MADERA STATION RELOCATION PROJECT

APPENDIX D
NOISE TECHNICAL MEMORANDUM

SAN JOAQUIN JOINT POWERS AUTHORITY

October 2020

Appendix D
Noise Technical Memorandum

Madera Station Relocation Project

Prepared for:

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1. INTRODUCTION

This Noise Technical Memorandum is prepared in support of the Initial Study for the Maderal Relocated Station Project (Project). This technical memorandum identifies regulations and laws that pertain to the analysis of noise on the environment. In addition, the existing setting is described and potential impacts related to construction and operation of the Project.

2. PROJECT DESCRIPTION

The Project consists of various project elements that can be separated into two phases, based on their purpose and timing of construction and implementation. The first phase, or the "Phase 1 – San Joaquins Relocated Station" (Phase 1), consists of elements related to the Relocated Madera San Joaquins Station (Relocated Station) from Madera Acres to the location described in the vicinity of Avenue 12. The existing Madera San Joaquins Station would no longer be used for San Joaquins operations following commencement of San Joaquins service at the Relocated Station. The second phase of the Project, or the "Phase 2 – HSR Interim Operating Segment Station" (Phase 2), consists of high-speed rail improvements at the Relocated Station to allow for future HSR service along California's future Merced to Bakersfield High-Speed Rail Interim Operating Segment, to access the Relocated Station (Figures 2-4, and 2-5). This HSR services is anticipated to be operated by the SJJPA.

For both Phase 1 and 2, the design, construction, and operation of the Project's rail components would comply with applicable standards from the Federal Railroad Administration (FRA) and/or California Public Utilities Commission (CPUC). Similarly, design, construction, and operation of site access improvements, including new roadways or modifications to existing roadways, would adhere to applicable standards such as the California Manual on Uniform Traffic Control Devices (MUTCD) and local design guidelines and specifications. Design approval for specific project components would be sought from the appropriate agencies as part of detailed design and subsequent stages of the Project.

2.1 Project Environmental Footprint

The Project Environmental Footprint (Project Footprint) is shown in Figure 2-1. In the north-south direction, the Project Footprint stretches approximately 3,600 feet north of Cottonwood Creek and approximately 150 feet south of Avenue 11 to accommodate trackwork associated with the Project. The Project Footprint also widens between Avenue 13 and Avenue 11 to accommodate the Project's station facilities and access road.

Figure 2-1. Proposed Project Environmental Footprint

2.2 Project Interim Build Phase – Relocated Station

2.2.1 Platform

As described below, the Relocated Station for Phase 1 would consist of a single side-loaded platform approximately 600 feet in length. The platform may include a canopy or canopies to offer protection from the elements for waiting passengers. There would also be fare machines, information panels, security video cameras, and lighting in the platform area. In general, the platform area would look similar to the existing Madera San Joaquins Station. Figures 2-2 and 2-3 show the proposed general layout of the Relocated Station, including the platform that the San Joaquins would utilize.

2.2.2 Trackwork

In order to access the Relocated Station platform, a new station siding track extending from the existing BNSF mainline single-track would be constructed. The entire length of the new station siding track, from the turnout locations at the north and south would be approximately 2,330 feet. The turnouts would be design for 50 mph. The new track would have a ballast base similar to the existing ballasted tracks on the BNSF Corridor.

2.2.3 Bus Depot

A bus depot would be constructed southeast of the proposed platform. The bus depot would be accessible via the access road. As part of the Phase 1, the entire footprint of the bus depot would be established, with space reserved for up to eight bus bays. However, only four of the eight bus bays would be constructed.

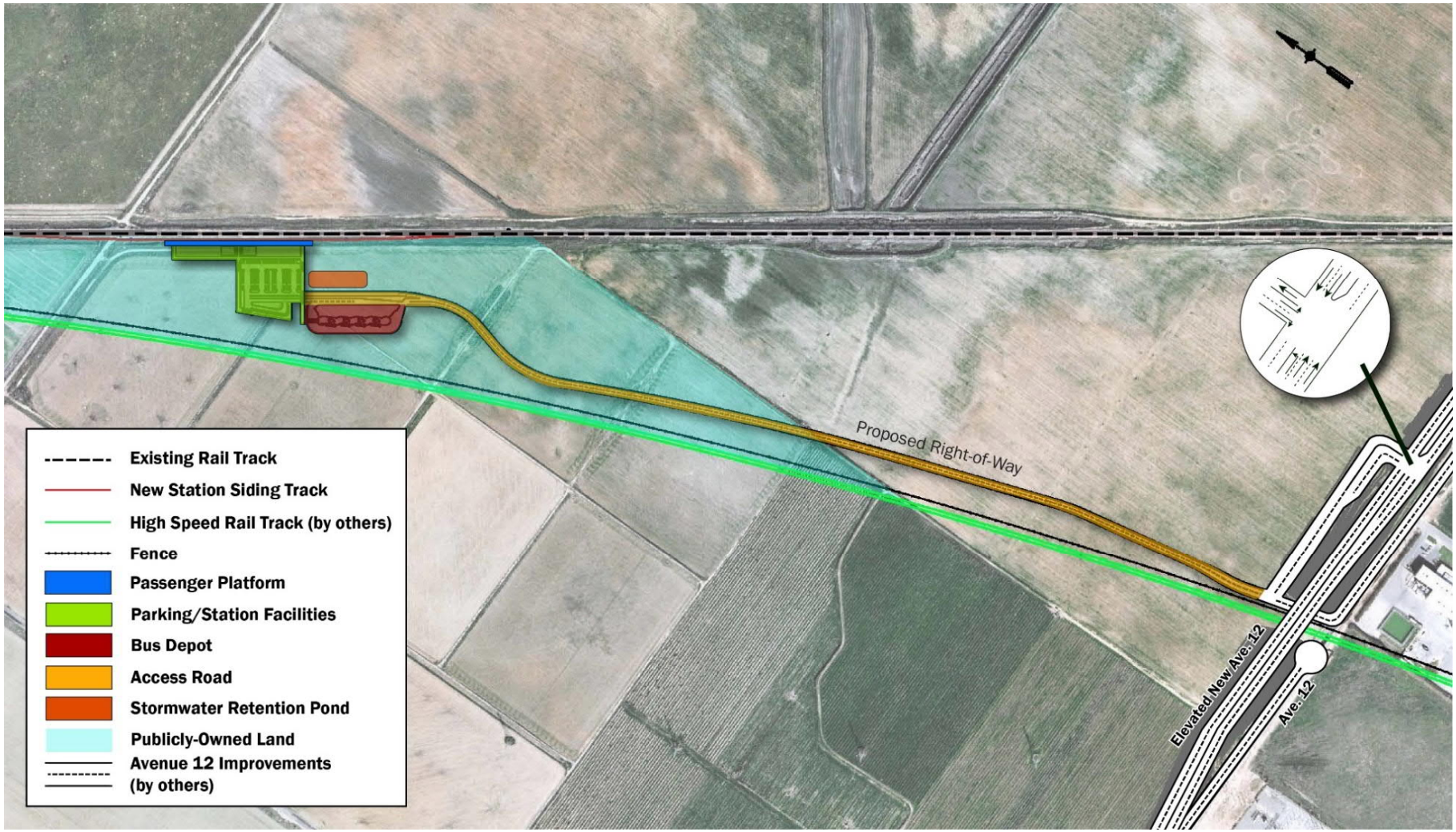
2.2.4 Parking

A surface parking lot would be constructed adjacent to and west of the Relocated Station platform, with 98 parking spaces that would be equipped with lighting and security video cameras. No parking structures are proposed. The parking lot would be accessed through via an access road connecting from Avenue 12. Parking would include disability parking. Additionally, a pick-up/drop off facility with a turnaround loop would be located within the westernmost area of the parking lot.

2.2.5 Access Road

A new two-lane access road would be constructed to provide access to the Relocated Station facilities from Avenue 12. The access road would primarily run adjacent to the CAHSR Project right-of-way and would connect to the new elevated section of Avenue 12 via a ramp structure on the north side of new grade-separated section of Avenue 12. Both the new elevated section of Avenue 12 and the ramp are being constructed as part of the CAHSR Project (Figure 2-2). No sidewalks or bike lanes would be included in the access road as part of Phase 1.

Figure 2-2 Proposed Design for Phase 1 – San Joaquins Relocated Station (Overview)



2.2.6 Roadway Network

The access road would also connect to a section of road located in an underpass through the grade-separated Avenue 12 being constructed as part of the CAHSR Project. This underpass would provide a connection to the at-grade Avenue 12 frontage road on the south side of the new elevated section of Avenue 12. The Avenue 12 frontage road is not a Project element and is section of the same roadway that is the current Avenue 12 and would provide access to properties located immediately south of Avenue 12 and in between the CAHSR Project corridor to the west and the existing BNSF corridor to the east.

2.2.7 Buildings and Structures

A small building or buildings would be constructed to house restrooms and cleaning supplies/equipment for station maintenance, which would be located immediately west the station platform. The building(s) would be one-story (approximately 12 feet) tall. In addition, lighting posts with light-emitting diode (LED) light fixtures would be installed. Various types of signage would be also installed.

A stormwater drainage system would be constructed to provide drainage for stormwater from the access road, parking lot, and other station facilities. The drainage system would lead to a stormwater retention pond located immediately south of Phase 1 parking structure. The stormwater retention pond would be designed to accommodate additional stormwater anticipated from the expanded station facilities and access road associated with Phase 2.

An onsite Wastewater Treatment System (OWTS) would be constructed to treat wastewater from the planned station restroom. It is assumed that the Project would not be hooked up to the sewer system.

2.2.8 Trains

Trainsets utilized by the San Joaquins and serving the new Relocated Station during Phase 1 would be FRA-complaint diesel-based rolling stock, the same or similar to trainset currently operated for the San Joaquins today. Most of the trainsets utilized for the San Joaquins Service will be hauled by Tier 4 locomotives at the time of service commencement (estimated for 2024).

2.3 Phase 2- HSR Interim Operating Segment Station

2.3.1 Platform

As part of Phase 2, a new single side-loaded platform would be constructed parallel to the CAHSR Project trackwork now under construction to the west and immediately adjacent to a new station siding track (see below for more details). The platform would be approximately 1,000 feet in length and may include canopies to protect passengers from the elements. The height of the platform would be designed to accommodate trainsets to be selected for the HSR system. The platform would also be located approximately 365 feet west of the northerly edge of the platform built as part of Phase 1 (Figures 2-4, 2-5, and 2-6).

Figure 2-3. Proposed Design for the Phase 1 – San Joaquins Relocated Station (Detailed View)

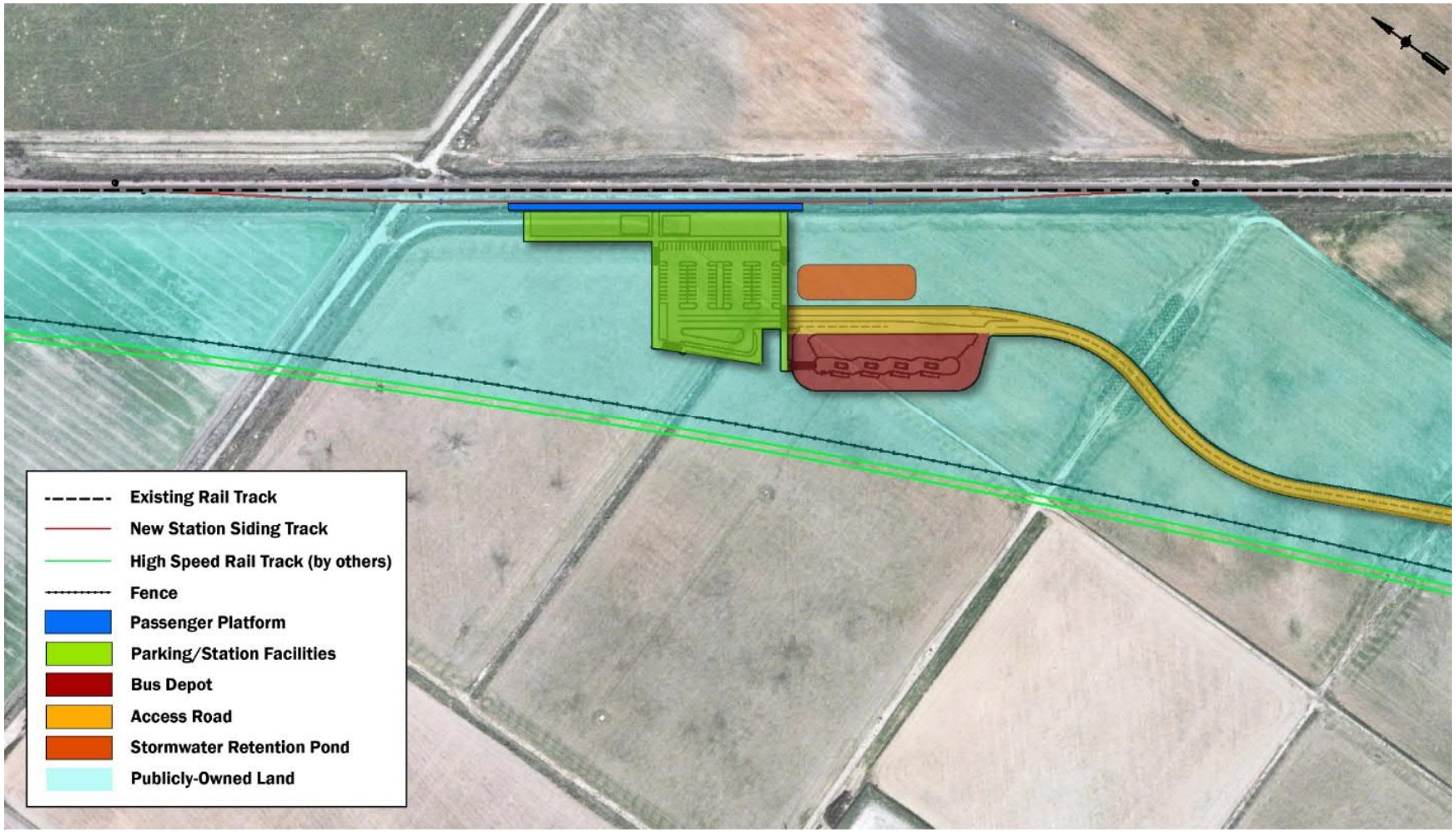


Figure 2-4. Proposed Design for the Project Phase 2 – HSR Interim Operating Segment Station (Overview)

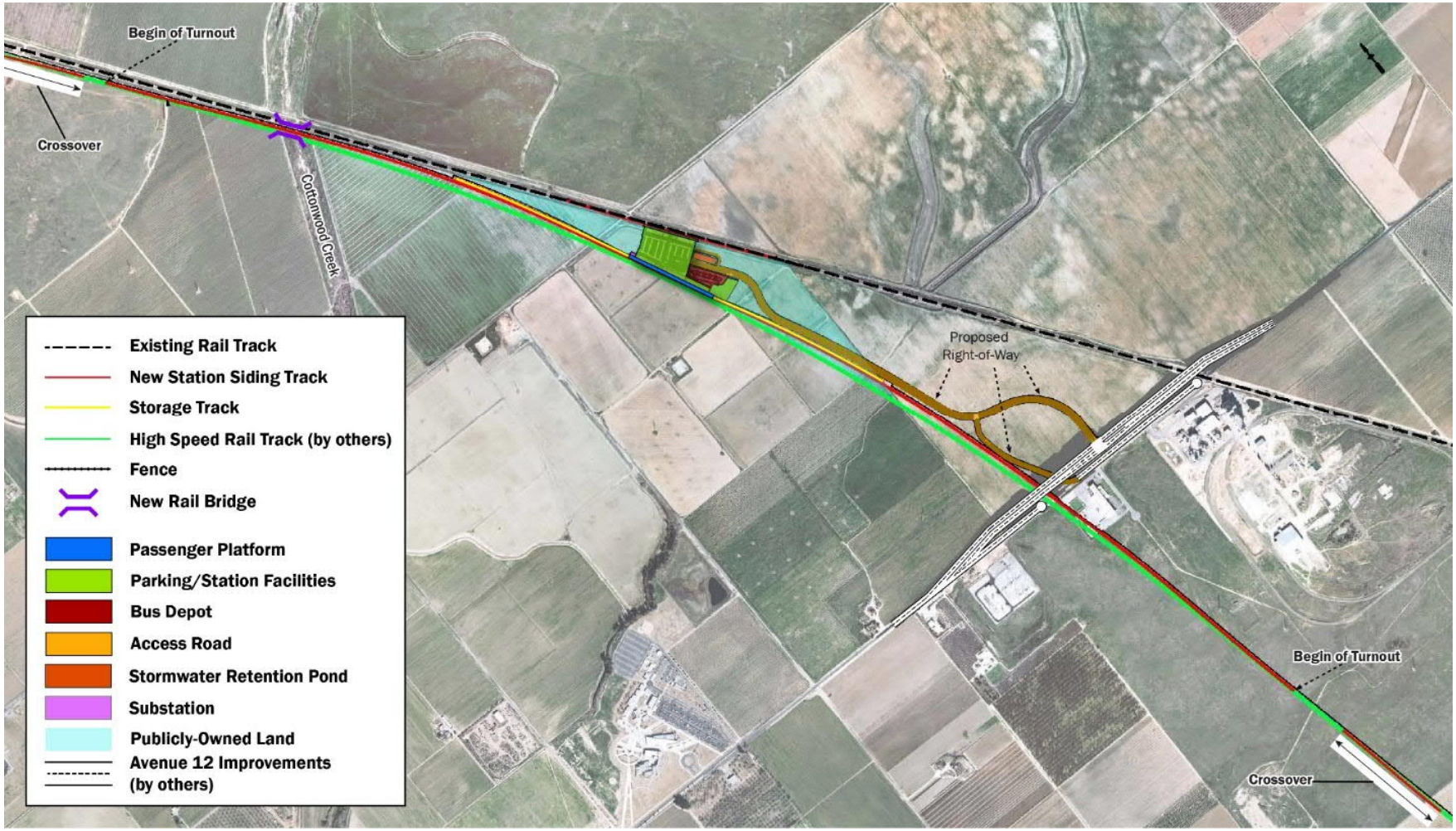


Figure 2-5. Proposed Design for the Project Phase 2 – HSR Interim Operating Segment Station (Detailed View)

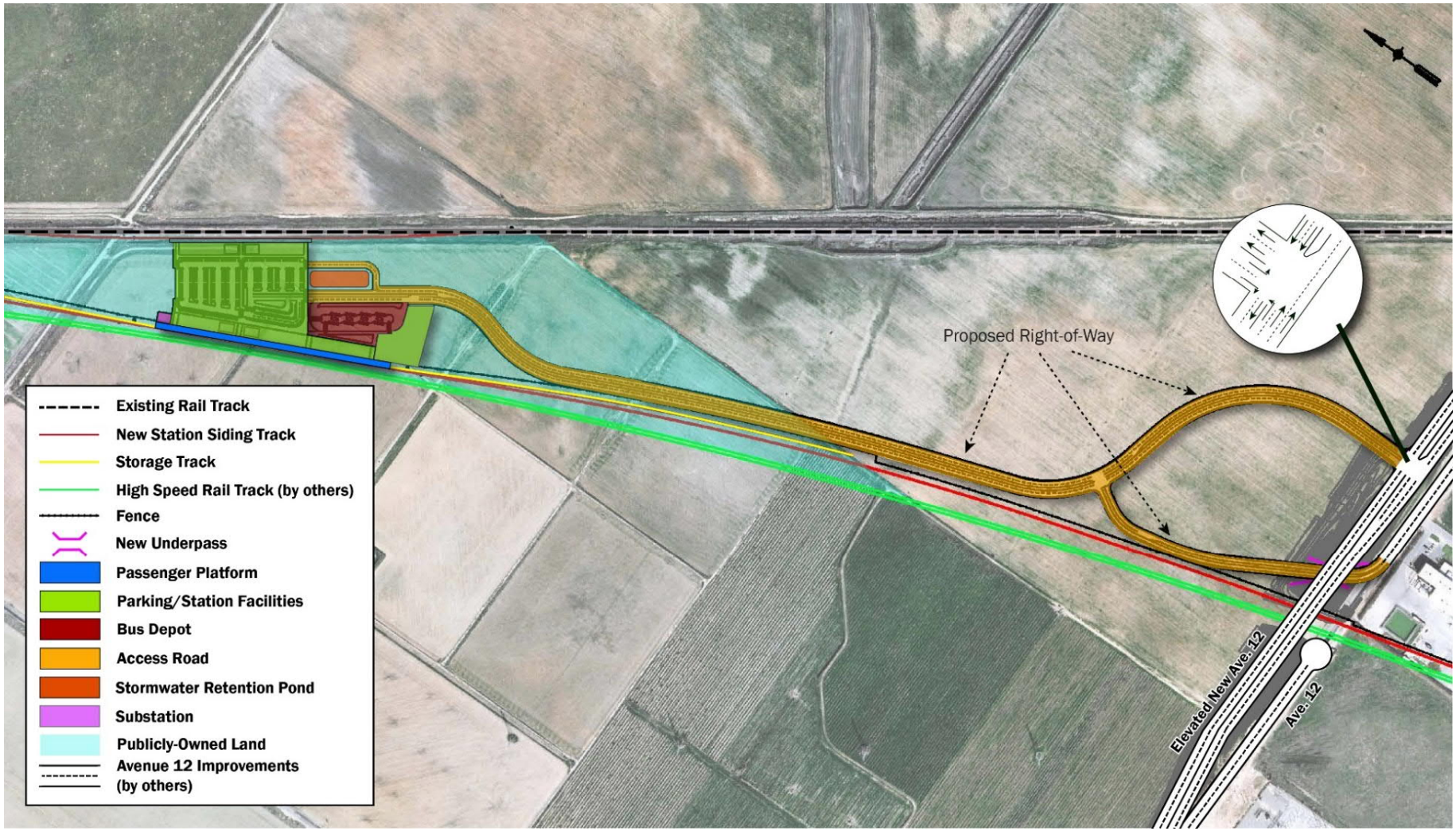
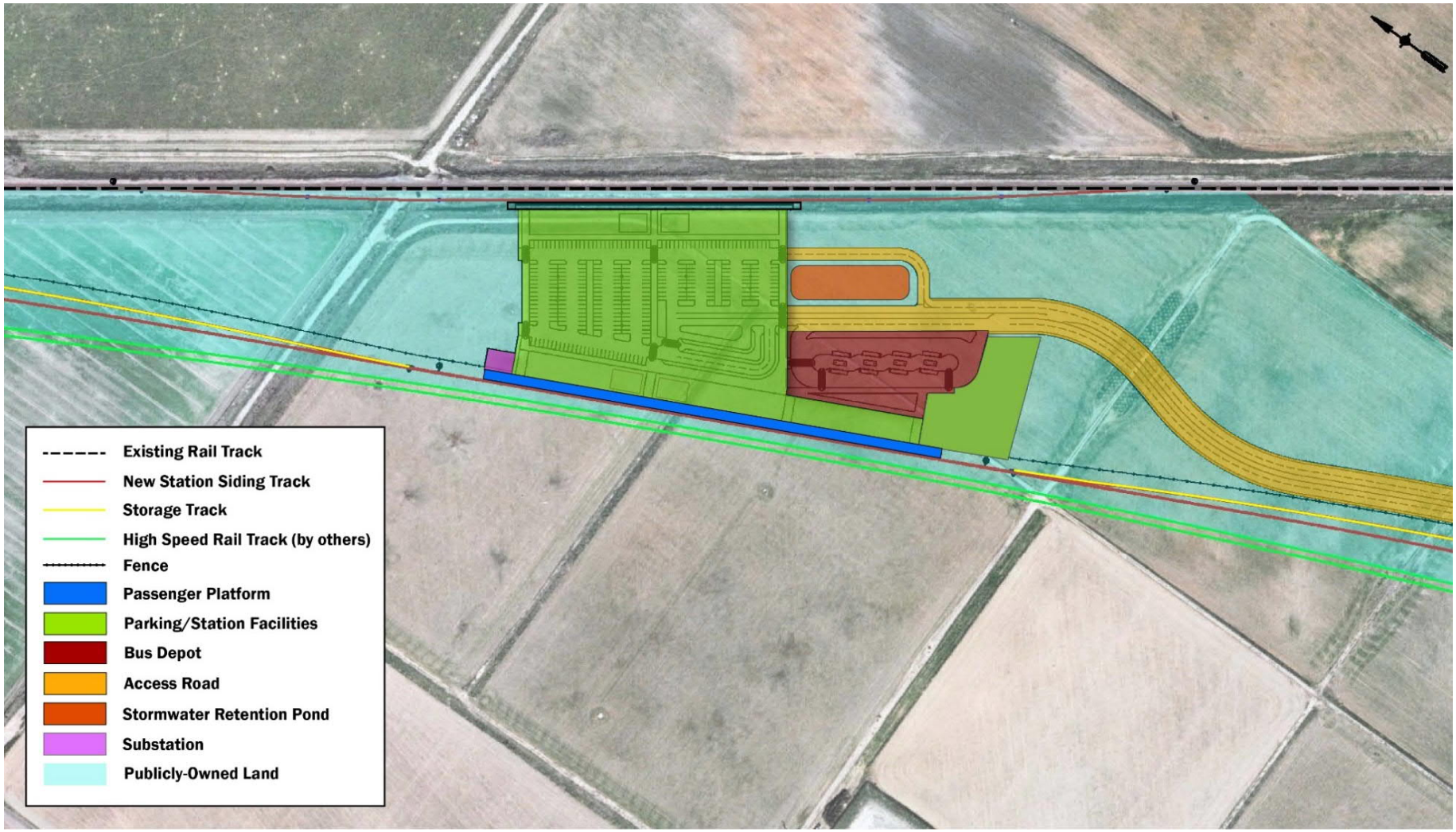


Figure 2-6. Proposed Design for the Project Phase 2 – HSR Interim Operating Segment Station (Station Close-In View)



2.3.2 Trackwork and Overhead Contact System

In order to provide access to the HSR platform, a new station siding track would be constructed to the east of the two-track mainline being constructed for the CAHSR Project. The entire length of the new station siding track, from the turnout locations at the north and south would be approximately 14,600 feet in length. The turnouts would be design for 110 mph. In addition, new crossover tracks would be constructed within the CAHSR Project corridor to the north and south of the new station siding track to allow southbound HSR trains to access the HSR platform at the Relocated Station. When including the north and south crossover tracks within the CAHSR Project right-of-way, this would extend the length of the trackwork associated with the Project to a total length of 17,300 feet. The northern crossover track would extend approximately 3,600 feet north of Cottonwood Creek. The southern crossover track would extend approximately 150 feet south of Avenue 11.

The station siding track would include a new rail bridge over Cottonwood Creek. The proposed bridge would be a single track, 5 span continuous cast-in-place, reinforced concrete slab type structure, matching the span arrangement and hydraulic conveyance capacity of the existing double-track bridge constructed as part of the CAHSR Project. The bridge would be 24 feet in width, 250 feet in length, and would be supported on 2 – 3' diameter cast-in-drilled-hole (CIDH) piles at each abutment and bent; each pile would be approximately 40 to 50 feet deep. The CIDH supported abutments would extend approximately 8 to 10 feet below the existing ground surface.

Two storage tracks for HSR trains would be constructed as part of Phase 2 of the Project. One storage track would extend from the station siding track to the north approximately 1,900 feet. A second storage track would extend south from station siding track approximately 1,900 feet (Figures 2-4, 2-5, and 2-6).

In association with the Phase 2 trackwork, an overhead contact system (OCS) would be constructed along entire length of the station siding track and storage tracks to provide electrical power to electrified trainsets. The OCS would consist of poles at intervals matching the OCS poles being constructed as part of the CAHSR Project. These OCS poles are expected to be approximately 30 feet tall and would have foundations approximately 6 to10 feet deep.

To provide power to the OCS system, a small Transmission Power Substation (TPSS) may be needed, though there is a possibility electrical power could be drawn from the OCS planned to be constructed in association with the adjacent mainline CHSRA Project tracks. If a TPSS is required, it would be located in an area in the vicinity of the north end of the HSR platform.

2.3.3 Bus Depot

A bus depot would be constructed just south of the access road as it approaches the Station parking lot. As part of Phase 1, the west side of the bus depot footprint would be built, including four bus bays. In Phase 2, four additional bus bays would be constructed such that a total of eight bus bays are operational.

2.3.4 Parking

The parking lot constructed as part of Phase 1 would be expanded by 179 additional spaces, for a total of 277 parking spaces in Phase 2. The additional parking would expand the size of surface lot; no parking structures are proposed. The parking area would be accessed through one road connecting from Avenue 12. Parking would

include disability parking. The pick-up/drop-off facility already provided in Phase 1 would be expanded with an additional 530 linear feet of curbside access divided between two additional lanes.

2.3.5 Access Road

In order to accommodate the trackwork required to reach the HSR platform, a portion of the access road constructed during Phase 1 would be reconfigured and relocated. The reconfigured portion of the access road would shift to the east and rise to meet the elevated portion of the Avenue 12 grade separation where a new signalized intersection would be created (Figure 2-5). The reconfigured portion of the access road would be a four-lane road. Furthermore, the remaining portion of the Phase 1 access road that extends north to the station, would be widened from the two-lanes to a four-lane road. A sidewalk and bike lanes would be also added to the widened access road during Phase 2.

In addition, a 2-lane auxiliary segment of access road would be built around the southern and eastern sides of the proposed stormwater retaining pond to provide an additional access point into the expanded parking lot.

2.3.6 Road Network

The new station siding track associated with Phase 2 of the Project would be constructed in the same space occupied by the automobile underpass currently under construction as part of the CAHSR Project. This would result in removal of the roadway in that space and severing the original automobile access to the Avenue 12 frontage road on the south of elevated Avenue 12. To address this, a new underpass would be constructed for automobiles slightly to the east (Figure 2-5). This new underpass would connect to the at-grade frontage road along the south side of Avenue 12. Construction of the new underpass in Phase 2 of the Project would require penetrating the retained fill of the Avenue 12 grade separation structure built as part of the CAHSR Project and constructing necessary support structures for the elevated Avenue 12.

2.3.7 Buildings and Structures

A building or buildings would be constructed in close proximity to the east of the HSR platform to provide space for station staffing support facilities, restrooms and cleaning supplies/equipment for station maintenance. The building(s) would be one-story (approximately 12 feet) tall. In addition, lighting posts and signage would be installed. Additional stormwater drainage facilities would be needed for the expanded station facilities and expanded roadway, but no additional work would be needed on the stormwater drainage basin constructed in Phase 1. Additional wastewater facilities would be need for additional bathroom planned near the CAHSR platform.

2.3.8 Trains

CAHSR trainsets would likely consist of lightweight electric multiple units (EMU) trainsets. However, no final decision has been made on rolling stock to-date. This Project has no influence on the selection of CAHSR rolling stock.

2.4 Construction Period

The construction of the proposed Project would be done in phases. Phase 1 would include all Project elements required to allow for the operations of the San Joaquins service at the Relocated Station. Construction of Phase 1 of the Project is anticipated to last 12 months. Construction of Phase 1 is anticipated to commence in 2023

and be completed in 2024. The construction schedule for Phase 1 is being coordinated with the construction of the CAHSR Project. CHSRA has indicated they will need to utilize the site of the Relocated Station (currently owned by the CHSRA) as a staging area for the CAHSR project. Given this, the schedule for Phase 1 would be delayed from the original anticipated commencement date by approximately 1.5 years.

Phase 2 would include all Project elements required to allow for the operations of HSR trains at the Relocated Station. Construction of Phase 2 of the Project is anticipated to last approximately 2 years. Assuming funding is secured, construction for Phase 2 is anticipated to commence in 2026 and be completed in 2028.

Access to construction sites would occur via a temporary access road within the Project Footprint connecting with the proposed access road segments during Phase 1 and Phase 2. There could be limited, temporary road closures, and road construction that could potentially cause increased traffic congestion in areas where emergency vehicles operate. These improvements could potentially disrupt traffic during construction activities and interfere with emergency response times.

Contractors would use staging areas within the Project Footprint and standard industry equipment such as excavators, pavers, and dump and concrete trucks to support the construction of the Project. For the construction of the new bridge over Cottonwood Creek, pile-driving equipment would be utilized.

Best Management Practices (BMPs) that would be implemented as part of the Project include:

- Use of fabric-covered screening fences to minimize public views of the construction activities, equipment, and stockpiles.
- Positioning of light direction and shielding, which would minimize lighting spillover.
- Measures found in Caltrans' Construction Site Field Manual and Troubleshooting Guide (Caltrans 2003a), and the Construction Site BMP Manual (Caltrans 2003b) to reduce impacts to soil erosion
- Standard construction practices such as Best Available Technology Economically Feasible (BATs), Best Conventional Pollutant Control Technology (BCTs) would help reduce potential impacts related to storm water drainage systems

2.5 Preliminary Project Capital Cost Estimates

Preliminary cost estimates of all Project elements – including trackwork, platforms, station facilities, power systems, drainage, bus depot, access road, and parking lots – were conducted for both Phases 1 and 2. Table 2-1 below provides the estimated cost for each phase, as well as a total for both phases. For more information on the preliminary capital cost estimates, refer to Appendix F (Preliminary Project Capital Cost Estimates).

Table 2-1. Preliminary Project Capital Cost Estimates

Phase 1	Phase 2	Total (Both Phases)
$24.9 Million	$105.0 Million	$129.9 Million

Source: AECOM 2020.

For more information on the preliminary capital cost estimates, refer to Appendix F (Preliminary Project Capital Cost Estimates).

2.6 Operations

Phase 1 of the Project presumes up to eight (8) San Joaquins roundtrip a day when the Relocated Station opens for service (anticipated in 2024). Phase 2 presumes up to eighteen (18) HSR service roundtrips a day (anticipated to commence in 2029). Once HSR service commences to the Relocated Station during Phase 2, San Joaquins trains would no longer serve the Relocated Station and would instead terminate at a new downtown multi-modal hub station in Merced, where they would connect to HSR trains, leaving only 18 HSR daily roundtrips serving Relocated Station.

Once the San Joaquins terminate in Merced, it is possible that there could be local/regional passenger rail service in the future that utilizes the slots that the San Joaquins would no longer utilize. However, this would have to be separate project and is not in the scope of this Project.

Ridership analysis was conducted for Phase 1 and Phase 2 for the years 2025 and 2029 respectively, which reflect estimated ridership for the operational plans at the Relocated Station described above, as well as for a No-Build condition, where the Existing Station is not relocated. Ridership was assessed by estimating passenger "ons and offs" (or "boardings and alightings"). In this approach, each person is counted twice (once for getting on at a station and once for getting off at a station). Therefore, the number of actual passengers would be 50% of the numbers shown above. Estimating ons/offs is useful to assess usage of the station facilities, etc.

The estimated ridership is summarized in Table 2.6-1 below.

Table 2.6-1. Estimated Project Ridership

No Build[1] 2025 (San Joaquins)	Phase 1[2] 2025 (San Joaquins)	Project Phase 2[3] 2029 (High-Speed Rail Service)
40,200[1] (passenger ons/offs)	103,100[2] (passenger ons/offs)	210,600[3] (passenger ons/offs)
Notes: [1]Assumes eight (8) San Joauquins roundtrips serving the Existing Station. [2]Assumes eight (8) San Joauquins roundtrips serving the Relocated Station. [3]Assumes eighteen (18) high-speed rail roundtrips serving the Relocated Station.		

For more information on the ridership estimates, refer to Appendix G (Ridership, Vehicle Miles Traveled, and Parking Estimates).

2.7 Required Permits

The Project is subject to CEQA, and the SJJPA is the lead agency for the Project. As such, SJJPA must oversee environmental review of the Project under CEQA, prior to approving the Project. SJJPA recognizes the need for a close relationship with Madera County (County) and the nearby City of Madera (City) and wishes to pursue the planning and environmental review of the Project in such a way that SJJPA, the County and the City can agree that the Project would be of overall community benefit and that all reasonable efforts to avoid significant environmental effects have been made. Towards this end, SJJPA would comply with regulations regarding site planning and construction, including such ordinances as the County noise regulations and provisions of the County's stormwater sewer system discharge permit.

The Project requires the following approvals and permits from agencies including:

- County of Madera Public Works Department of Public Work's Grading and Erosion Control Permit.
- County of Madera Public Works Department of Public Work's Encroachment Permit Application
- Central Valley Regional Water Quality Control Board's NPDES Construction General Permit Order 2009-0009-DWQ (as amended by 2010-0014-DWQ and 2012-0006-DWQ).
- Central Valley Regional Water Quality Control Board, Clean Water Act (CWA) Section 401 Permit/Waste Discharge Requirements.
- A consultation with U.S. Fish and Wildlife Service (USFWS) and the California Department of Fish and Wildlife (CDFW) would be conducted if special status plant specifies cannot be protected and an Incidental Take Permit (ITP) would be attained.
- CDFW Section 1600 Streambed Alteration Agreement.
- Central Valley Flood Protection Board (CVFPB) Encroachment Permit.
- Army Corps of Engineering Clean Water Act (CWA) Section 404 Permit.
- The California High-Speed Rail Authority (CHSRA) would need to approve connection into their track infrastructure.

2.8 Public Outreach

The SJJPA has engaged local stakeholders and agencies, as well as the general public in the Project's development since before the environmental process began. SJJPA has conducted ongoing coordination with the Madera County, Madera CTC, and the City of Madera since late 2016. The Madera CTC and Madera County sent letters of support for the Madera Station Relocation's TIRCP application. In 2018, SJJPA prepared and made available to the public a Madera Relocation Station Planning document that discussed the history and best sites for relocating the existing Madera Station. This document was updated in Spring of 2020 and made public.

Early on in the environmental process, SJJPA decided to include a robust public outreach component, even though CEQA does not require a substantial outreach effort for an IS/MND (relative to an Environmental Impact Report). An extensive stakeholder and public outreach process was undertaken to educate the public about the Project. Numerous materials were developed that include various information about the Project, including a Project factsheet. Additionally, a dedicated Project webpage was created (housed within the SJJPA website) that not only provided information about the Project but contained a tool to allow members of the public to sign-up to the Project stakeholder list.

In addition to providing general information about the Project, in-person public open houses were conceived at the onset of the Project's environmental process to further inform the public. However, due to COVID-19 and State and local restrictions on gatherings, and for the safety of the public, it was decided that webinars would be held instead of physical public open houses. Three webinars (two in English and one in Spanish) were held on May 14, 2020.

Several methods were utilized to promote the public webinars. E-mail notifications (e-blasts) were conducted to the extensive list of stakeholders assembled for the Project. Additionally, flyers, social media posts, and newspaper advertisements (both print and digital) were disseminated to inform the public about public webinars. Additionally, agencies and key stakeholders within Madera County were leveraged to further the reach of e-blasts, flyers and social media posts.

The format of all three webinars consisted of a 20-minute PowerPoint presentation on the Project history, the Project description, an overview of the environmental process, and a review of the proposed schedule for the Project. The presentation portion of the webinars were followed by a question and answer session. Approximately 20 people joined for all three meetings.

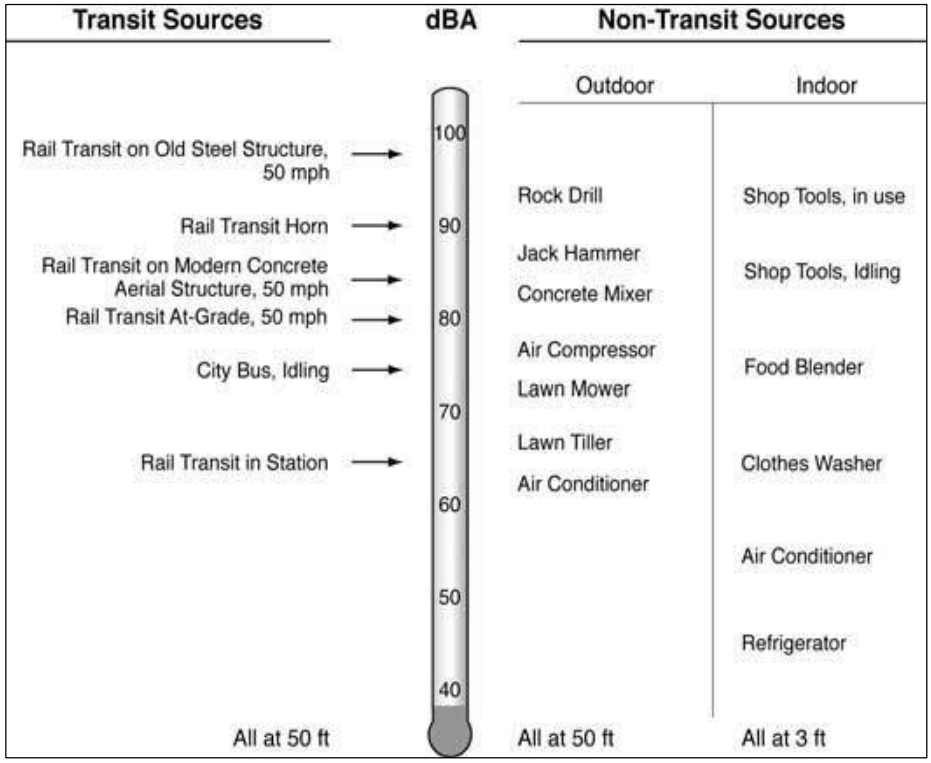
The email notifications (e-blasts), information sheets (English and Spanish), PowerPoint presentations (English and Spanish), and Project website screenshot are presented in Appendix H (Public Outreach). A second outreach effort will be made once the Draft IS/MND is published.

3. NOISE FUNDAMENTALS AND DESCRIPTORS

Noise from transit systems is expressed in terms of a source, path, and receiver. The source generates noise levels that depend on the type of source (e.g., a light-rail train versus a bus) and its operating characteristics (e.g., speed and type of power used to propel the vehicle). The receiver is the noise-sensitive land use (e.g., residence, hospital, or school) exposed to noise from the source. In between the source and the receiver is the path, where the noise is reduced by distance, intervening buildings, and topography. Environmental noise impacts are assessed at the receiver. Noise criteria are established for the various types of receivers because not all receivers have the same noise sensitivity.

Noise is unwanted sound. Sound is measured in terms of sound pressure level and usually is expressed in decibels (dB). The human ear is less sensitive to higher and lower frequencies than it is to mid-range frequencies. All noise ordinances and this noise analysis use the A-weighted decibel (dBA) system, which measures what humans hear in a more meaningful way because it reduces the sound levels of higher and lower frequency sounds—similar to what humans hear. Figure 3-1 shows typical maximum A-weighted sound pressure levels (Lmax) for transit and non-transit sources.

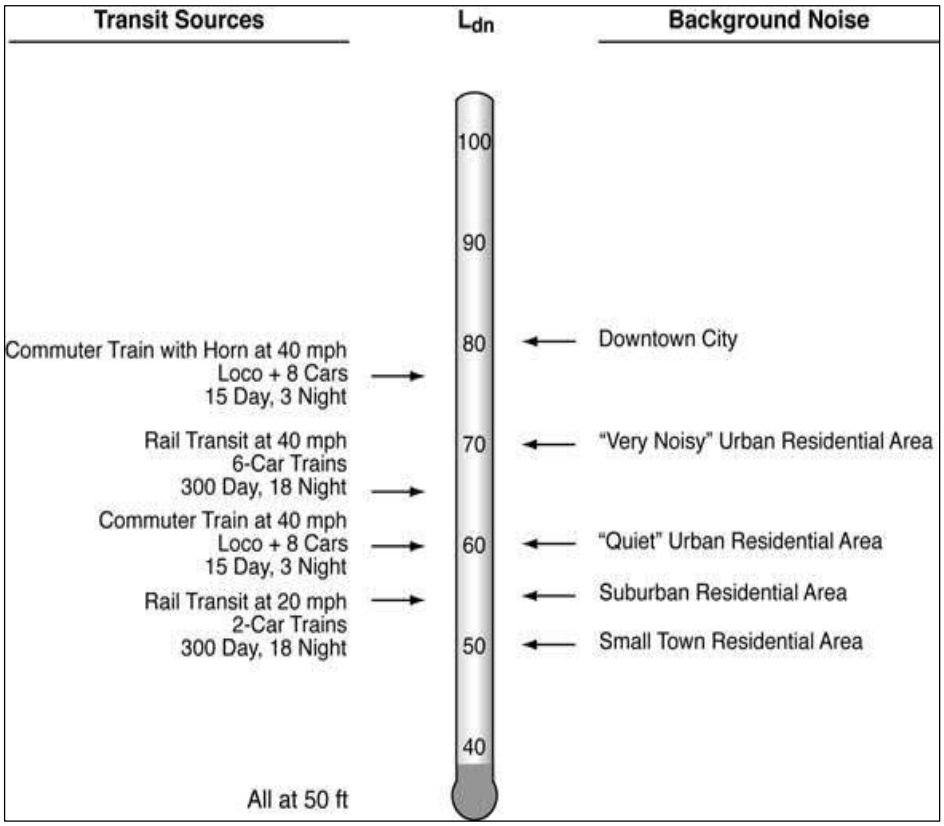
Figure 3-1 Typical A Weighted Sound Levels



Three primary noise measurement descriptors are used commonly to assess noise impacts from traffic and transit projects. They are the equivalent sound level (Leq), the day-night sound level (Ldn), and the sound exposure level (SEL), described as follows:

- L_{eq}: The level of a constant sound for a specified period of time that has the same sound energy as an actual fluctuating noise over the same period of time. The peak-hour L_{eq} is used for all traffic and commuter rail noise analyses at locations with daytime use, such as schools and libraries.
- L_{dn}: The L_{dn} is equivalent to the L_{eq} over a 24-hour period, with 10 Db added to nighttime sound levels (between 10 p.m. and 7 a.m.) to account the greater sensitivity and lower background sound levels during this time. The L_{dn} is the primary noise-level descriptor for rail noise at residential land uses. Figure 3-2 shows typical L_{dn} noise exposure levels.
- SEL: The SEL is the primary descriptor of a single noise event (e.g., noise from a train passing a specific location along the track). SEL is an intermediate value in the calculation of both L_{eq} and L_{dn}. It represents a receiver's cumulative noise exposure from an event and the total A-weighted sound during the event normalized to a 1-second interval.

Figure 3-2 Typical Ldn Noise Exposure Levels



In addition to the Leq, Ldn, and SEL, another descriptor is used to describe noise. The loudest 1 second of noise over a measurement period, or Lmax, is used in many local and State ordinances for noise emitted from private land uses and for construction noise impact evaluations.

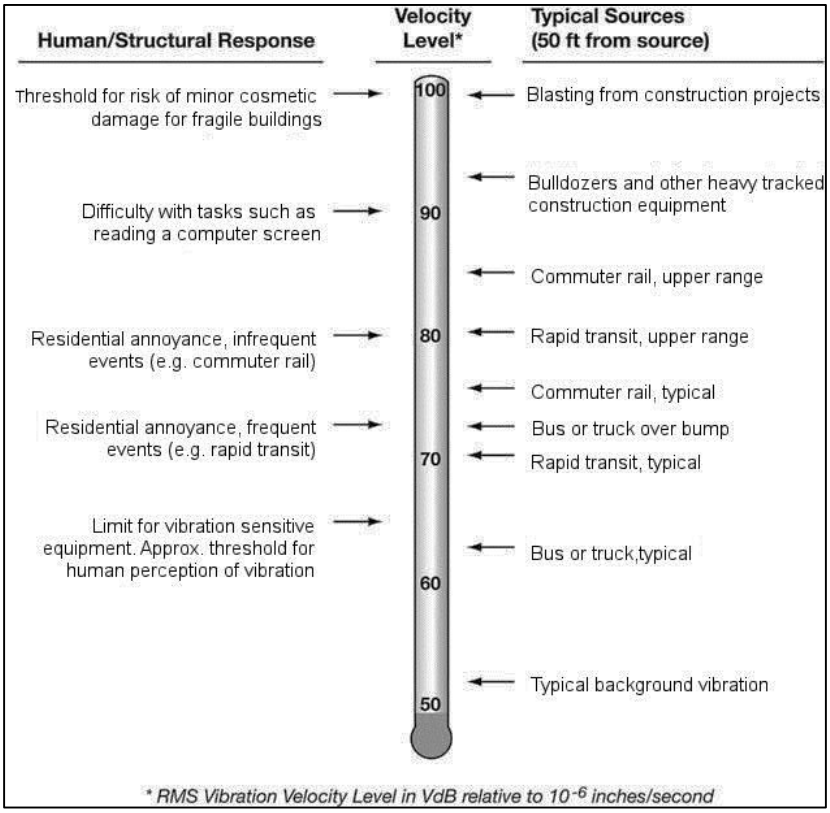
4. VIBRATION FUNDAMENTALS AND DESCRIPTORS

Vibration from a transit system also is expressed in terms of a source, path, and receiver. The source is the train rolling on the tracks, which generates vibration energy transmitted through the supporting structure under the tracks and into the ground. After the vibration gets into the ground, it propagates through the various soil and rock strata—the path—to the foundations of nearby buildings—the receivers. Groundborne vibrations generally are reduced with distance, depending on the local geological conditions. A receiver is a vibration-sensitive building (e.g., residence, hospital, or school) where the vibrations may cause perceptible shaking of the floors, walls, and ceilings and a rumbling sound inside rooms. Not all receivers have the same vibration sensitivity. Consequently, vibration criteria are established for the various types of receivers. Groundborne noise occurs as a perceptible rumble and is caused by the noise radiated from the vibration of room surfaces.

Vibration above certain levels can damage buildings, disrupt sensitive operations, and cause annoyance to people in buildings. The response of people, buildings, and equipment to vibration is most accurately described using velocity or acceleration. In this analysis, vibration velocity (VdB) is the primary measure to evaluate the effects of vibration.

Figure 3-3 shows typical groundborne vibration velocity levels for common sources and thresholds for human and structural response to groundborne vibration. As shown, the range of interest is from approximately 50 to 100 VdB in terms of vibration velocity level (i.e., from imperceptible background vibration to the threshold of damage). Although the threshold of human perception to vibration is approximately 65 VdB, annoyance usually does not occur unless the vibration exceeds 70 VdB.

Figure 3-3 Typical Levels of Groundbourne Vibration



5. EXISTING NOISE LEVELS

The existing noise environment is dominated by transportation sources, mainly trains in the Project Footprint. Trains that are used for the San Joaquin operations are diesel-based Amtrak trains. Noise and vibration-sensitive receivers were assessed in the area using the Federal Transit Administration (FTA) transit noise and vibration impact assessment manual's definitions of noise- and vibration-sensitive land uses (FTA 2018). Existing land use in the vicinity of the Project is agricultural land. Receivers potentially sensitive to train noise and vibration are not located in the proximity of the Project. The nearest noise-sensitive use to the Project site is a rural residential use located approximately one mile to the south along Road 30, between the Project site and SR-99. Future planned developments would be located within 200 feet of the Project sites.

Existing noise levels were assumed using the generic noise environment from the FTA Noise and Vibration Manual – Table 4-17, "Estimating Existing Noise Exposure for General Noise Assessment". Table 5-1 summarizes the assumed existing noise Environment in the Project corridor.

Table 5-1
Existing Noise Levels in the Project Corridor

Dominant Existing Noise Source	Distance from Major Noise Source, feet*	L_{dn} (dBA)
Interstate Highway**	200–400	60
	800 and up	50
Railway	120–240	60
	800 and up	45

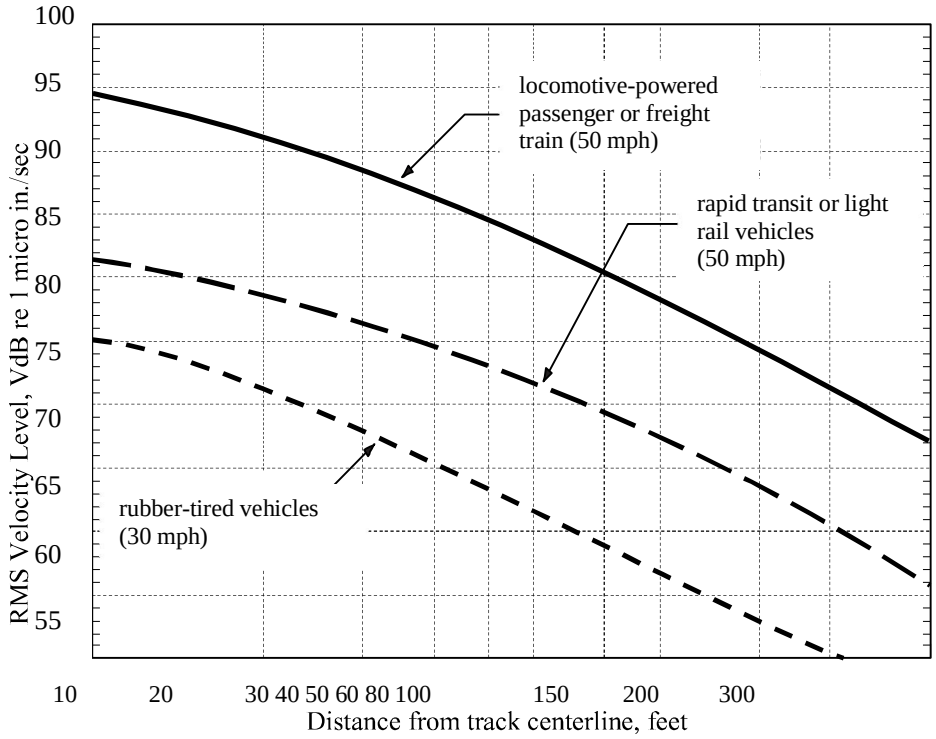
Notes:
* Distances do not include shielding from intervening rows of buildings. Generally, for estimating shielding attenuation in populated areas, assume 1 row of buildings every 100 ft, 4.5 dB for the first row, and 1.5 dB for every subsequent row up to a maximum of 10 dB attenuation.
** Roadways with 4 or more lanes that permit trucks, with traffic at 60 mph. SR-99 for the Project Footprint.
dBA = A-weighted decibels
L_{dn} = day-night noise level

6. EXISTING VIBRATION LEVELS

The existing vibration environment, like the noise environment, is dominated by transportation sources. Heavy truck traffic can generate groundborne vibration, which varies considerably depending on vehicle type, weight, and pavement conditions. However, groundborne vibration levels generated from vehicular traffic typically are not perceptible outside the road right-of-way. The other source of groundborne vibration in the Project Footprint vicinity is the existing railroad line.

The closest buildings to the Project Footprint that would be considered vibration-sensitive isa rural residential use located approximately 1 mile from the existing railroad tracks to the south along Road 30, between the Project Footprint and SR-99. Vibration levels are not reported in any known Madera County and City of Madera planning or environmental documents in the Project Footprint vicinity. In the absence of vibration data from these communities, the FTA manual (FTA 2018) was used to estimate vibration levels. According to FTA's ground-surface vibration curves, shown in Figure 6-1, rapid trasit vehicles (similar to Commuter Rail and HSR for this Project) operating at 50 miles per hour (mph) generate groundborne vibration of approximately 0.02 peak particle velocity (PPV) (75 VdB) at a distance of 100 feet. The resulting vibration levels at one mile would be negligible. Trains associated with the Project typically travel at less than 50 mph in the Project Footprint vicinity, resulting in even lower vibration levels at the nearest sensitive uses.

Figure 6-1 Generalized Ground Sufrace Vibration Curves



Source: FTA 2006; adapted by AECOM in 2015

7. REGULATORY FRAMEWORK

7.1 FTA Operational Noise and Vibration Impact Assessment Criteria.

For transit projects, FTA has prepared a noise and vibration manual that describes the methodology for identifying impacts and criteria in determining the severity of the noise exposure for both construction and operations. The following discussion is an abstract from the 2018 manual (FTA 2018).

FTA Impact Criteria for Noise. The FTA noise impact criteria are based on the best available research on community response to noise. This research shows that characterizing the overall noise environment using measures of noise exposure provides the best correlation with human annoyance.

FTA provides different thresholds for different land uses. Table 7-1 lists the three FTA land use categories and the applicable noise metric for each category. For Category 2 land uses (residential areas where people sleep), noise exposure is characterized using Ldn. In calculating Ldn, noise generated during nighttime hours is weighted more heavily than daytime noise to reflect residents' greater sensitivity to noise during those hours. For Category 1 and Category 3 land uses (areas with primarily daytime use), noise exposure is characterized using the peak hour Leq, which is a time-averaged sound level over the noisiest hour of transit-related activity. Other land uses, such as commercial and industrial land uses not identified, are not considered noise-sensitive by FTA, and thus standards have not been defined for those land uses. Background information on the Ldn and Leq noise descriptors is provided in the discussion of "Noise Fundamentals and Descriptors" at the beginning of this section.

Table 7-1
FTA Land Use Categories and Noise Metrics

Land Use Category	Noise Metric (dBA)	Description of Land Use Category
1	Outdoor $L_{eq(h)a}$	Land where quiet is an essential element of its intended purpose. Example land uses include preserved land for serenity and quiet, outdoor amphitheaters and concert pavilions, and national historic landmarks with considerable outdoor use. Recording studios and concert halls also are included in this category.
2	Outdoor L_{dnb}	This category is applicable for all residential land use and buildings where people normally sleep, such as hotels and hospitals.
3	Outdoor $L_{eq(h)}$a	This category is applicable to institutional land uses with primarily daytime and evening use. Example land uses include schools, libraries, theaters, and churches, where it is important to avoid interference with such activities as speech, meditation, and concentration on reading material. Places for meditation or study associated with cemeteries, monuments, museums, campgrounds, and recreational facilities also are included in this category.

Notes:

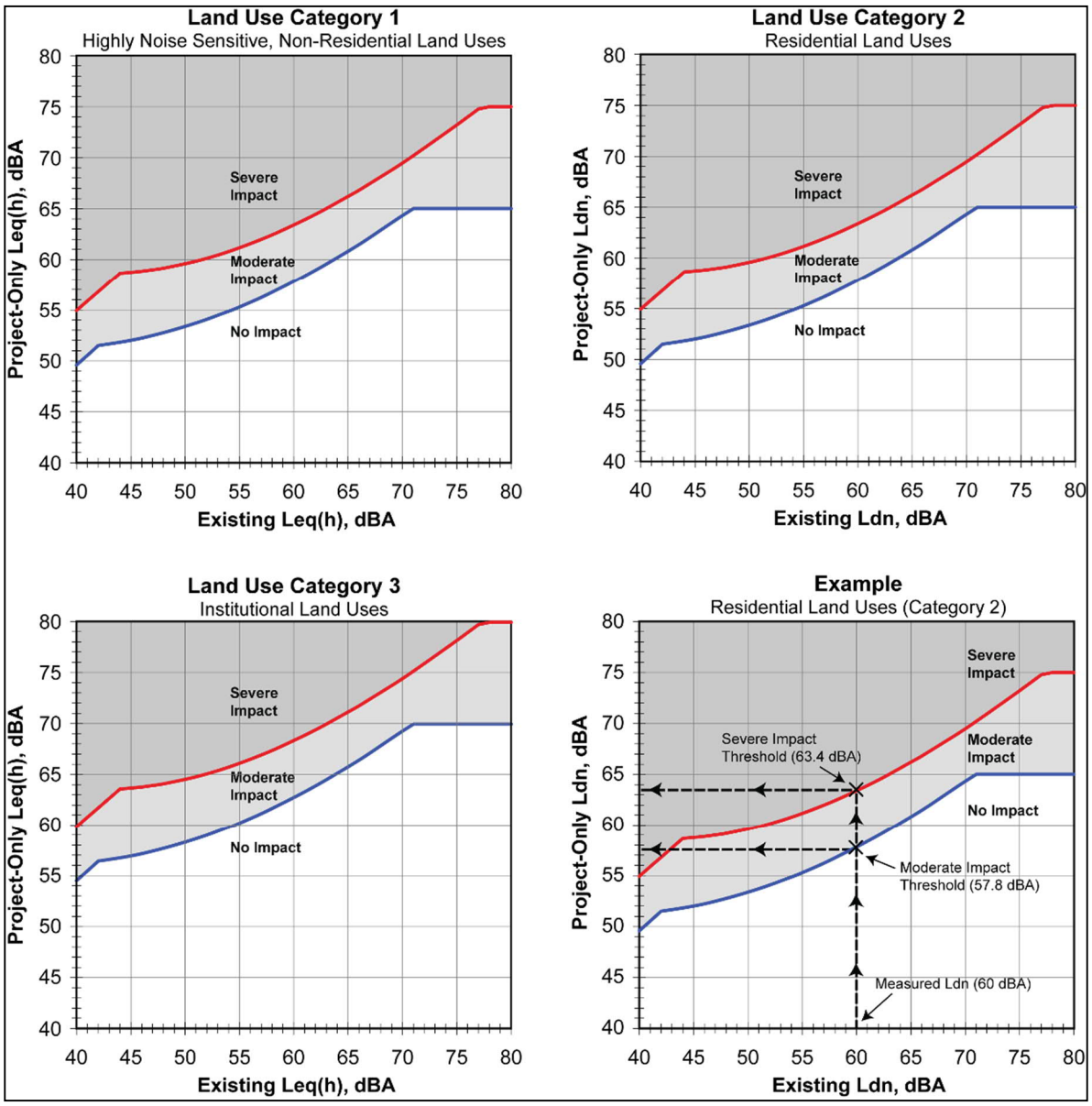
[a] L_{eq} for the noisiest hour of transit-related activity during hours of noise sensitivity.
[b] Ldn is a measure that counts for a full 24 hours of noise, with penalties for noise at night, which is defined as being between 10 p.m. and 7 a.m.

Source: FTA 2018

The FTA noise impact threshold is a sliding scale, based on existing noise exposure and land use of sensitive receivers. In areas where existing noise exposure is higher, the allowable increase above the existing noise exposure decreases. For example, in an area with an existing noise level of 55 dBA, the allowable increase in noise level is 3 dBA, resulting in a total future noise impact threshold of 58 dBA. For an area with an existing noise level of 60 dBA, the allowable increase in noise level is only 2 dBA, resulting in a total future noise impact threshold of 62 dBA. The FTA defines two levels of noise impact: moderate and severe.

The FTA noise impact criteria are shown graphically in Figure 7-1 for the different categories of land use, defined in Table 7-1, along with an example of how the criteria are applied. The two graphs on the left are for nonresidential land uses where Leq(h) represents the noise exposure metric, and the top right graph is for residential land uses where Ldn represents the noise exposure metric. In Figure 7-1, the existing noise is shown on the horizontal axis, and the amount of new noise that a project could create is shown on the vertical axis. The lower curve (blue) defines the threshold for moderate impact, and the upper curve (red) defines the threshold for severe impact.

Figure 7-1 FTA Impact Criteria for Noise



Source: FTA 2018

The sample graph in the bottom right corner of Figure 7-1 clarifies the concept of a sliding scale for noise impact. Assuming that the existing noise has been measured at 60 dBA Ldn (i.e., based on the noise measurement, this level represents the total noise from all existing noise sources over a 24-hour period, including traffic, aircraft, lawnmowers, children playing, and birds chirping). Following the vertical line from the measured 60 dBA on the horizontal axis, the intersection with the moderate and severe impact curves identifies the noise thresholds for moderate and severe impacts along the vertical axis: 57.8 dBA Ldn for moderate impact and 63.4 dBA Ldn for severe impact.

The curves that are shown in Figure 7-1 are defined in terms of project-only noise (on the vertical axes) and existing noise (on the horizontal axes). The project-only noise is the noise that would be introduced into the

environment by a project; it is not the future noise levels with the project. The project-only noise does not include noise from existing noise sources in the area that would not change because of the project, such as automobile traffic and airplanes.

Table 7-2 shows the FTA noise assessment criteria for construction. The 8-hour Leq noise exposure from construction noise calculations use the noise emission levels of the construction equipment, equipment location, and operating hours. The construction noise limits normally are assessed at the noise-sensitive receiver property line.

Table 7-2
FTA Construction Noise General Assessment Criteria

Land Use	8-hour L_{eq}, dBA	
	Day	Night
Residential	90	80
Commercial	100	100
Industrial	100	100

Notes:
L_{eq} = equivalent sound level
dBA = A-weighted decibel
dB = decibels
Source: FTA 2018

FTA Impact Criteria for Groundborne Vibration. The potential adverse effects of rail transit groundborne vibration include perceptible building vibration, rattle noises, re-radiated noise (groundborne noise), and cosmetic or structural damage to buildings. The vibration generated by the project-related commuter rail and HSR for this Project) operations is well below levels that are considered to be necessary to damage buildings. Therefore, the criteria for building vibration caused by transit operations are concerned only with the potential annoyance of building occupants.

The FTA vibration impact criteria are based on the maximum indoor vibration level as a train passes. No impact criteria exist for outdoor spaces, such as parks, because outdoor groundborne vibration does not provoke the same adverse human reaction as indoor vibration. For projects like the Madera Station Relocation Project that is in the early design phases, when construction details are based on reasonable assumptions, the FTA manual describes a “general vibration assessment” methodology that identifies impacts using an overall vibration velocity level.

The criteria for groundborne vibration for land use categories 1–3 are shown in Table 7-3. The criteria are presented in terms of acceptable indoor groundborne vibration levels, expressed in terms of RMS velocity levels in VdB.

The FTA vibration thresholds do not account for existing vibration specifically. Although substantial volumes of vehicular traffic are in the Project Footprint, rubber-tired vehicles rarely generate perceptible ground vibration unless irregularities occur in the roadway surface, such as potholes or wide expansion joints.

Historic structures that do not fall into the FTA land use categories are not included in the assessment for vibration impact from project-related commuter and HSR trains operations. The vibration impact thresholds are based on annoyance, and the primary concern for historic structures is the risk of damage. The recommended

limit in the FTA manual for buildings that are extremely susceptible to damage is 90 VdB, which is 18 dB higher than the limit for Category 2 (residential) land uses. Vibration from the new project-related commuter and HSR trains operations would be well below the limit for buildings that are extremely susceptible to damage, for all historic resources.

Table 7-3
FTA General Vibration Assessment Impact Criteria for Groundborne Vibration

Land Use Category	Groundborne Vibration Impact Levels (VdB re 1 micro Pascals)		
	Frequent Event[a]	Occasional Event[b]	Infrequent Event[c]
Category 1: Buildings where vibration would interfere with interior operations (Typical land uses in this category are vibration-sensitive research and manufacturing facilities.)	65 VdB	65 VdB	65 VdB
Category 2: Residences and buildings where people normally sleep	72 VdB	75 VdB	80 VdB
Category 3: Institutional land uses with primarily daytime use	75 VdB	78 VdB	83 VdB

Notes:

[a] "Frequent Events" is defined as more than 70 vibrations of the same source per day.
[b] "Occasional Events" is defined as between 30 and 70 vibration events of the same source per day.
[c] "Infrequent Events" is defined as fewer than 30 vibration events of the same source per day.

Source: FTA 2018

The operation of Project construction equipment would cause ground vibrations to spread through the ground and would diminish in strength with distance. Buildings founded on the soil near the construction site would respond to these vibrations with varying results, ranging from no perceptible effects at the lowest levels, low rumbling sounds and perceptible vibrations at moderate levels, and slight damage at the highest levels.

Building damage criteria recommended by FTA are shown in Table 7-4. These limits were used to estimate potential problems that should be addressed during the final design. The vibration limits that are shown are the levels at which risk for damage would exist for each building category, not the level at which damage would occur. These limits should be viewed as criteria to be used during the impact assessment phase, to identify problem locations.

Table 7-4
FTA Construction Vibration Damage Criteria

Building Category	PPV (inch/second)	Approximate RMS Vibration Velocity Level[a]
I. Reinforced concrete, steel, or timber (no plaster)	0.5	102
II. Engineered concrete and masonry (no plaster)	0.3	98
III. Non-engineered timber and masonry buildings	0.2	94
IV. Buildings extremely susceptible to vibration damage	0.12	90

Notes:
[a] RMS vibration velocity level in VdB relative to 1 micro-inch/second.
PPV = peak particle velocity
RMS = root-mean-square
Source: FTA 2018

To avoid temporary annoyance to building occupants during construction or construction interference with vibration-sensitive equipment inside special-use buildings, such as that from a magnetic resonance imaging machine, FTA recommends comparing the Project construction-related VdB to the criteria shown in Table 7-5 for frequent, occasional, and infrequent events. FTA defines frequent events as more than 70 events per day, occasional events as 30–70 events per day, and infrequent events as fewer than 30 events per day. It was conservatively assumed that the construction-related, vibration-generating activities under the Project would fall under occasional events as defined by FTA. The vibration annoyance criteria for occasional events because of construction are shown in Table 7-5 with 75 VdB for land use Category 2 and 78 VdB for land use Category 3.

Table 7-5
FTA Construction Vibration Annoyance Criteria

Land Use Category	Impact Levels (VdB; relative to 1 micro-inch/second)		
	Frequent Events[a]	Occasional Events[b]	Infrequent Events[c]
Category 1: Buildings where vibration would interfere with interior operations	65[d]	65[d]	65[d]
Category 2: Residences and buildings where people normally sleep	72	75	80
Category 3: Institutional land uses with primarily daytime uses	75	78	83

Notes:
[a] "Frequent events" is defined as more than 70 vibration events from the same source per day.
[b] "Occasional events" is defined as 30 to 70 vibration events from the same source per day.
[c] "Infrequent events" is defined as fewer than 30 vibration events from the same source per day.
[d] This criterion limit is based on levels that are acceptable for most moderately sensitive equipment, such as optical microscopes. Vibration-sensitive manufacturing or research would require a detailed evaluation to define the acceptable vibration levels.
Source: FTA 2018

7.2 Madera County General Plan.

The following Madera County General Plan policies are relevant to the Project.

Transportation Noise Source Policies

- Policy 7.A.2: Noise created by new transportation noise sources, including roadway improvement projects, shall be mitigated so as not to exceed 60 dB Ldn within the outdoor activity areas of existing or planned noise-sensitive land uses and 45 dB Ldn in interior spaces of existing or planned noise-sensitive land uses.

Non-Transportation Noise Source Policies

- Policy 7.A.5: Noise which will be created by new non-transportation noise sources, or existing non-transportation noise sources which undergo modifications that may increase noise levels, shall be mitigated so as not to exceed the noise level standards of Table 7.A.4 (refer to Table 7-6, Maximum Allowable Noise Exposure for Non-Transportation Noise Sources), on lands designated for noise-sensitive uses. This policy does not apply to noise levels associated with agricultural operations.

Table 7-6
Maximum Allowable Noise Exposure For
Non-Transportation Noise Sources[1]

Period	PPV (inch/second) Daytime (7 a.m. to 10 p.m.)	Nighttime (10 p.m. to 7 a.m.)
Hourly Leq, dB	50	45
Maximum level, dB	70	65

Notes:
Each of the noise levels specified above shall be lowered by 5 dB for pure tone noises, noises consisting primarily of speech or music, or for recurring impulsive noises. These noise level standards do not apply to residential units established in conjunction with industrial or commercial uses (e.g., caretaker dwellings).
L_{eq} = equivalent sound level
dBA = A-weighted decibel
dB = decibels
1. As determined at the property line of the receiving land use. When determining the effectiveness of noise mitigation measures, the standards may be applied on the receptor side of noise barriers at the property line.
Source: Madera County 1995

7.3 Madera County Noise Ordinance.

- 9.58.011. - Definitions.
- "Hz (hertz)" means a unit of measurement for a pitch that describes the number of cycles per second in sound vibration. Speech information usually falls between 200Hz and 6000Hz. "Middle C" on the piano falls at two hundred sixty-two Hz."
- "Vibration perception threshold" means the minimum ground or structure-borne vibrational motion necessary to cause persons of normal sensitivity to be aware of the vibration by such direct means as, but not limited to, sensation by touch or visual observation of moving objects. The perception threshold shall be presumed to be a motion velocity of one-tenth inches per second over the range of one to one hundred Hz. This threshold shall be applied at the location where the sensitivity exists, such as the property lines within a residential development or from the location of a residence constructed an agricultural property.

- Section 9.58.020F of the County's noise ordinance requires that operating or permitting the operation of any device that creates a vibration which is above the vibration perception threshold as defined in Section 9.58 at or beyond the property boundary of the source if on private property or one hundred fifty feet (forty-six meters) from the source if on a public right-of-way will be in violation of this chapter.
- Section 9.58.020FG of the County's noise ordinance, states that construction activities are limited to the hours of seven a.m. and seven p.m. Monday through Friday and nine a.m. and five p.m. on Saturdays. Construction activities will be prohibited on Sundays.

8. POTENTIAL IMPACTS

8.1 Construction Noise

Project construction for the various Phase I and Phase 2 elements would include basic activities associated with Cottonwood Creek Bridge, site work\track work, and platform work. Trackwork on the CAHSRA Project would also extend further north and south, beyond Cottonwood Creek in the north and to just north of Avenue 11 in the south. A new rail bridge for the CAHSR Project alignment has been completed over Cottonweed Creek (the Cottonwood Creek Viaduct), and the Project's proposed trackwork would include construction of a parallel viaduct to the east carrying the HSR station track, which would tie back into the HSR mainline's northbound track approximately 2,000 feet north of Cottonweed Creek. One difference would be the use of pile-driving equipment for the construction of the new bridge over Cottonwood Creek.

The local noise ordinances along the Project corridor generally limit construction noise to particular times during weekday, weekend, and holiday daytime hours. Sunday and Nighttime construction work are prohibited.

Table 8-1 summarizes the estimated construction noise levels and residential noise impact screening distances for each of the planned construction activities. The screening distances identify the distance within which the specified land use could be exposed to noise levels above the local or FTA criteria. As shown in Table 8-1, local noise ordinances generally exempt construction noise. As a result, impact distances based on local thresholds are not applicable for this assessment. The impact distances relevant to the FTA criteria from Table 7-2 reflect the types of equipment anticipated to be used. The potential for noise impact would be greatest during platform work. To be conservative, the impact distance estimates do not assume any topography or ground effects. The results of the analysis indicate that daytime noise could affect residences within approximately 74 feet (there are none within the daytime impact distance). Commercial uses would need to be sited within approximately 30 feet to be affected by construction noise (there are none in the Project Footprint). There are no noise-sensitive uses within the impact distances shown in Table 8-1. Construction noise at the nearest resident to the Project Footprint would result in a noise level of 44 dB Leq. This level of construction noise would be below the existing noise level in the Project Footprint (Table 3-1) and the County's thresholds (Table 7-6).

Table 8-1
Noise Impact Assessment for Construction Activities

Construction Activity and Equipment	Noise Level at 50 feet (L_{eq}, dBA)	Threshold (dBA)		Approximate Noise Impact Distance (feet)	
		Local	FTA	Based on Local Threshold	Based on FTA Threshold
Cotton Bridge Work	94	Daytime construction - Exempt Nighttime construction - Not permitted.	Residential: Daytime - 90 Nighttime - 80 Commercial: Daytime - 100 Nighttime - 100	Not applicable	Residential: Daytime - 74 Nighttime - 187 Commercial: Daytime - 30
Concrete Batch Plant	75				
Concrete Pump Truck	74				
Crane	73				
Compressor (air)	74				
Flat Bed Truck	70				
Generator	78				
Vibratory Pile Driver	94				
Site Work	85			Not applicable	Residential: Daytime - 31 Nighttime - 77 Commercial: Daytime - 12
Grader	81				
Excavator	77				
Compactor	76				
Auger/Bore Drill Rig	77				
Backhoe	74				
Platform Work	89			Not applicable	Residential: Daytime - 45 Nighttime - 113 Commercial: Daytime - 18
Dozer	88				
Grader	85				
Tamper	85				
Aligner	84				
Swinger	83				
Welders	85				
Crane	85				
Wheel Loader	74				
Paver	84				
Concrete Pump	75				
Ballast Regulator	75				
Rail grinder	83				

Notes:
dBA = A-weighted decibel
L_{eq} = equivalent sound level
Source: FHWA 2006; FTA 2018

8.2 Operational Noise

The operation of the proposed stations would increase new passenger rail service while generating both mobile and stationary source noise.

Phase 1 includes an assumption of up to eight (8) San Joaquins roundtrip trains a day when the Relocated Station opens for service (anticipated to commence in 2023). Phase 2 includes and assumption of up to eighteen (18) HSR service roundtrips a day (anticipated to commence in 2029). Once HSR service commences to the Relocated Station, current plans anticipate that San Joaquins trains would no longer serve the Relocated Station and would instead terminate at a new downtown multi-modal hub station, where they would connect to HSR trains, leaving only 18 HSR service daily roundtrips serving Relocated Station. Once the San Joaquins terminate

in Merced, it is possible that there could be local/regional passenger rail service in the future that utilizes the slots that the San Joaquins would no longer utilize. However, this would have to be separate project and is not in the scope of this Project.

The Project noise impact evaluation was performed in accordance with FTA general assessment methodology. The assessment of railroad operation noise considered noise from the type of train, track, and stationary noise sources at intersection locations. Operational noise source that was calculated included rail transit vehicles, crossing signals, and transit warning devices. Please refer to Appendix D for operational rail noise calculations. The existing noise level and the Project calculated noise level were combined to compute the noise exposure at the receiving locations. Table 8-2 summarizes the results. As shown, no noise impacts would occur due to the proposed stations, under existing and future (planned development) conditions. Existing noise-sensitive use would be approximately one mile from the Project Footprint, and future noise-sensitive uses closest to the Project Footprint would be the Madera State Center Community College condition as described and mapped in the Project description.

Table 8-2
Summary of Operational Noise Levels

Site	Land Use	Noise Level (L_{dn}/L_{eq}[1]dBA)			FTA Noise Level Criteria			CEQA	
		Existing	Project	Existing + Project	Moderate Impact[2]	Severe Impact[2]	Impact[2]	Increase over Existing	Significant Impact?
Existing	Residential @ 1 mile	50.0	39.3	50.4	53.4	59.6	None	0.4	Less than significant
Future	Institutional @ 200 feet	60.0	41.3	60.1	62.8	68.4	None	0.1	Less than significant

Notes:
CEQA = California Environmental Quality Act; dBA = A-weighted decibels; FTA = Federal Transit Administration; L_{eq} = equivalent sound level; LTS = less than significant
1 L_{dn} is used for Category 2 (residential) land use and L_{eq} is used for Category 3 (institutional) land use.
2 Based on Figure 7-1
Source: Data compiled by AECOM in 2020

8.3 Construction Vibration

Construction activities under the Project could generate vibration levels at 25 feet, as high as 0.2 PPV (94 VdB) from compactors during site work and 0.09 PPV (87 VdB) from bulldozers during rail and platform work. Construction activities would be considered to have a significant impact if they would generate vibration in excess of FTA thresholds. The nearest vibration-sensitive structure is approximately one mile from Project construction activities; it is a typical rural masonry building. The Project construction activities would generate groundborne vibration of approximately 0.000 PPV (20 VdB) at a distance of one mile. This level of vibration would be below the threshold of impact criteria of 0.3 PPV inches/second (Table 7-6) for structural damage resulting from vibration. Therefore, Project-related construction would not have any damage effects and is considered to result in less than significant impact.

In terms of vibration annoyance effects at vibration-sensitive uses, the closest vibration-sensitive uses (residential uses) to Project construction sites would be are approximately one mile away. The resulting

construction vibration level at these locations would be less than 20 VdB. These levels are below the FTA's impact threshold of 72 VdB.

8.4 Operational Vibration

Vibration caused by trains is caused by the wheels rolling on the rails. This energy then is transmitted through the track support system into the ballast, through the ground to the foundations of nearby buildings, and finally throughout the remainder of the building structure. The level of vibration received at the building is a function of the type of trains, their speeds, track system, structure, support and condition, distance from the tracks, geological condition, and the receiving structure. Groundborne vibration typically does not annoy people who are outdoors. Impacts were assessed based on a comparison of the predicted Project vibration level with the FTA impact criterion of 75 VdB for Category 2 and 78 VdB for Category 3 land uses. The vibration-sensitive uses adjacent to the proposed stations, along with the likely vibration level during train passage, are shown in Table 8-3.

Table 8-3
Summary of Operational Vibration Impact Assessment

Land Use Category	Distance to Near Track (feet)	Vibration Levels (VdB)		Impacts
		Project Operation	FTA Criteria	
Category 2: Residences and buildings where people normally sleep	5,280	5.0*	72 VdB	None
Category 3: Institutional land uses with primarily daytime use	200	61.0	75 VdB	None

Notes:
* Calculated using FTA's Equation 6-2 and Figure 6-4.
Source: FTA 2018; data compiled by AECOM in 2020

Based on the vibration significance criterion, vibration-sensitive receptors along the Project would not be exposed to perceptible vibration, and buildings would not be exposed to vibration levels with possible structural effects. These results indicate that the vibration criterion would not be exceeded (i.e.; vibration impacts would not occur) at vibration-sensitive use more than 65 feet from the centerline of the nearest railway track. No vibration-sensitive uses are known or expected to be within 65 feet of the Project tracks.

8.5 Conclusions

Noise and vibration associated with the Project construction and operation would be below the impact criteria established for surrounding land uses. The Project would not have any adverse effects on the noise and vibration environment in the Project Footprint.

9. REFERENCES

Madera County. 1995. General Plan Noise Element.

Federal Highway Administration (FHWA) and U.S. Department of Transportation (DOT). 2006 (January). Roadway Construction Noise Model User's Guide. FHWA-HEP-05-054. Washington, DC.

Federal Transit Administration (FTA). 2018 (September). Transit Noise and Vibration Impact Assessment. FTA Report No. 0123.

Appendix A

Noise Modeling Assumptions and Results

Federal Transit Administration
Noise Impact Assessment Spreadsheet

version: 7/3/2007

Project:	**Relocated San Joaquins Madera Station Platform**

Receiver Parameters	
Receiver:	**R1-Existing Residence**
Land Use Category:	**2. Residential**
Existing Noise (Measured or Generic Value):	**50 dBA**

Noise Source Parameters	
Number of Noise Sources:	**3**

Noise Source Parameters		**Source 1**
	Source Type:	Fixed Guideway
	Specific Source:	Diesel Multiple Unit (DMU)
Daytime hrs	**Avg. Number of DMU's/train**	1
	Speed (mph)	30
	Avg. Number of Events/hr	1
Nighttime hrs	**Avg. Number of DMU's/train**	1
	Speed (mph)	30
	Avg. Number of Events/hr	1
Distance	**Distance from Source to Receiver (ft)**	5280
	Number of Intervening Rows of Buildings	1
Adjustments		

Noise Source Parameters		**Source 2**
	Source Type:	Fixed Guideway
	Specific Source:	Rail Car
Daytime hrs	**Avg. Number of Rail Cars/train**	5
	Speed (mph)	30
	Avg. Number of Events/hr	1
Nighttime hrs	**Avg. Number of Rail Cars/train**	2
	Speed (mph)	30
	Avg. Number of Events/hr	1
Distance	**Distance from Source to Receiver (ft)**	5280
	Number of Intervening Rows of Buildings	1
Adjustments	**Noise Barrier?**	No
	Jointed Track?	No
	Embedded Track?	No
	Aerial Structure?	No

Noise Source Parameters		**Source 3**
	Source Type:	Stationary Source
	Specific Source:	Park & Ride Lot
Daytime hrs	**Avg. Number of Autos/hr**	4
	Avg. Number of Buses/hr	1
Nighttime hrs	**Avg. Number of Autos/hr**	4
	Avg. Number of Buses/hr	1
Distance	**Distance from Source to Receiver (ft)**	5280
	Number of Intervening Rows of Buildings	1
Adjustments	**Noise Barrier?**	No

Project Results Summary

Existing Ldn:	50 dBA
Total Project Ldn:	37 dBA
Total Noise Exposure:	50 dBA
Increase:	0 dB
Impact?:	None

Distance to Impact Contours

Dist to Mod. Impact Contour:	---
Dist to Sev. Impact Contour:	---

Source 1 Results

Leq(day):	35.9 dBA
Leq(night):	0.0 dBA
Ldn:	33.8 dBA

Source 2 Results

Leq(day):	35.4 dBA
Leq(night):	0.0 dBA
Ldn:	33.4 dBA
Incremental Ldn (Src 1-2):	36.6 dBA

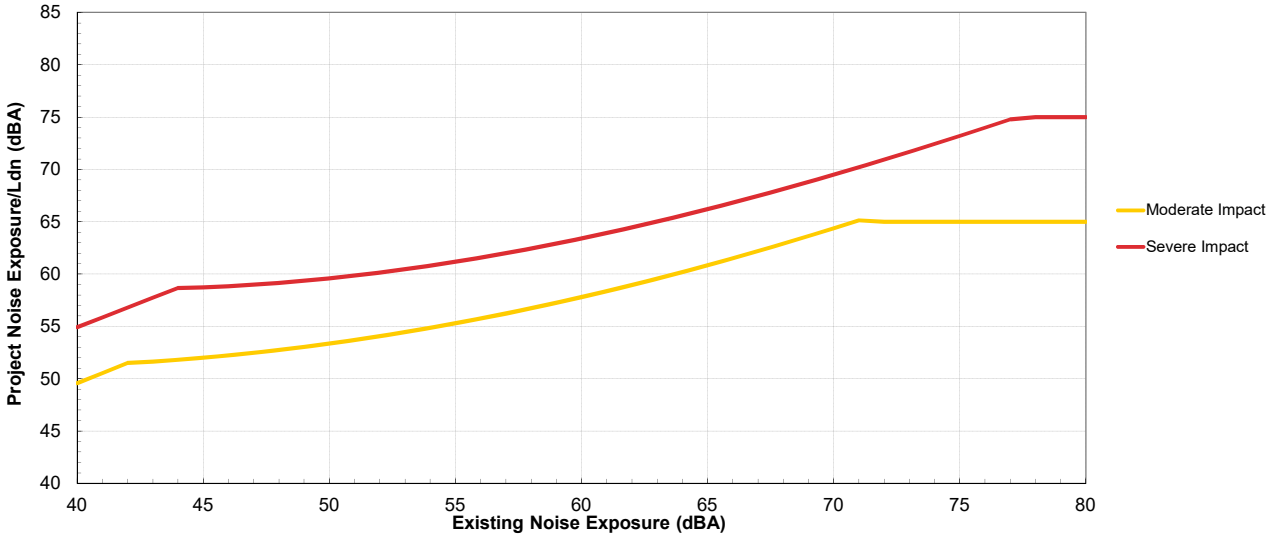
Source 3 Results

Leq(day):	0.0 dBA
Leq(night):	0.0 dBA
Ldn:	6.4 dBA
Incremental Ldn (Src 1-3):	36.6 dBA

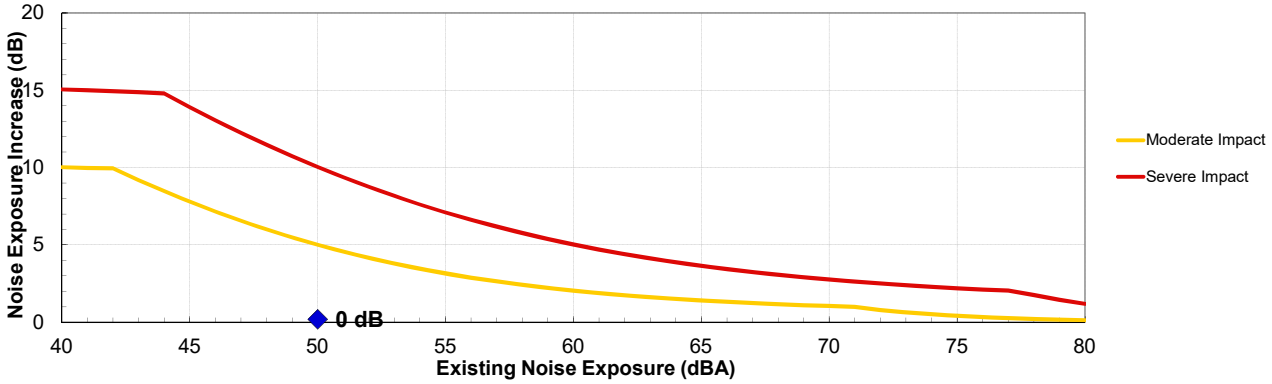
Project: Relocated San Joaquins Madera Station Platform
Receiver: R1-Existing Residence

	Source	Distance	Project Ldn	Existing Ldn	Noise Criteria Mod. Impact	Noise Criteria Sev. Impact	Impact?
1	Diesel Multiple Unit (DMU)	5280 ft	33.8 dBA	50 dBA	53 dBA	60 dBA	None
2	Rail Car	5280 ft	33.4 dBA	50 dBA	53 dBA	60 dBA	None
3	Park & Ride Lot	5280 ft	6.4 dBA	50 dBA	53 dBA	60 dBA	None
4	--	ft		50 dBA	53 dBA	60 dBA	
5	--	ft		50 dBA	53 dBA	60 dBA	
6	--	ft		50 dBA	53 dBA	60 dBA	
	Combined Sources		**37 dBA**	**50 dBA**	**53 dBA**	**60 dBA**	**None**

Noise Impact Criteria
(FTA Manual, Fig 3-1)



Increase in Cumulative Noise Levels Allowed
(FTA Manual, Fig 3-2)



Federal Transit Administration
Noise Impact Assessment Spreadsheet

version: 7/3/2007

Project:	**Relocated San Joaquins Madera Station Platform**

Project Results Summary

Existing Leqh:	60 dBA
Total Project Leqh:	39 dBA
Total Noise Exposure:	60 dBA
Increase:	0 dB
Impact?:	None

Distance to Impact Contours

Dist to Mod. Impact Contour:	---
Dist to Sev. Impact Contour:	---

Receiver Parameters	
Receiver:	**R2-Future College**
Land Use Category:	**3. Institutional**
Existing Noise (Measured or Generic Value):	**60 dBA**

Noise Source Parameters	
Number of Noise Sources:	**3**

Noise Source Parameters		**Source 1**
	Source Type:	Fixed Guideway
	Specific Source:	Diesel Multiple Unit (DMU)
Noisiest hr of Activity During Sensitive hrs	**Number of DMU's/train**	1
	Speed (mph)	30
	Number of Events/hr	1
Distance	**Distance from Source to Receiver (ft)**	200
	Number of Intervening Rows of Buildings	1
Adjustments		

Source 1 Results

Leqh: 35.9 dBA

Noise Source Parameters		**Source 2**
	Source Type:	Fixed Guideway
	Specific Source:	Rail Car
Noisiest hr of Activity During Sensitive hrs	**Number of Rail Cars/train**	5
	Speed (mph)	30
	Number of Events/hr	1
Distance	**Distance from Source to Receiver (ft)**	200
	Number of Intervening Rows of Buildings	1
Adjustments	**Noise Barrier?**	No
	Jointed Track?	No
	Embedded Track?	No
	Aerial Structure?	No

Source 2 Results

Leqh: 35.4 dBA

Incremental Leqh (Src 1-2): 38.7 dBA

Noise Source Parameters		**Source 3**
	Source Type:	Stationary Source
	Specific Source:	Park & Ride Lot
Noisiest hr of Activity During Sensitive hrs	**Number of Autos/hr**	10
	Number of Buses/hr	2
Distance	**Distance from Source to Receiver (ft)**	200
	Number of Intervening Rows of Buildings	1
Adjustments	**Noise Barrier?**	No

Source 3 Results

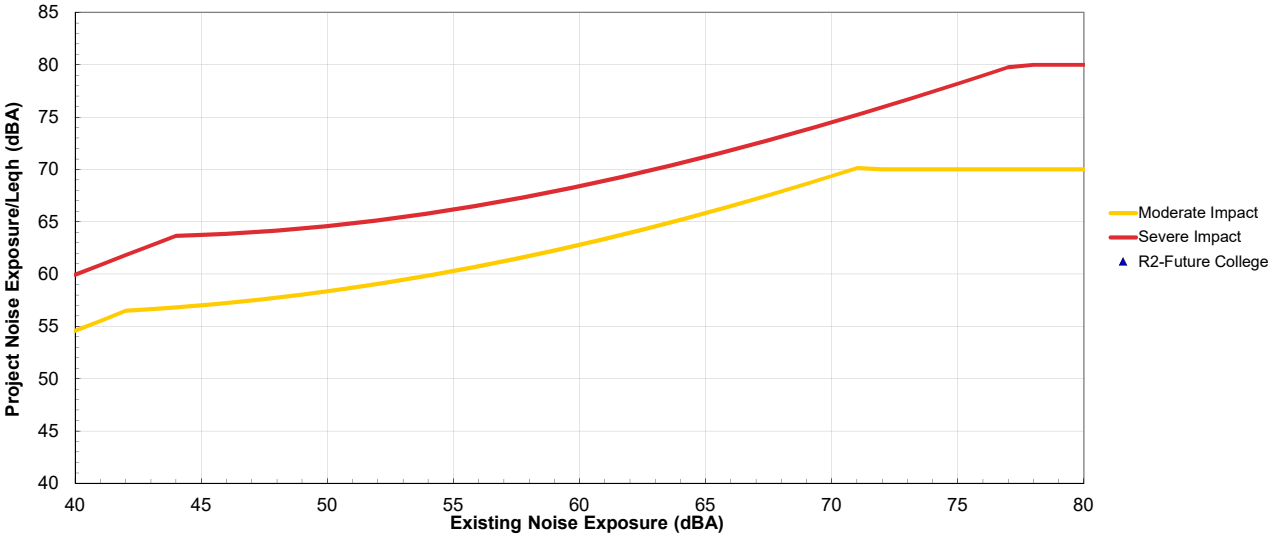
Leqh: 0.0 dBA

Incremental Leqh (Src 1-3): 38.7 dBA

Project: Relocated San Joaquins Madera Station Platform
Receiver: R2-Future College

	Source	Distance	Project Leqh	Existing Leqh	Noise Criteria Mod. Impact	Noise Criteria Sev. Impact	Impact?
1	Diesel Multiple Unit (DMU)	200 ft	35.9 dBA	60 dBA	63 dBA	68 dBA	None
2	Rail Car	200 ft	35.4 dBA	60 dBA	63 dBA	68 dBA	None
3	Park & Ride Lot	200 ft	0.0 dBA	60 dBA	63 dBA	68 dBA	None
4	--	ft		60 dBA	63 dBA	68 dBA	
5	--	ft		60 dBA	63 dBA	68 dBA	
6	--	ft		60 dBA	63 dBA	68 dBA	
	Combined Sources		**39 dBA**	**60 dBA**	**63 dBA**	**68 dBA**	**None**

Noise Impact Criteria
(FTA Manual, Fig 3-1)



Increase in Cumulative Noise Levels Allowed
(FTA Manual, Fig 3-2)