California High-Speed Rail Authority

Los Angeles to Anaheim Project Section

Paleontological Resources Technical Report

October 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
Amtrak	National Railroad Passenger Corporation
ARTIC	Anaheim Regional Transportation Intermodal Center
Authority	California High-Speed Rail Authority
BNSF	BNSF Railway
BP	before present
Cal. Public Res. Code	California Public Resources Code
Caltrans	California Department of Transportation
CEQA	California Environmental Quality Act
CP	construction package
EIR	Environmental Impact Report
EIS	Environmental Impact Statement
FRA	Federal Railroad Administration
HSR	High-Speed Rail
IAMF	impact avoidance and minimization feature
LACMVP	Natural History Museum of Los Angeles County Vertebrate Paleontology Department
LAUS	Los Angeles Union Station
LMF	light maintenance facility
Ma	million years ago
NEPA	National Environmental Policy Act
O&M	operations and maintenance
OCS	overhead contact system
PRMMP	Paleontological Resource Monitoring and Mitigation Plan
project section	Los Angeles to Anaheim Project Section
PRPA	Paleontological Resources Preservation Act
PRS	paleontological resources specialist
RSA	resource study area
SVP	Society for Vertebrate Paleontology
TPSS	traction power substation
U.S.C.	U.S. Code
UPRR	Union Pacific Railroad
WEAP	Worker Environmental Awareness Program

EXECUTIVE SUMMARY

This report documents paleontological resources analysis of the Los Angeles to Anaheim Project Section (project section) of the California High-Speed Rail (HSR) System. The project section would extend approximately 30 miles and travel through the cities of Los Angeles, Vernon, Bell, Commerce, Montebello, Pico Rivera, Santa Fe Springs, Norwalk, La Mirada, Buena Park, Fullerton, and Anaheim, as well as the unincorporated area of Los Angeles County, known as West Whittier–Los Nietos. The project's alignment would share the existing Los Angeles – San Diego – San Luis Obispo Rail Corridor with existing rail operations, including National Railroad Passenger Corporation (Amtrak) passenger trains, Metrolink commuter trains, and BNSF Railway (BNSF) freight trains. In addition to new tracks for HSR, the project section would include an HSR station in Anaheim, the Anaheim Regional Transportation Intermodal Center (ARTIC), as well as a maintenance of infrastructure siding, a light maintenance facility (LMF), and electric power utility improvements. The HSR station options for one additional HSR station in either Norwalk/Santa Fe Springs or Fullerton are included in the project section.

The Shared Passenger Track Alternatives for the project section include an alternative with the LMF at 26th Street (Shared Passenger Track Alternative A) and an alternative with the LMF at 15th Street (Shared Passenger Track Alternative B). A description of the alternatives and their locations can be found in Chapter 2, Project Description. This technical report focuses on analysis carried out for the Shared Passenger Track Alternatives exclusively within the project section between Los Angeles and Anaheim.

To analyze paleontological resources, first a resource study area (RSA) was defined and the geologic units underlying the RSA identified. These underlying geologic units may be potentially affected by project construction and operations. Identified geologic rock units were evaluated for their *paleontological sensitivity,* defined here as the potential of the affected geologic units to contain significant fossils. These assessments are based on the fossil remains previously recorded from the individual geologic units in or near the RSA. Geologic reports and maps at multiple repositories were reviewed to determine the sedimentary geologic units exposed along the project section and present in the shallow subsurface, particularly those rock units known to be fossiliferous, and to delineate their respective areal distributions in the RSA. Archival searches were conducted at the Natural History Museum of Los Angeles County, Vertebrate Paleontology Department (McLeod 2016; Bell 2023) museum, to determine the locations and depths of previously recorded fossil sites in each geologic unit in and near the RSA. Paleontological and geologic reports were reviewed for additional information regarding these and other previously recorded fossil sites occurring in and near the RSA and in the same geologic units.

The analysis concluded that geologic units in the RSA that have high sensitivity for paleontological resources per Society for Vertebrate Paleontology Guidelines include:

- Younger alluvium at depths greater than 6 feet
- Older alluvium
- Fernando Formation, Repetto Member
- Unnamed marine shale (possible Puente Formation)

Proposed earthwork in areas underlain by these geologic units has the potential to destroy significant fossil resources.

The analysis concluded that the following geologic unit in the RSA has a low sensitivity per Society for Vertebrate Paleontology Guidelines for paleontological resources:

- Recent Wash Deposits

This report identifies and assesses the nature and extent of effects on paleontologically sensitive geologic units as a result of construction and operations, taking into consideration ground-disturbing activities. The final determination of significance will be made in the project Environmental Impact Report/Environmental Impact Statement.

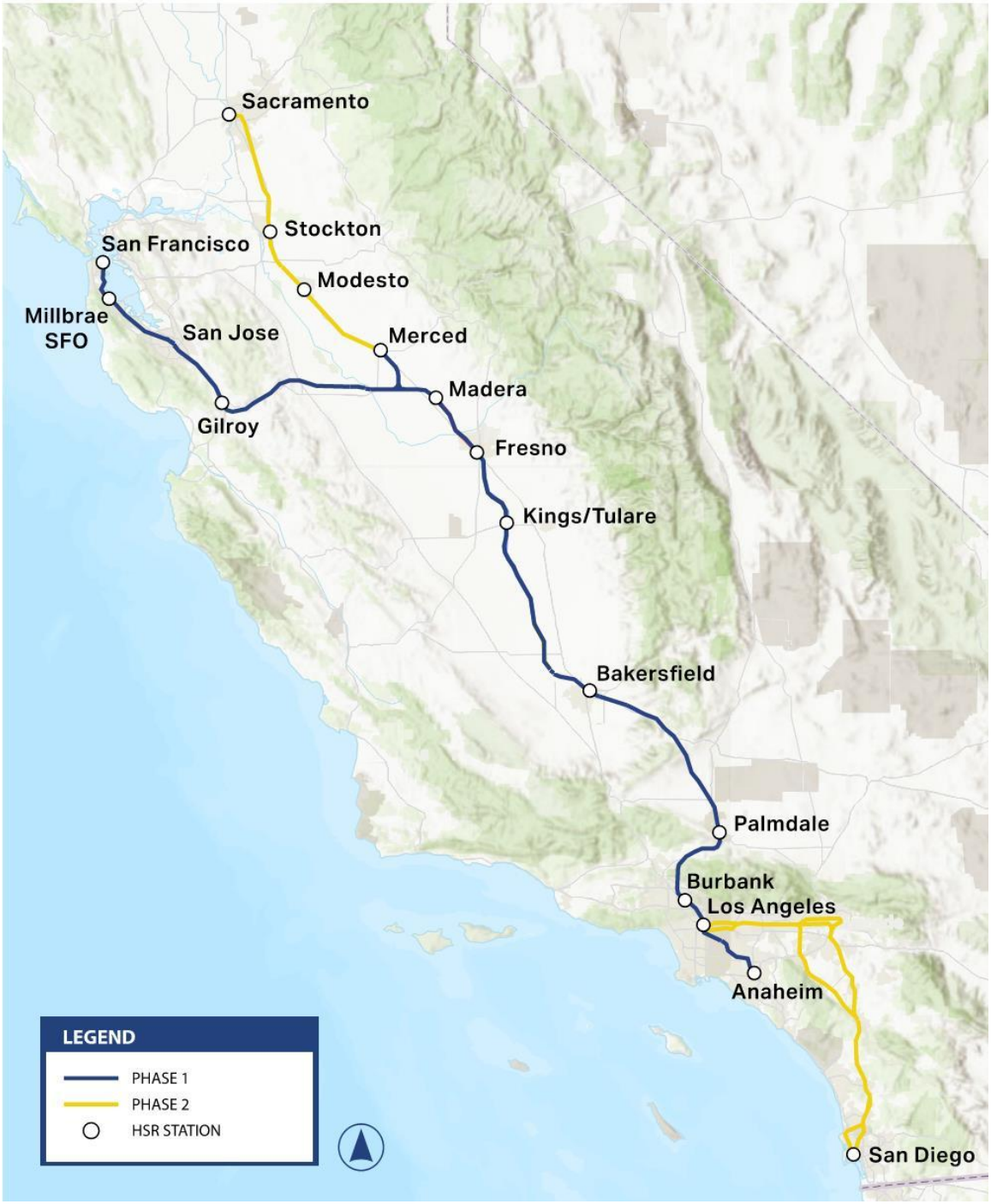
1 INTRODUCTION

1.1 California High-Speed Rail System Background

The California High-Speed Rail Authority (Authority), a state governing board formed in 1996, is responsible for planning, designing, building, and operating the California High-Speed Rail (HSR) System. Its statutory mandate is to develop an HSR system that coordinates with the state's existing transportation network, which includes intercity rail and bus lines, regional commuter rail lines, urban rail and bus transit lines, highways, and airports. The California HSR System will provide intercity, high-speed service on more than 800 miles of tracks throughout California, connecting the major population centers of Sacramento, the San Francisco Bay Area, the southern Central Valley, Los Angeles, the Inland Empire, Orange County, and San Diego, as depicted on Figure 1-1.[1] It will use state-of-the-art, electrically powered, high-speed, steel-wheel-on-steel-rail technology, including contemporary safety, signaling, and automated train control systems, with trains capable of operating up to 220 miles per hour.

The California HSR System is planned to 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 the Merced Station) to the state's capital in Sacramento and from Los Angeles to San Diego.

[1] The alignments depicted on Figure 1-1 reflect the Authority/Federal Railroad Administration decisions made in the 2005, 2008, and 2012 Programmatic Environmental Impact Report/Environmental Impact Statement documents.



Source: Authority 2023a

Figure 1-1 California High-Speed Rail System

1.2 Los Angeles to Anaheim Project Section Background

The Los Angeles to Anaheim Project Section (project section) of the HSR system would extend approximately 30 miles between Los Angeles Union Station (LAUS) in Los Angeles and Anaheim Regional Transportation Intermodal Center (ARTIC) in Anaheim. This narrow, existing railroad corridor is constrained by the surrounding urban environment and other existing rail operators in

the area, including trains operated by the National Railroad Passenger Corporation (Amtrak), Metrolink (governed by the Southern California Regional Rail Authority), the Union Pacific Railroad (UPRR), and BNSF Railway (BNSF).

The Authority, in cooperation with the Federal Railroad Administration (FRA), completed the *Final Program Environmental Impact Report/Environmental Impact Statement (EIR/EIS) for the Proposed California High-Speed Train System* in November 2005 (Authority and FRA 2005). For the Los Angeles to Anaheim Project Section, the Authority and FRA selected the existing Los Angeles – San Diego – San Luis Obispo Rail Corridor, with the intent of sharing the existing right-of-way as the alignment.

In 2007, the Authority and FRA released the Notice of Preparation/Notice of Intent to inform the public of the beginning of the preparation of a Draft EIR/EIS for the project section.[2] The Authority and FRA engaged in project scoping, completed a Preliminary Alternatives Analysis Report in 2009, and completed Supplemental Alternatives Analysis Reports in 2010 and 2016. The 2016 Supplemental Alternatives Analysis considered two alternatives: Alternative 1 (formerly called the Dedicated High-Speed Track Alternative) and Alternative 2 (formerly called the Consolidated Shared-Track Alternative), and advanced Alternative 2 (HSR Project Alternative) for analysis in the project Draft EIR/EIS.

In 2017 and 2018, BNSF conducted operational modeling that indicated a need for additional capacity during construction and operation of this project section. Consequently, the Authority added BNSF staging tracks in Lenwood (Lenwood Component) and a Colton Intermodal Facility (Colton Component) in San Bernardino County to the project. In 2020, the Authority initiated revised scoping to include the Lenwood and Colton Components in the project section. Stakeholder feedback received during scoping included substantial opposition to the BNSF Components far outside the project corridor.

In response, the Authority prepared a Supplemental Alternatives Analysis (Authority 2023b) to evaluate a new alternative that would eliminate the need for a BNSF Intermodal Facility in San Bernardino County. The 2023 Supplemental Alternatives Analysis examined three new build alternatives that did not include an Intermodal Facility and proposed advancing the Shared Passenger Track Alternative for further consideration in the EIR/EIS, which closely resembled the 2018 HSR Project Alternative without the Lenwood and Colton Components. Operationally, the Shared Passenger Track Alternative would reduce the peak service level for HSR trains to two trains per hour per direction, and up to 10 freight trains per day could operate on the passenger tracks, eliminating the need for the BNSF Intermodal Facility.

Additional design refinements and outreach occurred, and in May 2024, a Preliminary Impacts Assessment Report further defined elements of the Shared Passenger Track Alternative, such as HSR station options, light maintenance facility (LMF) sites, and grade crossings. The Preliminary Impacts Assessment Report recommended the Shared Passenger Track Alternative be split into two build alternatives, Shared Passenger Track Alternative A and Shared Passenger Track Alternative B, which are similar in all aspects, except for the LMF size and location. Shared Passenger Track Alternative A proposes an LMF at 26th Street in Vernon, and Shared Passenger Track Alternative B proposes an LMF at 15th Street in Los Angeles. In May 2024, the Board identified Shared Passenger Track Alternative A as the Preferred Alternative.

1.3 Project Description Purpose

This project description provides a condensed version of the technical information discussed in Chapter 2, Alternatives, of the Draft EIR/EIS and includes references to other documents for additional details and discussion. The basis of this project description is the Draft Los Angeles to Anaheim Preliminary Engineering for Project Definition document. Chapter 2 of the Draft EIR/EIS includes additional details beyond the content discussed herein, including information on the proposed operating plans and scenarios, construction plans, and capital and operating costs.

[2] The Notice of Intent was issued in the *Federal Register* on March 15, 2007 (72 Fed. Reg. 12,250).

1.4 Report Purpose

This report analyzes the paleontological setting and sensitivity of the project section. The geologic units that underlie the project footprint and previous fossil recovery from each geologic unit are described. Paleontological sensitivity is evaluated for each geologic unit. The potential effects of the project on paleontological resources are then considered.

2 PROJECT DESCRIPTION

The project section is approximately 30 miles long and travels through the cities of Los Angeles, Vernon, Commerce, Bell, Montebello, Pico Rivera, Santa Fe Springs, Norwalk, La Mirada, Buena Park, Fullerton, and Anaheim. The project's alignment would share a portion of the existing Los Angeles – San Diego – San Luis Obispo Rail Corridor with existing rail operators. The Authority adopted a strategy of sharing the existing corridor and blending HSR with existing rail systems on shared infrastructure (referred to as "blended operations"[3]) to accelerate and broaden benefits, improve efficiency, minimize community impacts, and reduce construction costs.

This section describes the No Project Alternative and Shared Passenger Track Alternatives A and B.

2.1 No Project Alternative

Under the No Project Alternative, the project section would not be built. The No Project Alternative represents the condition of the project section as it currently exists in the base year, and as it would exist without the California HSR System at the planning horizon year of 2040.

In assessing future conditions, it was assumed that all currently known, programmed, and funded improvements to the statewide transportation system (highway, rail, and transit) and reasonably foreseeable local land development projects would be implemented by the year 2040. The No Project Alternative is based on a review of and consultation with several documents and data sources, including, but not limited to, transportation plans such as the 2020 Southern California Association of Governments' Regional Transportation Plan[4]; the Governor's Office of Land Use and Climate Innovation CEQAnet Database; the Federal Aviation Administration's Air Carrier Activity Information System and Airport Improvement Plan grant data; the California State Transportation Commission's State Transportation Improvement Program; airport master plans and interviews with airport officials; intercity passenger rail plans; and city and county general plans and planning officials.

2.2 High-Speed Rail Build Alternatives

The project proposes two build alternatives: Shared Passenger Track Alternative A and Shared Passenger Track Alternative B. Shared Passenger Track Alternative A proposes an LMF at 26th Street, whereas Shared Passenger Track Alternative B proposes an LMF at 15th Street. Both alternatives include an HSR station option in either Norwalk/Santa Fe Springs or Fullerton. The main elements of the build alternatives are summarized in Table 2-1 and depicted on Figure 2-1.

Table 2-1 Summary of Design Features of Shared Passenger Track Alternative A and Shared Passenger Track Alternative B

Feature	Total
Total length (linear miles)	29.7
At-grade profile (linear miles)	23.8
Elevated profile (linear miles)	5
Below-grade/braced trench profile (linear miles)	0.9
Number of straddle bents[1]	16

[3] California High-Speed Rail Business Plans (California High-Speed Rail 2022 Business Plan) suggest blended railroad systems and operations. These terms refer to integrating the HSR system with existing intercity, and commuter and regional rail systems through coordinated infrastructure (blended systems) and scheduling, ticketing, and other means (blended operations).

[4] The No Project Alternative uses the 2020 Southern California Association of Governments Regional Transportation Plan as the basis for analysis, with the exception of the transportation analysis, which uses the 2016 Regional Transportation Plan as the baseline. This is because of the date and availability of traffic counts collected for the project.

Feature	Total
Number of at-grade railroad crossings[2]	8
Number of major water crossings[3]	9
Number of roadway overcrossings and undercrossings	58

[1] A straddle bent is a pier structure that spans (or "straddles") the functional/operational limit of a roadway, highway, or railway.
[2] Railroad crossing means a railroad crossing another railroad.
[3] Features considered major water crossings are Los Angeles River, Rio Hondo (and basins), San Gabriel River, North Fork Coyote Creek, La Mirada Creek, Coyote Creek, Brea Creek, Fullerton Creek, and Carbon Creek.



Source: Authority 2025a

Figure 2-1 Los Angeles to Anaheim Project Section Alignment

Currently, two to three mainline tracks occur throughout the corridor, with a variable number of freight siding tracks. The HSR project seeks to maintain existing operations in the corridor while minimizing impacts outside of the existing right-of-way. To accomplish this, the HSR project would add one new mainline track from LAUS to Fullerton Junction and would use existing tracks, where possible, to ensure that, overall, the project section includes two electrified tracks along the corridor for HSR, which would be shared with other passenger rail operators. These two electrified tracks are referred to herein as *shared tracks*. The specific details of Shared Passenger Track Alternative A and Shared Passenger Track Alternative B are discussed further below.

2.2.1 Shared Passenger Track Alternative A

2.2.1.1 *Alignment*

Table 2-2 summarizes the alignment of Shared Passenger Track Alternative A through the corridor cities. Figure 2-2 depicts the northern project section limit and its relationship with Los Angeles County Metropolitan Transportation Authority's proposed Link Union Station Project. Figure 2-3 through Figure 2-8, as referenced therein, provide cross-sections of various points along the project alignment discussed in Table 2-2. Where applicable, Table 2-2 also provides references to later sections of this project description that provide further details of other project components including, but not limited to, ancillary facilities, HSR and passenger rail stations, and the LMFs.

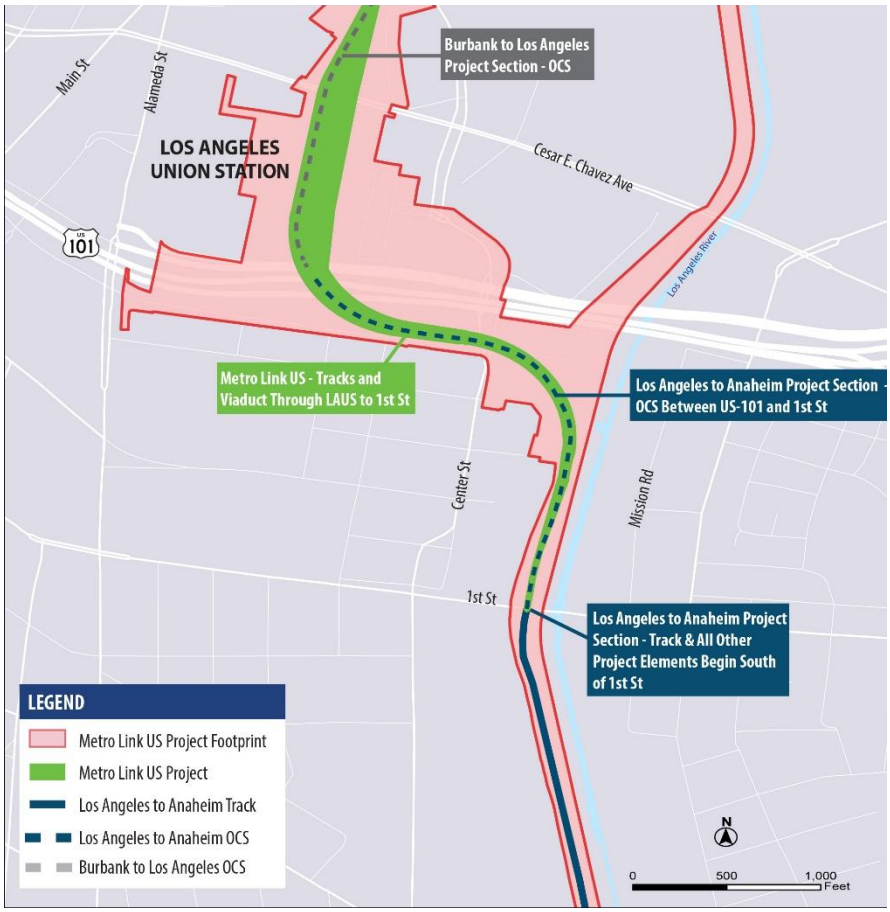
Table 2-2 Shared Passenger Track Alternative A Alignment

Project Section Segment	Segment Alignment Description
Los Angeles and Vernon	▪ The project section would begin immediately south of LAUS, at the northern edge of US 101, where a viaduct built as part of the Link US Project would begin. The installation of the OCS north of US 101 was previously approved as part of the Burbank to Los Angeles Project Section in January 2022. From US 101 to 1st St, the Authority would build the OCS for HSR. At 1st St, Shared Passenger Track Alternative A would include the HSR project tracks and all other project infrastructure south to ARTIC. ▪ Starting at the LAUS platforms, HSR trains would run on tracks built as part of Link US, cross over US 101, Commercial St, and Ducommun St on a viaduct, and come down to grade just before 1st St, joining the existing railroad right-of-way. From this tie-in point south, the HSR trains would use the existing tracks, which would be upgraded with an OCS. Refer to Figure 2-3 for a cross section of the track between 1st St and 4th St. ▪ Between 7th St and I-10, two HSR layover tracks would be added west of the shared tracks; refer to Section 2.2.1.2, Ancillary Facilities, for more information. The shared tracks would cross under the Olympic Blvd roadway overcrossing and rise onto an existing railroad bridge to cross over Washington Blvd and the Los Angeles River. The shared tracks would return to at grade east of Soto St and enter Vernon. ▪ The BNSF and shared tracks would pass by the BNSF Los Angeles Intermodal Facility (referred to as Hobart Yard). The proposed 26th St LMF would be south of Hobart Yard and is described in more detail in Section 2.2.1.4, Light Maintenance Facility.
Commerce, Bell, Montebello, and Pico Rivera	▪ East of Hobart Yard, the tracks would cross at grade under I-710 and enter Commerce. Starting from west of Eastern Ave, the shared tracks would rise onto a new elevated structure, referred to as the *Commerce Flyover*; refer to Section 2.2.1.5, Freight or Passenger Railroad Modifications, and Figure 2-4 for more information on the Commerce Flyover, which is designed to pass by the BNSF Commerce Intermodal Facility (referred to as *Commerce Yard*). ▪ The Commerce Flyover would cross over Eastern Ave and pass by the existing Commerce Metrolink Station. The elevated shared tracks would not connect with the Commerce Metrolink Station's existing location, which would be relocated. Refer to Section 2.2.1.5 for more information on the Commerce Metrolink Station's relocation. The elevated tracks would return to grade before I-5 and would remain so throughout Montebello and Pico Rivera.

Project Section Segment	Segment Alignment Description
Santa Fe Springs and Norwalk	▪ The tracks would continue east into Santa Fe Springs and cross over Pioneer Blvd, Norwalk Blvd, and Los Nietos Rd. All of these would be new grade separations, with the roadway lowered and tracks crossing over on new railroad bridges; refer to Section 2.2.1.6, State Highway or Local Roadway Modifications. ▪ From Slauson Ave to Telegraph Ave, the track configuration would remain at grade with four tracks, as depicted on Figure 2-5. ▪ South of Telegraph Rd, the shared tracks would diverge outside of the existing railroad right-of-way and rise onto retained fill to cross over Florence Ave on a new bridge, while three BNSF mainline tracks would cross Florence Ave on the existing railroad bridge. The shared tracks would transition from retained fill onto an elevated structure that crosses over Lakeland Rd, while the BNSF tracks would remain at grade in their current configuration throughout this segment. The elevated structure would continue south and transition from the west side of the corridor over to the east side. Figure 2-6 depicts the track configuration south of Lakeland Rd. ▪ The elevated structure would veer east out of the existing railroad corridor and cross over Imperial Hwy, necessitating modifications to the existing Norwalk/Santa Fe Springs Metrolink Station, described in Section 2.2.1.3, High-Speed Rail Station Facilities, in more detail. Under Shared Passenger Track Alternative A, HSR trains would not stop at the Norwalk/Santa Fe Springs Metrolink Station. ▪ South of the station, the elevated structure would rejoin the existing railroad corridor and transition back down to at grade just west of Carmenita Rd.
La Mirada and Buena Park	▪ The tracks would continue at grade through La Mirada and Buena Park. In Buena Park, the track design would conflict with the location of the existing Buena Park Metrolink Station platform, necessitating the station's relocation (refer to Section 2.2.1.5 for more information).
Fullerton	▪ East of Dale St, the tracks would enter Fullerton. The Fullerton Municipal Airport is south of the railroad corridor, and the shared tracks would require lowering as they pass by the airport to prevent the HSR project, including the OCS, trains, and all other project components, from conflicting with the airport runway protection zone. The shared tracks on the north side of the corridor would also need to transition to the south side in order to serve the existing Fullerton Metrolink/Amtrak Station farther south. ▪ The shared tracks would transition underneath the BNSF tracks via a short below-grade section, in a braced trench. The trench would start approximately 850 feet east of Dale St and, approaching the eastern end of the Fullerton Airport, would cross under the BNSF tracks to the south side of the corridor, continuing adjacent to the existing BNSF tracks (which would remain at grade). Refer to Figure 2-7 for a cross section of the shared tracks in the trench after they transition to the south side of the corridor. ▪ The shared tracks would return to grade just before Gilbert St. Continuing east, a fourth track would be added to the south side of the corridor at the Fullerton Metrolink/Amtrak Station, which would require modifications, described in more detail in Section 2.2.1.3. Under Shared Passenger Track Alternative A, HSR trains would not stop at the Fullerton Metrolink/Amtrak Station. ▪ East of the station at Fullerton Junction, the three tracks along the north side of the corridor would be dedicated to BNSF trains and would continue east through Fullerton Junction. The tracks along the south side of the corridor would be dedicated to passenger trains and travel south to ARTIC.

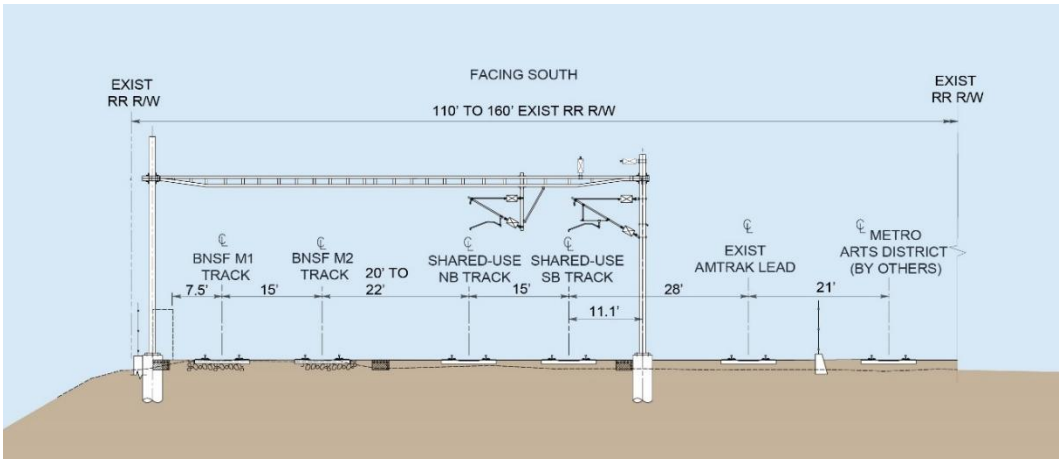
Project Section Segment	Segment Alignment Description
Anaheim	▪ South of Fullerton Junction, the tracks would enter Anaheim. From Fullerton Junction to ARTIC, the two existing tracks would be electrified to allow for shared operations with Metrolink. Several freight trains per day currently run on the existing tracks and would retain operation rights in the future. The two shared tracks would remain at grade through the rest of Anaheim. ▪ The existing at-grade crossings at Orangethorpe Ave, La Palma Ave, Sycamore St, Broadway St, Santa Ana St, South St, Vermont Ave, and Ball Rd would be maintained. Refer to Figure 2-8 for the cross section that is representative of the two-track configuration throughout this segment. ▪ From south of Ball Rd to south of Cerritos Ave, two HSR layover tracks would be added along the west side of the corridor. Cerritos Avenue and State College Blvd would be grade separated, with the roadways lowered and the tracks crossing over the road on new railroad bridges. ▪ The tracks would end at ARTIC, where HSR platforms and station facilities would be added to the existing station, described in more detail in Section 2.2.1.3.

ARTIC = Anaheim Regional Transportation Intermodal Center; Authority = California High-Speed Rail Authority; BNSF = BNSF Railway; HSR = high-speed rail; I = interstate; LAUS = Los Angeles Union Station; Link US = Link Union Station; OCS = overhead contact system; project section = Los Angeles to Anaheim Project Section; US 101 = U.S. Highway 101



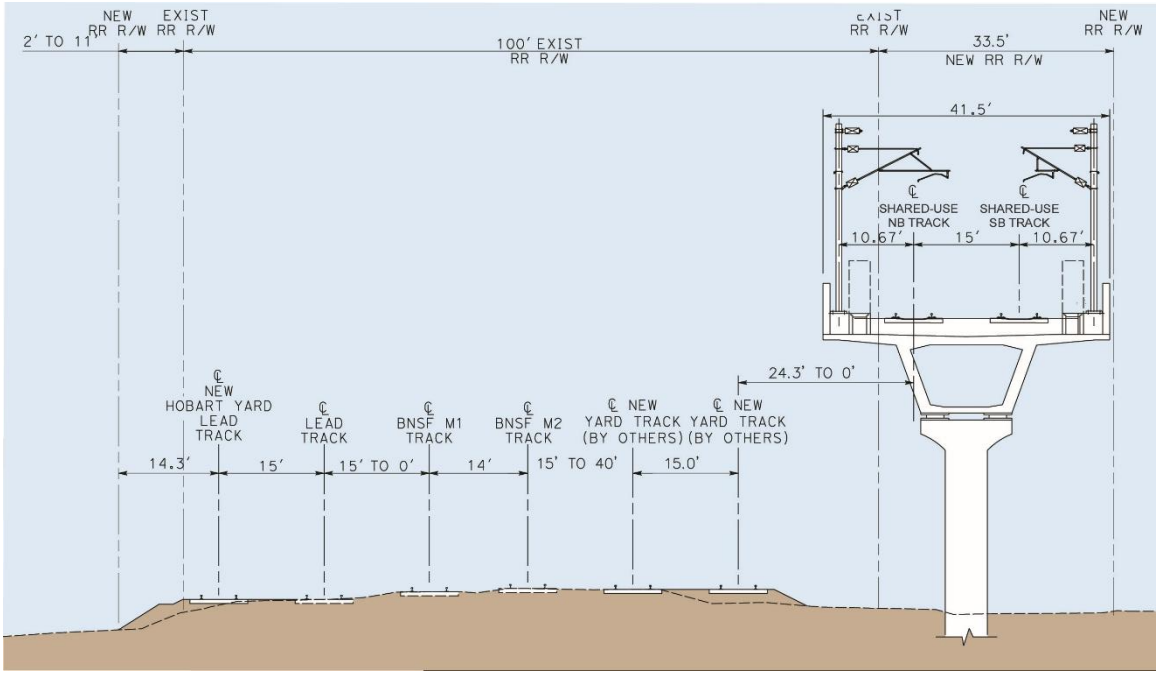
Source: Authority 2025a
Link US = Link Union Station; Metro = Los Angeles County Metropolitan Transportation Authority; OCS = overhead contact system

Figure 2-2 High-Speed Rail and Link Union Station Project



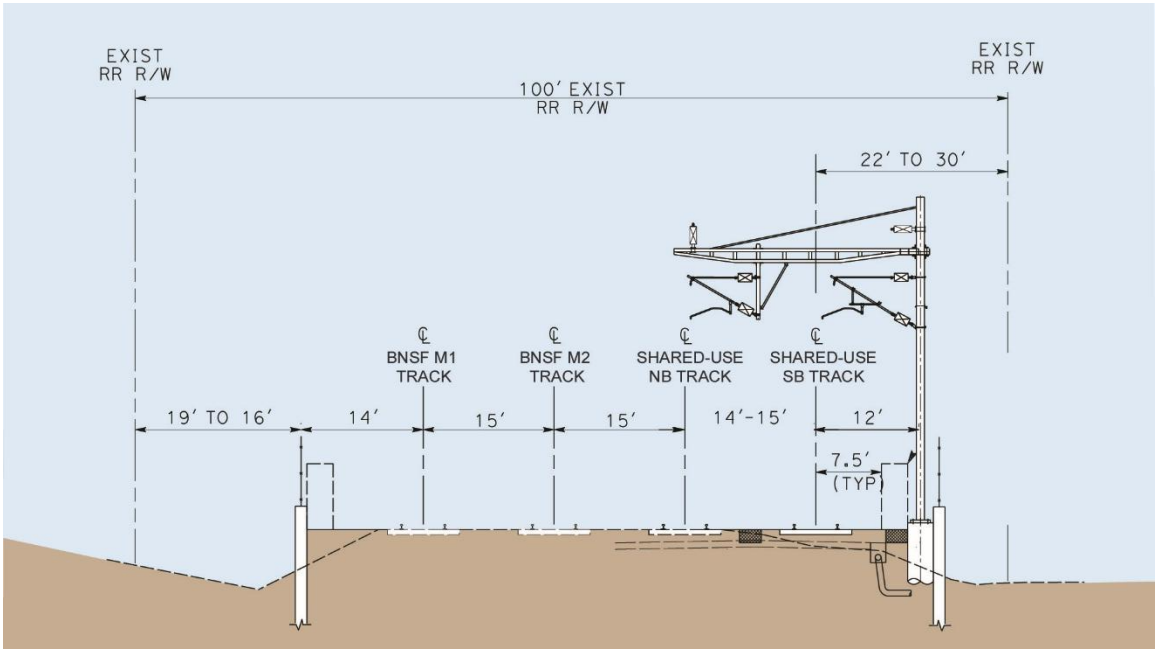
Source: Authority 2025a
M = main track; RR = railroad; R/W = right-of-way; NB = northbound; SB = southbound

Figure 2-3 At-Grade Cross Section between 1st Street and 4th Street



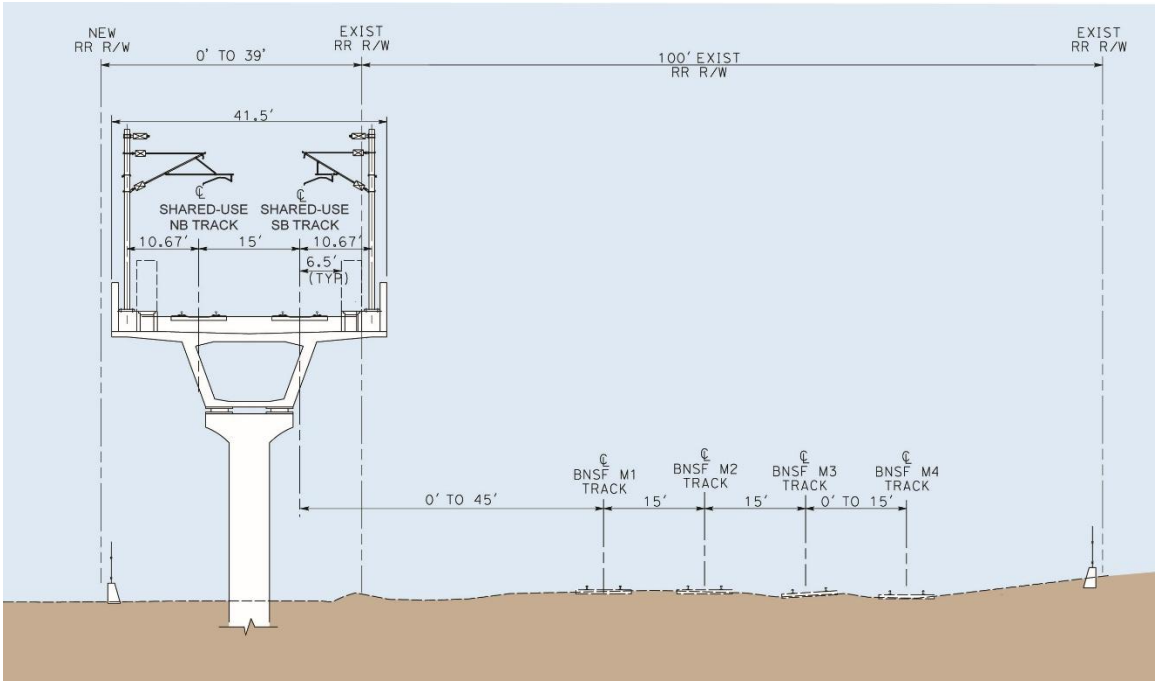
Source: Authority 2025a
M = main track; RR = railroad; R/W = right-of-way; NB = northbound; SB = southbound;

Figure 2-4 Elevated Cross Section between Atlantic Boulevard and Eastern Avenue (Commerce Flyover)



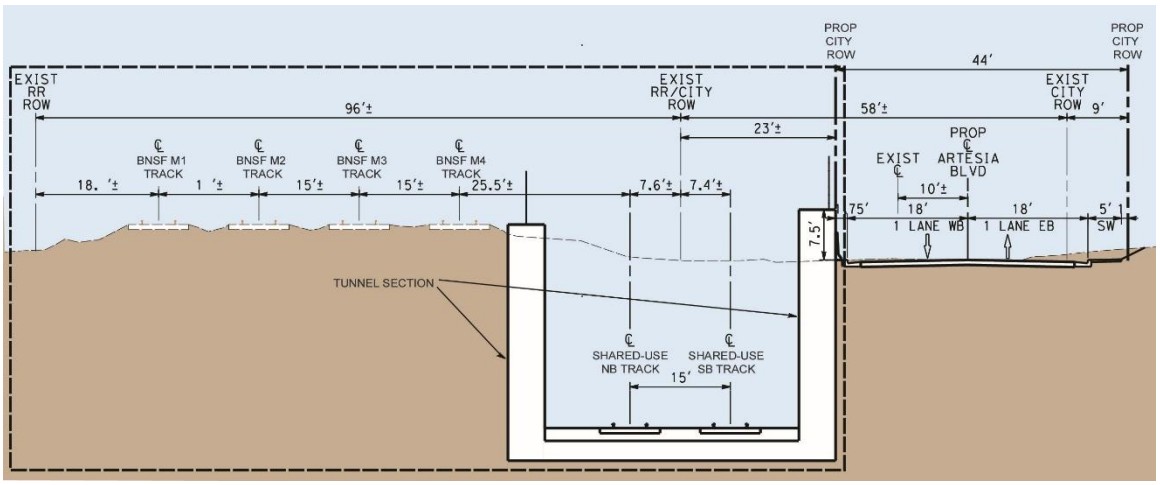
Source: Authority 2025a
M = main track; RR = railroad; R/W = right-of-way; NB = northbound; SB = southbound

Figure 2-5 At-Grade Cross Section from Slauson Avenue to Telegraph Road



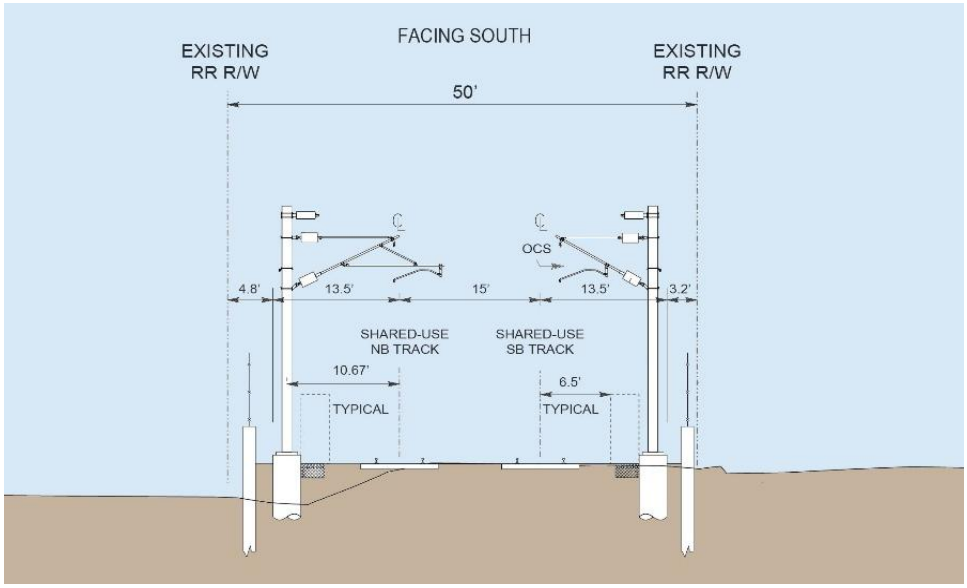
Source: Authority 2025a
M = main track; RR = railroad; R/W = right-of-way; NB = northbound; SB = southbound

Figure 2-6 Elevated Cross Section South of Lakeland Road



Source: Authority 2025a
Figure not to scale
M = main track; OCS = overhead contact system; RR R/W = railroad right-of-way

Figure 2-7 Braced Trench Cross Section East of Fullerton Airport



Source: Authority 2025a
OCS = overhead contact system; RR = railroad; R/W = right-of-way; NB = northbound; SB = southbound

Figure 2-8 At-Grade Cross Section between La Palma Avenue and Ball Road

2.2.1.2 *Ancillary Facilities*

Systems Facilities

HSR trains would draw power from California's existing electricity grid, with power distributed to the trains via the overhead contact system (OCS). The project would not include construction of a separate power source; rather, the existing grid would supply power to the OCS through the extension of underground or overhead transmission lines to a series of power substations positioned along the railroad corridor. The transformation and distribution of electricity would occur through the following three types of stations:

- Traction power substations (TPSS), which would transform high-voltage electricity supplied by public utilities to the train operating voltage. The project section would include two TPSS sites (Los Angeles and Anaheim), which would both be adjacent to existing utility transmission lines and outside of the existing right-of-way. The TPSS sites would be spaced apart by approximately 30 miles along the project alignment and each include an approximately 450-square-foot control room and two 115/50-kilovolt or 230/50-kilovolt, single-phase transformers that would both be rated at 60 megavolt-amperes. The foregoing components would be installed within an approximately 32,000-square-foot area, and screening of each TPSS would be provided by a wall or fence.
- A switching station to connect and balance the electrical load between tracks and switch OCS power on or off in the event of a power outage or emergency. A switching station would be installed in Santa Fe Springs, generally midway between the two TPSS sites, approximately 15 miles from the nearest TPSS and 0.1 mile northeast of the project alignment. Installation of the station's equipment would require approximately 9,600 square feet.
- Paralleling stations, or autotransformer stations, to provide voltage stabilization and equalize current flow. Two paralleling stations would be installed along the project alignment, with one each along the segments between the Santa Fe Springs switching station and the Los Angeles and Anaheim TPSS sites. Each paralleling station would be adjacent to the HSR right-of-way, include an approximately 450-square-foot control room, and require approximately 8,000 square feet.

Table 2-3 provides the locations of the proposed TPSSs, switching station, and paralleling stations.

Table 2-3 Traction Power, Paralleling, and Switching Station Locations

Traction Power Station Type	Location
Traction power substation (two sites)	**City of Los Angeles:** South of Washington Blvd, and west of Soto St, adjacent to the existing railroad viaduct **City of Anaheim:** On the northeast corner of Lewis St and Cerritos Ave, southwest of the HSR tracks
Paralleling station (two sites)	**City of Montebello:** Southwest corner of Maple Ave and Sycamore St, south of the HSR tracks (co-located with the relocated Commerce Metrolink Station) **City of Fullerton:** Northwest corner of Dale St and Artesia Ave, south of the HSR tracks
Switching station	**City of Santa Fe Springs:** Northeast corner of Los Nietos Rd and Santa Fe Springs Rd, north of BNSF Railway tracks

Source: Authority 2025a
HSR = high-speed rail

Signaling and Train-Control Elements

The National Transportation Safety Board, FRA, and other agencies mandate Positive Train Control, a train safety system designed to automatically implement safety protocols and provide communication with other trains to reduce the risk of a potential collision. Because of the lower operating speed of HSR trains in this project section compared to other HSR project sections, this project section would operate using conventional Positive Train Control signaling rather than a specialized HSR signaling system. This project section would use a radio-based communications network, including a fiber optic backbone and communications towers approximately every 2 to 3 miles, depending on the terrain and selected radio frequency. The towers would be in the HSR corridor in a fenced area of approximately 20 feet by 15 feet, including a 10- by 8-foot communications shelter and a 6- to 8-foot diameter, 100-foot-tall communications pole. These

communications facilities could be co-located within the TPSSs. Where communications towers cannot be located with TPSSs or other HSR facilities, they would be within or near the HSR corridor in an approximately 20- by 15-foot fenced area.

Layover Tracks

Layover tracks are used to store and restock trains during the day, in between service runs, and to store trains at night at terminus stations when they are not in service. Layover tracks are required where high-speed trains would end their runs, near LAUS and ARTIC, to support layover functions such as overnight storage, draining of waste tanks, filling of potable water tanks, and cleaning of windows, among others, as well as daily scheduled interior cleaning of passenger areas that would occur prior to the train entering revenue service. The Los Angeles layover tracks would be between Seventh Street and Interstate 10, and could be accessed for cleaning activities through the Amtrak Eighth Street Yard. The Anaheim layover tracks would be from south of Ball Road to south of Cerritos Avenue, and would have a layover support facility at the northeast corner of Lewis Street and Cerritos Avenue.

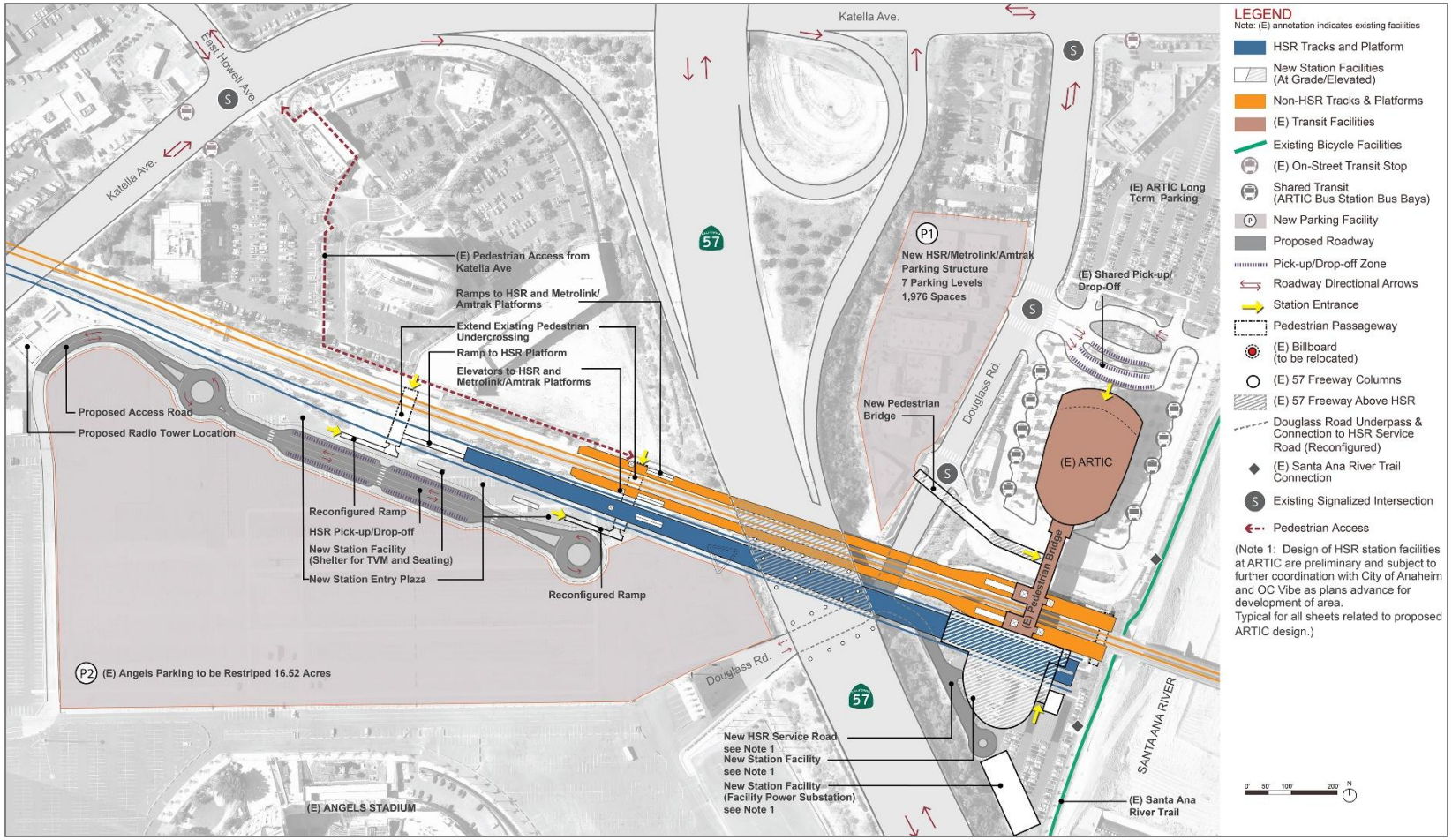
2.2.1.3 *High-Speed Rail Station Facilities*

Because the project section is within an existing corridor with passenger rail service, Shared Passenger Track Alternative A does not propose new HSR stations but rather modifies existing passenger rail stations to allow for shared operations with HSR. Shared Passenger Track Alternative A would include an HSR station platform and facilities at ARTIC, described below.

ARTIC High-Speed Rail Platform and Station Facilities

The proposed HSR platform and station facilities at the existing ARTIC station would be at grade, with two new HSR tracks and a single 1,410-foot center platform for HSR, south of and parallel to the existing Metrolink/Amtrak tracks and platforms. The HSR platform would be accessed through an extension of ARTIC's existing pedestrian bridge from the northeast and through an extension of two existing pedestrian tunnels on the western end of the existing ARTIC platforms. The Authority would work with the City of Anaheim, as the ARTIC passenger terminal owner, to share the passenger amenities inside ARTIC in the near term. Once ridership increases enough that combined HSR and local-provider passenger volumes exceed the design capacity of the ARTIC passenger terminal building, the Authority would build a separate HSR passenger terminal. This new HSR station building, included within the project footprint and depicted on Figure 2-9, would be at the southern end of the pedestrian bridge, along with a facility power substation to provide electricity to the building. The existing Metrolink/Amtrak parking lot north of Angel Stadium would be reconfigured into a pick-up/drop-off area and connected to the existing access road from Katella Avenue. The project would maintain the two existing access points between the Santa Ana River Trail and ARTIC. Radio towers would be built adjacent to the access road at Katella Avenue.

This project would include a new parking structure adjacent to State Route 57 and Katella Avenue, providing 1,350 HSR parking spaces and 626 replacement parking spaces to account for existing parking spaces at ARTIC that would be displaced by the HSR tracks and platform, for a total of 1,976 parking spaces. Figure 2-9 provides an illustration of the HSR platform and station facilities at ARTIC.



Source: Authority 2025a

Figure 2-9 High-Speed Rail Platform and Facilities at ARTIC

2.2.1.4 *Light Maintenance Facility*

HSR operations in Southern California would require a Level III[5] LMF for fleet storage, cleaning, repair, overnight layover accommodations, and servicing facilities, including the necessary water cistern and power facilities. The 26th Street LMF is designed to follow the Authority's *Requirements for High-Speed Trainset Fleet and Infrastructure Maintenance Facilities Technical Memorandum* (Authority 2024).

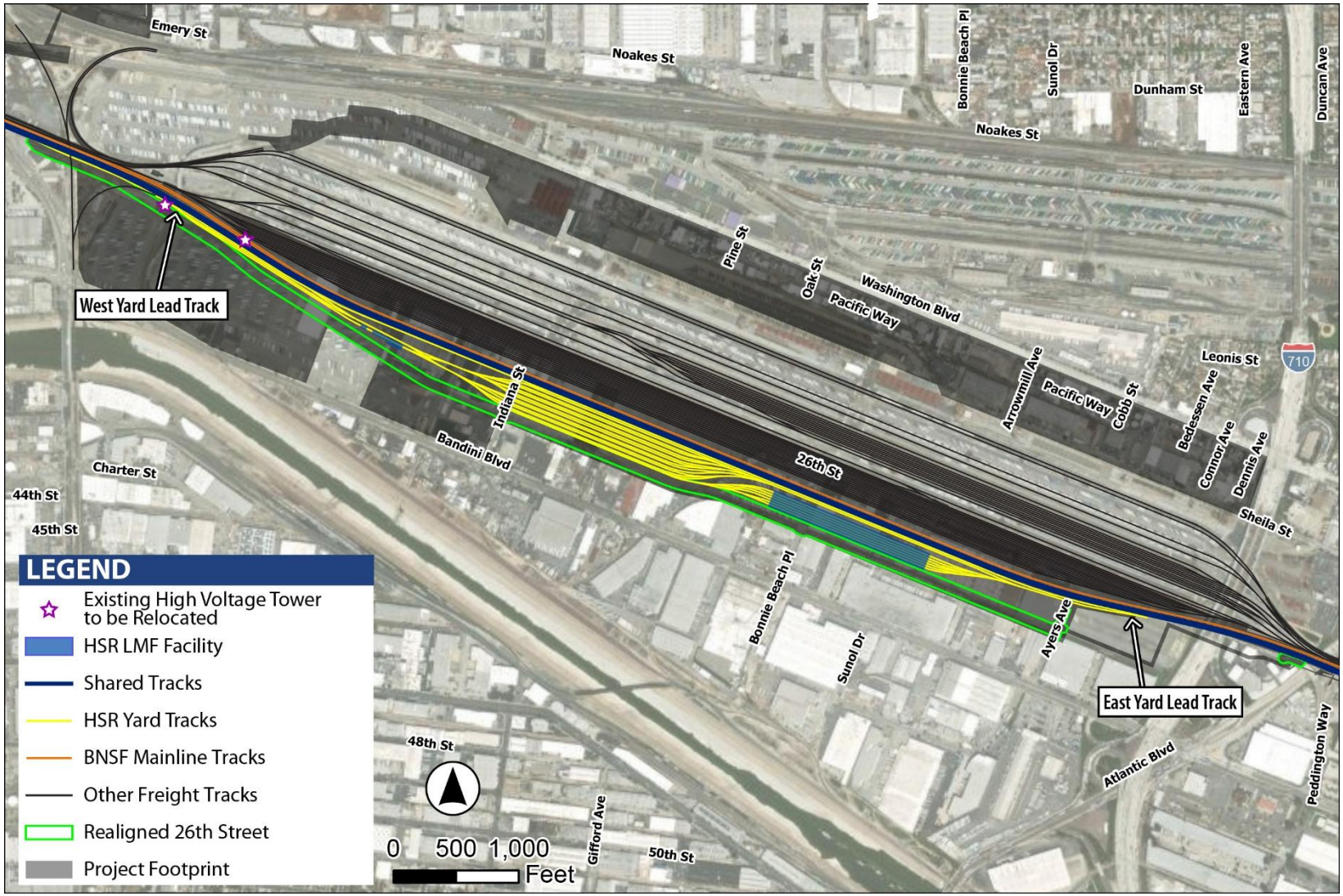
Refer to Figure 2-10 for an overview of the 26th Street LMF, which would have an overall size of 50 acres and be roughly bounded by the realigned mainline tracks on the north, a relocated 26th Street on the south, Downey Road on the west, and Interstate 710 on the east. The changes on the south side of Hobart Yard would require 26th Street to be realigned, which would provide access to the LMF. Two high-voltage utility towers would be relocated to accommodate the 26th Street realignment. Refer to Section 2.2.1.5 for more details on changes adjacent to Hobart Yard.

The LMF would be double-ended, with all tracks having access from the mainline on both the eastern and western sides. HSR trains would access the LMF from the east and west on two new yard lead tracks, which would be south of the mainline tracks. Within the 26th Street LMF, there would be an outdoor train yard with 12 yard tracks to allow for the storage of 24 single trainsets, along with a 1,345-foot-long, six-track shop building, which could accommodate 12 trainsets. The internal LMF access roads would be wide enough to accommodate service vehicles, consolidate commissary functions, and provide more clearance from the OCS poles to the yard tracks.

2.2.1.5 *Freight or Passenger Railroad Modifications*

Shared Passenger Track Alternative A would modify the existing rail corridor to create a corridor that is primarily four mainline tracks (two electrified and shared with other passenger rail operators) from Los Angeles to Fullerton, and two mainline tracks (electrified and shared with both passenger rail and freight operators) from Fullerton to Anaheim. Freight rail would operate primarily on the nonelectrified tracks, although the electrified tracks could accommodate freight traffic if necessary (up to 10 BNSF freight trains per day would be able to use the two passenger rail tracks), while maintaining service and operation levels for all operators within the corridor. The following sections describe the freight and passenger railroad modifications in more detail, which include modifications to BNSF storage and intermodal facilities as well as modifications to and relocations of existing passenger rail stations.

[5] The Authority defines three levels of maintenance to be conducted at an LMF.



Source: Authority 2025a

Figure 2-10 Shared Passenger Track Alternative A: 26th Street Light Maintenance Facility

BNSF Railway Storage and Intermodal Facilities

Adding and electrifying tracks in the existing right-of-way would require the Authority to remove or modify track and right-of-way that is currently used or planned for future use by BNSF for train storage and intermodal operations. This requires modifications to BNSF's plans for expansion at its yards in Vernon and Commerce. In several locations, Shared Passenger Track Alternative A would require removal/relocation of existing BNSF infrastructure. Thus, Shared Passenger Track Alternative A would replace the affected BNSF infrastructure, primarily adjacent to Hobart Yard, to maintain BNSF capacity and avoid disruptions to operations.

Table 2-4 lists the BNSF storage capacity that would be removed from the corridor and relocated to the new consolidated storage yard adjacent to Hobart Yard; refer to Figure 2-11 for an overview of the relocated infrastructure. The new storage yard would provide 101,094 track feet of storage, including 5,850 track feet for a new runaround track,[6] which is slightly more than the amount removed from the corridor (90,940 track feet). This is a result of the layout and overall length of the new consolidated yard. The tracks need to be operational while fitting within the new yard space and maintaining the removed storage capacity, and therefore some replacement tracks would be longer than the ones that are being removed from the corridor. In addition to the relocations described in Table 2-4, some BNSF yard lead and storage tracks throughout the corridor would be relocated and replaced within the same area, with the same level of storage capacity and operational functionality maintained. This includes the Pico Rivera Yard north and south lead tracks, La Mirada Yard lead track and storage track, and Fullerton storage track on the southern side between Commonwealth Avenue and Highland Avenue.

Table 2-4 BNSF Railway Facility or Track to Be Removed or Modified

HSR Project Element Affecting BNSF Infrastructure	BNSF Facility/Track to Be Removed/Relocated/Modified	Length of Removed/ Relocated Tracks (TF)
HSR mainline and layover tracks	BNSF 8th St Yard (BNSF storage tracks between 1st St and I-10 along West Bank)	35,000
Relocated Commerce Metrolink Station	South Vail Support Track (between Vail St and Minson Wy)	3,800
4th mainline track	Pico Rivera Storage Tracks	4,000
4th mainline track	Norwalk Support Track (between Telegraph Rd and Florence Ave)	4,400
4th mainline track	Santa Fe Springs Staging Track (through existing Norwalk/Santa Fe Springs Metrolink Station area)	14,600
Fullerton braced trench	Buena Park/Fullerton Storage Tracks (on north side between Dale St and Gilbert St)	15,840
4th mainline track	Fullerton support track (north of Fullerton Amtrak/Metrolink Station)	4,500
4th mainline track	Fullerton storage track (on north side between Commonwealth Ave and Highland Ave)	8,800
Total		**90,940**

Source: STV 2025
BNSF = BNSF Railway; HSR = high-speed rail; I = interstate; TF = track feet

[6] Runaround tracks allow a locomotive to move around the train and attach to the opposite end, enabling the train to be switched or moved in the desired direction. The runaround track must be as long as the longest set of cars that would be pulled. A runaround track is generally recommended for all modern rail yards to reduce overall freight congestion.



Source: STV 2025

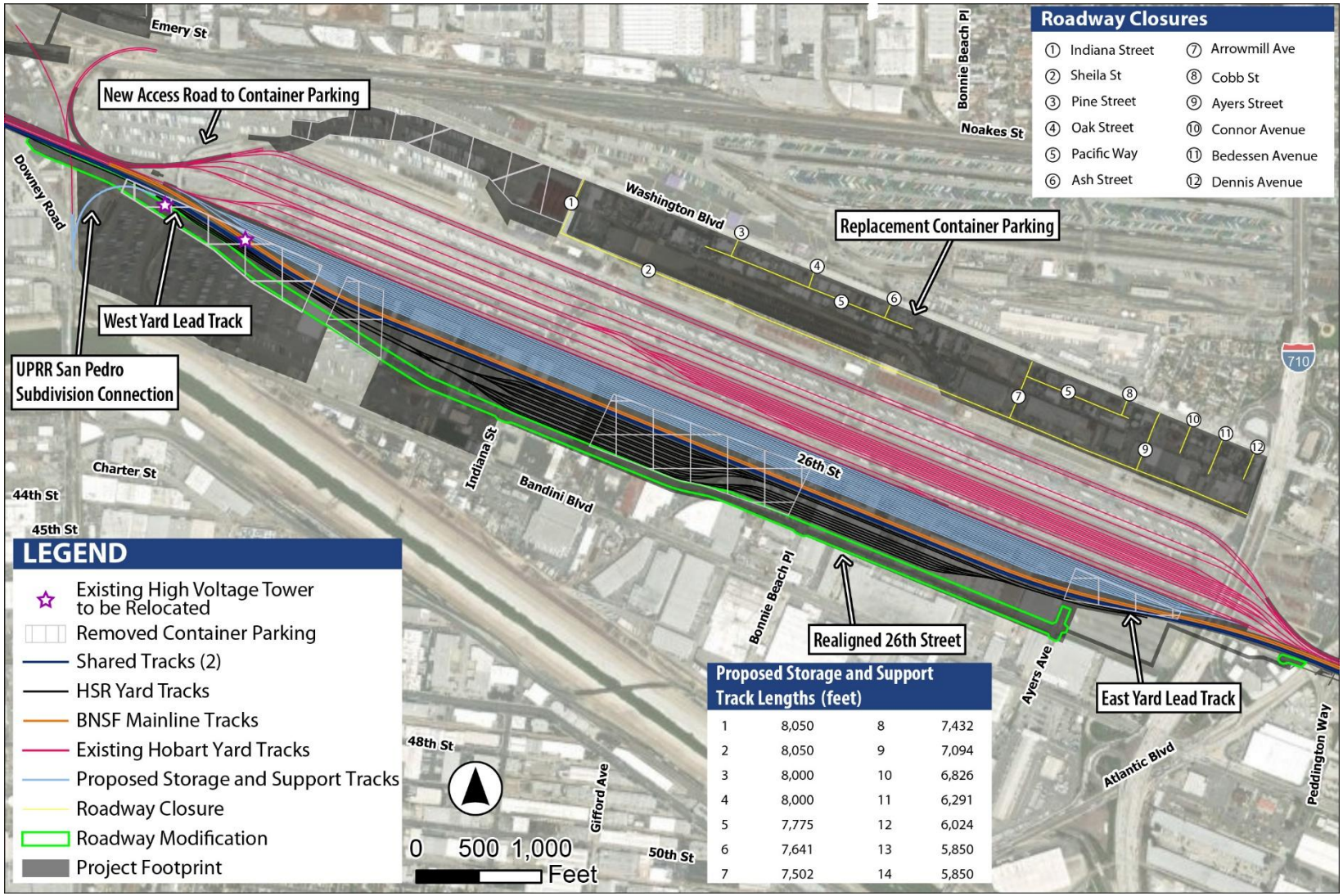
Figure 2-11 BNSF Railway Infrastructure Affected by the Los Angeles to Anaheim Project Section

BNSF Railway Los Angeles Intermodal Facility (Hobart Yard)

Figure 2-12 depicts the proposed changes at Hobart Yard. The consolidated storage yard, BNSF mainline tracks, shared tracks, and new connection to the UPRR San Pedro Subdivision would be up to 250 feet south of the current southern limit at Hobart Yard and into properties south of 26th Street. New second lead tracks into Hobart Yard from the west and east would also be added. These additional lead tracks would allow freight trains to move off the mainline tracks at speed and avoid delays and backups in an already heavily congested corridor. These track changes would require the vacation and realignment of the 26th Street right-of-way from Downey Road to Atlantic Boulevard.

The changes described above, along with LMF yard lead tracks, would displace some existing BNSF container parking south of the railroad corridor. This container parking would be replaced by acquiring properties north of Hobart Yard along the south side of Washington Boulevard, which would require a new access road north of Hobart Yard and the closure of several roads between Washington Boulevard and Sheila Street (refer to Section 2.2.1.6, State Highway or Local Roadway Modifications, for more details on roadway changes related to Hobart Yard). The new access road would also displace some existing container parking that would be replaced in the new container parking area.

Additionally, two high-voltage utility towers would be relocated to accommodate the 26th Street realignment.



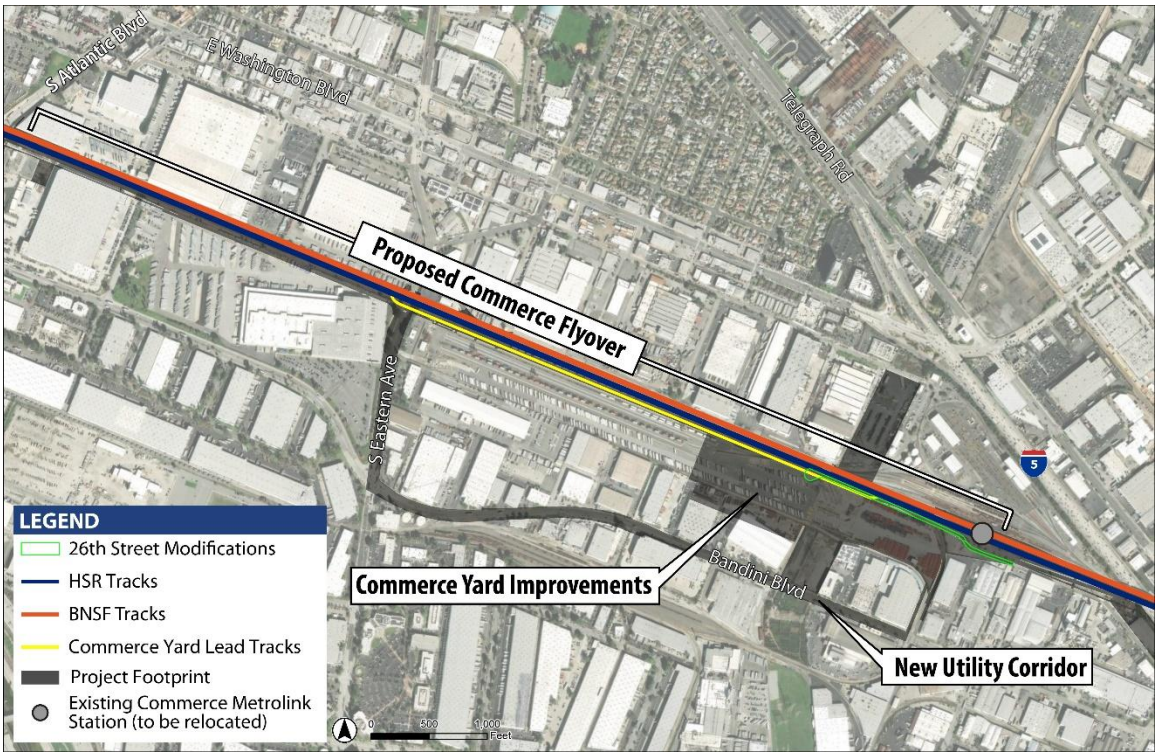
Sources: Authority 2025a; ESRI 2020

Figure 2-12 Hobart Yard Modifications (Shared Passenger Track Alternative A)

BNSF Railway Commerce Intermodal Facility (Commerce Yard)

Adjacent to Commerce Yard, the Commerce Flyover would separate passenger trains on an elevated structure from the freight trains running at grade. Figure 2-13 depicts the modifications required throughout the Commerce Yard area to maintain operations. Two new BNSF yard tracks would be added, converging into a new BNSF stub lead track west of Interstate 5, with additional connector tracks. Improvements would include reconstructing several of the lead tracks, relocating the truck entrance gates and internal access road, and adding truck storage parking and a switching tail track. These yard improvements would require a portion of 26th Street to be closed; 26th Street currently provides access to the yard from the east, but the new entrance to the yard would require approximately 1,300 feet of the road to be closed.

Existing utilities along the south side of the railroad corridor would be relocated to the south in a new utility corridor, within Bandini Boulevard. Additionally, the high-voltage power lines currently running south of and parallel to the railroad corridor must be raised to provide the required clearance from the Commerce Flyover structure.



Sources: Authority 2025a; ESRI 2020

Figure 2-13 Commerce Flyover and Commerce Yard Modifications

Modified Metrolink Stations

Norwalk/Santa Fe Springs Metrolink Station Modifications

HSR trains would not stop at the Norwalk/Santa Fe Springs Metrolink Station, but modifications would be required for HSR operations, as depicted on Figure 2-14. The existing platforms at Norwalk/Santa Fe Springs Metrolink Station are in an area that would not be able to accommodate an additional mainline track and shared operations between HSR and Metrolink. Adding the additional mainline track would require shifting the existing platforms to an area with a straight section of track. Therefore, the Metrolink platforms would be moved to be served by the shared tracks on the new elevated structure, approximately 350 feet east of the existing alignment (at their farthest points). The modified station would be elevated, with two 680-foot side

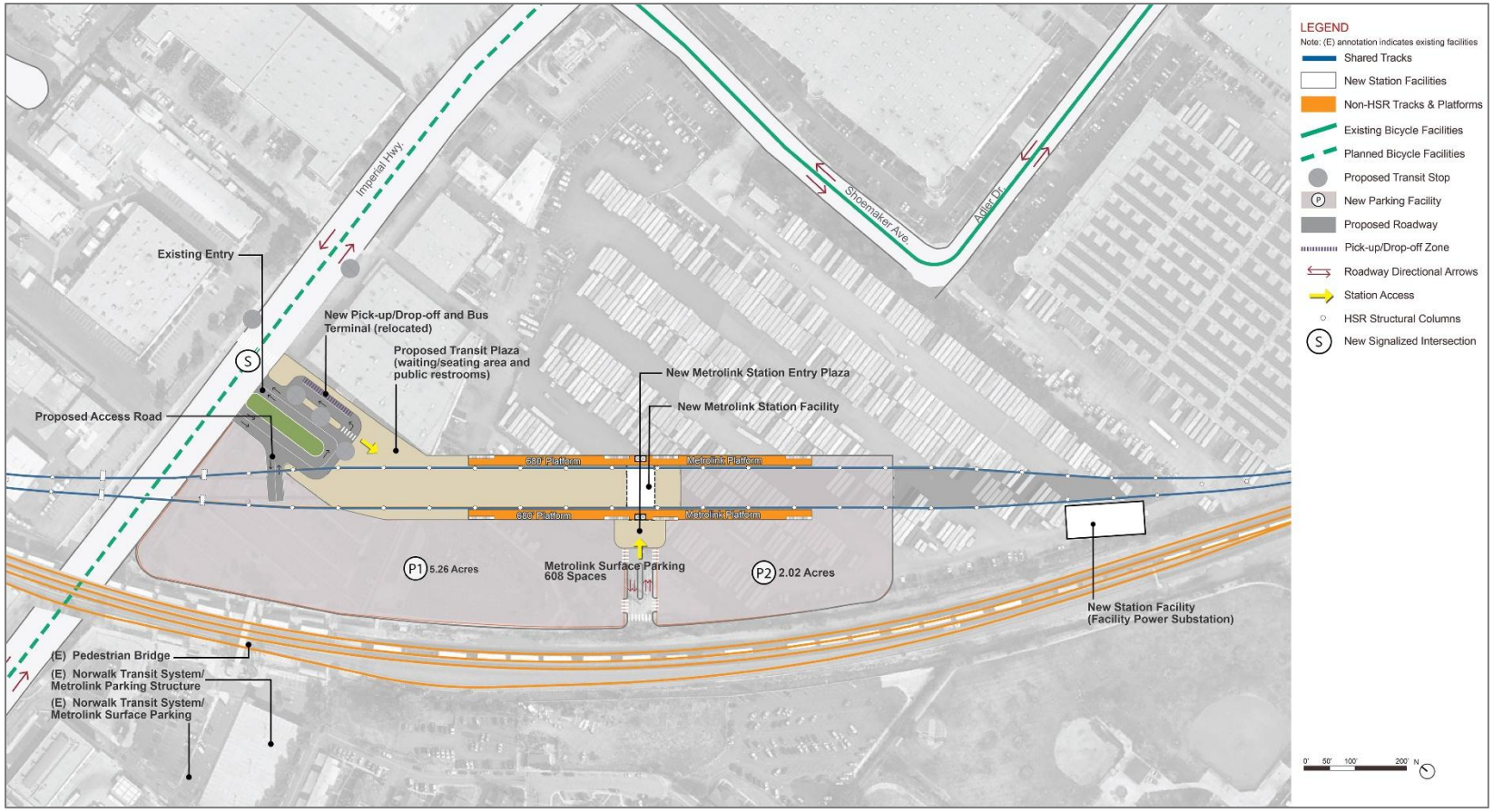
platforms, capable of future extension to 1,000 feet; the space for the future extension is included within the project footprint.

The existing Metrolink parking and bus drop-off west of the railroad corridor would be relocated to the east of the elevated structure to provide better access to the modified Metrolink platforms. Station entry points would be on Imperial Highway to the north and at Shoemaker Avenue and Adler Drive to the east and would require new access roadways. On Imperial Highway, the signalization leading into the parking garage would require modifications, as required by the City of Norwalk. The project would provide 608 surface parking spaces west of the modified platforms to replace the parking spaces at the existing Norwalk/Santa Fe Springs Metrolink Station displaced by the HSR modifications. Parking and pick-up/drop-off for Metrolink passengers would be within surface parking lots.

Fullerton Metrolink/Amtrak Station Modifications

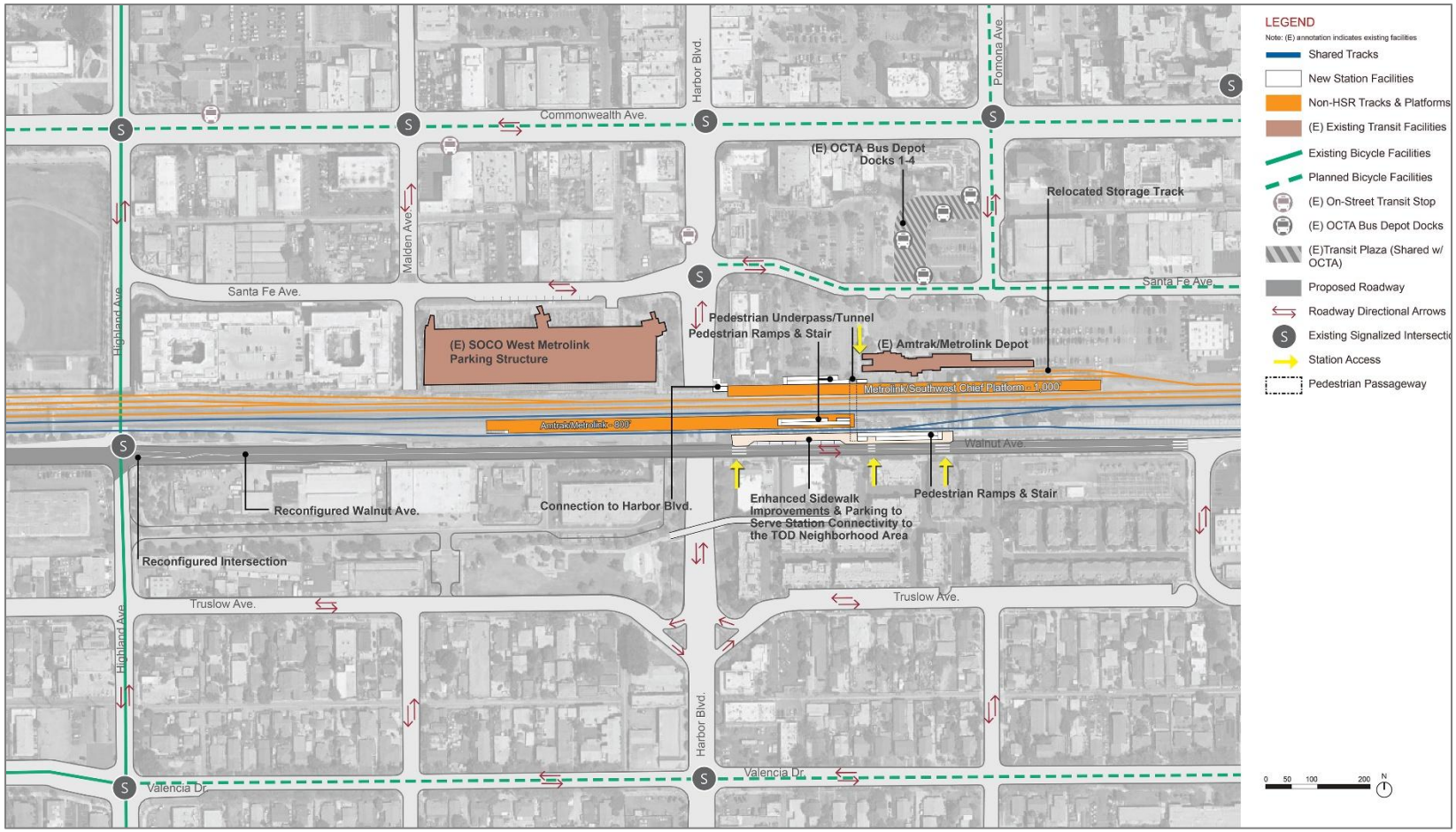
HSR trains would not stop at the Fullerton Metrolink/Amtrak Station, but modifications would be required for HSR operations, as depicted on Figure 2-15. At the Fullerton Metrolink/Amtrak Station, a fourth mainline track would need to be added on the southern side of the corridor, outside of the existing railroad right-of-way, to allow HSR trains to pass through the station. A new railroad bridge would be built over Highland Avenue to accommodate the new shared track, which requires Walnut Avenue to be slightly realigned to the south, and the intersection of Walnut Avenue and Highland Avenue would need to be redesigned.

Several modifications would occur for the Metrolink/Amtrak station platforms. The two existing platforms on the southern side would be removed, and a new 800-foot center platform would be added over Harbor Boulevard. The existing pedestrian bridge east of Harbor Boulevard that connects the two side platforms would be removed and replaced by a new pedestrian underpass that connects the existing northern platform, new center platform, and Walnut Avenue to the south, with ramps and stairs providing access. South of the new Metrolink/Amtrak center platform, Walnut Avenue would be slightly narrowed, and sidewalk improvements and crosswalks would be added east of Harbor Boulevard to improve station connectivity to the neighborhood.



Source: Authority 2025a

Figure 2-14 Modified Norwalk/Santa Fe Springs Metrolink Station Site Plan



Source: Authority 2025a

Figure 2-15 Modified Fullerton Metrolink/Amtrak Station Site Plan

Relocated Metrolink Stations

Commerce Metrolink Station Relocation

As stated in Section 2.2.1.1, the Commerce Flyover would require the Commerce Metrolink Station to be relocated to an area northeast of the intersection of Telegraph Road and Maple Avenue, which is approximately 0.75 mile to the east of its current location. The relocated Commerce Metrolink Station would be for Metrolink trains only; no HSR trains would stop at this station. An HSR paralleling station would be co-located at the relocated station site. Most of the relocated station would be within Montebello, including the replacement surface parking, plaza, and internal access roads; the platform and nonpublic station facilities north of the railroad corridor would be within Commerce.

The relocated station would have a center platform along the southern side of the rail corridor, accessible from the north via Sycamore Street via a new pedestrian underpass, and from the south via Maple Avenue. The intersection of Sycamore Street and Supply Avenue would be modified with pedestrian crosswalks, and the intersection of Telegraph Road and Maple Avenue would have a new signal and crosswalks to provide safe access to the new station location. All the existing station facilities, such as a transit plaza for buses, bicycle parking, vehicle parking (140 spaces), and a pick-up/drop-off area for motorists, would be replaced south of the corridor, to be accessed via Maple Avenue.

Buena Park Metrolink Station Relocation

As stated in Section 2.2.1.1, the HSR project would add and realign tracks through the existing Buena Park Metrolink Station, necessitating the relocation of the station. The Buena Park Metrolink Station would be relocated to between South Coyote Creek and Beach Boulevard, approximately 0.75 mile northwest of its current location within Buena Park. The proposed relocated Buena Park Metrolink Station would be for Metrolink trains only; no HSR trains would stop at this station.

The relocated station would have a center platform provided along the northern side of the existing rail corridor, accessible from the north via Stage Road and from the east via Beach Boulevard. A new signalized intersection is proposed at the intersection of Coyote Creek and Stage Road. All existing station facilities would be replaced, including a transit plaza for buses, bicycle parking, vehicle parking (313 spaces), and a pick-up/drop-off area for motorists.

2.2.1.6 *State Highway or Local Roadway Modifications*

Modifications at Roadway Crossings

Shared Passenger Track Alternative A would cross 58 federal, state, and locally controlled roadways, most of which are currently grade separated. A portion of the foregoing roadway crossings would require, in general, one of the following three types of roadway modifications:

- **New grade separations:** There are six roadway crossings where new railroad grade separations (railroad bridge crossings) would be needed. Five of the existing at-grade roadways would be fully grade separated and lowered to cross under the proposed railroad bridges. One roadway (Lakeland Road) would be partially grade separated and would not require vertical realignment, because the shared tracks would cross over the roadway on a new bridge.
- **Modified existing grade separations (roadway vertical realignment):** The alignment would use existing railroad bridges throughout the corridor, most of which would need to be widened or new bridges would need to be added adjacent to the existing bridges to accommodate new tracks. At nine of these existing grade separations, the roadways would require vertical realignments (i.e., be lowered) to provide the required clearances between the road and the railroad bridge.

- **Modified existing grade separations (new piers and abutments):** Thirteen existing grade separations would require modified piers or abutments to accommodate new or widened railroad bridges. No vertical realignment of the roadway would be required.

Eight at-grade crossings at Orangethorpe Avenue, La Palma Avenue, Sycamore Street, Broadway, Santa Ana Street, Sixth Street, Vermont Avenue, Ball Road, and Lewis Street would remain at grade and would be modified only to add OCS to the existing tracks.

Additionally, all existing roadway overcrossings that would span over the shared tracks would be modified to have protective barriers on the top to prevent people or objects from entering the HSR right-of-way from the bridge. Detailed plans of barrier type and installation details will be determined during the Preliminary Engineering for Procurement design phase and coordination with the corridor stakeholders.

Table 2-5 lists all the crossings and any modifications that would be required along the Shared Passenger Track Alternative A alignment.

Table 2-5 Modifications to Roadway Crossings (from northwest to southeast)

Roadway	City	Current Crossing Configuration	Proposed Modification
1st St	Los Angeles	Overcrossing	None
4th St	Los Angeles	Overcrossing	None
6th St/Whittier Blvd	Los Angeles	Overcrossing	None
7th St	Los Angeles	Overcrossing	None
I-10 (Santa Monica freeway)	Los Angeles	Overcrossing	None
Olympic Blvd	Los Angeles	Overcrossing	None
Washington Blvd	Los Angeles	Undercrossing	None
Soto St	Los Angeles	Undercrossing	None
Downey Rd	Vernon	Undercrossing	New pier and abutments within roadway
Private access road	Vernon	Overcrossing	None
I-710 (Long Beach freeway)	Vernon	Overcrossing	None
Atlantic Blvd	Commerce	Undercrossing	New piers and abutments within roadway
Eastern Ave	Commerce	Undercrossing	New piers and abutments within roadway
I-5 (Santa Ana freeway)	Commerce	Undercrossing	None
Telegraph Rd	Commerce	Undercrossing	None
Garfield Ave	Commerce	Undercrossing	None
Greenwood Ave	Montebello	Undercrossing	None
Paramount Blvd	Pico Rivera	Undercrossing	None
SR 19 (Rosemead Blvd)	Pico Rivera	Undercrossing	Road vertical realignment, new abutments within roadway
Passons Blvd	Pico Rivera	Undercrossing	New pier and abutments within roadway
Slauson Ave	Santa Fe Springs	Overcrossing	Pier modifications

Roadway	City	Current Crossing Configuration	Proposed Modification
I-605 (San Gabriel freeway)	Santa Fe Springs	Overcrossing	None
Pioneer Blvd	Santa Fe Springs	At grade	New grade separation; roadway lowered to cross under tracks on a new railroad bridge
Norwalk Blvd	Santa Fe Springs	At grade	New grade separation; roadway lowered to cross under tracks on a new railroad bridge
Los Nietos Rd	Santa Fe Springs	At grade	New grade separation; roadway lowered to cross under tracks on a new railroad bridge
Santa Fe Springs Rd	Santa Fe Springs	Undercrossing	New piers and abutments within roadway
Telegraph Rd	Santa Fe Springs	Undercrossing	New pier and abutments within roadway
Florence Ave	Santa Fe Springs	Undercrossing	New pier and abutments within roadway
Lakeland Rd	Santa Fe Springs	At grade	New grade separation (for HSR only); roadway remains at grade and shared tracks on elevated structure
Imperial Hwy	Santa Fe Springs, Norwalk	Undercrossing	None
Carmenita Rd	Santa Fe Springs	Undercrossing	Roadway vertical realignment, new piers and abutments within roadway
Rosecrans Ave/Marquardt Ave	Santa Fe Springs	Overcrossing	None
Valley View Ave	Santa Fe Springs, La Mirada	Undercrossing	New piers and abutments within roadway
Alondra Blvd	La Mirada	Overcrossing	Bridge replacement, roadway vertical realignment
SR 39 (Beach Blvd)	Buena Park	Undercrossing	New piers and abutments within roadway
Dale St	Buena Park	Undercrossing	Roadway vertical realignment, new piers and abutments within roadway
Gilbert St	Fullerton	Undercrossing	Roadway vertical realignment, new pier and abutments within roadway
Commonwealth Ave	Fullerton	Undercrossing	Roadway vertical realignment, new piers and abutments within roadway
Euclid St	Fullerton	Undercrossing	New pier and abutments within roadway
Highland Ave	Fullerton	Undercrossing	New abutments within roadway
Harbor Blvd	Fullerton	Undercrossing	New piers and abutments within roadway
Lemon St	Fullerton	Undercrossing	None

Roadway	City	Current Crossing Configuration	Proposed Modification
Orangethorpe Ave	Anaheim	At grade	None
SR 91 (Riverside freeway)	Anaheim	Overcrossing	None
La Palma Ave	Anaheim	At grade	None
Sycamore St	Anaheim	At grade	None
Lincoln Ave	Anaheim	Undercrossing	None
Broadway	Anaheim	At grade	None
Santa Ana St	Anaheim	At grade	None
South St	Anaheim	At grade	None
Vermont Ave	Anaheim	At grade	None
Ball Rd	Anaheim	At grade	None
Lewis St	Anaheim	Undercrossing	Roadway vertical realignment, new piers and abutments within roadway
Cerritos Ave	Anaheim	At grade	New grade separation; roadway lowered to cross under tracks on a new railroad bridge
State College Blvd	Anaheim	At grade	New grade separation; roadway lowered to cross under tracks on a new railroad bridge
Katella Ave	Anaheim	Undercrossing	Roadway vertical realignment, roadway widening, new piers and abutments within roadway
SR 57 (Orange freeway)	Anaheim	Overcrossing	None
Douglass Rd	Anaheim	Undercrossing	Roadway vertical realignment, new piers and abutments within roadway

Source: Authority 2025a
Authority = California High-Speed Rail Authority; HSR = high-speed rail; I = interstate; overcrossing = road over train tracks; SR = State Route; undercrossing = road under train tracks

New Grade Separations

As indicated in Table 2-5, five existing at-grade roadways would be grade separated for passenger rail and freight, with the roadway lowered to cross under new railroad bridges. These new grade separations are described in detail in Table 2-6, which includes references to the temporary and permanent footprints depicted on Figure 2-16 through Figure 2-19. The temporary project footprint includes areas such as utility easements and construction staging areas while the permanent project footprint includes areas that would be needed permanently for operation of HSR or areas that would permanently lose access from changes in roadway elevation. These grade separations are early action projects, which are described further in Section 2.3.1, Grade Separations.

Lakeland Avenue would be grade separated for HSR and passenger rail on a new elevated structure, but the freight tracks would remain at grade, with a minimal area of temporary and permanent impacts. Therefore, it is not included in Table 2-6.

Table 2-6 New Grade Separations with Roadway Vertical Realignments

Roadway	Grade Separation Description
Pioneer Boulevard (Figure 2-16)	▪ The existing roadway configuration at the Pioneer Blvd crossing in Santa Fe Springs consists of two northbound and two southbound traffic lanes and left-turn lanes to Rivera Rd (which is immediately adjacent and to the north of the railroad corridor) in both directions, with sidewalks on both sides of the road. ▪ The at-grade crossing would be grade separated as a roadway undercrossing, with the railroad tracks on a bridge structure. Approximately 1,275 feet of Pioneer Blvd would be lowered, with the roadway approximately 20 feet below its current elevation at the lowest point of the undercrossing. Additional excavation depths would be required for bridge footings, utilities, pump station, and roadway subbase. ▪ Direct access to Rivera Rd would be removed and a new roadway that loops west and south just north of the crossing would provide access from Pioneer Blvd to Rivera Rd.
Norwalk Boulevard (Figure 2-17)	▪ The existing roadway configuration at the Norwalk Blvd crossing in Santa Fe Springs consists of two northbound and two southbound traffic lanes and a southbound left-turn lane to eastbound Los Nietos Rd (which is immediately south of the crossing), with sidewalks on both sides of the roadway. ▪ The at-grade crossing would be grade separated as a roadway undercrossing, with the railroad tracks on a bridge structure. Approximately 1,325 feet of Norwalk Blvd would be lowered by approximately 20 feet below its current elevation at the lowest point. Roadway clearance from bottom of bridge to top of pavement would be approximately 15 to 16.5 feet. Additional excavation depths would be required for bridge footings, utilities, pump station, and roadway subbase. ▪ The intersection of Norwalk Blvd and Los Nietos Rd would also be lowered, as also described below.
Los Nietos Road (Figure 2-17)	▪ The existing roadway configuration at the Los Nietos Rd crossing in Santa Fe Springs consists of two westbound and two eastbound traffic lanes and a westbound left-turn lane to Norwalk Blvd (which is immediately west of the crossing), with sidewalks on both sides of the roadway. ▪ The at-grade crossing would be grade separated as a roadway undercrossing, with the railroad tracks on a bridge structure. Approximately 1,700 feet of Los Nietos Rd would be lowered, with the roadway elevation approximately 25 feet below its current elevation at the lowest point. Roadway clearance from bottom of bridge to top of pavement would be approximately 15 to 16.5 feet. Additional excavation depths would be required for bridge footings, utilities, pump station, and roadway subbase. ▪ The intersection of Norwalk Blvd and Los Nietos Road would also be lowered as part of this and the Norwalk Blvd grade separation.
Cerritos Avenue (Figure 2-18)	▪ The existing roadway configuration at the Cerritos Ave crossing in Anaheim consists of two westbound and two eastbound traffic lanes with sidewalks on both sides of the roadway. ▪ The at-grade crossing would be grade separated as a roadway undercrossing, with the railroad tracks on a bridge structure. Approximately 1,850 feet of Cerritos Ave would be lowered by 25 feet below its current elevation at the lowest point. Roadway clearance from bottom of bridge to top of pavement would be approximately 15 to 16.5 feet. Additional excavation depths would be required for bridge footings, utilities, pump station, and roadway subbase. ▪ In order to maintain its intersection with Cerritos Ave, Vernon St would need to be lowered about 5 feet below its existing elevation. Similarly, Lewis St would need to be lowered to maintain the intersection with Cerritos Ave.

Roadway	Grade Separation Description
State College Boulevard (Figure 2-19)	▪ The existing roadway configuration at the State College Blvd crossing in Anaheim consists of three northbound and three southbound traffic lanes with sidewalks on both sides of the roadway. ▪ The at-grade crossing would be grade separated as a roadway undercrossing, with the railroad tracks on a bridge structure. Approximately 1,660 feet of State College Blvd would be lowered below its current elevation, up to 25 feet at the lowest point. Roadway clearance from bottom of bridge to top of pavement would be approximately 17.5 feet. Additional excavation depths would be required for bridge footings, utilities, pump station, and roadway subbase. ▪ In order to maintain its intersections with State College Blvd, Howell Ave and Wright Circle would also need to be lowered below its existing elevation, along with multiple driveways and access roads along State College Blvd.



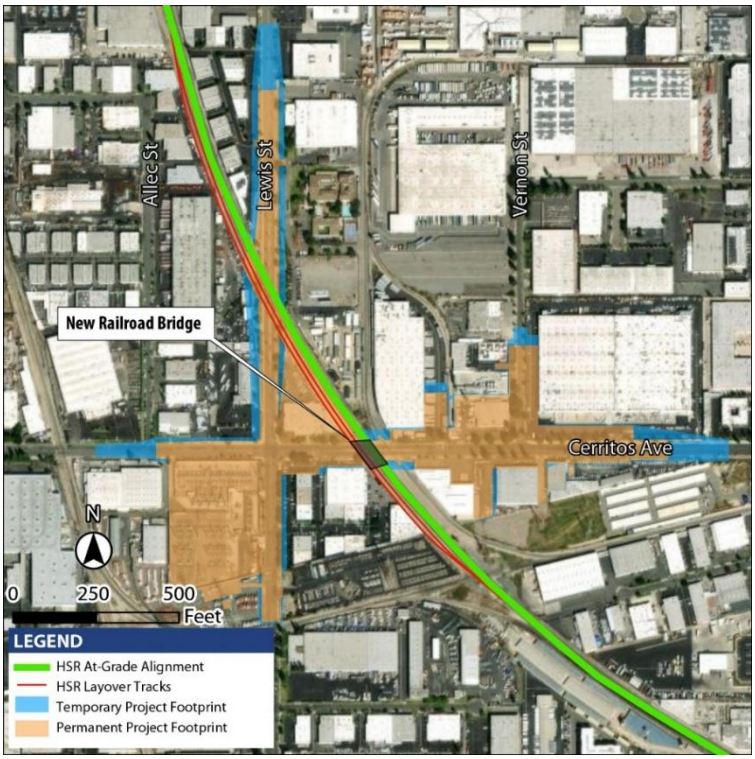
Sources: Authority 2025a; ESRI 2020

Figure 2-16 Pioneer Boulevard Grade Separation



Sources: Authority 2025a; ESRI 2020

Figure 2-17 Norwalk Boulevard and Los Nietos Road Grade Separations



Sources: Authority 2025a; ESRI 2020

Figure 2-18 Cerritos Avenue Grade Separation



Sources: Authority 2025a; ESRI 2020

Figure 2-19 State College Boulevard Grade Separation

Modifications to Other Roadways

In addition to modifications to roadway crossings described above for the railway alignment, several other roadways along the alignment would require modifications as a result of other project elements.

Roadway Modifications by Hobart Yard

The addition of new storage tracks and realignment of existing tracks throughout the Hobart Yard area would require 26th Street to be realigned. The roadway currently forms the southern boundary of Hobart Yard. At the eastern end of the yard, at Atlantic Boulevard, 26th Street connects to Pennington Way. From the UPRR San Pedro Subdivision track to Atlantic Boulevard, 26th Street would be realigned about 500 feet south from its existing location, at the farthest point. The realigned 26th Street would provide access to the 26th Street LMF, just north of the street. Currently, 26th Street intersects with Indiana Avenue, Bonnie Beach Place, and Ayers Avenue. Indiana Avenue and Bonnie Beach Place would connect with the realigned 26th Street, and the segments north of the realigned 26th Street would be closed. The realigned 26th Street would not connect to Pennington Way; it would end at Ayers Avenue, and Pennington Way would end in a cul-de-sac west of Atlantic Boulevard, accessible only from Bandini Boulevard. The existing segment of 26th Street between Ayers Avenue and Pennington Way would be closed.

Several roads between Sheila Street and Washington Boulevard are proposed to be closed because of the relocated BNSF truck parking. These roadway closures include the following, and are depicted on Figure 2-12 in yellow:

- Indiana Street
- S Pine Street
- Pacific Way
- Oak Street

- Ash Street
- Arrowmill Avenue
- Ayers Avenue
- Bedessen Avenue
- Connor Avenue
- Dennis Avenue

Roadway Modifications by Commerce Yard

Access is provided by 26th Street to BNSF's Commerce Yard from the east, but the yard improvements would require the entrance to the yard to be relocated approximately 1,300 feet to the east. This segment of 26th Street, within BNSF property, would be closed, and a new cul-de-sac would be provided at the end of the road.

Roadway Modifications by the Fullerton Braced Trench

The braced trench in Fullerton would be located partially outside the existing railroad right-of-way along the south side of the corridor, within the existing Artesia Boulevard right-of-way. Artesia Boulevard would be realigned slightly south, from approximately Pritchard Avenue to Gilbert Street. The intersection of Artesia Avenue and Gilbert Street would be reconfigured.

Roadway Modifications by Fullerton Metrolink/Amtrak Station

The changes at the Fullerton Metrolink/Amtrak Station would require Walnut Avenue to be realigned. Walnut Avenue currently runs east to west from Richman Avenue to Lawrence Avenue, south of and adjacent to the existing railroad corridor. With the addition of a fourth mainline track, Walnut Street would be slightly realigned south, from Richman Avenue to Lemon Street. All existing lanes and sidewalks would be maintained. At Highland Avenue, Walnut Street would be lowered slightly to meet the new, lowered grade of Highland Avenue, and the intersection would be reconfigured.

2.2.2 Shared Passenger Track Alternative B

Shared Passenger Track Alternative B would follow the same alignment and share the same project features and operational assumptions as Shared Passenger Track Alternative A, except for the location of the LMF as discussed below.

2.2.2.1 *Alignment*

The BNSF mainline and shared tracks for Shared Passenger Track Alternative B would be the same as those discussed for Shared Passenger Track Alternative A, as described in Section 2.2.1.1, because the LMF location would not affect the BNSF mainline and shared tracks.

2.2.2.2 *Ancillary Facilities*

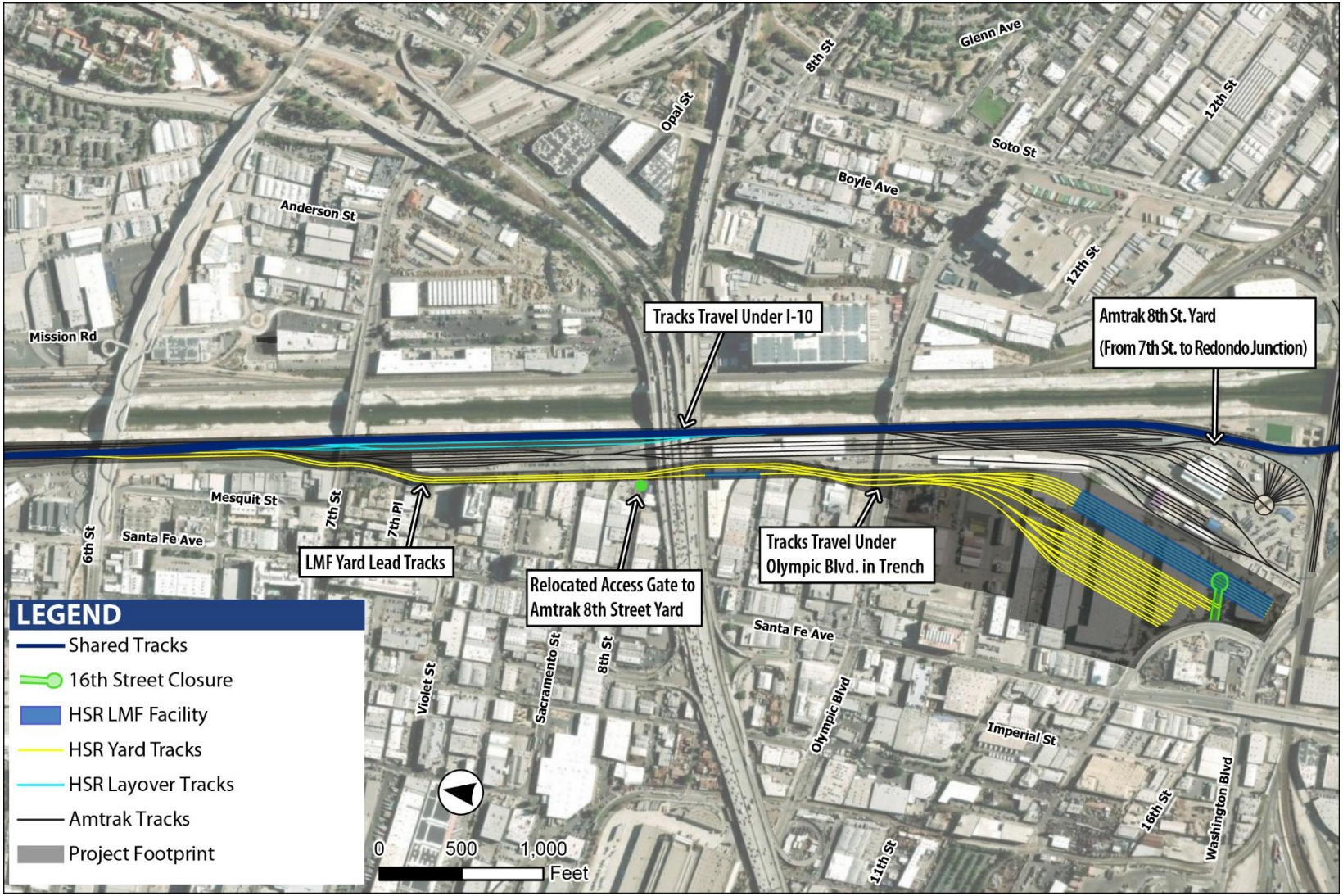
The proposed ancillary facilities for Shared Passenger Track Alternative B would be the same as those discussed for Shared Passenger Track Alternative A. Refer to Section 2.2.1.2 for more information on proposed ancillary facilities.

2.2.2.3 *High-Speed Rail Station Facilities*

Under Shared Passenger Track Alternative B, the proposed HSR station facilities at ARTIC would be the same as for Shared Passenger Track Alternative A. Refer to Section 2.2.1.3 for more information on proposed station sites.

2.2.2.4 *Light Maintenance Facility*

Shared Passenger Track Alternative B proposes an LMF between Olympic Boulevard and 15th Street, immediately adjacent to the existing Amtrak Eighth Street Yard. The 15th Street LMF would include the same maintenance operation facilities as the 26th Street LMF under Shared Passenger Track Alternative A, described in Section 2.2.1.4. Refer to Figure 2-20 for an overview of the 15th Street LMF.



Source: Authority 2025a

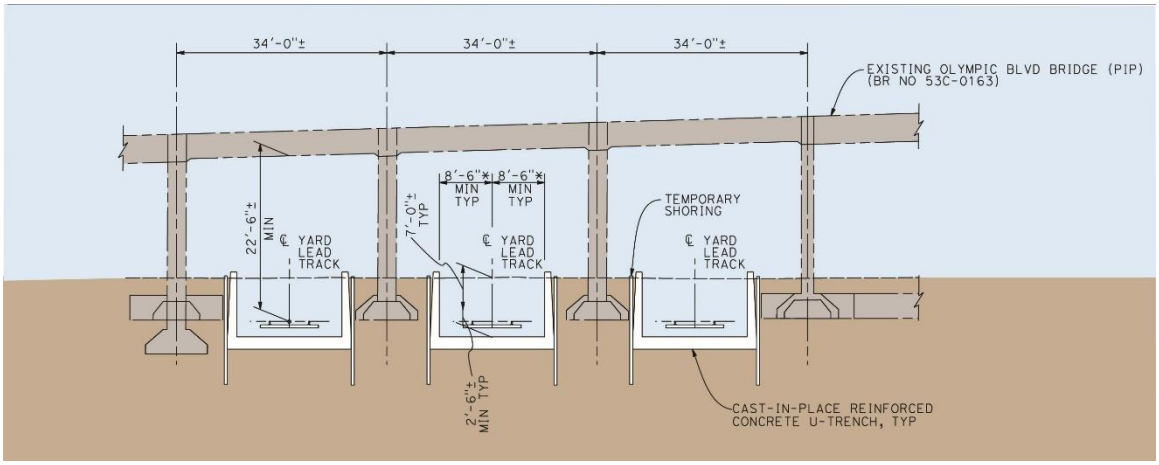
Figure 2-20 Shared Passenger Track Alternative B: 15th Street Light Maintenance Facility

The 15th Street LMF would have an overall size of 52 acres and would include a six-track shop building able to accommodate 12 trainsets, along with an outdoor train yard with a storage capacity of 20 HSR trainsets. The 15th Street LMF would be a single-ended yard, with access to and from the mainline tracks provided only from one side, at the northern end.

Primary roadway access to the 15th Street LMF would be from Washington Boulevard and 15th Street. HSR trains would access the yard via new yard lead tracks, which would start north of Seventh Street; the HSR project has been designed in coordination with the Los Angeles County Metropolitan Transportation Authority so that it would not conflict with the planned Metro Arts District Station, proposed north of Seventh Street. Two yard lead tracks would diverge from the mainline tracks out of the existing railroad right-of-way, cross under Seventh Street, and then branch into three tracks. Continuing south, the tracks would cross through part of Amtrak's existing primary access road to its Eighth Street Yard, which is currently gated at Eighth Street; these gates would need to be relocated to the west, but Amtrak would still be able to use the road to access its Eighth Street Yard. The three 15th Street LMF yard lead tracks would continue south to cross under Interstate 10.

Approaching Olympic Boulevard, the tracks would descend to provide the minimum required 24-foot clearance between the OCS and the historic Olympic Boulevard overpass. Only one track would fit between each of the Olympic Boulevard overpass' four piers. As depicted on Figure 2-21, each track would pass through the piers within a separate trench at a finished depth of 7 feet. The Olympic Boulevard piers would not be altered during construction and would remain in place during HSR operations.

South of Olympic Boulevard, the 15th Street LMF yard lead tracks would connect to the yard on a curve, which requires special trackwork (turnout tracks). To make this connection, the LMF site would be lowered to meet the yard lead tracks. This is because the yard lead tracks would still be below grade as they come out of the Olympic Boulevard trenches, and there would not be enough room to transition the tracks back up to the existing elevation of the LMF site. Additionally, the special trackwork to connect the yard leads to the LMF tracks needs to be located on flat sections of track, not on a slope. Therefore, to make the connection between the below-grade yard lead tracks and the yard tracks, the northern portion of the LMF site (approximately 25 acres) would be excavated up to an approximate depth of 8 feet and regraded at a finished depth of approximately 5 feet to match the grade of the yard lead tracks.



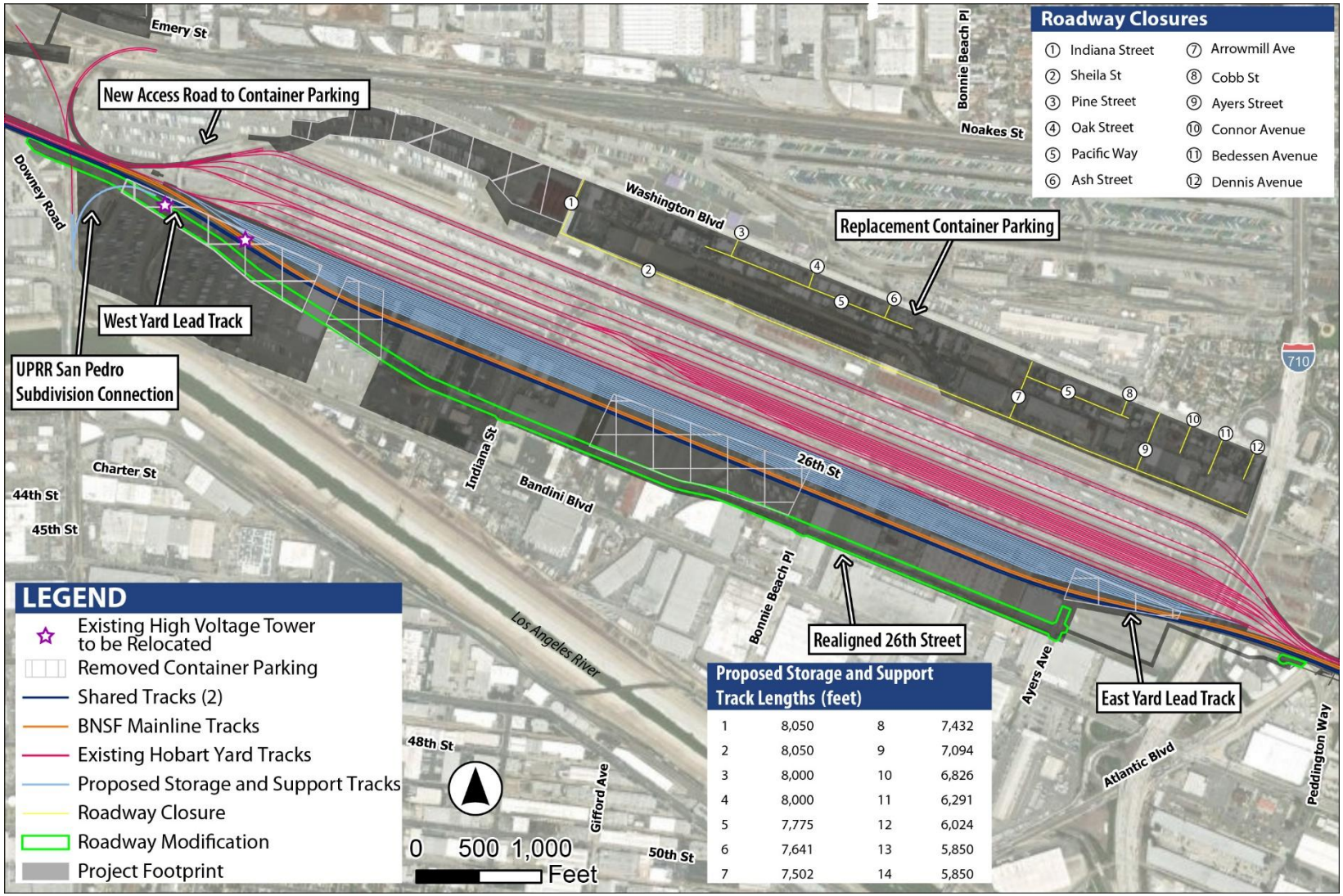
Source: Authority 2025a

Figure 2-21 Trenches for 15th Street Light Maintenance Facility Yard Lead Tracks Under Olympic Boulevard

2.2.2.5 *Freight or Passenger Railroad Modifications*

Freight and passenger railroad modifications for Shared Passenger Track Alternative B would be the same as for Shared Passenger Track Alternative A, except for one difference at Hobart Yard. Figure 2-22 illustrates Hobart Yard without the 26th Street LMF. Because there would not be LMF lead tracks or yard tracks running through BNSF's existing container parking areas, Shared Passenger Track Alternative B would displace slightly less container parking compared to Shared Passenger Track Alternative A.

The two passenger rail station modifications (Norwalk/Santa Fe Springs and Fullerton) and two Metrolink station relocations (Buena Park and Commerce) would be the same for Shared Passenger Track Alternative B as described for Shared Passenger Track Alternative A.



Sources: Authority 2025a; ESRI 2020

Figure 2-22 Shared Passenger Track Alternative B: Hobart Yard

2.2.2.6 *State Highway or Local Roadway Modifications*

The proposed modifications to roadways for Shared Passenger Track Alternative B would be the same as for Shared Passenger Track Alternative A, described in Section 2.2.1.6, except for the area around the 15th Street LMF site. Note that although the 26th Street LMF would not be included under Shared Passenger Track Alternative B, the realignment of 26th Street would still occur.

At the 15th Street LMF, Shared Passenger Track Alternative B would cross through part of Amtrak's access road to its Eighth Street Yard and through its existing access gate at Eighth Street. The access gate would be shifted to the west, and Amtrak would still be able to use its access road, but it would have to cross the three HSR yard lead tracks at grade to reach the road. The 15th Street LMF would also require the closure of a small portion of 16th Street, and the intersection of 15th Street and 16th Street would be reconfigured as a T-intersection. This portion of 16th Street, which is an existing cul-de-sac, serves the properties that would be acquired for construction of the 15th Street LMF. Refer to Figure 2-20, which depicts the portion of 16th Street that would be closed in green.

2.3 Early Action Projects

As described in the 2023 Project Update Report, the Authority has committed to investing in regionally important early action projects to provide early benefits to transit riders and local communities in Southern California, while laying a solid foundation for implementation of the HSR system. These early investments would be made by the Authority in collaboration with local and regional agencies. The types of projects include grade separations, track enhancements, and improvements at passenger rail stations, which would increase capacity, improve safety and air quality, and provide immediate mobility and reliability benefits for existing freight and passenger rail operations. The potential temporary construction and permanent operational environmental effects associated with these early action projects are included in the total evaluation of the Shared Passenger Track Alternatives. These early action projects may be implemented as standalone projects by other local agencies relying on the environmental analyses and conclusions of the Los Angeles to Anaheim Project Section in advance of the HSR system. The early action projects described below would be the same for both Shared Passenger Track Alternatives.

2.3.1 Grade Separations

The following five new railroad/roadway grade separations would be built as part of buildout of the project section and are identified as early action projects:

- Pioneer Boulevard
- Norwalk Boulevard and Los Nietos Road (considered a single early action project because of the adjacency of the two crossings)
- Cerritos Avenue
- State College Boulevard

The potential temporary construction and permanent operational environmental effects associated with these early action projects are analyzed in site-specific detail and included in the total evaluation of the project. Refer to Section 2.2.1.6 for more information.

2.3.2 Metrolink Station Relocations

Passenger rail currently operates within the Los Angeles – San Diego – San Luis Obispo Rail Corridor and would continue to do so with the introduction of HSR service. The relocations of the existing Commerce and Buena Park Metrolink Stations are necessary for implementation of either of the Shared Passenger Track Alternatives for reasons described in more detail in Section 2.2.1.5.

Existing transit service to the current Metrolink station locations would need to be modified to serve the relocated Metrolink station locations. Future coordination with Metrolink, Amtrak, and transit service providers would be necessary to determine bus routes and schedules for the

relocated Metrolink station locations and to inform final design of bus facilities at and near the station. Access roads, curb space, and passenger and operations facilities for buses have been included in the footprint in anticipation of this reconfigured service.

2.3.3 Fullerton Metrolink/Amtrak Modifications (Fullerton Interlocker)

The Shared Passenger Track Alternatives would modify the tracks and platforms throughout the Fullerton Metrolink/Amtrak Station, as well as the tracks east to Fullerton Junction, as described in Section 2.2.1.1. However, some of these proposed HSR modifications could be completed as an early action project to support the Metrolink Fullerton Interlocker Project, which is being planned by BNSF in coordination with Metrolink and the Authority. This project is critical to Metrolink's Southern California Optimized Rail Expansion Program and will allow for more frequent and regular service in Southern California. The Authority has incorporated the Fullerton Interlocker Project design as part of HSR's Fullerton/Metrolink Amtrak modifications, based on coordination with BNSF and Metrolink and on the anticipated timelines of the two projects.

If the Fullerton Interlocker Project occurs prior to HSR implementation, the early action project would consist of the same modifications described in Section 2.2.1.3 to the Fullerton Metrolink/Amtrak Station, with one exception. The fourth mainline track on the southern side of the corridor would only extend from east of Highland Avenue to Fullerton Junction because, in the absence of HSR, a fourth mainline track would not be added throughout the entire segment between LAUS and Fullerton Junction. All other modifications would be included: the removal of the southern side platforms, addition of a new center platform over Harbor Boulevard, new pedestrian underpass, and realignment and modifications to Walnut Avenue. If the HSR project is implemented later, the southern track would be extended west past Highland Avenue to connect to the fourth mainline track of the HSR alternatives.

2.3.4 Reconfiguration of Freight Rail Facilities

As discussed in Section 2.2.1.5, the project requires new or modified BNSF facilities to add and electrify tracks in the existing BNSF right-of-way between Los Angeles and Fullerton. The Hobart Yard modifications and Commerce Yard modifications (including the Commerce Flyover) could be implemented as early action projects to allow for improvements to existing Amtrak and Metrolink service in the Los Angeles – San Diego – San Luis Obispo Rail Corridor.

2.4 Optional High-Speed Rail Station

HSR trains would not stop at the Norwalk/Santa Fe Springs Metrolink Station or Fullerton Metrolink/Amtrak Station under either Shared Passenger Track Alternative A or Shared Passenger Track Alternative B. However, an option for a full-stop HSR station is considered, at either Norwalk/Santa Fe Springs or Fullerton. The inclusion of the HSR station option would require additional elements to support full-stop HSR service, in addition to the modifications described in Section 2.2.1.5. These HSR station elements are described in detail below.

2.4.1 High-Speed Rail Station Option: Norwalk/Santa Fe Springs

If the Norwalk/Santa Fe Springs Metrolink Station HSR Station Option is included, several additional elements would be included along with the station modifications described above for Shared Passenger Track Alternative A. An overview of the HSR station option elements is depicted on Figure 2-23, with the additional HSR station elements highlighted in green. The other elements depicted on Figure 2-23 would be completed as part of Shared Passenger Track Alternative A.

The Norwalk/Santa Fe Springs HSR Station Option would add two more electrified passenger rail tracks, for a total of four tracks through the station. The two tracks described under Section 2.2.1.1, Alignment, would serve the modified Metrolink side platforms; the two tracks added as part of the HSR station option would serve an HSR center platform in between the modified Metrolink side platforms. The HSR platform would be 1,000 feet long and capable of future extension to 1,410 feet.

The HSR station option would also require more parking to be added to serve HSR passengers. Parking and pick-up/drop-off for HSR and Norwalk/Santa Fe Springs Metrolink passengers would be combined within new surface parking lots. The HSR station option at Norwalk/Santa Fe Springs would provide 640 more parking spaces compared to what Shared Passenger Track Alternative A would otherwise provide, for a total of 1,248 parking spaces. A new access road would be provided from Imperial Highway, along the east side of the site, to the Shoemaker Avenue/Adler Drive intersection, with new signalized intersections.

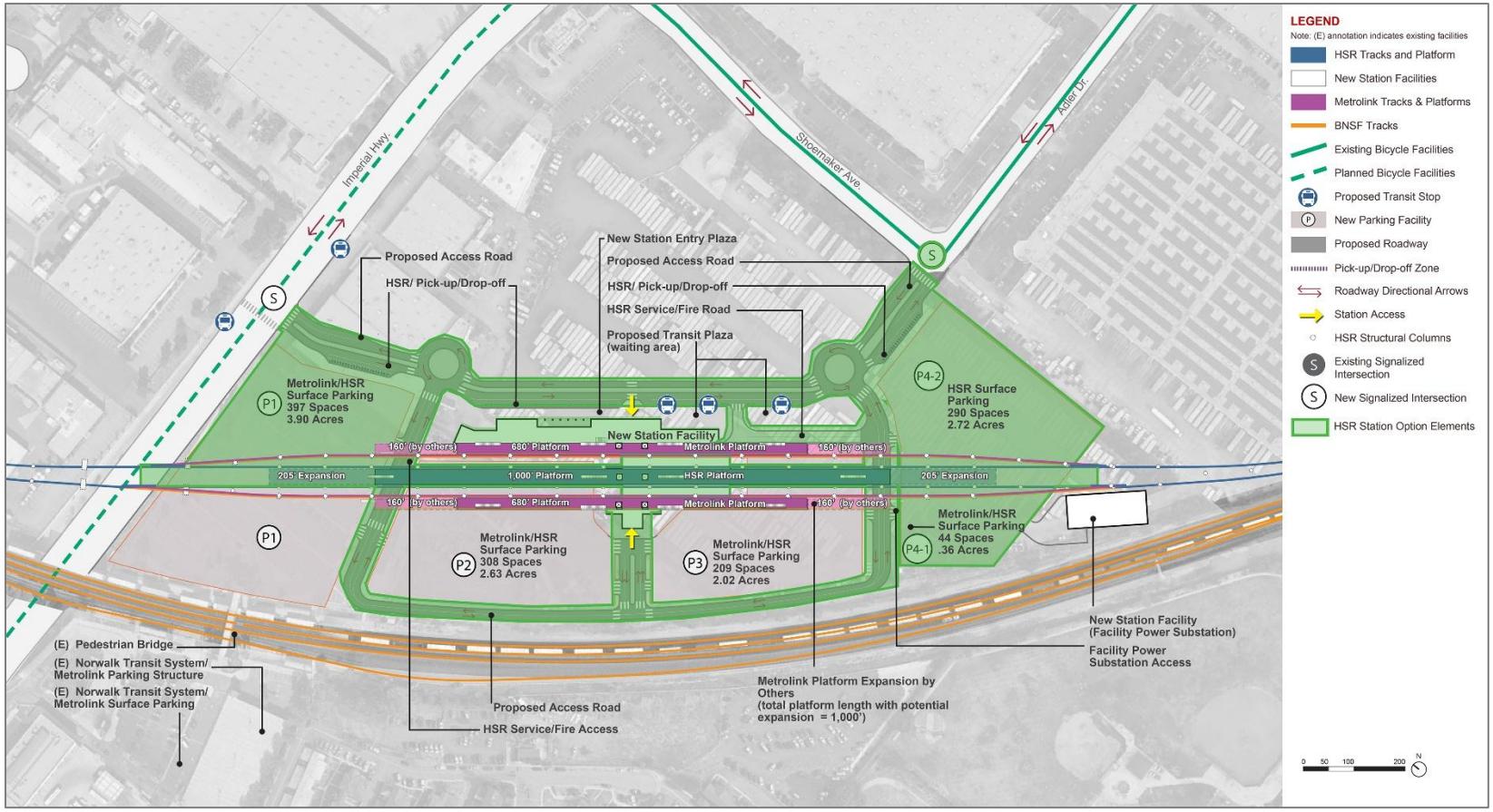
2.4.2 High-Speed Rail Station Option: Fullerton

If the Fullerton HSR Station Option is included, several additional elements would be included along with the station modifications described above for Shared Passenger Track Alternative A. An overview of the HSR station option elements is depicted on Figure 2-24, with the additional HSR station elements highlighted in green. The other elements depicted on Figure 2-24 would be completed as part of Shared Passenger Track Alternative A.

The overall track configuration would be the same as described in Section 2.2.1.1, but the southernmost shared track would be shifted south to accommodate a 1,000-foot HSR platform extending over Highland Avenue. The platform would be 48 inches above the rail on retained fill, at 10 feet at the highest point. A pedestrian ramp would connect the HSR platform to the Metrolink/Amtrak platform.

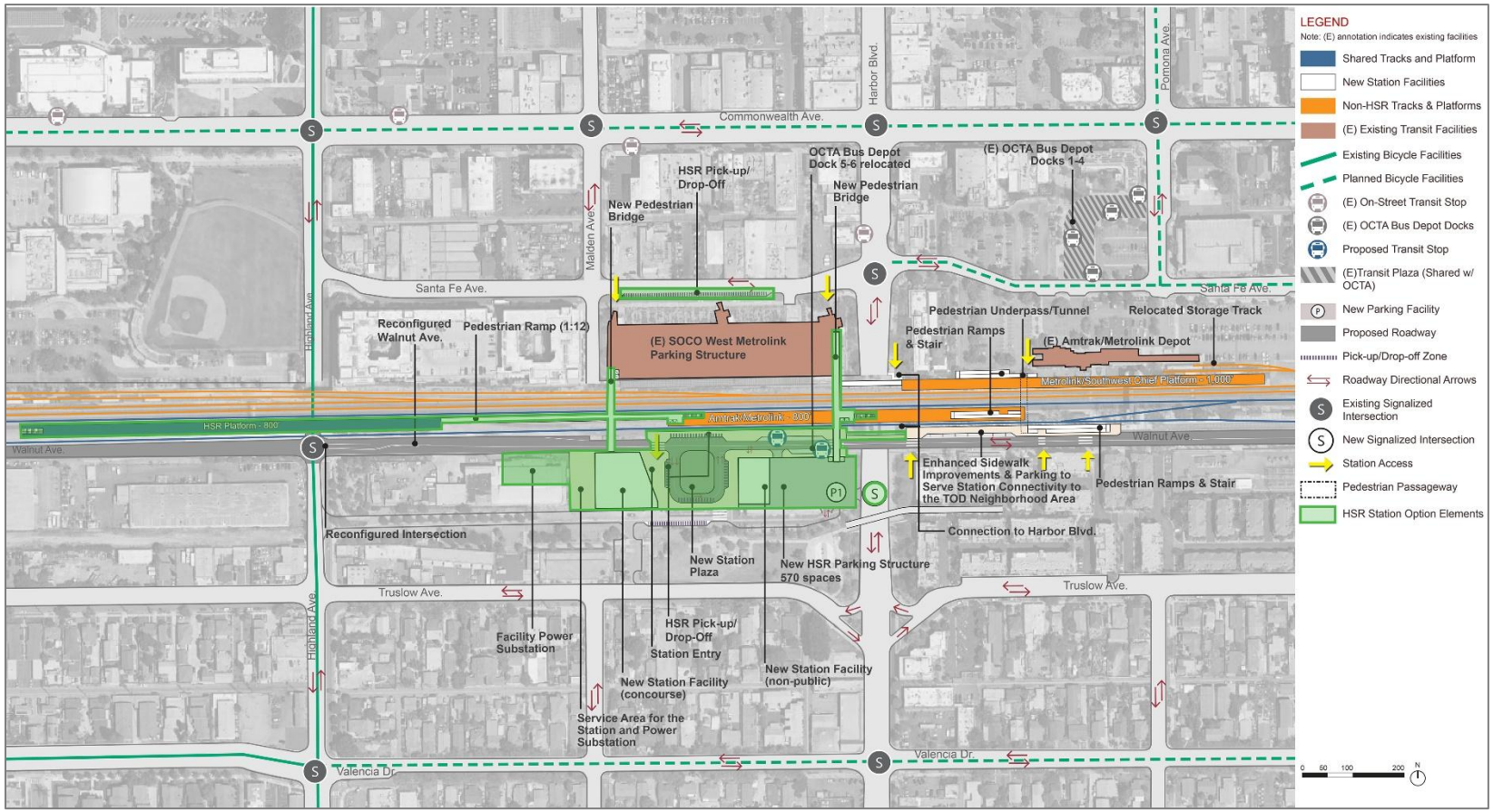
South of Walnut Avenue, the HSR station option would add HSR station buildings, a facility power substation, and a new multilevel parking structure that would provide a total of 570 new HSR parking spaces. The intersection of Highland Avenue and Walnut Avenue would be reconfigured to accommodate the new track and the Highland Avenue railroad bridge, along with improvements for transit stops and pedestrian crossings.

The HSR station option would add two pedestrian bridges: one west of Harbor Boulevard to connect the existing Metrolink parking structure to the HSR parking structure, and another east of Malden Avenue to connect the existing Metrolink parking structure to the HSR station building. A new signalized intersection on Harbor Boulevard would also be required to provide access to the HSR parking garage.



Source: Authority 2025a
Future platform extension not included in project definition for the environmental impact report/environmental impact statement.

Figure 2-23 Norwalk/Santa Fe Springs High-Speed Rail Station Option



Source: Authority 2025a

Figure 2-24 Fullerton High-Speed Rail Station Option

2.5 Project Construction

For the Los Angeles to Anaheim Project Section of the California HSR System, specific construction elements would include surface and elevated track; track work; grade-separated roadway crossings; and installation of a Positive Train Control system, as summarized in Table 2-7. Construction would take approximately 7.5 to 8 years.

Surface track sections would be built using conventional railroad construction techniques. A typical construction sequence includes clearing, grubbing, grading, and compacting the railbed; applying crushed rock ballast; laying track; and installing electrical and communications systems.

Elevated track sections would use the precast, segmented construction method. In this construction method, large concrete bridge segments are mass-produced at an on-site, temporary casting yard. Precast segments are then elevated atop the already completed portions of the elevated viaduct or embankment, and installed using a special gantry crane positioned on the aerial structure. Although the precast segmental method is the favored technique for aerial structure construction, other methods may be used, including cast-in-place, box girder, or precast, span-by-span techniques.

Preconstruction activities would occur during final design and would include geotechnical investigations, identification of staging areas, initiation of site preparation and demolition, relocation of utilities, and implementation of temporary, long-term, and permanent road closures. Additional studies and investigations to develop construction requirements and worksite traffic control plans would occur as needed.

Major construction activities for the project section would include earthwork and excavation support, systems construction, bridge and aerial structure construction, and railway systems construction (including trackwork, traction electrification, signaling, and communications).

During peak construction periods, work would be under way at several locations along the route simultaneously, with overlapping construction of various project elements. Working hours and the number of workers present at any time would vary depending on the activities being performed.

Table 2-7 Los Angeles to Anaheim Project Section Construction Schedule

Activity	Tasks	Schedule[7]
Right-of-way acquisition	Commencement of right-of-way acquisitions once State Legislature appropriates funds in annual budget, environmental due diligence	Prior to construction
Survey and preconstruction	Location of utilities, establishment of right-of-way and project control points and centerlines, establishment/relocation of survey monuments	Prior to construction
Mobilization	Safety devices and special construction equipment mobilization	Prior to construction
Site preparation	Utilities relocation; clearing/grubbing right-of-way; establishment of detours and haul routes; preparation of construction equipment yards, stockpile materials, and precast concrete segment casting yard	January 2031–January 2034
Earth moving	Excavation and earth support structures	April 2031–October 2036
Construction of road crossings	Surface street modifications, grade separations	July 2031–July 2037

[7] Schedule as of September 2023.

Activity	Tasks	Schedule[7]
Construction of aerial structures	Aerial structure and bridge foundations, substructure, and superstructure	July 2032–July 2036
Construction of underground structures	Straddle bent trench	October 2032–April 2036
Track laying	Includes backfilling operations and drainage facilities	July 2033–December 2037
Systems	Train control systems, OCS, communication system, signaling equipment	October 2035–October 2037
Demobilization	Includes site cleanup	At completion of construction
HSR stations and station relocations	Demolition, site preparation, foundations, structural frame, electrical and mechanical systems, finishes	Commerce Metrolink Station relocation: January 2031–January 2032
		Buena Park Metrolink Station Relocation: January 2034–March 2035
		Norwalk/Santa Fe Springs HSR/Metrolink Station: July 2033–July 2036[1]
		Fullerton HSR/Metrolink Station: January 2033–June 2035[1]
		Anaheim HSR platform and facilities: November October 2034–September 2037

Source: Authority 2024
[1] Construction schedule for Norwalk/Santa Fe Springs and Fullerton Station dependent on station selection.
OCS = overhead contact system; HSR = high-speed rail

2.6 Independent Utility of the Los Angeles to Anaheim Project Section

The Authority and FRA divided the HSR system they established with Tier 1 process into individual project sections for Tier 2 planning, environmental review, and decision making. The FRA, consistent with regulations issued by the Federal Highway Administration, considers three criteria when determining the scope of a project to be considered in an EIS: (1) whether it connects "logical termini" and has "sufficient length to address environmental matters on a broad scope"; (2) whether it has "independent utility or independent significance," meaning that it will "be usable and be a reasonable expenditure even if no additional transportation improvements in the area are made"; and (3) whether it will "restrict consideration of alternatives for other reasonably foreseeable transportation improvements" (23 Code of Federal Regulations Part 771.111(f)). *Logical termini* is defined by the Federal Highway Administration as the rational starting and ending points for a transportation improvement project and for review of the environmental impacts of the project (FHWA 1993).[8] The project section connects logical termini at planned passenger stations where HSR service would be provided, at LAUS to the north and at ARTIC to the south. If other sections of the HSR system are not completed, the infrastructure

[8] The Federal Highway Administration criteria for determining project scope, as established in 23 Code of Federal Regulations Part 771.11(f), do not specifically address the scope of individual projects considered in the second tier of a tiered National Environmental Policy Act process. With the tiered National Environmental Policy Act process, the same general principles apply, but they are applied in the context of the decisions made in Tier 1—in this case, the decision to build the HSR system as a whole. Therefore, in determining the scope of individual project sections for Tier 2 studies, the Authority and FRA focused primarily on determining whether each project section could serve a useful transportation purpose on its own, and ensuring that a decision in one project section does not limit consideration of reasonable alternatives for completing the HSR system in an adjacent section for which the National Environmental Policy Act process has not yet been completed.

could be used by regional and intercity services to improve their capacity, reliability, and performance (Authority 2009).

2.7 Operation of the Los Angeles to Anaheim Project Section

The conceptual HSR service plan for Phase 1 begins with service between Los Angeles/Anaheim running through the Central Valley from Bakersfield to Merced, and traveling northwest into the Bay Area. Subsequent sections in Phase 2 of the HSR system include a southern extension from Los Angeles to San Diego and an extension from Merced to Sacramento, which do not have an anticipated implementation date.

The Shared Passenger Track Alternatives would be within an active passenger and freight rail corridor, which would require a change in operational patterns and frequency for users. Because the project proposes new and realigned tracks throughout the corridor shared by other passenger rail and freight operators, implementation would change the tracks on which the various users operate. Currently, the Metrolink Orange County line and 91 line, Amtrak Pacific Surfliner, BNSF, and UPRR freight trains operate within the project section. The introduction of HSR service between Los Angeles and Anaheim would not conflict with the California State Rail Plan (Caltrans 2023).

Under the Shared Passenger Track Alternatives, there would be up to two HSR passenger trains per hour (peak) in each direction. Up to 10 freight trains per day could operate on the passenger tracks. The Shared Passenger Track Alternatives would maintain current and projected freight train volume within the corridor.

3 LAWS, REGULATIONS, ORDERS

Paleontological resources are afforded protection under various federal, state, and local laws, ordinances, regulations, and standards. Because the project is an undertaking of the Authority, in its capacity as state and federal agency, it is not required to be consistent with local plans. California Environmental Quality Act (CEQA) regulations, however, require the discussion of inconsistency or conflict of a proposed action with regional or local plans and laws. Where inconsistencies or conflicts exist, CEQA requires a description of the extent of reconciliation and the reason for proceeding if full reconciliation is not feasible (64 *Federal Register* 28545, 14(n)(15)).

The federal and state laws, regulations, and ordinances are discussed in detail in the following sections.

3.1 Federal

3.1.1 Federal Railroad Administration, Procedures for Considering Environmental Impacts (64 *Federal Register* 28545)

On May 26, 1999, the FRA released *Procedures for Considering Environmental Impacts* (FRA 1999). These FRA procedures describe the FRA's process for assessing the environmental impacts of actions and legislation proposed by the agency and for the preparation of associated documents (42 U.S. Code [U.S.C.] 4321 et seq.). The FRA Procedures for Considering Environmental Impacts states that "the EIS should identify any significant changes likely to occur in the natural environment and in the developed environment. The EIS should also discuss the consideration given to design quality, art, and architecture in project planning and development as required by U.S. Department of Transportation Order 5610.4." FRA procedures state that an EIS should consider possible impacts on energy and mineral resources.

3.1.2 American Antiquities Act of 1906 (16 U.S.C. 431–433)

The American Antiquities Act was enacted with the primary goal of protecting cultural resources. As such, it prohibits appropriation, excavation, injury, or destruction of "any historic or prehistoric ruin or monument, or any object of antiquity" located on lands owned or controlled by the federal government. The act also establishes penalties for such actions and sets forth a permit requirement for collection of antiquities on federally owned lands.

Neither the American Antiquities Act itself nor its implementing regulations (43 Code of Federal Regulations Part 3) specifically mentions paleontological resources. However, many federal agencies have interpreted objects of antiquity as including fossils. Consequently, the American Antiquities Act represents an early cornerstone for efforts to protect the nation's paleontological resources.

3.1.3 Paleontological Resources Preservation Act (16 U.S.C. 470aaa)

Enacted as part of the Omnibus Public Land Management Act (2009), the Paleontological Resources Preservation Act (PRPA) requires the Secretaries of the Interior and Agriculture to manage and protect paleontological resources on federal land using scientific principles and expertise. The PRPA includes specific provisions addressing management of these resources by the Bureau of Land Management, the National Park Service, the Bureau of Reclamation, the U.S. Fish and Wildlife Service, and the U.S. Forest Service of the Department of Agriculture. The PRPA affirms the authority for many of the policies the federal land managing agencies already have in place for the management of paleontological resources, such as issuing permits for collecting paleontological resources, curation of paleontological resources, and confidentiality of locality data.

3.1.4 National Environmental Policy Act (NEPA) (42 U.S.C. 4321 et seq.)

As with cultural resources, NEPA recognizes the continuing responsibility of the federal government to "preserve important historic, cultural, and natural aspects of our national heritage"

(42 U.S.C. 4321). With the passage of the PRPA (2009), paleontological resources are considered to be significant resources, and it is therefore now standard practice to include paleontological resources in NEPA studies in instances where there is a possible impact.

3.2 State

3.2.1 CEQA (California Public Resources Code, 21000 et seq.) and State CEQA Guidelines Protection for Paleontological Resources

The CEQA statute includes "objects of historic … significance" in its definition of the environment (CEQA 21060.5), and Section 15064.5 of the State CEQA Guidelines further defines historical resources as including "any object…site, area, [or] place… that has yielded, or may be likely to yield, information important in prehistory." This has been widely interpreted as extending CEQA consideration to paleontological resources, although neither the CEQA statute nor the State CEQA Guidelines provide explicit direction regarding the treatment of paleontological resources. Administrative regulations for the implementation of CEQA are set forth in California Code of Regulations Section 15000 et seq. Appendix G of the State CEQA Guidelines contains an Environmental Checklist of questions that a lead agency should normally address (California Code of Regulations Section 15063; Appendix G, Section VII, Part f), which asks: "Would the project directly or indirectly destroy a unique paleontological resource or site or unique geological feature?"

3.2.2 California Public Resources Code

The California Public Resources Code (Cal. Public Res. Code) also protects paleontological resources in specific contexts. In particular, California Public Resources Code Section 5097.5 prohibits "knowing and willful" excavation, removal, destruction, injury, and defacement of a vertebrate paleontological feature on public lands without express authorization from the agency with jurisdiction. Violation of this prohibition is a misdemeanor and is subject to fine or imprisonment (Cal. Public Res. Code 5097.5(c)), and persons convicted of such a violation may also be required to provide restitution (Cal. Public Res. Code 5097.5(d)(1)). Additionally, California Public Resources Code Section 30244 requires "reasonable mitigation measures" to address impacts on paleontological resources identified by the State Historic Preservation Officer.

3.2.3 California Administrative Code (California Code of Regulations, Title 14, 4307–4309)

The sections of the California Administrative Code relating to the State Division of Beaches and Parks afford protection to geologic features and "paleontological materials" but also assign the director of the state park system the authority to issue permits for activities that may result in damage to such resources, if the activities are for state park purposes and are in the interest of the state park system.

3.3 Regional and Local

Section 65300 et seq. of the California Government Code requires that every city and county in California prepare and adopt a general plan, which acts as a comprehensive, long-term blueprint for future development that contains community goals and policies on which land use decisions will be based. These goals and policies often require consideration and protection of paleontological resources. The project section would be built in the cities of Los Angeles, Vernon, Bell, Commerce, Montebello, Pico Rivera, Santa Fe Springs, Norwalk, La Mirada, Buena Park, Fullerton, and Anaheim. The alignment also would cross several unincorporated areas of Los Angeles and Orange Counties. Relevant regional and local plans that specify policies regarding paleontological resources are presented in Table 3-1.

Table 3-1 Regional and Local Plans and Policies

Policy Title	Summary
Los Angeles County	
Los Angeles County 2035 General Plan, Conservation and Natural Resources Element (2025)	The County of Los Angeles adopted the *Los Angeles County 2035 General Plan* on October 6, 2015, and last updated it in 2025. The general plan includes the following policies: • Policy C/NR 14.1: Mitigate all impacts from new development on or adjacent to historic, cultural, and paleontological resources to the greatest extent feasible. • Policy C/NR 14.2: Support an inter-jurisdictional collaborative system that protects and enhances historic, cultural, and paleontological resources. • Policy C/NR 14.5: Promote public awareness of historic, cultural, and paleontological resources. • Policy C/NR 14.6: Ensure proper notification and recovery processes are carried out for development on or near historic, cultural, and paleontological resources.
Los Angeles County Building Code (2024)	The County of Los Angeles Code is codified through Ordinance 2024-0051. • Title 26 – Building Code, Appendix J - Grading. Adopted as amended.
City of Los Angeles	
City of Los Angeles General Plan, Conservation Element (2024)	The City of Los Angeles last updated the *City of Los Angeles General Plan* in 2024. The Conservation Element includes the following objective and policy: • Archaeological and Paleontological Resources, Objective 1: Protect the City's paleontological resources for historical, cultural, research, and/or educational purposes. • Archaeological and Paleontological Resources, Policy 1: Continue to identify and protect significant paleontological sites and/or resources known to exist or that are identified during land development, demolition, or property modification activities. The Conservation Element of the *City of Los Angeles General Plan* identifies natural and cultural resources within the City and describes objectives, policies, and programs for their protection, preservation, and management. Chapter II: Resource Conservation and Management, Section 3: Archaeological and Paleontological discusses protection of paleontological resources and states, in part: "Pursuant to CEQA, if a land development project is within a potentially significant paleontological area, the developer is required to contact a bona fide paleontologist to arrange for assessment of the potential impact and mitigation of potential disruption of or damage to the site. If significant paleontological resources are uncovered during project execution, authorities are to be notified and the designated paleontologist may order excavations stopped, within reasonable time limits, to enable assessment, removal or protection of the resources." (p. II-5) This section also indicates that the city is responsible for protecting paleontological resources and outlines the following objective, policy, and program regarding paleontological resources (p. II-5, II-6): **Objective:** protect the City's archaeological and paleontological resources for historical, cultural, and/or educational purposes. **Policy:** continue to identify and protect significant archaeological and paleontological sites and/or resources known to exist or that are identified during land development, demolition or property modification activities. **Program:** permit processing, monitoring, enforcement and periodic revision of regulations and procedures.

Policy Title	Summary
Los Angeles Municipal Code (2025)	The Los Angeles Municipal Code is codified through legislation passed July 4, 2025. • Chapters 1 through 96 Los Angeles Building Code. Adopted as amended. • Section 106, Permits, Los Angeles Building Code.
City of Vernon	
The Code of the City of Vernon (2024)	The Code of the City of Vernon is codified through Ordinance No. 1300, adopted May 7, 2024. • Chapter 15.08.010 California Building Code. Adopted as amended.
City of Montebello	
Montebello Municipal Code (2024)	The Montebello Municipal Code is codified through Ordinance No. 2475, passed March 27, 2024. • Chapter 15.04 California Building Code. Adopted as amended.
City of Pico Rivera	
City of Pico Rivera General Plan (2014)	The City of Pico Rivera adopted the *City of Pico Rivera General Plan* in 2014. The general plan includes the following goals and policies: • Goal 8.7 Preservation of important cultural and paleontological resources that contribute to the unique identity and character of Pico Rivera. • Policy 8.7-1 Resource Preservation: Protect and preserve significant historic, archaeological, and paleontological resources, including those recognized at the national, state, and local levels. • Policy 8.7-3 Consultation: As part of the development review process, ensure that potential impacts to historic, archaeological, and paleontological resources are minimized. • Policy 8.7-4 Resource Assessment: Require new development necessitating discretionary approval that could potentially impact historic, archaeological, and/or paleontological resources to conduct a resource survey to ensure that potential sites are identified for avoidance or special treatment.
Pico Rivera Municipal Code (2025)	The Pico Rivera Municipal Code is codified through Ordinance No. 1194, adopted May 13, 2025. • Chapter 15.08.010 California Building Code. Adopted as amended.
City of Santa Fe Springs	
Code of Santa Fe Springs (2025)	Title 15, Section 150.001: California Building Code
City of Norwalk	
Norwalk Municipal Code (2024)	The Norwalk Municipal Code is codified through Ordinance No. 23-1746-12, passed August 18, 2016, and last updated December 5, 2024. • Chapter 15.06.010 California Building Code. Adopted as amended.
City of La Mirada	
La Mirada Code of Ordinances (2024)	Chapter 17.04.010: California Building Code

Policy Title	Summary
Orange County	
County of Orange General Plan, Resources Element (2025)	The County of Orange adopted the *County of Orange General Plan* in July of 2014 and last updated it in 2025. The general plan includes the following goals and policies in the Resources Element: • Cultural-Historic Resources, Goal 1: To raise the awareness and appreciation of Orange County's cultural and historic heritage. • Cultural-Historic Resources, Goal 2.2: Take all reasonable and proper steps to achieve the preservation of archaeological and paleontological remains, or their recovery and analysis to preserve cultural, scientific, and educational values. • Cultural-Historic Resources, Paleontological Resources Policy 1: To identify paleontological resources through literature and records research and surface surveys. • Cultural-Historic Resources, Paleontological Resources Policy 2: To monitor and salvage paleontological resources during the grading of a project. • Cultural-Historic Resources, Paleontological Resources Policy 3: To preserve paleontological resources by maintaining them in an undisturbed condition.
Codified Ordinances of the County of Orange (2024)	Section 7-1-12: California Building Code
Orange County Grading Manual (2017)	Compilation of rules, procedures, and interpretations necessary to carry out provisions of the Orange County Grading Code. The purpose of the grading manual is to control excavation, grading, and earthwork construction in unincorporated Orange County.
City of Buena Park	
Buena Park 2035 General Plan (2022)	Buena Park last updated the *Buena Park 2035 General Plan* in 2022. The general plan includes the following goals and policies: • Goal CS-3: Protection of important archaeological and paleontological resources. – Policy CS-3.1: Preserve and protect significant archaeological and paleontological resources.
Buena Park Municipal Code (2025)	The Buena Park Municipal Code is codified through Ordinance No. 1730, adopted November 14, 2023, and last updated in 2025. Title 15 Building and Construction Safety. Adopted as amended.
City of Anaheim	
Anaheim Municipal Code (2025)	Chapter 15.03.0101: California Building Code

Sources: *City of Anaheim 2025; City of Buena Park 2022, 2025; City of La Mirada 2024; City of Los Angeles 2024, 2025; City of Montebello 2024; City of Norwalk 2024; City of Pico Rivera 2014, 2025; City of Santa Fe Springs 2025; City of Vernon 2024; County of Los Angeles 2025a, 2025b; County of Orange 2017, 2024, 2025*

3.4 Professional Standards

The following discussion of professional standards for assessing project impacts on paleontological resources, determining appropriate paleontological mitigation measures, and implementing paleontological mitigation programs is based on the standards and procedures developed by the Society of Vertebrate Paleontology (SVP) (SVP 2010; refer to Appendix B, Assessment and Mitigation of Adverse Impacts to Nonrenewable Paleontological Resources—Standard Guidelines, of this report).

Per the SVP standards, aspects of paleontological assessment and mitigation should be conducted or overseen by a qualified professional paleontologist who has a graduate degree in paleontology or geology or a publication record in peer-reviewed journals; demonstrated competence in field techniques, preparation, identification, curation, and reporting; at least 2 full years of professional experience in the field; proficiency in recognizing fossils in the field and determining their significance; expertise in local geology, stratigraphy, and biostratigraphy; and experience collecting vertebrate fossils in the field. Paleontological monitoring should be conducted by monitors who have a B.S. or B.A. in geology or paleontology and 1 year experience in the field; or have an A.S., A.A., or enrollment in upper division courses, are pursuing a degree in paleontology or geology, and have 2 years of experience in the field.

Standard procedures for paleontological resource impact assessment and mitigation include an assessment before construction starts; a paleontological resource mitigation plan; adequate monitoring; macrofossil and microfossil salvage or avoidance as needed; fossil preparation, identification, cataloging, analysis, and storage; and reporting.

The paleontological assessment should be prepared by a qualified professional paleontologist and include a literature search, a records search, consultation with others, a field survey, and agency confirmation. The literature search consists of a review of pertinent geological and paleontological literature, such as geologic maps, journal articles, geotechnical reports, and borehole logs, all of which provide a baseline for evaluating the geological and paleontological context of the project site. The records search involves reviewing the fossil locality and specimen records from local or regional institutions in order to determine what, if any, fossils have been recovered from the deposits within the project site. This background data can be supplemented by consulting with other paleontologists or geologists who are knowledgeable about the area being developed. A survey of the project site is undertaken to re-examine previously recorded localities, collect resources that may be present at the surface, and delimit the boundaries of the geologic units within the site. This information is used to determine the potential for project development to affect paleontological resources that may be encountered within the project site, to make recommendations for necessary mitigation, and to prepare the paleontological assessment report. The lead agency then reviews the assessment report to ensure it is adequate.

Prior to construction, if the paleontological assessment recommends mitigation, a paleontological mitigation plan should be prepared by a qualified professional paleontologist, who will then oversee its implementation. This plan should outline the mitigation requirements, including procedures for monitoring; methods of fossil recovery, preparation, and identification; report preparation; and curation. It is useful to have a curation agreement with an appropriate repository in place prior to ground disturbance, although this agreement may be arranged if and when fossils are recovered. The project paleontologist should also attend a preconstruction meeting with representatives of the lead agency, the developer, and the contractors to explain the importance of fossils, the laws protecting fossils, the types of fossils that may be encountered, and the procedures to follow if fossils are encountered.

In very rare instances, paleontological mitigation may require avoidance or site protection when the fossil occurrence is so important that removal and salvage are unacceptable to the parties involved. However, paleontological mitigation generally involves paleontological monitoring during project excavation. In geologic units with high or undetermined paleontological sensitivity, paleontological monitoring should be conducted by a qualified paleontological monitor who is supervised by the professional paleontologist. In geologic units with low paleontological sensitivity, nonpaleontologists may conduct the monitoring. If paleontological resources are encountered during grading activities, the activities in the vicinity of the discovery should stop until a qualified paleontologist can assess the scientific significance of the discovery and recommend the appropriate course of action. Paleontological monitors must be equipped with the proper tools and supplies to quickly and efficiently recover significant resources discovered. If very large or abundant fossils are encountered, provisions should be made for additional staff to assist with recovery in order to minimize delays to the construction schedule.

Many fossils may be collected directly from the field; however, some specimens may require protection in the form of a consolidation medium or plaster jacket prior to removal. Depending on the lithology of the geologic units within a project area, samples should also be taken for screen washing to recover microfossils or for other studies that may provide additional information. When fossils are recovered, the associated contextual data including, but not limited to, location, geologic unit, sediment type, disposition, and condition, should be recorded as well. Once collected, fossils must be prepared to the point of identification, which may require removal of excess sediment surrounding the fossil, consolidation, repairs, or stabilization. Identification should be made to the lowest taxonomic level possible, and an itemized list of the specimens recovered should be compiled.

At the conclusion of the monitoring program, a final report should be prepared. This report should include a summary of the purpose of the monitoring program, the field and laboratory methods employed, a review of the geology of the project area, and a description and itemized list of the fossils recovered. As needed, copies of field notes, locality forms, maps, and stratigraphic sections also should be included as appendices. Copies of the report should be submitted to the lead agency for review and to the curation repository.

4 METHODS FOR EVALUATING IMPACTS

This section describes the methods used to define the resource study area (RSA), identify potentially affected geologic units, and determine NEPA and CEQA impacts. Analysis of impacts is presented in Section 6, Effects Analysis.

4.1 Definition of Resource Study Area

The RSA for the project section encompasses those areas where construction-related earth-moving activities would have the potential to encounter fossil remains in previously undisturbed strata. Included in the RSA for the project section are the existing railroad alignment, existing train stations that would be modified, new HSR station sites, column sites for aerial structures, overcrossing and undercrossing sites, and construction-related facility sites, such as equipment staging areas, borrow and disposal areas, access roads, and utility yards or components. The RSA for paleontological resources, therefore, is the project section proposed right-of-way and 150 feet on either side of the project footprint to accommodate areas of potential disturbance outside the right-of-way. The depth of the vertical dimension will vary regionally based primarily on project construction techniques.

Table 4-1 Definition of Resource Study Areas

General Definition	Resource Study Area Boundary
Paleontological resources	Project footprint plus a 150-foot buffer around the project footprint. The RSA also extends subsurface below the project footprint to include geological units below the horizontal RSA that project construction or operation may encounter.

RSA = resource study area

4.2 Methodology of Evaluating Impacts

The evaluation of impacts on paleontological resources for the proposed project were evaluated by determining whether ground-disturbing activities have the potential to affect areas that could contain a unique paleontological resource or site or a unique geologic feature. Information was gathered about existing conditions along the project section by examining geological maps and geotechnical information from subsurface borings, and by reviewing reports from nearby projects. Fieldwork was not conducted as of the writing of this report. Google Earth 2016, detailed aerial photography gathered in fall 2015 specifically for this project, and cab cam footage shot from the top of a train throughout the Los Angeles – San Diego – San Luis Obispo Rail Corridor in December 2013 were reviewed to obtain a general overview of adjoining/nearby existing conditions along the project section. This review determined that no portions of the project section were amenable to field survey because of the urbanized and built nature of the RSA.

Fossil materials represent a three-dimensional resource. They may be found at the ground surface where fossiliferous strata are surface-exposed but may also be present below the surface within buried geologic units. As a result, agencies often cannot be certain whether fossil resources will actually be encountered until earthwork has begun. The current approach to analyzing impacts on paleontological resources—reflected in the SVP guiding documents (SVP 1995, 1996 [refer to Appendix C, Conditions of Receivership for Paleontological Salvage Collections, of this report], 2010 [refer to Appendix B of this report]), the California Department of Transportation (Caltrans) Standard Environmental Reference (Caltrans 2014), and the approach used in the *Project Environmental Impact Report/Environmental Impact Statement Environmental Methodology Guidelines,* Version 5.11 as amended (Authority 2022)—is thus essentially a risk analysis. The goal is to identify the likelihood of impacts and provide flexible strategies to support appropriate adaptive management in response to information that may literally “come to light” during construction.

This strategy reflects the well-substantiated working assumption that a geologic unit that has produced fossil finds in the past is likely to do so again, and in other locations. A geologic unit

with a track record of producing important fossils is thus considered to have high paleontological potential or sensitivity. Moreover, the same paleontological potential is considered to apply throughout the three-dimensional extent of the unit, everywhere that unit occurs, regardless of whether fossils have actually been found in a given location or not. This is sometimes described as the concept of "sensitive anywhere, sensitive everywhere." By the same token, geologic units that have not produced past fossil finds are generally considered less sensitive throughout their regional extent. Consequently, the evaluation of paleontological potential—and by extension, of the potential for effects on fossil resources—depends not on fossil finds within a certain distance of the project footprint but, rather, on fossil finds in the geologic units affected by the project, wherever those units occur.

In this context, the *Project Environmental Impact Report/Environmental Impact Statement Environmental Methodology Guidelines,* Version 5.11 (Authority 2022) lay out four steps in analyzing a project's potential to affect paleontological resources, as follows:

1. Identify the geologic units in the RSA, including both surface-exposed geologic units and those in the subsurface that may be encountered by excavation, tunneling, foundation drilling, or other activity.
2. Evaluate the potential of the identified geologic units to contain significant fossils (their *paleontological potential* or *paleontological sensitivity*).
3. Identify/assess the nature and extent of impacts from project construction and operation. All ground-disturbing project activities are to be considered including but not necessarily limited to site preparation, excavation, grading, tunneling, and foundation drilling.
4. Evaluate impact effects or significance. The final determination of significance will be made in the Draft EIR/EIS.

4.2.1 Resource Inventory Methods

For this analysis, consistent with the *Project Environmental Impact Report/Environmental Impact Statement Environmental Methodology Guidelines,* Version 5.11, affected geologic units were considered to include those exposed at the surface within the anticipated project footprint and a surrounding 150-foot-wide buffer, as well as those present in the subsurface below this area, to the depth potentially encountered by construction or operations. The area evaluated for paleontological sensitivity, the RSA, covers a larger area than the project footprint because of the "sensitive anywhere, sensitive everywhere" rule that governs paleontological resources risk analysis. The following tasks were conducted to develop a baseline paleontological resource inventory of the RSA by geologic unit and to assess the potential paleontological productivity and the paleontological or scientific importance of each geologic unit.

- **Regional Surficial Geologic Mapping Scales:** Regional surficial geologic mapping that includes the entire RSA and surroundings is available at the standard scale of 1:100,000 (Saucedo et al. 2003; Morton 2004; Yerkes and Campbell 2005). Such coverage of Orange County is available at a scale of 1:48,000 (reduced from 1:24,000) by Morton and Miller (1981); similar mapping of Los Angeles County and the adjacent portion of Orange County is available at a scale of 1:24,000 by Dibblee (1989, 2001).
- **Sedimentary Geologic Units and Fossil Distributions:** Geologic reports and maps at the Natural History Museum of Los Angeles County Vertebrate Paleontology Department (LACMVP), the University of California, Los Angeles, the San Bernardino County Museum, and the University of California Museum of Paleontology were reviewed to determine the sedimentary geologic units exposed in the section and present in the shallow subsurface, particularly those geologic units known to be fossiliferous, and to delineate their respective areal distributions in the RSA.
- **Archival Searches Uncover Fossil Sites:** Archival searches were conducted at the LACMVP in 2016 and 2023 to determine the locations and depths of previously recorded fossil sites in each geologic unit in and near the RSA. The taxa represented by the fossil remains recovered at these sites also were recorded. Paleontological and geologic reports

were reviewed for additional information regarding these and other previously recorded fossil sites occurring in and near the RSA and in the same geologic units.

These assessments are based on the fossil remains previously recorded from the geologic units in or near the RSA. The tasks were completed in compliance with SVP (2010) guidelines for assessing the scientific importance of the paleontological resources, because this is the standard methodology used in California. More information regarding the methods employed in these tasks appears in Appendix A, Record Search Reports.

4.2.2 Society of Vertebrate Paleontology Categories of Sensitivity

The paleontological or scientific importance (high, low, none, undetermined) of a geologic unit exposed in the RSA is the measure most amenable to assessing the scientific importance of the paleontological resources of the RSA, because the areal distribution of a geologic unit can be delineated on a topographic map or a surficial geologic map. The paleontological importance of a geologic unit reflects: (1) its potential paleontological productivity; and (2) the scientific importance of the fossils it has produced locally.

The potential paleontological productivity (high, low, none, undetermined) of a geologic unit is based on the abundance or densities of fossil specimens and previously recorded fossil sites in exposures of the unit in and near the project section. Exposures of a specific geologic unit in the RSA are most likely to contain fossil sites, and to yield fossil remains representing particular species in numbers or densities similar to those previously recorded from the unit in and near the RSA. The criteria for establishing the potential paleontological sensitivity of a geologic unit exposed in the RSA are described in Appendix A.

A fossil specimen is considered scientifically highly important if it is identifiable and if it:

- Is complete
- Is well-preserved
- Is age-diagnostic
- Is useful in environmental reconstruction
- Is a type or topotypic specimen
- Is a member of a rare species
- Is a species that is part of a diverse assemblage
- Is a species new to science
- Provides new anatomical information
- A skeletal element different from, or a specimen more complete than, those available for its respective species

Identifiable fossil land mammal remains, for example, are considered scientifically highly important because of their potential use in providing accurate age determinations and environmental reconstructions for the geologic units in which they occur. Moreover, vertebrate remains are comparatively rare in the fossil record. The geologic age of some fossil mollusk and land mammal and plant remains can be determined by carbon-14 dating analysis.

A fossil site containing identifiable fossil remains and the stratum containing those fossils are considered as having a high paleontological sensitivity. Discussion of the importance of establishing paleontological sensitivity of each geologic unit exposed during construction in the RSA is included in Appendix A.

4.3 Evaluating Impacts Under NEPA

NEPA implementing procedures, regulations, and guidance provide the basis for evaluating project effects. The criteria of context and intensity are considered together when determining the severity of changes introduced by the project.

This section describes the sources and methods the Authority used to analyze potential impacts from implementing the project on geology, soils, and paleontological resources, and from seismicity. These methods apply to both NEPA and CEQA unless otherwise indicated.

4.3.1 Paleontological Resources Impact Analysis

4.3.1.1 *Professional Standards and Authority's Environmental Methodology Guidelines*

Although federal and state regulations establish protection for paleontological resources, the legal framework is nonspecific regarding some critical details:

- What resources merit protection?
- What constitutes a significant adverse effect on those resources?
- What level of protection is adequate?

This gap has been filled in two ways: through processes and protocols developed by individual practitioners and professional societies and through guidelines developed by federal, state, and local lead agencies under NEPA and CEQA, respectively.

To comply with applicable laws such as the American Antiquities Act of 1906, PRPA, California Public Resources Code Section 5097.5, and California Code of Regulations, Title 14, Sections 4307–4309, SVP, a scientific organization of professional vertebrate paleontologists, has established standard guidelines (SVP 1996, 2010) that outline acceptable professional practices in the conduct of paleontological resource assessments and surveys, monitoring and mitigation, data and fossil recovery, sampling procedures, museum curation, and specimen preparation, identification, and analysis. SVP's standard guidelines were approved by a consensus of professional paleontologists and are the standard against which many paleontological monitoring and mitigation programs are judged. Most professional paleontologists in California adhere closely to SVP's assessment, mitigation, and monitoring requirements as specifically spelled out in these standard guidelines. Many regulatory agencies as well as many county and city agencies have either formally or informally adopted SVP's standard guidelines for the mitigation of construction-related adverse impacts on paleontological resources. In addition, the SVP (2010) standard guidelines are in accordance with the specific reporting and monitoring requirements set forth in the Caltrans *Standard Environmental Reference* (Caltrans 2014). Briefly, SVP guidelines provide guidance for assessing the likelihood that geologic units contain significant fossils, require literature and museum archival reviews for each project, as well as a field survey, and, if there is a high potential for disturbing significant fossils during project construction, a mitigation plan that includes monitoring by a qualified paleontologist to salvage fossils encountered, identify salvaged fossils and determine their significance, and place curated fossil specimens into a permanent paleontological repository (e.g., public museum or other institution with a permanent curator on staff). For further details refer to the *Los Angeles to Anaheim Project Section Geology, Soils, and Seismicity Technical Report* (Authority 2025b). This report delves into greater depth, providing insights beyond what this section covers—specifically, the intricate connections with paleontology.

The portion of the *Project Environmental Impact Report/Environmental Impact Statement Environmental Methodology Guidelines,* Version 5.11 (Authority 2022) that addresses paleontological resources was based largely on the methodology laid out in Chapter 8, Paleontology, of the Caltrans *Standard Environmental Reference* (Caltrans 2014). The Caltrans methodology is an appropriate model for Authority needs because it is not only consistent with the discipline-standard SVP Standard Guidelines/Standard Procedures but was also developed to meet Caltrans' responsibilities under both NEPA and CEQA. The key difference between the Caltrans approach and the Authority's Environmental Methodology Guidelines is that the latter

replaced Caltrans' multiple sequential technical reports with a single project-specific technical report that meets the requirements of both the Caltrans Paleontological Identification Report and Paleontological Evaluation Report outlines. This approach streamlines the technical report preparation process without loss of scientific substance.

4.3.1.2 *Assessment of Paleontological Significance*

The analysis evaluated the risk to paleontological resources based on the anticipated three-dimensional extent of ground disturbance and the paleontological sensitivity (potential to contain scientifically important fossils) of the geologic units involved. Analysis considered ground-disturbing activities including site preparation, excavation, grading, tunneling/trenchless construction, and foundation drilling. The primary mechanism for effects on paleontological resources is ground disturbance, which can result in disturbance, damage, and loss affecting fossil resources contained within substrate materials. The analysis took into consideration the general proportionality between extent of disturbance and the extent of potential damage and loss of information but was qualitative; that is, the extent of disturbance within paleontologically sensitive geologic units was not quantified or used as a criterion in assessing the significance of potential. This is consistent with the prevailing discipline standard and reflects the fact that even a very small extent of ground disturbance can result in the loss of important information if scientifically important fossils are involved.

4.3.2 Paleontological Resources Context

The context for the proposed project's effect on paleontological resources would include:

- Conditions for paleontological resources, including the likelihood that fossils would be encountered within the project ground-disturbance area, and the potential for geologic units to contain scientifically important fossil resources (e.g., fossils that provide taxonomic, phylo-genetic, ecologic, and stratigraphic and geochronologic data; body fossils, casts and impressions, trace fossils, and tracks and trackways; vertebrate fossils)
- The regulatory setting relevant to paleontological resources, including paleontological, cultural, or "heritage resources" preservation ordinances

The intensity or severity of an effect on paleontological resources is determined by assessing the following:

- The potential for physical disturbance associated with the proposed project to result in the loss or destruction of significant scientific information found in paleontological resources
- The degree to which the proposed project affects public safety by exposing people or structures to existing geologic or seismic hazards, or results in changes to geology or soils that could affect public safety
- The duration of the effect (temporary, permanent, intermittent)

For project construction and operational actions that would result in impacts, feasible mitigation measures are identified to avoid or minimize effects or to compensate for effects.

4.4 Determining Significance Under CEQA

For the purposes of the analysis in this document, in accordance with Appendix G of the State CEQA Guidelines, the project alternatives would have a significant environmental impact on paleontological resources if they would:

1. Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature.

5 AFFECTED ENVIRONMENT

This section describes the geologic setting of the project section and the geology and paleontological sensitivity of the area as currently known.

5.1 Geographic Location

The project area is within the Los Angeles Basin, a broad, level expanse of land comprising more than 800 square miles that extends from the Hollywood Hills and Santa Monica Mountains south to the Pacific coast, and from Topanga Canyon southeast to the vicinity of Aliso Creek in Orange County. Valleys within the Los Angeles Basin include the Los Angeles Valley encompassing the northern portion of the project section, and the Santa Ana Valley encompassing the Orange County portion of the project section.

Prior to historical settlement, the Los Angeles Basin was characterized by extensive inland prairies and a lengthy coastal strand, with elevations approximately 500 feet above mean sea level. The Los Angeles Basin is traversed by several large watercourses, most notably the Los Angeles, Rio Hondo, San Gabriel, and Santa Ana Rivers. Marshlands fed by fresh or salt water also once covered many portions of the area (McCawley 1996).

5.2 Regional Geological Setting

The project section is in the Peninsular Ranges Geomorphic Province, which extends over 870 miles from just south of the San Gabriel and Santa Monica Mountains and south into Mexico, where it forms the Baja California peninsula. The province extends to the west offshore to the continental margin, and the eastern boundary is the west side of the Salton Trough (Jenkins 1938; CGS 2002). The Peninsular Ranges Province consists of Mesozoic to Paleozoic age plutonic and metamorphic rocks overlain by younger sedimentary geologic units (Bean 1955; Hadley and Combs 1974). The province is characterized by a series of northwest-trending mountain ranges and associated valleys. Extensive, active tectonics and seismicity within the province have created the northwest-trending fabric evident throughout the province (Hill 1928; Fenneman 1931; Reed 1933; Jahns 1954a, 1954b, Hinds 1952; Hadley and Combs 1974).

The formation of the current northwest-trending landscape within the Peninsular Ranges Province is the result of continuing movement along a series of generally northwest-trending faults paralleling the San Andreas Fault Zone. The active San Andreas Fault Zone is to the northeast of the province and forms the tectonic boundary between the North American and Pacific tectonic plates. Continuing tectonic interactions along this plate boundary are responsible for continued folding, as well as large-magnitude earthquakes that occur along the San Andreas and other parallel fault zones.

Within the province, the overall physiography and both Cenozoic and Mesozoic structural features are predominantly oriented northwest parallel to the coast. With the exception of the Los Angeles Basin and areas along major fault zones, the province has undergone only relatively minor internal deformation during the Cenozoic (Hadley and Combs 1974). This relatively low level of deformation contrasts strongly with the pervasive Cenozoic deformation in the Transverse Ranges, especially the San Gabriel Mountains.

The Los Angeles Basin is one of many basins making up the Neogene (23 million years ago [Ma] to 2.6 Ma) continental borderland of Southern California (Yerkes et al. 1965). The Los Angeles Basin is a structural depression that was the site of discontinuous marine deposition during the Late Cretaceous (99.6 Ma to 65.5 Ma). Tectonic movements in the middle Miocene (18 Ma to 12 Ma) resulted in clockwise rotation of the western Transverse Ranges (Nicolson et al. 1994; Meigs and Oskin 2002). This movement resulted in crustal extension and continuous subsidence of the Los Angeles Basin and primarily marine deposition during the middle Miocene (16 Ma to 11.6 Ma). As a result of this motion along the western margin of North America, the Los Angeles Basin and other sedimentary basins formed during the Miocene (23 Ma to 5.3 Ma) and Pliocene (5.3 Ma to 2.6 Ma) filled with thick sedimentary accumulations (Ingersoll and Rumelhart 1999).

At least three cycles of shallow marine transgression and regression created embayments and floodplains along the ancient coastline. During much of the middle Miocene, a northwest-trending

marine embayment covered the Los Angeles Basin. Rivers that drained the highlands to the north and east transported and deposited large volumes of coarse-grained sandstone and sandy cobble-boulder conglomerate into the embayment. This deposition continued until the end of the Pliocene. At that time the Palos Verdes Hills were an island, and large parts of the Santa Monica Mountains, the Puente Hills, the Santa Ana Mountains, and much of the southwestern portions of the basin were exposed. In the early Pleistocene, the Palos Verdes Hills and southwestern areas again subsided and marine deposition resumed (Yerkes et al. 1965).

The Los Angeles Basin began to fill with alluvium about 5 Ma and eventually was exposed above sea level and terrestrial deposition began. Geologic structures in this region reflect the resolution of tectonic forces as the northwest-trending structures of the northern Peninsular Range Province, exemplified by the Whittier-Elsinore fault, meeting the Santa Monica-Hollywood-Raymond fault of the Transverse Range Province. A segment of the boundary between the Peninsular Range and the Transverse Range provinces is characterized by the Elysian Park anticline (a large fold associated with the uplift of the Elysian and Repetto Hills), which is north and east of downtown Los Angeles. The Elysian and Repetto Hills are underlain by sedimentary bedrock of both marine and nonmarine origin, which has become folded into a series of low-relief, east-west-trending hills.

5.3 Geology and Paleontological Sensitivity in the Resource Study Area

5.3.1 Geology of the Resource Study Area

Surficial geologic mapping by Morton and Miller (1981), Dibblee (1989, 2001), Saucedo et al. (2003), Yerkes and Campbell (2005), and Bedrossian et al. (2012) indicate that the entire RSA is underlain at the ground surface by Quaternary older and younger alluvium and by wash deposits, as depicted on Figure 5-1, sheets 1 through 3. Underlying the younger Quaternary alluvium at varying depths in the Los Angeles Basin—usually more than 6 feet below the natural ground surface—is older Quaternary alluvium.

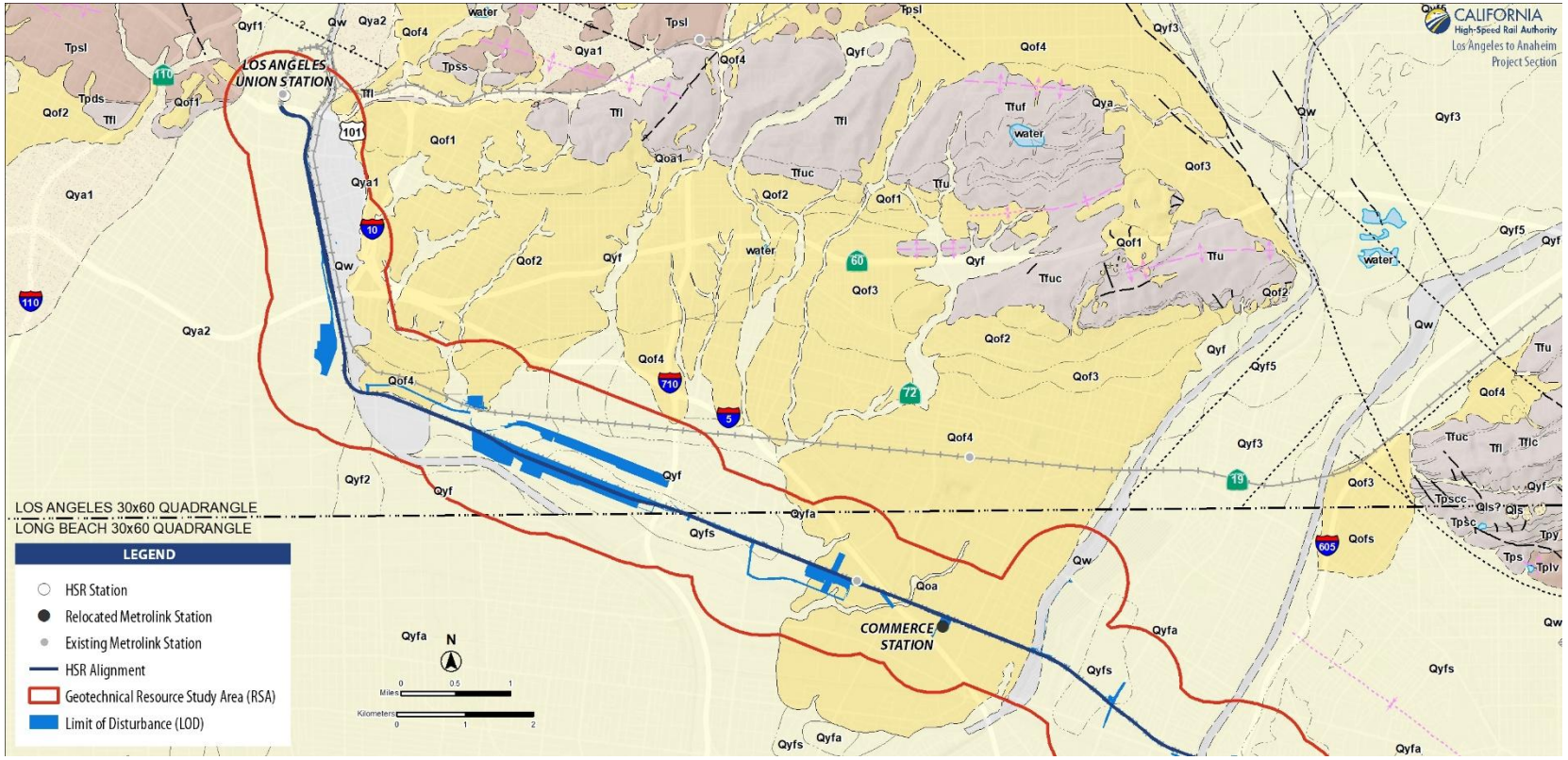
As depicted on Figure 5-1, sheets 1 through 3, in the Los Angeles Basin the project section alignment primarily crosses alluvial deposits (units Qyf, Qyf2, Qyfa, Qyfc, Qyfs), which are described as younger alluvium, Holocene to late Pleistocene in age. These surface deposits in the project section consist of floodplain deposits with varying amounts of clay (Qyfc), silt (Oyfs), sand (Qyfa), and gravel of Holocene age (11,000 years before present [BP] to Recent) at the ground surface, grading into Older Alluvium of Holocene (11,000 years BP to the present) and late Pleistocene age (126,000 years BP to 11,000 years BP) (Morton 2004).

Within the RSA, this Quaternary alluvium has yielded late Pleistocene fossil remains at a number of previously recorded fossil sites in the project vicinity, including in the downtown Los Angeles area and at LAUS where several localities occur in or very near the project section.

A portion of the RSA (refer to Figure 5-1, sheets 1 and 2) is underlain by sediments mapped as old alluvial-fan deposits and older Pleistocene sediments (units Qoa, Qof, Qof2, Qof4, Qofs, Qlh) of late to middle Pleistocene age (Saucedo et al. 2003; Yerkes and Campbell 2005). These sediments consist of lightly to moderately consolidated silt, sand, and gravel deposits on alluvial fans, with some surfaces dissected in varying degrees. Surface exposures of this unit, if not altered by modern ground disturbance, can reveal moderately to well-developed soils.

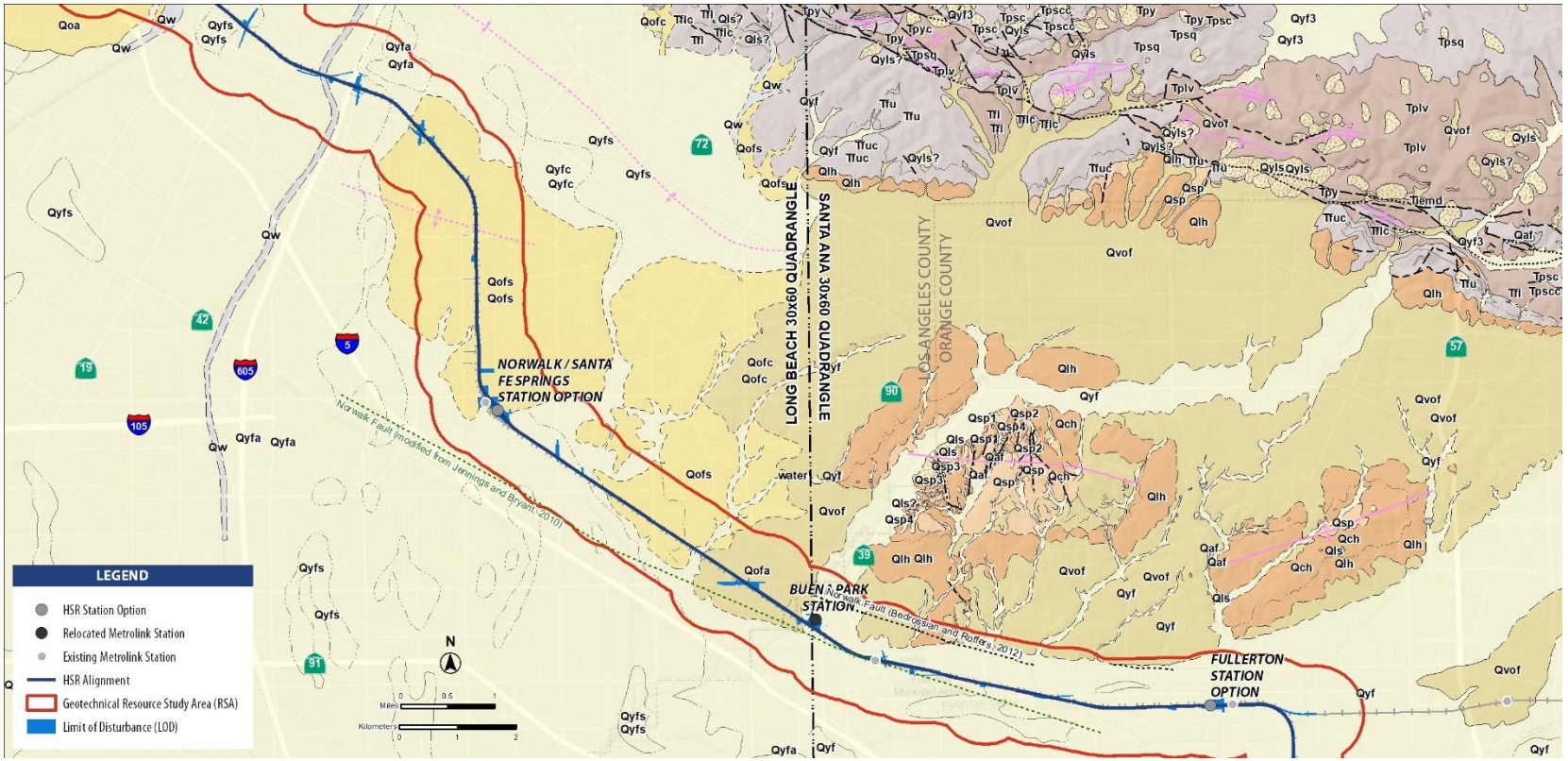
Underlying active stream channels in the RSA (refer to Figure 5-1, sheets 1 through 3) are strata of very recent wash deposits (unit Qw) generally made up of sandy alluvium with cobbles and boulders in the active channels. The Rio Hondo River and San Gabriel River systems consist chiefly of unconsolidated gravels, sands, and silts within active river beds and depositional basins.

Older marine geologic units underlie these younger and older alluvium deposits. These marine units include the Repetto Member of the Fernando Formation and an unnamed marine shale, which may be the Puente Formation. These marine units might be encountered by excavation or other project section–related earth-moving activities, because they are shallow subsurface near LAUS.



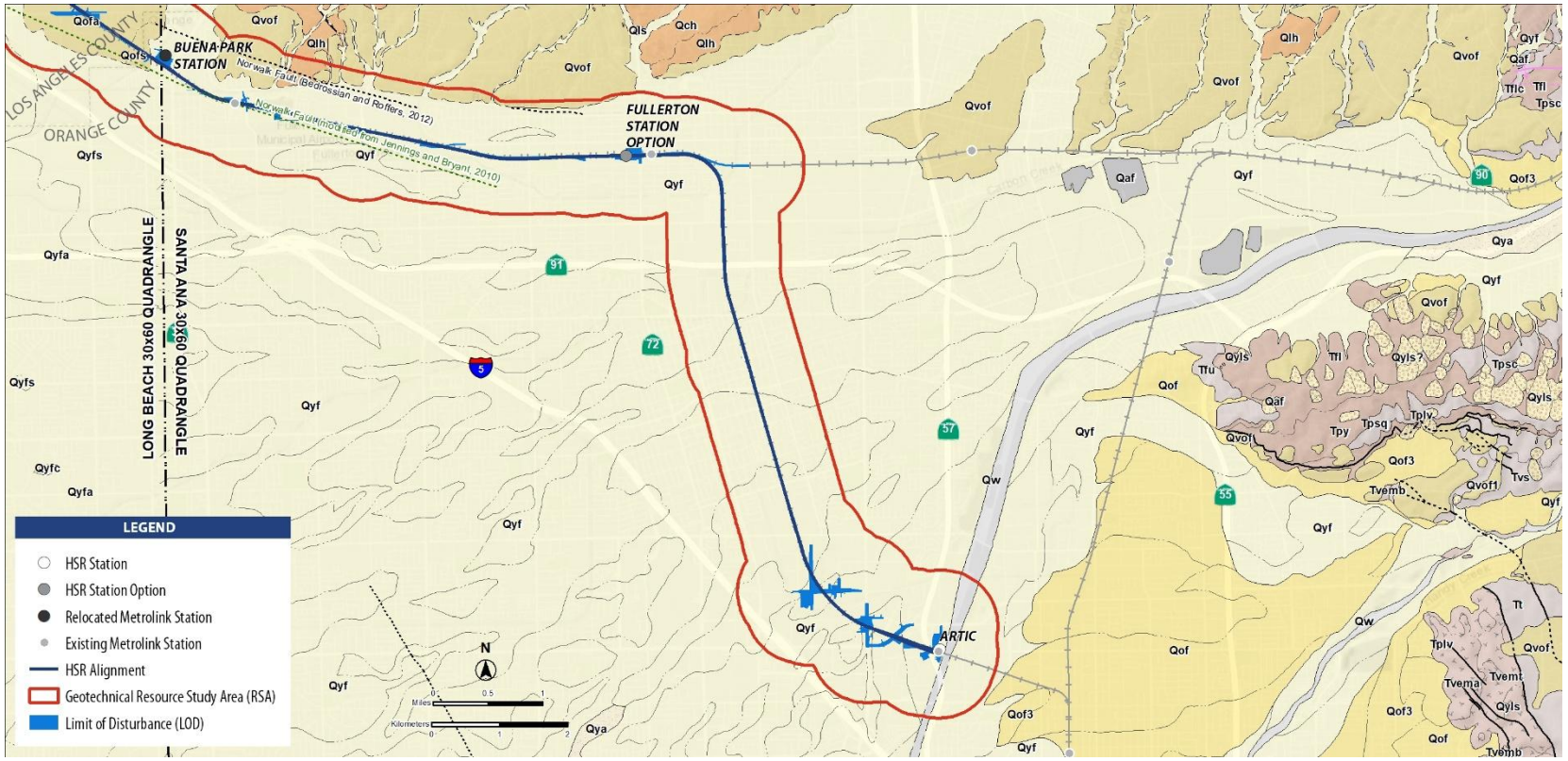
Sources: Authority 2023a; ICF 2023; Bedrossian et al. 2012; Saucedo et al. 2003; Yerkes et al. 2005

Figure 5-1 Surface Geology, Northern Segment (Sheet 1 of 4)



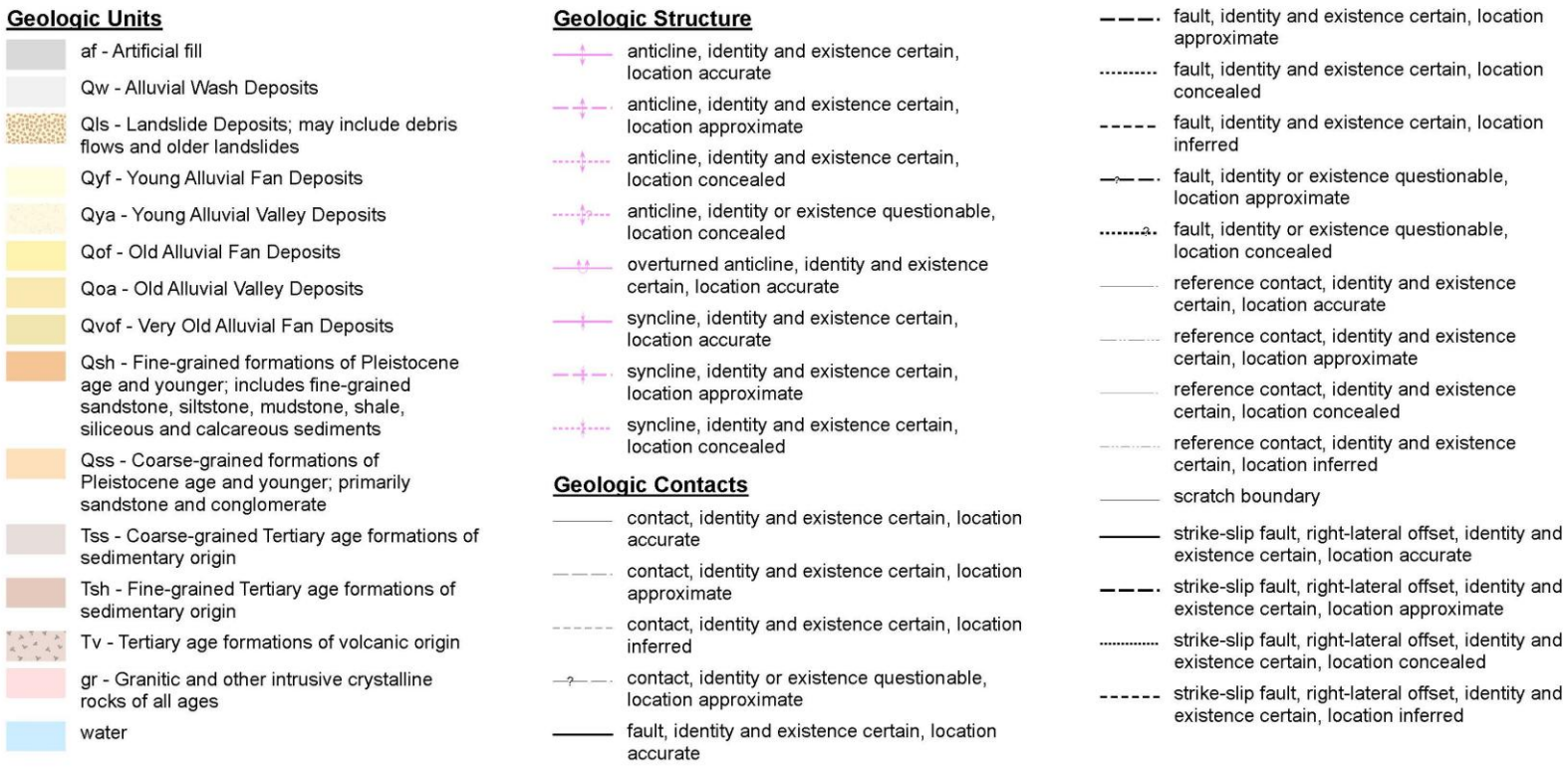
Sources: Authority 2023a; ICF 2023; Bedrossian et al. 2012; Saucedo et al. 2003; Yerkes et al. 2005

Figure 5-1 Surface Geology, Central Segment (Sheet 2 of 4)



Sources: Authority 2023a; ICF 2023; Bedrossian et al. 2012; Saucedo et al. 2003; Yerkes et al. 2005

Figure 5-1 Surface Geology, Southern Segment (Sheet 3 of 4)



Sources: Authority 2023a; ICF 2023; Bedrossian et al. 2012; Saucedo et al. 2003; Yerkes et al. 2005

Figure 5-1 Surface Geology Legend (Sheet 4 of 4)

5.3.1.1 *Stratigraphic Inventory*

Surficial geologic mapping by Morton and Miller (1981), Dibblee (1989, 2001), Saucedo et al. (2003), Yerkes and Campbell (2005), and Bedrossian et al. (2012) indicates that the entire RSA is underlain by Quaternary younger and older alluvium and wash deposits. However, older marine geologic units, including the Pliocene marine Repetto Member of the Fernando Formation and a late Miocene to early Pliocene marine geologic unit, underlie these younger units in the shallow subsurface of the RSA in the LAUS area of downtown Los Angeles. These units might be encountered by excavation or other earth-moving activities during construction of the project section. The paleontological resources of the RSA are discussed below by geologic unit.

Wash Deposits

Recent Wash deposits occur in active river channels that are crossed by the project section, specifically deposits of the Los Angeles, Rio Hondo, San Gabriel, and Santa Ana Rivers. These deposits consist of unconsolidated silts, sands, and gravels. They are described as late Holocene in age (Dibblee 1989, 2001), and are the result of flooding and deposition within these active river channels.

Younger Alluvium

Most of the RSA is underlain by late Quaternary younger alluvium, which consists of comparatively unconsolidated, coastal floodplain deposits that, in turn, are composed of layers of clay, silt, sand, and gravel (Dibblee 1989, 2001). Included in the younger alluvium are stream channel deposits, which are composed of silt, sand and gravel (Dibblee 1989, 2001). Following Morton and Miller (1981), these units are not distinguished in this report because they represent laterally continuous facies that are mapped as separate units only in some areas. The younger alluvium comprises historic (late Holocene) sediments at and very near the surface, but becomes progressively older with increasing depth below the surface.

Older Alluvium

Portions of the project section are underlain by Quaternary older alluvium, which consists of poorly consolidated, elevated, and dissected remnants of Pleistocene alluvial deposits composed of silt, sand, and gravel (Dibblee 1989, 2001). Limited exposures of this geologic unit occur approximately 2 miles south of LAUS, but the geologic unit is exposed much more extensively in the Santa Fe Springs to La Mirada area southeast of the San Gabriel River Freeway (Interstate 605). In the Los Angeles County portion of the RSA and near the Los Angeles County line in the Orange County portion of the RSA, the older alluvium underlies the younger alluvium at comparatively shallow depths Lander 1997; Springer 2006).

Fernando Formation, Repetto Member

The Pliocene marine Repetto Member of the Fernando Formation mostly consists of poorly bedded, soft, gray claystone that is exposed just west of LAUS in downtown Los Angeles (Dibblee 1989). The Repetto Member underlies the younger alluvium at comparatively shallow depths at and immediately south of LAUS.

5.3.1.2 *Unnamed Marine Shale (Possible Puente Formation)*

An unnamed, late Miocene to early Pliocene, marine geologic unit is exposed just west of LAUS in downtown Los Angeles. This geologic unit mostly consists of thinly bedded, gray to light brown, silty clay shale (Dibblee 1989). This unit has been correlated with the Puente Formation, which is exposed in the Elysian Hills just east of LAUS (CH2M Hill 2009:4-3). The unnamed marine shale was encountered at a depth approximately 29 feet below previous grade by excavation for the Metropolitan Water District of Southern California headquarters facility at LAUS (Lander 1997).

5.3.2 Paleontological Sensitivity Evaluation by Geologic Unit

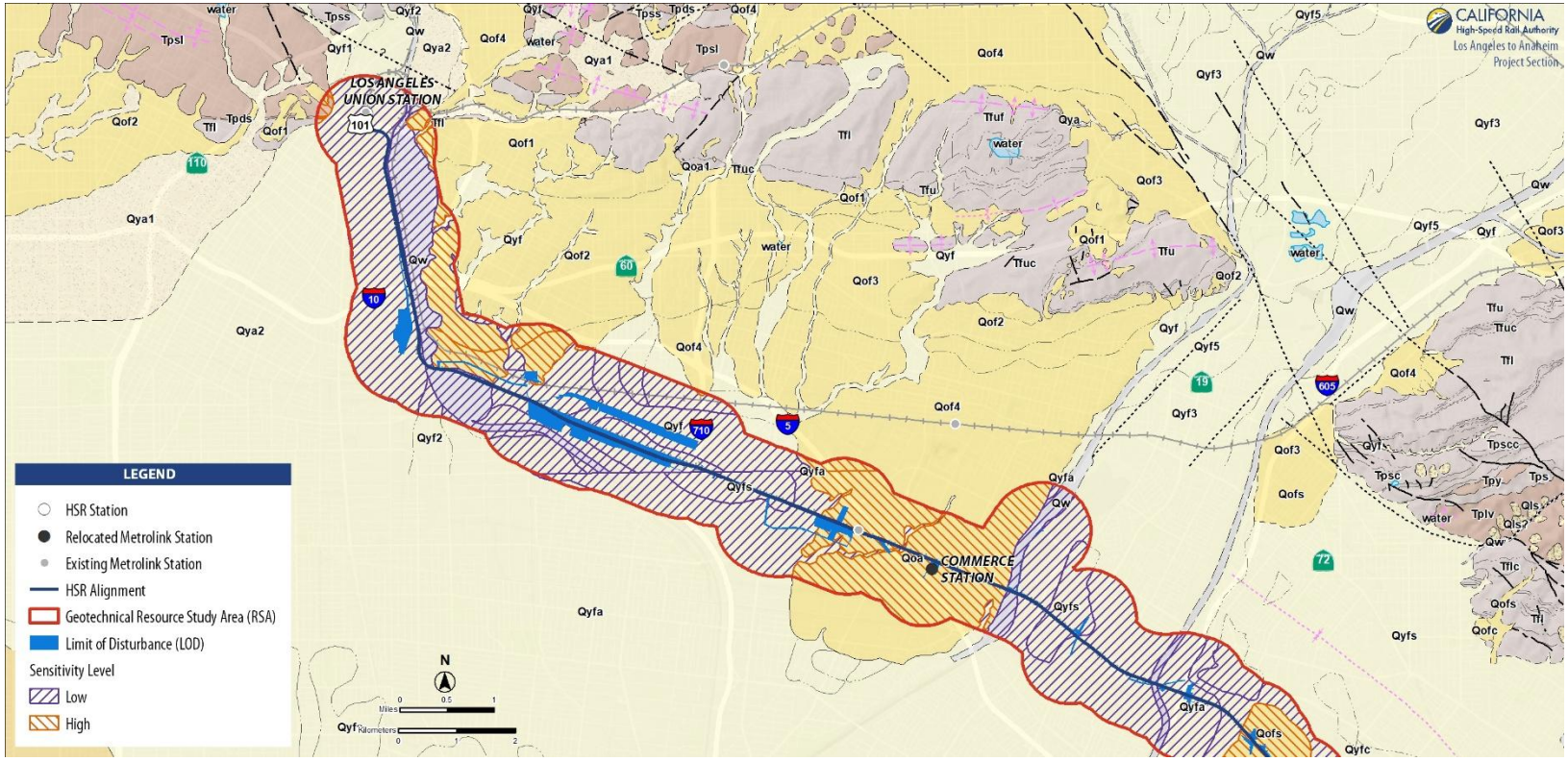
An inventory of the paleontological resources of each of the geologic units exposed at the surface in the RSA or present in the shallow subsurface is provided below and summarized in Table 5-1. These are presented by increasing geologic age, i.e., stratigraphic depth. These geologic units

may be found throughout the RSA. Surface paleontological sensitivity in the RSA is depicted on Figure 5-2, sheets 1 through 3.

Table 5-1 Paleontological Resources of Geologic Units in the Resource Study Area

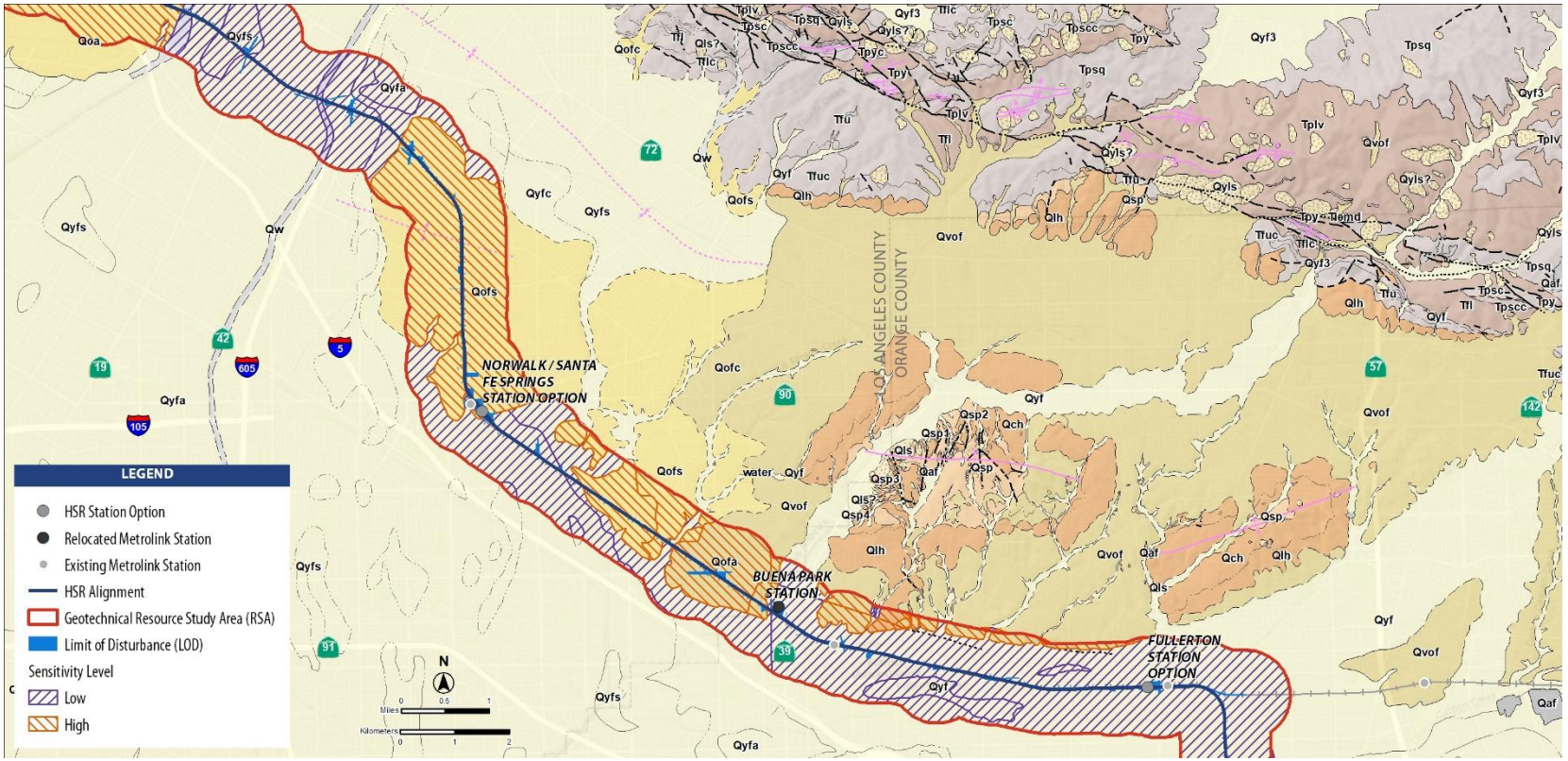
Geologic Unit	Paleontological Sensitivity (per SVP Guidelines	Age	Known Fossil Content
Wash Deposits	Low	5,000 years BP to the present	None
Younger Quaternary Alluvium	Low at the surface High at depths exceeding approximately 6 feet	11,000 years BP to the present	American mastodons, Columbian mammoths, horses, western camels, antique bison, ground sloths, dire wolves, coyotes, gray foxes, black bears, bobcats, mule deer, cottontails, rodents, Botta's pocket gophers, deer mice, California voles, birds, frogs, pond turtles, lizards, salamanders, snakes, fishes, brackish-water ostracods, freshwater snails and clam and land snails, brackish-water ostracods
Older Quaternary Alluvium	High	126,000 years BP to 11,000 years BP	Rancholabrean fauna: ground sloths, American lions, saber-tooth cats, dire wolves, American mastodons, Columbian mammoths, western horses, California tapirs, peccaries, western camels, large-headed llamas, pronghorns, shrub oxen, antique and long-horn bison; also insectivores (shrews, moles), bats, rabbits, rodents, salamanders, frogs and toads, turtles, lizards, snakes, birds, arachnids (spiders, scorpions), ostracods (aquatic bivalved crustaceans), isopods (sow bugs), millipedes, centipedes, insects, freshwater snails and clams, land snails, freshwater fishes, freshwater algae, gymnosperms, angiosperms
Plio-Pleistocene Repetto Member, Fernando Formation	High	2,000,000 years to 5,000,000 years BP	Sharks, rays, fishes, whales and porpoises, otters, birds, sponges, corals, moss animals, (bryozoans), lamp shells (brachiopods), chitons, snails, tusk shells (scaphopods), clams, sea urchins, crabs, benthic marine foraminifers (shelled amoebas), land plants
Unnamed Marine Shale (possible Puente Formation)	High	--	Whales, lanternfishes, netdevils, blackchins, lightfishes, viperfishes, sanddabs, turbots, flounders, herrings, sardines, mackerels, sea basses/groupers, dreamers, fangtooths, deep sea herring smelts, herrings, bristlemouths, sea urchin spines snails, clams, barnacles, starfishes, sea urchins, algal (seaweed) fronds, and, sea stars and land plants (e.g., aspens, buckthorns, oaks, laurels)

BP = before present; SVP = Society for Vertebrate Paleontology



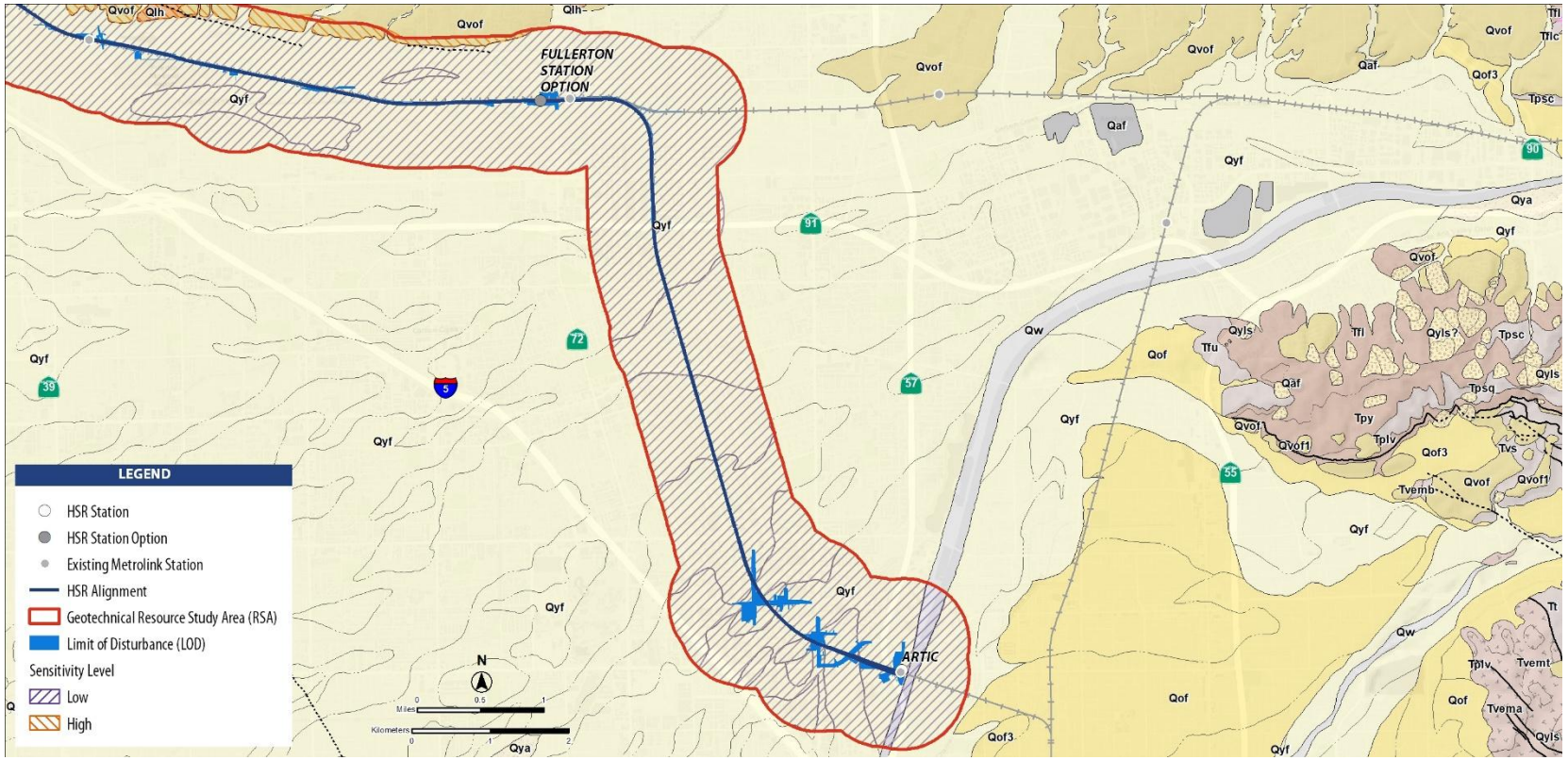
Sources: Authority 2023a; ICF 2023; Bedrossian et al. 2012; Saucedo et al. 2003; Yerkes et al. 2005

Figure 5-2 Surface Paleontological Sensitivity, Northern Segment (Sheet 1 of 3)



Sources: Authority 2023a; ICF 2023; Bedrossian et al. 2012; Saucedo et al. 2003; Yerkes et al. 2005

Figure 5-2 Surface Paleontological Sensitivity, Central Segment (Sheet 2 of 3)



Sources: Authority 2023a; ICF 2023; Bedrossian et al. 2012; Saucedo et al. 2003; Yerkes et al. 2005

Figure 5-2 Surface Paleontological Sensitivity, Southern Segment (Sheet 3 of 3)

5.3.2.1 *Wash Deposits*

Recent wash deposits in active river channels in the RSA have not yielded paleontological resources. These deposits are too young to contain fossil remains, which are usually preserved in sediments older than 5,000 BP. The wash deposits are classified as having low paleontological sensitivity.

5.3.2.2 *Younger Alluvium*

The younger alluvium is regarded as having a high paleontological sensitivity at depths of at least 6 feet below the natural ground surface. However, the younger alluvium is considered to be only of low paleontological sensitivity at depths less than 6 feet below the natural ground surface. Notable discoveries from this geologic unit are detailed below.

Fossilized wood, pollen, and spores of land plants were recovered from depths approximately 22 to 25 feet below previous grade and 6 to 9 feet above the base of the younger alluvium during construction of the Metropolitan Water District of Southern California headquarters facility at LAUS (Lander 1997, 2000). Carbon-14 dating analysis of a wood fragment from this fossil site (University of California Museum of Paleontology fossil locality PB98033) indicates that the land plant assemblage is 5,020 + 80 years (middle Holocene) in age (Lander 1997, 2000).

The remains of an extinct, late Pleistocene ("Ice Age") species of bison were encountered at an uncatalogued fossil locality roughly 35 to 55 feet below the surface during excavation of the Los Angeles County Metropolitan Transportation Authority Red Line tunnel immediately west of LAUS (Lander 1997, 2000). Bison remains indicate that the deeper fossil-bearing strata of the younger alluvium are assignable to the Rancholabrean North American Land Mammal Age (Savage 1951; Lundelius et al. 1987; Bell et al. 2004).

Miller (1971), Jefferson (1991b), and Lander (2000) reported the occurrence of fossilized bones and teeth representing extinct, late Pleistocene, land mammal species at numerous previously recorded fossil sites in the downtown Los Angeles-Hollywood area, most having been uncovered by excavation for other construction projects. Some of these sites are in areas mapped by Dibblee (1989) as being immediately underlain by younger alluvium, but some of the latter sites occurred at depths possibly sufficient to have been in the stratigraphically underlying older alluvium (Lander 2000). LACMVP fossil locality 1755, which yielded horse remains at a depth 43 feet below the previous ground surface, lies near the intersection of West 12th and South Hill streets and less than 1.8 miles southwest of LAUS. LACMVP fossil locality 3250 is near the U.S. Highway 101/Vermont Avenue interchange and yielded mammoth remains at a depth only 8 feet below grade.

Fossilized remains representing two taxonomically diverse fossil assemblages were found 11.5 to 15.5 and 30.5 to 33.5 feet below previous grade in the younger alluvium along 26th Street in Vernon (Lander 2008). The remains were recovered in or immediately adjacent to the RSA at LACMVP fossil localities 17869 and 17870 and LACMVP fossil localities 7701 and 7702 (Lander 2008). The remains comprise the valves of dominantly brackish-water species of ostracods, the shells of freshwater species of snails and clam and land snails, and the bones and teeth of small-bodied continental vertebrate species, including fishes, salamanders, lizards, snakes, birds, rabbits, and rodents (Lander 2008). The slender salamander *Batrachoseps* in the lower assemblage represents only the second reported occurrence of a slender salamander from the North American Pleistocene fossil record (Lander 2008). A carbon-14 radiometric dating analysis of mollusk shells indicates the lower assemblage is 35,980 + 530 years (late Pleistocene) in age and assignable to the Rancholabrean North American Land Mammal Age (Lander 2008).

The fossilized bones and teeth of Rancholabrean continental vertebrate species (including frogs, pond turtles, lizards, birds, ground sloths, cottontails, Botta's pocket gophers, deer mice, California voles, dire wolves, coyotes, gray foxes, black bears, bobcats, American mastodons, horses, western camels, mule deer, and bison) also were recovered from the younger alluvium at previously recorded fossil sites (LACMVP fossil localities 4185 to 4187, 4195 to 4201, and 6689) along Coyote Creek in La Mirada in Los Angeles County and Buena Park in Orange County

(Miller 1971; Kurtén and Anderson 1980; Jefferson 1991a, 1991b; Michalsky and Conkling 1994; Lander 2003); assigned incorrectly to La Habra Formation by some workers). These fossil sites are 0.4 to 1.5 miles northeast of the RSA and 0.4 mile north of the existing Buena Park Metrolink Station. The fossil-bearing strata, which also yielded the remains of land plants, have been determined to be 10,690 + 360 and 8,550 + 100 years in age on the basis of carbon-14 radiometric age determinations on some of the fossil remains (Jefferson 1991a, 1991b; Michalsky and Conkling 1994; Lander 2003). There is a potential for these types of fossils to be found within the project section.

The fossilized remains of an extinct species of sheep was recovered at an unknown depth in LACMVP locality 1652, in Anaheim along Rio Vista Avenue south of Lincoln (McLeod 2016). Farther to the east, the fossil remains of an extinct species of horse were recovered from a depth 8 to 10 feet below the surface at LACMVP fossil locality 4943 (Jefferson 1991b; Lander 2003). This locality lies at the intersection of Glassell Street and Fletcher Avenue, in the city of Orange, approximately 2.4 miles north-northeast of ARTIC. There is a potential for these types of fossils to be found within the RSA.

A fossil site southeast of ARTIC and near the El Toro Marine Corps Air Station in Irvine yielded fossilized rodent remains, which were recovered at depths as shallow as 6 feet below previous grade (Conkling 1997; Lander 2003) and might be Holocene in age. However, the fossilized bones and teeth of extinct large-bodied land mammal species (including Jefferson's ground sloths, American mastodons, Columbian mammoths, horses, western camels, and antique bison) also were recovered at the latter fossil site at depths as shallow as 10 feet below previous grade (Conkling 1997; Lander 2003). The presence of most of these species, particularly bison, indicate that the lower faunal assemblage at this locality is late Pleistocene in age and assignable to the Rancholabrean North American Land Mammal Age (Savage 1951; Lundelius et al. 1987; Bell et al. 2004).

These fossil remains are scientifically highly important because they document the late Pleistocene to middle Holocene age and nonmarine origin of the younger alluvium. Moreover, such remains are comparatively rare in the fossil record. These fossil occurrences also indicate a high potential for additional similar remains to be encountered by project-related earth-moving activities, even at depths only 6 feet below the current ground surface. In summary, the younger alluvium is regarded as paleontologically highly sensitive at depths at least 6 feet below the current ground surface. On the other hand, at shallower depths, probably only a low potential exists for such activities to encounter remains old enough to be considered a paleontological resource. Therefore, the younger alluvium is considered to have low paleontological sensitivity at depths less than 6 feet below current grade.

5.3.2.3 *Older Alluvium*

The older alluvium is classified as highly sensitive for paleontological resources. Fossil discoveries from the older alluvium, detailed below, indicate a high sensitivity for additional similar remains to be encountered at comparatively shallow depths below the natural ground surface.

The older alluvium has yielded late Pleistocene fossil remains at a number of fossil sites in the RSA vicinity, particularly in the downtown Los Angeles-Hollywood area, where numerous fossil sites occur west of the project section alignment.

Miller (1971), Jefferson (1991b), and Lander (2000) reported the occurrence of bones and teeth representing extinct, late Pleistocene land mammal species at numerous fossil sites west of downtown Los Angeles and in Hollywood. Many of these sites, including those in the La Brea Tar Pits at Hancock Park, are in areas immediately underlain by older alluvium (Lander 2000). The Rancho La Brea asphalt deposits have produced abundant fossil remains representing over 600 species of land plants and animals, including freshwater algae, gymnosperms (cone-bearing land plants), angiosperms (flowering land plants, including trees), arachnids (spiders, scorpions), ostracods (aquatic bivalved crustaceans), isopods (sow bugs), millipedes, centipedes, insects, freshwater snails and clams, land snails, freshwater fishes, salamanders, frogs and toads, turtles, lizards, snakes, birds, and land mammals including insectivores (shrews, moles), bats, rabbits,

rodents, and a diversity of extinct, large-bodied land mammal species (ground sloths, American lions, saber-tooth cats, dire wolves, American mastodons, Columbian mammoths, western horses, California tapirs, peccaries, western camels, large-headed llamas, pronghorns, shrub oxen, antique and long-horn bison) (Jefferson 1991a, 1991b; Stock and Harris 1992). On the basis of carbon-14 radiometric dating analyses, the Rancholabrean fossil land mammal remains from the La Brea Tar Pits and vicinity have been determined to be approximately 11,000 years to more than 46,500 years (late Pleistocene) in age (Marcus and Berger 1984; Stock and Harris 1992).

Approximately 1.1 miles northeast of the RSA north of LAUS, LACMVP fossil locality 2032 near the intersection of Mission Road and Daly Street in the city of Los Angeles produced fossil specimens of mammoth, mastodon, ground sloth, horse, camel, and pond turtle at depths of 20 to 35 feet below the modern ground surface. LACMVP locality 1023, about two-tenths of a mile farther north near the intersection of Alhambra Avenue and Workman Street in the city of Los Angeles yielded fossil specimens of saber-tooth cat, horse, deer, and turkey (Brattstrom and Sturn 1959; McLeod 2016; Steadman 1980).

Mammoth remains were also encountered at LACMVP fossil locality 3382 (Jefferson 1991b), 9.2 miles southwest of the RSA in Compton. Horse remains were recovered at LACMVP fossil locality 3347 (Jefferson 1991b) (assigned incorrectly to La Habra Formation), 3.1 miles east of the Norwalk/Santa Fe Springs Metrolink Station in La Mirada. Additional otherwise unidentified ungulate remains were found at LACMVP fossil locality 3524 in east of Beach Boulevard and north of Malvern Avenue (Jefferson 1991b) (assigned incorrectly to La Habra Formation), 0.4 mile north-northeast of the RSA in Fullerton.

These fossil remains are scientifically valuable because they document the late Pleistocene age and nonmarine origin of the older alluvium. These fossil occurrences also indicate a high potential for additional similar remains to be encountered by earth-moving activities in the RSA, even in areas immediately underlain by younger alluvium, and where the underlying older alluvium would be encountered by project-related earth-moving activities at comparatively shallow depths below the current ground surface. For these reasons, the older alluvium is regarded as having a high paleontological sensitivity.

5.3.2.4 *Fernando Formation, Repetto Member*

The Repetto Member of the Fernando Formation has yielded scientifically significant fossilized remains, and is classified as having a high sensitivity for paleontological resources. The Repetto Member has yielded fossil remains representing a diversity of marine invertebrate species including sponges, corals, moss animals (bryozoans), lamp shells (brachiopods), chitons, snails, tusk shells (scaphopods), clams, sea urchins, and crabs; tests of Repettian (Pliocene) benthic marine foraminifers (shelled amoebas); bones and teeth of marine vertebrate species, including sharks and rays, fishes, whales and porpoises, and otters; bones of birds; and the remains of land plants at fossil sites as little as 0.4 mile southwest of LAUS (Watts 1897; Lucas 1901; Arnold 1907; Moody 1916; Soper and Grant 1932; Woodring 1938; Dibblee 1989; Springer 2006; Lander 1991, in prep.).

Construction excavation about 0.5 mile south of LAUS in downtown Los Angeles, for subterranean parking, encountered Fernando Formation bedrock at depths of 20 to 35 feet below the ground surface. Paleontological monitors at this construction site recovered more than 4,025 fossil specimens from 65 numbered and mapped fossil localities during the course of monitoring of construction excavations on a single city block. Interestingly, these fossils were recovered from the Fernando Formation; none were found in the overlying older Quaternary alluvium (Scott pers. comm.).

These fossil remains are scientifically important because they document the Pliocene age and deep-marine origin of the Repetto Member. These fossil occurrences also indicate a high potential for additional similar remains to be encountered by earth-moving activities in the RSA, even in areas immediately underlain by younger alluvium, and where the underlying Repetto Member would be encountered by project-related earth-moving activities at comparatively shallow

depths below the current ground surface. For these reasons, the Repetto Member is regarded as having a high paleontological sensitivity.

5.3.2.5 *Unnamed Marine Shale (Possible Puente Formation)*

The unnamed marine shale has yielded scientifically significant fossil remains and is classified as having a high sensitivity for paleontological resources. A number of fossil fish skeletons were recovered from the marine shale at LACMVP fossil locality 5961 at the Los Angeles County Metropolitan Transportation Authority Red Line Tom Bradley/Civic Center Station (Lander 2000), 0.3 mile west of LAUS (Lander 2000). The specimens represent deep sea herring smelts, herrings, bristlemouths, and lanternfishes. Early Pliocene microfossils, algal (seaweed) fronds, and sea urchin spines also were recovered at this fossil locality (Lander 2000). Elsewhere in downtown Los Angeles and vicinity, the shale has yielded remains representing taxonomically diverse faunal assemblages including snails, clams, barnacles, starfishes, sea urchins, 65 extinct species of fishes (e.g., netdevils, lanternfishes, blackchins, lightfishes, viperfishes, sanddabs, turbots, flounders, herrings, sardines, mackerels, sea basses/groupers, dreamers, fangtooths), and whales, as well as the remains of sea stars and land plants (e.g., aspens, buckthorns, oaks, laurels) (Lander 2000). Some of the fish remains represent the first reported fossil records of their respective groups (Lander 2000). Most of the latter remains were exposed as a result of excavation for the Los Angeles County Metropolitan Transportation Authority Red Line Wilshire/Vermont Station (Lander 2000).

These fossil remains are scientifically important because they document the late Miocene to early Pliocene age and deep-water marine origin of the unnamed marine shale. Moreover, many of the species represented by the remains are extremely rare in the fossil record. These fossil occurrences also indicate a high potential for additional similar remains to be encountered by earth-moving activities in the RSA, even in areas immediately underlain by younger alluvium, and where the underlying shale would be encountered by HSR-related earth-moving activities at comparatively shallow depths below the current ground surface. Moreover, it is possible that some of the occurrences might represent the first known fossil records of their respective taxonomic groups. For these reasons, the unnamed marine shale is regarded as having a high paleontological sensitivity.

6 EFFECTS ANALYSIS

6.1 Introduction

This section analyzes the potential effects on paleontological resources.

6.2 No Project Alternative

The No Project Alternative would result in no construction for the project, and therefore would have no effects on paleontological resources. Continued growth in the Los Angeles County and Orange County regions with accompanying construction of other projects, such as housing, business buildings, and highways, would have the potential to affect paleontological resources. Following existing regulations would protect the great majority of these resources but, inevitably, some fossil resources would be lost because of errors and mistakes.

6.3 Shared Passenger Track Alternatives

Both Shared Passenger Track Alternatives A and B would require ground disturbance during construction. Ground disturbance that extends to depths of 6 feet or more could reach geologic units that have produced abundant and diverse fossil resources. These geologic units are considered highly sensitive for paleontological resources and likely to produce additional similar finds in the future. Earthwork such as trenching or excavation affecting these geologic units (referenced throughout the subsections below) has the potential to destroy significant fossil resources. Once lost, such resources cannot be recovered and the loss is permanent.

6.3.1 Geologic Units Sensitive to Paleontological Resources

6.3.1.1 *Construction*

Construction of the project would involve clearing, grading, excavation, utility relocation, and other earth-moving actions both on the alignment and in associated staging areas and access routes. Levels of disturbance would vary depending on the construction activity. Along the length of the alignment, the majority of trackwork built at grade would involve excavation with typical construction equipment to a depth of approximately 5 feet below the current grade. The depth of existing utilities would dictate the depth of excavation for their replacement, and may extend up to 30 feet below grade for activities such as sewer relocations. Deep excavations would take place for below-grade sections, such as the cut-and-cover tunnel near Fullerton Airport or at underpass grade separations for roadways. Elevated structures and bridgework over the Los Angeles, Rio Hondo, and San Gabriel Rivers and other locations would require placement of deep pile foundations.

These activities have the potential to affect geologic units with a high sensitivity for paleontological and therefore have the potential to destroy significant, scientifically important fossil resources. Geologic units that have a high sensitivity for paleontological resources include:

- Younger alluvium at depths greater than 6 feet
- Older alluvium
- Fernando Formation, Repetto Member
- Unnamed marine shale

6.3.1.2 *Operation*

Routine operations and maintenance (O&M) of the project is not expected to require disturbance of previously undisturbed geologic units of high paleontological sensitivity. With no ground disturbance in previously undisturbed materials, there would be no disturbance, damage, or loss of paleontological resources. If future maintenance activities require ground disturbance affecting previously undisturbed subsurface units, the potential for effects would be similar to that described for construction.

6.3.2 Significant Paleontological Resources

6.3.2.1 *Construction*

The project alignment is underlain by several geologic units that have yielded abundant, diverse, and scientifically important fossil finds including, but not limited to, numerous vertebrate remains. The younger alluvium, at depths greater than 6 feet, has yielded vertebrate specimens and freshwater species of invertebrates. Remains of land plants have also been recovered from this unit. The older alluvium has yielded vertebrate fossils of Rancholabrean fauna, including saber-tooth cats and Pleistocene megafauna, such as mammoth and mastodon.

The Repetto Member of the Fernando Formation has yielded extensive fossil remains of Pliocene marine invertebrates and vertebrates including sharks, fish, porpoises, and whales. In addition, this formation has yielded specimens of birds and land plants. Fossils recovered from the unnamed marine shale include early Pliocene deep sea fish, invertebrates, and remains of land plants. Therefore, work 6 feet or more below the ground surface and involving these geologic units has the potential to destroy significant paleontological resources.

6.3.2.2 *Operation*

Routine O&M of the project is not expected to require disturbance of previously undisturbed subsurface materials. With no ground disturbance in previously undisturbed materials, there would be no disturbance, damage, or loss of paleontological resources. If future maintenance activities, such as excavations for utility relocation or repairs, require ground disturbance affecting previously undisturbed underlying units, the potential for effects would be similar to that described for construction.

6.4 Station Sites

6.4.1 Geologic Units Sensitive to Paleontological Resources

6.4.1.1 *Construction*

The relocated Metrolink stations at Commerce and Buena Park would be at grade, while the modified Norwalk/Santa Fe Springs Transportation Center would be elevated. The modified Fullerton Transportation Center would be at grade. The sediments underlying the relocated station at Commerce are older alluvial-fan deposits of late to middle Pleistocene age, which are exposed at the ground surface. Work at this station may expose fossils at shallow depth in undisturbed sediments. The geological units underlying the relocated Buena Park Station are younger alluvium, which has high paleontological sensitivity at depths greater than 6 feet. The proposed HSR platform and station facilities at the existing ARTIC station would also be at grade.

Earthwork required for station development, such as grading, tunneling, excavation, utility relocation, or track realignment, at each station has the potential to affect highly sensitive geologic units, and thus the potential to destroy significant, scientifically important fossil resources. Geologic units that have a high sensitivity for paleontological resources include:

- Younger alluvium at depths greater than 6 feet
- Older alluvium
- Fernando Formation, Repetto Member
- Unnamed marine shale

Earthwork affecting these units has the potential to destroy significant fossil resources.

High-Speed Rail Station Options

High-Speed Rail Station Option: Norwalk/Santa Fe Springs

The Norwalk/Santa Fe Springs HSR Station Option would be elevated above grade. With inclusion of the Norwalk/Santa Fe Springs HSR Station Option, construction impacts on paleontological resources would be the same as those described for the Shared Passenger Track Alternatives. Construction of the HSR station platform, facilities, and parking would occur in the

same area that would be modified under the Shared Passenger Track Alternatives, which is on soils with highly sensitive older alluvial deposits.

High-Speed Rail Station Option: Fullerton

The Fullerton HSR Station Option would be at grade. With inclusion of the Fullerton HSR Station Option, construction impacts on paleontological resources would be the same as those described for the Shared Passenger Track Alternatives. Construction of the HSR station platform, facilities, and parking would occur in a larger area than the area modified under the Shared Passenger Track Alternatives. However, the Fullerton HSR Station Option components would be implemented entirely on low-sensitivity younger alluvial deposits.

6.4.1.2 *Operation*

Routine O&M of stations along the project section is not expected to require disturbance of geologic units of high paleontological sensitivity. With no ground disturbance in previously undisturbed materials, there would be no disturbance, damage, or loss of paleontological resources. If future maintenance activities require ground disturbance affecting previously undisturbed subsurface units, the potential for effects would be similar to that described for construction.

High-Speed Rail Station Options

High-Speed Rail Station Option: Norwalk/Santa Fe Springs

With inclusion of the Norwalk/Santa Fe Springs HSR Station Option, permanent impacts on paleontological resources would be similar to those described for the Shared Passenger Track Alternatives for operation. Although the types of impacts would be similar in nature, the area of operation of Norwalk/Santa Fe Springs HSR Station Option would be predominantly on highly sensitive older alluvial deposits, representing a greater potential for permanent impacts on paleontological resources. However, as stated previously, routine O&M of stations along the project section is not expected to require disturbance of geologic units of high paleontological sensitivity.

High-Speed Rail Station Option: Fullerton

With inclusion of the Fullerton HSR Station Option, permanent impacts on paleontological resources would be similar to those described for the Shared Passenger Track Alternatives for operation. Although the types of impacts would be similar in nature, the area of operation of Fullerton HSR Station Option would be entirely on low-sensitivity younger alluvial deposits, representing a reduced potential for permanent impacts from routine O&M activities on paleontological resources.

6.4.2 Significant Paleontological Resources

6.4.2.1 *Construction*

The project section and HSR station options are underlain by several geologic units that have yielded abundant, diverse, and scientifically important fossil finds including, but not limited to, numerous vertebrate remains. The younger alluvium, at depths greater than 6 feet, has yielded vertebrate specimens and freshwater species of invertebrates. Remains of land plants have also been recovered from this unit. The older alluvium has yielded vertebrate fossils of Rancholabrean fauna, including saber-tooth cats and Pleistocene megafauna, such as mammoth and mastodon.

The Repetto Member of the Fernando Formation has yielded extensive fossil remains of Pliocene marine invertebrates and vertebrates including sharks, fish, porpoises, and whales. In addition, this formation has yielded specimens of birds and land plants. Fossils recovered from the unnamed marine shale include early Pliocene deep sea fish, invertebrates, and remains of land plants. Therefore, work involving these units has the potential to destroy significant paleontological resources.

6.4.2.2 *Operation*

Routine O&M of stations along the project section is not expected to require disturbance of geologic units of high paleontological sensitivity. With no ground disturbance in previously undisturbed materials, there would be no disturbance, damage, or loss of paleontological resources. If future maintenance activities require ground disturbance affecting previously undisturbed subsurface units, the potential for effects would be similar to that described for construction.

6.5 Maintenance Facility and Freight Yards

Based on the project footprint at the time of this report, there are two Shared Passenger Track Alternatives with the LMF to be in one of two locations in the cities of Los Angeles and Vernon. The LMF for Shared Passenger Track Alternative A would be a 50-acre Level III facility at 26th Street near Hobart Yard in Vernon. This LMF would hold 24 single trainsets, with a shop building and six tracks, and would require the restriping of BNSF Lot 11 to maintain BNSF operations.

The LMF for Shared Passenger Track Alternative B would be a Level III facility at 15th Street along the west bank of the Los Angeles River in Los Angeles. This LMF would hold 20 single trainsets, with four shop tracks and two shop buildings, and would be built to the west of Amtrak's current Eighth Street Yard. Only one LMF would ultimately be needed; however, both alternatives are evaluated below.

Routine O&M of either of the LMFs is not expected to require disturbance of geologic units of high paleontological sensitivity, and the potential for effects would be similar to that described for construction.

6.5.1 Geologic Units Sensitive to Paleontological Resources

6.5.1.1 *Construction*

The sediments underlying both of the proposed LMFs are Younger Alluvium at the surface, which has high paleontological sensitivity at depths greater than 6 feet. Therefore, if earth-moving is required at these facilities, such as grading, excavation, or utility relocation to depths below 6 feet, this work has the potential to affect highly sensitive geologic units, and thus the potential to destroy significant, scientifically important fossil resources. Geological units that have a high sensitivity for paleontological resources include:

- Younger alluvium at depths greater than 6 feet
- Older alluvium
- Fernando Formation, Repetto Member
- Unnamed marine shale

Work involving these units has the potential to destroy significant fossil resources.

6.5.1.2 *Operation*

Routine O&M of either LMF location is not expected to require disturbance of geologic units of high paleontological sensitivity. With no ground disturbance in previously undisturbed materials, there would be no disturbance, damage, or loss of paleontological resources. If future maintenance activities require ground disturbance affecting previously undisturbed subsurface units, the potential for effects would be similar to that described for construction.

6.5.2 Significant Paleontological Resources

6.5.2.1 *Construction*

26th Street Light Maintenance Facility for Shared Passenger Track Alternative A

The 26th Street LMF is proximate to the Exide Technologies site in Vernon, which is contaminated with hazardous materials like lead and arsenic, and therefore contaminated soils

from a portion of the Exide Technologies site would need to be excavated or treated to support construction of the 26th Street LMF that will total 18,000 cubic yards of soil excavated. If the 26th LMF III options is chosen, then the entire Exide site would need to be excavated to some extent to accommodate the LMF tracks, access roads, and supporting buildings and infrastructure that supports the LMF. The 26th Street LMF is underlain by several geologic units that have yielded abundant, diverse, and scientifically important fossil finds including, but not limited to, numerous vertebrate remains. The younger alluvium, at depths greater than 6 feet, has yielded vertebrate specimens and freshwater species of invertebrates. Remains of land plants have also been recovered from this unit. The older alluvium has yielded vertebrate fossils of Rancholabrean fauna, including saber-tooth cats and Pleistocene megafauna, such as mammoth and mastodon.

The Repetto Member of the Fernando Formation has yielded extensive fossil remains of Pliocene marine invertebrates and vertebrates including sharks, fish, porpoises, and whales. In addition, this formation has yielded specimens of birds and land plants. Fossils recovered from the unnamed marine shale include early Pliocene deep sea fish, invertebrates, and remains of land plants. Therefore, work 6 feet or more below the ground surface involving these units has the potential to destroy significant paleontological resources.

15th Street Light Maintenance Facility for Shared Passenger Track Alternative B

The 15th Street LMF site is underlain by the same geologic units, with the same paleontological sensitivity, as the 26th Street LMF site. Work 6 feet or more below the ground surface involving these units has the potential to destroy significant paleontological resources, and excavation to avoid impacts on Olympic Boulevard Bridge in some places would involve up to 15 feet below ground level with approximately 60 percent of the LMF site to be depressed, totaling 120,000 cubic yards of cut soil. The 15th Street LMF yard lead tracks would need to cross under the Olympic Boulevard roadway overcrossing in three shallow trenches. The Olympic Boulevard overpass would have four piers, and only one track would fit between each pier. Excavation would be required to a depth of approximately 15 feet to account for soil improvements and construction of formwork for the cast-in-place structures. To make the connection between the below-grade lead tracks and the yard tracks, the northern portion of the LMF site (approximately 25 acres) would need to be excavated up to a depth of 5 feet and regraded to match the grade of the lead tracks. Each track would be within a separate trench to pass through the piers, at a depth of 7 feet. Relative to the 26th Street LMF site, ground-disturbing work at the 15th Street LMF may result in additional impacts on significant or unique paleontological resources because the depth of ground disturbance would be greater at this location than at the 26th Street LMF location.

6.5.2.2 *Operation*

26th Street Light Maintenance Facility for Shared Passenger Track Alternative A

Routine O&M of the 26th Street LMF is not expected to require disturbance of geologic units of high paleontological sensitivity. With no ground disturbance in previously undisturbed materials, there would be no disturbance, damage, or loss of paleontological resources. If future maintenance activities require ground disturbance affecting previously undisturbed subsurface units, the potential for effects would be similar to that described for construction.

15th Street Light Maintenance Facility for Shared Passenger Track Alternative B

Like the 26th Street LMF site, the 15th Street LMF site is not expected to require disturbance of geologic units of high paleontological sensitivity. If future maintenance activities require ground disturbance affecting previously undisturbed subsurface units, the potential for effects would be similar to that described for construction.

6.6 Electric Power Utility Improvements

6.6.1 Geologic Units Sensitive to Paleontological Resources

6.6.1.1 *Construction*

Construction of electric power utility improvement facilities, as well as TPSSs and communication facilities for the project, could involve clearing, excavation, utility relocation, and other earth-moving actions both on the alignment and in associated staging areas and access routes. Depending on the previous level of disturbance, this has the potential to affect highly sensitive geologic units and thus the potential to destroy significant, scientifically important fossil resources.

Current plans indicate that ground disturbance for mast poles would involve auguring 3-foot-wide holes to depths of approximately 20 feet, while manholes would be open cuts to depths of approximately 20 feet dug with excavation equipment. Therefore, installation of the mast poles and manholes would affect the geologic units sensitive to paleontological resources within the RSA.

Geological units that have a high sensitivity for paleontological resources include:

- Younger alluvium at depths greater than 6 feet
- Older alluvium
- Fernando Formation, Repetto Member
- Unnamed marine shale

Work at 6 feet or more below the ground surface involving these geologic units has the potential to destroy significant fossil resources.

6.6.1.2 *Operation*

Routine O&M of the electric power utility improvement facilities is not expected to require disturbance of geologic units of high paleontological sensitivity. With no ground disturbance in previously undisturbed materials, there would be no disturbance, damage, or loss of paleontological resources. If future maintenance activities require ground disturbance affecting previously undisturbed subsurface units, the potential for effects would be similar to that described for construction.

6.6.2 Significant Paleontological Resources

6.6.2.1 *Construction*

The project alignment is underlain by several geologic units that have yielded abundant, diverse, and scientifically important fossil finds including, but not limited to, numerous vertebrate remains. The younger alluvium, at depths greater than 6 feet, has yielded vertebrate specimens and freshwater species of invertebrates. Remains of land plants have also been recovered from this unit. The older alluvium has yielded vertebrate fossils of Rancholabrean fauna, including saber-tooth cats and Pleistocene megafauna, such as mammoth and mastodon.

The Repetto Member of the Fernando Formation has yielded extensive fossil remains of Pliocene marine invertebrates and vertebrates including sharks, fish, porpoises, and whales. In addition, this formation has yielded specimens of birds and land plants. Fossils recovered from the unnamed marine shale include early Pliocene deep sea fish, invertebrates, and remains of land plants. Therefore, work 6 feet or more below the ground surface involving these units has the potential to destroy significant paleontological resources.

6.6.2.2 *Operation*

Routine O&M of the electric power utility improvement facilities is not expected to require disturbance of geologic units of high paleontological sensitivity. With no ground disturbance in previously undisturbed materials, there would be no disturbance, damage, or loss of paleontological resources. If future maintenance activities require ground disturbance affecting

previously undisturbed subsurface units, the potential for effects would be similar to that described for construction.

6.7 Cumulative Effects

Cumulative effects are defined as environmental effects that on their own may not be considered adverse, but when combined with similar effects over time, result in substantial adverse effects. Construction activities associated with the Shared Passenger Track Alternatives could disturb or destroy paleontological resources and thereby contribute to the cumulative loss of fossil resources over time. Cumulative growth and development in the Los Angeles County and Orange County areas could have effects if paleontological resources are found during construction activities. In the past, fossil resources were destroyed or recovered in a partially random way, depending on interested individuals and construction crews to recover resources. Museum and university excavations were undertaken at significant sites, e.g., the La Brea Tar Pits. The implementation of environmental laws in the mid-twentieth century has resulted in more fossil recovery during construction and successful and relatively effective implementation of mitigation measures, such as review of final design plans by a qualified paleontologist to determine paleontologically sensitive areas, development and implementation of paleontological resources monitoring and mitigation plans, and worker environmental training on paleontological resources. Nonetheless, it should be noted that construction exposures of fossil resources allowing their recovery and study is a positive effect, cumulatively resulting in significant new scientific knowledge.

The potential for an individual project to affect significant paleontological resources is unknown but, given the number of projects, it is probable that growth and development in Los Angeles and Orange Counties could have effects on significant paleontological resources, including damage to fossils, destruction of fossils without scientific analysis, and permanent loss of, or loss of access to, a paleontological resource. The other reasonably foreseeable projects, including the adjacent Burbank to Los Angeles Project Section, Link Union Station project, Parkwest Development, and OCVIBE, would also be required to halt work and recover paleontological resources encountered during construction. However, measures such as **GEO-IAMF#11, Engage a Qualified Paleontological Resources Specialist**, through **GEO-IAMF#15, Halt Construction, Evaluate, and Treat If Paleontological Resources Are Found**, can be taken to protect fossil resources and mitigate these potential effects. These mitigation efforts, if carried out in the future, would continue to generate fossil and paleontological discoveries and new scientific knowledge. The Shared Passenger Track Alternatives would not contribute to a cumulatively considerable increase in paleontological resources impacts during construction.

6.8 Effects Summary

6.8.1 NEPA Effects Summary

6.8.1.1 *Construction*

Construction of the Shared Passenger Track Alternatives, including stations and HSR station options, LMFs, and electric power utility improvements, has the potential to affect paleontological resources. Ground disturbance during construction could affect geologic units that have produced paleontological resources, and thus has the potential to destroy significant paleontological resources absent any mitigation measures. Without implementation of appropriate mitigation measures, ground disturbance during construction poses a serious risk to the preservation of significant paleontological resources that have been produced by the underlying geologic units.

Geologic units in which fossils could be found include:

- Younger alluvium at depths greater than 6 feet
- Older alluvium
- Fernando Formation, Repetto Member
- Unnamed marine shale

Ground disturbance in these geologic units has the potential to affect paleontological resources.

No Project Alternative

The No Project Alternative would result in no construction for the project, and therefore would have no effects on paleontological resources.

Shared Passenger Track Alternatives

The Shared Passenger Track Alternatives would require ground disturbance during construction. Ground disturbance that extends to depths of 6 feet or more could reach paleontologically sensitive geologic units that have produced abundant and diverse fossil resources.

Station Sites

Earthwork required for station development, such as grading, tunneling, excavation, utility relocation, or track realignment, has the potential to affect highly sensitive geologic units, and thus the potential to destroy significant, scientifically important fossil resources or paleontologically sensitive geologic units.

High-Speed Rail Station Options

Although the types of impacts would be similar in nature between the two HSR station options, the area of construction of the Norwalk/Santa Fe Springs HSR Station Option would be predominantly on highly sensitive older alluvial deposits, representing a greater potential for construction impacts on paleontological resources because of the presence of these highly sensitive alluvial deposits. The area of construction of the Fullerton HSR Station Option would be entirely on low-sensitivity younger alluvial deposits, representing a reduced potential for construction impacts on paleontological resources.

Maintenance Facility and Freight Yards

The sediments underlying both of the proposed LMFs are Younger Alluvium at the surface, which has high paleontological sensitivity at depths greater than 6 feet. Work exceeding this depth involving these units has the potential to destroy significant fossil resources. Potential impacts on significant paleontological resources would be greater for Shared Passenger Track Alternative B than for Shared Passenger Track Alternative A because the Shared Passenger Track Alternative B LMF would include additional excavation for the trench under the Olympic Boulevard Bridge, which would require a greater area of excavation at a deeper depth even though the 26th Street LMF would include a portion of the Exide site, which is contaminated and would require ground disturbance to remove contaminated soils at that location to build the LMF.

6.8.1.2 *Operation and Maintenance*

Routine O&M of the Shared Passenger Track Alternatives, including station sites, HSR station options, and maintenance facility and freight yards, is not expected to require disturbance of previously undisturbed geologic units of high paleontological sensitivity. With no ground disturbance in previously undisturbed materials, there would be no disturbance, damage, or loss of paleontological resources. If future maintenance activities require ground disturbance affecting previously undisturbed subsurface units, the potential for effects would be similar to that described for construction.

6.8.2 CEQA Effects Summary

6.8.2.1 *Construction*

Construction of the Shared Passenger Track Alternatives, including stations and HSR station options, LMFs for the Shared Passenger Track Alternatives, and electric power utility improvements, has the potential to affect paleontological resources. Ground disturbance during construction could affect geologic units that have produced paleontological resources, and thus has the potential to destroy significant paleontological resources.

Geologic units with a high sensitivity for paleontological resources, in which fossils could be found, include:

- Younger alluvium at depths greater than 6 feet
- Older alluvium
- Fernando Formation, Repetto Member
- Unnamed marine shale

Ground disturbance in these geologic units has the potential to affect paleontological resources.

No Project Alternative

The No Project Alternative would result in no construction, and therefore would have no effects on paleontological resources.

Shared Passenger Track Alternatives

The Shared Passenger Track Alternatives would require ground disturbance during construction. Ground disturbance that extends to depths of 6 feet or more could reach paleontologically sensitive geologic units that have produced abundant and diverse fossil resources.

Station Sites

Earthwork required for station development, such as grading, tunneling, excavation, utility relocation, or track realignment, at each station has the potential to affect highly sensitive geologic units, and thus the potential to destroy significant, scientifically important fossil resources.

High-Speed Rail Station Options

Although the types of impacts would be similar in nature, the area of construction of the Norwalk/Santa Fe Springs HSR Station Option would be predominantly on highly sensitive older alluvial deposits, representing a greater potential for construction impacts on paleontological resources. The area of construction of the Fullerton HSR Station Option would be entirely on low-sensitivity younger alluvial deposits, representing a reduced potential for construction impacts on paleontological resources.

Maintenance Facility and Freight Yards

The sediments underlying both of the proposed LMFs are Younger Alluvium at the surface, which has high paleontological sensitivity at depths greater than 6 feet. Work exceeding this depth involving these units has the potential to destroy significant fossil resources. Potential impacts on significant paleontological resources would be greater at the 15th Street LMF than the 26th Street LMF because the additional excavation required to avoid impacts on the Olympic Boulevard Bridge, even though 26th Street LMF would include a portion of the Exide site, which is contaminated and would require ground disturbance to remove contaminated soils at that location to build the LMF.

6.8.2.2 *Operation*

Routine O&M of the project, including Shared Passenger Track Alternatives, station sites, HSR station options, and maintenance facility and freight yards, is not expected to require disturbance of previously undisturbed geologic units of high paleontological sensitivity. With no ground disturbance in previously undisturbed materials, there would be no disturbance, damage, or loss of paleontological resources. If future maintenance activities require ground disturbance affecting previously undisturbed subsurface units, the potential for effects would be similar to that described for construction.

7 IMPACT AVOIDANCE AND MINIMIZATION FEATURES

7.1 Introduction

The Shared Passenger Track Alternatives will incorporate standardized HSR features to avoid and minimize impacts. These features are referred to as impact avoidance and minimization features (IAMF). The Authority will apply these IAMFs during project design and construction to avoid or reduce impacts. Because the project section is in a shared corridor with existing passenger and freight service, the property owner will also be responsible for ensuring the IAMFs are incorporated during construction and operation. The Authority will coordinate with the property owner to obtain a memorandum of understanding to ensure the IAMFs are implemented.

The following IAMFs will be incorporated to avoid or minimize adverse effects on paleontological resources.

7.2 Impact Avoidance and Minimization Features for Paleontological Resources

7.2.1 GEO-IAMF#11: Engage a Qualified Paleontological Resources Specialist

Prior to the 90 percent design milestone for each construction package[9] (CP) within the project section, the Authority-designated contractor will retain a paleontological resources specialist (PRS) responsible for:

- Reviewing the final design for the CP
- Developing a detailed Paleontological Resources Monitoring and Mitigation Plan (PRMMP) for the CP
- Implementing the PRMMP by the PRS, including development and delivery of Worker Environmental Awareness Program (WEAP) Training, supervision of Paleontological Resource Monitors, evaluation and treatment of finds, if any, and preparation of a final paleontological mitigation report, per the PRMMP, and for each CP

Retention of PRS staff will occur in a timely manner, in advance of the 90 percent design milestone for each CP, such that the PRS is on board and can review the 90 percent design submittal without delay when it becomes available. If feasible, the same PRS will be responsible for the CPs within a given project section.

All PRS staff will meet or exceed the qualifications for a Principal Paleontologist as defined in Caltrans' current *Standard Environmental Reference*, Chapter 8 (Caltrans 2014). Appointment of PRS staff will be subject to review and approval by the Authority.

7.2.2 GEO-IAMF#12: Perform Final Design Review and Triggers Evaluation

For each CP within the project section, the responsible PRS will evaluate the 90 percent design submittal to identify the portions of the CP that will involve work in paleontologically sensitive geologic units (either at the surface or in the subsurface), based on findings of the final Paleontological Resources Technical Report prepared for the project section. Evaluation will consider the location, areal extent, and anticipated depth of ground disturbance, construction techniques that are planned/proposed, and geology (i.e., location of geologic units with high potential for paleontological resources) of the CP and vicinity. The evaluation and resulting recommendations will be consistent with guidance in SVP's *Standard Procedures for the Assessment and Mitigation of Adverse Impacts to Paleontological Resources* (SVP 2010), the SVP *Conditions of Receivership for Paleontologic Salvage Collections* (SVP 1996), and relevant

[9] Because of their length and complexity, most HSR project sections are expected to be designed and built in segments, with separate construction documents (plans and specifications) developed for each segment. *Construction package* refers to a portion (segment) of a project section for which a discrete, standalone construction document set will be developed.

guidance from Chapter 8 of the current Caltrans *Standard Environmental Reference* (Caltrans 2014).

The purpose of the Final Design Review and Triggers Evaluation is to develop specific language detailing the location and duration of paleontological monitoring and other requirements for paleontological resources applicable to each CP within the project section. Paleontological protection requirements identified through the Final Design Review and Triggers Evaluation will be recorded in a concise technical memorandum ("Final Design Review Requirements for Paleontological Resources Protection"), which will be incorporated in full detail into the PRMMP for each CP. Those portions of the CP requiring paleontological monitoring will also be clearly delineated in the project construction documents for each CP.

7.2.3 GEO-IAMF#13: Prepare and Implement Paleontological Resources Monitoring and Mitigation Plan (PRMMP)

Following the Final Design Review and Triggers Evaluation for each CP, the PRS will develop a CP-specific PRMMP. For greater efficiency, PRMMPs may be written such that they cover more than one CP, as long as the specific requirements of the IAMFs are satisfied explicitly and in detail for each CP included.

The PRMMP for each CP will incorporate the findings of the Design Review and Triggers Evaluation for that CP and will be consistent with SVP's *Standard Procedures for the Assessment and Mitigation of Adverse Impacts to Paleontological Resources* (SVP 2010), the SVP *Conditions of Receivership for Paleontologic Salvage Collections* (SVP 1996), and relevant guidance from Chapter 8 of the current Caltrans *Standard Environmental Reference* (Caltrans 2014). Therefore, the PRMMP will provide for at least the following:

- Implementation of the PRMMP by qualified personnel, including the following positions:
  - Paleontological Resources Specialist: The PRS will be required to meet or exceed Principal Paleontologist qualifications per Chapter 8 of the current *Caltrans Standard Environmental Reference* (Caltrans 2014). The Supervising Paleontologist may, but not necessarily, be the PRS who prepares the PRMMP.
  - Paleontological Resources Monitors: The paleontological resources monitors will be required to meet or exceed Paleontological Monitor qualifications per Chapter 8 of the current Caltrans *Standard Environmental Reference* (Caltrans 2014).
- Development of preconstruction and construction-period coordination procedures and communications protocols.
- Evaluation as to whether a preconstruction survey by qualified personnel is warranted for the CP. In general, preconstruction surveys are beneficial if there is a strong possibility that significant paleontological resources (e.g., concentrations of vertebrate fossils) are exposed at the ground surface and would be destroyed during the initial clearing and grubbing phase of earthwork. Such a determination can usually be made during preparation of the Paleontological Resources Technical Report.
- Requirements for paleontological monitoring by qualified paleontological resources monitors of ground disturbance activities known to affect, or potentially affect, highly sensitive geologic units and for ground disturbance activities affecting other geologic units in areas where the PRS considers it warranted based on the findings of the Paleontological Resources Technical Report or preconstruction surveys. In areas of the CP subject to monitoring, monitoring will initially be conducted full-time for ground disturbance activities. However, the PRMMP may provide for monitoring frequency in a given location to be reduced once approximately 50 percent of the ground disturbance activity has been completed, if the reduction is appropriate based on the implementing PRS's professional judgment in consideration of actual site conditions.
- Provisions, if recommended by the PRS, for paleontological monitoring of specific construction drilling operations. In general, small-diameter (i.e., smaller than 18 inches)

drilling operations or drilling operations using bucket augers tend to pulverize affected sediments and contained fossils and are typically not monitored. The section in the PRMMP addressing monitoring for drilling operations will rely, in part, on the information supplied by the CP design and geotechnical teams, but will also take into consideration the nature, depth, and location of drilling needed, and the anticipated equipment and staging configurations.

- Provisions for the content development and delivery of paleontological resources WEAP training.
- Provisions for in-progress documentation of monitoring (and, if applicable, salvage/recovery operations) via "construction dailies" or a similar approved means.
- Provisions for a "stop work, evaluate, and treat appropriately" response in the event of a known or potential paleontological discovery, including finds in highly sensitive geologic units as well as finds, if any, in geologic units identified as less sensitive, or nonsensitive, for paleontological resources.
- Provisions for sampling and recovery of unearthed fossils consistent with SVP *Standard Procedures* (SVP 2010) and the SVP *Conditions of Receivership* (SVP 1996). Recovery procedures will provide for recovery of both macrofossils and microfossils.
- Provisions for acquiring a repository agreement from an approved regional repository for the curation, care, and storage of recovered materials, consistent with the SVP *Conditions of Receivership* (SVP 1996). If more than one repository institution is designated, separate repository agreements must be provided.
- Provisions for preparation of a final monitoring and mitigation report that meets the requirements of the Caltrans *Standard Environmental Reference* Chapter 8 provisions for the Paleontological Monitoring Report and Paleontological Stewardship Summary (Caltrans 2014).
- Provisions for the preparation, identification, analysis, and curation of fossil specimens and data recovered, consistent with the SVP *Conditions of Receivership* (SVP 1996) and specific requirements of the designated repository institution(s).

7.2.4 GEO-IAMF#14: Provide WEAP Training for Paleontological Resources

Prior to groundbreaking for each CP within the project section, the Authority-designated contractor will provide paleontological resources WEAP training delivered by the PRS. Management and supervisory personnel and construction workers involved with ground-disturbing activities will be required to take this training before beginning work on the project. Refresher training will also be made available to management and supervisory personnel and workers as needed, based on the judgment of the PRS.

At a minimum, paleontological resources WEAP Training will include information on:

- Coordination between construction staff and paleontological staff
- Construction and paleontological staff roles and responsibilities in implementing the PRMMP
- The possibility of encountering fossils during construction
- The types of fossils that may be seen and how to recognize them
- Proper procedures in the event fossils are encountered, including the requirement to halt work in the vicinity of the find and procedures for notifying responsible parties in the event of a find

Training materials and formats may include, but are not necessarily limited to, in-person training, prerecorded videos, posters, and informational brochures that provide contacts and summarize procedures in the event paleontological resources are encountered. WEAP training contents will be subject to review and approval by the Authority. Paleontological resources WEAP training may be provided concurrently with cultural resources WEAP training.

On completion of any WEAP training, the Authority-designated contractor will require workers to sign a form stating that they attended the training and understand and will comply with the information presented. Verification of paleontological resources WEAP training will be provided to the Authority by the Authority-designated contractor.

7.2.5 GEO-IAMF#15: Halt Construction, Evaluate, and Treat If Paleontological Resources Are Found

Consistent with the PRMMP, if fossil materials are discovered during construction, regardless of the individual making the discovery, the activity in the immediate vicinity of the discovery will halt and the find will be protected from further disturbance. If the discovery is made by someone other than the PRS or paleontological resource monitors(s), the person who made the discovery will immediately notify construction supervisory personnel, who will in turn notify the PRS. Notification to the PRS will take place promptly (prior to the close of work the same day as the find), and the PRS will evaluate the find and prescribe appropriate treatment as soon as feasible. Work may continue on other portions of the CP while evaluation (and, if needed, treatment) takes place, as long as the find can be adequately protected in the judgment of the PRS.

If the PRS determines that treatment (i.e., recovery and documentation of unearthed fossil[s]) is warranted, such treatment, and required reporting, will proceed consistent with the PRMMP. The Authority-designated contractor will be responsible for ensuring prompt and accurate implementation, subject to verification by the Authority.

The stop-work requirement does not apply to drilling operations because drilling typically cannot be suspended in mid-course. However, if finds are made during drilling, the same notification and other follow-up requirements will apply. The PRS will coordinate with construction supervisory and drilling staff regarding the handling of recovered fossils.

The requirements of this IAMF will be detailed in the PRMMP and presented as part of the paleontological resources WEAP training.

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9 PREPARER QUALIFICATIONS

Project Role	Name, Credential	Qualifications
Paleo Environmental Associates		
Principal Author	Bruce Lander, PhD	25 years of experience PhD, Paleontology, University of California, Berkeley M.A., Paleontology, University of California, Berkeley B.S., Geology, University of California, Los Angeles Meets the qualifications of Principal Paleontologist as defined by Caltrans Standard Environmental Reference, Vol 1, Chapter 8.
ICF		
Author	Karen Crawford	28 years of experience M.A., Anthropology, University of California, Davis B.A., Anthropology, California State University, Long Beach
Secondary Author, Quality Assurance/Quality Control	James R. Allen	17 years of experience Professional Geologist No. 8335. Bachelor of Science and Master of Science degrees in geology from Sonoma State University and California State University, San Jose, respectively. Meets the qualifications of Principal Paleontologist as defined by Caltrans Standard Environmental Reference, Vol 1, Chapter 8.
Quality Assurance/Quality Control	Mark Robinson	30 years of experience M.S., Anthropology, University of Oregon M.A., English, University of Oregon B.A., Geology, University of Montana Mark C. Robinson, M.S., Anthropology, B.A. Geology, RPA, who meets the Secretary of the Interior's professional qualification standards for work in prehistoric archaeology, reviewed and edited this report. Mr. Robinson has more than 30 years of experience in archaeology, geoarchaeology, and geological research.
Quality Assurance/Quality Control	Debra Einstein Leight	23 years of experience B.A., Environmental Analysis and Design, University of California, Irvine
Technical Editor	Saadia Byram	32 years of experience
GIS Analysis and cartography	Brittany Buscombe	22 years of experience B.A., Environmental Analysis and Design, University of California, Irvine

Project Role	Name, Credential	Qualifications
STV Incorporated		
QA/QC Reviewer	Cade Hobbick	25 years of experience M.U.P, Planning, University of Kansas, Lawrence B.A. Architectural Studies, B.A. Environmental Studies, University of Kansas, Lawrence
QA/QC Reviewer	Deborah Connor	18 years of experience M.S., Regenerative Studies, California State Polytechnic University, Pomona B.S., Urban and Regional Planning, California State Polytechnic University, Pomona
QA/QC Reviewer	Doreen Zhao, AICP	9 years of experience M.U.R.P., Urban and Regional Planning, University of California, Los Angeles B.S., Business Management, Arizona State University

APPENDIX A: RECORD SEARCH REPORTS

Natural History Museum
of Los Angeles County
900 Exposition Boulevard
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NATURAL HISTORY MUSEUM
LOS ANGELES COUNTY

Vertebrate Paleontology Section
Telephone: (213) 763-3325
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12 September 2016

ICF International
601 West 5th Street, Suite 900
Los Angeles, CA 90071

Attn: Mark Robinson, Senior Archaeologist / Project Manager

re: Paleontological Resources for the proposed California High Speed Rail Los Angeles to Anaheim Section Project, Los Angeles and Orange Counties, project area

Dear Mark:

I have conducted a thorough search of our Vertebrate Paleontology records for the proposed California High Speed Rail Los Angeles to Anaheim Section Project, Los Angeles and Orange Counties, project area as outlined on the portions of the Los Angeles, Southgate, Whittier, La Habra, and Anaheim USGS topographic quadrangle maps that you sent to me via e-mail on 23 August 2016. We have two vertebrate fossil localities that lie either within or adjacent to the proposed project area boundaries, and we do have localities nearby from the same sedimentary units that occur in the proposed project area, either at the surface or at depth.

From the northern terminus of the proposed project area route southward, the route crosses predominately younger Quaternary Alluvium, derived as flood plain deposits from the Los Angeles River that currently flows in a concrete channel adjacent or nearby. Just south of the Santa Monica Freeway (I-10) around Olympic Boulevard though, the proposed project area route crosses exposures of older Quaternary Alluvium.

According to the geologic mapping there are some exposures older Quaternary Alluvium in Montebello west of Rio Hondo crossed by the proposed project area route. Otherwise, there are just younger Quaternary Alluvium deposits at the surface as the proposed project area route courses east-southeastward across the Rio Hondo and San Gabriel River. Beginning around Los

Nettos, as the proposed project area route turns first southeastward then due south in Santa Fe Springs, it crosses exposures of older Quaternary Alluvium. Just south of Leffingwell Road southeastward to near La Cañada Verde Creek, the proposed project area route crosses surface deposits of younger Quaternary Alluvium. Further southeastward to Coyote Creek, the proposed project area route crosses exposures of older Quaternary Alluvium except immediately along La Mirada Creek where the surface deposits consist of younger Quaternary Alluvium.

As the proposed project area route courses first east-southeastward across Brea Creek then due east into Fullerton, the surface deposits consist entirely of younger Quaternary Alluvium. In Fullerton, where the proposed project area route turns south across Fullerton Creek then south-southeastward into Anaheim and finally east-southeastward to its southern terminus at the Santa Ana River, the proposed project area route crosses exclusively younger Quaternary Alluvium, with the deposits probably becoming finer-grained closer to the fluvial source of the Santa Ana River.

Our closest vertebrate fossil locality from these older Quaternary deposits beneath the younger Quaternary Alluvium to the northern portion of the proposed project area is LACM 2032, northeast of the northern terminus of the proposed project area route east of the Golden State Freeway near the intersection of Mission Road and Daly Street, that produced fossil specimens of pond turtle, *Clemmys mamorata*, ground sloth, *Paramylodon harlani*, mastodon, *Mammut americanum*, mammoth, *Mammuthus imperator*, horse, *Equus*, and camel, *Camelops*, at a depth of 20-35 feet below the surface. The pond turtle specimens from locality LACM 2032 were figured in the scientific literature by B.H. Brattstrom and A. Sturn (1959. A new species of fossil turtle from the Pliocene of Oregon, with notes on other fossil *Clemmys* from western North America. Bulletin of the Southern California Academy of Sciences, 58(2):65-71). Just north of locality LACM 2032, still east of the Golden State Freeway (I-5) east of Taylor Junction near the intersection of Workman Street and Alhambra Avenue, we have another older Quaternary locality, LACM 1023, where excavations for a storm drain recovered fossil specimens of turkey, *Meleagris californicus,* sabre-toothed cat, *Smilodon fatalis*, horse, *Equus*, and deer, *Odocoileus*, at unstated depth. A specimen of the turkey, *Meleagris*, from this locality was published in the scientific literature by D. W. Steadman (1980. A Review of the Osteology and Paleontology of Turkeys (Aves: Meleagridinae). Contributions in Science, Natural History Museum of Los Angeles County, 330:131-207).

To the west of this northern portion of the proposed project area route, near the intersection of Hill Street and 12th Street, our locality LACM 1755 from the older Quaternary deposits produced a fossil specimen of horse, *Equus*, at a depth of 43 feet below the street.

Further southward, where the proposed project area route crosses the Long Beach Freeway (I-710) just north of the Los Angeles River, we have two vertebrate fossil localities from Quaternary deposits, LACM 7701-7702, that occur either along or adjacent to the proposed project area. Localities LACM 7701-7702 produced fossil specimens of threespine stickleback, *Gasterosteus aculeatus*, salamander, *Batrachoseps*, lizard, Lacertilia, snake, Colubridae, rabbit, *Sylvilagus*, pocket mouse, *Microtus*, harvest mouse, *Reithrodontomys*, and pocket gopher, *Thomomys*, at depths of 11 to 34 feet below grade.

East of the middle portion of the proposed project area route, north of Leffingwell Road east of La Mirada Boulevard, our older Quaternary deposits is LACM 3347, produced a fossil specimen of horse, *Equus*, at a depth of only two feet below the surface.

East of the southern portion of the proposed project area route, west of the Santa Ana river along Rio Vista Avenue south of Lincoln Avenue, our vertebrate fossil locality LACM 1652 produced a fossil specimen of sheep, *Ovis*. Almost due east of locality LACM 1652, along Fletcher Avenue east of Glassell Street east of the Santa Ana River, our fossil locality LACM 4943 produced a specimen of fossil horse, *Equus*, at a depth of 8-10 feet below the surface.

Even relatively shallow excavations in the proposed project area may well encounter significant fossil vertebrate remains in older Quaternary deposits. Any substantial excavations in the proposed project area, therefore, should be monitored closely to quickly and professionally recover any fossil remains discovered while not impeding development. Sediment samples should also be collected and processed to determine the small fossil potential in these rock units. Any fossils recovered during mitigation should be deposited in an accredited and permanent scientific institution for the benefit of current and future generations.

This records search covers only the vertebrate paleontology records of the Natural History Museum of Los Angeles County. It is not intended to be a thorough paleontological survey of the proposed project area covering other institutional records, a literature survey, or any potential on-site survey.

Sincerely,

Samuel A. McLeod

Samuel A. McLeod, Ph.D.
Vertebrate Paleontology

enclosure: invoice

Natural History Museum
of Los Angeles County
900 Exposition Boulevard
Los Angeles, CA 90007

tel 213.763.DINO
www.nhm.org

Research & Collections

e-mail: paleorecords@nhm.org

November 26, 2023

ICF

Attn: Benjamin Vargas

re: Paleontological resources for the High Speed Rail Los Angeles to Anaheim Project

Dear Benjamin:

I have conducted a thorough search of our paleontology collection records for the locality and specimen data for proposed development at the High Speed Rail Los Angeles to Anaheim project area as outlined on the portion of the Los Angeles, South Gate, Whittier, La Habra, Anaheim, Cajon, Silverwood Lake, Hesperia, and Victorville USGS topographic quadrangle map that you sent to me via e-mail on October 26, 2023.

The following table shows the fossil localities in the collection of the Natural History Museum of Los Angeles County (NHMLA) that have been recorded within the project area:

Locality Number	Location	Formation	Taxa	Depth
LACM VP 7702	Intersection of 26th St and Atlantic Blvd, Bell Gardens	Unknown Formation (Pleistocene; silt)	Fish (*Gasterosteus*); Snake (Colubridae), Rodents (*Thomomys, Microtus, Reithrodontomys)*; Rabbit (*Sylvilagus*)	30 feet bgs

VP, Vertebrate Paleontology; bgs, below ground surface

We have additional fossil localities nearby the project area from the same sedimentary deposits that occur in the proposed project area, either at the surface or at depth.

Locality Number	Location	Formation	Taxa	Depth
LACM VP 7990	Hall of Justice building	Puente Formation, Yorba Member (claystone; siltstone & sandstone layers)	Teleostei (viperfish [*Chauliodus*], cod [Gadiformes], herring/shad/sardines [Clupeidae], mackerel/tuna/bonito [Scombridae], slickheads	Unknown depth (fossil layers at 257-321 ft above mean sea level)

Locality Number	Location	Formation	Taxa	Depth
			[Alepocephalidae], smelts [Bathylagidae], herring smelt [Argentinidae], scaly dragonfish [Stomiatidae], bristlemouths [Gonostomidae])	
LACM VP 5961	Just north of the intersection of 1st & Hill Streets, downtown LA	Puente Formation	Bristlemouth (*Cyclothone*)	Unknown (collected during Metrorail excavations)
LACM VP 7730	LAPD Headquarters; near 2nd St. and Spring St.	Fernando Formation; Repetto Member (massive clayey siltstone)	diversity of plant material & invertebrates as well as over 40 specimens of vertebrates: sharks; rays; bony fishes; bird; & marine mammals	Unknown (261-250 feet above sea level)
LACM VP 1755	Near 12th & Hill Sts	Unknown Formation (Pleistocene)	Horse (*Equus*)	43 ft bgs
LACM VP 3347	11204 Bluefield; Whittier	La Habra Formation (lacustrine silt with caliche and plant detritus)	Horse (*Equus*)	2 feet bgs
LACM VP 3524	North of Malvern Avenue & approximately 1/2 mile west of Gilbert Street; Fullerton	Terrace deposits (silty sandstone)	Ungulata	unknown
LACM VP 4185-4201	Coyote Creek, adjacent to Ralph B Clark Regional Park in West Coyote Hills	La Habra Formation (Pleistocene; sandy silt shot through with caliche)	Bison (*Bison*), camel (*Camelops*), horse (*Equus*), mammoth (*Mammuthus*), mastodon (*Mamut*), elephant clade (Proboscidea), dire wolf *(Canis dirus*), Coyote (*C. latrans*), deer (*Odocoileus*), dwarf pronghorn (*Capromeryx*),unidentified artiodactyl; sea duck (*Chendytes*)	Surface, in creek bed
LACM VP 1224, 3352, 3498, 3512, CIT209	Along the west bank of the Mojave River in Victorville, California	Shoemaker Gravel Formation	Mammoth (*Mammuthus*), Horse (*Equus*), Camel family (Camelidae), deer (Cervidae); antelope (Antilocapridae)	Unknown
LACM VP 3353	Second Street at sand & gravel pit; near top of bluff, west bank of Mojave River	Shoemaker Gravel Formation	Horse (*Equus*)	unknown
LACM VP 5943	north side of Black Butte, west of Adelanto	Unknown Formation (Holocene)	Lizard (*Lacertilia*); snake (*Ophidia*); rabbit (Lagomorpha); rodent (Rodentia)	0-9 ft bgs
LACM VP 1652	Rio Vista Avenue	Alluvium	Sheep (*Ovis*)	Unknown

Locality Number	Location	Formation	Taxa	Depth
	south of Lincoln Avenue	(Pleistocene)		(excavations for housing project)

VP, Vertebrate Paleontology; IP, Invertebrate Paleontology; bgs, below ground surface

This records search covers only the records of the NHMLA. It is not intended as a paleontological assessment of the project area for the purposes of CEQA or NEPA. Potentially fossil-bearing units are present in the project area, either at the surface or in the subsurface. As such, NHMLA recommends that a full paleontological assessment of the project area be conducted by a paleontologist meeting Bureau of Land Management or Society of Vertebrate Paleontology standards.

Sincerely,



Alyssa Bell, Ph.D.
Natural History Museum of Los Angeles County

enclosure: invoice

APPENDIX B: ASSESSMENT AND MITIGATION OF ADVERSE IMPACTS TO NONRENEWABLE PALEONTOLOGICAL RESOURCES—STANDARD GUIDELINES

Standard Procedures for the Assessment and Mitigation of Adverse Impacts to Paleontological Resources

Society of Vertebrate Paleontology
Impact Mitigation Guidelines Revision Committee

Abstract
Fossils are nonrenewable paleontological resources that are subject to impacts from land development. Procedures are presented for evaluating the potential for impacts of a proposed action on paleontological resources and for mitigating those impacts. Impact mitigation includes pre-project survey and salvage, monitoring and screen washing during excavation to salvage fossils, conservation and inventory, and final reports and specimen curation. The objective of these procedures is to offer standard methods for assessing potential impacts to fossils and mitigating these impacts.

Introduction
Fossils are nonrenewable paleontological resources that are afforded protection by federal, state, and local environmental laws and regulations. The Paleontological Resources Preservation Act (PRPA) of 2009 calls for uniform policies and standards that apply to fossils on all federal public lands. All federal land management agencies are required to develop regulations that satisfy the stipulations of the PRPA. Section 6302 of the PRPA mandates that federal agencies "*shall manage and protect paleontological resources on Federal land using scientific principles and expertise.*" Thus, federal agencies need the help of the professional paleontological community in the formulation and implementation of these PRPA-mandated policies and regulations. The potential for destruction or degradation of paleontological resources on both public and private lands selected for development under the jurisdiction of various governmental planning agencies is recognized. The standard procedures below are intended to be applicable to both private and public lands under the jurisdiction of local, city, county, regional, state, and federal agencies. Protection of paleontological resources includes: (a) assessment of the potential for land to contain significant paleontological resources which could be directly or indirectly impacted, damaged, or destroyed by proposed development and (b) formulation and implementation of measures to mitigate these adverse impacts, including permanent preservation of the site and/or permanent preservation of salvaged fossils along with all contextual data in established institutions.

Assessment of the Paleontological Potential of Rock Units
Rock units are described as having (a) high, (b) undetermined, (c) low, or (d) no potential for containing significant paleontological resources.

High Potential
Rock units from which vertebrate or significant invertebrate, plant, or trace fossils have been recovered are considered to have a high potential for containing additional significant paleontological resources. Rocks units classified as having high potential for producing paleontological resources include, but are not limited to, sedimentary formations and some volcaniclastic formations (e. g., ashes or tephras), and some low-grade metamorphic rocks which contain significant paleontological resources anywhere within their geographical extent, and sedimentary rock units temporally or lithologically suitable for the preservation of fossils (e. g., middle Holocene and older, fine-grained fluvial sandstones, argillaceous

and carbonate-rich paleosols, cross-bedded point bar sandstones, fine-grained marine sandstones, etc.). Paleontological potential consists of both (a) the potential for yielding abundant or significant vertebrate fossils or for yielding a few significant fossils, large or small, vertebrate, invertebrate, plant, or trace fossils and (b) the importance of recovered evidence for new and significant taxonomic, phylogenetic, paleoecologic, taphonomic, biochronologic, or stratigraphic data. Rock units which contain potentially datable organic remains older than late Holocene, including deposits associated with animal nests or middens, and rock units which may contain new vertebrate deposits, traces, or trackways are also classified as having high potential.

Undetermined Potential
Rock units for which little information is available concerning their paleontological content, geologic age, and depositional environment are considered to have undetermined potential. Further study is necessary to determine if these rock units have high or low potential to contain significant paleontological resources. A field survey by a qualified professional paleontologist (see "definitions" section in this document) to specifically determine the paleontological resource potential of these rock units is required before a paleontological resource impact mitigation program can be developed. In cases where no subsurface data are available, paleontological potential can sometimes be determined by strategically located excavations into subsurface stratigraphy.

Low Potential
Reports in the paleontological literature or field surveys by a qualified professional paleontologist may allow determination that some rock units have low potential for yielding significant fossils. Such rock units will be poorly represented by fossil specimens in institutional collections, or based on general scientific consensus only preserve fossils in rare circumstances and the presence of fossils is the exception not the rule, e. g. basalt flows or Recent colluvium. Rock units with low potential typically will not require impact mitigation measures to protect fossils.

No Potential
Some rock units have no potential to contain significant paleontological resources, for instance high-grade metamorphic rocks (such as gneisses and schists) and plutonic igneous rocks (such as granites and diorites). Rock units with no potential require no protection nor impact mitigation measures relative to paleontological resources.

Discussion
It is extremely important to distinguish between archaeological and paleontological resources (see "definitions" section in this document) when discussing the paleontological potential of rock units. The boundaries of an archaeological resource site define the areal/geographic extent of an archaeological resource, which is generally independent from the rock unit on which it sits. However, paleontological sites indicate that the containing rock unit or formation is fossiliferous. Therefore, the limits of the entire rock unit, both areal and stratigraphic, define the extent of paleontological potential.

It is also important to ascertain if the paleontological resources are uniformly distributed throughout a rock unit or if they are confined as localized concentrations to specific members or facies. Using this information, paleontologists can develop maps which suggest areas that are likely to contain paleontological resources. These maps (Paleontological Resource Potential Maps) form the basis for preliminary planning decisions on which areas require a detailed paleontological resource impact assessment by a qualified professional paleontologist and which areas do not. Lead agency evaluation of a proposed project relative to such paleontological resource potential maps should trigger a "request for

opinion" from a qualified professional paleontologist, state paleontological clearing house, or an accredited institution with an established paleontological repository housing paleontological resources from the region of interest.

The determination of the paleontological resource potential of an area proposed for development is first founded on a review of pertinent geological and paleontological literature, geological maps, and on records in fossil locality databases of paleontological specimens deposited in institutions (e. g., museums and universities). This preliminary review may clearly indicate that particular rock units have known high potential. If the paleontological resource potential of a rock unit cannot be delimited from the literature search and specimen records, a field survey by a qualified professional paleontologist will be necessary to determine the fossiliferous potential and the distribution or concentrations of fossils within the extent of the rock units present in a specific project area. The field survey may need to extend outside the defined project limits to areas where the relevant rock units are better exposed. If the rock units in an area are determined to have a high potential for containing paleontological resources, a program to mitigate impacts to fossil resources must be developed. In areas containing rock units with high potential, a preconstruction survey (intensive reconnaissance) may be necessary to locate surface concentrations of fossils which might require salvage in advance of excavations to avoid delays to construction schedules.

Measures to Mitigate Adverse Impacts from Development

Measures for adequate protection or salvage of significant paleontological resources are applied to areas determined to contain rock units that have either a high or undetermined potential for containing significant fossils. The Paleontological Resource Preservation Act of 2009 establishes a uniform code for decision-making on all federal lands. Specific mitigation measures generally need not be developed for areas of low paleontological potential. Developers (public and private) and contractors should be made aware, however, that if there is not an on-site monitor it will be necessary to contact a qualified professional paleontologist if fossils are unearthed in the course of excavation. This contingency should be planned for in advance. In order to save time and project delays, in the advance planning phases of a project the developer should contact a qualified professional paleontologist and arrange for the salvage of any unanticipated fossils. The paleontologist will then salvage the fossils and assess the necessity for further mitigation measures, if applicable. Decisions regarding the intensity of the paleontological resource impact mitigation program will be made by the project paleontologist on the basis of the significance of the paleontological resources, and their biostratigraphic, biochronologic, paleoecologic, taphonomic, and taxonomic attributes, not on the ability of a project proponent to fund the paleontological resource impact mitigation program.

In areas determined to have high or undetermined potential for significant paleontological resources, an adequate program for mitigating the impact of development must include:

1. an intensive field survey and surface salvage prior to earth moving, if applicable;

2. monitoring by a qualified paleontological resource monitor (see "definitions" section in this document) of excavations in previously undisturbed rock units;

3. salvage of unearthed fossil remains and/or traces (e. g., tracks, trails, burrows, etc.);

4. screen washing to recover small specimens, if applicable;

5. preparation of salvaged fossils to a point of being ready for curation (i. e., removal of enclosing matrix, stabilization and repair of specimens, and construction of reinforced support cradles where appropriate);

6. identification, cataloging, curation, and provision for repository storage of prepared fossil specimens; and

7. a final report of the finds and their significance.

All phases of mitigation must be supervised by a qualified professional paleontologist who maintains the necessary paleontological collecting permits and repository agreements. All field teams will be supervised by a paleontologist qualified to deal with the significant resources that might be encountered. The lead agency must assure compliance with the measures developed to mitigate impacts of excavation. To assure compliance at the start of the project, a statement that confirms the site's paleontological potential, confirms the repository agreement with an established public institution, and describes the program for impact mitigation, must be deposited with the lead agency and contractor(s) before any ground disturbance begins. In many cases, it will be necessary to conduct a salvage program prior to grading to prevent damage to known paleontological resources and to avoid delays to construction schedules. The impact mitigation program must include preparation, identification, cataloging, and curation of any salvaged specimens. All field notes, photographs, stratigraphic sections, and other data associated with the recovery of the specimens must be deposited with the institution receiving the specimens. Since it is not professionally acceptable to salvage specimens without preparation and curation of specimens and associated data, costs for this phase of the program must be included in the project budget. The mitigation program must be reviewed and accepted by the lead agency. If a mitigation program is initiated early during the course of project planning, construction delays due to paleontological salvage activities can be minimized or even completely avoided.

Standard Procedures
These standard procedures for paleontological resource impact assessment and mitigation are designed to apply to areas containing rock units with high, low, and undetermined paleontological resource potential.

Assessment before Construction Starts
An adequate preconstruction paleontological resource impact assessment is the key to developing an adequate paleontological resource impact mitigation program. Only a professional paleontologist is qualified to prepare a paleontological resource impact assessment. An adequate assessment of potential impacts typically includes all the following elements:

1. Literature Search—A review of the pertinent paleontological, geological, geotechnical, and environmental literature provides an information baseline for evaluating the extent of previous paleontological work in an area. Such a review also provides a fundamental basis for formulating mitigation plans and for understanding the significance of paleontological resources. The preconstruction assessment should also include examination of geotechnical reports, borehole logs, and geologic cross sections to address whether project excavations will impact rock units with high potential.

2. Records Search—A review of institutional localities and specimen records provides a means for determining the extent of previous fieldwork and fossil recovery in, and adjacent to, an area of interest. This task can be accomplished either by sending a written request for information to the relevant institution(s) or visiting the institution to review the records directly. A simple, on-line search of an institution's records is often incomplete and inadequate for determining the number and extent of known fossil localities in an area.

3. Consultation with Others—The preconstruction assessment should include consultation with geologists and paleontologists knowledgeable about the paleontological resource potential of rock units present in the vicinity of the proposed project.

4. Field Survey—The assessment should include a field survey by a qualified professional paleontologist and approved staff, as needed, to determine the paleontological potential of each rock unit, to re-examine any known fossil localities on or near the project, to search for unknown fossil localities, and to delimit the specific boundaries of rock units within the project area.

5. Reports—A paleontological resource impact assessment report and a project-specific paleontological resource impact mitigation program should be prepared based upon data gathered during the assessment.

6. Agency Confirmation—Prior to ground disturbance, the lead agency should review the paleontological resource impact assessment and proposed mitigation program to determine the adequacy of the proposed program.

7. Repository Agreement—The project paleontologist should have a repository agreement arranged prior to the start of earth-moving for the project.

8. Pre-excavation meetings—The project paleontologist should hold pre-excavation meetings with representatives of the lead agency, the developer or project proponent, and contractors to

explain the importance of fossils, the laws protecting fossils, the need for mitigation, the types of fossils that might be discovered during excavation work, and the procedures that should be followed if fossils are discovered. Defining the process of salvaging fossils will reduce project delays.

Paleontological Resource Mitigation Plan

Prior to any ground disturbance at the project site, a paleontological resource mitigation plan should be prepared by a qualified professional paleontologist, who then will implement the plan as the project paleontologist, program supervisor, and principal investigator. The paleontological resource mitigation plan establishes the ground rules for the entire paleontological resource mitigation program. Excavations at the project site may reveal conditions unanticipated when the paleontological resource mitigation plan was prepared. These conditions may require additional tasks not described in the previously prepared project impact mitigation plan. The project paleontologist should be the person who makes these project-specific modifications to the paleontological resource mitigation program in consultation with representatives of the lead agency and project proponent.

Adequate Monitoring

For excavations in rock units of known high potential, the project paleontologist or paleontological monitor will need to be present initially during 100% of the earth-moving activities. After 50% of excavations are complete in either an area or rock unit and no fossils of any kind have been discovered, the level of monitoring can be reduced or suspended entirely at the project paleontologist's discretion. For excavations in rock units with high or undetermined potential, it is never acceptable to have excavation monitoring done by construction workers, engineers, or persons who are not qualified paleontological resource monitors (see "definitions" section below). For excavations in rock units determined by a qualified professional paleontologist to have low potential, non-paleontologists may monitor for fossils. If potential paleontological resources are discovered during excavations in a rock unit with low potential, all ground disturbance in the vicinity of the find should stop immediately until a qualified professional paleontologist can assess the nature and importance of the find and recommend appropriate salvage, treatment, and future monitoring and mitigation.

Paleontologists who monitor excavations must be experienced in locating and salvaging fossils, and collecting necessary associated critical data. The paleontological resource monitor must be able to document the stratigraphic context of fossil discovery sites. Paleontological resource monitors must be properly equipped with tools and supplies to allow rapid removal of specimens. The monitor must be empowered to temporarily halt or redirect the excavation equipment away from fossils to be salvaged. Some lead agencies require that paleontological monitors be approved prior to performing any field work.

To reduce potential delays to excavation schedules, provision must be made in the mitigation program for additional assistants to monitor or help in removing large or abundant fossils. If many pieces of heavy equipment are in use simultaneously but at diverse locations, each location will need to be individually monitored.

Macrofossil Salvage

Many specimens recovered from excavations are readily visible to the eye and large enough to be easily recognized and removed. Upon discovery of such macrofossils, the monitor will flag the fossiliferous area for avoidance until the project paleontologist can evaluate the resource and develop plans for removal/salvage of these specimens. Some fossil specimens may be fragile and require consolidation

with archival quality media (e. g., Acryloid, Butvar, or Vinac) before moving. Others may require protection by encasing them within a plaster jacket before removal to a laboratory for later preparation and conservation. Occasionally specimens encompass all or much of a skeleton and will require moving either as a whole or in multiple blocks for later preparation. Such specimens require time to excavate and strengthen with a hardening solution before removal and the patience and understanding of the contractor to recover the specimens properly. It is thus important that contractors and developers are fully aware of the importance and fragility of fossils for their recovery to be undertaken with the optimum chances of successful extraction.

Avoidance and Site Protection

In exceptional instances the process of preconstruction assessment or construction monitoring itself may reveal a fossil occurrence of such importance that salvage or removal is unacceptable to all concerned parties. In such cases, the project design may need to be modified to avoid, protect and/or exhibit the fossil occurrence, e. g., in the floor or wall of a museum or as a basement exhibit in a mall. Under such circumstances, the site may be declared and dedicated as a protected resource of public value. Associated fossil fragments salvaged from such a site should be placed in an approved institutional repository. Federal land managers have the ability to set aside such exceptional areas providing documentation supports special management considerations.

Microfossil Salvage

Many significant vertebrate fossils (e. g., small mammal, bird, reptile, amphibian, or fish remains) are too small to be readily visible within the sedimentary matrix and are referred to as "microvertebrates". Small fossils also include non-vertebrate paleoenvironmental indicators (e. g., foraminifers, small gastropods, and plant seeds). Fine-grained sedimentary horizons (e. g., mudstones and paleosols) most often contain such fossils, which are typically recovered through a process of bulk matrix sampling followed by screen washing through 20 and/or 30 mesh screens. If indicators of potential microvertebrate fossils are found (e. g., plant debris, abundant mollusks, clay clasts, carbonate-rich paleosols, or mudstones) screening of a "test sample" (0.4 cubic yard/meter, ~600 lbs) may produce significant returns and indicate whether or not a larger sample needs to be screen washed. An adequate sample (standard sample) consists of approximately 4.0 cubic yards/meters (6,000 lbs or 2,500 kg) of matrix from each site, horizon, or paleosol. However, the uniqueness of the microvertebrate fossils recovered may justify screen washing even larger amounts. With this possibility in mind, two standard samples (~8.0 cubic yards/meters) or more as determined by the project paleontologist should be collected when the discovery is first made and set aside in case processing of a larger sample is later determined to be necessary. The developer must recognize that funding must be available to process these bulk matrix samples, thereby reducing volume to facilitate cost-effective storage of fossil specimens.

To avoid construction delays, samples of matrix may need to be removed from the project site and processed elsewhere. Chemicals (e. g., detergents, weak acids, orange oil, etc.) may be necessary to facilitate the breakdown of matrix. In some cases the concentrate will need to be further processed using heavy liquids (e. g., zinc bromide, polytungstate, or tetrabromide) to remove mineral grains and create a concentrate enriched with microvertebrate bones and teeth. The concentrate should be directly examined under a microscope to locate and remove individual microfossils.

Samples

To place fossils within a temporal context, dating of rock units may be necessary. If available, samples of volcanic ash and organic carbon should be collected for radiometric and/or thermoluminescence dating.

When appropriate, oriented samples should also be collected for paleomagnetic analysis. In addition, samples of fine-grained matrices should be collected from measured stratigraphic sections for microfossil (e. g., pollen, spores, dinoflagellates, ostracodes, diatoms, foraminifers, etc.) analyses. Other matrix samples may need to be collected and retained with the samples submitted to the repository institution for future analysis, for clast source analysis, or as witness to the source rock unit and possibly for procedures not yet envisioned. The project paleontologist should determine which of these samples should be immediately processed and which samples can be stored for later processing. Many museums will not accept such rock or sediment samples for curation and storage.

Preparation

Salvaged specimens must be prepared for identification and curation (not exhibition). This means removal of all or most of the enclosing sediment to reduce the specimen volume, increase surface area for the application of consolidants/preservatives, provide repairs and stabilization of fragile/damaged areas on a specimen, and allow identification of the fossils. Large specimens may require construction of reinforced plaster or fiberglass cradles. Removal of excess matrix from macrofossils during the preparation process will facilitate identification, reduce storage space, and reduce the cost of storage. Project paleontologists need to be aware that many museums will not accept specimens that are not fully prepared for permanent curation.

Identification and Cataloging

Specimens must be identified by competent qualified paleontological specialists to the lowest taxonomic level possible. Ideally, identification of individual specimens will be to genus and species and to skeletal element. Specimens must be cataloged and a complete list of specimens to be accessioned into the collections must be prepared for the curator of the repository institution. Batch identification and batch numbering (e. g., “mammals, 75 specimens”) is unacceptable.

Analysis

Although academic research questions should dictate the field methods and types of data recorded, the overall goal of a paleontological resource mitigation program is not to conduct research but rather to discover and salvage significant fossil remains, record relevant stratigraphic and taphonomic data, and curate and permanently house the salvaged fossil remains for future study. However, before salvaged specimens are curated, either the project paleontologist or a competent qualified paleontological specialist should determine the significance and importance of the salvaged specimens and this information should be included in the final report.

Storage

Adequate curation and storage of salvaged specimens in an approved repository institution is an essential goal of the paleontological mitigation program. Adequate storage must include curation of individual specimens into the collections of a recognized, not-for-profit repository with a permanent curator, such as a museum or a university (institution). A complete set of GPS data, field notes, photographs, locality forms, and stratigraphic sections must accompany the fossil collections. Specimens must be stored in a fashion that allows retrieval of specific, individual specimens by future researchers.

Specific requirements of the designated repository must be established prior to the start of the project, field salvage work, and laboratory analysis. Adequate advance notice of funds required by the repository for curation is needed for the benefit of project funding. Costs of the project should cover the necessary curatorial supplies such as, but not limited to, trays, vials, foam, and storage cabinets or shelves to provide for the appropriate curation of the specimens.

Reporting

1) Interim report
At the close of the excavation phase of a project, an interim report should be prepared. This interim report should summarize exceptional fossil discoveries, note areas where monitoring occurred and fossils were collected, and list tasks remaining for preparation, identification, and curation of the salvaged specimens. In the interim report, the preconstruction repository agreement should be appended and any additional repository considerations and costs should be described.

2) Final report
After preparation, identification, analysis of significance, and curatorial inventory of the salvaged specimens is complete, a final report must be prepared by the project paleontologist including a summary of the field and laboratory methods, site geology and stratigraphy, faunal/floral list(s), and a brief statement of the significance and relationship of the fossils discovered to similar fossils found elsewhere The final report should emphasize the discovery of any new or rare taxa, or paleoecological or taphonomic significance. A complete set of field notes, geologic maps, stratigraphic sections, and a list of identified specimens must be included in or accompany the final report. This report should be finalized only after all aspects of the mitigation program are completed, including preparation, identification, cataloging, and curatorial inventory.

The final report (with any accompanying documents) and repository curation of specimens and samples constitute the goals of a successful paleontological resource mitigation program. Full copies of the final report should be deposited with both the lead agency and the repository institution with the request that all locality data remain confidential and not made available to the general public.

Compliance
From the beginning of the project, the lead agency should assure compliance with measures to protect fossil resources by:

1. requesting during initial planning phases an assessment and program for impact mitigation that is consistent with these SVP Standard Procedures;

2. ensuring the adequacy of the proposed mitigation measures;

3. acknowledging arrangements for salvaged specimens to be permanently housed in an institutional paleontological repository;

4. ensuring that the paleontological resource mitigation program is supervised by a qualified professional paleontologist;

5. ensuring that all monitoring for paleontological resources is performed by qualified paleontological resource monitors;

6. inspecting the monitoring program in the field periodically during project construction;

7. ensuring that specimens are prepared, identified, cataloged, and properly curated;

8. requiring an interim and final report before issuing final occupancy permits or equivalent documents; and

9. ensuring that the final report is complete and adequately describes the methods and results of the mitigation program.

The project paleontologist should be responsible for:

1. assessing potential impacts to paleontological resources and developing a program for impact mitigation during initial planning phases;

2. obtaining a repository agreement, and ensuring repository acceptance of specimens;

3. ensuring implementation of the mitigation measures; and

4. preparing the interim and final reports.

Acceptance of the final report by the lead agency signifies completion of the program of mitigation for the project. Review and approval of the final report by a qualified professional paleontologist designated by the lead agency will determine the effectiveness of the program and adequacy of the report. Inadequate performances in either area comprise noncompliance, and may result in the lead agency removing the project paleontologist from its list of qualified professional paleontological consultants.

Definitions

A QUALIFIED PROFESSIONAL PALEONTOLOGIST (Principal Investigator, Project Paleontologist) is a practicing scientist who is recognized in the paleontological community as a professional and can demonstrate familiarity and proficiency with paleontology in a stratigraphic context. A paleontological Principal Investigator shall have the equivalent of the following qualifications:

1. A graduate degree in paleontology or geology, and/or a publication record in peer reviewed journals; and demonstrated competence in field techniques, preparation, identification, curation, and reporting in the state or geologic province in which the project occurs. An advanced degree is less important than demonstrated competence and regional experience.
2. At least two full years professional experience as assistant to a Project Paleontologist with administration and project management experience; supported by a list of projects and referral contacts.
3. Proficiency in recognizing fossils in the field and determining their significance.
4. Expertise in local geology, stratigraphy, and biostratigraphy.
5. Experience collecting vertebrate fossils in the field.

PALEONTOLOGICAL RESOURCE MONITORS shall have the equivalent of the following qualifications:

1. BS or BA degree in geology or paleontology and one year experience monitoring in the state or geologic province of the specific project. An associate degree and/or demonstrated experience showing ability to recognize fossils in a biostratigraphic context and recover vertebrate fossils in the field may be substituted for a degree. An undergraduate degree in geology or paleontology is preferable, but is less important than documented experience performing paleontological monitoring, or
2. AS or AA in geology, paleontology, or biology and demonstrated two years experience collecting and salvaging fossil materials in the state or geologic province of the specific project, or
3. Enrollment in upper division classes pursuing a degree in the fields of geology or paleontology and two years of monitoring experience in the state or geologic province of the specific project.

4. Monitors must demonstrate proficiency in recognizing various types of fossils, in collection methods, and in other paleontological field techniques.

ASSOCIATED CRITICAL DATA includes adequate field notes, sketches of stratigraphic sections, geologic maps, and site and specimen photos. Associated critical data may also include samples of organic carbon and volcanic ash for radiometric dating, oriented samples for paleomagnetic analysis, samples for microfossil analysis, and samples for determining the sediment source.

A **PALEONTOLOGICAL REPOSITORY** is a not-for-profit museum or university approved by the lead agency and employing a permanent curator responsible for paleontological records and specimens. Such an institution assigns accession, locality, and/or catalog numbers to individual specimens that are stored and conserved to ensure their preservation under adequate security against theft, loss, damage, fire, pests, and adverse climate conditions. Specimens will be stored in a stable environment away from flammable liquids, corrosive chemicals, organic materials subject to mildew, and sources of potential water damage. Specimens must have all modifications, preparation techniques, etc. documented and linked with the specimen. The repository will also archive lists of collected specimens, and any associated field notes, maps, photographs, diagrams, or other data. The repository must have procedures for tracking specimens removed from storage for study, preparation, exhibit, or loan. The repository must make its collections of cataloged specimens available for study by qualified researchers.

ARCHAEOLOGICAL RESOURCES are human remains and items or artifacts associated with human cultures. If paleontological resources are determined to be in close stratigraphic association with human remains or human manufactured items, or if fossils can be demonstrated to be intentionally modified by humans, they are also considered archaeological resources.

SIGNIFICANT PALEONTOLOGICAL RESOURCES are fossils and fossiliferous deposits, here defined as consisting of identifiable vertebrate fossils, large or small, uncommon invertebrate, plant, and trace fossils, and other data that provide taphonomic, taxonomic, phylogenetic, paleoecologic, stratigraphic, and/or biochronologic information. Paleontological resources are considered to be older than recorded human history and/or older than middle Holocene (i. e., older than about 5,000 radiocarbon years).

A **LEAD AGENCY** is the agency responsible for addressing impacts to resources that a specific project might cause, and for ensuring compliance with approved mitigation measures.

PALEONTOLOGICAL POTENTIAL is the potential for the presence of significant paleontological resources. All sedimentary rocks, some volcanic rocks, and some low-grade metamorphic rocks have potential to yield significant paleontological resources. Paleontological potential is determined only after a field survey of a rock unit in conjunction with a review of available literature and relevant paleontological locality records.

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APPENDIX C: CONDITIONS OF RECEIVERSHIP FOR PALEONTOLOGICAL SALVAGE COLLECTIONS

submission rate, a publication balance can be achieved by further tightening of standards for acceptance and manuscript length. Clearly, additional measures will be necessary if submissions continue to increase. The two most obvious solutions are: 1) to further increase the length of the journal (which would necessitate a concomitant expansion of the revenue-generating basis for the journal, cost-cutting measures, or both); and 2) a change in the scope and mission of the journal, which would permit the adoption of more stringent rules regarding manuscript acceptance and length. (Richard L. Cifelli and Nicholas C. Fraser)

-- COMMITTEE REPORTS --

Conformable Mitigation Committee

In 1994 the Conformable Mitigation Committee submitted final guidelines for impact mitigation which were published in the Society's *News Bulletin*. The committee recognized that curators and existing collections might be impacted by mitigation collections if they were not received in a proper state. Consequently, in 1995, a restructured committee consisting primarily of curators developed "Conditions of Receivership for Paleontological Resource Salvage Collection."

With the sentiment that "museums are not a dumping ground," committee members provided the accompanying list of 11 conditions for collections derived from salvage projects. These conditions do not necessarily apply to collections acquired during research or collections donated by individuals to repositories. The main purpose of these conditions are to prevent already overtaxed staff and budgets of institutional repositories from being impacted by collections developed during excavations for profit-making ventures.

These conditions of receivership for paleontological resource salvage collections are respectively submitted for comments, suggestions, and additions by membership of SVP.

Final Draft--October 10, 1995

Conditions of Receivership for Paleontologic Salvage Collections

1. The repository museum and its curator maintain the right to accept or refuse the materials.

2. The materials received must fit with the repository museum's mission and policy statements.

3. All repository arrangements must be made with the curator in advance of receipt. All arrangements must be made with the curator in advance of receipt. All arrangements for

inventory numbers and locality numbers must be made in advance. "Museums are not a dumping ground."

4. The museum will act as the trustee for the specimens. A deed of gift from the land owner or agent must be provided. A loan form or M.O.U. must be prepared for specimens from governmental lands.

5. Specimens must receive discrete locality numbers. Locality data must be to the maximum specificity available and plotted on 7.5 minute topographic maps, and as specific as allowed by stratigraphic collecting and field mapping. The repository may require the repositor to bear the cost of entering locality data into computerized data files.

6. All reports prepared to meet mitigation requirements, field notes, and photgraphs must be provided at the time of transfer to the respository museum.

7. Specimens must be delivered to the repository fully prepared and stabilized. Standards of stabilization and modern conservation techniques must be established prior to preparation and must be acceptable to the repository institution. Details of stabilizing materials and chemicals must be provided by the repositor. For microinvertebrates, this means sorting and mounting. For large specimens, including whales, this means removal of all unneccessary materials and full stabilization. Fossiliferous matrix must be washed and processed. Earthquake-proofing includes inventory numbers of corks and in vials. In storage, specimens must be insulated or cushioned to protect each from contact or abrasion. Oversized specimens must be stored on shelves or on racks developed to fit existing constraints of the repository museum. The repositor must provide for all nonstandard materials for storage.

8. Specimens must be individually inventoried in accordance with the established system at the repository museum. The specimen inventory must be acceptable to and meet the requirements of the lead agency. Specimens must be individually inventoried in accordance with the established system at the repository museum. The specimen inventory must be acceptable to and meet the requirements of the lead agency. Specimens must be identified to element and to maximum reasonable taxonomic specificity. Batch or bulk cataloging must be avoided.

9. Specimens must be cataloged in accord with the repository system so that specimens are retrievable to curators and to researchers. The repository museum may require that the repositor bear the cost of having repository staff catalog specimens into computerized data bases.

10. The repository may require the repositor to bear the cost for completing preparation and stabilization, completing inventory, and completing cataloging.

11. There will be a one-time fee charged by the repository for permanent storage of specimens. This fee will be utilized to compensate the repository for storage space, cabinets or shelves, access or aisle space, a retrievable catalog system, additional

preparation, specimen filing, and labor involved in the above. The repository reserves the right to charge the repositor for unpacking and placement of specimens in approved storage cabinets.

Development Committee

In 1994, the Development Committee was charged with a new fundraising initiative to meet the growing financial needs of the Society, in particular, to enable the *Journal of Vertebrate Paleontology* to increase the number of pages published per year and, thereby, reduce the then-current 18-month backlog of manuscripts. A two-year campaign was kicked off at the 1994 annual meeting in Seattle, with two sources of donations to be targeted: (1) the SVP membership, and (2) private individuals and foundations. With the first year of the campaign already behind us, the Development Committee is very pleased to report significant results from both sources.

Regarding the SVP membership, at the 1995 annual meeting in Pittsburgh, Donald Baird donated $65,000 for the *Bibliography of Fossil Vertebrates.* We thank Don for his continued support of the Society and its programs. In addition, over the past year, a mail and telephone campaign netted more than $37,000, with the bulk targeted for the Endowment. To each and every one of you who contributed, the Development Committee and the SVP leadership are sincerely grateful. We also hope that you will renew your pledges for the coming year to help the Society and the *JVP* continue to move forward. New demands have been placed on the *Journal* through markedly increased submissions in the past year.

Regarding private individuals and foundations, since meeting in Pittsburgh, an anonymous private individual has contributed $200,000 to the Society. We are most grateful to this individual for his gift and to those SVP members who helped make this donation a reality. Also, in 1995, the Development Committee submitted a proposal for $25,000 to a private foundation. Although we did not receive an award, SVP gained valuable experience by putting such a proposal together. With needed modifications, this proposal will be submitted to other appropriate foundations in the coming year.

Finally, some new fundraising strategies are being tested or are in the planning stages. Thanks to Catherine Badgley, Emily Giffin, and the rest of the SVP Membership Committee, SVP has entered into marketing of products with the Society's theme or logo. Those SVP members in attendance in Pittsburgh already showed their approval by gobbling up annual meetng and SVP logo pins, mouse pads, and scale bars. We want your suggestions and requests for more items to market in the future. Under Stuart Sumida's initiative, the Development Committee is looking into an SVP Speakers Program, modeled loosely on the Sigma Xi program, with honoraria to be donated to the Society. Your ideas on this or on any other scheme for fundraising are always welcomed. (John R. Wible, Chair)

Education Committee