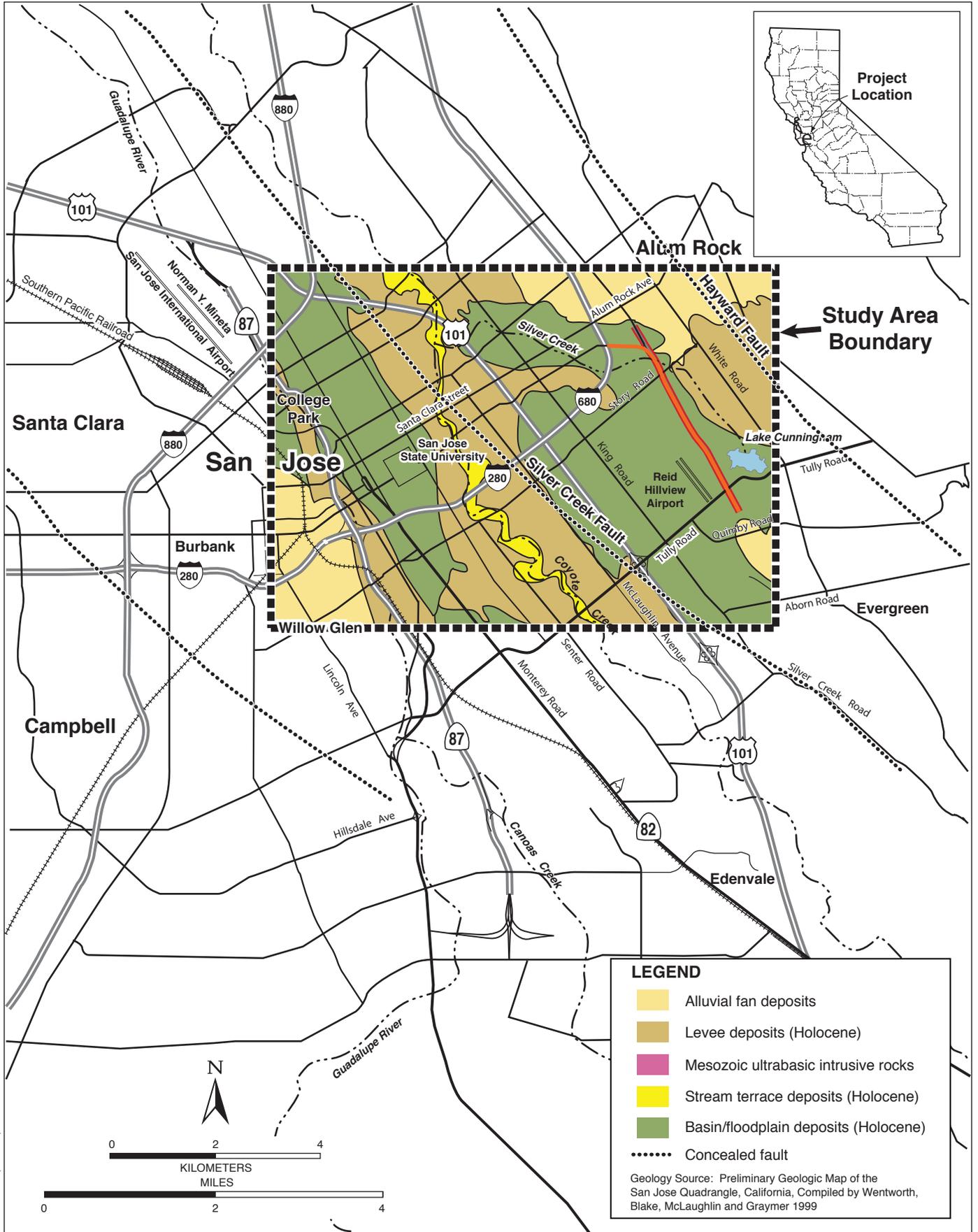
During the design process, VTA shall design any and all proposed infrastructure in accordance with the appropriate Caltrans Seismic Design Criteria. The criteria include, but are not limited to, designing infrastructure that can withstand an earthquake of magnitude 7.5 and a peak bedrock acceleration of 0.6 g with modifications. With the implementation of these criteria into the design and ultimate construction of the light rail system structures, there would not be any adverse effects on people or structures resulting from strong seismic ground shaking under this alternative.

Impact: Liquefaction

Sections of the Light Rail Alternative alignment would be grade separated and proposed aerial structures are located in an area that is highly susceptible to liquefaction. In addition, portions of the alignment would be placed within retained fill. Soils and underlying geologic materials that are susceptible to liquefaction could increase the risk of structural loss, injury, or death. Implementation of the following mitigation measure would minimize this adverse effect.

Mitigation: GEO-2 – Incorporate Liquefaction Minimization Methods to Prevent Localized Liquefaction

VTA shall conduct geotechnical and geologic investigations during final design, including field excavation and laboratory testing, to provide site-specific geotechnical conclusions and recommendations for design and construction of the proposed facilities. If liquefiable soils or soils susceptible to seismically induced settlement are determined to be present at any location along the corridor, corrective actions shall be taken, including removal and replacement of soils, in-site densification, grouting, design of special foundations, or other



**Figure 3.8-1
Geologic and Seismic Features**

similar measures, depending on the extent and depth of susceptible soils.

Impact: Lateral Spreading, Subsidence, and Collapse Caused by Underlying Unstable Geologic Units

As described above, the Light Rail Alternative alignment would be located in an area that may be susceptible to lateral spreading, subsidence, and collapse. Soils and underlying geologic materials that are susceptible to lateral spreading, subsidence, and collapse could increase the risk of structural loss, injury, or death. Implementation of the following mitigation measure would minimize this adverse effect.

Mitigation: GEO-3 – Implement Proper Construction Methods to Minimize Risk of Lateral Spreading, Subsidence, and Collapse Hazards

Prior to implementation of the proposed transit improvement activities the following construction methods shall be employed:

- construct edge containment structures such as berms, dikes, retaining structures, or compacted soil zones;
- remove or treat soils and geologic materials prone to lateral spreading and settling; and,
- install drainage measures to lower the groundwater table below the level of settleable soils (California Division of Mines and Geology 1997).

Impact: Expansive Soils

As described above, transportation improvements proposed under the Light Rail Alternative would be located in an area that may have expansive soils. Expansive soils could cause structures to fail, presenting a risk of structural loss, injury, or death. Implementation of the following mitigation measure would minimize this adverse effect.

Mitigation: GEO-4 – Reinforce Foundations or Excavate Expansive Soil to Minimize Risk of Soil Expansivity Hazards

Special engineering techniques such as using reinforced steel in foundations, using drainage control devices, and/or over-excavating and backfilling with non-expansive soil shall be implemented during construction activities to minimize the risk of structural loss, injury, or death.

Proposed Options

The above discussion is inclusive of the Light Rail Alternative options.

CUMULATIVE EFFECTS

No-Build Alternative

The No-Build Alternative would not contribute to cumulative impacts related to geology, soils or seismicity.

Light Rail Alternative

The San Francisco Bay Area is a region of expansive soils and considerable seismic activity. The Light Rail Alternative in combination with other reasonably foreseeable projects could potentially result in human injury or loss as a result of increased travel on facilities that may be damaged during a major earthquake. However, implementation of Mitigation Measures GEO-1 through GEO-4 would minimize the Light Rail Alternative's contribution to adverse cumulative impacts related to geology, soils or seismicity.