Chapter 5I. Soils, Geology, and Mineral Resources

INTRODUCTION

To provide the context on which potential impacts of the General Plan alternatives can be assessed, this chapter presents information on the geological, mineral, seismic, and soils setting of the planning area. This information is based on a review of soils mapping data provided by the U.S. Department of Agriculture's (USDA's) Natural Resources Conservation Service. This chapter also provides information on the regulatory setting that applies to soils and geology. For impacts related to soil erosion, please refer to "Impact HYD-4. Construction-Related, Short-Term Water Quality Degradation" in Chapter 5G, "Hydrology and Water Quality". For impacts related to the loss of prime farmland, please refer to "Impact LU-3. Conversion of Agricultural Land to Urban Use" in Chapter 5A, "Land Use, Aesthetics, and Hazardous Materials".

SETTING

Geological Setting

The City's planning area is located in the eastern portion of the Putah Creek Plain, one of the major features of the southwestern Sacramento Valley. Beneath the valley lies a layer of metamorphic and igneous rock above which is a layer of marine and sedimentary rocks up to 15,000 feet thick. Neither of these layers is water bearing. The surface layers consist of up to 3,000 feet of water-bearing alluvial sediments, most of which are semiconsolidated, and only the uppermost layer, up to 200 feet deep, consists of unconsolidated alluvial deposits.

Mineral Resources

The most important mineral resources in the region are sand and gravel, which are mined on Cache Creek and other channels in Yolo County. A survey of aggregate resources by the State Division of Mines and Geology showed that no significant deposits of aggregate resources are located in the planning area. The only mineral resource known to exist in the City's planning area is natural gas; however, specific resources areas have not been identified.

Seismic Setting

The planning area is surrounded by several faults in the San Andreas fault system to the west and the Eastern Sierra fault system to the east. A series of faults also runs along the eastern base of the foothills west of the City. No faults run directly through the planning area, although numerous earthquakes have been felt in the City. Major quakes occurred in 1833, 1868, 1892, 1906 and 1989, but the City experienced no damage. The Uniform Building Code identifies the planning area as being in Seismic Risk Zone III, which indicates that the maximum intensity of an earthquake that would be experienced in the planning area would be VII or VIII on the modified Mercalli intensity scale. An earthquake of such magnitude would result in "slight damage in specially designed structures; considerable in ordinary substantial buildings, with partial collapse; great in poorly built structures" (City of Davis 1987). U.S. Geological Survey studies indicate that the probability of a Richter magnitude 7 earthquake or greater occurring in the San Francisco Bay area within the next 30 years is 67%.

Soils

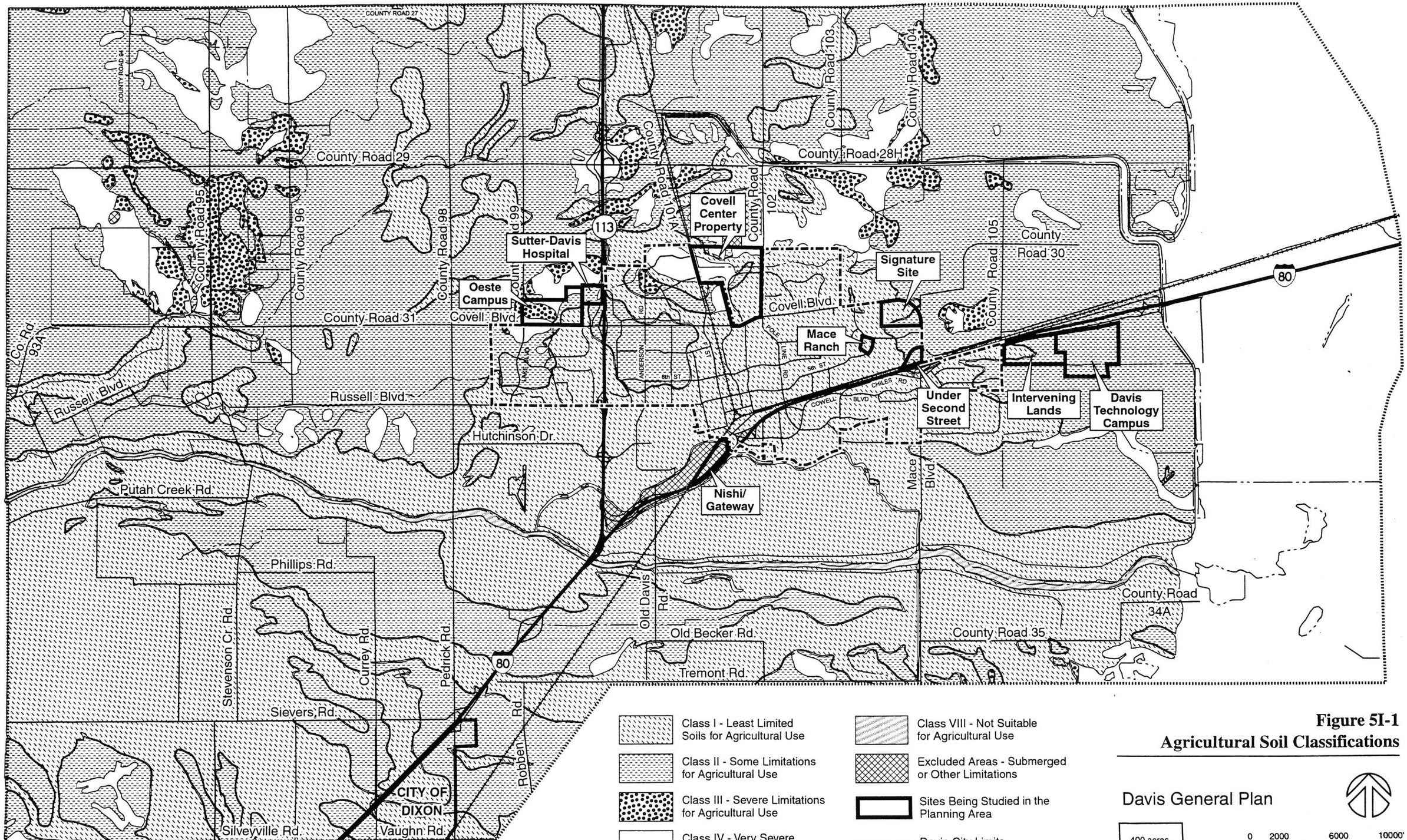
The City is built on mainly prime agricultural soils. Most of the land in the planning area that has not been developed is used for farming. In an area like the City, where virtually all land contiguous to the existing City that is not developed is mapped as prime farmland, expansion of the urban area will necessitate converting agricultural land to urban uses. Lower quality agricultural land is some distance from the developed City, and only noncontiguous development would be possible on these lower quality soils. (City of Davis 1987.)

Soils in the planning area generally have a high proportion of silt and clay and, as a result, are only moderately or slowly permeable, which hinders drainage and groundwater recharge. Erosion hazards are nonexistent to slight and shrink-swell potential is predominantly moderate to high.

Figure 5I-1 provides a map showing agricultural soil classifications. As shown on this figure, most of the planning area has either Class I soils (least limited for agricultural use) or Class II soils (some limitations for agricultural use).

Sites Being Studied

Table 5I-1 summarizes existing soils data for the sites being studied and is based on the most current soils mapping information provided by the USDA's Natural Resources Conservation Service. The table also provides soils rating per the Storie Index. The Storie Index is a soil productivity scale that runs from 0 to 100, with 100 being the most productive soils. The final column on the table shows the shrink-swell potential for the soils found on each site.



Class I - Least Limited Soils for Agricultural Use

Class II - Some Limitations for Agricultural Use

Class III - Severe Limitations for Agricultural Use

Class IV - Very Severe Limitations for Agricultural Use

Class VIII - Not Suitable for Agricultural Use

Excluded Areas - Submerged or Other Limitations

Sites Being Studied in the Planning Area

Davis City Limits

Figure 5I-1
Agricultural Soil Classifications

Davis General Plan

400 acres
100

0 2000 6000 10000'

Table 5I-1. Summary of Soils Information for the Sites Being Studied

Sites Being Studied	Soils Type (Designation)	Prime Farmland	Storie Index Rating	Shrink-Swell Potential
Nishi/Gateway	Yolo loam (Yo)	Yes	100	Moderate
Covell Center property	Yolo silt loam (Ya)	Yes	100	Moderate
	Yolo silty clay loam (Yb)	Yes	90	Moderate
	Sycamore silty clay loam, drained (St)	Yes	73	Moderate
	Rincon silty clay loam (Rg)	Yes	77	Moderate to high
	Merritt complex, saline-alkali (Mp)	No	14	Low to medium
	Pescadero silty clay, saline-alkali (Pb)	No	31	Moderate
Signature site	Sycamore silty loam, drained (Sp)	Yes	90	Moderate
	Sycamore complex, drained (Sv)	Yes	76	Moderate to high
Mace Ranch	Sycamore silty loam, drained (Sp)	Yes	90	Moderate
	Tyndall fine sandy loam, drained (Tc)	Yes	81	Low
Under Second Street	Sycamore complex, drained (Sv)	Yes	76	Moderate to high
Sutter-Davis Hospital	Brentwood silty clay loam, 2- to 5-percent slopes (BrA)	Yes	81	High
	Capay silty clay (Ca)	No	50	High
	Marvin silty clay loam (Mf)	No	65	Moderate
	Willows clay, alkali (Wc)	No	10	High
Davis Technology Campus	Capay silty clay (Ca)	No	50	High
	Rincon silty clay loam (Rg)	Yes	73	Moderate to high
	Sycamore complex, drained (Sv)	Yes	76	Moderate to high
Oeste Campus	Brentwood silty clay loam, 2- to 5-percent slopes (BrA)	Yes	81	High
	Marvin silty clay loam (Mf)	No	65	Moderate
	Pescadero silty clay (Pa)	No	35	Moderate to high
	Pescadero silty clay, saline-alkali (Pb)	No	14	Moderate
	Willows clay (Wb)	No	29	High
	Willows clay, alkali (Wc)	No	10	High
Intervening Lands	Rincon silty clay loam (Rg)	Yes	73	Moderate to high
	Sycamore complex, drained (Sv)	Yes	76	Moderate to high
	Tyndall fine sandy loam, drained (Tc)	Yes	81	Low

Source: U.S. Soil Conservation Service 1972.

Regulatory Setting

As described in section G, "Hydrology and Water Quality," a stormwater pollution prevention plan (SWPPP) is required under the National Pollution Discharge Elimination System (NPDES) for future projects within the planning area. The NPDES program is currently administered by the RWQCB and, in the future, by the City of Davis under a general NPDES permit. The purpose of the NPDES program is to eliminate non-point source water pollution resulting from

runoff. The SWPPP for a project will mandate specific erosion control measures that must be undertaken by the developer.

The SWPPP erosion control and restoration plan typically incorporates the following best management practices (BMPs) to control erosion:

- construction activities shall be limited to the minimum area necessary for implementation of the project;
- vegetative buffer strips shall be left in place adjacent to water courses when possible;
- silt fences or straw bales shall be used to filter runoff and control sediment-laden runoff beyond project boundaries;
- complete revegetation and stabilization of all disturbed soils prior to the rainy season (reseeding and mulching work will be completed following grading); and
- details regarding seed material, fertilizer, and mulching (the seed material will include native plant species and be approved by a qualified biologist).

IMPACTS AND METHODOLOGY

This discussion presents an assessment of potential impacts on soils and geologic resources. Impacts assessed include an evaluation of changes in policy, the potential to expose people and/or property to seismic hazards, and to cause property damage as a result of allowing development to occur on expansive soils found in the City's planning area. Loss of prime or unique agricultural land is addressed in Chapter 5A, "Land Use, Aesthetics, and Hazardous Materials" and soil erosion is covered in Chapter 5G, "Hydrology and Water Quality".

Certain impact categories discussed in the initial study checklist for this project (Appendix A) were found to not apply to Davis because of its topography and lack of a seismic hazards. These include landslide and liquefaction hazards. Septic tank capacity is also not an issue since development within the City is required to connect to the sewer system. Therefore, these issue areas are not evaluated further in this EIR.

As more fully described in the setting section, few mineral resources are known to exist within the City's planning area, and the sites being studied with the land use map alternatives were found to contain no important mineral resources. Therefore, impacts related to mineral resources are not discussed further in this chapter.

Identification of impacts was based on the following key assumptions:

- All new buildings constructed onsite will comply with the requirements of the Uniform Building Code enforced by the City of Davis.

- The developer, in order to prevent property damage, will implement construction measures and recommendations of geotechnical investigations.

Applicable Policies

The existing and proposed General Plan update contains a number of goals, policies, standards, and actions that are designed to reduce or eliminate potential environmental impacts that may be related to the implementation of the update. In evaluating the impacts to soils and geology, Alternative 2 assumes implementation of the existing General Plan and the goals, policies, standards, and actions it contains. In evaluating the impacts associated with Alternatives 3 through 5, it is assumed that the goals, policies, standards, and actions contained in the General Plan update will be implemented with all future projects. A comparison of the major policy differences between the current General Plan and the General Plan update is contained in Chapter 3, "Project Description".

In this chapter, the following policies and related actions and standards were applied to the assessment of potential impacts for Alternatives 3 through 5 (General Plan update):

Goals and Policies Specific to Agriculture, Soils, and Minerals

The General Plan update identifies goals, policies, standards, and actions relating to the planning areas agricultural, soils, and mineral resources. Specific goals, policies, standards, and actions that affect the assessment of impacts include the following:

- **Policy AG 1.1**. Protect agricultural land from urban development except where the General Plan land use map has designated the land for urban uses.

  - **Standard AG 1.1a.** New residential subdivisions and other urban development are discouraged in areas of Class 1 and 2 soils except where the General Plan land use map has designated the land for urban uses.

GOAL AG 3. Conserve soil resources within the planning area.

  - **Standard AG 3.1a.** Tree rows or other windbreaks shall be required in buffers on the edges of urban development and in other areas as appropriate to reduce soil erosion.

GOAL AG 4. Maintain Davis' visual character and natural topography by minimizing mineral resource exploitation.

- **Policy AG 4.1.** Discourage the extraction of mineral resources in the planning area.

  - **Action AG 4.1a.** Coordinate with County government in regulating mineral resource protection operations, including sand and gravel mining and oils and gas wells.

Goals and Policies Specific to Geotechnical Safety

The General Plan update identifies goals, policies, standards, and actions relating to the planning areas geotechnical (e.g., soils hazards, seismicity, etc.). Specific goals, policies, standards, and actions that affect the assessment of impacts include the following:

GOAL HAZ 2. Minimize risks associated with soils, geology and seismicity in Davis.

- **Policy HAZ 2.1.** Take necessary precautions to minimize risks associated with soils, geology, and seismicity.

  - **Standard HAZ 2.1a.** A soils report shall be required for development sites where soils conditions are not well known, as required by the Planning and Building or Public Works Departments.

Summary of Impacts Related to Land Use Map Alternatives

This chapter evaluates soils and geologic impacts related to the General Plan update and establishment of a new junior high school, including the four land use map alternatives. For this evaluation, impacts have been assessed in three categories. Table 5I-2 provides an overview of the significance findings made for the General Plan update project and each of the sites being studied under each alternative. The table also shows the impacts related specifically to the proposed new junior high school site under the heading "Signature Site" for Alternatives 4 and 5. The following paragraphs provide a brief summary of each impact.

- **Impact GEO-1. Consistency with General Plan Policies.** Each land use map alternative was assessed for consistency with the applicable policies (existing General Plan for Alternative 2 and the General Plan update for Alternatives 3 through 5). Each land use map alternative was found to be consistent with the applicable policies. The impacts of Alternatives 3 through 5 related to changes in policy were also assessed and found to not adversely effect the environment.

- **Impact GEO-2. Exposure of People and Property to Possible Seismic Hazards.** All four land use map alternatives were found have a less-than-significant impact, based on the relative seismic stability of the planning area and application of the Uniform Building Code to new development.

Table 5I-2. Summary of Soils, Geology, and Mineral Resource Impacts by Land Use Map Alternative

Project Impacts	Project Mitigations	Overall General Plan	Sites Being Studied									In-fill
			Nishi/Gateway	Covell Center	Signature Site	Mace Ranch	Under Second Street	Sutter-Davis	Oeste Campus	Davis Technology	Intervening Lands	
Alternative 2. Buildout to Year 2010 Using Existing General Plan												
GEO-1. Consistency with General Plan Policies	Not required	NI	NI	NI		NI	NI					NI
GEO-2. Exposure of People and Property to Possible Seismic Hazards	Not required	LS	LS	LS		LS	LS					LS
GEO-3. Potential Property Damage as a Result of Building on Expansive Soils	Not required	LS	LS	LS		LS	LS					LS
Alternative 3. Reduced Buildout Scenario												
GEO-1. Consistency with General Plan Policies	Not required	NI		NI		NI	NI					NI
GEO-2. Exposure of People and Property to Possible Seismic Hazards	Not required	LS		LS		LS	LS					LS
GEO-3. Potential Property Damage as a Result of Building on Expansive Soils	Not required	LS		LS		LS	LS					LS
Alternative 4. Community Expansion Scenario with Oeste Campus												
GEO-1. Consistency with General Plan Policies	Not required	NI	NI	NI	NI	NI	NI	NI	NI			NI
GEO-2. Exposure of People and Property to Possible Seismic Hazards	Not required	LS	LS	LS	LS	LS	LS	LS	LS			LS
GEO-3. Potential Property Damage as a Result of Building on Expansive Soils	Not required	LS	LS	LS	LS	LS	LS	LS	LS			LS
Alternative 5. Community Expansion Scenario with Davis Technology Campus												
GEO-1. Consistency with General Plan Policies	Not required	NI	NI	NI	NI	NI	NI	NI		NI	NI	NI
GEO-2. Exposure of People and Property to Possible Seismic Hazards	Not required	LS	LS	LS	LS	LS	LS	LS		LS	LS	LS
GEO-3. Potential Property Damage as a Result of Building on Expansive Soils	Not required	LS	LS	LS	LS	LS	LS	LS		LS	LS	LS

SU = Significant unavoidable
S = Significant, but can be reduced to less than Significant with mitigations included
LS = Less than significant
NI = No impact
N/A = None available

- **Impact GEO-3. Potential Property Damage as a Result of Building on Expansive Soils.** All four alternatives were found to have a less-than-significant impact. Expansive soils exist in many parts of the planning area, and all of the sites being studied have soils with at least a moderate potential for shrink-swell effects. For all sites being studied and potential in-fill development within the rest of the planning area, the application of

application of existing and proposed General Plan policies, compliance with the Uniform Building Code, and standard development practices used by the City will mitigate the impact to a less-than-significant impact.

Project Impacts

Impact GEO-1. Consistency with General Plan Policies

Significance Criteria

- A land use map alternative would cause a significant impact if one of its components would conflict with the environmental plans and goals of the local community or other planning regulations.
- For Alternatives 3 through 5, a significant impact would occur if a policy change in the General Plan update would result in a substantial adverse change in the environment related soils, geology, or mineral resources.

Impacts of the proposed project related to General Plan consistency was assessed with application of the above significance criteria. Table 5I-3 provides an overview/comparison of the level of impact associated with the General Plan under the four land use map alternatives evaluated in this EIR. A more detailed discussion of each alternative is described below.

Table 5I-3. General Plan Policy Consistency under Each Land Use Map Alternative

Alternative 2	Alternative 3	Alternative 4	Alternative 5
• No conflicts. Consistent with land use policies	• No conflicts. Consistent with land use policies	• No conflicts. Consistent with land use policies	• No conflicts. Consistent with land use policies

Alternative 2. Buildout to 2010 Using Existing General Plan. Implementation of Alternative 2 would maintain the goals and policies in the existing General Plan. The policies under the "Soils Hazards" section of the Safety Element primarily focus on soil hazards since seismic hazards are considered very low. While some of the sites being studied have soil hazard potential, the General Plan policies and application of the City's current building code would eliminate these impacts. Therefore, the land use map alternative would not conflict with existing General Plan policies, and would therefore have ***no impact***.

Alternative 3. Reduced Build-out Scenario. Implementation of Alternative 3 would only allow growth and development in the City to 2010 for projects that are already entitled. However, implementation of the updated General Plan policies would apply to this alternative.

The policies in the General Plan update are very similar to those in the existing General Plan. New policies provide for maintaining and increasing safety in the community, reducing the potential for soil erosion, and minimizing resource exploitation. While some of the sites being studied have soil hazard potential, the General Plan update policies and application of the City's current building code would eliminate these impacts. Therefore, the General Plan update is considered to have no adverse impact (***no impact***) related to the proposed land use map.

Related to the second significance criteria (impacts related to policy changes), changes in policy will have a neutral affect on soils and geologic issues. In preparing the General Plan update, City staff has identified the primary areas of policy where the proposed update differs from the existing General Plan. A list of these major changes is listed in Chapter 3 under a section labeled "New, Expanded, or Modified Goals and Policies in the General Plan Update". No major changes in policy were noted regarding soils and geology, and in fact, the General Plan update is very similar from a policy standpoint on soil and geologic hazards. The policies themselves are designed to protect public safety, and themselves do not adversely impact the environment. Therefore, the policies in the General Plan update would have no adverse environmental impact (***no impact***).

Alternative 4. Community Expansion Scenario with Oeste Campus. Implementation of Alternative 4 includes many new development opportunities on public and private lands within Davis. This land use map alternative would utilize the same policy set as Alternative 3, and would have the same policy impacts. Therefore, the General Plan update is considered to have no adverse impact (***no impact***) related to the proposed land use map.

Related to the second significance criteria (impacts related to policy changes), changes in policy would be the same as describe for Alternative 3, above, and are considered to have no adverse environmental impact (***no impact***).

Alternative 5. Community Expansion Scenario with Davis Technology Campus. Implementation of Alternative 5 includes many new development opportunities on public and private lands within Davis. This land use map alternative would utilize the same policy set as Alternatives 3 and 4, and would have the same policy impacts. Therefore, the General Plan update is considered to have no adverse impact (***no impact***) related to the proposed land use map.

Related to the second significance criteria (impacts related to policy changes), changes in policy would be the same as describe for Alternative 3, above, and are considered to have no adverse environmental impact (***no impact***).

Impact GEO-2. Exposure of People and Property to Possible Seismic Hazards

Significance Criterion

- A land use map alternative was determined to have a significant impact if potential development proposed in the plan would expose people, structures, or property to major geologic hazards, such as earthquakes or ground failures.

The impacts of the proposed land use map alternatives related to possible seismic hazard were assessed with application of the above significance criterion. Table 5I-4 provides an overview/comparison of the level of impact associated with the General Plan under the four land use map alternatives evaluated in this EIR. A more detailed discussion of each alternative is described below.

Table 5I-4. Exposure to Possible Seismic Hazards under Each Land Use Map Alternative

Alternative 2	Alternative 3	Alternative 4	Alternative 5
• No major geological hazards	• No major geological hazards	• No major geological hazards	• No major geological hazards

Alternative 2. Buildout to Year 2010 Using Existing General Plan. Major earthquakes along the San Andreas and Eastern Sierra faults may cause ground shaking in the planning area. The severity of the ground shaking in the area would depend on the characteristics of the quake (strength and duration of shaking) and the distance to the epicenter of the quake. No known faults exist in the planning area and even such a major seismic event as the 1906 San Francisco earthquake did not cause damage in the City of Davis (City of Davis 1987). Ground shaking is not considered a major geologic hazard in Davis.

All development associated with this alternative would be required by the City to comply with the requirements of the Uniform Building Code, which is intended to protect structures from collapse during a seismic event. Minor damage may occur, including the cracking of walls, chimneys, and masonry veneers; and the severing of water, natural gas, and sewer pipes. Personal property also may be displaced or damaged. Because ground shaking is not considered a major geological hazard, this impact is considered adverse, but a ***less-than-significant*** impact.

Alternative 3. Reduced Buildout Scenario. This scenario represents a lower intensity of development in the planning area than Alternative 2. Like Alternative 2, all development associated with this alternative would be required by the City to comply with the standards and actions outlined under Policy HAZ 2.1, which call for the enforcement of the Uniform Building Code. As described above, the Uniform Building Code is intended to protect structures from

collapse and other major property damage during a seismic event. Because ground shaking is not considered a major geological hazard and because of the additional safety polices included in the General Plan update, this impact is considered ***less than significant.***

Alternative 4. Community Expansion Scenario with Oeste Campus. This scenario would expand the area of potential development within the planning area over Alternatives 2 and 3. Areas peripheral to existing development include the Signature site and development at the Sutter- Davis Hospital and Oeste Campus sites. Despite the greater development potential and increased number of persons, residences, and businesses that would result from this scenario, this impact is considered ***less than significant*** because of the relative seismic stability of the planning area, the seismic safety policies (HAZ 2.1) and actions contained in the proposed General Plan update, and the application of the Uniform Building Code.

Alternative 5. Community Expansion Scenario with Davis Technology Campus. This scenario is similar to Alternative 4 with the substitution of the Davis Technology Campus and Intervening Lands for the Oeste Campus property. Despite the greater development potential and increased number of persons, residences, and businesses that would result from this scenario, this impact is considered ***less than significant*** because of the relative seismic stability of the planning area, the seismic safety policies (HAZ 2.1) and actions contained in the proposed General Plan update, and the application of the Uniform Building Code.

Mitigation Measure

Since this impact is ***less than significant*** under each of the land use map alternatives, no mitigation is required.

Impact GEO-3. Potential Property Damage as a Result of Building on Expansive Soils

Significance Criterion

- A land use map alternative was determined to have a significant impact if the alternative would result in deformation of foundations or damage to structures by soils that exhibit moderate to high shrink-swell characteristics.

The impacts of the proposed land use map alternatives related to expansive soils were assessed with application of the above significance criteria. Table 5I-5 provides an overview/comparison of the level of impact associated with the General Plan under the four land use map alternatives evaluated in this EIR. A more detailed discussion of each alternative is described below.

Table 5I-5. Expansive Soils Impacts under Each Land Use Map Alternative

Alternative 2	Alternative 3	Alternative 4	Alternative 5
• No major expansive soils impacts	• No major expansive soils impacts	• No major expansive soils impacts	• No major expansive soils impacts

Alternative 2. Buildout to Year 2010 Using Existing General Plan. Property damage could occur from construction of structures on expansive soils (moderate to high shrink-swell potential). The City's existing General Plan Safety Element contains Implementing Policies B, C, and D, requiring the developer to delineate hazardous areas and their proposed uses onsite. These implementing policies require submission of soils reports where conditions are not known and soil hazards are required to be mitigated. The City will require the developer to avoid hazardous areas, including areas of highly expansive soils on which construction cannot feasibly be made safe, and reserve them for use as open space, including greenbelts and parks. This impact is considered ***less than significant*** because development on hazardous soils will be addressed as part of compliance with General Plan policies, the Uniform Building Code, and standard development review practices of the City.

Alternative 3. Reduced Buildout Scenario. Under this scenario, the area of developed land within the City would increase, but to a lesser extent than under Alternatives 2, 4, and 5. This impact is considered ***less than significant*** because General Plan update policy HAZ 2.1 and related standards specifically regulate development on expansive soils. General Plan update standard HAZ 2.1a will require a soils report to be prepared prior to development of any land where soil conditions are not well known. Standard HAZ 2.1b would require the mitigation of any soils hazards as a condition of approval.

Alternative 4. Community Expansion Scenario with Oeste Campus. This scenario would result in a larger area of development than Alternative 3 with the addition of the Nishii/Gateway, Signature, Sutter-Davis, and Oeste Campus sites. As shown on Table 5I-1, each of these sites have soils ranging from moderate to high shrink-swell potential. Nonetheless, this impact is considered ***less than significant*** because of General Plan update policy HAZ 2.1 and related standards HAZ 2.1a and HAZ 2.1b that will specifically regulate development on expansive soils.

Alternative 5. Community Expansion Scenario with Davis Technology Campus. This scenario would result in the largest area of development with potential development on the Nishi/Gateway, Covell Center, Signature, Mace Ranch, Under Second Street, Sutter-Davis, Davis Technology, and Intervening Lands sites. As shown on Table 5I-1, each of these sites have soils ranging from moderate to high shrink-swell potential. Nonetheless, this impact is considered ***less than significant*** because of General Plan update policy HAZ 2.1 and related standards HAZ 2.1a and HAZ 2.1b that will specifically regulate development on expansive soils.

Mitigation Measure

Since this impact is ***less than significant***, no mitigation is required.

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