3.18 Cumulative Impacts

3.18.1 Introduction

This section analyzes the potential contribution of the San Francisco to San Jose Project Section (Project Section, or project) to cumulative impacts, and defines the regional context appropriate for each resource area, including adjacent project sections of the high-speed rail (HSR) system.

3.18.2 Laws, Regulations, and Orders

This section summarizes federal and state laws and regulations relevant to the cumulative impact analysis. There are no regional or local laws, regulations, or plans pertaining to cumulative impacts.

3.18.2.1 Federal

National Environmental Policy Act (42 U.S.C. § 4321 et seq.; 40 C.F.R. Parts 1500–1508)

Pursuant to the National Environmental Policy Act (NEPA) and Council on Environmental Quality (CEQ) regulations, a lead agency must consider cumulative impacts in addition to direct and indirect impacts. The CEQ regulations define a cumulative impact as an impact on the environment that results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or nonfederal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time (40 Code of Federal Regulations [C.F.R.] § 1508.7).

The CEQ guidance document *Considering Cumulative Effects under the National Environmental Policy Act* (CEQ 1997) recommends that cumulative impact analysis include the following steps in scoping those impacts that are worthy of analysis in an environmental impact statement (EIS):

- Step 1—Identify the cumulative effects issues associated with the proposed action and define the assessment goals.
- Step 2—Establish the geographic scope for the analysis.
- Step 3—Establish the timeframe for the analysis.
- Step 4—Identify other actions affecting the resources, ecosystems, and human communities of concern.

The guidance notes that “scoping is the key to analyzing cumulative impacts; it provides the best opportunity for identifying important cumulative impacts issues, setting appropriate boundaries for analysis, and identifying relevant past, present, and future actions. Scoping allows the NEPA practitioner to ‘count what counts.’” In this way, the cumulative analysis is focused on those cumulative impacts to which the project could contribute.

National Historic Preservation Act (36 C.F.R. Part 800)

The regulations implementing Section 106 of the National Historic Preservation Act acknowledge that a project’s adverse effects include any that are reasonably foreseeable, even if they may occur later in time, are farther removed in distance, or are cumulative.

Clean Water Act (33 U.S.C. § 1251 et seq.)

Section 404 of the Clean Water Act (CWA) requires the assessment of potential cumulative impacts on jurisdictional waters of the U.S., including special aquatic sites, protected by Section 404, which are under the jurisdiction of the U.S. Army Corps of Engineers (USACE) and the U.S. Environmental Protection Agency.

Federal Endangered Species Act (15 U.S.C. § 1531 et seq.)

The federal Endangered Species Act (FESA), Section 7, defines cumulative impacts as those effects of future state or private activities not involving federal activities that are reasonably certain to occur within the action area that is subject to consultation with the U.S. Fish and Wildlife Service, National Marine Fisheries Service, or both.

3.18.2.2 State

California Environmental Quality Act (Cal. Code Regs., tit. 14, § 15000 et seq.)

The California Environmental Quality Act (CEQA) defines cumulative impacts as two or more individual impacts that, when evaluated together, are considerable or compound or increase other environmental impacts (CEQA Guidelines § 15355). Under CEQA, when a project would contribute to a cumulatively significant impact, an environmental impact report (EIR) must discuss whether the project's incremental effect is cumulatively considerable. *Cumulatively considerable* means that the project's incremental effect is significant when viewed in the context of past, present, and reasonably probable future projects.

Similar to the approach under NEPA, the CEQA Guidelines provide that cumulative impact analyses should focus on *significant* cumulative impacts to which a project would contribute and the magnitude of the project's contribution.

When the combined cumulative impact associated with the project's incremental effect and the effects of other projects is not significant, the EIR briefly indicates why the cumulative impact is not significant and is not discussed in further detail. The lead agency must identify facts and analysis supporting the lead agency's conclusion that the cumulative impact is less than significant (CEQA Guidelines § 15130(a)(2)).

3.18.3 Methods for Evaluating Impacts

The California High-Speed Rail Authority (Authority) followed the steps listed below to determine the contribution of the project alternatives, if any, to cumulative impacts for each resource:

1. Define the cumulative impact resource study area (RSA) for each resource topic.
2. Compile a list, description, and environmental impact information for planned projects and relevant plans to be included in the cumulative condition. Check adopted plans such as regional transportation plans (RTP), regional transportation improvement plans, local long-range transportation plans, local land use general and specific plans; interviews with local and regional planning agencies; and recent environmental documents for other large-scale projects near project alternatives. Generally, projects are considered in the analysis if they are part of an adopted plan as described in this section or fall under any of the following conditions:
   - Applications for project entitlements or construction are pending with a government agency.
   - The project is included in an agency's budget or capital improvement program.
   - The project is a reasonably foreseeable future phase of an existing project.
   - The project is reasonably foreseeable to occur within the 2040 planning horizon for the HSR system.
3. Identify and evaluate the cumulative impacts of the past, present, and reasonably foreseeable projects (subsequently referred to as *cumulative projects*) in the cumulative RSA, along with Project Section impacts, to describe the cumulative condition for each resource area. Determine as part of this evaluation whether there is a cumulative impact.
4. Determine whether the incremental contribution of the project alternatives to the cumulative impacts for each resource area would be cumulatively considerable under CEQA. "Cumulative impacts can result from individually minor but collectively significant projects

taking place over a period of time" (CEQA Guidelines § 15355). The cumulative discussion only includes direct or indirect impacts found to result from one or more project alternatives; if no impact would result, there is no need to evaluate other projects' similar actions.

5. Identify reasonable, feasible options for avoiding or mitigating the project alternatives' considerable contribution to cumulative impacts.

The specific resource evaluations in Chapter 3, Affected Environment, Environmental Consequences, and Mitigation Measures, form the basis for analyzing the cumulative impacts of each resource. The cumulative analysis includes all resources considered in Chapter 3 (i.e., Sections 3.2, Transportation, through 3.16, Cultural Resources).[1] Where applicable, the cumulative impacts analysis section notes impacts to which the project alternatives would not contribute and explains the rationale.

3.18.4 Cumulative Projects and Growth Forecasts

This section discusses the historical context of the Project Section and how development trends in the past have influenced the environmental character of the area. This section also discusses projected development trends and describes how future urbanization is expected to change the character of the Project Section.

3.18.4.1 Historical Context of Project

Section 5.3, Historic Setting, in the *San Francisco to San Jose Project Section Archaeological Survey Report* (Authority 2019a) provides an overview of the history of cultural development in San Francisco, San Mateo, and Santa Clara Counties. It is organized according to pre-20th-century trends—which includes the Spanish and Mexican Period (1776–1846) and the American Period (1848–1906), as well as development of the railroad—and 20th-century development of San Francisco Peninsula.

Pre-20th-Century Trends (1776–1906)

Spanish explorers laid claim to California in 1542, and by the 18th century had established a system of religious missions and military presidios throughout the state. The areas around the missions in the San Francisco Bay Area (Bay Area) were the principal areas of settlement, with indigenous peoples making up most of the population. Alta California came under Mexican Rule after its 10-year-long war of independence with Spain ended in 1821. After the Mexican-American War of 1846–1848, California became an annexed territory to the U.S.

Through the 19th century, the City of San Francisco was the dominant development on the San Francisco Peninsula (Peninsula). After the discovery of gold at Sutter's Mill near Sacramento in 1848, thousands of settlers and immigrants moved to San Francisco, making the city the eighth largest urban center in the U.S. by 1890. Other towns in the Bay Area largely served the needs of San Francisco by producing and shipping foodstuffs and building materials. Industrial development on the Peninsula during the 19th century concentrated in the timber town of Redwood City and in the communities closest to San Francisco's center, from the South of Market (SoMa) neighborhood to South San Francisco. The first and principal industry in SoMa was iron founding, as a huge influx of ore and scrap metal came in from the Sierra Nevada diggings. The completion of the San Francisco–San Jose Railroad in 1864 introduced land-based shipping for San Francisco, and much of the SoMa area was dedicated to multimodal warehousing that could take advantage of marine shipping, rail transportation, and drayage.

Across the San Mateo County line, South San Francisco was originally the community of Baden. Over time the "Industrial City" attracted other industries that facilitated the growth of this town. Just south of South San Francisco, the communities of Burlingame and Hillsborough developed as a region with large moneyed estates. San Mateo serviced San Francisco rail traffic, as well as trading

[1] Section 3.17, Regional Growth, describes induced growth and indirect effects from growth; that section also identifies cumulative impacts associated with regional growth and future projects; accordingly, that analysis is not repeated in this section.

with and supplying local farmers. Elsewhere in San Mateo County, the lumber towns of Redwood City, Searsville, Woodside, and Ravenswood took advantage of the small redwood groves along the Peninsula's hills. Southern San Mateo and northern Santa Clara Counties were homesteaded as early as 1848 with small dairy and poultry communities emerging around market crossroads.

Regular railroad service along the Peninsula between San Francisco and San Jose was in operation in 1864. In 1875, the Southern Pacific Railroad (SPRR) acquired the earlier San Francisco–San Jose Railroad and opened a large station and office building at Fourth and Townsend Streets in San Francisco. Multiple passenger and freight trains used SPRR's Ocean View line, which traveled over steep grades and through neighborhoods. Because of the delays and hazards along this route, a cutoff was completed in December 1907 that shortened the route's distance and reduced the grade.

San Francisco Peninsula in the 20th Century

Prior to 1906, the development of subdivisions and new towns on the Peninsula was limited by the preponderance of large private estates. Following completion of the Bayshore Cutoff, the paving of El Camino, and the 1906 earthquake there was greater demand for housing on the Peninsula. In response to this demand, former estates were subdivided and commuter suburbs developed around San Mateo. The most rapid growth was at the north end of the Peninsula, near San Francisco's industrial areas, where laborers, tradesmen, and small shop owners predominated. When private cars began to surpass rail as the dominant means of transportation around 1920, the bayside communities' growth became more decentralized and less planned than growth that had accompanied the railroad (Hynding 1982: pages 188–189, 209, 239; Scott 1985: page 134).

While most post-1906 growth on the Peninsula was suburban, industrial development played a leading role in Redwood City and communities at the north end of San Mateo County and the south end of San Francisco County. Heavy industry in the region peaked during World War II, with steel production and shipbuilding as the leading industries. During this period, South San Francisco had 10,000 workers producing steel for Bethlehem and other companies. The railroad was a driving factor in determining where industry flourished, because it transported most of the raw materials and goods and also required its own freight and maintenance yards.

After World War II, suburban expansion on the Peninsula was fueled by the large number of service members and war-industry workers who had first encountered the Bay Area during the war and elected to stay permanently. During this same period the Bay Area economy was transitioning away from heavy industry toward the electronics and computing fields funded in part by military contracts. Federal spending also provided low-interest housing loans and educational assistance to veterans through the G.I. Bill. By the end of the 1960s, suburban communities spread the length of the Peninsula, tightly hugging the freeways that filled with commuters battling the traffic (Duany et al. 2000: pages 18–19; Hynding 1982: pages 273–274; Jackson 1985: pages 187, 233, 238–242; Rice et al. 2011: pages 488–492; Vance 1964: page 66).

The post-war decades brought a general decline in activity to the SPRR's Peninsula line as freight trains converted to diesel power and routed more through Oakland. The shift from steam to diesel power also led to the gradual closing of the maintenance facilities at the Bayshore Yard. The Bayshore Yard began to phase out operations in 1979 and had ceased activity by 1988 ("Diesels Soon to Replace Steam" 1955: page 7; Signor 1994: pages 154–159). The SPRR commuter service was also reduced as the dominance of the automobile eroded the profitably of passenger rail lines. The Menlo Park and Palo Alto California Avenue stations closed between 1958 and 1959, and in 1977 the SPRR formally petitioned the California Public Utilities Commission to abandon Peninsula passenger service.

After protracted negotiations, the state assumed control of the passenger service in 1980, operating it as Caltrain. In 1992, management passed to the Peninsula Corridor Joint Powers Board (PCJPB), an agency representing the three Peninsula counties. The PCJPB purchased the right-of-way for the track between San Jose and San Francisco and contracted with Amtrak to provide commuter operations. In 2012, the contract passed to Transit America Services, Inc.,

which still operates the line today, carrying approximately 27,000 passengers every weekday. Union Pacific Railroad (UPRR), successor to SPRR, retains the right to operate freight service in the corridor (Caltrain 2018; Signor 1994: pages 165–171, 175, 243–245; Stindt 1957: page 27).

3.18.4.2 Projected Growth Trends

As discussed in Chapter 2, Alternatives, projections show that under the No Project Alternative, the regional population would grow at a slightly lower rate (20.2 percent) than the statewide average for California (21.4 percent) between 2015 and 2040. Population growth in San Francisco, San Mateo, and Santa Clara Counties is projected to increase between 2015 and 2040 by about 20 percent, 15 percent, and 22 percent, respectively, with an estimated population increase for all three counties totaling approximately 712,880 people by 2040 (California Department of Finance [CDOF] 2014, 2016). Based on these population projections, housing needs during the same period would increase by 25.6 percent in the region, with the highest proportionate increase in Santa Clara County at 28.9 percent and the highest absolute growth also in Santa Clara County at nearly 190,000 new units (CDOF 2015).

The adopted long-range transportation, land-use and housing plan for the Bay Area encourages focused growth in priority development areas, which are existing neighborhoods served by public transit that have been identified as appropriate for additional, compact development. *Plan Bay Area 2040* projects that priority development areas will accommodate two-thirds of all housing and employment growth through the year 2040, on less than 5 percent of the land within the Bay Area (Association of Bay Area Governments [ABAG] and Metropolitan Transportation Commission [MTC] 2017). The land use plans of San Francisco, San Mateo, and Santa Clara Counties and their cities also encourage infill and higher-density development in urban areas and concentration of uses around transit corridors to accommodate future population growth and provide more modal choices for residents and workers.

Future housing and associated development consistent with adopted regional plans and county and city general plans would concentrate future development and transportation improvements in urban areas, minimizing the conversion of undeveloped lands. This anticipated population growth would generate additional traffic in urban areas, increases in localized air emissions and greenhouse gas (GHG) emissions, and increased traffic-related noise. The demand for energy and water would increase, the amount of impervious surface would increase and affect the quality and amount of stormwater runoff, and demand for public facilities and parks would increase because of population growth. Temporary disruptions to circulation and access associated with construction of future development could affect community cohesion under the cumulative condition. Additionally, the construction of future projects would result in localized effects on wildlife habitat; the loss or degradation of aquatic resources; the potential for disruption, damage, or destruction of scientifically important fossil resources; the degradation of existing visual character or quality for some adjacent residential viewers; and the demolition, destruction, or alteration of historic built resources.

3.18.4.3 Cumulative Project Lists and Regional Projections

In addition to considering general plan projections identified for the City and County of San Francisco, the Counties of San Mateo and Santa Clara, and the Cities of Brisbane, South San Francisco, San Bruno, Millbrae, Burlingame, San Mateo, Belmont, San Carlos, Redwood City, Atherton, Menlo Park, Palo Alto, Mountain View, Sunnyvale, and Santa Clara, the cumulative impacts analysis also considered an expanded list of planned development projects listed in Volume 2, Appendix 3.18-A, Cumulative Nontransportation Plans and Projects List, and Appendix 3.18-B, Cumulative Transportation Plans and Projects Lists. Appendix 3.18-A provides detailed information about cumulative development projects and plans, and Appendix 3.18-B provides similarly detailed information about transportation projects considered in this cumulative impact analysis.

Appendix 3.18-A includes a series of tables listing major capital or new development projects by jurisdiction for the counties and cities in the cumulative RSAs, including large-scale planning efforts through the region; county and city general plan updates to accommodate long-term development and urbanization; and smaller-scale mixed-use, residential, and commercial

developments planned through 2040. In summary, more than 338 projects and plans have been identified for San Francisco, San Mateo, and Santa Clara Counties.

Projects listed in Volume 2, Appendix 3.18-B reflect consideration of adjacent HSR project sections and applicable state and local projects and plans, identified primarily in RTPs and general plan transportation elements. The Authority reviewed these plans to identify planned and programmed transportation improvements considered in the cumulative setting and relevant impact analyses. Funded and programmed improvements on the intercity highway network are based on financially constrained RTPs[2] developed by regional transportation planning agencies; these projects include more than 82 transportation improvements in San Francisco, San Mateo, and Santa Clara Counties.

3.18.5 Organization of Cumulative Impacts Analysis

The analysis considers potential short-term, long-term, and indirect impacts from adopted plans, concurrent construction activities, and cumulative projects listed in Volume 2, Appendices 3.18-A and 3.18-B. Transportation projects include the adjacent HSR project section (i.e., the San Jose to Merced Project Section).

3.18.5.1 Resource Study Area

Each cumulative resource analysis describes the cumulative RSA relevant to that resource. This discussion describes similarities and differences of the cumulative RSA to the project RSA for that resource as described for the respective resource section in Chapter 3.

3.18.5.2 Cumulative Condition

The combined environmental influence of the cumulative changes described in Section 3.18.4, Cumulative Projects and Growth Forecasts, and Volume 2, Appendices 3.18-A and 3.18-B, in conjunction with adjacent HSR project sections and the project alternatives is referred to as the *cumulative condition* through 2040.

The potential for cumulative impacts is considered assuming incorporation of the Authority's relevant impact avoidance and minimization features (IAMF) (Chapter 2 and Volume 2, Appendix 2-E, Project Impact Avoidance and Minimization Features), and with application of mitigation measures identified for the project alternatives in the individual resource analyses in Chapter 3 (Sections 3.2 through 3.16). In addition to including IAMFs and mitigation measures, the project alternatives' design and footprints have been refined during the environmental planning process to avoid or minimize impacts while meeting the project purpose and objectives. Where appropriate, additional feasible mitigation measures are proposed that could reduce the contribution of the project alternatives to specific cumulative impacts.

The cumulative impacts analysis considers whether the cumulative condition could result in a *cumulative impact* for each resource. Each cumulative condition analysis includes a conclusion of whether the cumulative projects (listed in Volume 2, Appendices 3.18-A and 3.18-B) in combination with either project alternative would result in a cumulative impact on a particular resource. If a cumulative impact was identified for a resource, then the subsection titled "Contribution of the Project Alternatives" has been included for that resource. Conversely, if no cumulative impact was identified, then that subsection has been omitted for that resource. Where applicable, the analysis in the "Contribution of the Project Alternatives" subsection determines whether the incremental contributions of the project alternatives to the identified cumulative impacts would be *cumulatively considerable* (see Section 3.18.5.3, Contribution of the Project Alternatives).

3.18.5.3 Contribution of the Project Alternatives

If a cumulative impact was identified for a resource in the subsection titled "Cumulative Condition," then the project alternatives' incremental contribution to the cumulative impact was

[2] Plans are constrained by the amount of revenue the planning agencies expect to be available.

evaluated noting any differences between the alternatives. If the incremental effect of the project alternatives is found to be cumulatively considerable, the analysis then describes additional feasible mitigation measures beyond those already identified, if available, to address the contribution of the project alternatives to a cumulative impact.[3]

Through the planning horizon of 2040, the contributions of the project alternatives to cumulative impacts would be cumulatively considerable in some resource areas and would reduce a potential cumulative impact in others, as described in the resource-specific sections.

3.18.5.4 CEQA Conclusion

The analysis of each resource area concludes with a determination of CEQA significance where it is applicable. This conclusion specifically identifies whether the project, in combination with cumulative projects in the cumulative RSA, would result in a significant cumulative impact under CEQA and whether the contribution of the project alternatives, after any applicable mitigation, would be cumulatively considerable.

3.18.6 Cumulative Impacts Analysis

3.18.6.1 Transportation

Resource Study Area

The cumulative RSA for transportation is the area encompassing San Francisco, San Mateo, and Santa Clara Counties, which is larger than the RSAs described in Table 3.2-1. Section 3.2 defines the transportation RSA as the major roadway, transit pedestrian, bicycle, and freight rail facilities that would be affected by changes resulting from the project. The cumulative RSA was selected to develop a broad, regional context of cumulative transportation impacts and to capture transportation-related impacts associated with construction and operations of the project alternatives combined with the cumulative projects affecting transportation infrastructure and conditions in the cumulative RSA.

Cumulative Condition

Past development patterns have resulted in increased distances between jobs and housing and transit, influencing where people live, how far they travel, and how they choose to travel. In response, planning agencies have worked to increase densities in already highly urbanized areas, such as San Francisco and San Jose, including the areas surrounding the 4th and King Street and San Jose Diridon Stations. Under the cumulative condition, it is anticipated that the overall population growth trends in the cumulative RSA would continue. Traffic volumes on roadways in the cumulative RSA would increase because of the cumulative projects, including the planned developments listed in Volume 2, Appendix 3.18-A. This growth would result in additional stress on the transportation network and affect existing vehicle miles traveled (VMT), intersections, parking, transit, nonmotorized facilities, and freight rail.

Vehicle Miles Traveled

In 2015, the annual total VMT was estimated to be 2.395 billion miles in San Francisco County, 4.177 billion miles in San Mateo County, and 10.312 billion miles in Santa Clara County. By 2040, cumulative growth would result in total annual VMT rising to 2.720 billion miles in San Francisco County, but the annual Plus Project VMT would be 2.697 billion miles. In San Mateo County, cumulative growth would result in total annual VMT rising to 4.963 billion miles in 2040, but the annual Plus Project VMT would be 4.873 billion miles. In Santa Clara County, cumulative growth would result in total annual VMT rising to 13.202 billion miles in 2040, but the annual Plus Project VMT would be 12.972 billion miles. Either of the project alternatives in combination with the cumulative projects would not result in cumulative impacts on VMT.

[3] This analysis is included to comply with CEQA, which requires a determination as to whether cumulative impacts are cumulatively considerable. See Section 3.18.2.2, State, for further information.

Intersections (Vehicle Circulation)

The planned transportation projects listed in Volume 2, Appendix 3.18-B include rail and bus rapid transit (BRT) projects, carpool and express lanes, interchange modifications on U.S. Highway (US) 101, road widening and improvements on numerous roadways, pedestrian and bicycle improvements, and various intersection improvements. These cumulative transportation projects in combination with the project alternatives are anticipated to increase the capacity of the existing network by building new facilities, improving existing facilities, improving safety, and reducing congestion levels. Taken together, the cumulative transportation projects including the project alternatives would result in a regional improvement to transportation circulation and access in the region. Nevertheless, while these planned transportation improvements would alleviate a portion of the transportation network deficiencies or failures, the RTPs recognize that traffic and congestion levels would continue to outpace the transportation network's ability to serve the demand.

The project alternatives in combination with the cumulative projects would require temporary closures of and modifications to some regionally significant roadways during construction, resulting in increased congestion on US 101. Cumulative transportation projects that would contribute to these conditions include the high-occupancy vehicle (HOV)/high-occupancy toll (HOT) lanes on US 101 and Interstate (I-) 280 in San Francisco County, the US 101 Managed Lane Project in San Mateo County, US 101 Express Lanes in Santa Clara County, Bay Area Rapid Transit (BART) Silicon Valley Extension, BRT projects in San Jose, and various interchange improvement projects on US 101. Construction of either of the project alternatives would require temporary road closures and would generate construction-related traffic, resulting in intersection delays and degradation of level of service (LOS). Within the San Jose Diridon Station Approach Subsection, Alternative B (Viaduct to I-880) and Alternative B (Viaduct to Scott Boulevard) would temporarily result in greater intersection delays and degradation of LOS than Alternative A due to construction of the viaduct. Construction activities of the project alternatives and other cumulative projects would have multiple-year construction timeframes, leading to potential temporal and geographic overlaps with construction of the project alternatives. The designs of these projects would be consistent with regional and local land use plans and regulatory standards; moreover, they would incorporate traffic management plans and procedures for alternate routes during road closures. The Authority's contractor would prepare a construction safety transportation management plan (SS-IAMF#1: Construction Safety Transportation Management Plan) in collaboration with local jurisdictions to maintain emergency vehicle access during construction. The Authority's contractor would also develop a construction transportation plan (CTP) (TR-IAMF#2: Construction Transportation Plan) that would establish procedures for implementing temporary road and lane closures and coordinating with local jurisdictions to minimize conflicts and maintain pedestrian, bicycle, and transit access. Even with these project features, the closures and modifications of significant roadways from the project alternatives in combination with the cumulative projects would result in cumulative impacts on local vehicle circulation from the delays and degradation of existing transportation networks.

The project alternatives in combination with the cumulative projects would also contribute to permanent increases in traffic volumes during project operations, particularly near the 4th and King Street, Millbrae, and San Jose Diridon Stations and at at-grade crossings along the Caltrain corridor. The transportation network would not be expected to keep pace with demand in the long term, even with the project's regional reduction in VMT. At certain localized intersections, the project would exacerbate traffic congestion and delays. As a result, the project alternatives in combination with the cumulative projects would result in a cumulative impact on local vehicle circulation from the traffic congestion and delays of existing transportation networks.

Parking

As described in Section 3.2, the 4th and King Street Station would not generate new parking demand, the station design and facilities provided at the Millbrae Station (including new parking facilities) would meet mode of access demands, and the light maintenance facility (LMF) would include parking adequate to meet LMF parking demands. No further discussion of these locations

is provided in this cumulative analysis and the cumulative parking analysis focuses on the area adjacent to the San Jose Diridon Station.

As described in Section 3.2, project construction would temporarily displace parking in certain areas within the construction footprint including at and adjacent to the San Jose Diridon Station (both project alternatives). Displacements at the San Jose Diridon Station would include parking used for special events at the SAP Center. Project features would minimize temporary effects in parking through identification of employee parking locations (TR-IAMF#2), off-street parking for construction-related vehicles (TR-IAMF#3: Off-Street Parking for Construction-Related Vehicles), and replacement on a 1:1 basis for temporary displacement of special event parking at the SAP Center (TR-IAMF#8: Construction during Special Events).

The BART Extension would result in the loss of 715 parking spaces during operations adjacent to the San Jose Diridon Station and the SAP Center. The BART Extension and the Peninsula Corridor Electrification Project (PCEP) will also increase transit access to the San Jose Diridon Station and the SAP Center, increasing transit mode share for the SAP Center users. Project operations would permanently displace parking at and adjacent to the San Jose Diridon Station and the SAP Center (both alternatives), but the project includes construction of replacement parking on a 1:1 basis, so there would be no permanent reduction of available parking at these locations. As discussed in Section 3.2, increased parking demands caused by HSR riders at the San Jose Diridon Station (both alternatives) would be accommodated through existing parking facilities, project parking facilities, and the offsetting effects of increased transit service (including the BART Extension and the PCEP) to the station so that station user and SAP Center cumulative parking demands can be met without cumulative secondary environmental or socioeconomic impacts.

Bus Transit

The delays resulting from construction of either of the project alternatives, in combination with the increased traffic volumes from projected population growth, would temporarily increase intersection delay affecting bus transit performance. Recognizing the potential for transportation impacts that could result from concurrent construction projects, the Authority's contractor would prepare a CTP (TR-IAMF#2). However, the construction staging and traffic resulting from the HSR project in combination with other cumulative projects would result in a cumulative impact on bus transit caused by the delays and degradation of existing transportation networks.

Operation of the project alternatives and development projects would also increase intersection delay adjacent to at-grade crossings and near passenger rail stations resulting in permanent delays to high-frequency bus routes. The Authority would implement mitigation that includes intersection improvements and bus transit prioritization equipment to reduce impacts on bus transit. Although future transportation improvement projects as identified in RTPs (Volume 2, Appendix 3.18-B) would provide transportation benefits, the programmed transportation network capacity improvements would not be enough to meet long-term future demand and population growth. Because the transportation network would not be expected to keep pace with demand, there would be a cumulative impact on bus service performance as a result of vehicle congestion.

Nonmotorized Travel

The project alternatives and other transportation improvement projects along with planned development projects would increase pedestrian volumes adjacent to the 4th and King Street Station that would exceed the capacity of the existing pedestrian network. The Caltrain PCEP and Central Subway Project also would generate increased pedestrian activity in the station vicinity. Development projects that would further increase pedestrian demand in the station vicinity include the Mission Rock project in Mission Bay as well as build-out of the Central SoMa Plan in San Francisco. The increased pedestrian traffic would permanently affect pedestrian access along the 4th and King Street Station frontage. The project in combination with other cumulative projects would exacerbate pedestrian crowding concerns around limited sidewalk capacity along the frontage between Townsend Street and King Street.

The project would not conflict with adopted policies, plans, or programs regarding bicycle or pedestrian facilities, or otherwise materially decrease the performance of such facilities. The project would provide safe and accessible bike and pedestrian facilities. For all reconstructed roadways, all bicycle and pedestrian facilities would be replaced upon completion of construction to maintain nonmotorized access. Pedestrian and bicycle accessibility would be provided and maintained and would be prioritized over motor vehicle access. Other projects in the vicinity of the 4th and King Street, Millbrae, and San Jose Diridon Stations, such as the PCEP, the Central Subway project, enhanced underpass connections along State Route (SR) 87 and Caltrain underpasses, and potential future land use development near Millbrae are also being designed with bicycle and pedestrian access and movement in mind. Accordingly, there would not be cumulative impacts on pedestrian access and movement.

Passenger and Freight Rail Service

Increases in passenger and freight rail service as a result of added HSR service and other cumulative projects without a corresponding increase in track capacity could result in delays to average operational service times for Caltrain service or freight rail service, and could further restrict the hours of freight operation along the Caltrain corridor. In addition, PCEP and HSR construction activities could disrupt passenger and freight rail service.

Population, employment, and economic activity in San Francisco, San Mateo, and Santa Clara Counties will increase through 2040, increasing demands for passenger rail service and transport of freight by rail. The PCEP is one response to projected increases in population and employment and would increase peak-hour trains from 5 per peak hour per direction to 6 per peak hour per direction and weekday trains from 92 trains per day to 114 trains per day. The increased demand for goods movement would result in increased freight rail transport along the Caltrain corridor. Although the exact amount of freight rail transport in the future is difficult to predict, it was assumed that freight would increase in the future at a rate of 3.5 percent per annum (California Department of Transportation [Caltrans] 2014). This rate is an informal rate that freight operators, such as UPRR, often cite. Additionally, the HSR project would increase peak-hour trains by an additional 4 per peak hour per direction and would add an additional 134 to 144 trains per day to the Caltrain corridor.

The increase in passenger rail service associated with increased Caltrain operations, the addition of HSR service associated with the project operations, and the increase in freight service within the Caltrain corridor would cumulatively affect the capacity of the Caltrain corridor. During operations, Caltrain, HSR, and freight would all use the Caltrain corridor between the Quint Street Lead in San Francisco to Control Point Coast. HSR and Caltrain would share tracks from San Francisco to Control Point Coast (i.e., from 4th and King Street Station southward in 2029 and from the Salesforce Transit Center (SFTC) once the Downtown Extension (DTX) is completed.

Operational modeling conducted by the Authority to evaluate blended service effects on passenger rail operations indicates that average Caltrain operational service times between San Francisco and San Jose would be nearly the same with blended service under Alternative A as under No Project conditions. Under Alternative B, Caltrain operational service times between San Francisco and San Jose would be approximately 2.5 minutes slower. The addition of HSR trains would result in some supplemental time[4] (4.8 minutes with Alternative A and 7.6 minutes with Alternative B) for Caltrain trains (Authority 2017). The results of the operational analysis indicated that blended service would not substantially increase Caltrain average operational service times nor would it affect Caltrain's ability to operate northbound and southbound trains with scheduled station arrivals at regular intervals each hour, which allows commuters to use the service reliably. Therefore, blending of Caltrain/HSR service under the cumulative condition would not result in cumulative impacts on passenger rail service.

[4] *Supplemental time* refers to the time when Caltrain is waiting at a station or operating at less-than-optimal speeds to provide time for passing HSR trains.

Construction of Alternative B would result in permanent impacts on passenger rail service access due to the relocation of the San Carlos Caltrain Station. Under Alternative B, the San Carlos Station would be relocated approximately 2,260 feet south of its current location to accommodate passing tracks. This would reduce Caltrain rider's accessibility to downtown San Carlos and would lengthen travel times for San Mateo County Transit District (SamTrans) Route 260 and buses that travel from Redwood Shores. Implementation of the San Carlos Station pedestrian improvements (TR-MM#4: Install San Carlos Caltrain Station Pedestrian Improvements) would reduce the impacts by building improved pedestrian facilities, although there would still be degradation in access from the relocation. There are no other projects that contribute to impacts on Caltrain service access in San Carlos and thus there would be no cumulative impact. Alternative A would not require relocation of the San Carlos Caltrain Station and thus would not result in this impact.

Freight operations would be affected by the cumulative increases in passenger service because freight could not operate during morning and evening passenger peak periods due to limited track capacity and due to passenger rail speeds up to 110 miles per hour (mph). The resultant compression of freight service hours would result in changes in the timing of freight operations and inconvenience to operators. However, as explained in Section 3.2, there would remain adequate time outside of passenger peak periods to maintain current and future expanded freight operations overall. Diversion of freight from rail to other modes due to expanded passenger service is not likely to occur and thus would not result in secondary impacts related to air quality, GHG emissions, noise, or traffic congestion. As a result, there would not be cumulative impacts on freight rail service of increased passenger service because freight rail service would be accommodated in the Caltrain corridor, allowing freight rail to continue to service customers.

PCEP construction is presently underway and is scheduled for completion in 2021. HSR construction would occur between 2021 and 2026. There is a possibility that Caltrain construction and HSR construction may overlap in 2021 based on current construction schedules. If that occurs, there could be cumulative disruption of existing Caltrain and freight rail service along the Caltrain corridor due to cumulative temporary track closures, which would result in passenger rail delays and freight rail service and access. Even if the construction of the two projects does not overlap, the combined construction duration would be from the present through 2026, which would also result in a longer combined duration in which periodic disruption of passenger rail and freight rail service would occur due to construction track closures. This extended duration of temporary reductions in track capacity due to construction track closures would result in a cumulative impact on passenger and freight rail service.

Contribution of the Project Alternatives

Vehicle Miles Traveled

By 2040, the project would reduce overall VMT from 2.720 billion miles to 2.697 billion miles in the City and County of San Francisco, from 4.963 billion miles to 4.873 billion miles in San Mateo County, and from 13.202 billion miles to 12.972 billion miles in Santa Clara County. The reduction in VMT would be the same for both project alternatives because ridership and trip diversion associated with the project alternatives would be the same. The project would lower cumulative VMT compared to No Project conditions, resulting in a beneficial effect.

Intersections

Construction of the project alternatives would contribute to cumulative effects on the transportation network from temporary road closures and construction-related traffic. Construction of the Alternatives A and B would involve realignment of the Tunnel Avenue overpass in Brisbane, resulting in temporary delays and permanent changes to the roadway network. Alternative B would include construction of a 6-mile passing track that would lead to temporary delays caused by temporary construction detours and closures associated with undercrossing modifications. Traffic generated by construction vehicles under Alternative B would lead to intersection delays associated with modifications to undercrossings in the passing track area that affect vehicles. Within the San Jose Diridon Station Approach Subsection, Alternative B (Viaduct

to I-880) and Alternative B (Viaduct to Scott Boulevard) would temporarily result in greater intersection delays and degradation of LOS than Alternative A due to construction of the viaduct. Alternative B would have a greater contribution to cumulative impacts on intersection operations due to the additional temporary road closures and modifications and construction-related traffic associated with passing track and viaduct construction.

Operations of the project alternatives would result in increases in intersection delay in the San Francisco 4th and King Street, Millbrae, and San Jose Diridon Station areas, as well as increased delays at intersections adjacent to at-grade crossings during operations. The operation of the two project alternatives would have the same effect on intersection operations in all four northernmost subsections. Although there are fewer affected intersections under Alternative A in the San Jose Diridon Station Approach Subsection, there would be more substantial effects at the at-grade crossings and on Autumn Boulevard and Montgomery Street in the San Jose Diridon Station area from additional gate-down time at at-grade crossings and the absence of the Cahill Street extension to Park Avenue.

Potential mitigation that could reduce congestion or delay at affected intersections or freeway segments has been identified in TR-MM#1: Potential Mitigation Measures Available to Address Traffic Delays (NEPA effects only). However, because traffic congestion/delay is not a CEQA impact and because implementation of mitigation measures is not mandatory under NEPA, this mitigation is not assumed to be implemented. Rather, implementation would be at the discretion of the lead agency. Thus, assuming this mitigation is not implemented, the project alternatives would contribute to this cumulative effect.

Parking

The BART Extension to downtown San Jose would displace up to 715 parking spaces adjacent to the San Jose Diridon Station and the SAP Center during construction. As described in Section 3.2, project features would minimize temporary effects on parking through identification of employee parking locations (TR-IAMF#2), off-street parking for construction-related vehicles (TR-IAMF#3), and replacement on a 1:1 basis for temporary displacement of special event parking at the SAP Center (TR-IAMF#8), so that the project would not contribute considerably to any parking deficits adjacent to the San Jose Diridon Station or SAP Center during construction.

As discussed in Section 3.2, the project includes construction of replacement parking on a 1:1 basis, so there would be no permanent reduction of available parking at these locations and no contribution to any parking deficits. While the project would result in increased parking demands caused by HSR riders at the San Jose Diridon Station (both alternatives), those demands, along with the loss of parking resulting from the BART Extension would be accommodated through existing parking facilities, project parking facilities, and the offsetting effects of increased transit service (including the BART Extension and the PCEP) to the station so that station user and SAP Center parking demands can be met without secondary environmental or socioeconomic effects.

Bus Transit

Construction of either of the project alternatives would require temporary road closures, which would lead to shifts in traffic patterns onto other roadways, causing intersection delays and LOS failures that affect bus transit service performance. Implementation of the CTP (TR-IAMF#2) would minimize or reduce temporary construction impacts, although there would still be degradation in LOS and delays.

Additionally, project operations would contribute to a cumulative impact on bus transit service performance because of increased traffic levels in the station areas and increased delays at at-grade crossings from increased gate-down time from added HSR trains. Within the San Jose Diridon Station Approach Subsection, Alternative A would result in greater intersection delays at at-grade crossings than Alternative B due to gate-down time. The Authority would implement TR-MM#2: Install Transit Priority Treatments, which would install transit signal priority improvements along segments of Fifth Street and Townsend Street near the 4th and King Street Station. However, even with project mitigation, several high-frequency bus routes in San Francisco would continue to experience delays. As a result, project operations would contribute to cumulative

congestion affecting bus transit service performance. No additional feasible mitigation measures are available to avoid this impact.

Nonmotorized Travel

As discussed under Cumulative Condition, no cumulative impacts on nonmotorized travel were identified and thus the project's contribution would not be considerable.

Passenger and Freight Rail Service

Construction of both project alternatives would cause temporary disruptions of passenger rail and freight service because it would periodically limit the number of tracks available to passenger rail and freight rail service. This would result in delays to average operational service times for Caltrain or freight rail service and restrictions on the hours of freight operations in all five subsections. During project construction, there would be temporary periods of service disruption when connecting existing tracks to new tracks. Where feasible, the contractor would schedule any necessary track closures during nights and weekends to minimize disruption to passenger rail service, but nighttime closures would affect freight service. Service disruptions, when they occur, would last several hours to several days except during construction of the passing track segment, wherein freight operations may be limited to overnight hours for up to 2 years. The Authority, Caltrain and freight railroads would work together to build the project in a manner consistent with the agreements negotiated by the Authority's contractor during the final design process (TR-MM#3: Implement Railway Disruption Control Plan). This would enable each entity to conduct its relevant activities in a manner that would avoid and minimize impacts on passenger and rail freight railroad operations. Alternative B would have a greater contribution to cumulative passenger rail and freight service capacity constraints from the increased amount of construction and track closures associated with passing track construction compared to Alternative A.

CEQA Conclusion

The project alternatives would provide an overall long-term reduction in VMT during operations by shifting travelers from automobiles to transit. Therefore, the project would have a less-than-significant impact on VMT. The contribution of the project alternatives to this cumulative impact on VMT would not be considerable. Therefore, CEQA does not require any mitigation.

Construction of either project alternative, in combination with cumulative projects, would result in temporary road and lane closures and modifications. Operations of the project would result in a permanent increase in traffic around stations and increased delays at intersections near at-grade crossings due to increased gate-down time from HSR trains. However, automobile delay at intersections is not treated as a significant impact under CEQA. Therefore, there would not be a significant cumulative impact on intersection operations and the project's incremental contribution would not be cumulatively considerable. CEQA does not require any mitigation.

Operations of the project, in combination with cumulative projects, would result in significant cumulative impacts on bus transit service performance because of added vehicle traffic and increased gate-down time at at-grade crossings which would lead to delays and effects on-time performance. The project alternatives' contribution to this significant cumulative impact would be considerable because after mitigation the overall performance of the network would remain below the identified service standards. No additional mitigation is feasible to reduce the project's contribution to the significant cumulative impact on bus transit service performance.

Project operations at the 4th and King Street Station, in combination with cumulative projects, would result in a less-than-significant cumulative impact on bicycle and pedestrian access to the 4th and King Street Station from increased pedestrian volumes. The contribution of the project alternatives to this cumulative impact on pedestrian access to the 4th and King Street Station would not be considerable. Therefore, CEQA does not require any mitigation.

For passenger and freight rail service, construction of either of the project alternatives in combination with other passenger and freight rail services would result in a significant cumulative impact on passenger and freight rail service because project construction would require periodic track closures during construction. There would be greater contributions to temporary rail capacity

constraints associated with construction of Alternative B compared to Alternative A because of more extensive track closures during passing track construction. However, with implementation of TR-MM#3, delays would be minimized to a matter of a few hours or at most a matter of a few days, and contribution of the project to cumulative delays, diversion to other modes, or secondary effects, would be mitigated to a less-than-significant level. Operationally, cumulative impacts on passenger and rail capacity, service, and operations would be less than significant and thus the project alternatives' contributions to cumulative impacts would not be considerable. Therefore, CEQA does not require any mitigation.

3.18.6.2 Air Quality and Greenhouse Gases

The evaluation of air quality at the air basin level and global climate change at the global level is an inherently cumulative approach because criteria pollutant and GHG emissions, once emitted, mix into the atmosphere and affect a larger area than any individual project site. Thus, the air quality and GHG analysis does not consider individual cumulative projects near the project alternatives. Rather, it uses the same thresholds as the project-level thresholds developed by the Bay Area Air Quality Management District (BAAQMD), which are based on projections of future development compared to existing conditions. Criteria pollutant concentrations that exceed air quality standards under modeled conditions are considered to reflect the cumulative impacts resulting from contributors in the air basins. Exceedance of project-level thresholds indicates that there would be both a project-level and a cumulative impact.

Resource Study Area

The cumulative RSA for air quality impacts is the San Francisco Bay Area Air Basin (SFBAAB), which is illustrated on Figure 3.3-1. Consistent with the project-level GHG analysis described in Section 3.3, Air Quality and Greenhouse Gases, the cumulative RSA for global climate change impacts is the state and global atmosphere. The cumulative RSA is larger than the air quality (direct and indirect impacts) RSA, which comprises the state, regional (SFBAAB), and local study areas (areas in the immediate vicinity of construction activities).

Cumulative Condition

Air Quality

Regional Impacts

Construction-Related Criteria Pollutants

The SFBAAB is in nonattainment status for the California ambient air quality standards (CAAQS) and national ambient air quality standards (NAAQS) for multiple pollutants because of the emissions from past and present projects. Table 3.3-7 lists the attainment status for each pollutant and standard. Construction of future projects, including construction of either of the project alternatives, would contribute further to nonattainment of the NAAQS and CAAQS in the SFBAAB, resulting in a cumulative impact. The project alternatives incorporate design features to minimize the potential for new exceedances of air quality standards or contributions to existing or projected exceedances in the SFBAAB (AQ-IAMF#1: Fugitive Dust Emissions; AQ-IAMF#2: Selection of Coatings; AQ-IAMF#3: Renewable Diesel; AQ-IAMF#4: Reduce Criteria Exhaust Emissions from Construction Equipment; AQ-IAMF#5: Reduce Criteria Emissions from On-Road Construction Equipment). Furthermore, the Authority would mitigate construction nitrogen oxide (NO_X) emissions in the BAAQMD through the purchase of offsets (AQ-MM#1: Offset Project Construction Emissions in the SFBAAB) (see Section 3.3.7, Mitigation Measures, for more information on the mitigation measures).

Operations-Related Criteria Pollutants

Operation of future projects would contribute further to nonattainment of the NAAQS and CAAQS in the SFBAAB. Emission reductions achieved during HSR project operations, however, would help improve regional air quality and cumulative air quality conditions, as discussed further below.

Local Impacts

Emissions analysis at the local level entails evaluating whether there would be concentrations of certain criteria pollutants and diesel particulate matter (DPM) that could affect sensitive receptors within 1,000 feet of construction areas. Exceedances of the CAAQS or NAAQS indicate that there would be both a project-level and a cumulative localized criteria pollutant impact. Likewise, exceedances of the BAAQMD's cumulative health risk thresholds would constitute a cumulative DPM impact. A discussion of criteria pollutants, construction-related DPM, operations-related carbon monoxide (CO) hot spots, and operations-related toxic air contaminants follows.

Construction-Related Criteria Pollutants

As disclosed in the discussion of Impact AQ#5 in Section 3.3, there are existing exceedances of the CAAQS for particulate matter smaller than or equal to 10 microns in diameter (PM_{10}), which means that background concentrations without the project alternatives already exceed the CAAQS. Emissions from construction and operations of future projects, including construction of either of the project alternatives, would increase concentrations of PM_{10} above existing levels, further contributing to existing exceedances of ambient air quality standards. Construction of the project alternatives would result in temporary localized concentrations that would exceed the particulate matter smaller than or equal to 2.5 microns in diameter ($PM_{2.5}$) CAAQS and the $PM_{2.5}$ NAAQS. The project alternatives include project features AQ-IAMF#1 through AQ-IAMF#5 that collectively would avoid or minimize emissions of these pollutant through implementation of a dust control plan and use of low-volatile organic compound (VOC) coatings, renewable diesel fuel, Tier 4 off-road engines, and model year 2010 or newer on-road engines. Nevertheless, future projects, including construction of either of the project alternatives, would contribute to existing exceedances of the PM_{10} CAAQS and new exceedances of the $PM_{2.5}$ CAAQS and NAAQS, and therefore would result in localized cumulative impacts.

Construction-Related Diesel Particulate Matter and $PM_{2.5}$

There are multiple cumulative projects located within 1,000 feet of the project alternative footprints that would contribute to a cumulative impact for DPM:

- **Existing sources of DPM**—Multiple stationary, rail, and roadway sources.
- **Planned land use development**—Land use development in the region would increase traffic levels and result in increased vehicle-related emissions along roadways, although, over time, state and federal regulations would reduce the allowed emission rates for new vehicles. Planned development may also generate additional DPM during construction activity, as well as DPM from emergency generators, truck traffic, and trucks idling at loading bays.
- **Future passenger rail service expansion**—Capitol Corridor, an intercity passenger rail service that operates between San Jose and Sacramento, has proposed expanding passenger train service, which would result in an increased number of passenger trains. In addition, Facebook and SamTrans are exploring Dumbarton Rail Corridor service, which in the past has included potential service from the East Bay to San Jose. Environmental compliance for improvements necessary to facilitate expanded Capitol Corridor or Dumbarton Rail service to San Jose has not been completed and funding has not been obtained yet, so they are not included in the cumulative analysis.
- **Future freight rail service expansion—**Freight rail service may also expand in the future as the economy expands. The exact amount of freight rail transport is difficult to predict, as freight levels depend on not only the overall level of economic activity but also the specific demand for bulk and oversize commodities that dominate freight carried by rail. As a

conservative assessment, it was assumed that freight would increase in the future at a rate of 3.5 percent per annum (Caltrans 2014).

A quantitative health risk assessment (HRA) has not been conducted to estimate future DPM-related health risks to nearby sensitive receptors resulting from cumulative land use development because construction and operations details are not available, and those projects would be responsible for analyzing their contributions. The cumulative HRA, therefore, focuses on ambient concentrations from stationary, rail, and roadway sources.

A cumulative HRA was performed for project construction, consistent with BAAQMD requirements. The BAAQMD has developed Google Earth and geographic information system (GIS) files that identify source-specific health risks throughout the SFBAAB. These files were used to screen the Project Section and select representative areas in each subsection to analyze cumulative health risks (Winkel 2018). Total cumulative health risks at the representative locations in each subsection were calculated by adding the background health risk sources to the health risk and hazard impacts of project construction. Table 3.18-1 shows cumulative cancer risk, chronic health hazard, and $PM_{2.5}$ concentrations at representative locations in the subsections. Refer to the *San Francisco to San Jose Project Section Air Quality and Greenhouse Gases Technical Report* (Authority 2019b) for more detailed modeling information.

Table 3.18-1 Cumulative Cancer and Noncancer Health Risks from Construction of Either of the Project Alternatives in the Bay Area Air Quality Management District

Subsection/Source	Cancer (per million)	Chronic Hazard Index (unitless)	$PM_{2.5}$ (µg/m^3)
San Francisco to South San Francisco Subsection			
Ambient	1,355*	4.2	66.1*
HSR construction[1]	1	<0.1	<0.1
Total[2]	**1,356***	**4.2**	**66.1***
San Bruno to San Mateo Subsection			
Ambient	103*	0.5	6.7*
HSR construction[1]	2	<0.1	<0.1
Total[2]	**105***	**0.5**	**6.7***
San Mateo to Palo Alto Subsection			
Ambient	148*	0.7	48.1*
HSR construction[1]	Alternative A: 2 Alternative B: 3	<0.1	<0.1
Total[2]	**Alternative A: 150*** **Alternative B: 152***	**0.7**	**48.1***
Mountain View to Santa Clara Subsection			
Ambient	**224***	0.2	10.3*
HSR construction[1]	4	<0.1	<0.1
Total[2]	**228***	**0.2**	**10.3***
San Jose Diridon Station Approach Subsection			
Ambient	51	<1	51.6*
HSR construction[1]	Alternative A: 5 Alternative B: 4	<1	<0.1
Total[2]	**Alternative A: 56**	**<1**	**51.6***

Subsection/Source	Cancer (per million)	Chronic Hazard Index (unitless)	$PM_{2.5}$ (µg/m³)
	Alternative B: 55		
Threshold			
BAAQMD threshold[3]	100	10.0	0.8

Sources: BAAQMD 2012a, 2012b, 2012c, 2012d, 2017; Winkel 2018; PCJPB 2015; OEHHA 2015
< = less than
µg/m³ = micrograms per cubic meter
BAAQMD = Bay Area Air Quality Management District
HSR = high-speed rail
$PM_{2.5}$ = particulate matter 2.5 microns or less in diameter
Risks apply to both Alternative A and Alternative B unless noted otherwise. Risks for Alternative B apply to both viaduct options.
Exceedances of threshold are denoted by underline and an asterisk (*).
[1] Presents the maximum health risk from HSR construction
[2] Sum of individual values may not equal total due to rounding.
[3] BAAQMD has adopted both project- and cumulative-level thresholds for health risks. BAAQMD's cumulative thresholds are used in this analysis.

As shown in Table 3.18-1, existing ambient cancer risk and $PM_{2.5}$ concentrations in representative locations in the subsection are from the contributions of past and present projects. Although the contributions of the project alternatives by themselves are less than the BAAQMD thresholds, emissions from construction of cumulative projects, including the project alternatives, would lead to cancer risks and $PM_{2.5}$ concentrations greater than the thresholds, and so would result in a cumulative impact. The exceedances are the result of existing ambient risks.

Operations-Related Carbon Monoxide Hot Spots

Background traffic volumes would increase because of future growth and new development projects in the cumulative RSA. Additionally, operation of the project alternatives would attract additional motor vehicles to new and expanded transit stations in the cumulative RSA. While additional traffic associated with the project alternatives and other existing and future projects may increase CO concentrations, cumulative CO impacts would not occur because the additional traffic created by the project alternatives in conjunction with background traffic volumes would not result in CO concentrations greater than the NAAQS or CAAQS and therefore would not result in a cumulative impact.

Operations-Related Toxic Air Contaminants

The project alternatives would shift existing tracks used by UPRR freight trains in the railroad right-of-way. Shifting tracks used by existing freight trains would result in increased DPM concentrations at certain receptor locations and in corresponding decreases at other locations. In addition, operation of emergency generators at the HSR stations and Brisbane LMF would contribute to DPM and $PM_{2.5}$ concentrations. The BAAQMD's Google Earth and GIS files were used to screen the areas of shifted track to select locations for cumulative HRA. The selected areas were chosen based on their proximity to residential receptors and the extent of the shift in track position, as well as overall density of existing sources. Total cumulative health risks at each location were calculated by adding the background health risk sources to the health risk and hazard impacts of freight trains on the shifted track, stations, and LMF.

Table 3.18-2 and Table 3.18-3 summarize cumulative cancer risks, chronic health hazards, and $PM_{2.5}$ concentrations at the locations analyzed along the shifted track sections and near HSR stations and the Brisbane LMF.

As shown in Table 3.18-2, total cumulative cancer and noncancer chronic health hazards to sensitive receptors located near the shifted tracks would not exceed the BAAQMD's health risk thresholds. However, cumulative $PM_{2.5}$ exposure would be greater than the BAAQMD's cumulative $PM_{2.5}$ threshold, and therefore would result in a cumulative impact. The impact of the track shifts on $PM_{2.5}$ would be very small, and the exceedances are the result of existing ambient risks. As shown in Table 3.18-3, total cumulative health risks to sensitive receptors near Millbrae Station and the LMF would not exceed the BAAQMD's health risk thresholds.

Table 3.18-2 Cumulative Cancer and Noncancer Health Risks from Operation of Freight Trains on Shifted Track

Subsection and Location	Project Alternatives vs. Existing[1]			Project Alternatives vs. No Project[2]		
	Cancer (per million)	Chronic Hazard Index (unitless)	$PM_{2.5}$ ($\mu g/m^3$)	Cancer (per million)	Chronic Hazard Index (unitless)	$PM_{2.5}$ ($\mu g/m^3$)
San Francisco to South San Francisco Subsection						
Ambient	6	<0.1	65.9*	6	<0.1	65.9*
Project	<0.1	<0.1	<0.1	1	<0.1	<0.1
Total	**7**	**<0.1**	**65.9***	**7**	**<0.1**	**65.9***
San Bruno to San Mateo Subsection						
Ambient	28	<0.1	1.1	28	<0.1	1.1
Project	<0.1	<0.1	<0.1	2	<0.1	<0.1
Total	**28**	**<0.1**	**1.1**	**30**	**<0.1**	**1.1**
San Mateo to Palo Alto Subsection						
Ambient	32	<0.1	1.0	32	<0.1	1.0
Project	<0.1	<0.1	<0.1	2	<0.1	<0.1
Total	**32**	**<0.1**	**1.0**	**34**	**<0.1**	**1.0**
Mountain View to Santa Clara Subsection						
N/A[3]	N/A	N/A	N/A	N/A	N/A	N/A
San Jose Diridon Station Approach Subsection[4]						
Ambient	83	<0.1	0.1	61	<0.1	0.1
Project	8	<0.1	<0.1	6	<0.1	<0.1
Total	**90**	**<0.1**	**0.1**	**66**	**<0.1**	**0.1**
Threshold						
BAAQMD threshold[5]	100	10.0	0.8	100	10.0	0.8

Sources: BAAQMD 2012a, 2012b, 2012c, 2012d, 2017; Winkel 2018; PCJPB 2015; OEHHA 2015
< = less than
$\mu g/m^3$ = micrograms per cubic meter
BAAQMD = Bay Area Air Quality Management District
$PM_{2.5}$ = particulate matter 2.5 microns or less in diameter
Risks apply to both Alternative A and Alternative B unless noted otherwise. Risks for Alternative B apply to both viaduct options.
Sum of individual values may not equal total due to rounding.
Exceedances of threshold are denoted by underline and an asterisk (*).
[1] Presents the maximum incremental contribution from freight trains on shifted track, relative to existing conditions
[2] Presents the maximum incremental contribution from freight trains on shifted track, relative to No Project conditions
[3] N/A = not applicable. No locations with both substantial track shifts and nearby receptors were identified in this subsection.
[4] Risks apply to Alternative A only. No track carrying freight service would be shifted in the San Jose Diridon Station Approach Subsection under Alternative B.
[5] BAAQMD has adopted both project- and cumulative-level thresholds for health risks. BAAQMD's cumulative thresholds are used in this analysis.

Table 3.18-3 Cumulative Cancer and Noncancer Health Risks from Station and Brisbane Light Maintenance Facility Operation

Location	Risks from Station and LMF Operations vs. Risks from Existing and No Project[1]		
	Cancer (per million)	Chronic Hazard Index (unitless)	$PM_{2.5}$ (µg/m³)
West Brisbane LMF (Alternative B only)[3]			
Ambient	10	<0.1	<0.1
Project	<10[2]	<1.0[2]	<0.01
Total	**<20**	**<1.0**	**<0.1**
Millbrae Station			
Ambient	35	0	0.3
Project	<10[2]	<1.0[2]	<0.01
Total	**<45**	**<1.0**	**0.3**
San Jose Diridon Station			
Ambient	1	<1	<0.1
Project	3	<1	<0.1
Total	4	<1	<0.1
Threshold			
BAAQMD threshold[4]	100	10.0	0.8

Sources: BAAQMD 2012a, 2012b; OEHHA 2015
< = less than
µg/m³ = micrograms per cubic meter
BAAQMD = Bay Area Air Quality Management District
LMF = light maintenance facility
$PM_{2.5}$ = particulate matter 2.5 microns or less in diameter
Sum of individual values may not equal total due to rounding.
[1] Presents the maximum incremental contribution from emergency generator operation, relative to existing and No Project conditions. 4th and King Street Station is not included in table because the project would not affect the existing emergency generator and no additional generators would be installed.
[2] A project-specific cancer risk and chronic health hazard assessment was not conducted because BAAQMD Regulation 2, Rule 5, Section 302, prohibits generator use if it would result in cancer or acute hazard impacts in excess of BAAQMD's health risk thresholds of significance.
[3] No ambient sources were identified within 1,000 feet of the East Brisbane LMF and receptors under Alternative A. Accordingly, there would be no cumulative effect, and East Brisbane LMF under Alternative A has been omitted from the table.
[4] BAAQMD has adopted both project- and cumulative-level thresholds for health risks. BAAQMD's cumulative thresholds are used in this analysis.

Combined Construction- and Operations-Related DPM and $PM_{2.5}$ Exhaust

Long-term residents residing in the same location may be exposed to project-generated emissions from multiple sources (e.g., construction, station operation, freight trains on shifted track). Health risks depend on the duration receptors are exposed to the emission source. Individuals currently residing near the project corridor are exposed to a certain amount of pollution (representative of ambient risks described in Tables 3.18-1 through 3.18-4). If that individual remains in the same location during and after construction, they would be exposed to project-generated DPM during construction and then any incremental changes in project-generated DPM during operations. The Authority conservatively estimated the potential lifetime risks to long-term residents who may be present during both construction and operations. Table 3.18-4 shows the results of the analysis and compares the risks to BAAQMD's cumulative thresholds.

Table 3.18-4 Cumulative Cancer and Noncancer Health Risks from Combined Construction and Operations

Subsection and Source	Cancer (per million)	Chronic Hazard Index (unitless)	$PM_{2.5}$ (µg/m^3)
San Francisco to South San Francisco Subsection			
Ambient[1]	1,355*	4.2	66.1*
HSR construction	1.1	<0.1	<0.1
West Brisbane LMF (Alternative B only)[2,3]	<10	<1.0	<0.01
Freight trains on shifted track[4]	0.8	<.01	<0.1
Total	1,367*	5.2	66.1*
San Bruno to San Mateo Subsection			
Ambient[1]	103*	0.5	6.7*
HSR construction	2.3	<0.1	<0.1
Millbrae Station operation[2]	<10	<1.0	<0.01
Freight trains on shifted track[4]	2.0	<.01	<0.1
Total	117*	1.5	7*
San Mateo to Palo Alto Subsection			
Ambient[1]	148*	0.7	48*
HSR construction	3.3	<0.1	<0.1
Freight trains on shifted track[4]	4.0	<.01	<0.1
Total	156*	0.7	48*
Mountain View to Santa Clara Subsection			
Ambient[1]	224*	0.2	10*
HSR construction	3.6	<0.1	<0.1
Freight trains on shifted track[4]	N/A[5]	N/A	N/A
Total	228*	0.2	10*

Subsection and Source	Cancer (per million)	Chronic Hazard Index (unitless)	$PM_{2.5}$ (µg/m³)
San Jose Diridon Station Approach Subsection			
Ambient[1]	68	<1	0.5
HSR construction	Alternative A: 5 Alternative B: 4	<1	<0.1
Station operations	<10[7]	<1[7]	<0.1
Total	Alternative A: <83 Alternative B: <82	<1	<0.7
Threshold			
BAAQMD Threshold[6]	100	10	0.8

Sources: Winkel 2018; AERMOD version 18081; OEHHA 2015; and HARP 2 version 18159
< = less than
µg/m3 = micrograms per cubic meter
BAAQMD = Bay Area Air Quality Management District
HSR = high-speed rail
LMF = light maintenance facility
N/A = not applicable
$PM_{2.5}$ = particulate matter 2.5 microns or less in diameter
Risks apply to both Alternative A and Alternative B unless noted otherwise. Risks for Alternative B apply to both viaduct options.
Sum of individual values may not equal total due to rounding.
Exceedances of threshold denoted by underline and an asterisk (*).
[1] Sum of existing ambient risks from stationary sources, roads, and rail
[2] Maximum incremental contribution from emergency generator operation
[3] No ambient sources were identified within 1,000 feet of the LMF and receptors under Alternative A. Accordingly, there would be no cumulative effect, and LMF Alternative A has been omitted from the table.
[4] Maximum incremental contribution from the freight trains on shifted track.
[5] No locations with both substantial track shifts and nearby receptors were identified in this subsection.
[6] BAAQMD has adopted both project- and cumulative-level thresholds for health risks. BAAQMD's cumulative thresholds are used in this analysis.
[7] A project-specific cancer risk and chronic health hazard assessment was not conducted because BAAQMD Regulation 2, Rule 5, Section 302, prohibits generator use if they would result in cancer or acute hazard impacts in excess of BAAQMD's health risk thresholds of significance.

As shown in Table 3.18-4 total cumulative cancer risks and $PM_{2.5}$ concentrations for combined construction and operations would exceed the BAAQMD's thresholds. The exceedances are the result of existing ambient risks. The relative contribution of the combined construction and operation of the project to the exceedances of the thresholds would be less than the BAAQMD's project-level thresholds and minor compared to ambient cancer risks and $PM_{2.5}$ concentrations from existing sources.

Greenhouse Gases

Climate change occurs globally and GHGs are global pollutants, unlike criteria air pollutants (such as ozone precursors), which are primarily pollutants of regional and local concern. Given their long atmospheric lifetimes, GHGs emitted by sources worldwide accumulate in the atmosphere. No single emitter of GHGs is large enough to produce global climate change on its own. Rather, climate change is the result of the individual contributions of countless cumulative sources. Therefore, GHG impacts are inherently cumulative.

Even with the more stringent regulations on GHG emissions expected in the future, projected growth in California could result in cumulative increases in GHG emissions. Increased GHG emissions from cumulative projects, including the project alternatives, would result in impacts on global climate change. Although the project alternatives include project features (AQ-IAMF#2 through AQ-IAMF#5), which collectively would minimize emissions of GHGs, construction of either of the project alternatives would result in temporary GHG emissions.

During project operation, the project's statewide demand for electricity also would result in indirect GHG emissions from power generation facilities. Although the Authority has adopted a policy to

purchase energy from renewable, clean-power sources, it cannot guarantee that only renewable energy would be used to power the HSR system because the local power distribution network does not distribute energy based on specific energy sources. Therefore, GHG emissions may be associated with the provision of electrical energy to the HSR system. However, decreased GHG emissions from vehicles and aircraft would more than offset the increases from energy generation, which would result in a net decrease in GHG emissions with project operation. GHG emissions from cumulative projects represent a cumulative impact

Contribution of the Project Alternatives

Air Quality

Regional Impacts

Construction-Related Criteria Pollutants

Construction of both project alternatives would result in NO_X emissions that would exceed BAAQMD's threshold in all construction years (Tables 3.3-12 and 3.3-13). These NO_X emissions would be offset through the purchase of offsets (see Section 3.3.7 for information on the mitigation measures). Because this purchase would offset NO_X emissions to below BAAQMD thresholds, construction of either of the project alternatives would not contribute to a cumulative impact from NO_X emissions during construction.

Operations-Related Criteria Pollutants

With respect to operations impacts, as disclosed in the discussion of Impact AQ#7 in Section 3.3, HSR service would help the region attain air quality standards and plans by reducing the amount of regional vehicular traffic and providing an alternative mode of transportation. Criteria pollutant emissions from additional electricity required to power the HSR system, as well as from operation of the stations and Brisbane LMF, would increase relative to the 2015 Existing and 2029 and 2040 No Project conditions. Fugitive dust emissions would also increase because of train movement over the track. However, the project alternatives would result in emissions reductions from on-road vehicles and aircraft, relative to the 2015 Existing and 2029 and 2040 No Project conditions. These emissions benefits would be achieved equally by both project alternatives through reductions in vehicle trips and aircraft activity; with a greater number of people traveling on the HSR system, fewer vehicle and aircraft miles would occur. Ultimately, the criteria pollutant reductions achieved by changes in on-road vehicle and aircraft activity would more than offset the emissions increase from project operations (electricity, train movement, stations, and Brisbane LMF). Because the project alternatives would decrease regional emissions of criteria pollutants and precursors (e.g., reactive organic gases, NO_X), project operations would result in a net benefit to regional air quality.

Local Impacts

Construction-Related Criteria Pollutants

As disclosed in the discussion of Impact AQ#3 in Section 3.3, construction of both project alternatives would contribute to existing exceedances of the PM_{10} CAAQS where background concentrations already exceed the standards, and would contribute to new exceedances of the $PM_{2.5}$ CAAQS and NAAQS. Because pollutant concentrations during construction of either of the project alternatives would exceed the CAAQS and NAAQS, these activities would contribute to a localized cumulative air quality impact. The Authority has incorporated all feasible measures for reducing particulate emissions from construction into AQ-IAMF#1, which minimizes health impacts of particulates to the maximum extent feasible, though existing violations of the CAAQS would remain.

Construction-Related Diesel Particulate Matter and $PM_{2.5}$

The addition of HSR service would achieve health risk reductions in the cumulative RSA, constituting a regional air quality benefit. Nevertheless, combined total cumulative cancer risks and noncancer impacts on sensitive receptors would exceed the BAAQMD's thresholds (Table 3.18-1). The exceedances would be the result of existing ambient sources. The project's relative

contribution to the exceedances of the cumulative threshold would be less than the BAAQMD's project-level health thresholds and minor compared to health risks from existing sources.

Operations-Related Carbon Monoxide Hot Spots

As discussed above, there would be no cumulative impact with respect to operations-related CO hot spots. Additional traffic created by the project alternatives would not result in CO concentrations in excess of the NAAQS or CAAQS (see Table 3.3-24). Therefore, the project's relative contribution would not be cumulatively considerable.

Operational-Related DPM and $PM_{2.5}$ Exhaust

As shown in Table 3.18-2, total cumulative cancer and noncancer chronic health hazards to sensitive receptors located near shifted tracks would not exceed the BAAQMD's cancer and hazard index thresholds for health risk. Cumulative $PM_{2.5}$ exposure would be greater than the BAAQMD's cumulative $PM_{2.5}$ threshold, and therefore would result in a cumulative impact. However, the exceedance is the result of existing sources in the vicinity of the tracks. The relative contribution of freight trains on shifted track to the exceedances of the screening threshold is less than the BAAQMD's project-level heath thresholds and is minor compared to health risks from existing sources (less than 0.1 micrograms per cubic meter relative to No Project conditions and a net benefit relative to existing conditions).

Total cumulative health risks to sensitive receptors located near Millbrae Station, San Jose Diridon Station, and the LMF would not exceed the BAAQMD's health risk thresholds, as shown in Table 3.18-3.

Combined Construction- and Operations-Related DPM and $PM_{2.5}$ Exhaust

As shown in Table 3.18-4, total cumulative cancer risks and $PM_{2.5}$ concentrations for combined construction and operations would exceed the BAAQMD's thresholds. The exceedances are the result of existing ambient risks. The relative contribution of the combined construction and operation of the project to the exceedances of the thresholds would be less than the BAAQMD's project-level thresholds and minor compared to ambient cancer risks and $PM_{2.5}$ concentrations from existing sources. Therefore, the contribution of the project alternatives would not materially increase this impact.

Greenhouse Gases

Construction of either project alternative would result in a temporary increase in GHG emissions of between 20,073 and 56,069 metric tons carbon dioxide equivalent (CO_2e) per construction year (see Table 3.3-27). However, operation of the project alternatives would decrease overall GHG emissions by reducing vehicle and aircraft trips and would result in a net reduction in CO_2e emissions, as disclosed in the discussion of Impact AQ#15 in Section 3.3. This reduction in GHG emissions would more than offset the increase in GHG emissions associated with project construction. The emissions associated with construction of either of the project alternatives would be offset in 1 to 7 months of project operations because of reduced passenger vehicle and aircraft travel. Amortized construction GHG emissions for the project would be 8,036 metric tons CO_2e per year under Alternative A, 9,419 metric tons CO_2e per year under Alternative B (Viaduct to I-880), and 9,363 metric tons CO_2e per year under Alternative B (Viaduct to Scott Boulevard). Because operations-related emission reductions are tied to ridership, and ridership would be the same under both alternatives, GHG reductions achieved by long-term project operations would not differ between the alternatives. Consequently, the overall GHG effect (construction plus operations) would be a reduction and therefore would be consistent with Assembly Bill 32 and Senate Bill 32 goals. Thus, the project alternatives would not result in net increases of direct or indirect GHG emissions and would not conflict with any applicable plans to reduce GHGs. The HSR system as a whole is anticipated to result in a net cumulative GHG reduction after construction.

CEQA Conclusion

Air Quality

Construction of either of the project alternatives, in combination with cumulative projects, would result in a significant regional cumulative impact with respect to NO_X because emissions from construction activities would exceed the BAAQMD threshold. The project alternatives' contribution to this significant cumulative impact would not be cumulatively considerable because purchase of offsets through project-level mitigation would offset NO_X emissions to below the BAAQMD threshold. Therefore, CEQA does not require any further mitigation.

Construction of either of the project alternatives, in combination with cumulative projects, would result in a significant cumulative impact with respect to localized PM_{10} impacts because background PM_{10} concentrations already exceed the CAAQS. Construction also would result in $PM_{2.5}$ concentrations that would exceed the CAAQS and NAAQS. The project alternatives' contribution to this significant cumulative impact would be cumulatively considerable because total PM_{10} and $PM_{2.5}$ concentrations would exceed the ambient air quality standards. Localized PM_{10} and $PM_{2.5}$ concentrations would remain above the CAAQS even after implementation of all feasible mitigation. No further mitigation is available to address this cumulative impact, which would be significant and unavoidable.

Project construction, in combination with cumulative projects, would lead to local cancer risks and $PM_{2.5}$ concentrations greater than the BAAQMD cumulative thresholds (Table 3.18-1), and therefore, would result in a significant cumulative impact. The exceedances are the result of existing ambient risks. Although the project alternatives' contribution to this cumulative impact is small compared to health risks from existing sources, the impact of project construction would be cumulatively considerable because the BAAQMD cumulative thresholds would be exceeded. No further mitigation is available to address this cumulative impact, which would be significant and unavoidable.

Project operations, in combination with cumulative projects, would not result in local cumulative impacts with respect to CO hot spots. CO hot spots typically occur at heavily congested roadway intersections where a substantial number of gasoline-powered vehicles idle for prolonged periods; modeling conducted at 18 intersections with the highest traffic volumes and worst congestion shows that CO concentrations at these intersections would not exceed the CAAQS and NAAQS. There would be no cumulative impact because the cumulative condition would not result in CO concentrations in excess of the NAAQS or CAAQS; therefore, CEQA does not require any mitigation.

Project operations, in combination with cumulative projects, would result in a local significant cumulative impact with respect to $PM_{2.5}$ because local concentrations at sensitive receptors near shifted tracks would exceed the BAAQMD's cumulative threshold (Table 3.18-2). The exceedances are the result of existing ambient risks. Although the project alternatives' contribution to this cumulative impact is small compared to health risks from existing sources, the impact of project construction would be cumulatively considerable because the BAAQMD cumulative thresholds would be exceeded. No further mitigation is available to address this cumulative impact, which would be significant and unavoidable.

Operation of the project stations and LMF in combination with cumulative projects (Table 3.18-3) would not result in a significant cumulative impact because risks and $PM_{2.5}$ concentrations would be less than BAAQMD thresholds. Therefore, CEQA does not require mitigation.

Combined construction and operation of the project alternatives, in combination with cumulative projects, would lead to local cancer risks and $PM_{2.5}$ concentrations greater than the BAAQMD cumulative thresholds (Table 3.18-4), and therefore would result in a significant cumulative impact. The exceedances are the result of existing ambient risks. Although the project alternatives' contribution to this cumulative impact would be small compared to health risks from existing sources, the combined impact of project construction and operations would be cumulatively considerable because the BAAQMD cumulative thresholds would be exceeded. No

further mitigation is available to address this cumulative impact, which would be significant and unavoidable.

The Authority will coordinate with BAAQMD to identify if there are feasible additional measures consistent with the project that may lower some of the cumulative health risks in areas with existing cumulative health risks above cumulative thresholds and where the project would contribute in a limited way to those risks. This may result in lowering of some of the cumulative health risks identified, but the feasibility and effectiveness of any such measures are unknown at this time and not presumed for the purposes of CEQA determinations.

Greenhouse Gases

Past, present and future projects cumulatively contribute to GHG impacts. Although construction of either of the project alternatives would result in a temporary increase in GHG emissions, operations of the project alternatives would decrease overall GHG emissions by reducing vehicle and aircraft trips, which would more than offset the temporary increase in GHG emissions associated with construction of the HSR project. The contribution of the project alternatives to cumulative GHG impacts would not be cumulatively considerable; therefore, CEQA does not require any mitigation.

3.18.6.3 Noise and Vibration

Resource Study Area

This cumulative analysis uses the same RSAs for noise and vibration as those described in Section 3.4, Noise and Vibration, because they are sufficiently broad to cover the area in which the potential noise and vibration impacts of the project alternatives, in combination with cumulative projects, could result in cumulative impacts. The noise RSA extends approximately 2,500 feet from the project alternatives' centerlines and includes all sensitive receptors potentially exposed to noise impacts.

Cumulative Condition

Noise

Present activities that contribute to the baseline ambient noise environment of the cumulative RSA include Caltrain passenger trains and freight trains. Additionally, traffic on roadways throughout the cumulative RSA, as well as aircraft, BART, and local community noise sources, contribute to the baseline ambient noise environment. Future population growth throughout the project corridor will cause increased traffic in the cumulative RSA and increased operations at nearby airports.[5] Construction of some of the planned developments listed in Volume 2, Appendix 3.18-A could add localized noise increases from increased traffic and contribute to noise increases in the cumulative RSA.

Volume 2, Appendix 3.18-B lists the transportation projects that would occur in the cumulative RSA. From a noise-generating perspective, these transportation projects can be categorized into three groups: rail and transit projects, roadway projects, and other projects. The planned rail and transit projects, including construction and operations of the HSR project, would be most likely to cause cumulative noise impacts because they would generate the most additional noise exposure at noise-sensitive receptors. Some roadway projects could also cause cumulative impacts where changes in traffic would occur near the cumulative RSA.

Rail and Transit

For the cumulative noise impact analysis, the Authority evaluated the changes as a result of the Caltrain PCEP (which would increase train operations from 92 to 114 trains per day), increased

[5] Although Bay Area airports are projected to face capacity issues by 2020, increases in passenger demand would be met by increased use of larger planes with higher load factors and improvements in air traffic technologies which would support increased operations (Eno Center for Transportation 2013).

operation of freight railroads in the corridor by 3.5 percent per annum, and blended system operations. The following changes would occur as a result of blended system operations:

- Increase in the number of passenger trains—Add an estimated 122 revenue trains and 12 to 22 nonrevenue trains to the Caltrain corridor (depending on location along the corridor);
- Change in passenger train technology—Shift Caltrain operations to 100 percent electrical multiple units compared to only 75 percent electrical multiple units with the PCEP. HSR would use 100 percent electrical multiple units.
- Increase in passenger train speeds—With track curve straightening, passenger service speeds would be up to 110 mph in certain locations for both Caltrain and HSR service.

Additional rail or transit projects that could combine with blended system operations to cause cumulative noise impacts include the El Camino Real Bus Rapid Transit Improvements project, the Mineta San Jose International Airport People Mover project, and the Dumbarton Bridge Commuter Rail Service. The cumulative noise impacts of these projects were not analyzed quantitatively in Section 3.4, because potential noise increases generated by them would be more localized. Potential localized increases in noise from these projects could combine with blended system operations to cause cumulative impacts, although the likelihood of such combined increases would decrease rapidly with distance from the noise source.

Construction of cumulative rail and transit projects including the project alternatives would generate temporary noise levels requiring project-specific mitigation. Construction of either of the project alternatives in combination with the noise generated by construction of other cumulative projects would not, however, result in cumulative noise impacts because construction, including potential pile driving, of multiple projects generating high noise levels would have to take place simultaneously and near sensitive receptors such that they combine to create noise levels exceeding federal (Federal Railroad Administration [FRA] and Federal Highway Administration [FHWA]) or state standards. Additionally, the project would be required to comply with FRA and Federal Transit Administration [FTA] guidelines for minimizing construction noise when work is conducted within 1,000 feet of sensitive receptors (NV-IAMF#1: Noise and Vibration). Furthermore, the Authority would implement a noise-monitoring program and noise control measures (NV-MM#1: Construction Noise Mitigation Measures) (see Section 3.4.7, Mitigation Measures, for more information on the mitigation measures). Therefore, there would not be a cumulative noise impact in the cumulative RSA from rail and transit projects related to construction.

Blended system operations and other cumulative rail and transit projects would create new and permanent sources of noise during operations from train passbys and from the sounding of train horn warnings at at-grade roadway crossings and passenger stations. The Authority would reduce exposure of sensitive receptors to operational noise by installing noise barriers where they are effective; if noise levels are still not reduced below the threshold for severe noise impact, the Authority would consider installing sound insulation at residences and institutional buildings to improve outdoor-to-indoor noise reduction (NV-MM#3: Implement Proposed California High-Speed Rail Project Noise Mitigation Guidelines). If noise barriers or sound insulation are not effective, the Authority would consider acquisition of affected properties. The Authority would also support potential implementation by local jurisdictions of Quiet Zones, which would avoid trains sounding warning horns when approaching at-grade crossings (NV-MM#4).The Authority would require bidders for HSR vehicle technology procurement to meet federal regulations for vehicle noise (NV-MM#5: Vehicle Noise Specification), install special trackwork to minimize noise at track junctions (NV-MM#6: Special Trackwork at Crossovers, Turnouts, and Insulated Joints), and conduct additional noise analysis during final design to identify further opportunities for noise mitigation (NV-MM#7: Additional Noise Analysis during Final Design). While mitigation would reduce exposure of sensitive receptors to noise from train passbys during operations, it would not eliminate the exposure of sensitive receptors to noise that, in combination with noise from other cumulative rail and transit projects, would exceed standards set by the FRA for high-speed ground transportation (see quantitative modeling results in discussion of project contribution

below). Therefore, the blended system operations in combination with other cumulative transportation projects would result in a cumulative impact.

Roadways and Traffic

Operations of the blended system in combination with cumulative projects (Volume 2, Appendices 3.18-A and 3.18-B), the US 101 Express Lane Conversion project in both Santa Clara and San Mateo Counties, and the SR 87 HOV project would increase traffic and thereby increase traffic-related noise. HSR project operations would contribute to increased traffic-related noise around HSR stations from passengers using auto and transit to access the trains. Even with implementation of NV-MM#3, the traffic-related noise would exceed existing levels by more than 3 decibels (dB) near the 4th and King Street Station in 2029 and would exceed existing levels by more than 3 dB near the San Jose Diridon Station. In combination with existing sources of traffic noise, traffic-related noise associated with HSR project operations would combine with noise generated by other cumulative transportation projects to create a cumulative noise impact at the 4th and King Street Station during operation of this interim station and at the San Jose Diridon Station. No cumulative traffic-related noise impacts would occur at the Millbrae Station.

Vibration

Constructing the project alternatives and other cumulative projects would produce vibration. Ground-borne vibration generally travels only short distances from the vibration source and does not readily combine with other sources of vibration to increase in magnitude because of differing frequencies. Certain types of specialized construction activities, such as pile driving, can generate levels of ground-borne vibration that can cause human annoyance or physical damage to structures. Construction of either of the project alternatives would require some pile-driving activities; however, project design includes compliance with FRA and FTA guidelines for minimizing construction vibration when work is conducted within 1,000 feet of sensitive receptors (NV-IAMF#1). The Authority would also implement mitigation measure NV-MM#2: Construction Vibration Mitigation Measures, to avoid or offset vibration impacts from construction, including the development of vibration reduction methods for all high-vibration-producing activities that would occur within 50 feet of any building. Therefore, even if construction activities were taking place on adjacent projects, it is unlikely that there would be multiple vibration sources (such as impact pile drivers) in close proximity generating high levels of vibration at the same frequency and at the same time near sensitive receptors.

Existing operational vibration sources consisting primarily of Caltrain operations, other BART operations (San Bruno and Millbrae), and freight train operations generate vibration levels that exceed the residential criterion of 72 vibration decibels (VdB) in all project subsections. Increased passenger and freight rail operations and the addition of train passbys associated with blended system operations would further increase vibration levels in all subsections, contributing to the current exceedance of residential vibration criterion. While implementing mitigation measures such as NV-MM#8: Project Vibration Mitigation Measures, would reduce exposure of sensitive receptors to vibration from train passbys during operations, it would not eliminate the exposure of sensitive receptors to vibration. Blended system operations, in combination with vibration from other cumulative rail and transit projects, would exceed FRA standards for residential vibration criteria, and therefore would result in a cumulative impact. Construction and operations of cumulative projects would not be expected to contribute to cumulative vibration impacts, because the vibration levels generated by rubber-tired vehicles are typically very low (FRA 2012).

Contribution of the Project Alternatives

Noise

Rail and Transit

Blended system operations and other cumulative rail and transit projects would expose sensitive receptors to noise levels exceeding standards set by the FRA for high-speed ground transportation. In 2040, there would be 2,299 cumulative severe noise impacts on sensitive receptors associated with train passbys during operations for Alternative A, 2,214 severe noise impacts for Alternative B (Viaduct to I-880), and 2,144 severe noise impacts for Alternative B

(Viaduct to Scott Boulevard). For comparison, Caltrain PCEP and blended system operations (Table 3.18-5) would result in 1,758 severe noise impacts on sensitive receptors under Alternative A, 1,648 severe noise impacts under Alternative B (Viaduct to I-880), and 1,628 severe noise impacts under Alternative B (Viaduct to Scott Boulevard). The additional 516 to 566 severe noise impacts under the cumulative condition would occur as a result of increases in freight operations and increased passenger train operations south of Santa Clara.

Table 3.18-5 Summary of 2040 No Project, Plus Project, and Cumulative Plus Project Noise Impacts

Analysis	No Project		Alternative A		Alternative B[1]	
	Moderate	Severe	Moderate	Severe	Moderate	Severe
Plus Project	42	9	4,296	1,758	4,186/ 4,141	1,648/ 1,628
Cumulative Plus Project	602	46	4,228	2,299	4,087/ 4,142	2,214/ 2,144

I- = Interstate

[1] Where applicable, values are presented for Alternative B (Viaduct to I-880) first, followed by Alternative B (Viaduct to Scott Boulevard). If only one value is presented, the value would be identical under the two viaduct options.

Operation of the blended system would affect a large number of sensitive receptors, and would be the largest source of cumulative noise impacts. The project would add an estimated 122 revenue trains and 12 to 22 nonrevenue trains to the Caltrain corridor, more than double the total number of trains operations per day. Operation of the blended system would result in the largest change in noise from ambient conditions and would produce noise that exceeds FRA standards for high-speed ground transportation.

Roadways and Traffic

The project in combination with cumulative transportation projects would add vehicles to the regional roadway network, generating noise increases exceeding 3 dB near the 4th and King Street Station in 2029 and at the San Jose Diridon Station in 2040.

Vibration

Train passbys associated with blended system operations in combination with planned rail operations in the cumulative RSA would result in a cumulative vibration impact because they would exceed vibration criterion for human annoyance for receptors in all subsections. Blended system operations would result in 2,493 vibration impacts on sensitive receptors under Alternative A, 2,307 vibration impacts under Alternative B (Viaduct to I-880), and 2,366 vibration impacts under Alternative B (Viaduct to Scott Boulevard). There would be 18 ground-borne noise impacts on sensitive receptors under both alternatives. Blended system operations would more than double the total number of trains per day operating within the Caltrain corridor and would expose a large number of sensitive receptors to increases in ground-borne vibration.

CEQA Conclusion

Noise

During construction, the project in combination with cumulative projects would not result in a significant cumulative noise impact under CEQA because it is anticipated that construction activities would not occur simultaneously near sensitive receptors such that they would combine to create noise levels exceeding federal (FRA and FHWA) or state standards, as described under the subsection titled “Cumulative Condition.” Furthermore, project design would comply with FRA and FTA guidelines for minimizing construction noise when work is conducted within 1,000 feet of sensitive receptors. The project would not contribute to a significant cumulative construction noise impact; therefore, CEQA does not require any mitigation.

Operation of the blended system in combination with cumulative projects would result in significant cumulative noise impacts under CEQA because noise-sensitive receptors would generate noise levels above existing ambient levels and in exceedance of FRA criteria for moderate and severe noise impact. The project contribution to the cumulative impact would be considerable because it would cause the largest change in the baseline ambient noise conditions of the cumulative projects. The Authority would implement mitigation measures to minimize operations noise impacts (NV-MM#3, NV-MM#5, NV-MM#6, and NV-MM#7), discussed in more detail in Section 3.4. While these mitigation measures would be effective at reducing the number of severe noise impacts in the cumulative RSA, they would not mitigate all cumulative noise impacts because noise barriers are not cost effective or acoustically feasible in all areas with predicted noise impacts. The Authority would support regional efforts aimed at grade separation (TR-MM#2), which would avoid train horn noise at at-grade crossings, but funding is not assured for this mitigation and thus its implementation is uncertain. Because severe cumulative noise impacts would remain following mitigation, the cumulative noise impact associated with blended system operations would be significant and unavoidable under CEQA.

Traffic noise generated by the HSR project in combination with cumulative transportation projects would result in a significant cumulative noise impact under CEQA in 2029 near the 4th and King Street Station because noise levels would increase by 3 dB above existing conditions at two roadway segments. The contribution of the HSR project to this cumulative impact would be considerable because it would be the primary generator of the increased traffic at this location. Additionally, near the San Jose Diridon Station, there would be four roadway segments under Alternative A where the increases in traffic under the 2040 Plus Project condition would be greater than or equal to 3 dB. Under Alternative B (both viaduct options), there would be five roadway segments where the increases in traffic under the 2040 Plus Project condition would be greater than or equal to 3 dB. The Authority would implement mitigation measures to minimize impacts from traffic noise increases (NV-MM#3 and NV-MM#7). These mitigation measures would reduce but not eliminate traffic-related cumulative noise impacts because line-of-sight and safety concerns would limit the application of effective noise barriers. Therefore, cumulative traffic-related operational noise impacts would be significant and unavoidable.

Vibration

During construction, the project in combination with other cumulative projects would not generate a significant cumulative vibration damage impact under CEQA because vibration levels decrease rapidly with distance, vibrations from multiple sources do not readily combine with one another, and the Authority would develop and implement vibration reduction methods for all high vibration-producing activities that would occur within 50 feet of any building. The Authority would implement NV-IAMF#1 to minimize construction vibration and the potential for it to cause damage to buildings and human annoyance. There would not be a significant cumulative construction vibration impact under CEQA to which the project would contribute. Therefore, CEQA does not require any additional mitigation.

Blended system operations in combination with other cumulative projects would generate a significant cumulative vibration impact under CEQA because vibration levels would exceed the FRA criteria of 72 VdB for residential use, 65 VdB for lab facilities and 75 VdB for institutional use at multiple sensitive receptors; ground-borne noise criteria are 35 A-weighted decibels (dBA) for residences and 40 dBA for institutions. The contribution of blended system operations to this cumulative impact would be considerable because it would be the primary contributor to the increases in ground-borne vibration along the corridor. The Authority would implement NV-MM#8, requiring mitigation measures that would minimize vibration impacts from operations. There are various options to reduce train vibration, though it may not be possible in all instances to mitigate all vibration impacts because it may not be cost effective or acoustically feasible. The specific design and implementation of this mitigation measure would be identified during final design. There is no additional feasible mitigation. Because vibration impacts would remain following mitigation, the impact would be significant and unavoidable under CEQA.

3.18.6.4 Electromagnetic Fields and Electromagnetic Interference

Resource Study Area

The cumulative RSA for electromagnetic fields (EMF) and electromagnetic interference (EMI) is the same as the RSA used for the analysis in Section 3.5, Electromagnetic Fields and Electromagnetic Interference, because it is sufficiently broad to cover the area in which the potential impacts of the project alternatives, in combination with cumulative projects, could result in cumulative impacts. The EMF and EMI RSA is defined as the project footprint for each of the project alternatives plus 500 feet from the track centerline[6] and 500 feet from the perimeter of the Brisbane LMF.

Cumulative Condition

The majority of the cumulative projects that overlap the cumulative RSA are residential or mixed-use developments or transportation projects that would not contribute to the generation of EMF or be particularly sensitive to EMI. Only one future project—a planned research and development facility in Sunnyvale—would introduce a new sensitive site into the cumulative RSA. However, under the cumulative condition, electrical power equipment that emits EMFs and EMI, including high-voltage electric power lines, would continue to be used in the cumulative RSA. Directional and non-directional (cellular and broadcast) antennas and radio frequency communication equipment would continue to be used and expanded through ongoing development and transportation projects.

Construction of either of the project alternatives would employ equipment that would generate temporary fluctuations in EMF levels. The practical effects of exposure to EMF and fluctuations in EMF levels from construction activities, including those of the project alternatives and other cumulative projects, are expected to be limited to within 50 feet of construction activities, and these levels are expected to remain below levels known to result in a documented health risk. Furthermore, project features, such as EMF/EMI-IAMF#2: Controlling Electromagnetic Fields/Electromagnetic Interference, include specifications for controlling EMF and limiting EMI in specific areas where it could disrupt nearby sensitive equipment. In addition, Federal Communications Commission (FCC) regulations designed to prevent interference would be applied to the use of communications equipment at all construction sites; therefore, the use of this equipment during construction of cumulative projects, including the project alternatives, would not subject sensitive equipment at other facilities to potential EMF and EMI.

As described in Section 3.5, EMF fluctuation generated by construction vehicle movements related to construction of either of the project alternatives would attenuate below background levels at all construction locations adjacent to facilities with known sensitive equipment. No cumulative impact is anticipated during construction of either of the project alternatives and other cumulative projects because construction activities of these various projects would not generally overlap, EMF from radio equipment would comply with FCC regulations designed to prevent interference, sources of EMF and EMI would attenuate within approximately 50 feet of construction activity, and EMF emissions are expected to remain below levels known to result in a documented health risk. Moreover, all identified planned projects would be located such that, even where construction would overlap with construction or operations of the project alternatives, there would be no cumulative impacts on any of the known sensitive receptors in the cumulative RSA.

Operations of the project in combination with cumulative development projects would likely increase the intentional demand for electromagnetic spectrum and the unintentional generation of EMI. In urban areas, numerous cumulative projects, in addition to the project alternatives, would generate and be affected by EMF and EMI. These include medical facilities such as the University of California, San Francisco Mission Bay Medical Center and Palo Alto Medical Foundation, and high technology facilities such as the Genentech Gateway Campus. The

[6] Although 60-Hertz magnetic fields are generated by the overhead contact system conductors, the HSR track centerline is used as a proxy from which distance to sensitive receptors and other potentially affected land uses is measured.

electrification of the Caltrain corridor between San Francisco and San Jose under the Caltrain PCEP would represent a new major source of EMF within the cumulative RSA. EMF levels generated by PCEP would be similar to or less than those generated by HSR trains because of their lower running currents and smaller motors. Because both systems would operate in a shared corridor (along with non-electrified freight operations), operations would be necessarily separated in time.

Throughout the cumulative RSA, EMF levels are not expected to increase to levels that would expose people to EMF health risks because exposure to such EMF levels generally occurs only very close to EMF generating sources. Aside from the electricity required to operate HSR trains, no other planned large sources of EMF are in the cumulative RSA that would not be regulated and controlled to prevent EMI. Furthermore, all radio equipment would be required to comply with FCC regulations designed to avoid interference. With respect to the project alternatives, the Authority would use a dedicated spectrum for radio and positive train control (PTC) equipment and would maintain an electromagnetic compatibility program plan, which provides a performance standard that is compatible with equipment of all neighboring facilities and would avoid potential interference with other equipment and facilities. The project also includes grounding of linear metallic structures to avoid the potential for corrosion or nuisance shocks from ground currents, as well as coordination with adjacent railroads to avoid radio frequency interference with train signaling equipment (EMF/EMI-IAMF#1: Preventing Interference with Adjacent Railroads). Therefore, operations of the project alternatives, in combination with cumulative projects, would not result in a cumulative EMF and EMI impact.

While there are a large number of EMF sources in the cumulative environment, they do not simply add together to arrive at a cumulative effect. For cumulative impacts to occur, the contributing sources must not only be close together, but their emissions overlap in time and affect the same portions of the electromagnetic spectrum. The Authority has acquired two dedicated frequency blocks, each with a width of 4 megahertz in the 700-megahertz portion of the spectrum, for use by HSR communications and PTC systems. These blocks, are exclusively dedicated for HSR use and therefore not subject to interference from or with other users, avoiding entirely the possibility of cumulative impacts. The analysis did not identify any instance where EMI would combine in a way to cause equipment malfunctions or health risks.

CEQA Conclusion

The project in combination with other cumulative projects would not generate a significant cumulative impact under CEQA related to EMF and EMI to which the project alternatives would contribute because there are no instances where EMI would combine in a way to cause equipment malfunctions or health risks. All communication equipment procured for HSR use would comply with FCC regulations designed to prevent interference, and the use of dedicated frequency blocks avoids interference with other uses. Therefore, CEQA does not require any mitigation.

3.18.6.5 Public Utilities and Energy

Resource Study Area

Public Utilities

The cumulative RSA for public utilities is the entirety of San Francisco, San Mateo, and Santa Clara Counties, which is larger than the RSA used for the analysis in Section 3.6, Public Utilities and Energy (defined as affected service areas of utilities and utility-owned properties within and beyond the project footprints). The cumulative RSA was chosen to develop a broad, regional consideration of cumulative impacts and because it captures impacts on public utilities associated with the construction and operations of the project alternatives and regional impacts on public utilities associated with planned development. Specifically, the cumulative RSA allows for the analysis of additional cumulative projects that could affect stormwater and water supply lines; water supplies (i.e., potable water, recycled water, and wastewater and stormwater treatment facilities); solid waste landfills; electricity transmission facilities; natural gas and petroleum product pipelines; fiber optics; and communication facilities.

Energy

The cumulative RSA for energy (including electricity) is the same as the RSA described in Section 3.6, which includes infrastructure and service areas of energy resource providers within and beyond the project footprint, including the state of California. The entire electricity grid of the state of California and other western states that produce energy and export to California is sufficiently broad to cover the area in which the project alternatives, in combination with other cumulative projects, could result in impacts. Electricity is examined using projections, rather than a list of other projects, given its large RSA.

Cumulative Condition

Public Utilities

Ongoing urban development would be expected to continue in the cumulative RSA. A number of urban development plans, which guide future development, are proposed in the jurisdictions where the project would be located. In addition, many residential and commercial development projects are proposed in the jurisdictions where the project would be located. A full list of these cumulative development projects is provided in Volume 2, Appendix 3.18-A. Major utilities (e.g., communications lines, electrical lines, water and sewer lines) either cross or run parallel to the right-of-way near cumulative projects and the project alternatives.

Cumulative transportation projects in the project right-of way that could combine with the project alternatives to cause cumulative impacts on public utilities include the Caltrain PCEP, the Bayshore Intermodal Facility, the Caltrain Grade Separation Program, the Capitol Corridor Joint Powers Authority Oakland to San Jose Phase 2 Double-Track Project, and the Caltrain Double-Track San Jose to Gilroy Segment. These projects would involve work in the Caltrain right-of-way, which is where the project would be located.

Utility Relocation

Construction of the project in combination with cumulative projects would require relocation of utility lines, which would result in planned or accidental temporary interruption of utility services. Construction activities in the Caltrain right-of-way would require temporary shutdown of aboveground, belowground, and overhead electrical transmission lines; natural gas transmission pipeline facilities; petroleum product conveyance facilities; and water conveyance infrastructure. Shutdowns would interrupt utility services to industrial, commercial, and residential customers. Regulations require development of a construction safety and security management plan that includes identification and mapping of buried and overhead utility lines. Contractors would be required to coordinate with utility service providers and local government agencies to identify and map the locations of underground utilities prior to construction. This coordination would establish safety and response procedures in the event a previously unidentified or unmapped underground utility is encountered during construction.

Prior to construction in areas where utility service interruptions are unavoidable, contractors would be required to notify the public in that jurisdiction and the affected utility service providers of the planned outage (PUE-IAMF#3: Public Notifications). Construction of the project in combination with planned development in the cumulative RSA would be coordinated with utility service providers and utility customers to avoid interruptions of utility service to hospitals and other critical users. In addition, prior to construction of the project, the Authority's contractor would prepare a technical memorandum documenting how construction activities would be coordinated with utility service providers to minimize or avoid interruptions of utility service (PUE-IAMF#4: Utilities and Energy). Based on the regulatory requirements and the incorporation of project features, construction of the project in combination with the cumulative projects, would not result in cumulative impacts related to interruption of utility services.

Utility Access

The Caltrain right-of-way be permanently fenced and secured to prevent unauthorized access during operations. Construction activities associated with the project and other cumulative projects would require work in the right-of-way that would reduce maintenance access to existing utilities in the right-of-way. Other cumulative transportation projects involving work in the right-of-

way include the Bayshore Intermodal Facility, the Caltrain PCEP, the Caltrain Grade Separation Program, the Capitol Corridor Joint Powers Authority Oakland to San Jose Phase 2 Double-Track Project, and the Caltrain Double-Track San Jose to Gilroy Segment. Utility districts would typically coordinate and schedule any field visits to their facilities with the owner of the property within which their facilities are located. Prior to construction of the project, coordination and scheduling procedures would be established between the utility owners and the HSR operator. The utility districts would also follow this practice of avoiding reduced access to existing utilities in the right-of-way for the cumulative projects. In addition, the construction schedules of the cumulative projects would not necessarily coincide with the construction schedule for the HSR project. For example, the Caltrain PCEP would be completed before project construction could begin. Additionally, construction schedules would be developed and coordinated with utility service providers to minimize the extent and duration of planned service interruptions. Therefore, there would not be a cumulative impact on public utilities because of reduced access from project construction or operations in combination with planned development in the cumulative RSA.

Construction of New Utility Lines

Cumulative projects would result in construction of new utility lines and utility infrastructure to provide energy service (e.g., electricity, natural gas); water, wastewater, and stormwater management services; and communications services to the growing developments as the population continues to grow and place greater demand on utility services. The general plans of the cities and communities in the cumulative RSA anticipate growing demand for utilities and coordinated development planning with utility service providers. As a result, future public utility capacity in the cumulative RSA would keep pace with the planned growth and future demand. Therefore, the construction and operations of the project alternatives in combination with other cumulative projects would not place a demand on utility services that exceeds their capacities, and there would be no cumulative impact on public utilities.

Solid Waste and Hazardous Waste Generation

Construction of the project and other cumulative projects would generate solid waste during demolition, excavation, and concrete preparation. Operation (i.e., occupancy and use) of residential, commercial, and industrial cumulative development projects would also result in solid waste generated by residential, commercial, and industrial activities in the cumulative RSA. The increased solid waste generation from these cumulative projects would result in direct impacts on solid waste management landfills and facilities from increased demands. While construction and demolition wastes generated by cumulative projects would be reused to the extent feasible, particularly for transportation projects, these projects would still generate construction wastes. However, existing landfills in the Bay Area have the capacity to receive solid wastes from these projects. Furthermore, because county planning documents account for the increased need for solid waste disposal facilities, construction of the project in combination with cumulative projects would not exceed the capacity of permitted solid waste landfills and would therefore not result in a cumulative impact related to generation of solid waste.

The project in combination with cumulative projects would also generate hazardous waste from demolition, excavation, and other construction activities. Depending on the age of the buildings that would be demolished, these projects could generate waste that contains asbestos or lead-based paint. These cumulative projects include area plans and neighborhood plans (e.g., Oyster Specific Plan in South San Francisco) and specific projects (e.g., 1144-1150 Harrison Street in San Francisco and 500 Sylvan Avenue in San Bruno) that may require demolition of existing buildings containing hazardous materials. A list of these proposed plans and projects is provided in Volume 2, Appendix 3.18-A. During operations, these cumulative projects and the project alternatives would also generate hazardous waste, such as chemical solvent use and household hazardous waste.

There are no licensed hazardous waste disposal facilities in San Francisco, San Mateo, and Santa Clara Counties. There are three licensed hazardous waste disposal facilities in California—one each in Kern County, Kings County, and Imperial County—with a combined available hazardous waste disposal capacity of approximately 15 million cubic yards. The Chemical Waste Management hazardous waste landfill located at Kettleman Hills (Kings County) was issued a

permit in 2014 by the California Department of Toxic Substances Control to expand the landfill's capacity by 4.9 million cubic yards; the Kettleman Hills landfill was nearing full capacity at the time the permit was issued in 2014 (DTSC 2018). The Buttonwillow hazardous waste landfill (Kern County) and Westmorland hazardous waste landfill (Imperial County) have not applied for permits to expand hazardous waste disposal capacity; each has an estimated permitted disposal capacity of 5 million cubic yards (Clean Harbors n.d.[a], n.d.[b]). The amount of hazardous waste generation from construction and operations of the project alternatives would be no greater than the amount of nonhazardous waste generation for the purposes of comparison to available hazardous waste disposal capacity. The capacity of the three existing hazardous waste facilities would be sufficient for hazardous waste generated by the project alternatives and other cumulative projects. In light of adequate existing landfill capacities to receive solid and hazardous wastes, and because county planning documents account for the increased need for waste disposal facilities, the project in combination with cumulative projects would not result in cumulative impacts related to generation of hazardous waste.

Water Consumption

Construction of cumulative residential, commercial, and industrial development projects, including office and industrial park developments (e.g., 250 Howard in San Francisco and 494 Forbes Boulevard in South San Francisco) and residential projects (e.g., Potrero HOPE in San Francisco and 36-50 San Bruno Avenue in Brisbane), would result in consumption of water for construction during excavation and concrete preparation. A full list of cumulative projects is provided in Volume 2, Appendix 3.18-A.

Construction of cumulative transportation projects, including highway construction and improvement projects, railway improvement projects, and the project alternatives, would require water during construction. Operations of these projects, including occupancy and use and drinking water supplies, would also result in water use. Water uses from these projects would increase the demands of water suppliers in or servicing the cumulative RSA. The largest water supplier in the cumulative RSA is the San Francisco Public Utilities Commission. The commission maintains a water shortage contingency plan that provides procedures for allocating reduced water deliveries, plans for responding to water shortages, and emergency procedures in case of catastrophic supply interruptions (SFPUC 2016).

Additionally, existing and proposed water projects in the cumulative RSA have been implemented or proposed to increase the availability of water in the cumulative RSA and elsewhere in the region. As described in Section 3.6.5.1, Public Utilities, recycled water projects have been implemented or proposed in San Francisco, Millbrae, Burlingame, Redwood City, Palo Alto, Mountain View, Sunnyvale, Santa Clara, and San Jose. These recycled water projects reduce or would reduce the water demand. In addition, the project and other cumulative development projects would be constructed on different schedules, which would minimize the potential for multiple concurrent demands for water resources. Therefore, construction and operations of the project in combination with planned development in the cumulative RSA would not exceed the capacity of water supplies and would not result in a cumulative impact.

Wastewater Generation

Construction of the HSR project and other cumulative development projects would result in direct impacts on wastewater management facilities by generating wastewater through excavation and concrete preparation. Municipalities operate several wastewater treatment plants in the cumulative RSA with the capacity to accept and treat wastewater from the project and the cumulative projects. The total remaining wastewater treatment capacity of these wastewater treatment systems is 224.4 million gallons per day (mgd), which is 46.6 percent of the total treatment capacity. Wastewater generation from project construction activities would represent less than 0.01 percent of overall available wastewater treatment capacity in the cumulative RSA. Because of the minimal amount of water that would be generated during project construction and because almost half of the wastewater treatment capacity remains, it is unlikely that the total amount of wastewater from construction of the project alternatives and the cumulative projects would exceed the capacity of existing wastewater treatment facilities to result in the need for

construction of new wastewater treatment infrastructure. Therefore, there would not be a cumulative impact.

Project operations in combination with cumulative development projects would place greater demands on existing wastewater treatment plants by generating wastewater for operations. Operation of stations and the Brisbane LMF would generate wastewater, assumed to equal the amount of water consumed at those facilities. The wastewater that would be generated for operation of the 4th and King Street Station and Brisbane LMF would be treated at the San Francisco Public Utilities Commission Southeast Water Quality Control Treatment Facility. This facility has a remaining capacity of 81.2 mgd, which is 57.2 percent of the total treatment capacity. Wastewater generation from the 4th and King Street Station and Brisbane LMF would be approximately 108,000 gallons per day, approximately 0.1 percent of the remaining capacity at the Southeast Water Quality Control Treatment Facility. The wastewater generated at the Millbrae Station would be treated at the City of Millbrae Water Pollution Control Plant. This facility has a remaining capacity of 1.2 mgd, which is 40 percent of the total treatment capacity. Wastewater generation from the Millbrae Station is approximately 6,000 gallons per day, which is approximately 0.5 percent of the remaining capacity at the City of Millbrae Water Pollution Control Plant. The wastewater generated at the San Jose Diridon Station would be treated at the San Jose/Santa Clara Water Pollution Control Plant. This facility has a remaining capacity of 57 mgd, which is 34 percent of the total treatment capacity. Wastewater generation from the San Jose Diridon Station is approximately 18,800 gallons per day, which is approximately 0.03 percent of the remaining capacity at the San Jose/Santa Clara Water Pollution Control Plant.

Because of the minimal amount of water that would be generated during project operations and because more than 40 percent of wastewater treatment capacity remains, it is unlikely that the total amount of wastewater from operation of the HSR project and the cumulative projects would exceed the capacity of existing wastewater treatment facilities to result in the need for construction of new wastewater treatment infrastructure. Therefore, there would not be a cumulative impact.

Stormwater Generation

Construction of the HSR project in combination with other cumulative development projects would result in changes to stormwater runoff, including increases in stormwater runoff from new impervious surfaces. Greater stormwater runoff would place higher demands on existing stormwater infrastructure. The Authority, during the detailed design phase, would evaluate each receiving stormwater system's capacity to accommodate runoff from the project alternatives. The Authority's contractor would build new stormwater management structures in accordance with the stormwater pollution prevention plan (SWPPP) and stormwater management and treatment plan. Cumulative projects would be subject to permitting of proposed stormwater management systems under the San Francisco, San Mateo, and Santa Clara Counties' National Pollutant Discharge Elimination System (NPDES) stormwater management programs, including assessment of potential conflicts of proposed projects with existing stormwater management infrastructure and stormwater management system capacity. In view of these requirements, the project in combination with cumulative projects would not require construction of additional stormwater management systems beyond those systems already in place or planned, nor would it result in exceedance of stormwater management system capacity. Consequently, the project in combination with other cumulative projects would not result in cumulative impacts on stormwater management systems.

Energy

The cumulative condition for energy resources consists of the statewide electrical grid and is reflected in electricity supply and demand planning documents of the California Energy Commission and California Independent System Operator (Cal-ISO). The cumulative condition for energy resources also involves natural gas supply and distribution and petroleum product (e.g., diesel fuel, gasoline) supply and distribution.

According to the California Energy Commission, total statewide electricity consumption grew from 219,362 million kilowatt hours in 1990 to 285,700 million kilowatt hours in 2016 (CEC 2018).

Santa Clara County consumed the most electricity (62.4 percent of the region's 26,876 million kilowatt hours), followed by San Francisco County (21.4 percent), and San Mateo County (16.1 percent). Statewide electricity consumption in 2027 is projected to be approximately 320,000 gigawatt hours for the mid-demand energy projection case. Average annual projected energy demand growth rate from 2015 to 2027 is 1.1 percent for the mid-demand energy projection case (CEC 2017). The increasing demand for electrical energy is based on growth in both population (i.e., households) and commerce (i.e., commercial and industrial businesses).

The project in combination with cumulative development would contribute to an increase in electricity use and increased demands on the existing electric utility infrastructure, including increased peak and base period electricity demand. Construction and operations of the project alternatives would consume electricity for construction equipment, train operation, stations, and the Brisbane LMF. Electric power for the project would be provided by electrification of the existing Caltrain corridor, which is being installed as part of the PCEP. Cumulative development projects (e.g., commercial, residential, and industrial development projects) would consume electricity during the same timeframe as construction and operations of the project, and the generally projected increase in population and economic output in the cumulative RSA would result in increased electricity demands. High-voltage electric transmission lines, power lines, and distribution lines would potentially need to be built or upgraded to serve the increased electricity demand or to meet grid reliability requirements, respectively.

Electricity providers in California perform regular electricity demand projections that estimate the demand created by planned development. In addition, Cal-ISO annually publishes a transmission plan that assesses the need for transmission lines or other electrical infrastructure to meet the future needs of the Cal-ISO-controlled electrical grid. The Cal-ISO *2016–2017 Transmission Plan* indicates that transmission infrastructure projects needed to meet California's renewable energy standards by 2020 are already approved and underway, and that Cal-ISO will conduct an assessment of transmission infrastructure needed to meet California's 2030 renewable energy goals (Cal-ISO 2017). Furthermore, the Cal-ISO *2016–2017 Transmission Plan* identifies that the PCEP would address the increase in load resulting from the blended system and connect the Caltrain and HSR system to the Pacific Gas and Electric Company transmission system by two substations in South San Francisco and South San Jose. The Cal-ISO *2016–2017 Transmission Plan* concurs with the proposed interconnections (Cal-ISO 2017). Thus, this interconnection would accommodate the project's electricity demand. As a result, energy used for construction of cumulative projects in combination with HSR construction and operations would not require additional energy capacity beyond that which already exists or is already planned and would not greatly increase peak or base period demands for electricity and other forms of energy. Because the construction and operation of cumulative projects would include new/upgraded transmission/power lines and would not require a new unplanned energy supply or unplanned additional capacity, there would not be a cumulative impact on energy resources.

California's population was 39.8 million as of January 1, 2018 (CDOF 2018a), and is projected to exceed 42 million by 2025 and 47 million by 2040 (CDOF 2018b). In 2017, sales of diesel fuel to California end users were approximately 1.2 mgd and sales of gasoline to California end users were approximately 4.4 mgd (approximately 1.6 billion gallons per year) (EIA 2018a, 2018b). Because of trends in travel demand, congestion, and other travel conditions, the market for intercity travel in California that the proposed HSR system would serve is projected to grow by up to 46 percent over the next 30 years, placing greater demands on gasoline and fuel resources. Construction of cumulative projects would consume gasoline and diesel fuel for operation of construction equipment and vehicles. Operations of cumulative projects and general population growth would result in increases in petroleum product consumption. Construction of either of the project alternatives would consume gasoline and diesel fuel for operation of construction vehicles and equipment. However, project operations would reduce demand for transportation fuels because passengers would use the HSR as an alternative to vehicles and airplanes. Consumption of gasoline and diesel fuel for construction and operations of the project in combination with cumulative projects would not constrain the availability of fuel in the cumulative RSA because fuel for construction and operations would be supplied by the

petroleum product production and distribution infrastructure in California, and because HSR operations would reduce demand for petroleum fuel products. Therefore, construction and operations of the project in combination with cumulative projects would not generate a cumulative impact on energy resources.

CEQA Conclusion

Public Utilities

The project in combination with other cumulative projects would not generate significant cumulative impacts under CEQA related to public utilities to which the project alternatives would contribute because effective coordination and notification activities applied during construction and local and regional planning and regulatory requirements would minimize the impact of temporary utility service interruptions on public utilities and public utility customers. Construction that would affect the rail right-of-way would be subject to design and construction requirements to maintain access to utilities in the right-of-way and to avoid impacts on utilities remaining within the right-of-way. Water conservation measures and use of nonpotable and recycled water for construction activities would reduce impacts from water use for project construction. Therefore, CEQA does not require any mitigation.

Energy

The project in combination with other cumulative projects would not generate significant cumulative impacts under CEQA related to energy to which the project alternatives would contribute because energy consumption for construction and operations would not place a substantial demand on regional energy supply, require construction of substantial additional electric generating capacity, or substantially increase peak- or base-period electricity demand. Therefore, CEQA does not require any mitigation.

3.18.6.6 Biological and Aquatic Resources

Resource Study Area

The cumulative RSA for biological and aquatic resources is defined as the nine subsections of the Central California Foothills and Coastal Mountains and California Central Valley ecoregions in which the project and adjacent San Jose to Merced Project Section are located: San Francisco Peninsula, Bay Flats, Bay Terraces/Lower Santa Clara Valley, Leeward Hills, Upper Santa Clara Valley, East Bay Hills/Western Diablo Range, Diablo Range, Westside Alluvial Fans and Terraces, and San Joaquin Basin (Griffith et al. 2016). This area is appropriate for analyzing cumulative impacts because ecoregion boundaries “are designed to serve as a spatial framework for the research, assessment, management, and monitoring of ecosystems and ecosystem components” (Griffith et al. 2016). The cumulative RSA captures regional impacts on biological and aquatic resources associated with cumulative projects affecting similar land cover types and occurring within neighboring watersheds. It is slightly larger than the RSAs described in Section 3.7, Biological and Aquatic Resources, because it considers impacts at the landscape (i.e., ecoregion) instead of local (i.e., project footprint and habitat study area) scale.

Cumulative Condition

Special-Status Species

Past and ongoing development in the cumulative RSA has resulted in the widespread conversion of undeveloped land to commercial, residential, transportation, and agricultural land uses, which has resulted in large-scale habitat loss and degradation for native plants and wildlife. For example, between 1800 and 1998, 79 percent (150,000 acres) of tidal marshes and 42 percent (21,000 acres) of tidal flats in the San Francisco Bay Estuary were lost to diking and filling (California State Coastal Conservancy 2015). Most of the areas between the San Francisco Bay shoreline and surrounding foothills (i.e., the Bay Terraces/Lower Santa Clara Valley ecoregion) were developed for urban and residential uses in the same period. These trends in the northern portion of the cumulative RSA have slowed in the last decade because of extensive wetland restoration around San Francisco Bay (California State Coastal Conservancy 2015) and

increased regulatory protection of remaining habitat fragments for federally and state-listed species (e.g., San Bruno Mountain) and aquatic resources (i.e., wetlands and nonwetland waters such as streams) in a heavily urbanized landscape. Minor and localized impacts on these resources are expected to continue in the cumulative RSA but large-scale habitat loss is not expected because very little undeveloped land remains to be lost. Most areas with high ecological integrity[7] and that support these resources are already protected by local, state, and federal agencies. In other portions of the cumulative RSA (e.g., Lower and Upper Santa Clara Valleys, SR 152 corridor through Diablo Range, San Joaquin Valley), however, development pressures are expected to continue.

The permanent conversion of existing land uses to residential, commercial, agricultural, and transportation uses would result in cumulative impacts on special-status species in the cumulative RSA. These cumulative impacts would be mostly likely to occur for species that occur in suitable habitat throughout the cumulative RSA (e.g., California red-legged frog [*Rana draytonii*]); species confined to specific, well-known sites that are already protected (e.g., callippe silverspot butterfly [*Speyeria callippe callippe*], Bay checkerspot butterfly [*Euphydryas editha bayensis*], and Mission blue butterfly [*Plebejus icariodes missionensis*] at San Bruno Mountain near Brisbane, San Francisco garter snake [*Thamnophis sirtalis tetrataenia*] at the San Francisco International Airport [SFO]) West-of-Bayshore property) would not be subjected to impacts of other projects in different geographic areas. Additionally, construction of these projects could result in land disturbance, increased vehicle traffic, and topography alteration, which could lead to disturbance, injury, or mortality of special-status wildlife individuals. Examples of other current or planned projects that would affect special-status species and their habitat include the PCEP (construction is currently underway and is scheduled for completion in 2021), development anticipated by the 2018 Brisbane General Plan Amendment at the Brisbane Baylands site,[8] the 1400 North Shoreline Boulevard development project in the City of Mountain View, the SFO Expansion project in South San Francisco, and the San Jose to Merced Project Section.

Some special-status species (i.e., listed under FESA or the California Endangered Species Act) are protected by law and any cumulative projects would be required to incorporate measures to minimize disturbance of special-status species, such as conducting pre-construction surveys; avoiding occupied habitat or relocating individuals out of work areas during construction; salvaging, relocating, and propagating special-status plant species found during pre-construction surveys; and restoring temporarily affected habitat after construction. Projects may also be required by federal permits, state permits, or both to compensate for direct impacts on listed species habitat by preserving, creating, restoring, or enhancing in-kind habitat. Additionally, the project alternatives include requirements that would avoid or minimize many of the direct and indirect impacts associated with construction of the HSR system. For example, the IAMFs identified in Section 3.7 include measures to designate agency-approved project biologists, develop a comprehensive biological resources management plan, and provide training to all workers regarding identification and avoidance of sensitive biological and aquatic resources (including special-status species and their habitat), and require site housekeeping practices to minimize degradation of habitat.

The project alternatives would also implement an array of mitigation measures to avoid or minimize impacts on special-status species and their habitat, including preparation of a restoration and revegetation plan and weed control plan, identification of environmentally sensitive areas, conducting pre-construction surveys and biological monitoring during construction, and providing compensatory mitigation for habitat loss. Other cumulative projects

[7] Ecosystems have ecological integrity when their native components are intact, including abiotic components, biodiversity, and ecosystem processes.

[8] At the November 2018 general election the City of Brisbane approved a General Plan Amendment for the Baylands area that designated locations and densities for residential, commercial and hotel development. A revised Specific Plan is under preparation to reflect the approved General Plan Amendment. This cumulative impacts analysis considers the proposed changes to zoning and land use designations, consistent with the 2018 Brisbane General Plan Amendment when assessing the potential contribution of the project to cumulative impacts.

would have in place similar measures to minimize impacts. While these measures would minimize project-specific impacts, they would not completely prevent habitat loss for all species throughout the cumulative RSA, nor would they eliminate the potential for injury or mortality of species individuals during construction. These impacts would combine within the cumulative RSA to result in a cumulative impact.

Non-Special-Status Wildlife

As described in Section 3.7, the cumulative RSA supports an abundant diversity of non-special-status wildlife species that do not receive legal protection and that are not considered sensitive by regulatory agencies, but that nonetheless contribute to the state's biodiversity. Cumulative development has resulted in the conversion or degradation of habitat for some species and has encouraged the expansion of generalist species that have adapted to and thrive in human-dominated landscapes (e.g., American crow, black-tailed deer), often at the expense of other native species. See the discussion under Special-Status Species for a description of the cumulative condition and the cumulative projects that contribute to these impacts.

Other cumulative projects potentially affecting non-special-status wildlife would be required to incorporate measures to minimize impacts on non-special-status wildlife, such as conducting pre-construction surveys to identify occupied habitat features to be avoided during construction (e.g., active nests, occupied bat roosts). Additionally, the project alternatives include requirements that would avoid or minimize many of the direct and indirect impacts associated with construction of the HSR system. The project IAMFs and mitigation measures for special-status species would also minimize impacts on non-special-status wildlife. Other cumulative projects would likely have in place similar measures to minimize impacts, although the effectiveness of such measures would likely vary by project. While these measures would minimize project-specific impacts, they would not completely prevent habitat loss for all species throughout the cumulative RSA, nor would they eliminate the potential for injury or mortality of species individuals during construction. These impacts would combine within the cumulative RSA to result in a cumulative impact.

Special-Status Plant Communities

Construction of cumulative projects would result in the removal of land cover supporting natural vegetation types, some of which may support special-status plant communities. The project alternatives would affect two special-status plant communities: pickleweed mats and arroyo willow thickets. Other cumulative projects that could affect these communities include Bayfront Park in Burlingame (pickleweed mats) and development at the Brisbane Baylands site (arroyo willow thickets); impacts would occur if activities associated with these projects resulted in the direct removal or degradation of these communities in or adjacent to the project footprints. Other special-status plant communities known to occur in the cumulative RSA include Fremont's goldfields-salt grass alkaline vernal pools, valley oak woodland, Fremont cottonwood forest, creeping rye grass turfs, and purple needlegrass grassland, among others. See the discussion under Special-Status Species for a description of the cumulative condition and the cumulative projects that contribute to regional impacts on these communities.

Other cumulative projects potentially affecting special-status plant communities would be required to incorporate measures to minimize impacts on such communities when they are legally protected (i.e., synonymous with listed species habitat [e.g., vernal pools that support federally listed vernal pool fairy shrimp] or aquatic resources regulated under the federal CWA, Porter-Cologne Water Quality Control Act, or California Fish and Game Code § 1600 et seq.). Projects would not be required to avoid or minimize impacts on special-status plant communities without legal protection unless the CEQA lead agency determined that such impacts were significant and warranted mitigation. The project alternatives include requirements that would avoid or minimize many of the direct and indirect impacts associated with construction of the HSR system. The project IAMFs and mitigation measures for special-status species would also minimize impacts on special-status plant communities. Other cumulative projects would have in place similar measures to minimize impacts on special-status plant communities. While these measures would minimize project-specific impacts, they would not completely prevent the loss of all special-status

plant communities throughout the cumulative RSA. These impacts would combine within the cumulative RSA to result in a cumulative impact.

Aquatic Resources

Past and ongoing development in the cumulative RSA has resulted in the widespread conversion of undeveloped land to commercial, residential, transportation, and agricultural land uses, which has resulted in large-scale loss and degradation of aquatic resources (i.e., wetlands and nonwetland waters such as streams). For example, between 1800 and 1998, 79 percent (150,000 acres) of tidal marshes and 42 percent (21,000 acres) of tidal flats in the San Francisco Bay Estuary were lost to diking and filling (California State Coastal Conservancy 2015). Most of the areas between the San Francisco Bay shoreline and surrounding foothills (i.e., the Bay Terraces/Lower Santa Clara Valley ecoregion) were developed for urban and residential uses in the same period. These trends in the northern portion of the cumulative RSA have slowed in the last decade because of extensive wetland restoration around San Francisco Bay (California State Coastal Conservancy 2015) and increased regulatory protection of remaining aquatic resources in a heavily urbanized landscape. Minor and localized impacts on these resources are expected to continue in the cumulative RSA.

Construction of cumulative projects would result in the direct removal, filling, or hydrological interruption of wetlands or nonwetland waters considered jurisdictional under Section 404 of the federal CWA and the State Porter-Cologne Act, navigable waters considered jurisdictional under Section 10 of the federal Rivers and Harbors Act, or riparian habitat outside CWA jurisdiction but subject to notification under California Fish and Game Code Section 1600 et seq. The cumulative transportation projects expected to create the most temporary and permanent impacts on aquatic resources are roadway widening projects, such as the following: SR 92 between I-280 and US 101 as well as US 101 between Whipple Avenue and Millbrae in San Mateo County; Woodside Road (SR 84) between El Camino Real and Broadway in Redwood City; and San Tomas Expressway from El Camino Real to Williams Road and SR 237 from Mathilda Avenue to SR 85 in Santa Clara County. Highway projects that modify existing roadway interchanges may also require earthwork and build new impervious surfaces in the cumulative RSA, including the following interchanges with US 101: Sierra Point Parkway in San Mateo County; Candlestick in Brisbane; Broadway in Burlingame; Holly Street in San Carlos; Woodside Road in Redwood City; Willow Road in Menlo Park; Trimble Road/De La Cruz Boulevard/Central and Montague Expressway in Santa Clara County; and SR 237/Mathilda in Sunnyvale. Several more interchanges, not involving US 101, would be rebuilt in the cumulative RSA, such as SR 92/El Camino Real in San Mateo; I-880/I-280/Stevens Creek Boulevard in Santa Clara County; and I-880/Coleman Avenue in San Jose.

Several of the cumulative development projects would also have direct impacts on aquatic resources. These include residential projects, such as development at the Brisbane Baylands site and the Inner Harbor Specific Plan in Redwood City; transportation projects, like widening US 101 from Whipple Avenue to Millbrae in San Mateo County, construction of express lanes and auxiliary lanes on SR 85 from I-280 to SR 87 in Santa Clara County, and a new Ferry Terminal in Redwood City; and the Central Valley Wye, which requires new crossings of numerous wetlands and nonwetland waters. Impacts would occur if activities associated with these projects resulted in the direct removal, filling, or hydrological interruption of these resources within or adjacent to the project footprints.

Other cumulative projects would be required to incorporate measures to avoid or minimize cumulative temporary construction impacts and permanent impacts on aquatic resources. USACE has regulatory authority over activities affecting wetlands and nonwetland waters under Section 404 of the CWA and Section 10 of the Rivers and Harbors Act and issues standard permits for such activities on a project-by-project basis. The California Department of Fish and Wildlife (CDFW) has regulatory authority over streams. streambeds, and sometimes adjacent riparian habitat under Section 1600 et seq. of the California Fish and Game Code (streams and streambeds would also be subject to USACE jurisdiction under the CWA) and issues lake and streambed alteration (LSA) agreements for activities affecting these resources on a project-by-

project basis. Other cumulative projects affecting aquatic resources would be required to incorporate measures to minimize impacts, such as construction best management practices (BMP) to reduce soil erosion and limit physical changes to stream channels and riparian habitat, as part of their standard permit from the USACE and LSA agreement from the CDFW. In addition, the project alternatives include requirements that would avoid or minimize many of the direct and indirect impacts associated with construction of the HSR system. The project IAMFs and mitigation measures for special-status species would also minimize impacts on aquatic resources because such resources provide habitat for special-status species known to occur. While these permit processes and measures work together to minimize impacts related to direct removal, filling, or hydrological interruption of aquatic resources, they would not completely prevent the loss or degradation of aquatic resources throughout the cumulative RSA. These impacts would combine within the cumulative RSA to result in a cumulative impact.

Protected Trees

Protected trees are afforded protection by, and specifically identified in, county and city ordinances, codes, or general plans (see Volume 2, Appendix 2-I, Regional and Local Plans and Policies). A single project may affect protected trees in multiple jurisdictions, but there is no single law or policy covering all public trees in the cumulative RSA. Cumulative projects would affect protected trees if construction or operation activities require the removal or trimming of trees protected under local tree protection ordinances. The project is not expected to remove a substantial number of protected trees because many within the Caltrain right-of-way were removed during construction of the PCEP, but impacts could still occur. Because cumulative projects, including the PCEP and project alternatives, would entail removal and trimming of protected trees, construction activities would result in a cumulative impact.

Operation of cumulative projects, including the project alternatives, could entail occasional trimming of some protected trees with branches that grow into the electrical safety zone. However, because construction would likely have resulted in the bulk of impacts (removal, extensive trimming) of protected trees, operations in the same area are not likely to have a substantial further impact. Accordingly, there would not be a cumulative impact on protected trees from operation of cumulative projects, including the project alternatives.

Wildlife Corridors

Construction of cumulative projects would interfere with established wildlife corridors identified in statewide (Caltrans and California Department of Fish and Game [CDFG] 2010) or regional (Penrod et al. 2013) habitat connectivity reports but the project alternatives would not. Wildlife corridors of statewide importance (Caltrans and CDFG 2010) near the project alternatives include two Natural Landscape Blocks: San Bruno Mountain to the north of South San Francisco and an uninterrupted block of high-quality northern coastal salt marsh that fringes the southern end of San Francisco Bay. Both of these areas are designated for biological resource protection and outside the footprint of the project alternatives. Several wildlife corridors of regional importance are located in the cumulative RSA, including the Santa Cruz Mountains to Diablo Range linkage across the Santa Clara Valley (Penrod et al. 2013). Planned transportation projects such as the adjacent San Jose to Merced Project Section would affect this and other corridors where roads or HSR tracks create new barriers to wildlife movement.

The project alternatives cross 18 watercourses that are not identified as established wildlife corridors but facilitate movement of local wildlife under the existing Caltrain tracks. Construction activities at eight of these watercourses (Guadalupe Valley Creek, Borel Creek, Belmont Creek, Cordilleras Creek, San Francisquito Creek, Stevens Creek, Los Gatos Creek, and Guadalupe River) would temporarily disrupt local wildlife movement but would not create any new barriers to wildlife movement. HSR operations would not affect existing wildlife movement through these corridors because any local animals that use these corridors would have habituated to existing Caltrain operations and maintenance (O&M).

Planned transportation projects, including the adjacent San Jose to Merced Project Section, would implement measures to minimize impacts on wildlife movement, including the creation of

dedicated wildlife crossings where the alignment crosses known corridors. While these measures would minimize project-specific impacts, they would not prevent such impacts and would contribute to regional habitat fragmentation and loss of regional habitat connectivity. These impacts would combine within the cumulative RSA to result in a cumulative impact.

Conservation Areas and Habitat Conservation Plans

Construction of cumulative projects would remove or degrade natural land cover within land parcels that are protected or managed specifically or have been designated for the conservation of biological or aquatic resources, and would conflict with the provisions of adopted habitat conservation plans (HCP). The project would not affect any conservation areas because there are no such areas in the project footprint. The project overlaps with the planning area for the *Pacific Gas and Electric Company Bay Area Operations & Maintenance Habitat Conservation Plan* (Pacific Gas and Electric Company [PG&E] Bay Area O&M HCP) (PG&E 2017) and those for the *Santa Clara Valley Habitat Plan* (SCVHP) (County of Santa Clara et al. 2012) and Santa Clara Valley Greenprint (Santa Clara Valley Open Space Authority [SCVOSA] 2014) in the San Jose Diridon Station Approach Subsection, but would not conflict with the provisions of any of these plans.

Although the cumulative projects, such as the adjacent San Jose to Merced Project Section, would implement measures to minimize impacts on conservation areas and HCPs, they would not prevent such impacts. Other cumulative projects would also affect conservation areas and conflict with regional HCPs. The combined impacts of these projects within the cumulative RSA would result in a cumulative impact.

Contribution of the Project Alternatives

Special-Status Species

Although the project alternatives would result in temporary and permanent construction impacts on habitat for special-status species, these impacts would be minimal compared to the total amount of remaining habitat for these species within their known range as well as the cumulative RSA. Moreover, these impacts would be confined to an area that is dominated by urban development and exposed to ongoing human disturbance. The project alternatives would not eliminate remaining tidal marsh habitat for Alameda song sparrow (*Melospiza melodia pusillula*) and saltmarsh common yellowthroat (*Geothlypis trichas sinuosa*) at Brisbane Lagoon or wetland and upland habitat for San Francisco garter snake at the SFO West-of-Bayshore property. Alternative A would remove 0.6 acre of potential estuarine habitat for central California coast steelhead and green sturgeon and designated essential fish habitat in Visitacion Creek, but the habitat at this location is severely degraded. Alternative B would remove 8 acres of suitable habitat for three federally listed butterfly species (callippe silverspot butterfly, Bay checkerspot butterfly, and Mission blue butterfly) on Icehouse Hill near San Bruno Mountain, but would not affect any habitat known to be occupied by these species. In addition, mitigation measures identified in Section 3.7.9, Mitigation Measures, would compensate for permanent and temporary impacts by providing for on- or off-site protection, restoration, or enhancement of listed species habitat. The measures proposed and compliance with FESA and CESA mitigation requirements would fully offset impacts on special-status species habitat and individuals.

Non-Special-Status Wildlife

Although the project alternatives would result in temporary and permanent construction impacts on habitat for non-special-status wildlife, these impacts would be minimal compared to the total amount of remaining habitat for native wildlife in the cumulative RSA. Moreover, these impacts would be confined to an area that is dominated by urban development and exposed to ongoing human disturbance. Most non-special-status wildlife species affected by the project alternatives are common and highly adapted to the urban environment.

Special-Status Plant Communities

Although the project alternatives would result in temporary and permanent construction impacts on special-status plant communities (i.e., pickleweed mats and arroyo willow thickets), these

impacts would be minimal compared to the total acreage of these communities in the cumulative RSA. In addition, the project alternatives would have minimal impacts (4.2 acres under Alternative A, 3.8 acres under Alternative B) on only two of the hundreds of special-status plant communities known to occur in the cumulative RSA.

Aquatic Resources

Although the project alternatives would result in temporary and permanent construction impacts on aquatic resources, these impacts would be minimal compared to the total acreage of aquatic resources in the cumulative RSA. For instance, the extent of affected resources is 6.1 acres of wetlands, 7.1 acres of nonwetland waters, and 2.4 acres of riparian habitat under Alternative A and 11.4 acres of wetlands, 6.7 acres of nonwetland waters, and 3.7 acres of riparian habitat under Alternative B.[9] Mitigation measures identified in Section 3.7.9 would compensate for permanent and temporary impacts by providing for on- or off-site creation, restoration, enhancement, or preservation of "in kind" wetlands or nonwetland waters that provide the same functions and values as those impacted by construction. This action would be consistent with the USACE "no net loss" policy for wetland mitigation.

Protected Trees

Although the project would result in the removal or trimming of protected trees, the number of such trees is expected to be small because many within the Caltrain right-of-way would have been removed during construction of the PCEP.

Wildlife Corridors

The project alternatives would have minimal impacts on resident wildlife movement along 8 of the 18 watercourses that cross under the project footprint (Table 3.7-4). Project impacts would occur when animals delay or alter their normal movement patterns in response to construction or operations activities within or near the watercourse crossings. The project alternatives would not affect any wildlife corridors of statewide or regional importance. The project alternatives would not affect any established wildlife corridors and impacts of the project alternatives on resident wildlife movement would be short-term and temporary.

Conservation Areas and Habitat Conservation Plans

The project alternatives would not affect any conservation areas or HCPs.

CEQA Conclusion

Special-Status Plant and Wildlife Species

Construction and operation of the project in combination with other cumulative projects would result in a significant cumulative impact on special-status species under CEQA because they would have a substantial adverse effect, both directly (i.e., causing mortality of individual animals) and through habitat modifications (i.e., conversion or degradation of habitat), on such species. The project's contribution to the significant cumulative impact would not be considerable, however, because extensive mitigation measures, such as species-specific avoidance, minimization, and compensatory mitigation measures, are proposed to help reduce the project's contribution to this impact. Based on the conclusion that the impact is not a considerable contribution, CEQA does not require any mitigation.

Non-Special-Status Wildlife

Construction and operation of the project in combination with other cumulative projects would result in a significant cumulative impact on non-special-status wildlife under CEQA because they

[9] Because the San Jose Diridon Station Approach Subsection is evaluated under both the San Francisco to San Jose Project Section and the San Jose to Merced Project Section, the acreage of affected aquatic resources is included in the estimates for both projects and conservatively assumes that all resources in the project footprint would be affected. Actual impacts are anticipated to be less because of opportunities for avoidance provided by design refinements and construction planning.

would impede the use of wildlife nursery sites (e.g., bird nests, occupied bat roosts) throughout the cumulative RSA. The project's contribution to the significant cumulative impact would not be considerable, however, because most non-special-status wildlife species affected by the project are common, urban-adapted species that are ubiquitous throughout the cumulative RSA. Therefore, CEQA does not require any mitigation.

Special-Status Plant Communities

Construction and operation of the project in combination with other cumulative projects would result in a significant cumulative impact on special-status plant communities under CEQA because affected communities include riparian habitat and other sensitive natural communities identified by the CDFW, and the cumulative projects would affect such communities throughout the cumulative RSA. The project's contribution to the significant cumulative impact would not be considerable, however, because of the low number and limited extent of communities and small amount affected. Therefore, CEQA does not require any mitigation.

Aquatic Resources

Construction and operation of the project in combination with other cumulative projects would result in a significant cumulative impact on aquatic resources under CEQA because such resources include federally protected wetlands as defined by Section 404 of the CWA, and the cumulative projects would affect such wetlands throughout the cumulative RSA. The project's contribution to the significant cumulative impact would not be considerable, however, because of the low habitat quality and limited extent of affected wetlands, as well as the proposed mitigation. Therefore, CEQA does not require any mitigation.

Protected Trees

Construction and operation of the project in combination with other cumulative projects would result in a significant cumulative impact on protected trees under CEQA because they would conflict with local tree preservation policies or ordinances throughout the cumulative RSA. The project's contribution to the significant cumulative impact would not be considerable, however, because of the small number of trees expected to be removed. Therefore, CEQA does not require any mitigation.

Wildlife Corridors

Construction and operation of the project in combination with other cumulative projects would result in a significant cumulative impact on wildlife corridors under CEQA because they would interfere substantially with the movement of native wildlife and with established native resident and migratory wildlife corridors. The project's contribution to the significant cumulative impact would not be considerable, however, because it would not affect any established wildlife corridors and its impacts on resident wildlife movement across the blended Caltrain/HSR right-of-way would be short-term and temporary. Therefore, CEQA does not require any mitigation.

Conservation Areas and Habitat Conservation Plans

Construction and operation of the project in combination with other cumulative projects would result in a significant cumulative impact on HCPs under CEQA because they would conflict with the provisions of an adopted HCP and natural community conservation plan (SCVHP) and local HCP (Coyote Valley Landscape Linkages Report). The project would not contribute to the significant cumulative impact, however, because there are no conservation areas that overlap with the project footprint and the portion of the project footprint that overlaps with the SCVHP (County of Santa Clara et al. 2012) and Santa Clara Valley Greenprint (SCVOSA 2014) would not conflict with any provisions of these plans. Therefore, CEQA does not require any mitigation.

3.18.6.7 Hydrology and Water Resources

Resource Study Area

This cumulative analysis uses the same RSAs for surface water, groundwater, and floodplains as those described in Section 3.8, Hydrology and Water Resources, because they are sufficiently

broad enough to cover the area in which the potential cumulative impacts of the project alternatives, in combination with cumulative projects, could occur. The cumulative RSAs are illustrated on figures in Section 3.8.4.1, Definition of Resource Study Area.

The surface water RSA is defined as either portions of or entire CalWater Planning Watersheds that would be crossed by the project alternatives, depending on the subsection (Figure 3.8-1). The groundwater RSA consists of the California Department of Water Resources (DWR) groundwater subbasin boundaries of the aquifers crossed by the project (Figure 3.8-2). The groundwater RSA was further defined by limiting the RSA to portions of groundwater basins within 2 miles or 10 miles of the project footprint, depending on the subsection. The floodplain RSA includes all Federal Emergency Management Agency (FEMA) 100-year floodplain boundaries in the surface water RSA (Figure 3.8-6).

Cumulative Condition

Past and ongoing urban development has resulted in widespread conversion of undeveloped land to commercial, residential, and transportation land uses. Under the cumulative condition, this trend would be expected to continue in the cumulative RSAs, but at a slower rate. Development stemming from the projected population increase through 2040 would primarily consist of redeveloping existing residential, industrial, commercial, educational, and transportation facilities to increase residential capacity, improve business operations, and expand public services. To a lesser extent, the cumulative condition also includes new construction in areas that are currently undeveloped, resulting in land use change.

Surface Water Hydrology

Construction and operation of the project in combination with other cumulative projects would change how water flows over the ground surface and through streams, creeks, ditches, and wetlands. The project in combination with other cumulative projects would result in a cumulative impact on surface water hydrology if the combined effect alters the drainage pattern, resulting in substantial erosion and sedimentation or exceeding the capacity of existing or planned drainage systems.

During construction, temporary impacts on surface water hydrology would result from earthwork, temporary stream diversion, dewatering, and construction activities in aquatic resources. Therefore, construction of planned development could require temporary stream diversion, dewatering, or construction in aquatic resources when the development crosses over an aquatic resource or is located on or near the banks of the aquatic resource. Permanent impacts from building planned developments would result from earthwork, net increases in impervious surface area, and modifications to existing stormwater drainage systems. New roadway and highway widening projects and commercial and residential development would add pavement area, rooftops, sidewalks, and other new construction that would replace existing undeveloped land. These new impervious surfaces would also require new drainage systems or modification of existing drainage systems to prevent standing water. This increase in impervious surface and drainage density would result in periodic permanent increases in stormwater runoff volumes during rain events.

In the cumulative RSA, many linear transportation projects would cross over one or more aquatic resources, potentially requiring temporary stream diversion and construction activities in aquatic resources. Many of these linear transportation projects would also require earthwork and build new impervious surfaces. As a linear transportation project, the project alternatives would add more than 100 acres of impervious surfaces distributed throughout the RSA, with the San Jose Diridon Station and the East or West Brisbane LMF being the largest additions of impervious surfaces from the project alternatives. The planned transportation projects expected to create the most temporary and permanent impacts on surface water hydrology are roadway widening projects, such as the following: SR 92 between I-280 and US 101 as well as US 101 between Whipple Avenue and Millbrae in San Mateo County; Woodside Road (SR 84) between El Camino Real and Broadway in Redwood City; and San Tomas Expressway from El Camino Real to Williams Road and SR 237 from Mathilda Avenue to SR 85 in Santa Clara County. Highway

projects that modify existing roadway interchanges may also require earthwork and build new impervious surfaces in the cumulative RSA, including the following interchanges with US 101: Sierra Point Parkway in San Mateo County; Candlestick in Brisbane; Broadway in Burlingame; Holly Street in San Carlos; Woodside Road in Redwood City; Willow Road in Menlo Park; Trimble Road/De La Cruz Boulevard/Central and Montague Expressway in Santa Clara County; and SR 237/Mathilda in Sunnyvale. Several more interchanges not involving US 101, would be rebuilt in the cumulative RSA, such as SR 92/El Camino Real in San Mateo; and I-880/I-280/Stevens Creek Boulevard in Santa Clara County. Construction of the HSR project in combination with other cumulative projects would contribute additional runoff during storm events from new impervious surfaces.

Several of the cumulative development projects would also have direct impacts on aquatic resources. These include mixed-use development consistent with the Brisbane General Plan amendment at Brisbane Baylands, which would be located near the proposed Brisbane LMF. Both the proposed Brisbane LMF and Brisbane Baylands development would permanent affect several aquatic resources in the jurisdiction of the San Francisco Bay Conservation and Development Commission. With build-out of both the Brisbane Baylands and the LMF, a majority of the existing aquatic resources in the vicinity of these developments would be filled or otherwise affected, triggering the need for compensatory mitigation due to a net loss in jurisdictional aquatic resources. Other developments would also have direct impacts on aquatic resources, including residential projects, such as the Inner Harbor Specific Plan in Redwood City; transportation projects, such as widening US 101 from Whipple Avenue to Millbrae in San Mateo County, construction of express lanes and auxiliary lanes on SR 85 from I-280 to SR 87 in Santa Clara County, and a new Ferry Terminal in Redwood City; and the Central Valley Wye, which requires new crossings of numerous aquatic resources. Each of the project alternatives would cross more than 60 aquatic resources, some of which would require temporary stream diversion and work in the aquatic resource. While each of the project alternatives would cross numerous aquatic resources, many of these proposed crossings would utilize existing infrastructure where possible, modifying the existing crossing where necessary to minimize impacts on surface water hydrology. Construction of the HSR project in combination with cumulative development projects would require work in aquatic resources and result in direct impacts on aquatic resources.

Existing laws and permit processes in the cumulative RSA would work together to avoid or minimize cumulative temporary construction impacts and permanent impacts on surface water hydrology from planned development and the project alternatives. Under the construction general permit (CGP), a SWPPP is required for all planned developments that disturb more than 1 acre of soil. The SWPPPs would include temporary erosion and sediment control BMPs to control erosion and sedimentation resulting from changes in topography (i.e., cut-and-fill slopes), as well as temporary drainage systems, such as slope drains and stabilized flow conveyance systems, to maintain existing drainage patterns during construction of planned development. Other regulations restrict where development can occur in relation to an aquatic resource, such as riparian and streambank setbacks required by the municipal regional permit (MRP) and local municipal codes, as well as control temporary construction impacts and permanent physical changes to aquatic resources, including CWA Section 401 Water Quality Certifications, CWA Section 404 permits for dredge and fill activities in aquatic resources, and LSA agreements. Additional permit processes require new development, redevelopment, and transportation projects to incorporate temporary and permanent stormwater capture and hydromodification features (e.g., basins, bioswales, storage features), as applicable, during construction and operations to moderate peak discharges and treat additional runoff of planned development and the project alternatives. These permits consist of federal CWA Section 402 NPDES municipal separate storm sewer system (MS4) permits, such as the MRP, Phase II MS4 permit, and Caltrans NPDES permit.

In accordance with these existing laws and permit processes, the Authority would develop a SWPPP under the CGP and a stormwater management and treatment plan pursuant to the Phase II MS4 permit for the project alternatives (HYD-IAMF#3: Prepare and Implement a Construction Stormwater Pollution Prevention Plan; HYD-IAMF#1: Stormwater Management).

Temporary and permanent BMPs would be applied in the footprint of the project alternatives to stabilize soil, control sediment transport, minimize leaks and spills of materials and equipment, reduce the quantity of runoff, and improve the quality of runoff. Additionally, local grading ordinances would control earthwork proposed by planned development to prevent substantial changes in existing drainage patterns that could result in erosion and sedimentation. Compliance with these permit processes and laws would minimize impacts related to changes in drainage patterns and stormwater runoff quantities and rates; accordingly, there would be no cumulative impacts on surface water hydrology resulting from construction of the planned development and the project alternatives.

Operations of the project alternatives and planned development would include maintenance activities that would intermittently affect drainage patterns and stream flows. These activities may consist of landscaping, such as vegetation management along or near streams, and cleaning storm drainage systems. Local grading, drainage requirements, and local MS4 permits may trigger the need to develop an erosion control or similar plan to minimize surface water hydrology impacts during these operations. These project features would minimize intermittent surface water hydrology impacts with BMPs designed to avoid or minimize erosion and sedimentation in receiving aquatic resources. Therefore, operation of the project in combination with other cumulative projects would not result in cumulative impacts on surface water hydrology.

Surface Water Quality

Construction and operations of the project alternatives in combination with other cumulative projects would alter the quality of water flowing in streams, creeks, and wetlands in the cumulative RSA, all of which eventually discharge into San Francisco Bay. A cumulative impact on water quality would occur if the combined effect of the project alternatives and cumulative projects exceeds a water quality standard, violates a waste discharge requirement, provides substantial additional sources of polluted runoff, or otherwise degrades water quality.

Construction of planned developments would destabilize soil, require the use of materials and equipment, and generate waste, all of which have the potential to degrade water quality. Planned development would also result in temporary impacts on aquatic resources when these features are crossed or when development occurs on or near their banks. Cumulative projects that cross over aquatic resources and involve the construction of bridges or other infrastructure in or near aquatic resources may require construction activities in aquatic resources, potentially exposing surface water to direct introduction of construction materials, equipment, and wastes. New roadway and highway widening projects and commercial and residential development would also add impervious surfaces to the landscape from additions like pavement, rooftops, sidewalks, and other new developments. These new impervious surfaces would also require new drainage systems or modifying existing drainage systems to prevent standing water. New impervious surfaces associated with transportation corridors, including highways, airports, and transit centers, would collect pollutants associated with vehicles and the combustion of fossil fuels.

As described under cumulative impacts on Surface Water Hydrology, linear transportation projects could cross over several aquatic resources, potentially requiring temporary stream diversion and construction activities in those aquatic resources and expose surface water to construction materials, equipment, and wastes. Additionally, linear transportation projects have the potential to create dozens of acres of contiguous new impervious surfaces that accumulate pollutants, which are subsequently discharged into surface aquatic resources and San Francisco Bay via stormwater drainage systems. While the project alternatives would add or replace impervious surfaces throughout the project footprint, the impervious surfaces associated with the San Jose Diridon Station would be the largest single addition of impervious surface area associated with the project alternatives, followed by the East or West Brisbane LMF. This increase in impervious surface area and drainage density would result in periodic and permanent increases in stormwater runoff volumes during rain events. An increase in runoff volumes can accelerate sediment transport, creating permanently elevated levels of suspended sediment in surface water.

As stated under cumulative impacts on Surface Water Hydrology, existing laws and permit processes in the cumulative RSA, such as the CGP, the MRP, Phase II MS4 permit, and the Caltrans NPDES permit, work together to avoid or minimize both temporary impacts and permanent impacts on surface water quality resulting from the construction of individual projects. Permanent stormwater treatment BMPs required by these permits would be incorporated into the design of the project alternatives and planned development to improve runoff quality by reducing concentrations of particulate and dissolved contaminants and reduce runoff volumes prior to discharge into surface aquatic resources to the maximum extent practicable. For the project alternatives, these permanent stormwater treatment BMPs would be documented in a stormwater management and treatment plan in accordance with the Phase II MS4 permit (HYD-IAMF#1). Compliance with these permits would maintain existing water quality in compliance with the CWA, avoiding the potential to exceed water quality standards or violate waste discharge requirements.

In addition, approval from regulatory agencies, including but not limited to the San Francisco Bay Regional Water Quality Control Board, State Water Resources Control Board, CDFW, USACE, and U.S. Fish and Wildlife Service, would be obtained prior to initiating any activity in jurisdictional areas of aquatic resources, such as permanently realigning, modifying, or filling an aquatic resource. Local regulations also restrict where development can occur in relation to an aquatic resource, such as riparian and streambank setbacks required by the MRP and local municipal codes. Compliance with existing laws and permit processes would avoid cumulative impacts on surface water quality, such as violating water quality standards or creating a substantial new source of contaminated runoff.

Operations of the project alternatives in combination with other cumulative projects would use materials and chemicals that could contribute to cumulative surface water quality impacts. Operating many planned developments would be subject to the stormwater permits described in the preceding paragraphs. Additionally, planned industrial development, including transportation facilities, may also be regulated under the industrial general permit (IGP). These permits require the implementation of BMPs to minimize impacts of municipal, industrial, commercial, and transportation operations on surface water quality. Operating the project alternatives would be regulated under the IGP and Phase II MS4 permit (HYD-IAMF#4: Prepare and Implement an Industrial Stormwater Pollution Prevention Plan). Whereas the SWPPP under the IGP would only apply to specific areas that engage in industrial activities, such as stations and the East or West Brisbane LMF, the Phase II MS4 permit would apply to the project's entire right-of-way. These features of cumulative projects and the project alternatives would reduce the risk of project operation to violate water quality standards or create a substantial new source of contaminated runoff. Therefore, operation of the project in combination with other cumulative projects would not result in cumulative impacts on surface water quality.

Groundwater

Construction and operation of the project alternatives in combination with other cumulative projects would affect groundwater quality and the elevation of the groundwater table. Construction of planned developments, including the project alternatives and adjacent project alternatives sections, could require dewatering, or the pumping of groundwater from excavations below the water table. Future development could permanently increase impervious surfaces that reduce the amount of water recharging aquifers in the cumulative RSA by covering soil with pavement and other impermeable surfaces. Operation of the project alternatives in combination with other cumulative projects would require the use of hazardous materials, such as fuels, cleaning products, pesticides, and fertilizers, and generate waste. Exposure of these pollutants to groundwater would contribute to the cumulative degradation of groundwater quality. A cumulative impact would result if the collective effect of the construction or operation of the project in combination with other cumulative projects violates a groundwater quality standard or results in a net lowering of the groundwater table or deficit in the aquifer's productive capacity.

Not all aquifers in the cumulative RSA have experienced the level of demand that historic development has placed on the Santa Clara subbasin, which has been used as a water supply for more than 100 years. The basin recovered from a period of overdraft and associated ground

subsidence after formation of the Santa Clara Valley Water District in 1929. The district applies sound groundwater management methods, including active recharge programs and subsidence monitoring, in compliance with the Sustainable Groundwater Management Act (Santa Clara Valley Water District [SCVWD] 2016). San Mateo County is currently investigating the feasibility of groundwater development in the San Mateo Plain subbasin (County of San Mateo 2018), and, although smaller in area and total storage capacity than both the Santa Clara and San Mateo Plain subbasins, the Westside basin supplies up to 50 percent of the drinking water for San Bruno and Daly City (City of San Bruno et al. 2012). However, the importation of surface water into the cumulative RSA via numerous water supply pipelines since the 1960s, such as the Hetch Hetchy Aqueduct and the Pacheco Conduit, has relieved development pressure on the aquifers in the cumulative RSA, such that they are not at risk of overdraft during typical climatic conditions.

Many planned developments including the project alternatives would be located near the San Francisco Bay. Planned development that includes the construction of foundations near the bay may require deep piles for seismic stability; these piles may require dewatering. For example, pile foundations for the viaduct in the San Jose Diridon Station Approach Subsection are anticipated to require such dewatering. Additionally, the DTX, which includes the construction of a tunnel to extend blended HSR and Caltrain services to the SFTC, and the Central Subway Project, which also proposes a new tunnel, are both located in San Francisco. Both the DTX and Central Subway projects' tunnels would pass through water-bearing alluvium in the Downtown groundwater basin in San Francisco. Construction of these tunnels is likely to require dewatering deep portions of the aquifer. However, because of relatively shallow groundwater in the Downtown basin, the predominant discharge of water from the aquifer would be from construction dewatering (U.S. Department of Transportation et al. 2008).

While these tunnel projects are anticipated to involve deep dewatering, the project alternatives are expected to require shallow dewatering, with the exception of viaduct foundations, in widely spaced locations throughout the project footprint. In addition, some of the dewatering performed in the cumulative condition would occur within aquatic resources in association with temporary stream diversions. Since aquatic resources often receive baseflows from aquifers, dewatering performed in aquatic resources could have an indirect impact on groundwater levels. If groundwater is found to be contaminated during any dewatering activities conducted for the project alternatives or planned development, such as in the location of the proposed Brisbane LMF and mixed-use Brisbane Baylands development, it would be treated prior to release or disposed at a publicly owned treatment works. Existing laws and project approvals, such as CWA Section 401 certifications, CWA Section 402 Waste Discharge Requirements, such as the VOC and Fuel General Permit, LSA agreements from CDFW, and permits from San Francisco Bay Conservation and Development Commission, require this treatment or disposal for all planned development. Groundwater that does not pose a threat to the quality of receiving waters can be discharged under the CGP.

As described under cumulative impacts on Surface Water Hydrology and Surface Water Quality, the project alternatives in combination with other cumulative projects would result in a permanent net increase in impervious surface area within the RSA. While the project alternatives would mostly add or replace small areas of impervious surface throughout the project footprint, the impervious surfaces associated with the San Jose Diridon Station would be the largest single addition of impervious surface area associated with the project alternatives, followed by the East or West Brisbane LMF. Linear transportation projects have the potential to create dozens of acres of contiguous new impervious surfaces that cross over several aquatic resources, whereas cumulative residential projects and other developments would likely result in smaller areas of impervious surface distributed throughout the cumulative RSA. Some of these additional impervious surfaces would cover pervious areas that allow rainfall to percolate into the ground and recharge the aquifers, resulting in a net reduction in groundwater recharge.

Existing laws and permits create incentives for planned development and the project alternatives through the implementation of design features that promote infiltration of stormwater. These design features stem from requirements in CWA Section 402 NPDES permits like the MRP, Phase II MS4 permit, and Caltrans NPDES permit, which encourage maximizing areas of

pervious surfaces, directing runoff to pervious areas where it can infiltrate, and minimizing the construction of impervious surfaces. Compliance with these permits would minimize impacts on groundwater recharge from impervious surfaces. Additionally, active management of groundwater resources in the Santa Clara subbasin is compliant with the Sustainable Groundwater Management Act, stating that groundwater resources are anticipated to meet demand through 2040 during typical years (SCVWD 2016). Pending future release of the updated Bulletin 118 from the DWR in 2020, the San Mateo Plain subbasin may also be required to comply with the Sustainable Groundwater Management Act (County of San Mateo 2018).

Furthermore, operations activities associated with planned development and the project alternatives would require the use of chemicals and other potentially toxic materials, such as mechanical train maintenance, would occur while operating the project alternatives and many of the cumulative projects. The design features of the project alternatives would include standard BMPs to avoid the infiltration of contaminated runoff. In addition, the Authority would prepare a SWPPP according to the CGP and IGP, construction management plan, and hazardous materials monitoring plan, as well as identify alternative nonhazardous materials for use during operations. Cumulative projects would be required to store, manage, transport, and dispose of hazardous materials in accordance with state and federal regulations, which may also include preparing a hazardous materials business plan for review and approval by the local agency's certified unified program agency. These features of cumulative projects and the project alternatives would minimize the potential for leaks and spills and establish contingency plans if a leak or spill nevertheless occurs.

Floodplains

Construction and operation of the project alternatives in combination with other cumulative projects could have a cumulative impact on the vertical profile and horizontal extents of flooding. Construction of either of the project alternatives would require temporary fill in 100-year floodplains regulated by FEMA; this temporary fill could include falsework, trestles, stream diversions, and other temporary structures. Some of the developments in the cumulative RSA are expected to involve the installation of permanent infrastructure and buildings in 100-year floodplains, including bridges and culverts. Additionally, operating planned development and the project alternatives would require maintenance activities conducted in or near floodplains, including but not limited to the routine maintenance of existing bridges, culverts, and drainage systems. These temporary, permanent, and operations impacts have the potential to alter existing 100-year floodplains in the cumulative RSA. A cumulative impact would occur if construction or operation of the project alternatives in combination with other cumulative projects redirects flood flows or increases flood elevations such that people and structures in a floodplain would be imperiled.

Cumulative projects and the project alternatives could contribute to cumulative floodplain impacts. Cumulative development includes residential, highway, aviation, port, industrial, and commercial projects. More residential projects are planned in or near floodplains than any other planned project type in the cumulative RSA, including transportation projects. Residential projects in or near 100-year floodplains delineated by FEMA include Pier 70 Mixed-Use District Project in San Francisco; development anticipated by the 2018 Brisbane General Plan Amendment at the Brisbane Baylands site and Parkside at Brisbane Village Precise Plan in Brisbane; Downtown Station Area Specific Plan in South San Francisco; Transit Corridors Plan in San Bruno; Station Area Specific Plan in Millbrae; Downtown Specific Plan in Burlingame; Belmont Village Specific Plan in Belmont; 353 Main Street and 707 Bradford Street in Redwood City; and 617 East Evelyn Avenue, 669 Old San Francisco Road, 701-729 East Evelyn Avenue, and 755 East Evelyn Avenue in Sunnyvale. Other cumulative developments in or near 100-year floodplains delineated by FEMA include the following transportation projects: new Ferry Terminal in Redwood City; and SR 85 from I-280 to SR 87, US 101 Southbound Trimble Road/De La Cruz Boulevard/Central, and San Tomas Expressway from El Camino Real to Williams Road in Santa Clara County. As a linear transportation project, the project alternatives would include direct modification of floodplains with cut and fill and new or modified hydraulic structures in numerous floodplains between downtown San Francisco and San Jose Diridon Station. The project alternatives in

combination with other cumulative projects could result in both temporary and permanent impacts on floodplains from the placement of temporary fill in the floodplain or the construction of permanent infrastructure and buildings in the floodplain.

Existing laws and permits would avoid or minimize cumulative construction and operation impacts on floodplains that could arise from the construction of from planned development and the project alternatives. The National Flood Insurance Program (NFIP) delegates the management of floodplains to many levels of government. In the cumulative RSA, floodplains are managed at the municipal or county level. Municipalities and counties in the cumulative RSA generally have floodplain management ordinances that promulgate the requirements of the NFIP. In this way, planned development in 100-year floodplains would be subject to approval of local floodplain managers. Within their jurisdiction, local floodplain managers carry out the intent of the NFIP by reviewing design plans of proposed developments with respect to the location and impacts on floodplains. A proposed development in a floodplain can only be built once the local floodplain manager approves the project and issues a permit. When development in floodplains is authorized by the floodplain manager, there is a reduced risk of damage to life and property from flooding as well as a reduced risk of affecting the ecological values of floodplains. In accordance with the NFIP, the project alternatives would minimize temporary and permanent impacts on floodplains with a flood protection plan (HYD-IAMF#2: Flood Protection). The flood protection plan would use hydraulic analysis of the proposed design to design new bridges and culverts or modifications to existing bridges and culverts. Under Alternative A, mitigation would be implemented to prevent change in the existing floodplain hydraulics of Guadalupe River in San Jose as a result of project construction. Furthermore, the Guadalupe River crossing under both alternatives would require coordination with USACE pursuant to Section 14 of the Rivers and Harbors Act (33 United States Code § 408) to ensure there would not be substantial impacts on the floodplain.

Operations of the project alternatives and planned development would require intermittent maintenance in floodplains, such as maintenance of bridges, culverts, and storm drainage systems. However, O&M activities associated with the project alternatives would not require intermittent fill within a floodplain. Therefore, operations of the project alternatives in combination with cumulative projects would not result in cumulative impacts on floodplains.

CEQA Conclusion

Surface Water Hydrology

No cumulative impacts related to surface water hydrology are anticipated during construction or operations of the project in combination with cumulative projects because regulatory standards and conditions of individual project approvals (e.g., CWA § 401 Water Quality Certifications, CWA § 402 NPDES permits and associated local stormwater requirements, CWA § 404 permits for dredge/fill activities in aquatic resources, Cal. Fish and Game Code § 1600 et seq., LSA agreement) would minimize impacts on surface water hydrology associated with construction of cumulative projects, including the project alternatives. On this basis, the project would not result in cumulatively considerable contributions to construction or operational impacts on surface water hydrology under CEQA; therefore, CEQA does not require any mitigation.

Surface Water Quality

No cumulative impacts related to surface water quality are anticipated during construction or operations of the project alternatives in combination with other cumulative projects because regulatory standards and conditions of individual project approvals (e.g., CWA § 401 Water Quality Certifications, CWA § 402 NPDES permits and associated local stormwater requirements, CWA § 404 permits for dredge/fill activities in aquatic resources, Cal. Fish and Game Code § 1600 et seq., LSA agreement) would minimize impacts on surface water quality associated with construction. On this basis, the project would not result in cumulatively considerable contributions to construction or operational impacts on surface water quality under CEQA; therefore, CEQA does not require any mitigation.

Groundwater

No cumulative impacts related to groundwater are anticipated during construction or operations of the project alternatives in combination with other cumulative projects because regulatory standards (e.g., Sustainable Groundwater Management Act and local well ordinances) and conditions of individual project approvals (e.g., CWA § 401, § 404) would minimize impacts on groundwater associated with construction. On this basis, the project alternatives would not result in cumulatively considerable contributions to construction or operational impacts on groundwater under CEQA; therefore, CEQA does not require any mitigation.

Floodplains

No cumulative impacts related to floodplains are anticipated during construction or operations of the project alternatives in combination with other cumulative projects because regulatory standards (e.g., National Flood Insurance Act with local floodplain management ordinances), conditions of individual project approvals (e.g., permits from local floodplain managers and coordination with the USACE), and mitigation for Alternative A would avoid substantial impacts on floodplains associated with construction. On this basis, the project alternatives would not result in cumulatively considerable contributions to construction or operational impacts on floodplains under CEQA; therefore, CEQA does not require any mitigation.

3.18.6.8 Geology, Soils, Seismicity, and Paleontological Resources

Resource Study Area

Geology, Soils, and Seismicity

The cumulative RSA for geology, soils, and seismicity encompasses 5 miles on either side of the project alternatives' footprints. This RSA is larger than the RSAs used for the analyses in Section 3.9, Geology, Soils, Seismicity, and Paleontological Resources (defined as 150 feet on either side of the project footprints for geologic conditions and soils and 0.5 mile on either side for geologic hazards). The larger cumulative RSA is sufficiently broad to cover an area in which the potential impacts (i.e., increased risk of personal injury, loss of life, and damage to property as a result of exposure to hazards related to geology, soils, and seismicity associated with the project alternatives) in combination with other cumulative projects, could result in cumulative impacts. Specifically, the cumulative RSA allows for analysis of additional projects that regionally affect risks associated with geology, soils, and seismicity.

Paleontological Resources

The cumulative RSA for paleontological resources is the entirety of San Francisco, San Mateo, and Santa Clara Counties, which is larger than the RSA used for the analysis in Section 3.9 (defined as 150 feet on either side of the project alternatives' footprints). The cumulative RSA is larger because it captures impacts on paleontological resources associated with planned development and allows for the analysis of additional projects that would affect paleontological resources in the region.

Cumulative Condition

Geology, Soils, and Seismicity

Most of the cumulative projects identified in Volume 2, Appendices 3.18-A and 3.18-B, would be susceptible to hazards related to geology, soils, and seismicity in the cumulative RSA. If the impacts of these cumulative projects were to combine to create public risk related to geologic, soil-related, or seismic hazards, such risk would constitute a cumulative impact.

In general, cumulative development has and will continue to lead to more densely populated land use, thereby increasing exposure of people to hazards associated with geology, soils, and seismicity. Development will occur throughout much of the San Francisco Peninsula, where cumulative projects will be built in areas of these geologic and seismic hazards that include unstable soils; expansive soils; corrosive soils; soils susceptible to erosion, areas of difficult excavations due to shallow bedrock or groundwater, and primary or secondary seismic hazards.

Soft soil, expansive soil, corrosive soil, and difficult excavation conditions can result in exposure to construction hazards and permanent damage to cumulative projects throughout the cumulative RSA. Regulatory standards such as the California Building Code, project features that require the implementation of geotechnical engineering practices (GEO-IAMF#1: Geologic Hazards; GEO-IAMF#10: Geology and Soils), and the incorporation of BMPs would minimize the risks associated with these soil conditions and avoid damage from ground settlement, ground heave, bearing-capacity failure, and long-term degradation of buried concrete and steel. Because the design of cumulative projects, including the project alternatives, would minimize the individual project-level risks associated with construction and operation of cumulative development projects on soft soils, expansive soils, corrosive soils, or in areas with difficult excavation conditions, these impacts would not combine to result in a cumulative impact.

Cumulative projects, in combination with the project alternatives, would be affected by ground subsidence because of construction dewatering. As described previously under Section 3.18.6.7, Hydrology and Water Resources, planned development that includes the construction of foundations near the bay may require dewatering for the construction of piles for seismic stability. Dewatering deep portions of the aquifer may be required for construction of the DTX project and the Central Subway Project in San Francisco. While these projects are anticipated to involve deep dewatering, the project alternatives are expected to require mostly shallow dewatering in widely spaced locations throughout the project footprint. Like the project alternatives, cumulative projects would comply with building codes and construction standards, which would include a geotechnical assessment of site conditions to determine engineering solutions to avoid localized subsidence from construction-related dewatering. Considering that building codes and construction standards would be applied, construction or operations of the project alternatives, in combination with cumulative projects, would not result in a cumulative impact regarding ground subsidence associated with construction dewatering.

Landslides would affect cumulative projects sited near existing landslides or steep slopes. The risk of landslides is limited to sloping areas, such as Potrero Hill, Mount St. Joseph, Visitacion Valley, and San Bruno Mountain in the northern portion of the cumulative RSA. Although the project alternatives would not require construction on existing slopes susceptible to landslides, development of residential and transportation projects on steep terrain would increase risks of exposure to landslides. These development projects would use building codes and local construction standards including geotechnical assessment of site conditions to determine engineering solutions to avoid impacts from landslides. Construction or operations of the project alternatives, in combination with cumulative projects, would not result in cumulative impacts from risks associated with landslides.

Accelerated soil erosion, including the loss of topsoil, would result from construction of the HSR project alternatives in combination with cumulative projects. Construction activities associated with the project alternatives and other development in all subsections, such as the 405 East Fourth Avenue Mixed Use Project in San Mateo, would involve ground-disturbing activities such as excavating and grading that may entail the removal of vegetation and the generation of stockpiles. Removal of vegetation and generation of soil stockpiles exposes soil at the ground surface, making it susceptible to erosion. The State of California CGP Order 2009-0009-DWQ requires a SWPPP, which would minimize soil erosion, including the loss of topsoil, from construction activities. With compliance with these requirements, construction or operations of the project alternatives, in combination with cumulative projects, would not result in a cumulative impact regarding soil erosion.

The increasing population of the Bay Area would result in additional development along the entire Project Section in a seismically active region of California with high risks associated with primary and secondary seismic hazards. While development in such areas, when combined with the project alternatives, would result in increased risk to the public and a greater chance of property damage from seismic hazards, advances in engineering and building standards have reduced risks from hazards related to geology, soils, and seismicity. Planned development requires project-specific analyses to evaluate the risks of primary and secondary seismic hazards as well as individual project permits that specify regulatory requirements and design standards that

reduce potential hazards. For example, the California Building Code requires projects to adhere to geotechnical and stability requirements that would avoid or minimize impacts from seismic hazards. HSR project features include designing components for the impacts of earthquakes, including bending moments, shear forces, and displacements resulting from surface fault rupture (GEO-IAMF#7: Evaluate and Design for Large Seismic Ground Shaking). Caltrain currently uses, and the blended system would continue to use, the University of California at Berkeley's Rapid Earthquake Data Integration System to determine the magnitude and location of earthquakes and their possible impact on track and structures. Depending on magnitude and location, earthquakes may trigger a system response such as slowing or halting train operations until track inspection and any necessary repairs can be completed. For dedicated HSR facilities, the Authority would incorporate motion-sensing instruments to provide ground motion data and a control system to shut down HSR operations temporarily during or after a potentially damaging earthquake (GEO-IAMF#8: Suspension of Operations during an Earthquake). Monitoring equipment would be installed at select locations where high ground motions could occur. Because the project alternatives and cumulative projects would comply with California Building Code requirements including adherence to geotechnical engineering standards and because the project alternatives would include a control system to shut down HSR operations temporarily during or after a potentially damaging earthquake, construction or operations of the project alternatives, in combination with cumulative projects, would not result in cumulative impacts related to primary and secondary seismic hazards.

A seismically induced dam failure of one or more of the dams in the cumulative RSA would result in flooding in the cumulative RSA in mapped inundation zones; however, this would be an unlikely event because the seismic event would need to be large enough to cause catastrophic damage to the dam structures. Existing and future development, in combination with the project alternatives, would result in the greatest potential exposure of people to this hazard in the San Bruno to San Mateo and San Mateo to Palo Alto Subsections where there are dense populations downstream of major dams. However, DWR's dam safety program minimizes public risk involving dam failure inundation. The blended system would rely on the University of California at Berkeley's Rapid Earthquake Data Integration System for earthquake detection. The dedicated HSR facilities include motion-sensing instruments to provide ground motion data and a control system to shut down HSR operations temporarily during or after a potentially damaging earthquake (GEO-IAMF#8). Monitoring equipment would be installed at select locations where high ground motions could occur. Based on these HSR project features and the existing DWR dam safety program, construction or operations of the project alternatives, in combination with cumulative projects, would not result in cumulative impacts related to risks associated with seismically induced dam failure and inundation.

Paleontological Resources

A cumulative impact on paleontological resources would occur when cumulative projects, in combination with the project alternatives, cumulatively disturb, damage, or destroy scientifically important fossil resources. Once lost, such resources cannot be recovered.

Under the cumulative condition, ongoing urban development is expected to continue in the cumulative RSA. Future projects in the cumulative RSA involving ground disturbance during construction would involve geologic units that have produced abundant and diverse fossil resources, including vertebrate remains, and are thus considered highly sensitive for paleontological resources (i.e., would produce additional similar finds in the future). Construction of various cumulative projects would require ground-disturbing activities in areas that include the Merced Formation, Santa Clara Formation, and Colma Formation, as well as unnamed older Quaternary deposits. These developments, in combination with the project alternatives, would have the potential to cumulatively disturb, damage, or destroy scientifically important fossil resources.

The project alternatives, in combination with cumulative projects such as the Plan Bay Area, El Camino Real and Stevens Creek Corridor BRT Improvements, US 101 Express Lane, SR 87 HOV and I-280 Express Lane Conversion, Caltrain Double-Track, and the Capitol Expressway

Corridor projects, would have the potential to cause ground disturbance in paleontologically sensitive geologic units and cumulatively disturb, damage, or destroy scientifically important fossil resources. The project alternatives, in combination with these projects, would contribute to cumulative impacts on paleontological resources if native sediments are directly disturbed by construction activities. Project features would address paleontological resources through monitoring and mitigation, discovery procedures, halting construction when paleontological resources are found, and training of construction personnel to avoid affecting unique paleontological resources or sites (GEO-IAMF#11: Engage a Qualified Paleontological Resources Specialist; GEO-IAMF#12: Perform Final Design Review and Triggers Evaluation; GEO-IAMF#13: Prepare and Implement Paleontological Resources Monitoring and Mitigation Plan; GEO-IAMF#14: Provide WEAP Training for Paleontological Resources; GEO-IAMF#15: Halt Construction, Evaluate, and Treat if Paleontological Resources Are Found). Regulatory standards that provide protection for paleontological resources would reduce potential impacts if paleontological resources are found during ground-disturbing activities associated with construction and operations of cumulative projects. Such regulatory standards include the California Public Resources Code requirements; regional and local policies in San Francisco, San Mateo, and Santa Clara Counties; and Caltrans paleontological standards. Cumulative impacts on paleontological resources would result from construction of the project alternatives in combination with other cumulative projects.

Ground disturbance associated with operations of the project alternatives would be minimal and likely would occur in areas of previous disturbance. Operation of the project alternatives in combination with other cumulative projects would not result in a cumulative impact related to paleontological resources.

Contribution of the Project Alternatives

Paleontological Resources

As discussed in Section 3.9, paleontological resource impacts during construction would be similar under both project alternatives, with some variations as shown in Table 3.9-18. Both alternatives would affect the same paleontologically sensitive geologic units, and the overall construction process and the O&M activities would be similar under the two alternatives, resulting in similar potential for impacts on paleontological resources during ground-disturbing activities. Alternative B would potentially affect more buried paleontological resources than Alternative A because of the additional excavation in paleontologically sensitive geologic units that would be required for construction of the passing track and construction of viaducts in the San Jose Diridon Station Approach Subsection for Alternative B. The project would require monitoring, discovery procedures, and halting construction when resources are found (GEO-IAMF#11 through GEO-IAMF#15), which would prevent the destruction of unique paleontological resources or sites.

CEQA Conclusion

Geology, Soils, Seismicity

The project alternatives in combination with other cumulative projects would not result in a significant cumulative impact under CEQA with respect to risks associated with geology, soils, and seismicity hazards because project features would include geotechnical design resulting in infrastructure that can resist geologic and seismic forces to reduce risks of damage to structures and minimize the potential for injury or death. Cumulative projects would adhere to similar guidelines for geotechnical design including applicable building codes and construction standards that would reduce risk of damage to structures and minimize the potential for injury or death from hazards related to geology, soils, and seismicity. Therefore, CEQA does not require any mitigation.

Paleontological Resources

The project alternatives in combination with other cumulative projects would result in a significant cumulative impact under CEQA with respect to paleontological resources because these actions would have the potential to disturb, damage, or destroy scientifically important fossil resources

throughout the cumulative RSA. The project alternatives' contribution to this cumulative impact would not be cumulatively considerable because the project would require monitoring, discovery procedures, and halting construction when resources are found, which would prevent the destruction of unique paleontological resources or sites. Therefore, CEQA does not require any mitigation.

3.18.6.9 Hazardous Materials and Wastes

Resource Study Area

The cumulative RSA for hazardous materials and waste is the same as is documented in Section 3.10, Hazardous Materials and Wastes, which consists of the project footprint for each of the project alternatives plus a 150-foot buffer from the project footprints to account for hazardous material and waste issues on adjacent properties. The cumulative RSA is also the same as that identified for potential environmental concern (PEC) sites, which consists of a 0.25-mile buffer around the project footprint. These cumulative RSAs are applicable because they sufficiently capture hazardous materials and waste impacts associated with construction and operations of the project alternatives, in combination with cumulative projects that would reasonably overlap to create a cumulative impact. For this analysis, the RSAs are combined into a single cumulative 0.25-mile RSA for hazardous materials and waste, including PEC sites.

Cumulative Condition

Under the cumulative condition, ongoing urban development is expected to continue in the cumulative RSA. The project alternatives traverse urban, residential, and industrial settings, each of which has different hazardous materials and hazardous waste contexts. Historically, hazardous materials have been used in the cumulative RSA along the existing Caltrain alignment.

In general, the cumulative RSA has, in the past, had areas of hazardous materials and waste concerns: transportation of hazardous materials and wastes, potential building materials containing hazardous substances, potential road and railway corridor hazardous substances, potential utility corridor hazardous substances, former landfills, potential industrial facility hazardous substances, and PEC sites. The Project Section is located predominantly within the existing Caltrain railway corridor, which has been in operation by SPRR and other rail agencies since 1861. Historic railway operations and associated maintenance activities have used or generated hazardous materials in the cumulative RSA. Soil contamination from rail operations results from heavy metals associated with ballast, petroleum hydrocarbons (e.g., diesel, creosote) associated with railroad ties and operations, and herbicides associated with maintenance. Past development within the cumulative RSA has also resulted in the current mix of land uses that tightly hug the railway corridor—ranging from industrial uses adjacent to the corridor in San Francisco and Brisbane, to a mixture of commercial and residential between South San Francisco and Redwood City, as well as the San Jose area, to predominantly residential uses between Atherton and Santa Clara. Future development would consist primarily of infill or redevelopment of underutilized property that would make adjacent communities even more densely populated, further increasing the potential for people to be exposed to hazardous materials and wastes. However, future planned development, including residential, industrial, and commercial developments, would be required to comply with state and local regulatory requirements that would avoid individual hazardous materials impacts. Such environmental regulations have resulted in reduced risks to the public from hazardous materials.

Construction of either of the project alternatives in combination with other cumulative projects would combine to contribute to the transport, storage, use, and disposal of hazardous materials and wastes. Cumulative transportation and rail projects such as Dumbarton Rail, BART Transbay Corridor Core Capacity Program, Caltrain PCEP, SR 87 HOV and I-280 Express Lane conversions, Caltrain Double-Track, and the Capitol Expressway Corridor projects would combine with the project alternatives to contribute to the cumulative transport of, and potential risk for spills or releases of, hazardous substances in the cumulative RSA.

Temporary construction activities for both project alternatives would increase the potential for new hazards to the public or the environment through the routine transport, use, or disposal of

hazardous materials; the scale, type, and duration of construction activities would be approximately the same for both alternatives. Through conditions that involve the release of hazardous materials into the environment, or through hazardous material releases, including hazardous air emissions, project construction would pose a risk to human health or safety. However, the use of hazardous materials during construction and operations of cumulative projects is tightly controlled to protect human health and avoid releases. For example, for the project alternatives the Authority would require construction contractors to comply with BMPs established as part of a spill prevention, control, and countermeasure plan, to make certain that any release of hazardous materials is cleaned up; containers used to store hazardous materials are in good condition and not leaking; containers are kept closed except when adding or removing hazardous materials; hazardous materials storage and handling areas are away from natural watercourses, storm drains, and other sensitive receptors; and policies for cleaning up accidental spills are in place and enforced (HMW-IAMF#6: Spill Prevention).

Future planned development, including the project alternatives, would be required to comply with state and local regulatory requirements that would avoid individual hazardous materials impacts. As part of the project design for the alternatives, the contractor would be required to comply with regulations that control the transport, use, and storage of hazardous materials and minimize the potential for an accidental release of hazardous materials during construction and transport of these hazardous wastes (HMW-IAMF#7: Transport of Materials). In the future, irrespective of the HSR project, some of the existing PEC sites in the cumulative RSA would be investigated further and, if necessary, remediated with appropriate regulatory agency oversight (HMW-IAMF#1: Property Acquisition Phase 1 and Phase 2 Environmental Site Assessments). With such measures and restrictions in place concerning the use of hazardous materials, the potential for the cumulative accumulation or release of hazardous materials from project construction and operations, in combination with cumulative projects, would be low, and therefore cumulative impacts would not occur.

CEQA Conclusion

The project alternatives in combination with other cumulative projects would not result in a significant cumulative impact under CEQA with respect to hazardous materials and wastes because cumulative projects, including the project alternatives, would be subject to strict federal, state, and local regulatory requirements to protect human health, avoiding the potential for cumulative accumulation or release of hazardous materials. Therefore, CEQA does not require any mitigation.

3.18.6.10 Safety and Security

Resource Study Area

The cumulative RSAs for safety and security are the same as those used for the analysis in Section 3.11, Safety and Security, which are within 0.5 mile of the project footprint of each alternative; within 0.25 mile of the project footprint for schools and landfills; within 2 miles of the project footprint for airports and high-risk facilities; within 200 feet of the project footprint for oil and gas wells; and the identified service area for emergency service providers (e.g., fire departments, police departments, hospitals). In the City and County of San Francisco, San Mateo County, and Santa Clara County, the cumulative RSAs are characterized mostly by incorporated cities (i.e., San Francisco, Brisbane, South San Francisco, San Bruno, Millbrae, Burlingame, San Mateo, Belmont, San Carlos, Atherton, Redwood City, Menlo Park, Palo Alto, Mountain View, Sunnyvale, Santa Clara, and San Jose), and unincorporated areas outside these cities.

Cumulative Condition

Emergency Services

The populations of San Francisco, San Mateo, and Santa Clara Counties are projected to increase approximately 20 percent by 2040. This increased growth would be accommodated primarily through redevelopment of existing residential, industrial, commercial, and transportation facilities to increase residential capacity, improve business operations, and expand public

services. This projected population growth would place increased demands on emergency response services, including emergency medical services, law enforcement, and fire response, while simultaneously placing additional stress on the transportation network. Interference with emergency response services would be most pronounced in areas with high development and where existing traffic volumes and levels of congestion are highest. Cumulative development projects near the Project Section that would contribute to this impact include the Mission Bay and Central SoMa Plan projects in San Francisco and East of 101 Area Plan in South San Francisco in the San Francisco to South San Francisco Subsection, the Bayhill Specific Plan and Millbrae Specific Plan in the San Bruno to San Mateo Subsection, and the North Bayshore Precise Plan in the Mountain View to Santa Clara Subsection. The project alternatives and other development and transportation improvement projects in the San Jose Diridon Station Approach Subsection would create new, temporary closures of and modifications to some regionally significant roadways and would generate indirect impacts related to transportation, such as increased congestion on US 101. Such projects could include the US 101 Express Lanes, BART Silicon Valley Extension, BRT projects in San Jose, and various interchange improvement projects on US 101.

While cumulative transportation projects, such as carpool and express lanes on US 101 and I-280, roadway widening and improvements, in combination with the project alternatives, would result in long-term regional improvements to the capacity of the roadway network, it is anticipated that traffic and congestion levels will continue to outpace the transportation network's ability to serve the demand, as discussed in Section 3.18.6.1, Transportation. Increases in traffic and congestion levels would pose challenges for maintaining acceptable service times ratios, response times, or other performance objectives for emergency service.

Cumulative transportation projects, such as carpool and express lanes on US 101 and I-280, roadway widening and improvements, in combination with the project alternatives, would result in cumulative impacts on emergency response during construction due to temporary closures of and modifications to some regionally significant roadways. Construction activities from the project alternatives and planned development in the cumulative RSA would have multiple-year construction timeframes, leading to potential temporal and geographic overlaps with construction of either of the project alternatives. The designs of these projects would be consistent with regional and local land use plans and regulatory standards, and would incorporate traffic management plans and procedures for alternate routes during road closures, as previously discussed in Section 3.18.6.1. For the project alternatives, the Authority's contractor would prepare a construction safety transportation management plan (SS-IAMF#1) that describes collaborative efforts with local jurisdictions to maintain emergency vehicle access during construction, as well as a CTP (TR-IAMF#2) that describes procedures for implementing temporary road and lane closures. The Authority would also implement additional construction traffic management for the passing track area under Alternative B which would minimize the temporary construction impacts of construction and construction traffic on adjoining and nearby roadways (SS-MM#1: Construction Traffic Management for Passing Track Section). However, even with these project features and mitigation measures, the closures and modifications of significant roadways from the project alternatives in combination with planned development in the cumulative RSA would result in a cumulative impact on transportation from delays and degradation of existing transportation networks that would affect emergency response providers.

Operation of the project alternatives would result in increased gate-down time at the at-grade crossings and an increase in traffic in the vicinity of stations providing HSR service. These increases, in combination with the various growth projections based on regional forecasts, would result in delays near the stations and at-grade rail crossings for emergency responders. Under both project alternatives, additional station-related traffic and the increase in gate-down time from added HSR trains would result in delays that would adversely affect fire station emergency vehicle access and response times in Burlingame, Redwood City, Menlo Park, Palo Alto, Mountain View, and San Jose. The Authority would implement TR-MM#1 to mitigate delays at certain intersections in the vicinity of the 4th and King Street and Millbrae Station areas and SS-MM#3: Install Emergency Vehicle Priority Treatments near HSR Stations, which would develop

an emergency vehicle priority plan and install emergency vehicle priority treatments and new traffic control devices. Additionally, as part of SS-MM#4: Install Emergency Vehicle Priority Treatments Related to Increased Gate-Down Time Impacts, the Authority would provide funding for monitoring of at-grade crossing conditions and construction of emergency vehicle priority treatments as needed to address effects on emergency access and response time. If the cities chose not to build new and operate new or expanded facilities, project operations in combination with regional growth projections would result in a degradation of emergency vehicle access and response times in Burlingame, Redwood City, Menlo Park, and Mountain View. As a result, the project alternatives in combination with other planned development in the cumulative RSA would result in cumulative impacts on response time and access for emergency responders as a result of increased congestion due to cumulative growth in traffic from new development and due to the limitations of project mitigation.

Community Safety and Security

Under the cumulative condition, ongoing urban development to accommodate the forecasted population growth is expected to continue in the cumulative RSA. Cumulative projects would have implications for community safety and security related to criminal activity, exposure to traffic hazards, airport safety hazards, high-risk facilities, and operational safety hazards. Each of these topics is discussed in the following subsections.

Criminal Activity

Criminal, violent, and terrorist acts, which would lead to the exposure of workers and the public to safety and security risks, would be expected to increase as increasing population results in the need for new planned development. The project alternatives and other planned urban (i.e., industrial, residential, and commercial developments) and transportation development, would continue to increase the potential for criminal, violent, and terrorist acts in certain areas of the cumulative RSA.

Crime rates vary dramatically by region and type of crime. Compared to the state of California as a whole, the Bay Area had the highest rates of property crime in 2017, with a rate of 3,049 property incidents per 100,000 residents in 2017 (Public Policy Institute of California 2018). Trends in violent crime and property crime over the 2010 to 2015 period depict increases in both violent and property crime in San Francisco and San Mateo Counties and decreases in Santa Clara County over this period. The overall trend of high property crime rates in the Bay Area would be expected to continue with ongoing urbanization in the cumulative RSA (e.g., build-out of the Central SoMa Plan in San Francisco and Millbrae Station Area Specific Plan, and the Flea Market General Plan Amendment and Rezoning Project in San Jose).

Goals and policies in the general plans of the City and County of San Francisco, San Mateo and Santa Clara Counties, and the Cities of Brisbane, South San Francisco, San Bruno, Millbrae, Burlingame, San Mateo, Belmont, San Carlos, Redwood City, Atherton, Menlo Park, Palo Alto, Mountain View, Sunnyvale, Santa Clara, and San Jose contain elements for the logical and efficient expansion or upgrading of law enforcement, fire protection, and emergency medical services to accommodate future growth in the cumulative RSA. These goals and policies would reduce the risk of exposure to safety and security risks associated with criminal acts. Under the project alternatives, criminal or terrorist acts that could result in increased exposure to safety and security risks would be minimized through heightened deterrence and detection systems and threat and vulnerability assessments; increased security procedures; security lighting; and security and training procedures. Occupational and construction-related public safety regulations and BMPs would also reduce the potential for the project alternatives and construction of other cumulative projects to result in exposure to safety and security risks, which would increase demand for law enforcement, fire protection, and emergency response services beyond already planned expansions. With these measures, goals, and policies in place it is anticipated that increased urbanization from the project alternatives in combination with other cumulative projects would not result in a cumulative impact from the increased exposure to safety and security risks from criminal activity.

Traffic Hazards

Construction activities associated with planned roadway improvements and transportation facilities, including those identified in Volume 2, Appendices 3.18-A and 3.18-B, in combination with the project alternatives and other regional growth would result in increased exposure of construction workers and the public to traffic hazards and potential accidents from temporary road closures and relocations, operation of construction vehicles, and other construction activities.

The project alternatives in combination with planned development in the cumulative RSA would create temporary closures of and modifications to some regionally significant roadways. Such projects would include the HOV/HOT lanes on US 101 and I-280 in San Francisco County; the US 101 Managed Lane Project in San Mateo County, US 101 Express Lanes in Santa Clara County, and various interchange improvement projects on US 101. Major development projects include the Mission Rock and Pier 70 projects in Mission Bay as well as build-out of the Central SoMa Plan in San Francisco; build-out of the East of 101 Area Plan in South San Francisco; the Bayhill Specific Plan (YouTube Headquarters) in San Bruno; build-out of the Millbrae Station Area Specific Plan; and build-out of the North Bayshore Precise Plan (Google Headquarters) in Mountain View. Large planned urban developments in San Jose in the San Jose Diridon Station Approach Subsection include the proposed Bay 101 Casino and Mixed Use Project and other mixed-use developments (including residential uses) such as Cannery Park/Hanover, Flea Market General Plan Amendment and Rezoning Project, Garden City Rezoning Project, and the North San Pedro Tower 3 Residential Project in San Jose.

Construction activities from the project alternatives and other cumulative projects would have multiple-year construction timeframes, leading to potential temporal and geographic overlaps with construction of either of the project alternatives.

The designs of these cumulative projects, in combination with the project alternatives would be consistent with regional and local land use plans and regulatory standards, and would incorporate traffic management plans and procedures for alternate routes during road closures. For the project alternatives, the Authority's contractor would prepare a construction safety transportation management plan (SS-IAMF#1) and a CTP (TR-IAMF#2) that describes procedures for implementing temporary road and lane closures as well as coordination efforts between the construction contractor and local jurisdictions to minimize conflicts and maintain pedestrian, bicycle, and transit access. As a result, the project in combination with other cumulative projects would not result in a cumulative impact on safety due to construction-related traffic hazards.

Airport Safety

All cumulative projects in addition to the project alternatives would be subject to assessment and review with respect to compliance with Federal Aviation Regulation (FAR) Part 77 height limits and conformance to airport comprehensive land use plans. Communications towers, each approximately 100 feet tall, would be built in the cumulative RSA. The locations of these towers are identified in Volume 2, Appendix 3.11-B, Airport Obstructions. As discussed in Section 3.11.6.3, Community Safety and Security, proposed communication towers would require notification to the Federal Aviation Administration (FAA) under FAR Part 77 for either project alternative because they would be within the FAR Part 77 notification areas of SFO, San Carlos Airport, Palo Alto Airport, and Moffett Field. Proposed projects that could potentially affect airport safety, including the proposed Bay 101 Casino, Orchard Parkway Properties, and North San Pedro Tower projects in the vicinity of the Norman Y. Mineta San Jose International Airport, would be reviewed by the FAA and would be subject to and would conform with FAA requirements. The communications towers and other cumulative structures planned to be built within airport land use planning areas would be subject to conformance with land use plans. As a result, the communications towers and other cumulative projects would not exceed height limits for any airport in the cumulative RSA and would not pose safety hazards for aviation such as navigation hazards to aircraft and hazards to people on the ground in areas exposed to aircraft overflight. All cumulative projects would comply with airport operations, and no cumulative impact would result related to interference with airport safety.

High-Risk Facilities

Construction of cumulative transportation projects, in addition to construction of either of the project alternatives, would result the relocation of some high-risk utility lines. Cumulative projects involving work in the right-of-way that could affect high-risk utility lines include transportation projects, such as the Bayshore Intermodal Facility, the Caltrain PCEP, and the Caltrain Grade Separation Program.

Implementation of project features guiding removal, relocation, or protection in place of high-risk facilities (SS-IAMF#2: Safety and Security Management Plan), development of facility-specific measures, and operational safety features would minimize the potential for high-risk facilities to pose significant hazards risks associated with the project alternatives. The Authority would conduct a preliminary hazard analysis (SS-IAMF#3: Hazards Analysis) that would evaluate the potential impacts of high-risk facilities on the project. The Authority's programmatic preliminary hazard analyses are developed in conformance with the FRA's *Collision Hazard Analysis Guide: Commuter and Intercity Passenger Rail Service* (FRA 2007). Pursuant to utility agreements negotiated between stakeholders, cumulative projects would also typically require collaboration with utility providers to remove, relocate, or protect utilities in place, as necessary, during construction, reducing potential conflicts and helping to avoid hazards from high-risk facilities. Consequently, the project alternatives in combination with other planned development in the cumulative RSA would not result in a cumulative impact on safety from conflicts with or exposure to high-risk facilities.

Operational Safety Hazards

Operation of the project alternatives, in combination with other planned passenger and freight rail improvements in the Caltrain corridor between San Francisco and San Jose, would result in an increase in the number, frequency, and speeds of trainsets operating on blended track. These factors would increase the potential for collisions and derailments and the potential for accidents and incidents involving trains, other objects, and people. HSR and other trains operating in the corridor would be controlled by the same systems that makes use of positive train control and collision avoidance technology and would run at lower speeds than in the most other sections because of geometric alignment limitations and shared use of the route. Additionally, scheduled operations of HSR and Caltrain trains would be temporally separated from the operation of freight trains. These project features and operations schedules would reduce the potential for train-to-train collisions.

The project alternatives and other cumulative rail projects in the Caltrain right-of-way would also establish PTC systems to prevent train derailments and reduce the potential for safety hazards in the event of a derailment or accident. Other features, such as intrusion detection systems and hazard detection systems for dedicated HSR facilities, as well as maintenance programs, would also minimize the risk of operational safety hazards related to train accidents that could lead to the intrusion of train components or cargo from trains operating on adjacent tracks. As a result, the project alternatives in combination with other cumulative transportation projects would not result in a cumulative impact from increased risk of safety hazards due to collisions or derailments during train operations.

Operation of the project alternatives in combination with other cumulative projects would not increase the risk of collision between HSR trains and vehicles, pedestrians, or bicycles along the Caltrain right-of-way. The project alternatives would implement safety improvements throughout the project corridor that would reduce traffic hazards by minimizing potential for conflicts between trains and motor vehicles, pedestrians, and bicycles, resulting in a beneficial effect on community safety. With these safety measures in place, the project alternatives in combination with other cumulative projects would not result in a cumulative impact on community safety as a result of train operations.

Contribution of the Project Alternatives

Emergency Services

As described in Section 3.18.6.1, temporary road closures and construction-related traffic as a result of the project alternatives and other cumulative projects would result in intersection delays affecting vehicles including emergency responders and would increase emergency response times. As part of the project, the Authority would implement a construction safety transportation management plan (SS-IAMF#1) and CTP (TR-IAMF#2), which would describe the contractor's coordination efforts with local jurisdictions for maintaining emergency vehicle access and reducing impacts on emergency service response time during the construction period. Temporary road closures and lane closures and construction-related traffic would occur under both project alternatives and would disrupt and delay emergency response vehicles, but these effects would be greater under Alternative B. Construction of the passing track under Alternative B would require modifications/replacement of nine existing grade separations in Belmont, San Carlos, and Redwood City in an area along El Camino Real with high levels of traffic and congestion, which would result in temporary interference with emergency vehicle access and increase in response times. The Authority would also implement construction traffic management for the passing track area (SS-MM#1) under Alternative B which would stagger construction for the passing track to prevent simultaneous temporary closures of adjacent at-grade undercrossings. This mitigation measure would minimize but not eliminate temporary impacts on emergency vehicles during passing track construction.

Cumulative development projects in combination with operation of the project alternatives would increase delay near HSR station areas due to added traffic volumes. The Authority would implement SS-MM#3 to develop an emergency vehicle priority plan and install emergency vehicle detection equipment at certain intersections near the HSR stations to address effects on emergency access and response time. Cumulative development projects in combination with operation of the project alternatives would also increase delay at intersections adjacent to at-grade crossings due to increased gate-down events from added HSR trains. Operation of both project alternatives would result in delays that would adversely affect fire station emergency vehicle access and response times in Burlingame, Redwood City, Menlo Park, Palo Alto, and Mountain View. To mitigate fire station/first responder emergency access impacts related to added travel time from increased gate-down time at the at-grade crossings, the Authority would conduct monitoring and implement phased emergency vehicle priority treatment strategies as part of SS-MM#4. Where impacts are identified based on monitoring, the Authority would develop an emergency vehicle priority treatment plan in conjunction with local agencies. The Authority would make a fair share contribution toward emergency vehicle priority treatments. The Authority's fair share contribution would take the form of providing capital funds for project implementation to local agencies, who would be responsible for implementation of capital improvements as well as ongoing O&M of any facilities constructed.

Even with implementation of these mitigation measures, in the long term, the transportation network is not expected to keep pace with demand. The delays resulting from operations of the project in combination with the various growth projections based on regional forecasts, would result in delays at intersections and at-grade rail crossings for vehicles including emergency responders. Although the project would include intersection improvements, and the installation of emergency vehicle detection to reduce impacts on emergency responders, the increased traffic and gate-down times would contribute to the largest share of the increase in emergency response times.

CEQA Conclusion

Emergency Services

The project alternatives, in combination with other cumulative projects, would result in a significant cumulative impact under CEQA with respect to emergency response because of the temporary delays in emergency vehicle access and response times during project construction and permanent delays in emergency vehicle access and response times during project operations. The project alternatives' contribution to this cumulative impact would be cumulatively

considerable because the project would be the largest contributor toward the degraded intersection operations that would result in increased emergency response times. Although mitigation measures (SS-MM#1, SS-MM#3, TR-MM#2) would address some of the intersection delays contributing to increase emergency vehicle response times, increases in emergency response times would continue to affect emergency responders during construction of Alternatives A and B and in Burlingame, Redwood City, Menlo Park, and Mountain View during operation of either project alternative. No additional mitigation is available.

Community Safety and Security

There are no anticipated significant cumulative impacts under CEQA related to community safety and security to which the project would contribute. The project alternatives and cumulative projects would comply with public safety regulations and implement BMPs to reduce the occurrence of, and consequently the exposure to, criminal or terrorist acts. The project alternatives and cumulative projects would also implement construction transportation and safety plans and coordination to reduce traffic hazards. In addition, the project alternatives and cumulative projects would comply and conform with applicable aviation requirements and land use plans to avoid interference with airport safety; implement procedures to effectively and safely remove, relocate, or protect in place high-risk facilities to minimize safety hazards or potential conflicts; and implement PTC, intrusion deterrence, and inspection and maintenance programs for safe project operations. Therefore, no mitigation is required under CEQA.

3.18.6.11 Socioeconomics and Communities

Resource Study Area

The cumulative RSA for socioeconomics and communities is the entirety of San Francisco, San Mateo, and Santa Clara Counties, which coincides with the largest of the RSAs used for the analyses in Section 3.12, Socioeconomics and Communities. This three-county area is sufficient for the cumulative RSA to develop a broad regional consideration of cumulative impacts, and because it captures impacts on socioeconomics and communities from construction and operations of the project alternatives in concert with impacts associated with planned development throughout the region.

Cumulative Condition

Recent development trends are anticipated to continue, potentially resulting in the disruption or division of communities; impacts on children's health and safety; displacements and relocations of residences, businesses, and community facilities; and contributions to changes in the local economy. A discussion of the cumulative condition with respect to each of these subtopics is provided in the following subsections.

Communities and Neighborhoods

Construction and operations of cumulative projects in concert with the project alternatives are most likely to cause cumulative impacts on communities and neighborhoods. These cumulative projects consist primarily of mixed-use, residential, and office development projects located throughout the cumulative RSA. Projects in San Francisco consist primarily of mixed-use, residential, and office development, in addition to transportation projects such as transit priority and pedestrian improvement projects, the Central Subway Project, Geary BRT, Van Ness Improvement Project, and improvements to BART stations. The cities of South San Francisco, Burlingame, San Mateo, Redwood City, Menlo Park, Palo Alto, Mountain View, Sunnyvale, Santa Clara, and San Jose all have a large number of mixed-use, residential, and office development projects. Transportation projects in these cities are generally related to highway interchange improvement projects, highway widening, transit improvement projects, grade separations, traffic safety improvements, or pedestrian and bicycle improvement projects, such as US 101 widening, Whipple Avenue to Millbrae, US 101/Produce Avenue Interchange, US 101/Millbrae Avenue Bike/Pedestrian Bridge, Capitol Expressway Light Rail Transit Extension Phase II, San Tomas Expressway widening, El Camino Real to Williams Road, and Moreno-Amarillo Bicycle Boulevard project.

Disruption or Division of Communities

Future residential and commercial development is expected to result in a net increase in housing units and to contribute to increased urbanization in the region. Transportation projects are expected to improve mobility and enhance emergency response times through roadway and connectivity improvements. It is unlikely that the project alternatives in combination with the cumulative projects would create new barriers that would disrupt community interactions or divide established communities. In the long term, the overall HSR system, along with cumulative transportation projects, would improve regional access. However, the increased down time of four-quadrant gates would make it harder for vehicles, bicycles, and pedestrians to cross the right-of-way and would increase transit time, thus increasing congestion and delay. Such delays could lead to weakened cohesion between communities that cross the right-of-way. Although community cohesion would be weakened during project operation from increased congestion and delay, the project alternatives would not physically divide the communities because the project would operate within the existing Caltrain corridor that currently travels through these communities, and because access would be maintained to neighborhoods, businesses, and community and public facilities. Accordingly, operation of the project alternatives and other cumulative projects would not physically divide communities; these projects would be consistent with applicable land use plans and would not result in substantial direct land use conversion or introduce incompatible uses. As a result, continued growth in the region, construction and operations of the project alternatives, and cumulative planned projects would not result in cumulative impacts from disruption of community interactions or division of established communities.

Community Cohesion

Construction of cumulative projects, including the project alternatives, would disrupt circulation and access, leading to a temporary loss of community cohesion. Construction of either of the project alternatives in combination with cumulative projects would cause traffic delays, particularly around the station areas, and would temporarily disrupt circulation and access. These delays would lead to a loss of community cohesion from decreased access to certain neighborhoods in these areas. The required construction plans would include measures to coordinate construction activities with other projects to allow traffic to continue to flow during construction and minimize conflicts with other concurrent activities (TR-IAMF#2). Individual construction plans of these projects would be subject to review by the cities in which they are located and would be expected to minimize disruptions of circulation and access. Additionally, the Authority would incorporate the following IAMFs to avoid and minimize temporary construction-related traffic impacts, all of which are designed to minimize detours and maintain accessibility to residents, businesses, and community facilities: TR-IAMF#1: Protection of Public Roadways during Construction; TR-IAMF#2; TR-IAMF#3; TR-IAMF#4: Maintenance of Pedestrian Access; TR-IAMF#5: Maintenance of Bicycle Access; TR-IAMF#6: Restriction on Construction Hours; TR-IAMF#7: Construction Truck Routes; TR-IAMF#8; TR-IAMF#9: Protection of Freight and Passenger Rail during Construction; TR-IAMF#11: Maintenance of Transit Access; and TR-IAMF#12: Pedestrian and Bicycle Safety. Regulatory requirements would also minimize disruptions in circulation and access. It is anticipated that some of the construction schedules of cumulative projects that may add traffic to roadways in the station areas may overlap, and, as a result, construction of either of the project alternatives in combination with cumulative projects would lead to localized disruption of circulation and access. However, with implementation of these measures, there would not be a cumulative impact on community cohesion in the cumulative RSA from disruptions to circulation and access during construction.

Construction of either of the project alternatives in combination with other cumulative projects, would not introduce new visual barriers or obstructions to views. In the more heavily urbanized and industrialized portions of the project, introducing large-scale infrastructure into the landscape would not constitute a notable visual change. HSR structures such as new station facilities, the Brisbane LMF, passing tracks and viaduct (Alternative B), radio communication towers, and four-quadrant gates would be built predominantly within the existing Caltrain corridor. Changes to the visual environment in these areas would be less apparent because of the existing industrial character of the corridor and would not be expected to affect community cohesion. In more

suburban areas, the visual change resulting from the project would be slightly more noticeable. However, HSR structures would still be built within the existing Caltrain corridor and would have only minor impacts on the cities and communities in the cumulative RSA. Refer to Section 3.15, Aesthetics and Visual Quality, for additional information. Along the corridor, viewer groups are likely to be accustomed to seeing large-scale transportation infrastructure because of the presence of US 101, I-280, I-380, SR 82, SR 92, and SR 237 near the project. The visual changes from new heavy rail infrastructure would not be expected to alter the sense of community character and belonging to a place for residents. Alteration of the visual environment from new rail infrastructure would not physically divide any of the communities along the project corridor because the communities developed around the corridor and currently have train and rail infrastructure in their viewsheds due to their proximity to the railroad corridor. Additionally, cumulative development projects typically represent infill development that would be consistent with the existing visual character or modifications to existing infrastructure, none of which would substantially change the visual environment. Therefore, cumulative development would not combine with the project alternatives to obstruct views or introduce an incongruous new physical barrier that would affect community cohesion in the cumulative RSA. No cumulative impacts on visual intactness would result.

Operations of the project alternatives in combination with cumulative projects, would increase traffic, particularly around HSR station areas and through the increase in residential units and commercial activity to accommodate future growth. Operations of cumulative projects and the project alternatives would, however, not result in a loss of community cohesion because roadway improvements, including those associated with the project alternatives, would increase mobility and access throughout the cumulative RSA. No cumulative impacts from operation of the cumulative projects would result.

Noise and Vibration

Construction of cumulative projects would generate noise and vibration levels above ambient levels. However, noise and vibration would generally be experienced only in close proximity to the sites of individual construction projects. The Authority would implement a construction management plan prior to construction that would include noise controls to avoid and minimize construction noise levels (SOCIO-IAMF#1: Construction Management Plan). The project would also incorporate NV-IAMF#1, which identifies noise reduction measures for construction. Multiple projects that generate high noise levels are not expected to be constructed simultaneously and adjacent to sensitive receptors such that they would combine to create noise levels exceeding federal or state standards. Because the noise and vibration from construction of either of the project alternatives would be site specific and decrease exponentially with distance from the source, the project alternatives in combination with cumulative projects would not result in a cumulative impact on communities because of disruptions from noise and vibration during construction.

The project alternatives and cumulative rail and transit projects would create new and permanent sources of noise during operations from train passbys and sounding of train horns, passenger railroad operations, and roadway traffic. The Authority would implement mitigation as part of approval of the project alternatives, which would reduce exposure of sensitive receptors to noise associated with operations of the blended HSR and Caltrain system. Mitigation would include installation of noise barriers, and, if noise levels are still not reduced to reasonable levels, the Authority would install sound insulation at residences and institutional buildings. The Authority would also require compliance with federal regulations for vehicle noise. Mitigation would reduce exposure of sensitive receptors to noise, which, in combination with other rail and transit projects, would not result in a cumulative impact from noise and vibration.

Children's Health and Safety

Some cumulative projects would be built and operate near or adjacent to places where children congregate. Potential impacts on children's health and safety include potential respiratory impacts associated with air quality, noise impacts on health and learning, EMI, exposure to hazardous materials, and potential safety risks to children. Construction of cumulative projects throughout

the cities in the RSA, such as the Geary BRT or the Capitol Expressway Light Rail Transit Extension Phase II, in concert with the project alternatives are most likely to cause cumulative impacts on children's health and safety in the cumulative RSA. However, cumulative projects, in addition to the project alternatives, would be required to implement project features to avoid impacts, mitigation measures to reduce exposure of sensitive receptors to potential impacts, and adhere to regional and local regulations regarding air quality, noise, and hazardous materials.

AQ-IAMF#1 would minimize the potential for construction activities to generate dust and the project would minimize off-gassing emissions of VOCs that would occur from paints and other coatings (AQ-IAMF#2). The Authority would implement a construction management plan (SOCIO-IAMF#1) prior to construction that includes actions pertaining to noise controls to avoid and minimize impacts on children's health and safety and community facilities (NV-IAMF#1). Project features (HMW-IAMF#1; HMW-IAMF#4: Undocumented Contamination; HMW-IAMF#5: Demolition Plans; HMW-IAMF#6; HMW-IAMF#7; HMW-IAMF#8: Permit Conditions; HMW-IAMF#9: Environmental Management System; HMW-IAMF#10: Hazardous Materials Plans) would avoid and minimize the use of extremely hazardous substances or mixtures thereof in a quantity equal to or greater than the state threshold quantity within 0.25 mile of a school. See Sections 3.3, 3.4, 3.10, and 3.12 for additional information on air quality and hazardous materials and wastes.

The construction safety transportation management plan (SS-IAMF#1) would describe the contractor's coordination efforts with local jurisdictions for maintaining emergency vehicle access. The plan would also specify the contractor's procedures for implementing temporary road closures, such as maintaining access to residences and businesses during construction, lane closures, signage and flag persons, temporary detour provisions, alternative bus and delivery routes, emergency vehicle access, and alternative access locations. The Authority has adopted a safety and security management plan (SS-IAMF#2) to guide the safety and security activities, processes, and responsibilities during construction to protect the safety and security of construction workers and the public, further minimizing the potential exposure of children to construction site safety hazards. See Section 3.11 for additional information on these features. The Authority would also implement a CTP (TR-IAMF#2) that would include minimization practices such as provisions for safe pedestrian and bicycle passage or detours. Additionally, mitigation measures are proposed for circulation and access, air quality, and noise and vibration to reduce impacts on all members of the population, including children. With implementation of these measures and adherence to regulations, the project alternatives in combination with cumulative projects would not result in a cumulative impact on children's health and safety during construction.

The project alternatives, in concert with other cumulative projects, are not expected to have an adverse impact on children's health and safety. Project alternatives, in addition to cumulative projects, are expected to have a beneficial effect on regional air quality and safety. In addition, any increases in operational noise are not expected to be perceptible. Therefore, the project alternatives, in combination with cumulative projects, would not result in a cumulative impact on children's health and safety during operation.

Property Displacements and Relocations

Some cumulative projects would require acquisition of land and result in displacement and relocation of residences, businesses, and community facilities. The projects listed in Volume 2, Appendices 3.18-A and 3.18-B, are not expected to result in a large number of displacements of businesses or residences, because the majority of these projects are proposed on vacant land or are transportation improvement projects in existing transportation corridors. However, displacements from construction of some projects such as California Communities—Harrison Ave in Redwood City and Shorebreeze Apartments (460 North Shoreline Boulevard) in Mountain View would occur simultaneously and result in the inability of displaced property owners and tenants to relocate. Such impacts would be greatest in Sun Bruno, Belmont, Santa Clara, and San Jose, where the most displacements would occur. Development of individual project construction plans, coordination with local agencies, and project features (SOCIO-IAMF#2: Compliance with Uniform

Relocation Assistance and Real Property Acquisition Policies Act) would avoid and minimize the potential for temporary and permanent impacts on associated with displacements and relocations in the cumulative RSA.

A gap analysis performed for residential and nonresidential business relocations revealed an adequate supply of properties that would be available to accommodate displaced persons or businesses in the general vicinity, but potentially not in the same community. The cumulative projects in San Francisco, South San Francisco, San Mateo, Redwood City, and San Jose consist of many new residential projects such as 124 Airport Boulevard/100 Produce Avenue in South San Francisco and 303 Baldwin Avenue Mixed Use Project in San Mateo, so they could accommodate many of the residents displaced by the project alternatives or other cumulative projects in the area. In addition, it is also expected that most of the labor force working on these cumulative projects would come from the labor force already living in or near the cumulative RSA, thereby not requiring new housing or services (see Section 3.17, Regional Growth, for more information on construction employment). Therefore, the project alternatives, combined with other cumulative projects, would not result in a cumulative impact from residential displacements or relocations.

Operations of cumulative projects, including the project alternatives, would not result in property displacements or relocations. There would be no cumulative impact as a result of project operations from property displacements or relocations.

Economic Impacts

School District Funding

Cumulative projects include transportation improvement projects, residential developments, expansion of existing industrial facilities, and implementation of general and specific plans throughout San Francisco, San Mateo, and Santa Clara Counties. The cumulative projects would facilitate growth in population, housing, and jobs. This commercial, industrial, and residential development is scattered throughout the cities and communities in the cumulative RSA, and is expected to increase property tax revenues and support the regional economy, school districts, and budgets for public services within these communities. Thus, the project alternatives, in combination with the cumulative projects, would not result in a cumulative impact on property tax revenues that would lead to changes in school district funding.

CEQA Conclusion

Communities and Neighborhoods

The project alternatives, in combination with cumulative projects, would not result in significant cumulative impacts under CEQA related to the temporary and permanent loss of community cohesion because the neither the project alternatives nor the cumulative projects would physically divide the communities. The construction impacts would be temporary, detours would be provided, and access would be maintained for both the project alternatives and the cumulative projects. The design features of the project alternatives would include coordination with other projects to allow traffic to continue to flow during construction and minimize conflict with other concurrent activities. In addition, mitigation measures described in Section 3.2 would reduce these impacts. During operations, although community cohesion would be weakened by increased congestion and delay, the project alternatives would not physically divide the communities because the project would operate within the existing Caltrain corridor that currently travels through these communities, and because access would be maintained to neighborhoods, businesses, and community and public facilities. The cumulative projects would also not physically divide communities because roadway improvements would increase mobility and access throughout the cumulative RSA and most new development would be completed as infill development on existing parcels. Therefore, there would not be a significant cumulative impact on community cohesion and no mitigation is required under CEQA.

Children's Health and Safety

CEQA does not require an analysis of impacts on children's health and safety. Therefore, no further discussion is required.

Property Displacements and Relocations

There would be no significant cumulative impacts under CEQA on communities from displacements and relocations caused by the project alternatives in combination with other cumulative projects because, where residential displacements are required, the project alternatives and other projects would coordinate with local agencies and comply with the Uniform Relocation Assistance and Real Property Acquisition Policies Act to minimize impacts associated with displacements and relocations. An adequate supply of properties in the cumulative RSA would be available to accommodate any displaced businesses and residents, and it is expected that the current labor force in the cumulative RSA would be sufficient to support any future labor need, not requiring new housing, services, or employees that would result in additional displacements or relocations; therefore, CEQA does not require any additional mitigation.

Development of individual project construction plans, coordination with local agencies, and compliance with the Uniform Relocation Assistance and Real Property Acquisition Policies Act would minimize the potential for temporary and permanent impacts associated with displacements and relocations in the cumulative RSA. A gap analysis performed for residential and nonresidential business relocations revealed an adequate supply of properties that would be available to accommodate displaced persons or businesses. The cumulative projects identified above consist of many new residential projects that would accommodate many of the residents displaced by the project alternatives or other cumulative projects in the area. The project alternatives, combined with other planned development, would not result in a cumulative impact because of residential displacements or relocations.

Economic Impacts

CEQA does not require an analysis of economic impacts. Therefore, no further discussion is required.

3.18.6.12 Station Planning, Land Use, and Development

Resource Study Area

The cumulative RSA for station planning, land use and development encompasses San Francisco, San Mateo, and Santa Clara Counties, which is larger than the RSA described in Section 3.13, Station Planning, Land Use, and Development. Located at the northern end of the Peninsula, the City and County of San Francisco is highly urbanized, and San Francisco is one of the most densely populated major cities in the country. San Mateo County extends across most of the peninsula and is primarily suburban, with some urban land areas and several corporate campuses and headquarters. Land uses in Santa Clara County range from dense, urban areas in the northern portion of the county to suburban uses south of San Jose with scattered rural and agricultural uses between areas of urban/suburban development.

Cumulative Condition

Past and ongoing growth trends within the cumulative RSA are expected to continue, resulting in increased population growth and continued changes to land uses. Existing land uses would be converted for residential, commercial, and industrial development, as well as for transportation infrastructure, to accommodate future growth.

Alteration of Land Use Patterns

Construction activities associated with new development and transportation facilities identified in Volume 2, Appendices 3.18-A and 3.18-B, in the cumulative RSA would result in the temporary use of lands for construction and would generate indirect impacts related to increased traffic, noise and vibration, air emissions, and visual changes. Cumulative projects such as the San Jose to Merced Project Section; Phase II of the BART Silicon Valley Extension; other transportation

projects including rail and BRT projects, carpool and express lanes, and interchange modifications on US 101; and development projects such as the build-out of the Central SoMa Plan in San Francisco, the Millbrae Station Area Specific Plan in Millbrae, and the Diridon Station Area Plan in San Jose, could have overlapping multiple-year construction timeframes. These projects would be planned and regulatory standards and conditions of individual project approvals (avoidance features and mitigation) would minimize temporary construction-related traffic, road and lane closures noise, dust, and visual impacts of construction. Additionally, although some of these activities may have overlapping timeframes, they would not generally overlap in geographic areas and these temporary construction impacts would not result in the permanent alteration of land use patterns.

Cumulative projects would result in changes in the pattern and density of land uses. As described in Section 3.13, the land use plans for the three counties in the cumulative RSA encourage infill and higher-density development in urban areas and concentration of uses around transit corridors to accommodate the projected regional population growth through 2040. As a result, many of the cumulative residential or mixed-use projects rely on infill development, which minimizes the alteration of land use patterns. The Bay Area's RTP—*Plan Bay Area 2040* (ABAG and MTC 2017)—furthers this goal by encouraging compact development and a greater investment in local transit modes.

Construction and operations of the project alternatives in combination with other cumulative projects would increase the density of residential and commercial development around transit hubs. Near the 4th and King Street Station, the City and County of San Francisco recently adopted the *Central SoMa Plan,* which would allow an additional 8,800 housing units in the existing high-density urban environment around the station (City and County of San Francisco 2018). This increased density would be complemented by transportation improvements, such as the Central Subway Project (anticipated completion in 2020 with start of revenue service in 2021), which will extend the San Francisco Municipal Railway Metro T Third Line through SoMa, Union Square, and Chinatown. Similarly, the Millbrae Station Area Specific Plan proposes higher-density housing, retail, restaurant, office, hotel, and entertainment in a mixed-use setting, connecting the Millbrae Station to adjacent neighborhoods and downtown. The plan is pedestrian- and transit-oriented and is designed to complement the nearby Millbrae Station (City of Millbrae 2016). Higher density transit-oriented development (TOD) has also been proposed for the areas in and around the San Jose Diridon Station in the *Diridon Station Area Plan* (City of San Jose 2014). Because this development is generally planned and included in city and county general plans and the Bay Area's RTP, these changes in land use patterns and density would be compatible with adjacent land uses and other existing land uses would continue to exist alongside new cumulative projects.

Although the project alternatives would result in some localized changes in land use patterns near the East or West Brisbane LMF and at the Millbrae Station, the project alternatives would not lead to incompatible uses on a broad scale that would result in the substantial alteration of land use patterns within the cumulative RSA. The project, in combination with cumulative projects, would not result in incompatible land uses from the alteration of land use patterns, and there would not be a cumulative impact within the cumulative RSA. As these changes in land use would occur during construction, and as this development would be planned to be compatible with adjoining land uses, once constructed, there would also not be a cumulative operations impact related to this conversion of land.

Inducement of Population Growth beyond Planned Levels

If development in the cumulative RSA results in population growth that exceeds planned levels, a cumulative impact would result. Construction of cumulative projects identified in Volume 2, Appendices 3.18-A and 3.18-B, would generate short-term construction employment in the region and a number of long-term permanent jobs to maintain new and expanded facilities, but no permanent land use and population changes are expected to result from cumulative construction activities. As previously stated, the land use plans of San Francisco, San Mateo, and Santa Clara Counties and their cities and communities encourage infill and higher-density urban development

and concentration of uses around transit corridors to accommodate future population growth and provide more modal choices for residents and workers. Population increases at the 4th and King Street, Millbrae, and San Jose Diridon Stations have been anticipated in the station area plans for these sites. As a result, the project, in combination with cumulative projects, would not induce population growth beyond planned levels. Because cumulative projects are generally included in city and county general plans and RTPs, population increases associated with the project and other cumulative development would not result in a cumulative impact with regard the inducement of substantial population growth beyond planned levels.

CEQA Conclusion

There are no anticipated significant cumulative impacts under CEQA related to station planning, land use, and development to which the project alternatives would contribute because cumulative projects, including the project alternatives, are generally planned for in city and county general plans and RTPs. In addition, ongoing and future changes in land use patterns and density would be consistent with general plans and therefore compatible with adjacent land uses, and other existing land uses would continue to exist alongside new transportation and development projects in the cumulative RSA. Therefore, CEQA does not require any mitigation.

3.18.6.13 Parks, Recreation, and Open Space

Resource Study Area

The cumulative RSA for parks, recreation, open space, and school district play areas is the entirety of San Francisco, San Mateo, and Santa Clara Counties, which is larger than the RSA used for the analysis in Section 3.14, Parks, Recreation, and Open Space. The RSA in Section 3.14 is areas within 1,000 feet of the project footprint for track alignment and within 0.5 mile of the project footprint for stations and maintenance facilities. The cumulative RSA was selected because it captures impacts on parks, recreation, open space, and school district play areas of the project alternatives in combination with cumulative projects that would collectively increase population growth and consequently increase the pressure on parks, recreation, open space, and school district play areas in the cumulative RSA. This analysis also considers planned parks, and recreational facilities that would be built by the time the HSR project is under construction.

Cumulative Condition

The project would traverse urban, residential, commercial, and industrial settings in a historic and existing railway corridor. From north to south along its route, the cumulative RSA includes urban and suburban development in San Francisco, and to a lesser extent in San Mateo, Redwood City, Mountain View, Sunnyvale, and San Jose. Single-family neighborhoods of lower density are in San Bruno, Atherton, and Palo Alto. There are pockets of open space throughout the corridor with the largest found west of Brisbane at San Bruno Mountain State and County Park. The type and character of the parks, recreational facilities, open space, and school district play areas in the cumulative RSA vary with the landscape, resulting in a diverse range of resources and associated user experiences.

Past development in the cumulative RSA has resulted in the creation of new parks, recreation, open space, and school district play areas, while past transportation and other planned development has resulted in the conversion of parks, recreation, open space, and school district play areas to other land uses. Under the cumulative condition, ongoing urban and transportation development would be expected to continue in the cumulative RSA, as described in Section 3.18.4.2, Projected Growth Trends. To maintain the current quality of life, the incorporated areas and the other communities in the cumulative RSA would need to add parkland acreage to accommodate the population forecast for 2040. Due to higher than anticipated land costs and population growth, San Jose has not yet reached its goal to provide access to public parks or recreational open spaces within 0.5 kilometer (0.3 mile) of every urban resident (City of San Jose 2018).

Cumulative impacts would occur if the incremental demand associated with planned developments under the cumulative condition combines with the project alternatives to result in a

shortage of park facilities for communities or contributes to an existing shortage, or if the demand results in the loss of parkland currently used by communities in the cumulative RSA. The relevant projects in the cumulative RSA consist of residential, industrial, commercial, mixed-use, and pedestrian and bicycle improvements; rail and transit improvements; and roadway improvement projects including interchange modifications, road widening, and intersection improvements.

Some projects in the cumulative RSA include construction of new park or recreational facilities to serve projected increases in population. For example, the Brisbane Baylands development project includes plans for approximately 170 acres of parks, plazas, linear parks, shared-use areas, and preservation of natural features for both passive and active recreational uses (City of Brisbane 2013). Mission Rock and Pier 48 is a new mixed-used neighborhood project with plans for 8 acres of new parks and open-space areas (Port of San Francisco n.d.).

The cities of and communities along the Caltrain corridor would require that all new residential and commercial development fund the provision of park and recreational facilities or create new recreational facilities within project limits (e.g., a neighborhood park or public plaza within a new residential or commercial development) to meet the need created by that development. In that way, future development projects would not contribute to the shortage of facilities but would directly provide recreation areas or contribute funds for new parks to accommodate their incremental demand for parkland. Therefore, the project alternatives would not contribute to a cumulative impact related to acquisition of parklands in the cumulative RSA.

Construction activities of the project alternatives in combination with other cumulative projects would result in temporary noise and visual impacts that could require project-specific mitigation. However, it is not considered likely that construction of either of the project alternatives would combine with the noise-generating activities or temporary visual impacts of other construction projects to result in cumulative impacts on parks, recreation, open space, and school district play areas. For such cumulative impacts to occur, construction of multiple projects creating high noise levels or visual impacts would have to take place simultaneously near parks, recreation, open space, and school district play areas and result in noise levels exceeding federal (FRA and FHWA) or state standards, or create a barrier that would preclude the use of the resource. This scenario is unlikely to occur because construction of planned projects would be temporary, the projects do not generally have overlapping or adjacent construction footprints, and construction activities would not preclude the use of the resources.

Furthermore, the project would comply with FRA and FTA guidelines for minimizing construction noise when work is conducted within 1,000 feet of sensitive receptors, which includes parks, recreation, open space, and school district play areas (NV-IAMF#1). The Authority and its contractors would screen and site activities away from sensitive viewers, restore temporary construction sites to their pre-construction condition; and develop and implement a fugitive dust control plan to minimize fugitive dust emissions and associated visual impacts. Access to all resources would be maintained during the construction period. Because it is unlikely that construction of either of the project alternatives would combine with construction of other cumulative projects to preclude the use of a parks, recreation, open space, and school district play, and because project features would minimize construction-related noise associated with the project alternatives, there would not be a construction-related cumulative impact on parks, recreation, open space, and school district play areas.

Cumulative impacts would also occur if the project alternatives and other cumulative projects combine to have permanent air quality, noise, or visual impacts that degrade the user's experience. The project alternatives and other cumulative projects would create permanent sources of noise during operations from Caltrain and HSR train passbys and train horn noise at parks, recreation, open space, and school district play areas. The Authority would implement mitigation as part of approval of the project alternatives, which would reduce exposure of users at parks, recreation, open space, and school district play areas to noise associated with operations of the blended Caltrain and HSR system. Mitigation would include installation of noise barriers, and if noise levels are still not reduced to reasonable levels, the Authority would install sound insulation at buildings to improve the outdoor-to-indoor noise reduction. If noise barriers or sound

insulation are still ineffective, the Authority would acquire affected properties. The Authority would require bidders for HSR vehicle technology procurement to meet federal regulations for vehicle noise, install special trackwork to minimize noise at track junctions, and conduct additional noise analysis during final design to identify further opportunities for noise mitigation. While mitigation would reduce exposure of users at parks, recreation, open space, and school district play areas to noise from train passbys during operations, it would not eliminate the exposure of these users to noise, which in combination with noise from other cumulative projects, would exceed standards set by the FRA for high-speed ground transportation. Although noise level increases would be noticeable to users, the cumulative noise increases would not prevent the use of, or create a perceived barrier to, the use of any park, recreation, open space, or school district play area. These resources are already located in an existing corridor dominated by noise from rail operations and primarily support active uses that do not require quiet or tranquil surroundings. Therefore, there would be no cumulative impact on parks, recreation, open space, and school district play areas during operations.

CEQA Conclusion

There would be no cumulative impact during construction related to acquisition of or demand for parkland, including recreational resources, open-space areas, and school district play areas because projects in the cumulative RSA would not result in a reduction in the overall availability of parks, recreational facilities, open-space resources, or school district play areas. Additionally, no cumulative impacts related to construction noise and visual changes are anticipated because such activities would not create a barrier to use that would preclude the use of the resource. Therefore, there would not be a significant cumulative construction impact on parks, recreational facilities, open-space resources, or school district play areas under CEQA caused by the project or to which the project would contribute. CEQA does not require any mitigation.

Operations of the blended system would increase the number of trains operating in the corridor and the frequency of horn noise events, which would result in an increase in noise level that would be noticeable to park users. However, cumulative noise impacts as a result of blended system operations and other cumulative projects would not prevent the use of, or create a perceived barrier to, the use of any park, recreation, open space, or school district play area. Therefore, there would not be a significant cumulative operations-related impact on parks, recreational facilities, open-space resources, or school district play areas under CEQA caused by the project or to which the project would contribute. CEQA does not require any mitigation.

3.18.6.14 Aesthetics and Visual Quality

Resource Study Area

The cumulative RSA for aesthetics and visual resources is the same as that identified in Section 3.15, because it is sufficiently broad to cover the area in which potential aesthetic impacts of the project alternatives, in combination with cumulative projects, could result in cumulative impacts. The cumulative RSA is the project alternatives' viewshed (i.e., the area that could have views of HSR track and systems).

Viewing distances along the project, which determines the cumulative RSA, vary by location. Because the project corridor is almost completely urbanized, the cumulative RSA is generally within 0.25 mile of the project alternatives' track centerlines. Many views within this distance are obscured by landscaping or buildings, limiting views to and from the alternatives. In some locations along the project corridor, viewing distances extend over wider areas from geographic conditions that permit longer views from elevated locations, primarily residential areas on hillsides near the railway. In this area, the cumulative RSA expands to include areas within 0.5 mile of the alternatives' track centerlines. Except where blocked by adjacent landscaping or development, the views can include the distant hills, the San Francisco Bay, and urban skylines. This wider RSA also accounts for the anticipated scale of the HSR's features and is generally the distance at which the project infrastructure can be distinguished from background features in the landscape.

Cumulative Condition

Over the past 150 years, the visual character of the cumulative RSA along the San Francisco Peninsula and in the Santa Clara Valley has developed along El Camino Real and the Caltrain railway, with most commercial districts anchored by a railway station. The cumulative RSA is a mature urban and suburban landscape. Almost all open space and agricultural uses are gone. Under the cumulative condition, most development is expected to occur in older developed areas, where commercial, industrial, and retail development are expected to be redeveloped into denser and more urban development. This infill development would occur in existing developed areas around Caltrain stations, vacant lands, and along transportation corridors such as El Camino Real. Cumulative impacts would occur if the growth and cumulative projects associated with the cumulative condition resulted in a cumulative reduction in visual quality or would degrade the scenic views within the cumulative RSA.

Temporary construction activities of the cumulative projects including the project alternatives would cause dust and material stockpiles that could collectively degrade the cultural order and natural harmony of the surroundings. Depending on location, viewers could see staging areas, worker parking, and equipment and materials storage areas, which would add industrial-looking elements into the landscape. Introducing construction activities and equipment into the viewshed would be short term and temporary, and the activities would generally be geographically dispersed. During construction of the project alternatives, the Authority and its contractors would screen and site activities away from sensitive viewers, restore temporary cumulative sites to their pre-construction condition; and develop and implement a fugitive dust control plan to minimize fugitive dust emissions and associated visual impacts. The Authority and its contractors would also develop a construction management plan that would include visual protection measures designed to minimize impacts on residents and businesses. Mitigation would require the contractor to prepare technical memorandums identifying how the project would minimize construction-related visual/aesthetic disruption and how the contractor would shield nighttime construction lighting and direct it downward to minimize the light that falls outside the construction site boundaries. Therefore, there would not be a temporary construction cumulative impact on aesthetics and visual resources in the cumulative RSA.

Construction of permanent features and infrastructure of the project alternatives in combination with other cumulative projects would result in new buildings, structures, and infrastructure in the cumulative RSA. Aesthetics and visual changes would be concentrated at 4th and King Street Station, Brisbane Baylands, Millbrae Station, and San Jose Diridon Station:

- **4th and King Street Station**—Ongoing development around the 4th and King Street Station, would continue to replace existing low-rise commercial and industrial buildings with taller, mixed-use development. When the DTX allows rail service to extend to the SFTC, portions of the existing Caltrain rail facilities in San Francisco would be expected to be declared surplus, providing additional parcels for mixed-use development near the 4th and King Street Station. This development would be similar to cumulative projects in the area.
- **Brisbane Baylands**—Identified as a priority development area in *Plan Bay Area 2040,* Brisbane Baylands is one of the largest undeveloped infill sites (660 acres) in the Bay Area, and is proximate to transit, which makes it an attractive site for TOD infill development opportunities (ABAG and MTC 2017). At the northwest of the site, the Schlage Lock project is currently under construction and will provide 1,679 residential units and 46,700 square feet of retail. In November 2018, the City of Brisbane and the city's voters approved a General Plan Amendment that designates planned development of 1,800–2,200 dwelling units, 6.5 million square feet of commercial development, and 500,000 square feet of a hotel on the remainder of the site. The site would likely be developed with a mix of new housing, retail, commercial, and recreational development on land that is currently open space and lightly developed. New development would alter residents' views from homes in the hills of Brisbane through the conversion of open space to urban uses, and expand nighttime light sources in the hillside residents' views. New and enhanced recreational facilities around the Brisbane

Lagoon and throughout the Baylands development would bring new recreational viewers to the area, where they would experience views of the Caltrain railway.

- **Millbrae Station—**Development around the Millbrae Station is guided by the Millbrae Station Area Specific Plan, which proposes higher-density mixed-use residential and commercial uses in the areas closest to the Millbrae Station, including at the location of the current BART parking lots. Development applications have been submitted for two projects on these sites—the Millbrae Serra Station Project and the Gateway at Millbrae Station—located immediately west and east of the station, respectively. Cumulative projects near the Millbrae Station would increase building density and height, reducing the contrast in scale of the development in the station district with the HSR facilities. While the project would implement aesthetic guidelines (AVQ-IAMF#1: Aesthetic Options) and an aesthetic review process to integrate the HSR infrastructure in the surrounding landscape and local context (AVQ-IAMF#2: Aesthetic Review Process), it would still change the existing visual character.
- **San Jose Diridon Station—**Development around the San Jose Diridon Station is guided by a cooperative agreement between the Authority, Caltrain, Santa Clara Valley Transportation Authority, and the City of San Jose, which seeks to integrate the transportation improvements (HSR, BART, Caltrain Modernization, Altamont Corridor Express) and higher-density mixed-use residential and commercial uses, including the Google mixed-use development. Cumulative projects near the San Jose Diridon Station would increase building density and height and develop existing surface parking areas, reducing the contrast in scale of the development in the station district with the HSR facilities but blocking views from highly sensitive residential viewers. While the project would implement aesthetic guidelines (AVQ-IAMF#1) and an aesthetic review process to integrate the HSR infrastructure in the surrounding landscape and local context (AVQ-IAMF#2), it would still change the existing visual character.

Residents with moderately high to high viewer sensitivity adjacent to new development would experience a permanent reduction in visual quality from the change in land uses where such changes would be out of scale or character with the existing development or would permanently alter views, degrading the existing visual character or quality of the cumulative RSA. Construction of either of the project alternatives in combination with other cumulative projects would result a permanent construction-related cumulative impact on aesthetics and visual resources at the 4th and King Street Station, Brisbane Baylands, Millbrae Station, and the San Jose Diridon Station.

Operations of the project alternatives and other cumulative projects has the potential to induce employment and housing growth in the station areas, which would advance the implementation of approved TOD plans around HSR and result in changes in the built environment and indirect impacts on visual quality. Operations would also generate new light sources, including buildings, facilities, and increase traffic, public and private, to and from the stations, contributing to increases in nighttime light levels. Design features of the project alternatives would avoid and minimize potential visual impacts by implementing HSR station area development principles and guidelines and would provide lighting and building design intended to conform to the local design context (LU-IAMF#1: HSR Station Area Development: General Principles and Guidelines). Because HSR stations would be located at existing transportation hubs in developed areas, the impact of operation of the project alternatives, in combination with operation of other cumulative projects, would not result in a permanent operation cumulative impact on aesthetics and visual resources.

Contribution of the Project Alternatives

Under both project alternatives, residents would experience altered views from permanent construction of new HSR infrastructure. Aesthetics and visual quality impacts associated with Alternative A would be centered around the existing stations in San Francisco and Millbrae, and the LMF in Brisbane. Impacts from Alternative B would also occur between San Mateo and San Carlos where the existing Caltrain right-of-way would be expanded to accommodate four tracks and the aerial San Jose Diridon Station. The contribution of the project alternatives to cumulative impacts on aesthetic and visual quality at the 4th and King Street Station, Brisbane Baylands, the

Millbrae Station, San Jose Diridon Station and approaches, and the passing track area are summarized as follows:

- **4th and King Street Station**—At the existing 4th and King Street Station, where HSR service would be added to the existing Caltrain service, cumulative impacts would occur as properties redevelop around the station. Either project alternative would produce minimal changes to the station and surrounding area, contributing to no change in visual quality. New development in the area would likely produce buildings taller than the buildings they would replace, or added in portions of the Caltrain station and terminal area when the DTX opens, allowing redevelopment. New buildings would block views of existing residents in existing buildings, affecting their visual quality. This development would be guided and mitigated by the city's planning documents.
- **Brisbane Baylands**—Both alternatives would develop a LMF within the Brisbane Baylands area, either east or west of the existing Caltrain corridor. New and enhanced recreational facilities around the Brisbane Lagoon and throughout the planned Brisbane Baylands development would bring new recreational viewers to the area, where they would experience views of the Brisbane LMF and the Caltrain right-of-way. IAMFs to provide community input to the design of HSR infrastructure (AVQ-IAMF#2) to adapt to local conditions (AVQ-IAMF#1) would avoid and minimize the contrast of views of HSR infrastructure by sensitive viewers. This would include design enhancements to the architecture of HSR facilities, and landscaping to shield views of HSR from sensitive viewers.
- **Millbrae Station—**At the existing Millbrae Station, where HSR service would be added to Caltrain and BART services, cumulative impacts would occur as properties redevelop around the station. The project alternatives would permanently acquire and demolish existing one-story commercial development west of the existing Millbrae Station to construct a new station facility, circulation elements, and parking. The Millbrae Area Specific Plan envisions eventual redevelopment of the site as a multistory TOD.
- **Passing tracks (Alternative B only)—**Alternative B would add two tracks to the existing Caltrain railway between San Mateo and San Carlos. This would entail rebuilding or modifying existing grade separations and adding and modifying existing filled and retained portions of the railway. Specific impacts would occur at limited locations where the expanded railway would become visible to sensitive residential viewers or where it visually encroaches on the historic San Carlos Depot. Planning documents from San Mateo, Belmont, and San Carlos all identify opportunities for TOD along El Camino Real and the rail corridor. New development would replace existing uses with larger and taller buildings, reducing views to the rail corridor. New buildings would be subject to contemporary planning guidelines, and be designed to complement existing uses in the area.
- **San Jose Diridon Station**—Around the existing station, cumulative impacts would occur as properties redevelop around the station, drawn by new HSR and BART service, expanded Caltrain, ACE, and Capitol Corridor service. Alternative A would produce minimal changes to the station and surrounding area, contributing to no change in visual quality. Alternative B, with an aerial station and viaduct structures extending north and south of the station, would reduce visual quality by altering views of highly sensitive residential viewers. New development in the area would produce buildings taller than the buildings they would replace, or build on existing surface parking lots. New buildings would block views of existing residents in existing buildings, affecting their visual quality. This development would be guided and mitigated by the city's planning documents, but the denser and taller development would degrade the views of sensitive residential viewers.

CEQA Conclusion

There would be no cumulative impact from temporary construction activities on aesthetics and visual resources. Depending on location, viewers could see staging areas, worker parking, and equipment and materials storage areas, which would add industrial-looking elements into the landscape. Introducing construction activities and equipment into the viewshed would be short

term and temporary, and the activities would generally be geographically dispersed. Therefore, there would not be a significant cumulative temporary construction impacts on aesthetics and visual resources under CEQA caused by the project or to which the project would contribute. CEQA does not require any mitigation.

The construction of new permanent features as part of the project alternatives and combined with other planned development in the cumulative RSA would result in significant cumulative construction impacts under CEQA where the visual quality and setting would be degraded by construction activities that contrasts in scale with existing development where highly sensitive residential viewers are present. While project construction activities would be limited to areas on or adjacent to the existing rail line, planned developments would be built in scattered locations, with greater exposure to highly sensitive residential viewers than project construction activities. Construction of the HSR project would not contribute significantly to these permanent cumulative impacts on aesthetics and visual quality. Therefore, under CEQA, no further mitigation is required.

Operation of the project alternatives in combination with other planned development in the cumulative RSA would not result in permanent significant visual impacts under CEQA related to light and glare because, lighting from new buildings, facilities, and trains would not contribute significantly to increases in nighttime light levels. Therefore, CEQA does not require any mitigation.

3.18.6.15 Cultural Resources

Resource Study Area

The cumulative RSAs for cultural resources are the same as the archaeological area of potential effect (APE) for archaeology, and the APE for historic built resources detailed in Section 3.16, which includes a map series of these APEs in Volume 2, Appendix 3.16-C, Archaeological and Built Resources. These RSAs are sufficiently broad to cover the areas in which the potential impacts of the project alternatives in combination with cumulative projects could result in cumulative impacts on cultural resources. The archaeological APE is defined as the area of ground to be disturbed before, during, or after construction of the HSR project. The historic built resources APE includes all legal parcels intersected by the HSR footprint under all project alternatives, including the HSR right-of-way and ancillary features such as grade separations, stations, LMF, utilities, and construction staging areas. The historic built resources APE includes properties where historic materials or associated landscape features would be demolished, moved, or altered by construction. The historic built resources APE is larger than the project footprint and was delineated to take into consideration direct and indirect impacts of the project alternatives.

Cumulative Condition

Under the cumulative condition, past and ongoing urban development and transportation projects would be expected to continue in the cumulative RSAs. Urban development stemming from the anticipated population increase through 2040 would result in redevelopment of existing urban and suburban areas for residential, commercial, and industrial uses. Cumulative projects that are anticipated to be built by 2040 include shopping centers, industrial parks, residential developments, and mixed-use development. Current plans for land use and transportation near the Project Section include forecasts for improvements to the highway, aviation, conventional passenger rail, freight rail, and port systems through the 2040 planning horizon.

Cumulative impacts on cultural resources would occur if construction of the cumulative projects combine to result in the physical demolition, destruction, relocation, or alteration of significant historical, archaeological, or other cultural resources. Significant historical, archaeological, or other cultural resources are those determined to be significant in American history, architecture, archaeology, engineering, or culture, consistent with Criteria A through D of the National Register of Historic Places (NRHP) and the California Register of Historical Resources (CRHR) criteria. See Section 3.16 for more information on application of the NRHP and CRHR criteria.

Archaeological Resources

Construction and operations of cumulative projects in the archaeological APE (i.e., the area of ground disturbance) in combination with the project alternatives would result in cumulative impacts on archaeological resources if such construction activities would result in damage to or destruction of these resources. Because the APE is a relatively small area, many of the cumulative projects identified in Volume 2, Appendices 3.18-A and 3.18-B are located outside the archaeological APE and are not considered in this analysis. Some of the cumulative projects that would combine with the project alternatives to result in cumulative impacts on archaeological resources are the Showplace Square Potrero Hill Area Plan, Central Waterfront—Dogpatch Public Realm Plan, San Bruno General Plan, the Millbrae Station Area Specific Plan, and the baseball stadium in the San Jose Diridon Station area.

Construction activities of cumulative projects, including the project alternatives, would involve ground-disturbing activities and excavation, which may damage or destroy a cultural resource, resulting in loss of the features that made the resource eligible for listing in the NRHP or the CRHR. Past and present development in the cumulative RSA has resulted in permanent disturbance or destruction of unknown archaeological sites through construction activities such as grading or excavating. This disturbance has occurred when urban or suburban older development has been replaced by new development. Continued redevelopment of existing properties in the cumulative RSA, such as that anticipated under the portions of the general plans of cities and communities along the Caltrain corridor, is assumed to result in further potential impacts on known and unknown archaeological sites.

Various laws and regulations that apply to planned development direct that archaeological resources be avoided or impacts on them be mitigated prior to development. Project features would avoid and minimize impacts by evaluating archaeological sensitivity that require monitoring within the APE, conducting pre-construction surveys, and implementing an archaeological monitoring plan (CUL-IAMF#1: Geospatial Data Layer and Archaeological Sensitivity Map; CUL-IAMF#3: Pre-Construction Cultural Resource Surveys; CUL-IAMF#5: Archaeological Monitoring Plan and Implementation). Lastly, mitigation would include implementation of an archaeological treatment plan (ATP) and halting work in case of an archaeological discovery and complying with the programmatic agreement, memorandum of agreement, ATP, and all state and federal laws, as applicable (CUL-MM#1: Mitigate Adverse Effects on Archaeological and Built Resources Identified during Phased Identification and Comply with the Stipulations Regarding the Treatment of Archaeological and Historic Built Resources in the PA and MOA; CUL-MM#2: Halt Work in the Event of an Archaeological Discovery, and Comply with the PA, MOA, ATP, and all State and Federal Laws, as Applicable). Therefore, these requirements, project features, and mitigation measures would prevent the loss of significant archaeological resources and there would be no cumulative impact during construction.

Operations of the project alternatives in combination with planned development in the cumulative RSA would not result in impacts on archaeological resources because ground disturbance would not be necessary. Therefore, there would be no cumulative impact during operations.

Historic Built Resources

Construction and operations of the cumulative projects most likely to cause cumulative impacts on historic built resources would be those located within the historic built resources APE. Because this constitutes a relatively small area, many of the cumulative projects identified in Volume 2, Appendices 3.18-A and 3.18-B are located outside of the historic built resources APE and are not considered in this analysis. Some of the plans and projects that could combine with the project alternatives to cause cumulative impacts on historic built resources include Better Market Street, Central Waterfront—Dogpatch Public Realm Plan, Millbrae Station Area Specific Plan, Caltrain Parking Lot Improvement Project (City of San Carlos), and baseball stadium in the San Jose Diridon Station area. Permanent demolition, destruction, relocation, or alteration of a built historic resource or its setting from these projects could combine with the project alternatives to cause cumulative impacts.

Construction activities of cumulative projects could result in permanent demolition, destruction, relocation, or alteration of a built historic resource or its setting, resulting in loss of the features that made the resource eligible for listing in the NRHP or the CRHR. The project alternatives would not result in the loss of features that make any of the historic built resources eligible for such listing. Cumulative development projects have resulted in demolition, relocation, and alteration of historic built resources and their settings when older development has been replaced by new development through the demolition and replacement of existing buildings, and when agricultural lands have been converted to residential, commercial, and industrial uses, resulting in new construction and a change in the historic setting or rural areas. Continued redevelopment of existing properties in the cumulative RSA, such as that anticipated under the portions of the general plans of cities and communities along the Caltrain corridor, would result in further potential impacts on known historic built resources. Continued residential development is also expected as the population increases in the area, resulting in further demolition and replacement of historic built resources, especially in and around the city centers of San Francisco, San Bruno, Millbrae, Burlingame, San Mateo, Belmont, San Carlos, Redwood City, Menlo Park, Palo Alto, Mountain View, Sunnyvale, Santa Clara, and San Jose.

Laws and regulations that apply to cumulative projects direct that impacts on historic built resources be avoided or mitigated and would, therefore, minimize or avoid some impacts on known resources. Project features would avoid and minimize these impacts (CUL-IAMF#6: Pre-Construction Conditions Assessment, Plan for Protection of Historic Built Resources, and Repair of Inadvertent Damage; CUL-IAMF#7: Built Environment Monitoring Plan; CUL-IAMF#8: Implement Protection and/or Stabilization Measures). Mitigation measures would require that the Authority or its contractors prepare and submit additional recordation and documentation (CUL-MM#6: Prepare and Submit Additional Recordation and Documentation), prepare interpretative educational materials (CUL-MM#7: Prepare Interpretive or Educational Materials), repair inadvertent damage (CUL-MM#8: Repair of Inadvertent Damage), and stay consistent with the *Secretary of the Interior's Standards for the Treatment of Historic Properties* (36 C.F.R. Part 68) (CUL-MM#10: Station Design Consistent with the Secretary of the Interior's Standards for the Treatment of Historic Properties). However, mitigation measures would not reduce or avoid impacts related to demolition of historic built resources. If constructed, both alternatives would result in impacts on historic built resources because construction activities would result in the demolition, destruction, or alteration of historic built resources, their settings, or both through the introduction of a new rail corridor, the construction of new roads, the expansion of existing rail tracks and roads, and the generation of ground-borne vibrations during construction that have the potential to damage historic built resources. These impacts, in combination with other cumulative projects, would result in a cumulative impact on historic built resources during construction.

Operation of the cumulative projects in the cumulative RSA may also result in damage to or loss of historic built resources through intermittent noise and vibration impacts. Intermittent operational vibration impacts from the project alternatives would not cause permanent destruction or alteration of cultural resources that could affect the ability of these resources to convey historic significance. Neither project alternative would result in vibration impacts at levels that would cause permanent damage or that would affect the ability of these resources to convey their historical significance. The impacts of other cumulative projects could result in a cumulative impact on historic built resources; the project's contribution to this impact is discussed in the next section.

Contribution of the Project Alternatives

Historic Built Resources

Twenty-seven historic built resources are located in the architectural APE for built resources. Of these, one is in the footprint of Alternative A, three are in the footprint of Alternative B (Viaduct to I-880), and four are in the footprint of Alternative B (Viaduct to Scott Boulevard).

If the project is built, 2 of the 27 historic built resources would be permanently demolished or substantially altered under Alternative A. The Authority would implement mitigation measures to minimize impacts on cultural resources. Pending concurrence with consulting parties, in all cases,

CUL-MM#6 would be applied to require that the property be fully documented prior to construction to record the character-defining features, and CUL-MM#7 would be applied to provide for the creation of interpretive materials using documentation prepared under CUL-MM#6. Additionally, CUL-MM#10 would require that new station facilities be designed in a manner consistent with the Secretary of the Interior's (SOI) Standards for Rehabilitation. While these mitigation measures would alleviate some of the impacts on the resources by documenting and interpreting their history, and requiring that new station designs conform to the SOI's Standards for Rehabilitation, these measures would not fully mitigate for demolition or destruction of historical resources and their character-defining features or the alteration to the resources' settings. Therefore, the impacts of Alternative A would be significant and unavoidable for 2 historic built resources.

If the project is built, Alternative B (Viaduct to I-880) would permanently demolish or substantially alter 4 of the 27 built resources. The Authority would implement the same mitigation measures to minimize impacts on cultural resources as described under Alternative A. These mitigation measures would alleviate some of the impacts on the resources by documenting and interpreting their history, and requiring that new station designs conform to the SOI's Standards for Rehabilitation, but would not fully mitigate for demolition or destruction of the majority of the historic resources and their character-defining features or alterations to the resources' settings. The exception would be 415 Illinois Avenue (ID#0585), for which impacts would be mitigated to a less-than-significant level with the implementation of mitigation. Therefore, the impacts of Alternative B (Viaduct to I-880) would be significant and unavoidable for three historic built resources.

If the project is constructed, Alternative B (Viaduct to Scott Boulevard) would permanently demolish or substantially alter 5 of the 27 built resources. For four of these properties, demolition or destruction would result from introduction of or substantial changes to the HSR right-of-way, introduction of a road right-of-way, or introduction of an automatic train control site. The Authority would implement the same mitigation measures to minimize impacts on cultural resources as described under Alternative A. These measures would not fully mitigate for demolition or destruction of the majority of the historic resources and their character-defining features or the alteration to the resources' settings. The exception would be the 415 Illinois Avenue (ID#0585), for which impacts would be mitigated to a less-than-significant level with the implementation of mitigation. Therefore, the impacts of Alternative B (Viaduct to Scott Boulevard) would be significant and unavoidable for four historic built resources.

The greatest number of significant impacts would occur under Alternative B (Viaduct to Scott Boulevard) (four significant, unavoidable impacts under CEQA). Fewer significant impacts would occur under Alternative B (Viaduct to I-880) (three significant, unavoidable impacts under CEQA) and Alternative A (two significant, unavoidable impacts under CEQA). The project would be the largest contributor to cumulative impacts on historic built resources during construction.

While mitigation measures would be implemented to reduce the impacts, they would not compensate for the loss of the all affected resources. These project-specific impacts would combine with other construction impacts such that there would be a new cumulative impact on historic built resources. There is no additional feasible mitigation.

CEQA Conclusion

Archaeological Resources

There would not be a significant cumulative construction or operational impact on archaeological resources under CEQA caused by the project alternatives or to which the project alternatives would contribute because requirements are in place for both planned development and the project that would prevent significant cumulative impacts. These requirements include laws and regulations that apply to planned development, directing that archaeological resources be avoided or impacts on them be mitigated prior to development; project features that would avoid and minimize impacts by evaluating archaeological sensitivity that require monitoring within the APE, conducting pre-construction surveys, and implementing an archaeological monitoring plan

and; and mitigation that would include implementation of an ATP and halting work in case of an archaeological discovery and complying with the programmatic agreement, memorandum of agreement, ATP, and all state and federal laws, as applicable. Therefore, CEQA does not require any mitigation.

Historic Built Resources

During construction, both project alternatives would result in permanent demolition, destruction, relocation, or alteration of a built historic resource or its setting resulting in loss of the features that made the resource eligible for listing in the NRHP or the CRHR. These impacts would combine with impacts of other planned projects to result in significant cumulative construction impacts on historic built resources under CEQA because these projects would result in the demolition, destruction, or alteration of historic built resources, their settings, or both. The contribution of the project alternatives to this cumulative impact would be considerable because construction of the HSR project would result in damage or destruction of historic built resources, resulting in their loss of significance. There are no additional mitigation measures available.

3.18.6.16 Environmental Justice

Effects of the project alternatives on minority communities and low-income communities are addressed in Chapter 5, Environmental Justice. Chapter 5 also includes a discussion of the effects of cumulative projects on such communities.

3.18.7 Cumulative Impact Summary

The analysis of cumulative impacts determined that there would be significant cumulative impacts on eight resources. Table 3.18-6 lists those resources. Resource topics for which no significant cumulative impacts were identified are not included in the table. These resource topics are: EMF and EMI; public utilities and energy; hydrology and water resources; hazardous materials and waste; socioeconomics and communities; station planning, land use, and development; parks, recreation, and open space; and archaeological resources.

Table 3.18-6 Summary of Cumulative Effects and Impacts

NEPA Cumulative Effect	CEQA Considerable Contribution
Transportation	
The closures and modifications of roadways from the project alternatives in combination with the cumulative projects would result in increased traffic congestion and delay at intersections and certain freeway segments.	N/A: Traffic congestion/delay is not a CEQA impact.
Increased traffic volumes and delays near stations and at-grade crossings affected by the project in combination with the ongoing increases in traffic volumes as a result of the cumulative projects and regional growth would result in traffic congestion and delay at intersections.	N/A: Traffic congestion/delay is not a CEQA impact.
The closures and modifications of roadways from the project alternatives in combination with the cumulative projects would result in delays and degradation of existing transportation networks and the performance of bus transit.	There would be a considerable contribution to temporary delays and degradation of existing transportation networks and the performance of bus transit under both project alternatives due to temporary road closures and realignments. Alternative B would have a greater contribution to cumulative impacts on intersection operations due to the additional road closures and construction-related traffic associated with passing track construction.

NEPA Cumulative Effect	CEQA Considerable Contribution
Increased traffic volumes and delays near stations and at-grade crossings constructed by the project in combination with the ongoing increases in traffic volumes as a result of the cumulative projects and regional growth would result in delays and degradation of existing transportation networks and the performance of bus transit.	There would be a considerable contribution to permanent delays and degradation of existing transportation networks and the performance of bus transit under both project alternatives due to increased traffic at 4th and King Street Station and Millbrae Station and increased delays at at-grade crossings due to increased gate-down times.
Temporary track closures associated with construction of the PCEP and the project alternatives would disrupt existing Caltrain and freight rail service along the Caltrain corridor, resulting in delays and restrictions on operations.	There would be a considerable contribution to disruptions in existing Caltrain and freight rail service under both project alternatives associated with temporary track closures during construction. These temporary track closures would reduce rail capacity and result in passenger rail service delays and performance and freight rail service delays and access constraints. Alternative B would have a greater contribution to cumulative passenger rail and freight service capacity constraints from the increased amount of construction and track closures associated with passing track construction.
Air Quality and Greenhouse Gases	
Construction-related impacts associated with the project alternatives in combination with the cumulative projects would contribute further to nonattainment of criteria pollutants, DPM, and $PM_{2.5}$, and health risks.	There would be a considerable contribution associated with project construction to nonattainment of criteria pollutants. Project operations would decrease regional emissions of criteria pollutants and precursors, resulting in a net benefit to regional air quality. Therefore, operations would not result in a considerable contribution to regional emission.
Increased GHG emissions associated with the project in combination with the cumulative projects and increased growth would result in impacts on global climate change.	Project operations would not result in a considerable contribution to cumulative impacts on GHG emissions; both alternatives would result in a new operational reduction of GHG emissions.
Noise and Vibration	
Operational rail noise impacts on sensitive receptors in excess of FRA standards from blended system operations and other cumulative rail and transit projects.	There would be a considerable contribution to noise impacts due to blended system operations because both project alternatives would double the total number of trains operating in the Caltrain corridor per day and would produce noise that exceeds FRA standards for high-speed ground transportation.
Traffic-related noise impacts would exceed 3 dB at roadways near the 4th and King Street Station in 2029 due to project operations and other cumulative projects.	There would be a considerable contribution to traffic-related noise impacts under both project alternatives due to increased traffic volumes generated by passengers accessing the 4th and King Street Station.
Operations of planned rail and transit projects and the HSR project would generate vibration in excess of FRA standards for residential vibration criteria.	There would be a considerable contribution due to blended system operations because both project alternatives would double the total number of trains operating in the Caltrain corridor per day and would expose a large number of sensitive receptors to increases in ground-borne vibration.

NEPA Cumulative Effect	CEQA Considerable Contribution
Biological and Aquatic Resources	
Construction-related impacts on special-status species, non-special-status wildlife species, and special-status plant communities resulting from habitat loss and degradation as a result of the project alternatives in combination with the cumulative projects.	The project would not result in a considerable contribution to impacts on special-status species, non-special-status wildlife species, and special-status plant communities resulting from habitat loss and degradation.
Construction-related impacts associated with the loss and degradation of aquatic resources as a result of the project alternatives in combination with the cumulative projects.	The project would not result in a considerable contribution to impacts associated with the loss and degradation of aquatic resources.
Construction-related impacts associated with removal and disturbance of protected trees as a result of the project alternatives in combination with the cumulative projects.	The project would not result in a considerable contribution to impacts associated with removal and disturbance of protected trees.
Construction-related impacts on wildlife movement associated with regional habitat fragmentation and loss of regional habitat connectivity as a result of the project alternatives in combination with the cumulative projects.	The project would not result in a considerable contribution to impacts on wildlife movement associated with regional habitat fragmentation and loss of regional habitat connectivity.
Construction-related loss and disturbance of conservation areas and conflicts with regional habitat conservation plans as a result of the project alternatives in combination with the cumulative projects.	The project alternatives would not result in a considerable contribution to loss and disturbance of conservation areas and conflicts with regional habitat conservation plans.
Geology, Soils, Seismicity and Paleontological Resources	
Construction activities for the project alternatives in combination with the cumulative projects have the potential to cumulatively disturb, damage, or destroy scientifically important fossil resources.	Construction of either of the project alternatives would not have a considerable contribution to the disturbance, damage, or destruction of scientifically important fossil resources.
Safety and Security	
Construction and operations-related impacts on response time for emergency responders due to the project alternatives in combination with the cumulative project.	There would be a considerable contribution under both project alternatives to impacts on emergency vehicle response times as a result of temporary road closures and construction-related traffic during construction. There would also be a considerable contribution under both project alternatives as a result of increased gate-down time at at-grade crossings during operations; however, this could be reduced through available mitigation if local jurisdictions chose to construct and operate new and expanded fire station facilities.
Aesthetics and Visual Resources	
Cumulative development at the 4th and King Street Station, Brisbane Baylands, Millbrae Station, and San Jose Diridon Station would reduce visual quality for sensitive viewers.	The project alternatives would not result in a considerable contribution to the permanent reduction of visual quality for sensitive viewers.

NEPA Cumulative Effect	CEQA Considerable Contribution
Cultural Resources	
Construction of either of the project alternatives in combination with cumulative projects would result in permanent demolition, destruction, relocation, or alteration of built historic resources or their settings.	The project alternatives would result in a considerable contribution to the permanent demolition, destruction, relocation, or alteration of built historic resources or their settings.

CEQA = California Environmental Quality Act
dB = decibel
DPM = diesel particulate matter
FRA = Federal Railroad Administration
GHG = greenhouse gases
HSR = high-speed rail
N/A = not applicable
NEPA = National Environmental Policy Act
PCEP = Peninsula Corridor Electrification Project
$PM_{2.5}$ = particulate matter smaller than or equal than 2.5 microns in diameter