PALEONTOLOGICAL RESOURCES TECHNICAL REPORT

Draft Supplemental Environmental Impact Statement/ Draft Subsequent Environmental Impact Report

Los Angeles Eastside Corridor

Prepared for:
Los Angeles County Metropolitan Transportation Authority
and
U.S. Department of Transportation
Federal Transit Administration

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The information contained in this technical report is current as of the publication date on the cover. Changes in the evaluation methodology or results may have been made subsequent to the publication of this report. All substantive changes are reflected in the Draft Supplemental Environmental Impact Statement/Draft Subsequent Environmental Impact Report for the Los Angeles Eastside Corridor.

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1.0 INTRODUCTION

1.1 BACKGROUND

This report is one of a series of technical reports prepared in support of the Draft Supplemental Environmental Impact Statement/Draft Subsequent Environmental Impact Report, Los Angeles Eastside Corridor (Draft SEIS/SEIR). Section 1.0 of this report begins with a background of the project and a presentation of the alternatives being evaluated. A description of the affected environment is presented in Section 2.0 to provide information about the baseline conditions in the corridor. Section 3.0 describes the methodology used to conduct the impact evaluation. The potential operational and construction impacts and mitigation for the alternatives being considered are discussed in Sections 4.0 and 5.0. Section 6.0 includes a bibliography.

As part of the Minimum Operable Segment 3 (MOS-3) of the Los Angeles Metro Red Line project, an Alternatives Analysis/Draft Environmental Impact Statement/Draft Environmental Impact Report (AA/DEIS/DEIR) was previously prepared in 1993, and a Final Environmental Impact Statement/Final Environmental Impact Report (FEIS/FEIR) was prepared in 1994. These two documents studied several subway alignments between Union Station in Central Los Angeles and just east of Atlantic Boulevard in the unincorporated community of East Los Angeles. In 1994, after completion of the FEIS/FEIR and the Record of Decision (ROD) by the Federal Transit Administration (FTA), the Metropolitan Transportation Authority (MTA) Board adopted a Locally Preferred Alternative (LPA) for Metro Red Line Segment 3 in the corridor. The Eastside extension was environmentally cleared between Union Station and Whittier/Atlantic Boulevards. At the same time the MTA Board also adopted a LPA for the Metro Red Line in the Mid-City and North Hollywood Corridors. Full Funding Grant Agreements were executed with the Federal Transit Administration (FTA) for an initial segment of the Eastside extension to 1st/Lorena as well as for the Mid-City and North Hollywood segments, and the projects were transitioned into the construction phase.

Subsequently, an evaluation of the current local funding available for the Eastside project and other rail projects in Los Angeles County led to a suspension of work in January 1998. Voters also approved a new County law in November 1998 that restricts the use of local Proposition A and C sales tax revenues for "new subways". The MTA Restructuring Plan adopted in May 1998 called for the agency to study "viable and effective options" for all parts of Los Angeles County, with an emphasis on the corridors in which the rail lines had been suspended. Within the Los Angeles Eastside Corridor, this necessitated the examination of alternative fixed guideway options to heavy rail subway. A Regional Transit Alternatives Analysis (RTAA) Study was completed in 1998 that included a preliminary evaluation of fixed guideway alternatives in the Eastside Corridor as well as in the other corridors where the work was suspended. The study did not make recommendations with regard to preferred fixed guideway transit modes or configurations, but recommended that a Major Investment Study (MIS) level of analysis be conducted to provide more information regarding these choices. To evaluate feasible options, the MTA Board subsequently authorized preparation of a Re-Evaluation/Major Investment Study (MIS) and Draft and Final SEIS/SEIRs for the suspended Metro Red Line Eastside Transit Corridor project.

The Re-Evaluation/MIS for the Eastside Corridor looked at eight build alternatives as well as a No-Build Alternative and a Transportation System Management (TSM) Alternative within a broadened study area from that evaluated in the original AA/DEIS/DEIR and FEIS/FEIR. The study area for the Los Angeles Eastside Corridor extends from Alameda Street in Central Los Angeles east through the Boyle Heights community in the City of Los Angeles and the City Terrace, Belvedere, and East Los Angeles communities of unincorporated Los Angeles County. South and east of the East Los Angeles area, the corridor study area includes major portions of the cities of Montebello, Pico Rivera, and Commerce and

areas that include portions of Monterey Park, Downey, Santa Fe Springs, and Whittier. The eight build alternatives assessed in the Re-Evaluation/MIS included: three at-grade Bus Rapid Transit (BRT) alternatives; two at-grade Light Rail Transit (LRT) Alternatives; one LRT alternative consisting of both at-grade and subway alignment; one hybrid alternative consisting of LRT at-grade alignment with heavy rail subway alignment; and one hybrid alternative consisting of BRT at-grade alignment with heavy rail subway alignment. All of the build alternatives generally would operate between Union Station and the intersection of Whittier Boulevard/Norwalk Boulevard in the City of Whittier. The reader is referred to the *Eastside Transit Corridor Study, Los Angeles, California, Re-Evaluation/MIS* draft report (February 24, 2000) for additional information about the alternatives studied.

Subsequent to completion of the Re-Evaluation/MIS and an extensive public involvement program, the MTA Board directed further study of an alignment that was basically a combination of a shortened segment of two of the LRT alternatives considered. The alignment runs between Union Station on the western terminus to the intersection of Beverly Boulevard/Atlantic Boulevard in East Los Angeles. The board further directed that this alignment, consisting of at-grade as well as a subway segment through a portion of Boyle Heights, be studied assuming use of two alternative modes: LRT and BRT. The board also decided to defer the segment of the alignment east of Atlantic Boulevard that was studied in the Re-Evaluation/MIS from the initial project segment to a potential second phase of the Eastside Corridor. This will be studied in the MTA Long Range Plan initially and may be the subject of a separate MIS. On June 22, 2000, the MTA Board re-examined the BRT mode and determined that this mode should be dropped from further consideration since the Governor's Transportation Initiative committed to funding only the light rail mode.

The FTA, as lead agency, and the MTA are preparing a joint SEIS/SEIR in accordance with the National Environmental Policy Act of 1969 (NEPA) and the California Environmental Quality Act (CEQA). The SEIS/SEIR supplements the information in the 1994 Final EIS/EIR. The SEIS/SEIR assesses the impacts of the LRT Build Alternative that MTA directed for further study. In addition, the No-Build Alternative is assessed in accordance with NEPA and CEQA requirements. The remaining discussion focuses on a description of the alternatives to be assessed in this technical report and in the SEIS/SEIR.

1.2 ALTERNATIVES UNDER CONSIDERATION

1.2.1 No-Build Alternative

The No-Build Alternative as defined by FTA should represent the baseline case consisting of existing and committed elements of the region's transportation plan, excluding the proposed fixed guideway transit investments for the study corridor. The No-Build Alternative includes all highway and transit projects and operations that the region and MTA expect to be in place by the year 2020. These include improvements to the local bus systems and operation of the existing Red, Blue, and Green Lines as well as completion of the Pasadena Blue Line from Union Station to Sierra Madre Villa in Pasadena.

1.2.2 LRT Build Alternative

The LRT Build Alternative introduces the light rail transit (LRT) mode to the Los Angeles Eastside Corridor. The LRT fixed guideway concept would operate in a dual track configuration in the center of selected streets and provide for high platform center station arrangements for the at-grade LRT segments (similar to that in use on the Long Beach Blue Line) and cut-and-cover station boxes for the subway segment (similar, but of shorter length, to that in use on the Metro Red Line subway). LRT is electrically powered and receives its electric power from overhead power lines (like the Long Beach Blue Line and Green Line) within the street rights-of-way or in the tunnel for the subway segment. The LRT Build Alternative is approximately six miles long with eight stations from a connection with the planned

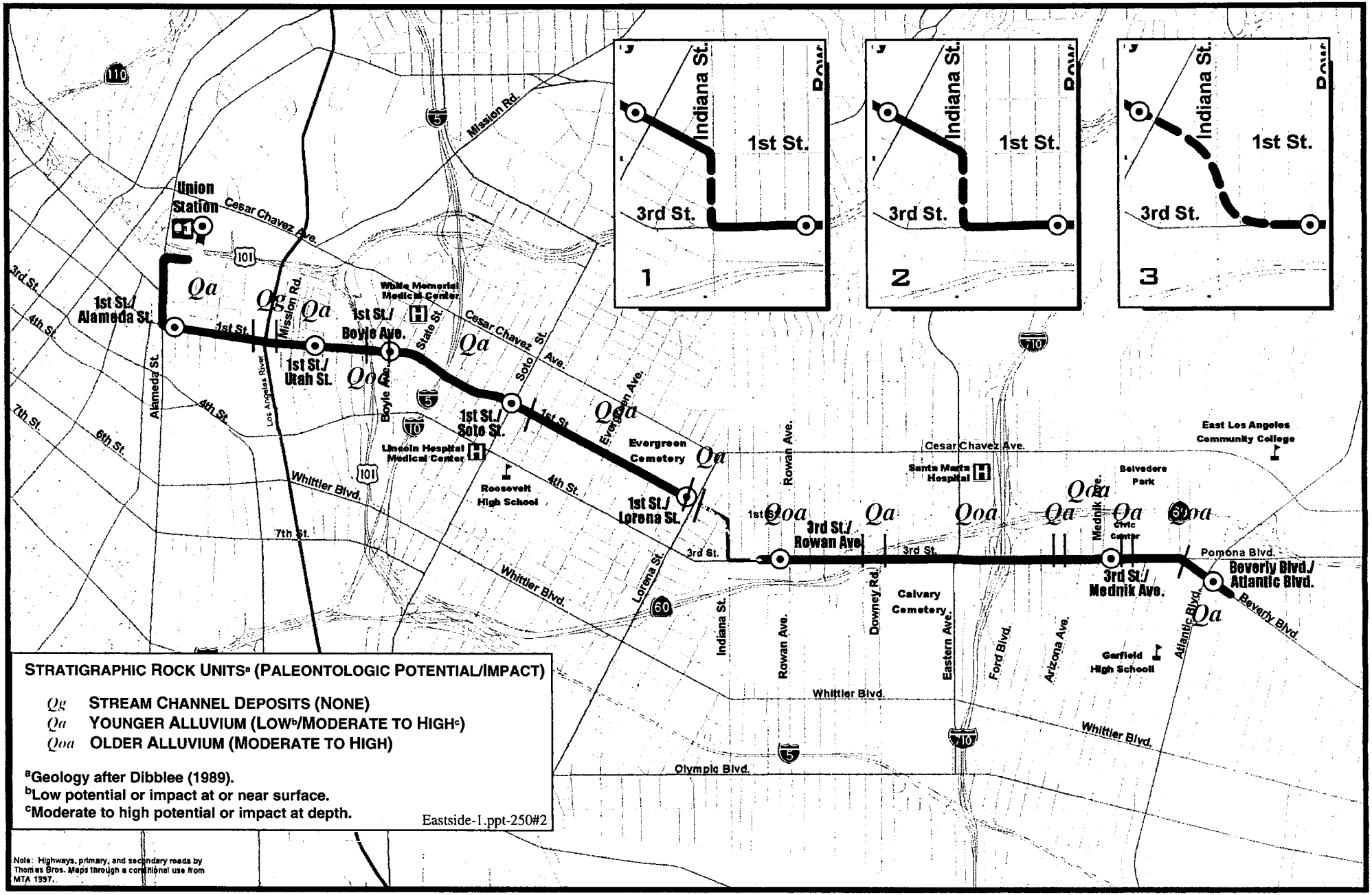
Pasadena Blue Line at Union Station to Beverly and Atlantic Boulevards via Alameda Street, 1st Street, Indiana Street (with the exception of options as discussed below), 3rd Street, and Beverly Boulevard (Figure 1). The Los Angeles Eastside Corridor LRT Build Alternative would operate as an extension of the Pasadena Blue Line.

The alignment begins at Union Station and crosses over US 101 on an aerial structure (approximately 1,000 feet in length) and then gradually becomes an at-grade segment near where it intersects with Alameda Street. The alignment continues south along Alameda Street and then turns east on 1st Street where it continues at grade to Clarence Street in Boyle Heights and then becomes a subway segment. The subway segment traverses underneath or adjacent to 1st Street for about 1.8 miles east to just west of Lorena Street in Boyle Heights.

From about Lorena Street to about Hicks Avenue, three alignment options are being studied. They include: 1) Indiana Street Remove Parking Option; 2) Indiana Street Acquire Additional Right-of-Way Option; and 3) Extended Subway Option. The Indiana Street Remove Parking Option (Option 1) includes an at-grade segment traversing 1st Street east from Lorena Street to Indiana Street where it turns south and continues along Indiana Street to 3rd Street. At 3rd Street, the alignment turns eastward to Hicks Avenue. This option removes the existing parking lanes on both sides of Indiana Street and results in narrower sidewalks along that street. The Indiana Street Acquire Additional Right-of-Way Option (Option 2) is similar to Option 1 except that an additional 26-foot width of right-of-way on the west side of Indiana Street would be required to accommodate the two LRT tracks. However, the parking lanes and current sidewalk widths would be preserved with implementation of Option 2. Indiana Street has a narrower right-of-way (60 feet) than the other streets along the alignment, thus the LRT double-track facility requires additional area from the parking lanes or adjacent right-of-way to accommodate it. The Extended Subway Option (Option 3) involves continuation of the tunnel in a southerly and easterly direction under several properties, including Ramona High School, to a point along 3rd Street just east of Hicks Avenue where the alignment again becomes at grade.

From Hicks Avenue, the alignment travels east on 3rd Street at grade to Beverly Boulevard where it turns to the southeast and continues for a short distance on Beverly Boulevard to a point just east of Atlantic Boulevard. For the at-grade sections, the LRT would operate on existing arterial streets and would generally require removal of one general purpose travel lane in each direction. This design configuration would allow for the retaining of a majority of the on-street parking on the arterial streets that are used. The center sections of all the designated arterial streets would require major reconstruction in order to implement the LRT system.

As mentioned, the LRT Build Alternative consists of eight new stations and one station modification: Union Station (station modification), 1st/Alameda, 1st/Utah, 1st/Boyle, 1st/Soto, 1st/Lorena, 3rd/Rowan, 3rd/Mednik, and Beverly/Atlantic. Under Options 1 and 2, all stations are at grade with the exception of 1st/Boyle and 1st/Soto, which are within the subway segment and 1st/Lorena, which is located in an open cut. For Option 3 (Extended Subway Option), three stations (1st/Boyle, 1st/Soto, and 1st/Lorena) are within the subway segment. The LRT at grade station stops would entail constructing a 270-foot long platform (allows for a maximum of three-car trains) along with pedestrian walkways to allow for safe passage to crosswalks for arriving and departing passengers. The LRT underground stations will include 270-foot platforms.



STRATIGRAPHIC ROCK UNITS[a] (PALEONTOLOGIC POTENTIAL/IMPACT)

- *Qg* STREAM CHANNEL DEPOSITS (NONE)
- *Qa* YOUNGER ALLUVIUM (LOW[b]/MODERATE TO HIGH[c])
- *Qoa* OLDER ALLUVIUM (MODERATE TO HIGH)

[a]Geology after Dibblee (1989).
[b]Low potential or impact at or near surface.
[c]Moderate to high potential or impact at depth.

Eastside-1.ppt-250#2

Note: Highways, primary, and secondary roads by Thomas Bros. Maps through a conditional use from MTA 1997.

0 0.25 0.5 Miles
0 0.25 0.5 0.75 1 Kilometers

LEGEND

- Stations
- At Grade
- Tunnel
- Elevated
- Options Area
- ① - - Indiana Street Remove Parking Option
- ② - - Indiana Street Acquire Additional Right-of-Way Option
- ③ - - Extended Subway Option
- Highway
- Primary Road
- Secondary Road

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Los Angeles Eastside Corridor SEIS/SEIR

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Surficial Geology/ Paleontologic Potential

Figure 1

Two areas for park-and-ride facilities are associated with this alternative. The first is the existing lot at Union Station, which is the western terminus of the Los Angeles Eastside Corridor LRT line. The project does not involve any expansion or improvements to that lot. The second is near the Beverly/Atlantic Station at the eastern terminus of the line. Park-and-ride surface parking for a total of about 200 vehicles would be provided at two locations near the station. One location includes the half-block located at the southwest corner of Beverly and Atlantic Boulevards. A Mobil gasoline station is currently located there and would be acquired and relocated. Approximately 100 spaces would be provided at this site. The other location is the existing parking lot behind (to the east of) the Pep Boys auto parts store that is located on the east side of Atlantic Boulevard north of Beverly Boulevard. MTA intends to enter into negotiations with the owners of Pep Boys to develop a joint use agreement with them for the existing parking lot that contains about 100 spaces. Minor improvements to the Pep Boys lot are anticipated.

The operating plan for the LRT Build Alternative is comprised of two components: 1) the LRT operating line (extension of the Pasadena Blue Line) between Sierra Madre Villa and Beverly/Atlantic Boulevards with five-minute peak service and 12-minute off-peak service; and 2) local connecting bus routes to all stations along the LRT line. Because the individual cars can be "trained" together, the train lengths can then vary from one to three cars depending on the demand and time of day. Local buses with local stops would continue to operate along the same arterial streets as the LRT but would be at lower service frequencies. This will also allow transit patrons to access areas that are not directly served by the LRT station stops. The LRT running time with making stops at each station is estimated to be 16 minutes from Beverly/Atlantic Boulevards to Union Station. Based on the LRT operating plan, the number of trains per hour in the peak direction on the LRT track would be 12 during the peak times and five during the off-peak times.

The LRT operating speeds for the at-grade segments would be similar to existing street-running LRT operations in other parts of Los Angeles. Because of the placement of the LRT track and stations within arterial streets, the maximum speed of operation would be limited by the streets' speed limit (varies from 25 mph to 35 mph) with a 35 mph maximum speed allowed under all circumstances by State PUC regulations. Based on experience with the Long Beach Blue Line operations, the lower speed at-grade operation has less fatalities than high speed (55 mph) operations even though the number of minor accidents are greater with the in-street operation proposed for the Los Angeles Eastside Corridor. The maximum LRT operating speed of the subway portion would be much faster (55 mph) than the at-grade segments because it would not operate along the existing street rights-of-way. The Eastside Corridor would not have high speed surface-running operations in a reserved right-of-way such as exists in the mid corridor of the existing Long Beach Metro Blue Line.

Automobiles and delivery vehicles would operate in a different fashion along the at-grade segments than they do now. In order to maximize the safety of the LRT operation and to minimize private vehicles conflict with the LRT trains, left turns and crossings of the LRT train track would be limited and mostly restricted to major intersecting streets where advanced traffic and train control systems can be implemented. Between major intersections, a six-inch curb next to the travel lane would protect the LRT track section and, therefore, driveways and minor or secondary streets would be limited to right-turns in and out. Private vehicles would not be able to make left turns across the LRT tracks or cross from one side to the other (no straight through movements) between intersections. Private vehicles left turns at designated intersections would be controlled and all safety measures (including the possibility of left-turn gates) would be taken. The mountable curb for the track section would allow for emergency vehicles to park on or cross the track when necessary. All of these changes will be similar to those encountered when a street has a raised center median of any type.

It is expected that the streets where the LRT tracks are located will become more "transit" oriented, and through traffic will be reduced and shifted to other streets within the corridor. On the narrower streets,

left turns may need to be restricted at certain intersections during some portions of the day (probably peak periods) because of the lack of space for a dedicated left turn pocket. The reduction of one traffic lane in each direction would impact the level of service and possible ease of access by automobile to commercial buildings and other public activities. It is expected that, over time, traffic would re-orient itself because many of the streets in the corridor have some available capacity and might accept more traffic and still operate at acceptable levels of service. In addition, the LRT will provide an improved level of service of public transit service, which some may choose in preference to using an automobile.

2.0 AFFECTED ENVIRONMENT

2.1 REGULATORY SETTING

Paleontologic resources, including fossil remains, associated specimen data and corresponding geologic and geographic site data, fossil sites, and the fossil-bearing stratigraphic rock units, are a limited, nonrenewable, and very sensitive scientific and educational resource and, particularly with regard to fossil sites, are afforded protection under the following federal and state environmental legislation (California Office of Historic Preservation, 1983; Lander, in press).

National Environmental Policy Act of 1969 (NEPA) (P.L. 91-190; 31 Stat. 852, 42 U.S.C. 4321-4327).—Requires that important natural aspects of our national heritage be considered in assessing the environmental consequences of a proposed project.

Archaeological and Historic Data Preservation Act of 1974 (P.L. 86-253, as amended by P.L. 93-291; 88 Stat. 174, U.S.C. 469).—Provides for the survey, recovery, and preservation of significant paleontologic data when such data might be destroyed or lost due to a federal, federally licensed, or federally funded project.

California Environmental Quality Act of 1970 (CEQA) (13 Public Resources Code: 21000 *et seq.*).—Requires that public agencies and private interests identify the environmental consequences of their proposed projects on any object or site of significance to the scientific annals of California (Division I, Public Resources Code: 5020.1 [b]).

Guidelines for the Implementation of CEQA, as amended March 29, 1999 (Title 14, Chapter 3, California Code of Regulations: 15000 *et seq.*).—Define procedures, types of activities, persons, and public agencies required to comply with CEQA, and include definitions of significant impacts on a fossil site (Section 15023, Appendix G [5.c]).

Public Resources Code, Section 5097.5 (Stats. 1965, c. 1136, p. 2792).—Defines any unauthorized disturbance or removal of a fossil site or remains on public land as a misdemeanor.

Public Resources Code, Section 30244.—Requires reasonable mitigation of adverse environmental impacts that result from development of public land and affect paleontologic resources.

2.2 STUDY AREA SETTING

Geologic maps, cross sections, and reports covering the Los Angeles Eastside Corridor study area were reviewed to determine the stratigraphic rock units underlying the study area. An archival search was conducted at the Natural History Museum of Los Angeles County (LACM) Vertebrate Paleontology Section (VP) to determine the locations of previously recorded fossil sites in each rock unit in and near the study area, as well as the taxa represented by the fossil remains recovered at these sites. Paleontologic reports were reviewed for additional information regarding these and other previously recorded fossil sites occurring in and near the study area and in the same rock units. The potential for additional similar fossil remains being uncovered at previously recorded and unrecorded fossil sites that might be encountered by construction-related earth-moving activities for the Light Rail Transit (LRT) Build Alternative in previously undisturbed strata was determined, based on the transportation modes (subway, aerial, at-grade) to be implemented for the alternative, the paleontologic productivity of the stratigraphic rock unit in which these activities will occur and the corresponding potential for fossil remains being encountered during construction, and the depths at which the activities will occur. The

subway segments of the LRT Build Alternative will require tunneling through previously undisturbed strata to depths up to about 80 feet below grade, and the aerial segment will require excavation for aerial structure supports. The at-grade segments and the No-Build Alternative will not require any earth-moving activity in previously undisturbed strata.

Surficial geological mapping of the study area is provided by Dibblee (1989) at a scale of 1:24,000. The study area is underlain by three stratigraphically superposed late Quaternary nonmarine rock units, including, in order of decreasing geologic age, 1) late Pleistocene older dissected surficial sediments, including remnants of older weakly consolidated alluvial deposits of gravel, sand, and silt (unit Qoa; older alluvium) and 2) Holocene surficial sediments, including alluvium and unconsolidated floodplain deposits of gravel, sand, and silt (unit Qa; younger alluvium), and stream channel deposits of gravel, sand, and silt (unit Qg) (Dibblee, 1989) (see Figure 1). Except for the Los Angeles River, which is underlain by stream channel deposits, the younger alluvium underlies the entire study area between Union Station and the Santa Ana (101) Freeway. East of the freeway, virtually the entire study area is underlain by the older alluvium, the younger alluvium underlying only some of the passes and the eastern end of the study area.

Previous investigations regarding the paleontologic resources of the rock units in the study area were conducted by Lander (1988, 1994) and RMW Paleo Associates (1993) as part of the AA/DEIS/DEIR, the FEIS/FEIR, and an earlier study that were completed in support of the suspended Metro Red Line project.

Although no previously recorded fossil site was documented as occurring in the study area as a result of the data searches conducted for this study, a number of previously recorded fossil sites were documented as occurring in the study area vicinity in the same rock units as those occurring in the study area.

The older alluvium (unit Qoa) has yielded fossilized bones and teeth representing a diversity of continental vertebrate species, including extinct late Pleistocene (Ice Age) land mammals species, at a number of previously recorded fossil sites (including La Brea tar pits) west of downtown Los Angeles and in the Hollywood area (Hay, 1927; Jefferson, 1991a, -b; Lander, 1994, in press; Miller, 1971). Some of these fossil remains were recovered at newly discovered fossil sites encountered by tunneling under Hollywood and Wilshire Boulevards during construction of the Metro Red Line tunnels between the Hollywood/Western and Hollywood/Vine Stations (Lander, in press). These latter fossil sites yielded fossil land mammal remains representing mastodons, horses, camels, and bison, the remains having been recovered as a result of the paleontologic resource impact mitigation program conducted during and in support of Red Line construction (Lander, in press).

Additional late Pleistocene continental vertebrate remains were recovered at a number of previously recorded fossil sites in the downtown Los Angeles, Union Station, Vernon, El Sereno, and Universal City/North Hollywood areas (Hay, 1927; Jefferson, 1991a, -b; Lander, 1994, in press; Miller, 1971) in areas mapped as being underlain by younger alluvium (unit Qa). Presumably, all of these fossil occurrences were recovered at depth in the underlying older alluvium (unit Qoa) (Lander, in press). In these areas and in the study area, the older and younger alluvium are not differentiated in the subsurface (see Geotransit Consultants, 1994; Lander, in press). One of these fossil sites, which yielded extinct bison remains, was encountered by tunneling immediately west of Union Station during construction of the Metro Red Line tunnel between Union Station and the Tom Bradley/Civic Center Station (Lander, in press). Wood of incense cedar, pollen of redwood and other land plant species, and the remains of extinct late Pleistocene land mammal species (ground sloths, elephants, camels, bison) were recovered under Lankershim Boulevard at some of the other sites or from the tunneling debris piles as a result of the paleontologic resource impact mitigation program conducted during and in support of construction of the Metro Red Line North Hollywood Station and the Red Line tunnels between the Universal City and

North Hollywood Stations (Lander, in press). These latter remains have been determined to be at least 46,000 to as much as 280,000 years in age partly on the basis of carbon-14 dating analyses (Lander, in press).

The fossilized wood of cottonwood and possibly cedar of early to middle Holocene age and pollen of other land plant species were recovered from stratigraphic levels at newly discovered fossil sites at or near the base of the younger alluvium (unit Qa) at Union Station and, as a result of the paleontologic resource impact mitigation program conducted during and in support of construction of the Metro Red Line, at Universal City Station (Lander, in press). The fossilized shells of fresh-water and land snail species and the bones and teeth of continental vertebrate species (fresh-water fishes, frogs, lizards, snakes, birds, shrews, rabbits, rodents) also were recovered at Universal City Station (Lander, in press). The remains recovered at these sites have been determined to be 5,000 to 10,500 years in age on the basis of carbon-14 dating analysis (Lander, in press).

The fossil occurrences from these rock units are scientifically highly important because they have allowed determinations of the ages of their respective fossil-bearing strata, reconstructions of the depositional paleoenvironments represented by the sediments comprising the strata, and documentation of the paleoclimates of the region during deposition of the sediments. Moreover, some of these occurrences are similarly important because they represent temporal and/or geographic range extensions (including first reported fossil occurrences) for their respective taxa.

These fossil occurrences suggest that there probably is a moderate to high potential for additional similar fossil remains being encountered in the fossil-bearing rock units at previously unrecorded fossil sites by construction-related earth-moving activities where these activities will disturb previously undisturbed strata in areas underlain by these rock units (see Table 1, Figure 1). However, at or near the surface, the younger alluvium probably is too young to contain remains old enough to be considered fossilized and, therefore, there probably is only a low potential for any fossil remains or previously unrecorded fossil site being encountered by shallow earth-moving activities in areas underlain by this rock unit (see Table 1, Figure 1).

TABLE 1
POTENTIAL FOR FOSSIL SITES BEING ENCOUNTERED DURING CONSTRUCTION

Alternative	Segment	Stratigraphic Rock Unit	Potential
No-Build	—	—	none
LRT Build	at-grade	Qg[1]	none
		Qa	low (at/near surface), moderate to high (at depth)
		Qoa	moderate to high
	aerial	Qa	low (at/near surface), moderate to high (at depth)
	tunnel	Qa	low (at/near surface), moderate to high (at depth)
		Qoa	moderate to high

[1]Qa: younger alluvium; Qg: stream channel deposits; Qoa: older alluvium.

The stream channel deposits (unit Qg) have not yielded any fossil remains in the study area region. Moreover, at or near the surface, this rock unit probably is too young to contain remains old enough to be considered fossilized. However, the stream channel deposits do not occur in an area where any earth-moving activity will occur. Therefore, there probably is no potential for any fossil remains or previously unrecorded fossil site being encountered by shallow construction-related earth-moving activities where

these activities will disturb previously undisturbed strata in areas underlain by this rock unit (see Table 1, Figure 1).

3.0 METHODOLOGY FOR IMPACT EVALUATION

The potential for fossil remains being uncovered at previously unrecorded fossil sites that might be encountered by construction-related earth-moving activities, if any, for each alternative in previously undisturbed strata was assessed. This assessment is based on the type of transportation mode (subway, aerial, at-grade) and construction method to be implemented for the LRT Build Alternative, the depths at which earth-moving activities will occur, and the paleontologic productivity of the stratigraphic rock unit in which these activities will occur (see Table 1, Figure 1).

4.0 POTENTIAL OPERATIONAL IMPACTS AND MITIGATION

4.1 IMPACTS

4.1.1 No-Build Alternative

There will be no potentially significant impact on paleontologic resources as a result of operation of the No-Build Alternative because there will be no earth-moving activity in previously undisturbed strata.

4.1.2 LRT Build Alternative

There will be no potentially significant impact on paleontologic resources as a result of operation of the LRT Build Alternative because there will be no earth-moving activity in previously undisturbed strata.

4.2 MITIGATION

No mitigation measure will be necessary during operation of the No-Build or LRT Build Alternative because there will be no earth-moving activity in previously undisturbed strata and, therefore, no potentially significant impact on paleontologic resources.

5.0 POTENTIAL CONSTRUCTION IMPACTS AND MITIGATION

5.1 IMPACTS

5.1.1 No-Build Alternative

There will be no potentially significant impact on paleontologic resources as a result of construction of the No-Build Alternative because there will be no earth-moving activity in previously undisturbed strata (see Table 1).

5.1.2 LRT Build Alternative

There will be potentially significant impacts on paleontologic resources as a result of construction of the LRT Build Alternative in those parts of the study area where earth-moving activities will be conducted in previously undisturbed strata. These activities will occur primarily in the tunnel segment between Clarence Street (just east of 1st/Utah Station) and Lorena Street (just east of 1st/Lorena Station) under Options 1 and 2, and between Clarence Street and 3rd Street/Hicks Avenue under Option 3 (see Figure 1). The activities also will occur in the aerial segment in the area of the Santa Ana (101) Freeway adjacent to Union Station, and also could occur in the at-grade segment (see Figure 1). In the tunnel segment, these activities will include (but not necessarily be limited to) open cut excavation for the tunnel portals, 1st/Lorena Station box, and line vent structures; cut-and-cover excavation for the 1st/Boyle and 1st/Soto Station boxes and those portions of the tunnels adjacent to one or both of the portals; possible mining (instead of cut-and-cover excavation) of that portion of the tunnel segment between the western portal and the 1st/Boyle Station without using a tunnel boring machine (TBM); and tunneling of the remaining portions of the tunnel segment using a TBM. In the aerial segment, these activities will include drilling or driving piles for aerial guideway column foundations. In the at-grade segment, these activities could include trenching or other excavation associated with utility relocation along trackways. Impacts include the moderate to high potential for the loss of paleontologic resources, including fossil remains, associated specimen data and corresponding geologic and geographic site data, and previously unrecorded fossil sites, in areas underlain by older alluvium and, at depth, by younger alluvium (see Table 1, Figure 1). Unauthorized fossil collecting by construction workers also might result in the loss of additional fossil remains and associated data.

The potential impact on paleontologic resources of the younger alluvium in the study area as a result of shallow earth-moving activities associated with construction of the LRT Build Alternative probably will be of no more than low significance because there probably will be only a low potential for shallow earth-moving activities in previously undisturbed strata encountering any fossil remains considered old enough to be considered fossilized or any previously unrecorded fossil site in areas underlain by this rock unit (see Table 1, Figure 1).

There will be no potentially significant impact on paleontologic resources in the at-grade segments of the study area as a result of construction of the LRT Build Alternative unless there will be earth-moving activities in previously undisturbed strata in the older alluvium and, at depths greater than 5 feet below grade, the younger alluvium (see Table 1, Figure 1). This depth often is one at which remains old enough to be considered fossilized are first encountered in areas underlain by younger alluvium.

The Eastside Corridor, in combination with other projects in the study area region, could contribute to a cumulative loss of fossil remains from the older and younger alluvium that potentially would have been available for future study.

5.1.2.1 Option 1

Impacts that will result from the construction of this option and could affect the paleontologic resources of the study area will be similar to those described in Section 5.1.2.

5.1.2.2 Option 2

Impacts that will result from the construction of this option and could affect the paleontologic resources of the study area will be similar to those of Option 1.

5.1.2.3 Option 3

Impacts that will result from the construction of this option and could affect the paleontologic resources of the study area will be similar to those of Options 1 and 2. However, under this option, more fossil-bearing strata will be encountered by 2.4 instead of 1.8 miles of tunneling and other earth-moving activities in the tunnel segment.

5.2 MITIGATION

Mitigation measures will be necessary during construction of the tunnel segment and possibly the aerial and at-grade segments of the LRT Build Alternative because there will be earth-moving activities in previously undisturbed strata and, therefore, potentially significant impacts on the paleontologic resources of the older and younger alluvium (see Table 1, Figure 1). However, no mitigation measure will be necessary during construction of the at-grade segments if there will be no earth-moving activity in previously undisturbed strata in the older alluvium and, at depths less than 5 feet below grade, the younger alluvium because there will be no potentially significant impact on paleontologic resources (see Table 1, Figure 1). Moreover, no mitigation measure will be necessary during construction of the aerial segment if piles are impact driven and, therefore, there is no drilling for aerial guideway column foundations (see below).

The following mitigation measures will reduce the potentially significant (including cumulative) impacts of construction of the LRT Build Alternative on the paleontologic resources of the study area to an insignificant level by allowing for the recovery of fossil remains and associated data that might be uncovered by earth-moving activities in the tunnel and aerial segments (see Figure 1). These measures will ensure project compliance with mitigation measures stipulated in Los Angeles County Metropolitan Transportation Authority (MTA) Specifications Section 01170, and with Society of Vertebrate Paleontology (SVP, 1995, 1996) standard measures for mitigating construction-related impacts on paleontologic resources and for the museum repository acceptance of a mitigation program fossil collection.

1. Prior to any earth-moving activity in the study area, the MTA will retain the services of a vertebrate paleontologist approved by the Natural History Museum of Los Angeles County Vertebrate Paleontology Section (LACMVP) to manage a paleontologic resource impact mitigation program in support of earth-moving activities associated with construction of the Eastside Corridor.

2. The paleontologist will develop a storage agreement with the LACMVP regarding permanent storage and maintenance of any vertebrate fossil remains recovered as a result of the mitigation program.

3. The paleontologist or his/her designated representative will present an environmental awareness training session to construction workers regarding the appropriate procedures to be implemented if fossil remains are uncovered by earth-moving activities, particularly tunneling and/or when mitigation program personnel are not on site.

4. A paleontologic construction monitor will monitor earth-moving activities, including drilling for aerial guideway column foundations in the aerial segment (however, see below regarding use of slurry displacement method and impact driven piles) and, in the tunnel segment, open cut excavation for the tunnel portals, 1st/Lorena Station box, and line vent structures; cut-and-cover excavation for the 1st/Boyle and 1st/Soto Station boxes and those portions of the tunnels adjacent to one or both of the portals; and mining of that portion of the tunnel segment between the western portal and the 1st/Boyle Station if mining is implemented without using a TBM. Monitoring will include the inspection of strata freshly exposed by these activities and will allow for the recovery of larger fossil remains uncovered by the activities. Although tunneling will not be monitored because of the confined working space and safety concerns, tunneling debris will be inspected for larger fossil remains if an earth pressure balance TBM is used (however, see below regarding use of slurry TBM). In areas underlain by younger alluvium, monitoring will not begin until earth-moving activities have reached a depth 5 feet below grade.

5. The monitor will recover fossil remains uncovered by earth-moving activities.

6. The monitor or a paleontologic technician will recover and process rock samples to allow for the recovery of smaller fossil remains. The total weight of all samples recovered from each rock unit and subsequently processed will not exceed 6,000 pounds (12,000 pounds combined total for older and younger alluvium).

7. The monitor will have the authority to temporarily divert any earth-moving activity around a newly discovered fossil site or a sampling site until the fossil remains or a rock sample have been recovered and the earth-moving activity has been allowed to proceed through the site by the monitor.

8. The monitor will record associated specimen/sample data (taxon, element) and corresponding geologic (stratigraphic rock unit, stratigraphic level, lithology) and geographic site data (location, depth), and will plot site locations on maps of the study area.

9. All identifiable fossil remains will be fully treated. Treatment will include preparation of the remains by a paleontologic technician to the point of identification; identification to the lowest taxonomic level possible by knowledgeable paleontologists; curating and cataloguing the remains, plotting fossil site locations on maps of the study area, and entry of associated specimen data and corresponding geologic and geographic site data into appropriate computerized data bases by the technician; and placement of the remains in the appropriate museum repository fossil collection for permanent storage and maintenance. Any vertebrate and invertebrate fossil remains will be placed in the LACMVP and LACM Invertebrate Paleontology Section (IP), respectively. Fossil plant remains will be placed in the University of California Museum of Paleontology (UCMP). Associated data will be archived at the appropriate museum repository, where the data, along with the fossil remains, will be made available for future study by qualified scientific investigators.

10. The paleontologist will prepare a comprehensive final report of results and findings that describes study area geology/stratigraphy, summarizes field and laboratory methods used, includes a faunal list and an inventory of curated/catalogued fossil remains, evaluates the scientific importance of the remains, and discusses the relationship of any newly recorded fossil site in the study area to relevant fossil sites previously recorded from other areas.

With these mitigation measures, earth-moving activities associated with construction of the LRT Build Alternative could result in beneficial effects, including the recovery of scientifically highly important fossil remains that would not even have been exposed without the project and, therefore, would not have

been available for future study. Similar mitigation measures were implemented as part of the mitigation programs conducted under the direction of the MTA and in support of construction of Metro Red Line Segments 1, 2, and 3 (see Lander, in press). These measures resulted in the recovery of numerous, scientifically highly important fossil remains and their placement in the LACMIP, LACMVP, and UCMP fossil collections (see Lander, in press). The MTA also developed a worker incentive program to ensure that fossil remains uncovered by earth-moving activities (particularly tunneling) when and/or where a monitor was not on site were recovered and, along with associated data, were submitted to the MTA paleontologist for treatment. As part of its outreach program, the MTA supported extensive media coverage of the fossil remains to expedite the dissemination of the results of the mitigation programs to the public and scientific community. Media coverage included interviews of the MTA paleontologist and other mitigation program personnel for local, national, and international television and radio news and other programming, as well as for newspaper, magazine, and professional journal articles. The paleontologist and other mitigation program personnel also assisted the MTA in developing a web site and a traveling public exhibit regarding the results of the mitigation programs. The MTA will support similar mitigation measures and outreach activities in support of the Los Angeles Eastside Corridor.

Significant impacts on the paleontologic resources of the study area could remain after mitigation. If implemented, drilling using the slurry displacement method for cast-in-place caissons or the impact driving of piles for the aerial guideway column foundations in the aerial segment, and the use of a slurry TBM in the tunnel segment will destroy any fossil remains and associated data.

6.0 BIBLIOGRAPHY

Dibblee, T.W., Jr. 1989. Geologic map of the Los Angeles Quadrangle, Los Angeles County, California. Dibblee Geological Foundation Map DF-22.

Geotransit Consultants. 1994. Geotechnical investigation for Preliminary Engineering Program, Eastside Extension, Metro Red Line Project. Geotransit Consultants project no. 94-1100. Prepared for Engineering Management Consultants.

Hay, O.P. 1927. The Pleistocene of the western region of North America and its vertebrated animals. Carnegie Institution of Washington Publication 322B:1-3476.

Jefferson, G.T. 1991a. A catalogue of late Quaternary vertebrates from California, Part One, Nonmarine lower vertebrate and avian taxa. Natural History Museum of Los Angeles County Technical Reports Number 5:1-60.

Jefferson, G.T. 1991b. A catalogue of late Quaternary vertebrates from California, Part Two, Mammals. Natural History Museum of Los Angeles County Technical Reports Number 7:1-129.

Lander, E.B. 1988. Paleontologic resources. *In* Engineering-Science, Inc., and KDG. Study of Metro Rail extension through the northern segment of the Santa Ana Corridor. Prepared for Los Angeles County Transportation Commission and Sinclair/Tudor Group.

Lander, E.B. 1994. Paleontologic resources. *In* U.S. Department of Transportation Federal Transit Administration and Los Angeles County Metropolitan Transportation Authority. Final environmental impact statement, Los Angeles East Side Extension.

Lander, E.B. In review. Los Angeles Metro Red Line Project final paleontologic resource impact mitigation program final technical report of findings. Paleo Environmental Associates, Inc., project 94-6A/B. Prepared for Los Angeles County Metropolitan Transportation Authority.

Miller, W.E. 1971. Pleistocene vertebrates of the Los Angeles Basin and vicinity (exclusive of Rancho La Brea). Bulletin of the Los Angeles County Museum of Natural History, Science 10:1-124.

RMW Paleo Associates. 1993. Paleontologic resources. *In* U.S. Department of Transportation Federal Transit Administration and Los Angeles County Metropolitan Transportation Authority. 1994. Alternatives analysis/draft environmental impact statement/environmental impact report, Los Angeles County Eastside Corridor.

Society of Vertebrate Paleontology. 1995. Assessment and mitigation of adverse impacts to nonrenewable paleontologic resources: standard guidelines. Society of Vertebrate Paleontology News Bulletin 163:22-27.

Society of Vertebrate Paleontology. 1996. Conditions of receivership for paleontologic salvage collections. Society of Vertebrate Paleontology News Bulletin 166:31-32.