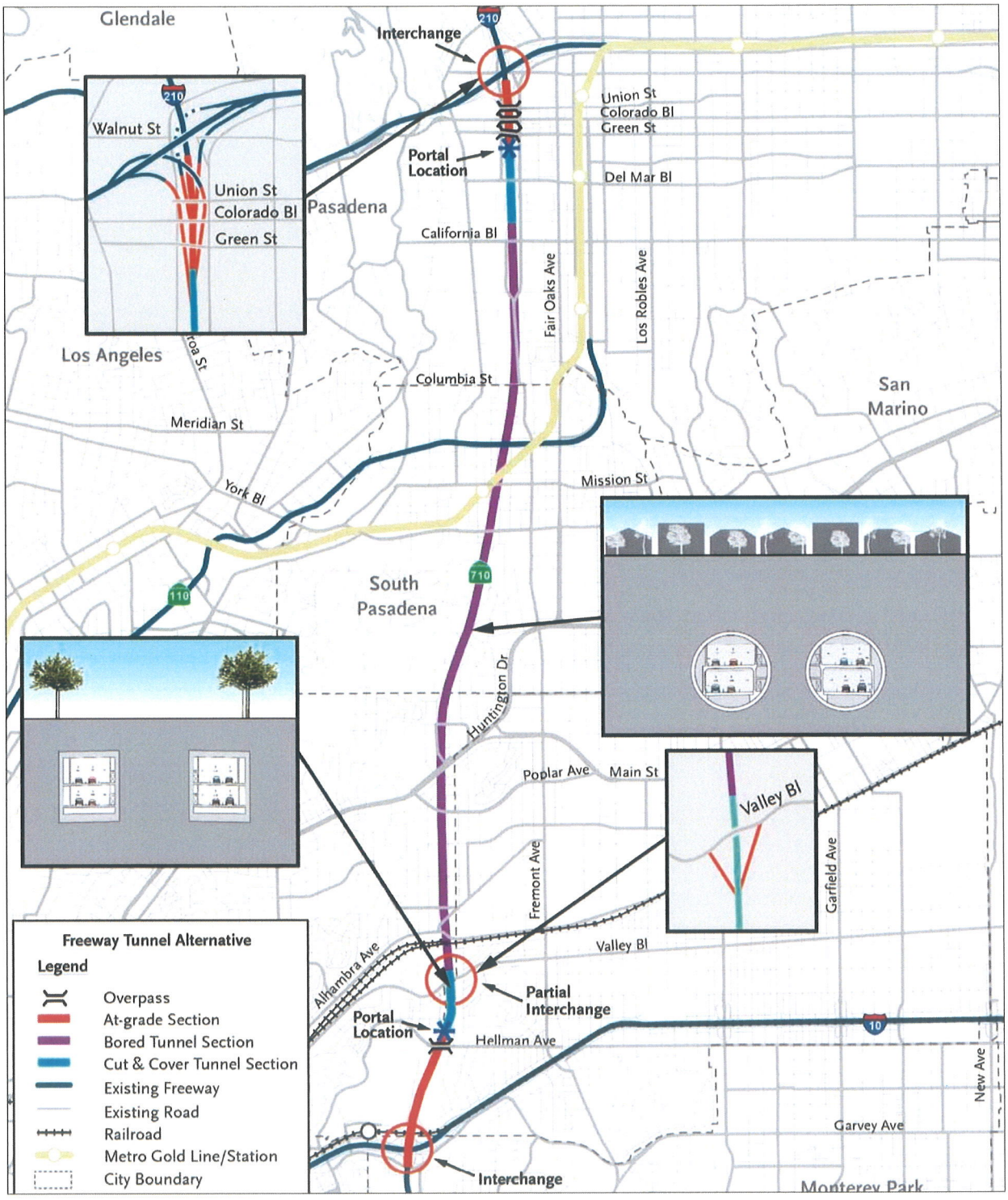

SR 710 North Study
Freeway Tunnel Alternative
Single and Dual Bore
07-LA-710 (SR 710)
EA 187900
EFIS 0700000191

FIGURE 2
Freeway Tunnel Alternative

using published references for excavation volumes, including Toll (1993) and Caterpillar Performance Handbook (1996), as well as engineering judgment based on prior experience with similar materials. The unit weights and bulking factors used in this TM are summarized in Table 1. The bulking factors may vary based on the method of excavation, but it is expected that they would be similar to, and not much larger than, those listed in Table 1 given the information currently available. The bulking factors should be re-evaluated when more geotechnical information is available.

TABLE 1
Formation Unit Weights and Bulking Factors

Geologic Unit	Range of In Situ Unit Weights (pcf)	Assumed In Situ Unit Weight (pcf)	Bulking Factor Range	Assumed Bulking Factor
Alluvium	110 - 150	125	1.05 – 1.4	1.3
Fernando Formation	110 - 140	136	1.5 – 1.6	1.6
Puente Formation	110 - 160	134	1.4 – 1.65	1.6
Topanga Formation	110 - 160	134	1.4 – 1.65	1.6
Basement Rock	100 - 160	158	1.5 – 1.7	1.6

3 Tunnel Alternative Description

3.1 Freeway Tunnel Alternative

There are several elements of the Freeway Tunnel Alternative that would generate excavated material in completing the required excavations. The following sections describe each element and the assumptions made in estimating the volume of excavated material generated for this alternative. The assumtions presented herein is based on the current vertical and hotizontal tunnel alignment, and is subject to change as the alignments are optimized in future stages of the study.

3.1.1 Bored Tunnels. The Freeway Tunnel Alternative has two variations - either a single- or twin-bore tunnel both 22,340 feet in length; the outside diameter of the final lining is expected to be be 58.5 feet. The excavated diameter of the tunnel would be slightly larger to account for overcut and TBM shield thickness, making the diameter of the excavated tunnel approximately 60 feet, which would be used in estimating excavated material volumes (Jacobs Associates, 2014c).

Each tunnel bore is expected to be driven with two TBMs based on the understanding of the current schedule demands, with one starting at the south portal and one at the north portal and meeting in the middle for each bore. This would require four TBMs total for the twin-bore alternative, and two TBMs total for the single-bore alternative. For the purposes of this TM, it is assumed that each TBM would mine half of each bore–the excavated material from the north reach would be generated at the north portal and the excavated material from the south reach would be generated at the south portal.

A generalized profile of the Freeway Tunnel Alternative provided by CH2M HILL (2014) was used to evaluate the percentage of each geologic unit that would be present along the freeway tunnel at the approximate tunnel depth (refer to Attachment A). The approximate distribution of the various geologic units is summarized in Table 2. The lengths shown are per tunnel bore, and would be doubled for the twin-bore option.

TABLE 2
Summary of Geologic Unit Expected in the Freeway Tunnel Alternative (per Tunnel Bore)

Geologic Unit	North Reach Length (ft)	%	South Reach Length (ft)	%
Alluvium	4,620	42%	0	0%
Fernando Formation	0	0%	3,650	33%
Puente Formation	0	0%	3,550	32%
Topanga Formation	4,950	44%	3,970	35%
Basement Rock	1,600	14%	0	0%
Total	11,170	100%	11,170	100%

3.1.2 Cross Passages. In addition to the bored tunnels of the Freeway Tunnel Alternative, six pairs of emergency vehicle cross passages (twelve total) would be included along the twin-bore variation to connect the two tunnels, which are located approximately one tunnel diameter apart (i.e. approximately 64 feet). These cross passages would be roughly circular in shape and approximately 29 feet in diameter. They would be excavated using the Sequential Excavation Method (SEM) after the bored tunnels are excavated. The excavated material generated would be removed from the nearest portal. Therefore, it is assumed that excavated material from three pairs of cross passages would be removed from the north portal and the excavated material from the other three at the south portal. Table 3 shows a summary of the number of cross passages to be excavated through each geologic unit.

3.1.3 Construction Portals. Construction portals at the north and south ends of the tunneled portion of the Freeway Tunnel Alternative are expected to be excavated prior to the initiation of tunneling operations. These portals would be used to launch the TBM(s) and support construction activities. The roadway ramps down from the ground surface within the portal to gain cover for launching the TBM. The north portal is expected to be approximately 100 feet deep, measured at the headwall (where the tunnel starts), 240 feet wide, and 500 feet long. The south portal is expected to be approximately 130 feet deep, measured at the headwall, 230 feet wide and 500 feet long. The portal excavations gradually increase in depth from the ground surface to the headwall. The portals for the single-bore alternative are similar in shape, but the width is smaller – approximately 110 feet less. Although the portal excavations are longer than 500 feet, the excavated material volume beyond this length of the excavation will be estimated by CH2M HILL in their assessments for the design of the permanent works.

The north portal would be excavated entirely in alluvial soils and the south portal would be excavated in a mixture of alluvial soils and the Puente Formation. Refer to *Preliminary Design Concepts for Freeway Portal Excavation Support Systems* (Jacobs Associates, 2014a) for additional information on the portals for the Freeway Tunnel Alternative.

TABLE 3
Freeway Cross Passage Geologic Units

Geologic Unit	No. of Cross Passages	
	North Reach	South Reach
Alluvium	2	0
Fernando Formation	0	2
Puente Formation	0	2
Topanga Formation	4	2
Basement Rock	0	0