APPENDIX 1-A: CHANGES IN PROJECT BENEFITS AND IMPACTS

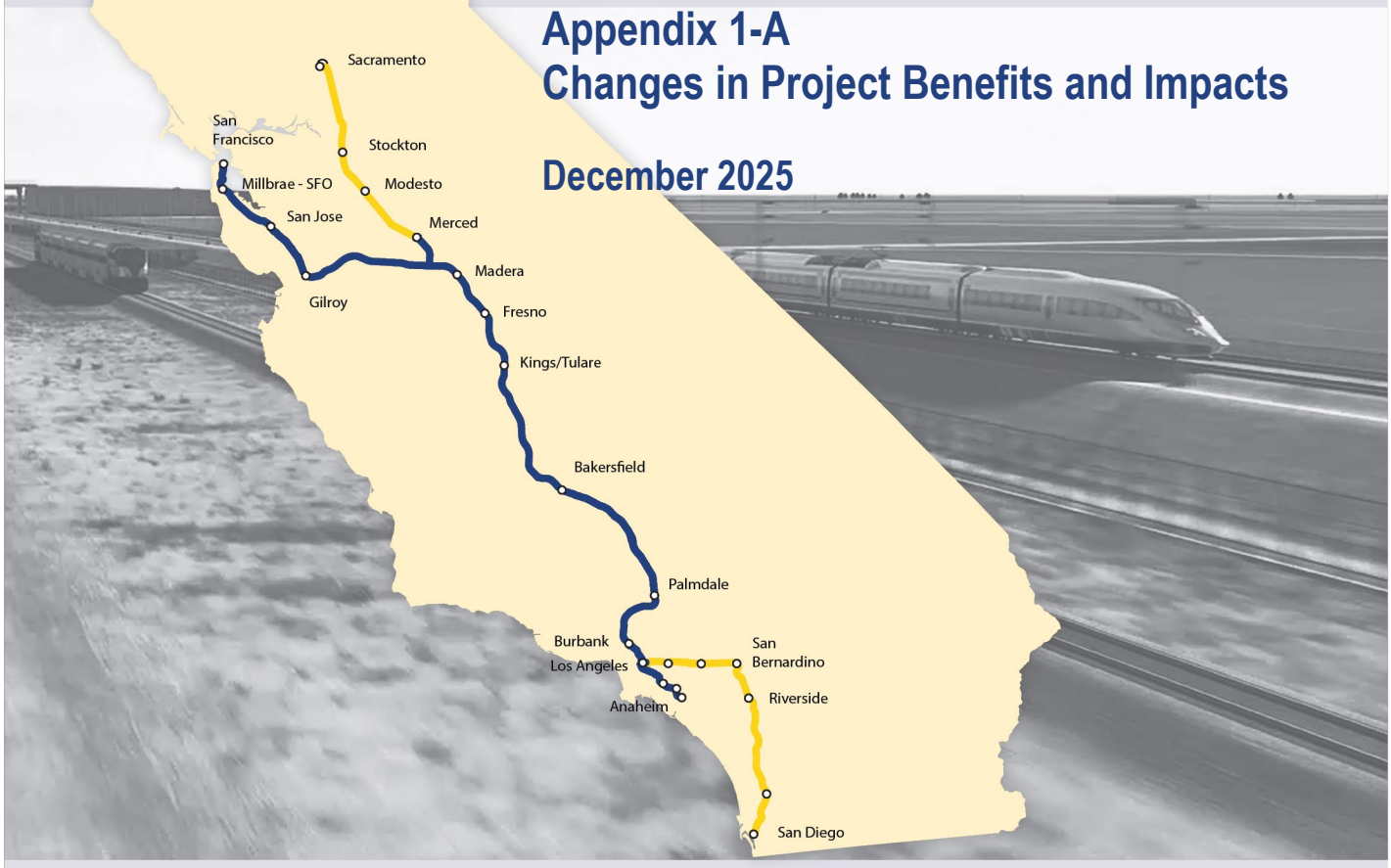
California High-Speed Rail Authority

Los Angeles to Anaheim Project Section

Draft Project Environmental Impact Report/ Environmental Impact Statement

Appendix 1-A Changes in Project Benefits and Impacts

December 2025



CALIFORNIA High-Speed Rail Authority

The environmental review, consultation, and other actions required by applicable federal environmental laws for this project are being or have been carried out by the State of California pursuant to 23 U.S.C. 327 and a Memorandum of Understanding dated July 22, 2024, and executed by the Federal Railroad Administration and the State of California.

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ACRONYMS AND ABBREVIATIONS

Term	Definition
Authority	California High-Speed Rail Authority
EIR/EIS	Environmental Impact Report/Environmental Impact Statement
GHG	greenhouse gas
HSR	high-speed rail
VMT	vehicle miles traveled

1 BACKGROUND

This appendix describes the utilization of the California High-Speed Rail (HSR) 2023 Project Update Report and 2024 Business Plan modeling data for the Los Angeles to Anaheim Project Section Draft Environmental Impact Report/Environmental Impact Statement (EIR/EIS), and how the different data sources may affect the impact analyses.

When the California High-Speed Rail Authority (Authority) began preparing the Los Angeles to Anaheim Draft EIR/EIS, the 2023 Project Update Report was used as the basis for environmental analysis, because the 2024 Business Plan was not yet available and it was being prepared without an analysis of the optional intermediate HSR stations. The 2024 Business Plan was adopted by the Authority Board on April 11, 2024, and it contained updated ridership assumptions that were lower than those presented in the 2023 Project Update Report. Upon publication of the 2024 Business Plan, the Authority determined that data from both the 2023 Project Update Report and 2024 Business Plan would be used to support the analysis in the Los Angeles to Anaheim Draft EIR/EIS, depending on the resource topic and availability of data from the two Authority models.

The following sections describe the ridership assumptions within the 2023 Project Update Report and 2024 Business Plan, and how the differences in ridership projections affect the operational benefits and impacts identified in the Los Angeles to Anaheim Draft EIR/EIS for the three topics directly related to ridership: greenhouse gas (GHG) emissions, energy, and transportation (specifically statewide vehicle miles traveled [VMT] reductions by 2040). The information contained in this appendix does not constitute a change to the proposed components of the Los Angeles to Anaheim Project Section, nor does it identify new or more severe adverse environmental impacts beyond those identified in the Los Angeles to Anaheim Draft EIR/EIS. The information contained herein is consistent with the text and discussions of potential environmental effects in the Los Angeles to Anaheim Draft EIR/EIS and is intended to reflect the potential range of outcomes for benefits associated with the Los Angeles to Anaheim Project Section in the future, and to inform the decision-making process.

Some topics analyzed in the Los Angeles to Anaheim Draft EIR/EIS are not generally affected by differences in ridership estimates or frequency of service, because they rely on the physical effects of the project on the environment, such as temporary construction-related impacts and impacts resulting from maintenance activities. These topics include electromagnetic fields and electromagnetic interference; public utilities; biological and aquatic resources; hydrology and water resources; geology, soils, seismicity, and paleontological resources; hazardous materials and wastes; station planning, land use, and development; parks, recreation, and open space; aesthetics and visual quality; cultural resources; and regional growth. Additionally, both the 2023 Project Update Report and the 2024 Business Plan assume 164 revenue service trains per day and both assume the same number of trains operating between Los Angeles and Anaheim in their service plans (Authority 2024b); therefore, there would be no difference in any analyses that are a function of frequency of service, such as noise and vibration, safety and security, and socioeconomics and communities.

2 OVERVIEW OF KEY ASSUMPTIONS IN THE 2023 PROJECT UPDATE REPORT AND 2024 BUSINESS PLAN

The Los Angeles to Anaheim Draft EIR/EIS quantifies the Los Angeles to Anaheim Project Section's reduction of VMT, GHG emissions, and changes in energy use. The VMT reductions were estimated using the 2023 Project Update ridership model and not the current ridership model supporting the 2024 Business Plan. The VMT reductions are the basis of the GHG emissions estimates and a key input to the assessment of energy use changes. The 2024 Business Plan ridership model estimated lower ridership and lower VMT reductions for Phase 1 operations compared to prior ridership models, but does not include a breakdown for each operating segment within Phase 1.[1]

The 2023 Project Update Report includes ridership estimates for each operating segment in Phase 1[2] of the California HSR System that are based on the California Rail Ridership Model. This model was developed in 2023 in coordination with the California State Transportation Agency and California Department of Transportation and encompasses the entire state of California, as well as external travel links to reflect travel to and from neighboring states. The California Rail Ridership Model provides outputs that help to understand the ridership effect of connecting HSR with regional and local rail and transit services. The model was first used in the 2023 Project Update Report. The 2023 Project Update Report prepared a ridership forecast for the Merced to Bakersfield Project Section, Silicon Valley to Central Valley, and San Francisco to Los Angeles/Anaheim. The 2023 Project Update Report also includes an analysis of the optional intermediate stations at Fullerton and Norwalk/Santa Fe Springs.

Development of the California Rail Ridership Model involved an extensive data collection process, including current (at the time) population and employment forecasts for a 2040 horizon year, based on estimates from the California Department of Finance and the California Department of Transportation's Economics Branch. The forecasts indicated that population and employment were not expected to grow as fast as projected previously, which would affect overall travel demand in the state.

The 2024 Business Plan continued to use the California Rail Ridership Model, with refined assumptions and updated population and employment information. The 2024 modeling output provides estimates for the following scenarios: Valley to Valley (San Francisco to Bakersfield) and Phase 1 (San Francisco to Anaheim). The 2024 Business Plan ridership model does not analyze intermediate station options at Fullerton and Norwalk/Santa Fe Springs. Although the 2024 Business Plan model results forecasted a slight increase in projected Valley to Valley ridership, the Phase 1 systemwide forecast was lower than what the 2023 Project Update Report projected, which is a continuation of the trend presented in Table 1.

As presented in Table 1, the Authority's ridership projections have been decreasing with each Business Plan Update, primarily because of a decrease in California population projections. Phase 1 medium-ridership is now forecast at 28.4 million in 2040, which is a 9 percent reduction from the projection from the 2023 Project Update Report. Despite this reduction in projected ridership, based on an analysis conducted by the Authority's Early Train Operator in 2024, the Authority continues to conclude that building the electrified system in California remains economically beneficial, with farebox revenue projected to be $3.576 billion in 2040 (Authority 2024a).

[1] The HSR system would be implemented in two phases. Phase 1 would connect San Francisco to Los Angeles and Anaheim via the Pacheco Pass and the Central Valley. Phase 2 would extend the HSR system from the Central Valley (starting at Merced Station) to the state's capital in Sacramento and from Los Angeles to San Diego.

[2] Phase 1 for purposes of the 2023 Project Update Report is defined as the HSR route between San Francisco and Anaheim.

Table 1 Comparison of High-Speed Rail System Ridership Forecasts Under the Medium Scenario (millions of riders per year)

Forecasts	2030	2033	2040
2018 Business Plan	-	23.6	40.0
2020/2022 Business Plan[1]	-	12.8	38.6
2023 Project Update Report	-	-	31.3
2024 Business Plan	27.6	-	28.4

[1] The 2022 Business Plan ridership estimates were the same as those presented in the 2020 Business Plan.

As discussed below for specific resource topics, the discrepancy in ridership projections between the 2023 Project Update Report and the 2024 Business Plan does not result in any new or more severe adverse environmental effects, although project benefits could be less than reported.

3 COMPARISON OF KEY PROJECT BENEFITS AND IMPACTS UNDER THE 2023 PROJECT UPDATE REPORT AND 2024 BUSINESS PLAN

3.1 Air Quality and Global Climate Change

Section 3.3, Air Quality and Global Climate Change, of the Los Angeles to Anaheim Draft EIR/EIS uses ridership estimates from the 2023 Project Update Report to assess changes in GHG emissions, as compared to the No Project Alternative.

The HSR Business Plans typically include project section–specific details of statewide modeled trips by mode and for different project scenarios, and the associated VMT reductions. However, the 2023 Project Update Report only forecasts VMT at the regional level (e.g., Southern California) and does not calculate specific VMT reductions for the Los Angeles to Anaheim Project Section. Because the 2023 Project Update Report does not calculate VMT reductions between Los Angeles and Anaheim, the Authority had to develop a method to do so. The Authority's ridership rail operations and modeling consultant (Deutsche Bahn) calculated the VMT reductions using a method that had been successfully applied within the Authority's 2023 Sustainability Report. The Authority applied this model, represented by the equation below. Using passenger miles traveled data from the 2023 Project Update Report, the Authority's modeling consultant calculated VMT reduction with the following formula:

$$VMT_{reduction} = \frac{HSR\ Passenger\ Miles\ Traveled}{1.8\ \ Vehicle\ Occupants}$$

Passenger miles traveled refers to the cumulative sum of distances traveled between Los Angeles and Anaheim; this was calculated for the three scenarios (no intermediate station option, with Norwalk/Santa Fe Springs HSR Station Option, and with Fullerton HSR Station Option). The average vehicle occupancy expected for long distance trips is 1.8.

The Authority then estimated the GHG emissions that would result from these calculated VMT reductions. Table 2 (taken from Table 3.3-33 in Section 3.3 of the Los Angeles to Anaheim Draft EIR/EIS) summarizes the net regional GHG-emission changes, quantified in carbon dioxide equivalent, resulting from the medium-ridership scenario from the 2023 Project Update Report. As Table 2 indicates, the Los Angeles to Anaheim Project Section is predicted to reduce GHG emissions within the Los Angeles to Anaheim region, with a net reduction of no less than 600,000 metric tons of carbon dioxide equivalent per year by 2040. The total operational emissions analysis includes the indirect emissions from regional vehicle travel and power plants, and the direct project operational emissions from HSR stations, maintenance facilities, and train movements. Reductions in emissions from aircraft are also expected because of passengers switching from flying to taking HSR, but such reductions were not quantified in the 2023 Project Update Report ridership modeling and, therefore, are not analyzed quantitatively in the Los Angeles to Anaheim Draft EIR/EIS.

Table 2 Summary of 2040 Regional Carbon Dioxide Equivalent Emissions Changes from Operation (tons per year) with 2023 Project Update Report Ridership Estimates

Alternative/Option	CO_2e
Shared Passenger Track Alternatives A and B	-615,341
With inclusion of Norwalk/Santa Fe Springs HSR Station Option	-631,598
With inclusion of Fullerton HSR Station Option	-627,737

CO_2e = carbon dioxide equivalent; HSR = high-speed rail

Under operation of the Phase 1 system (from San Francisco to Los Angeles/Anaheim) in 2040, the 2024 Business Plan estimates that the California HSR System would achieve about 9 percent fewer annual riders systemwide than projected in the 2023 Project Update Report. As presented in Table 5.2.1 in the 2024 Business Plan, Phase 1 of the system would result in a reduction of

611,000 metric tons of carbon dioxide equivalent per year by 2040, which is based on the inputs from the ridership modeling for the 2024 Business Plan (Authority 2024a).[3] Because project benefits in the form of reduced VMT, air pollution, GHG emissions, and energy use are directly related to the public's use of the HSR system, the lower ridership forecasts of the 2024 Business Plan would result in a slightly lower magnitude of GHG-emission-reduction benefits compared to those described in the Draft EIR/EIS. Using the 2024 Business Plan modeling, the project would reduce carbon dioxide equivalent by 0.7 percent less than estimated in the Draft EIR/EIS using the 2023 Project Update Report data. A 0.7 percent reduction in project benefits associated with GHG reduction is not statistically significant.

However, the GHG reductions benefits presented in the Los Angeles to Anaheim Draft EIR/EIS (which were calculated using VMT proxy data and represent only the region) cannot be directly compared to the GHG reduction benefits presented in the 2024 Business Plan (which were calculated directly with VMT data and represent the statewide system). Although there are data limitations, the Los Angeles to Anaheim Project Section would still result in GHG emissions reductions. These emissions benefits would begin accumulating after construction emissions are offset, which would occur after about 1 month of operations. Operation of either of the Build Alternatives, with or without the HSR station options, would lead to reductions in travel by on-road vehicles and aircraft compared to the No Project Alternative and, therefore, help the state reach the goal established in Assembly Bill 1279 (i.e., achieve an 85 percent reduction in statewide human-made GHG emissions [from 1990 levels] by 2045). The California HSR System is also identified in the California Air Resources Board's Assembly Bill 32 Scoping Plan and 2017 Scoping Plan Update as a component of a sustainable transportation system and would be consistent with the state's plan to achieve GHG-emission reductions in the long run. Such GHG reductions would be consistent with statewide goals. Consequently, the Los Angeles to Anaheim Project Section would help rather than impede the state from meeting the statewide GHG-emission-reduction target.

3.2 Transportation

Section 3.2, Transportation, of the Los Angeles to Anaheim Draft EIR/EIS analyzes continuous permanent impacts during operation related to statewide VMT. The Authority determined that data from both the 2023 Project Update Report and the 2024 Business Plan ridership models would need to be used to allow for a comparison of statewide VMT in the project's horizon year of 2040 for the scenarios that included the HSR station options. The 2023 Project Update Report did not include VMT reduction information, while the 2024 Business Plan estimates the total statewide VMT in the horizon year of 2040 but does not include the intermediate station options between Los Angeles and Anaheim. Therefore, the Authority used the 2024 Business Plan ridership and corresponding statewide VMT for the nonstop scenario in the analysis, and the Authority generated the 2040 Horizon Year values for the scenarios with inclusion of the HSR station option. The following formula was applied (which used the VMT reduction calculations described above in Section 3.1, Air Quality and Global Climate Change, for air quality):

$$VMT_{2024\ BP\ |\ Option\ A/B} = \frac{VMT\ Reduction_{2023\ PUR\ |\ OptionA/B}}{VMT\ Reduction_{\ 2023\ PUR\ |\ Option\ C}} * VMT_{2024\ BP\ |\ Option\ C}$$

Option A = with inclusion of Norwalk/Santa Fe Springs HSR station option
Option B = with inclusion of Fullerton HSR station option
Option C = no HSR station option (e.g., nonstop ride between Los Angeles Union Station and Anaheim Regional Transportation Intermodal Center)

Table 3 (taken from Tables 3.2-23, 3.2-24, and 3.2-25 in Section 3.2 of the Los Angeles to Anaheim Draft EIR/EIS) summarizes the results of these calculations. With implementation of the Los Angeles to Anaheim Project Section, there would be an estimated annual decrease in statewide VMT by the horizon year 2040 for all three scenarios. The 2040 statewide VMT

[3] Equivalent comparisons for the two station options are not possible, because the 2024 Business Plan did not model any intermediate stations.

reductions for the nonstop scenario are consistent with the 2024 Business Plan data, because this scenario used data directly from the 2024 Business Plan model. However, the 2040 statewide VMT reductions for the HSR station option scenarios are partially based on 2023 Project Update Report data, and it is possible that the VMT benefits for those two scenarios may be slightly overstated.

Table 3 Reduction in Statewide Annual Vehicle Miles Traveled in Horizon Year 2040, with a Blend of 2023 Project Update Report and 2024 Business Plan Ridership Data

Alternative/Option	Annual Statewide VMT		
	No Project	Plus Project	VMT Change
Shared Passenger Track Alternatives A and B	97,525,790,530	95,658,503,838	-1,867,286,692
With inclusion of Norwalk/Santa Fe Springs HSR Station Option[1]	97,525,790,530	97,086,923,954	-438,866,576
With inclusion of Fullerton HSR Station Option[1]	97,525,790,530	97,050,734,457	-475,056,073

[1] The VMT estimates for inclusion of HSR station options was calculated using a blend of 2023 Project Update Report and 2024 Business Plan data.
HSR = high-speed rail; VMT = vehicle miles traveled

In addition to VMT, Section 3.2 of the Los Angeles to Anaheim Draft EIR/EIS analyzes continuous permanent impacts during operation related to changes in traffic. With implementation of HSR, traffic patterns and level of service on local roadways and freeways in the Los Angeles to Anaheim Project Section would change because there would be greater activity around HSR stations, with more passengers traveling to and from stations using a variety of modes. The 2023 Project Update Report ridership data were used to determine the number of passengers that would access HSR stations in each of the three scenarios (no intermediate station options, with inclusion of the Norwalk/Santa Fe Springs HSR Station Option, and with inclusion of the Fullerton HSR Station Option). As described in the Los Angeles to Anaheim Draft EIR/EIS, in each scenario, there would be continuous permanent level of service impacts on intersections and roadways within the Los Angeles to Anaheim Project Section, including immediately around the station areas. With inclusion of the station option in either Norwalk/Santa Fe Springs or Fullerton, people may choose to access the intermediate station instead of one of the terminus stations, and therefore traffic patterns would change within each scenario. However, the 2024 Business Plan did not model ridership for any optional stations; therefore, a direct, quantitative comparison to the 2023 Project Update Report cannot be made for the optional station areas for traffic impacts. It is reasonable to assume that the lower ridership forecasts of the 2024 Business Plan would result in fewer people making trips to access the HSR stations, leading to a slightly lesser magnitude of traffic impacts within station areas compared to those described in the Los Angeles to Anaheim Draft EIR/EIS.

3.3 Energy

Section 3.6, Public Utilities and Energy, of the Los Angeles to Anaheim Draft EIR/EIS evaluates the energy usage of the project, which accounts for the HSR system's energy consumption, as well as reductions in energy consumption resulting from VMT reductions. As described in Section 3.1, the 2023 Project Update Report ridership data were used to derive the VMT reductions; the Authority used this information to estimate the corresponding energy reductions.

Table 4 (taken from Table 3.6-28 in Section 3.6 of the Los Angeles to Anaheim Draft EIR/EIS) summarizes the estimated decrease in energy use, which would be at least -9,660,265.26 million British thermal units per year in 2040. It is reasonable to expect that the lower ridership forecasts of the 2024 Business Plan scenarios would result in a lower diversion of intercity road trips to HSR, leading to a slightly lesser magnitude of VMT reduction and corresponding energy consumption benefits compared to those described in the Los Angeles to Anaheim Draft EIR/EIS.

Table 4 2040 Estimated Change in Regional Energy Consumption with 2023 Project Update Report Ridership Estimates

Alternative/Option	Projected Energy Change Outcomes (MMBtu/year)		
	VMT Reduction[1]	Increased Energy Consumption[2]	Net Change in Energy Demand
Shared Passenger Track Alternatives A and B	-9,871,962.57	211,697.31	**-9,660,265.26**
With inclusion of Norwalk/Santa Fe Springs HSR Station Option	-10,067,541.13	216,551.79	**-9,850,989.34**
With inclusion of Fullerton HSR Station Option	-10,008,270.62	215,659.36	**-9,792,611.26**

[1] The VMT reductions used in the energy calculations were derived from the 2023 Project Update Report ridership model data.
[2] The Los Angeles to Anaheim Project Section accounts for 5.6 percent of Phase 1 operations. Therefore, energy consumption for HSR was estimated by taking 5.6 percent of total energy consumption estimates for Phase 1 of HSR and adding energy consumption for light maintenance facilities and HSR station options.
HSR = high-speed rail; MMBtu = million British thermal units; VMT = vehicle miles traveled

4 CONCLUSION

The 2024 Business Plan assumes 9 percent fewer annual systemwide riders in 2040 when compared to the 2023 Project Update Report, which translates into a lower VMT reduction. As described in the sections above, this difference in ridership and VMT reduction would result in changes in the impact analysis for GHG, energy, and transportation, but would not result in any new or more severe adverse environmental effects.

The Los Angeles to Anaheim Draft EIR/EIS relies on the 2023 Project Update Report ridership data for analysis of GHG emissions and energy consumption. For these two topics, there would be a net benefit with operation of the Los Angeles to Anaheim Project Section, although the magnitude of benefits may be overstated when compared to the 2024 Business Plan forecasts. With the lower ridership forecasts of the 2024 Business Plan, there would be lower VMT reduction and consequently lower reductions in GHG emissions and energy consumption.

For the transportation analysis in Section 3.2 of the Los Angeles to Anaheim Draft EIR/EIS, VMT reductions in the horizon year 2040 use a blend of data from the 2023 Project Update Report and the 2024 Business Plan, because there were limitations from each dataset. VMT analysis already accounted for the lower ridership as modeled in the 2024 Business Plan. However, the VMT analysis with inclusion of the HSR station options reflects a blend of data. For roadway operations within station areas, the magnitude of traffic impacts around station areas may be overstated in the Los Angeles to Anaheim Draft EIR/EIS; as ridership goes down, the number of people accessing the station areas would likely decrease. However, because the 2024 Business Plan ridership model did not include optional stations, this cannot be quantitatively analyzed.

5 REFERENCES

California High-Speed Rail Authority (Authority). 2024a. 2024 Business Plan. https://hsr.ca.gov/wp-content/uploads/2024/05/2024-Business-Plan-FINAL.pdf.

———. 2024b. 2024 Business Plan Service Planning Methodology. https://hsr.ca.gov/wp-content/uploads/2024/05/2024-Business-Plan-Service-Planning-Methodology-A11Y.pdf.