4.6 GEOLOGY AND SOILS

INTRODUCTION

This section of the EIR evaluates the proposed Project's potential to result in or expose people or property to adverse geologic conditions or hazards. It considers the existing soil conditions, along with the geologic hazards, such as faulting, seismic ground shaking, and liquefaction. Various federal, State, regional, and local programs and regulations related to anticipated geologic hazards are also discussed in this section.

This section incorporates information from the *Preliminary Geological and Other Hazards Evaluation prepared for the Compton High School Reconstruction* (Preliminary Evaluation)*,* dated October 31, 2017, and the *Geological Evaluation prepared for the Compton High School Reconstruction* (Geotechnical Report)*,* dated January 12, 2018, prepared by Ninyo & Moore Geotechnical & Environmental Science Consultants. These Geotechnical Reports are provided in **Appendix J** of this Draft EIR.

ENVIRONMENTAL SETTING

Regulatory Framework

a. Federal

Earthquake Hazards Reduction Act

The US Congress passed the Earthquake Hazards Reduction Act in 1977 to reduce the risks to life and property from future earthquakes in the United States through the establishment and maintenance of an effective earthquake hazards reduction program. To accomplish this goal, the act established the National Earthquake Hazards Reduction Program. This program was substantially amended in November 1990 by the National Earthquake Hazards Reduction Program Act, which refined the description of agency responsibilities, program goals, and objectives.

b. State

Alquist-Priolo Earthquake Fault Zoning Act

The purpose of the Alquist-Priolo Earthquake Fault Zoning Act is to identify hazards associated with surface fault ruptures and to prevent the construction of buildings on active faults.[1] The State Geologist is required to establish and map zones around the surface traces of active faults, which are then distributed to county and city agencies to be incorporated into their land use planning and construction policies. Proposed development needs to be proven through geologic investigation to not be located

1 Alquist-Priolo Earthquake Fault Zoning Act, California Public Resources Code (PRC), sec. 2621.5.

across active faults before a city or county can permit the implementation of projects. If an active fault is found, development for human occupancy is prohibited within a 50-foot setback from the identified fault. Alquist-Priolo Special Studies Zones are now commonly known as State of California Earthquake Fault Zones.

Seismic Hazards Mapping Act

The purpose of the Seismic Hazards Mapping Act is to protect the public from the effects of nonsurface fault rupture earthquake hazards, inducing strong ground shaking, liquefaction, seismically induced landslides, or other ground failure caused by earthquakes. The Seismic Hazards Mapping Act requires delineated maps to be created by the State Geologist to reflect where potential ground shaking, liquefaction, or earthquake-induced landslides may occur.[2] Cities and counties are required to obtain approval for development on nonsurface fault rupture hazard zones and mitigate seismic hazards.

California Building Standards Code, California Code of Regulations

The California Building Standards Code (CBC) is administered by the California Building Standards Commission (CBSC).[3] The CBC governs all development within the State of California, as amended and adopted by each local jurisdiction. These regulations include provisions for site work, demolition, and construction, which include excavation and grading, as well as provisions for foundations, retaining walls, and expansive and compressible soils. The CBC provides guidelines for building design to protect occupants from seismic hazards. The most recent version of the code, the 2016 CBC, went into effect on January 1, 2017.[4]

The CBC also requires geological and soil engineering studies to be made for the construction of any school building, or for the reconstruction or alternation or addition to any school building for work which alters structural elements if the site of the project is within the boundaries of any Alquist-Priolo Special Studies Zone.

California Division of the State Architect

The California Division of the State Architect (DSA) has the jurisdiction to provide design and construction oversight for K–12 schools, community colleges, and other public facilities.[5] DSA also develops accessibility, structural safety, and historical building codes and standards utilized in various public and

2 Seismic Hazards Mapping Act, PRC sec. 2690–2699.6.
3 California Building Standards Commission (CBSC), "Welcome to the California Building Standards Commission," accessed February 2018, http://www.bsc.ca.gov/.
4 California Building Standards Code, 24 California Code of Regulations (CCR).
5 California Government Code, Section 4453.5.

private buildings throughout the State. DSA ensures that all new construction of public school facilities comply with applicable building codes, including provisions related to safeguards against seismic or other geologic hazards. Specifically, DSA created the Interpretation of Regulations (IR) to document acceptable methods for achieving compliance with applicable building codes and regulations.[6] The purpose of the IR is to promote uniform Statewide criteria in plan review and monitoring of construction of public school, community college, and essential services building projects.

b. Regional and Local

City of Compton General Plan

The City's existing General Plan was adopted in December 1991, with its 2030 Comprehensive General Plan Update currently in the working draft stages.[7] The General Plan serves as a blueprint for planning and development in the City and indicates the community's vision for the future.

The purpose of the City's adopted Public Safety Element is to describe potential safety hazards and to establish policies to minimize danger to residents, workers, and visitors. The Public Safety Element describes the seismic hazards within the City, including liquefaction. The Public Safety Element identifies the eastern portion of the City as being located within an area with medium potential for liquefaction and notes that new construction will require special foundation design.

The Public Safety Plan, as described within the Public Safety Element, discusses the hazard mitigation and emergency preparedness planning needed both to provide everyday safety and emergency services, and to respond to major disasters. In regard to seismic hazards, the Public Safety Plan calls for the City to continue to abate deficiencies in unreinforced masonry buildings and requires geology studies for development in the Newport-Inglewood Alquist-Priolo Earthquake Fault Zone to establish appropriate setbacks and other building restrictions.

Furthermore, the City's proposed Public Safety Element of the Comprehensive General Plan Update identifies the City of Compton's goals for 2010 through 2030 as they relate to public safety and emergency preparedness, and sets the policies and programs for achieving them.[8] The proposed Public Safety Element recognizes that seismic activity is a regular occurrence in California and, as such, identifies policies to guide the City in planning for seismic hazards through emergency response strategies and quality construction.

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6 Division of the State Architect, "DSA's Interpretations of Regulations," accessed February 2018, http://www.dgs.ca.gov/dsa/Resources/IRManual.aspx.

7 City of Compton, *Draft 2030 Comprehensive General Plan Update [Draft General Plan Update]* (November 6, 2014).

8 City of Compton, *Draft General Plan Update*.

Existing Conditions

a. Regional

As described in the Geotechnical Report, the Project Site is located within the southerly portion of the Los Angeles Basin, which is included in the Peninsular Ranges Geomorphic Province (Province). This Province encompasses an area that extends approximately 125 miles from the Transverse Ranges and the Los Angeles Basin south to the Mexican border, and beyond another approximately 775 miles to the tip of Baja California. Varying in width from approximately 30 to 100 miles, this Province is characterized by its northwest-trending mountain range blocks separated by similarly trending northwest-trending faults.

Active northwest-trending fault zones in the Peninsular Ranges Province include the Newport-Inglewood Fault Zone, Elsinore Fault Zone (Whittier Fault), and San Jacinto Fault Zone. The northern boundary of the Province is formed by the Transverse Ranges Southern Boundary fault system which includes the active Malibu, Santa Monica, Hollywood, and Raymond Faults. The active San Andreas Fault Zone is located northeast of the Province within the adjacent Colorado Desert Geomorphic Province. The predominant major tectonic activity associated with these and other faults within this regional tectonic framework is right-lateral, strike-slip movement.

The Project Site is located within the central structural block of the Los Angeles Basin. The central block is a depositional basin characterized by thick sequences of alluvium overlying predominantly sedimentary rock of Cretaceous through Pleistocene age. The central block includes the Los Angeles coastal plain, which extends from West Los Angeles southeast to the Downey Plains in central Orange County. Quaternary sediments, primarily of alluvial origin, compose the low-lying valley and drainage areas within the region, including the Compton Creek drainage adjacent to the west side of the Project Site.

The Project Site is located in a seismically active area, as is the majority of Southern California. The California Geological Survey (CGS) classifies faults as either active, potentially active, or inactive.[9] Active faults as those that have or are suspected to have ruptured within the Holocene epoch—that is, within the last 11,000 years. Potentially active faults are those that show evidence of movement during Quaternary time (approximately the last 1.6 million years) but for which evidence of Holocene movement has not been established. Inactive faults have not ruptured in the last 1.6 million years.

9 Department of Conservation, California Geological Survey, *Earthquake Fault Zones: A Guide for Government Agencies, Property Owners/Developers, and Geoscience Practitioners for Assessing Fault Rupture Hazards in California,* special publication 42 (rev. 2018), accessed February 2018, http://www.conservation.ca.gov/cgs/Documents/CGS_SP42_2018.pdf.

The Geotechnical Report identified 14 known active faults that may affect the Project Site.[10] Each of these faults is believed to be capable of producing sizeable earthquake events with significant ground motions.

b. Project Site

The Project Site is relatively flat, with an elevation of approximately 68 feet above mean sea level, with topographic relief across the site at approximately 5 feet, gentle sloping ground toward the southeast.[11] The existing soil and geologic units present within the Project Site are described below.

Soils

As discussed previously, the Project Site is located within the central structural block, which is characterized by Quaternary-age alluvial deposits, of the Los Angeles Basin. The Geotechnical Report identified that soils on the Project Site comprises a mix of alluvial deposits and fill materials, consisting of silty and clayey layers, soft to hard in consistency, with varying amount of loose to very dense sands.[12] These on-site soils are generally dry and soft soils that tend to undergo dynamic compaction during a seismic event.

Seismic Hazards

Earthquake Faults

Due to the nature of Southern California straddling the North American and Pacific plates, the region is located in an area where numerous strike-slip faults are present. As shown in **Table 4.6-1: Active Earthquake Faults near the Project Site**, 14 known active faults are near Project Site and have the potential to create seismic hazards. These active faults range from a distance of 1.8 miles to 21.6 miles from the Project Site, with a maximum moment magnitude ranging from 6.7 to 7.5.[13]

10 Ninyo & Moore Geotechnical & Environmental Science Consultants, *Preliminary Geotechnical and Other Hazards Evaluation, Compton High School Reconstruction [Preliminary Evaluation]* (October 2017).
11 Converse Consultants, *Phase I Environmental Site Assessment Report, Compton High School* (January 3, 2018).
12 Ninyo & Moore, *Geotechnical Evaluation, Compton High School Reconstruction* (January 12, 2018).
13 Ninyo & Moore, *Preliminary Evaluation.*

Table 4.6-1
Active Earthquake Faults near the Project Site

Fault Name	Distance to Project Site (miles)	Maximum Moment Magnitude (Mmax)
Newport-Inglewood	1.8	7.5
Puente Hills Blind Thrust (Los Angeles Basin)	4.8	7.0
Puente Hills Blind Thrust (Santa Fe Springs)	5.2	6.7
Palos Verdes	9.2	7.7
Puente Hills Blind Thrust (Coyote Hills)	10.5	6.9
Elysian Park (Upper)	12.1	6.7
Elsinore	12.5	7.8
Santa Monica	15.2	7.4
Hollywood	15.7	6.7
Raymond	15.7	6.8
Verdugo	17.1	6.9
Malibu Coast	19.6	7.0
Anacapa-Dume	20.7	7.2
San Joaquin Hills Blind Thrust	21.6	7.1

*Source: Ninyo & Moore Geotechnical & Environmental Science Consultants, Geotechnical Evaluation, Compton High School Reconstruction (January 2018) (Refer to **Appendix J**).*

Surface Fault Rupture

Primary fault rupture results in fissuring and offset of the ground surface along a rupturing fault during an earthquake. Primary ground rupture typically makes up a relatively small percentage of the total damage in an earthquake but being too close to a rupturing fault can cause severe damage to structures, and it is difficult to safely reduce the effects of this hazard through building and foundation design. The State definition of an active fault is designed to gauge the surface rupture potential of a fault and is used to prevent development from being sited directly on an active fault. The Alquist-Priolo Earthquake Fault Zoning Act imposes development constraints within active fault zones.

While the Project Site is located within a seismically active area, it is not located within a State of California Earthquake Fault Zone (formerly known as an Alquist-Priolo Special Studies Zone).[14]

14 Ninyo & Moore, *Geotechnical Evaluation.*

Strong Seismic Ground Shaking

Ground shaking poses the greatest potential hazard to the Project Site given its location to several active faults that have the capability of producing earthquakes. Impacts that would result from ground shaking include extensive structural damage and risk of injury or death. This hazard is common all throughout Southern California and is associated with inducing other geologic hazards, such as slope failure, liquefaction, and soil settlement.

The largest known earthquake within proximity to the Project Site was in 1812 in Wrightwood along the Newport-Inglewood Fault, with a magnitude of 7.3.[15] Historically, the Project Site suffered significant damage during the 1933 Long Beach earthquake, which had a magnitude of 6.4.[16] Several structures and buildings were damaged—and have since been rebuilt—as a result of this earthquake.

Other notable earthquakes, such as the 1971 San Fernando Earthquake and the 1994 Northridge Earthquake, have not caused notable damage to the existing structures and buildings.[17]

Liquefaction and Ground Failure

Liquefaction generally occurs within the upper 50 feet of the ground surface when loose, cohesionless, and water-saturated soils (fine to medium grained) are subjected to strong seismic ground motions of earthquakes. The seismic shaking increases the pressure of the water that fills the pores of the soil grains.

The historic high depth to groundwater is mapped near the Project Site as approximately 10 feet below ground surface (bgs). Review of readily available groundwater data indicates groundwater depths directly south of the Project Site are estimated to range between 23 and 44 feet bgs.[18] It should be noted that the depths to groundwater observed at the time of drilling are not considered stabilized conditions, and fluctuations in the level of groundwater at the site may occur due to variations in ground surface topography, subsurface stratification, rainfall, irrigation practices, and other factors which may not have been evident at the time of the conducted geotechnical evaluation.

The State of California Seismic Hazard Zones Map indicates the Project Site is located within an area mapped as subject to seismically induced liquefaction hazards.[19] The City's proposed 2030

15 Ninyo & Moore, *Geotechnical Evaluation.*
16 Ninyo & Moore, *Geotechnical Evaluation.*
17 Ninyo & Moore, *Geotechnical Evaluation.*
18 Ninyo & Moore, *Geotechnical Evaluation.*
19 California Department of Conservation, Seismic Hazard Zonation Program, "CGS Information Warehouse: Regulatory Maps," accessed February 2018, http://maps.conservation.ca.gov/cgs/informationwarehouse/index.html?map=regulatorymaps.

Comprehensive General Plan Update also identifies the majority of the Project Site to be located within an area having potential for liquefaction.[20]

Based on the nature of the underlying formational materials, such as the presence of loose, sandy soils, in combination with the historic high groundwater levels at approximately 10 feet bgs, the potential for dynamic settlement due to liquefaction is considered likely. According to the Geotechnical Report, during a seismic event, the Project Site would currently exhibit a liquefaction-induced dynamic settlement of up to 2 inches and a liquefaction-induced lateral spread of up to 1 foot, and differential settlement on the order of 1 inch.[21]

Lateral Spread

Lateral spread of the ground surface during an earthquake usually takes place along weak shear zones that have formed within a liquefiable soil layer. Lateral spread has generally been observed to take place in the direction of a free face (i.e., retaining wall, slope, creek) but has also been observed to a lesser extent on ground surfaces with very gentle slopes. For sites located in proximity to a free face, the amount of lateral ground displacement is strongly correlated with the distance of the site from the free face. Other factors—such as earthquake magnitude, distance from the earthquake epicenter, thickness of the liquefiable layers, and the fines content and particle sizes of the liquefiable layers—also affect the amount of lateral ground displacement.

As indicated in the Geotechnical Report, liquefaction-induced lateral spread up to approximately 1 foot may occur during the design seismic event.[22]

Seismically Induced Settlement

Under certain conditions, strong ground shaking can cause the densification of soils, resulting in local or regional settlement of the ground surface. During strong shaking, soil grains become more tightly packed due to the collapse of voids and pore spaces, resulting in a reduction of the thickness of the soil column. This type of ground failure typically occurs in loose, granular, cohesionless soils and can occur in either wet or dry conditions. Under the added weight of fill embankments or buildings, these soils tend to settle, causing distress to improvements. Damage to structures typically occurs as a result of local differential settlements, although regional settlement can damage pipelines by changing the flow gradient on water

20 City of Compton, *Draft General Plan Update,* "Public Safety Element," Exhibit 5-1: Seismic and Flood Hazards.
21 Ninyo & Moore, *Geotechnical Evaluation.*
22 Ninyo & Moore, *Geotechnical Evaluation.*

and sewer lines, for example. Wind-blown sand and unconsolidated young alluvial deposits are especially susceptible to seismically induced settlement.

The Project Site comprises soils with alluvial deposits, making it susceptible to seismically induced settlement. Further, as stated in the Geotechnical Report, up to approximately 1 inch of dynamic settlement of dry sand may occur during the design seismic event.[23]

Other Geologic Hazards

Other geologic hazards that could affect the site include collapsible soils and ground subsidence are as follows:

Expansive/Collapsible Soils

Expansive soils are characterized as fine-grained soils, such as silts and clays, with variable amounts of expansive clay minerals that can change in volume due to changes in water content. Collapsible soils typically occur in recently deposited soils that tend to be more dry and granular.

Given that the majority of the Project Site is underlain by fill soils and Quaternary-age alluvium, the overall sand composition of the Project Site possesses very low expansion and collapsible potential.[24]

Groundwater

The depth of groundwater ranging between 23 to 44 feet bgs, with a historic high depth of approximately 10 feet bgs.[25] According to the Geotechnical Report prepared for the Project Site, the nearest water storage tank (well, pump, and a small holding tank) is located approximately 1,000 feet to the north of the site.

ENVIRONMENTAL IMPACTS

Methodology

The information within this section contains information from the Geotechnical Report that was conducted for the Project Site (refer to **Appendix J**). The analysis of potential impacts to geologic and soil hazards that would be associated with the proposed Project included the following elements:

- Review of background information, including readily available geotechnical reports, geologic maps, fault maps, landslide maps, flood inundation maps, and historical stereoscopic aerial photographs;

23 Ninyo & Moore, *Geotechnical Evaluation.*
24 Ninyo & Moore, *Geotechnical Evaluation.*
25 Ninyo & Moore, *Geotechnical Evaluation.*

- Performance of a geologic reconnaissance of the site and surrounding areas;
- Performance of an aboveground water or fuel storage tank analysis in accordance with California Code of Regulations 14010(h); and
- Preparation of the report presenting the preliminary findings and conclusions regarding potential geological and other hazards.

Thresholds of Significance

To assist in determining whether the proposed Project would have a significant effect on the environment, the District finds the proposed Project may be deemed to have a significant impact related to geology and soils if it would:

Threshold GEO-1: **Expose people or structures to potential substantial adverse effects involving 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.**

Threshold GEO-2: **Expose people or structures to potential substantial adverse effects involving strong seismic ground shaking.**

Threshold GEO-3: **Expose people or structures to potential substantial adverse effects involving seismic-related ground failure, including liquefaction.**

Threshold GEO-4: **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.**

Threshold GEO-5: **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.**

Threshold GEO-6: **Involve the construction, reconstruction, or relocation of any school building on a site subject to moderate-to-high liquefaction.**

Please refer to **Section 6.1: Effects Found Not to Be Significant** for an evaluation of those topics that were determined to be less than significant or have no impact and do not require further analysis in the EIR**.**

Project Impact Analysis

Threshold GEO-1: Expose people or structures to potential substantial adverse effects involving 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.

Reconstruction of CHS Campus

The Project Site is located in a region that consists of numerous active faults, such as the Newport-Inglewood, Puente Hills Blind Thrust (Los Angeles Basin), and Puente Hills Blind Thrust (Santa Fe Springs) Faults. Because the Project Site does not traverse an active fault or is not located within a State of California Earthquake Fault Zone (formerly known as an Alquist-Priolo Earthquake Fault Zone), the probability of damage from surface ground rupture is considered to be low. For these reasons, there would be no exposure to the risk of loss, injury, or death associated with a surface rupture of a known earthquake fault.

Impacts would be less than significant.

Relocation of District Uses

As part of the Project, the District's Facilities Department and the Pupil Services, Enrollment Center, and Special Education offices would be demolished and relocated to existing District facilities with available capacities at Caldwell Elementary School and Cesar Chavez Continuation High School.

The Caldwell Elementary School is located at located at 2300 W. Caldwell Street, approximately 1.25 miles southwest of the Project Site; the Cesar Chavez Continuation High School is located at 12501 N. Wilmington Avenue in Compton, approximately 2 miles north of the Project Site. Similar to the Project Site, these District facility sites do not traverse an active fault, nor are they located within a State of California Earthquake Fault Zone.[26] Therefore, the relocated uses would also not be exposed to risk of loss, injury, or death associated with a surface rupture of a known earthquake fault.

Impacts would be less than significant.

26 California, Department of Conservation, "The California Earthquake Hazards Zone Application," accessed April 2018, http://www.conservation.ca.gov/cgs/Pages/SH_EQZ_App.aspx.

Threshold GEO-2: Expose people or structures to potential substantial adverse effects involving strong seismic ground shaking.

Reconstruction of CHS Campus

The Project Site is in a seismically active area and is subject to some level of ground shaking as a result of movement along the major active (and potentially active) fault zones that characterize this region. Further, the Project Site suffered significant damage during the 1933 Long Beach earthquake, which had a magnitude of 6.4 on the Richter scale.

The Project Site would most likely experience background shaking or potentially moderate to occasionally high ground shaking from faults in the region. Strong ground shaking can cause settlement by allowing sediment particles to become more tightly packed, thereby reducing pore space. Unconsolidated, loosely packed granular alluvial deposits, such as those located on site, are especially susceptible to this phenomenon. Poorly compacted artificial fills such as any engineered fills that may result from site grading and construction activities may also experience seismically induced settlement.

The Project Site is not located within a State of California Earthquake Fault Zone. The nearest faults to the Project Site capable of generating seismic activity that would potentially affect the site are Newport-Inglewood at approximately 1.8 miles west of the Project Site, Puente Hills Blind Thrust (Los Angeles Basin) approximately 4.8 miles to the north, and Puente Hills Blind Thrust (Santa Fe Springs) Faults approximately 5.2 miles to the northeast of the Project Site. These faults have to the potential to generate earthquakes with magnitude of up to 7.5 (see **Appendix J**).[27] The proposed Project's proximity to these three faults entails the likely prospect that seismic activity is bound to be experienced at the Project Site.

Intensity of ground shaking at a given location depends primarily upon earthquake magnitude, site distance from the source, and site response (soil type) characteristics. Based on criteria established by the CBC to evaluate seismic loads for design of buildings and other structures, the Project Site is located within an area with the potential for strong seismic accelerations. The CBC contains provisions to safeguard against major structural failures or loss of life caused by earthquakes or other geologic hazards.[28]

The design of the proposed school buildings and structures associated with the proposed Project would comply with the minimum standards and seismic safety requirements contained within the current edition of the CBC[29] and the requirements of the DSA, including compliance with DSA IR-A-24 for safety design requirements for construction of school facilities, which requires completion of the California

27 Ninyo & Moore, *Geotechnical Evaluation.*
28 CBSC, California Building Code, 24 CCR.
29 CBSC, California Building Code, 24 CCR.

Geological Survey Checklist for the Review of Geology and Seismology Reports for California Public Schools, Hospitals, and Essential Services Buildings.[30] As such, the design would incorporate these requirements as well as address any of the recommendations presented in the Geotechnical Report.[31]

Impacts would be less than significant.

Relocation of District Uses

As part of the Project, the District's Facilities Department and the Pupil Services, Enrollment Center, and Special Education offices would be demolished and relocated to existing District facilities with available capacities at Caldwell Elementary School and Cesar Chavez Continuation High School.

Similar to the Project Site and the majority of Southern California, these District facility sites are located within a seismically active area. However, these District facility sites are not located within a State of California Earthquake Fault Zone.[32] These existing District facility sites were designed to comply with the minimum standards and seismic safety requirements contained within the CBC and the requirements of the DSA. Impacts would be less than significant.

Threshold GEO-3: Expose people or structures to potential substantial adverse effects involving seismic-related ground failure, including liquefaction.

Reconstruction of CHS Campus

The Project Site is located within an area mapped as subject to seismically induced liquefaction hazards. The City's proposed 2030 Comprehensive General Plan Update also identifies the majority of the Project Site as being located within an area having potential for liquefaction.[33]

Groundwater depths directly south of the Project Site are estimated to range between 23 and 44 feet bgs, with the historical high within the Project vicinity estimated as approximately 10 feet bgs. Based on the depth of groundwater in the soils, liquefaction is likely to occur if shallow groundwater conditions are present. The Geotechnical Report indicates that dynamic settlement up to approximately 2 inches and lateral spread up to approximately 1 foot due to soil liquefaction may occur at the site during the design seismic event.[34]

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30 Division of the State Architect (DSA), *Construction Phase Duties of the School District, Contractor, and Design Professional,* IR A-24 (November 3, 2008; last rev. December 2, 2016), accessed February 2018, https://www.documents.dgs.ca.gov/dsa/pubs/IR_A-24_rev12-02-16.pdf.

31 Ninyo & Moore, *Geotechnical Evaluation.*

32 State of California, Department of Conservation, "The California Earthquake Hazards Zone Application."

33 City of Compton, *Draft General Plan Update,* "Public Safety Element," Exhibit 5-1.

34 Ninyo & Moore, *Geotechnical Evaluation.*

The proposed facilities would be subject to adherence to the minimum standards and seismic safety requirements contained within the current edition of the CBC and the requirements of the DSA, including compliance with DSA IR-A-24 for safety design requirements for construction of school facilities.[35] The design of the proposed buildings and structures associated with the proposed Project also would address the recommendations presented in the Geotechnical Report.[36]

While the site would still be subject to potential liquefaction, by addressing these requirements, impacts related to the exposure of people or structures to liquefaction hazards would be less than significant.

Relocation of District Uses

As part of the Project, the District's Facilities Department and the Pupil Services, Enrollment Center, and Special Education offices would be demolished and relocated to existing District facilities with available capacities at Caldwell Elementary School and Cesar Chavez Continuation High School.

Of the two District facility sites proposed for relocation, only the Caldwell Elementary School is located within an area having potential for liquefaction.[37] However, this existing District facility site was designed to comply with the minimum standards and seismic safety requirements contained within the CBC and the requirements of the DSA.

Impacts related to the exposure of people or structures to liquefaction hazards would be less than significant.

Threshold GEO-4: 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.

Reconstruction of CHS Campus

The relatively flat topography of the Project Site and surrounding off-site areas precludes both stability problems and the potential for lurching, which is earth movement at right angles to a cliff or steep slope during ground shaking. The potential for landslides is low.

Liquefaction may also cause lateral spreading. For lateral spreading to occur, the liquefiable zone must be continuous, unconstrained laterally, and free to move along gently sloping ground toward an unconfined

35 CBSC, California Building Code, 24 CCR.
35 DSA, *Construction Phase Duties.*
36 Ninyo & Moore, *Geotechnical Evaluation.*
37 City of Compton, *Draft General Plan Update,* "Public Safety Element," Exhibit 5-1.

area. If lateral containment is present for those zones, then no significant risk of lateral spreading would be present. Because the liquefaction potential at the Project Site is high, earthquake-induced lateral spreading would be considered to be a potentially significant seismic hazard. The proposed facilities would be subject to adherence to the minimum standards and seismic safety requirements contained within the current edition of the CBC and the requirements of the DSA, including compliance with DSA IR-A-24 for safety design requirements for construction of school facilities. In addition,[38] the Geotechnical Report indicates that dynamic settlement up to approximately 2 inches and lateral spread up to approximately 1 foot due to soil liquefaction may occur at the site during the design seismic event.[39]

While the Project Site would still be subject to potential lateral spreading, subsidence, liquefaction or collapse, by addressing these requirements, impacts would be less than significant.

Relocation of District Uses

As part of the Project, the District's Facilities Department and the Pupil Services, Enrollment Center, and Special Education offices would be demolished and relocated to existing District facilities with available capacities at Caldwell Elementary School and Cesar Chavez Continuation High School.

Similar to the Project Site, these District facility sites are relatively flat and have low potential for stability problems, such as landslides. Only the Caldwell Elementary School is located within an area having potential for liquefaction, which could result in the likelihood of earthquake-induced lateral spreading. However, this existing District facility site was designed to comply with the minimum standards and seismic safety requirements contained within the CBC and the requirements of the DSA.

Impacts would be less than significant.

Threshold GEO-5: 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.

Reconstruction of CHS Campus

The Project Site is underlain by fill soils and quaternary-age alluvium, which are primarily composed of silty and clayey layers, soft to hard in consistency, with varying amount of loose to very dense sands.

The proposed facilities would be subject to adherence to the minimum standards and seismic safety requirements contained within the current edition of the CBC and the requirements of the DSA, including

38 DSA, *Construction Phase Duties.*
39 Ninyo & Moore, *Geotechnical Evaluation.*

compliance with DSA IR-A-24 for safety design requirements for construction of school facilities.[40] In addition, the Geotechnical Report prepared for the Project Site provides recommendations for the utilization of certified fills.

While the Project Site would still be subject to potential expansive soils, by addressing these requirements, impacts would be less than significant.

Relocation of District Uses

As part of the Project, the District's Facilities Department and the Pupil Services, Enrollment Center, and Special Education offices would be demolished and relocated to existing District facilities with available capacities at Caldwell Elementary School and Cesar Chavez Continuation High School.

Given that the relocated uses would be contained within already existing buildings at each of the new locations, construction is not warranted. The existing District facility sites were designed to comply with the minimum standards and seismic safety requirements contained within the CBC and the requirements of the DSA.

Impacts would be less than significant.

Threshold GEO-6: Involve the construction, reconstruction, or relocation of any school building on a site subject to moderate-to-high liquefaction.

Reconstruction of CHS Campus

The Project Site is located within an area subject to seismically induced liquefaction hazards.

The proposed facilities would be subject to adherence to the minimum standards and seismic safety requirements contained within the current edition of the CBC and the requirements of the DSA, including compliance with DSA IR-A-24 for safety design requirements for construction of school facilities.[41] In addition, pursuant to the Geotechnical Report's recommendations, including remedial grading and the use of reinforced shallow foundations (e.g., mat foundation or footings supported by reinforced soil mat), the design of the proposed buildings and structures on the Project Site would be constructed in accordance with the final geotechnical evaluation and approved by DSA.

Impacts would be reduced to a level of less than significant.

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40 DSA, *Construction Phase Duties.*
41 DSA, *Construction Phase Duties.*

Relocation of District Uses

As part of the Project, the District's Facilities Department and the Pupil Services, Enrollment Center, and Special Education offices would be demolished and relocated to existing District facilities with available capacities at Caldwell Elementary School and Cesar Chavez Continuation High School.

Of the two District facility sites proposed for relocation, only the Caldwell Elementary School is located within an area having potential for liquefaction.[42] However, this existing District facility site was designed to comply with the minimum standards and seismic safety requirements contained within the CBC and the requirements of the DSA. Impacts related to the exposure of people or structures to liquefaction hazards would be less than significant.

CUMULATIVE IMPACTS

Geologic hazards, such as liquefaction, seismic shaking and earthquake faults, exist near the Project Site, and because the entire region is seismically active, the proposed Project will be subject to seismic risks similar to those for other developments identified in the related projects list provided in **Section 3.0: Environmental Setting**, and those located throughout the City and surrounding areas.

The geographic context of the analysis of rupture of a fault, strong seismic ground shaking, liquefaction, landslide, seismic-induced settlement, and expansive soils are generally site specific rather than cumulative in nature. This is because each development site has unique geologic considerations that would be subject to uniform site development and construction standards. In this way, potential cumulative impacts resulting from geological, seismic, and soil conditions would be reduced to less than significant level on a site-by-site basis by implementation of specific design requirements pursuant to the CBC, as well as adherence to local standards.

Impacts would not be cumulatively considerable.

MITIGATION MEASURES

No mitigation is required.

LEVEL OF SIGNIFICANCE AFTER MITIGATION

The proposed Project would be subject to the minimum standards and seismic safety requirements contained within the current edition of the CBC and the requirements of the DSA, including compliance with DSA IR-A-24 for safety design requirements for construction of school facilities.[43] As such, potential

42 City of Compton, *Draft General Plan Update,* "Public Safety Element," Exhibit 5-1.
43 DSA, *Construction Phase Duties.*

impacts associated with geology and soils would be reduced to a level of less than significant, and would be addressed through the design and construction process, which would be subject to DSA oversight and inspection.

Therefore, all potential impacts related to geology and soils would be less than significant.