

Bakersfield to Palmdale Project Initial Alternatives Analysis

Thursday July 8, 2010

INTRODUCTION

The Bakersfield to Palmdale Project Alternatives Analysis (AA) study limits are from the Bakersfield Station near Truxtun Avenue in Bakersfield and the Palmdale Station near the Palmdale Transportation Center in Palmdale (see **Figure 1**). This analysis is limited to consideration of alignment alternatives between the two stations. The stations themselves are addressed in AA studies for the Fresno to Bakersfield and Palmdale to Los Angeles sections.

Development and review of alignment alternatives for the Bakersfield to Palmdale Project began in late 2009 and has resulted in a preliminary set of alternatives for detailed study. To facilitate review and discussion, initial alternatives have been developed for three subsections described below and shown on **Figure 1**.

PROGRAM EIR/EIS ALIGNMENTS CONSIDERED

Eight alignments were considered during the Bakersfield to Los Angeles Regional study (2001). Of these, three alignments connected Bakersfield with Palmdale, generally following three different corridors: State Route (SR)-58/UPRR, SR-138, and the California Aqueduct. The SR-138 and Aqueduct corridor alignments were eliminated due to constructability and seismic risk considerations, in that both would require long tunnels and steep sustained grades much greater than High-Speed Train (HST) rolling stock could achieve, and would also cross multiple faults within tunnels. The SR-58/UPRR corridor was selected by the California High Speed Rail Authority and the Federal Railroad Administration with the Statewide Program EIR/EIS as it would minimize slopes and tunnel lengths and also allow crossing faults at grade rather than within tunnels.

PROJECT-LEVEL ALIGNMENTS CONSIDERED AND INITIAL RECOMMENDATIONS

Edison Subsection. Five alignment alternatives were developed and considered in this subsection from Edison Highway/Oswell Street in East Bakersfield to Caliente Creek at the base of the Tehachapi Mountains (see **Table 1** and **Figure 2**).

Alternative **E1** is north of the town of Edison, crossing the UPRR right-of-way (ROW), and passes through agricultural land. Alternative **E2** is aligned as close to the SR-58 ROW as possible in order to minimize impacts to agriculture. Both Alternatives **E2** and **E3** would require significant modifications to SR-58, however. Alternative **E4** would have limited impact on agricultural land, but could affect truck circulation into and out of the many businesses that line Edison Highway in the town of Edison.

The following four alignments, as indicated in **Figure 3**, are recommended for detailed study:

- **E2** – Elevated north of SR-58
- **E2** – Partially at-grade north of SR-58
- **E3** – Elevated in the median of SR-58
- **E4** – Elevated along Edison Highway

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Table 1: Edison Subsection – Alignment Alternatives Considered

Horizontal Alignment	E1 North of Edison Hwy	E2 SR-58 Adjacent North Side		E3 In SR-58 Median	E4 Along Edison Hwy
Profile	Primarily At-Grade	Partially At-Grade	All Elevated	All Elevated	All Elevated

Notes: Gray-shaded alternative is recommended to be withdrawn. Other colors are keyed to Figure 3.

It was recommended that Alternative **E1** north of the town of Edison be withdrawn from consideration due to impacts on prime agricultural land and encroachment on UPRR right-of-way.

Tehachapi Subsection. Using updated engineering criteria, a single alternative was developed between Caliente Creek and Mojave (see **Table 2** and **Figure 4**), based on the Program EIR/EIS Preferred Alignment through the Tehachapi Mountains (**T2**). This refined program alignment turned out to be steeper and required more tunneling than desired, which led to removing it from further consideration.

A wider range of options was developed using alignment optimization software (Quantm). This allowed the alignments to maintain design criteria, including acceptable slopes through the mountains, while containing construction costs. The initial output generated over 50 alignments that spanned a distance of 16 miles from north to south of the corridor, using a combination of tunnels, bridges, and at-grade sections to cross the mountains.

Table 2: Tehachapi Subsection – Alignment Alternatives Considered

Horizontal Alignment	T2 Refined Program Alignment	T3-1 Quantm-Generated Alignment	T3-2 Modified Quantm-Generated Alignment	T3-B Phase Break Alignment	T3-2B Revised Phase Break Alignment
Grade	Exceeds 3.5% Extensive Tunneling	2.65% Ave. Grade / 2.75% Sust. Grade over 12 miles	2.5% Ave. Grade / 2.5% Sust. Grade over 20 miles	2.65% Ave. Grade / 3.5% Sust. Grade over 3.4 miles	2.5% Ave. Grade / 3.5% Sust. Grade over 3.4 miles

Notes: Gray-shaded alternative not carried forward. Other colors are keyed to Figure 5.

Based on the Quantm analysis, all of the most promising alignments in this subsection – in terms of environmental impact, cost, constructability, and acceptable grades – were found to lie within the SR-58 corridor. The alternatives largely share the same horizontal configuration but have different profiles. Slope is the primary differentiator among the various **T3** alternatives, which is measured both in terms of average grade from Caliente Creek to the Tehachapi Summit, and maximum sustained slope. The **T3** alternatives were subsequently examined to determine if traction power facilities could be integrated into the western incline section of the Tehachapis. The modified **T3** “**B**” alternatives contain a relatively flat section for nearly one

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mile to accommodate a very short stretch of track where electric power to the train switches from one source to another.

The following four alignments, as indicated in **Figure 5**, are recommended for detailed study:

- **T3-1** – Quantm Generated Alignment
- **T3-2** – Modified Quantm Generated Alignment
- **T3-B** – Phase Break Alignment
- **T3-2B** – Revised Phase Break Alignment

Antelope Valley Subsection. Three primary alignment alternatives were developed through the Antelope Valley between Mojave and Avenue M in Lancaster, the southern boundary of the AA study area (see **Table 3** and **Figure 6**). Alignment alternatives south of Avenue M are being addressed by the Palmdale to Los Angeles team as part of their study of Palmdale station location alternatives. Alternative **AV2** is located along the east side of the UPRR ROW through Rosamond and Lancaster. Alternative **AV3** is located between the UPRR ROW and Sierra Highway (west side of UPRR) and is defined in two versions: primarily elevated or mixed at-grade/elevated. Finally, Alternative **AV4** is primarily elevated within or along Sierra Highway to the west of **AV3**.

Table 3: Antelope Valley Subsection – Alignment Alternatives Considered

Alternative Horizontal Alignment	AV2 East Side of UPRR	AV3 Between UPRR and Sierra Highway		AV4 Within or Adjacent to Sierra Hwy	AV4 Option UPRR Avoidance
Profile	Mixed At-Grade and Elevated	All At-Grade	Partially Elevated	Primarily Elevated	Primarily Elevated

Local Officials from Lancaster and Rosamond have indicated that all alternatives under consideration are potentially workable for them, with the possible exception of the at-grade variation of Alternative **AV3** in Lancaster and Alternative **AV4** in Rosamond. After discussions with the City of Lancaster, Alignment **AV2** was realigned to address their concerns. Alignment **AV4** was also realigned to avoid existing land uses on the west side of Sierra Highway. Finally, because of uncertainty associated with use of using airspace over the UPRR ROW, a variant of Alignment AV4 (**AV4 Option**) was defined that completely avoids UPRR property.

All five alignments in **Table 3** are recommended for detailed study.

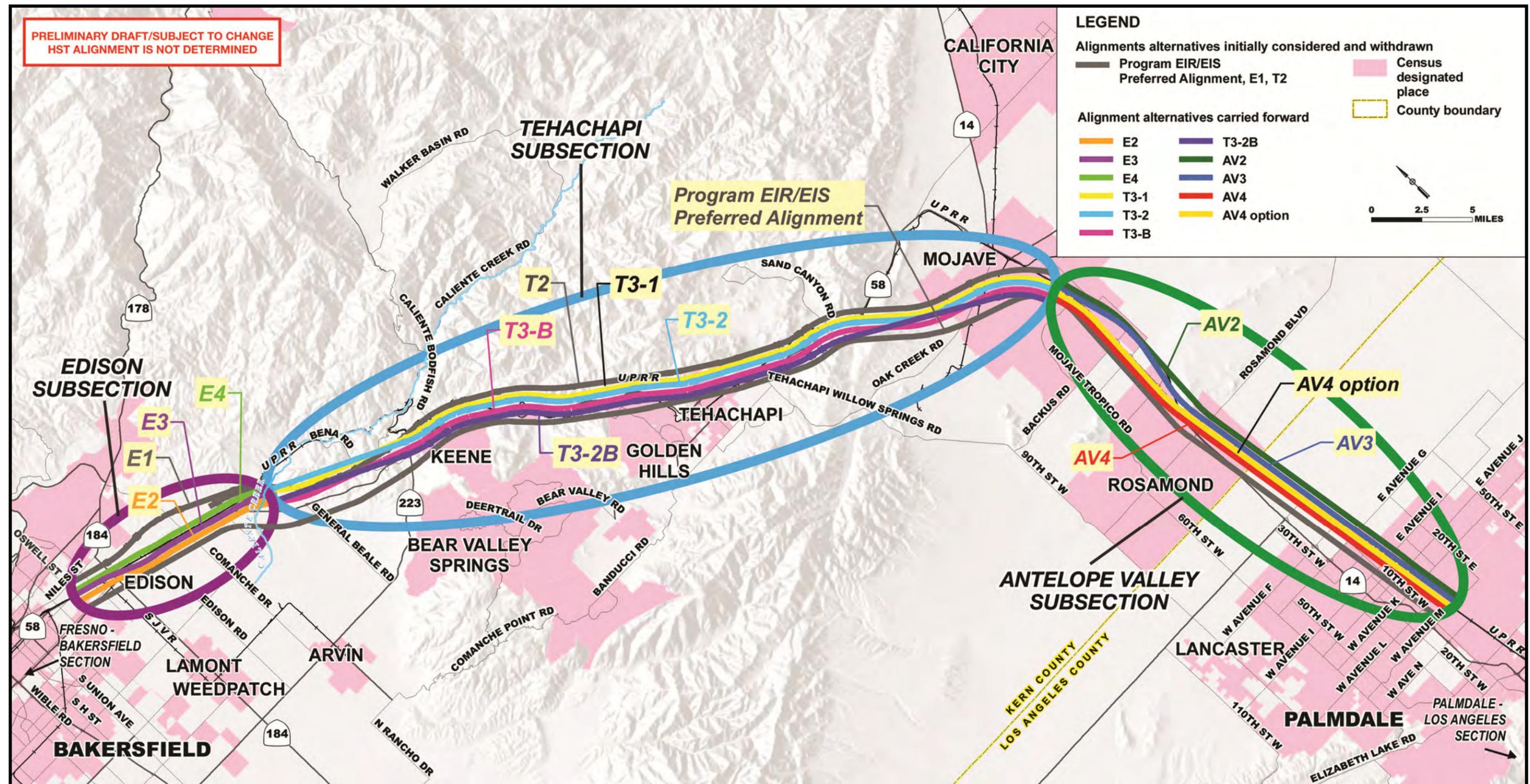
SUMMARY – ALTERNATIVES RECOMMENDED TO BE CARRIED FORWARD

The alternatives recommended to be carried forward into Preliminary AA for the Bakersfield to Palmdale section are as indicated above and as shown in **Figure 1**.

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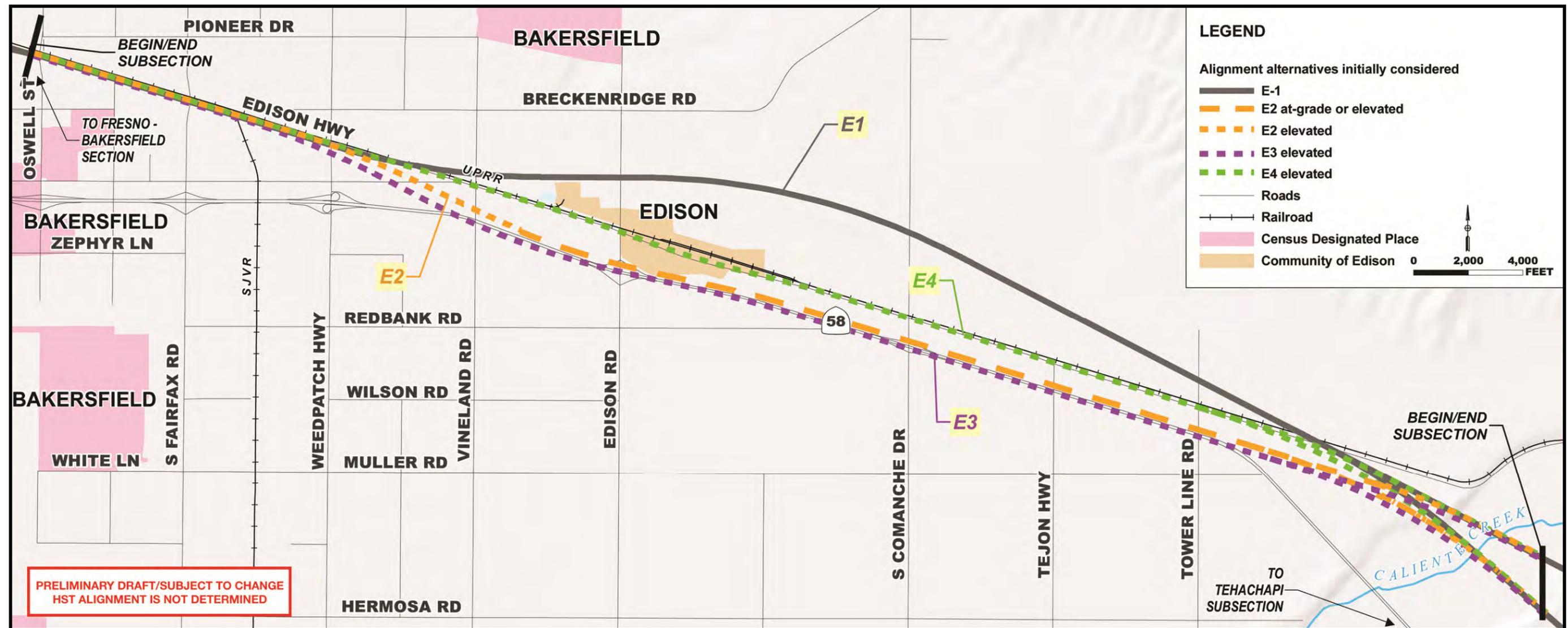
Figure 1: Bakersfield to Palmdale Section – Alignment Alternatives



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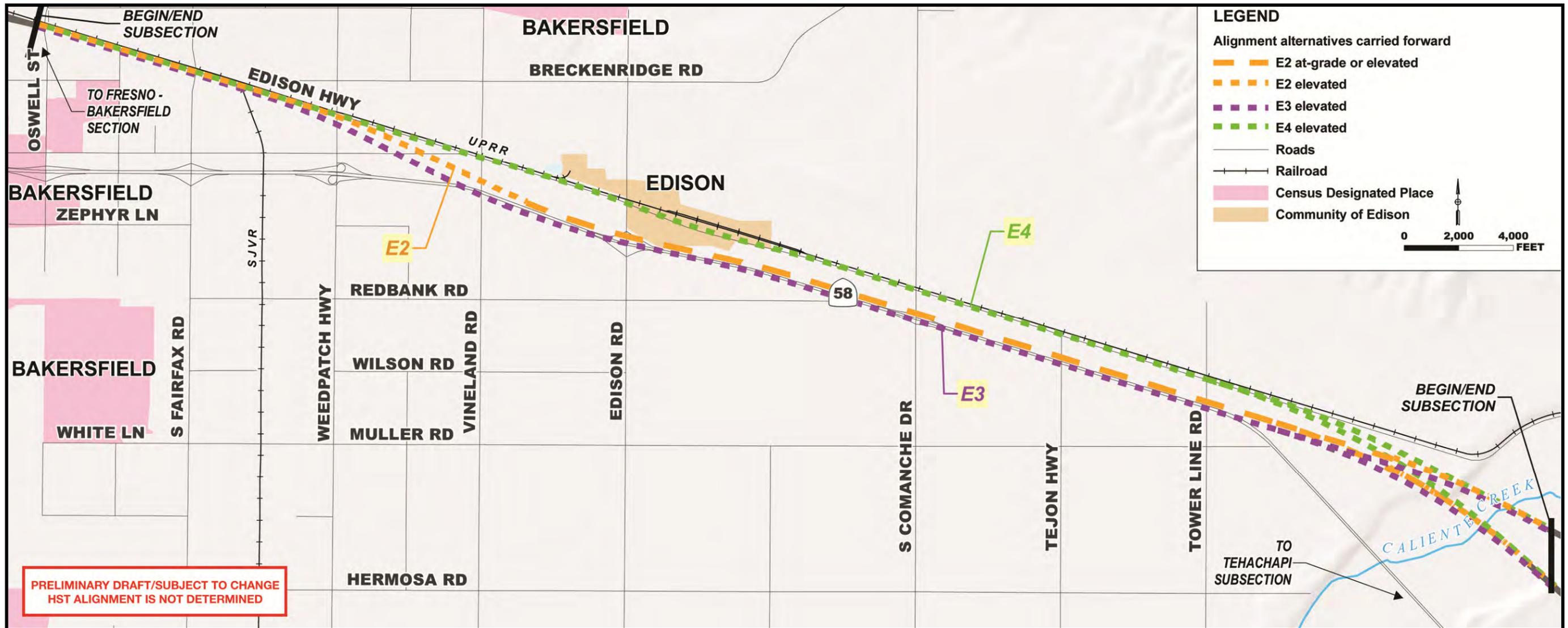
Figure 2: Edison Subsection – Alignment Alternatives Initially Considered



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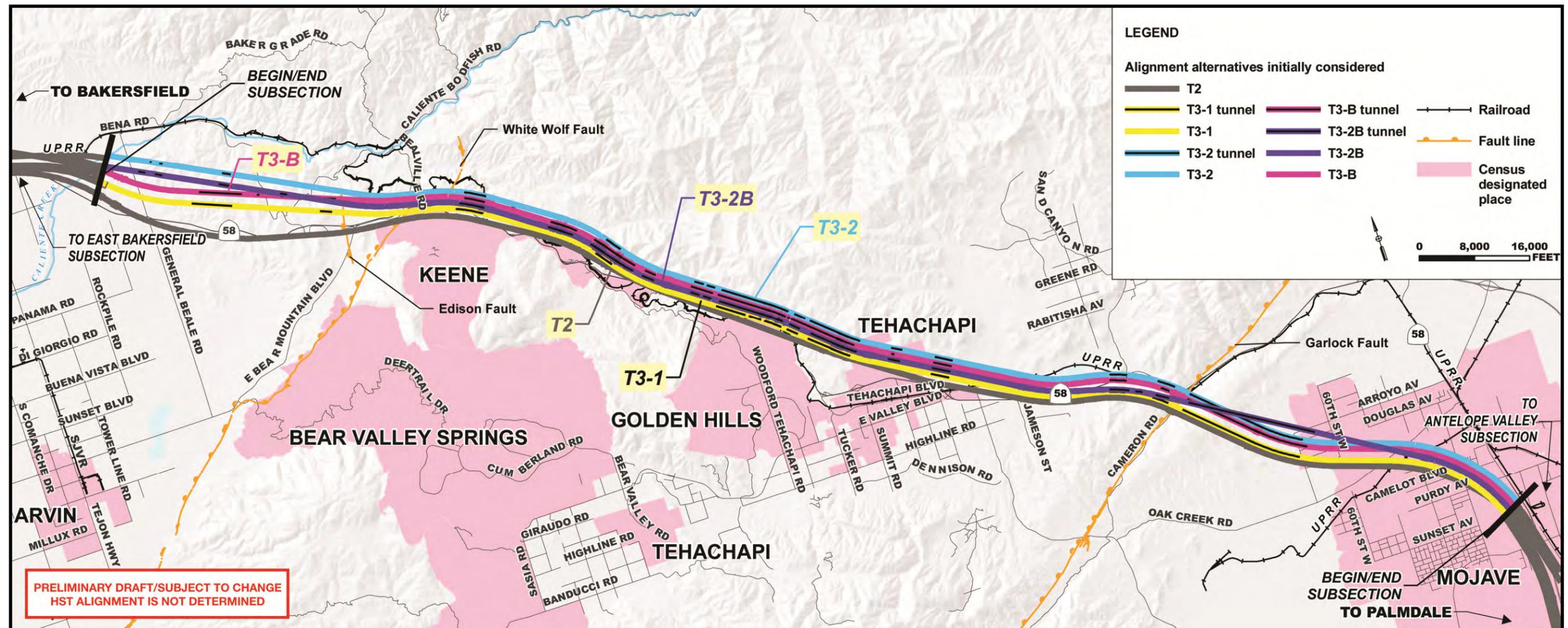
Figure 3: Edison Subsection – Alignment Alternatives Carried Forward



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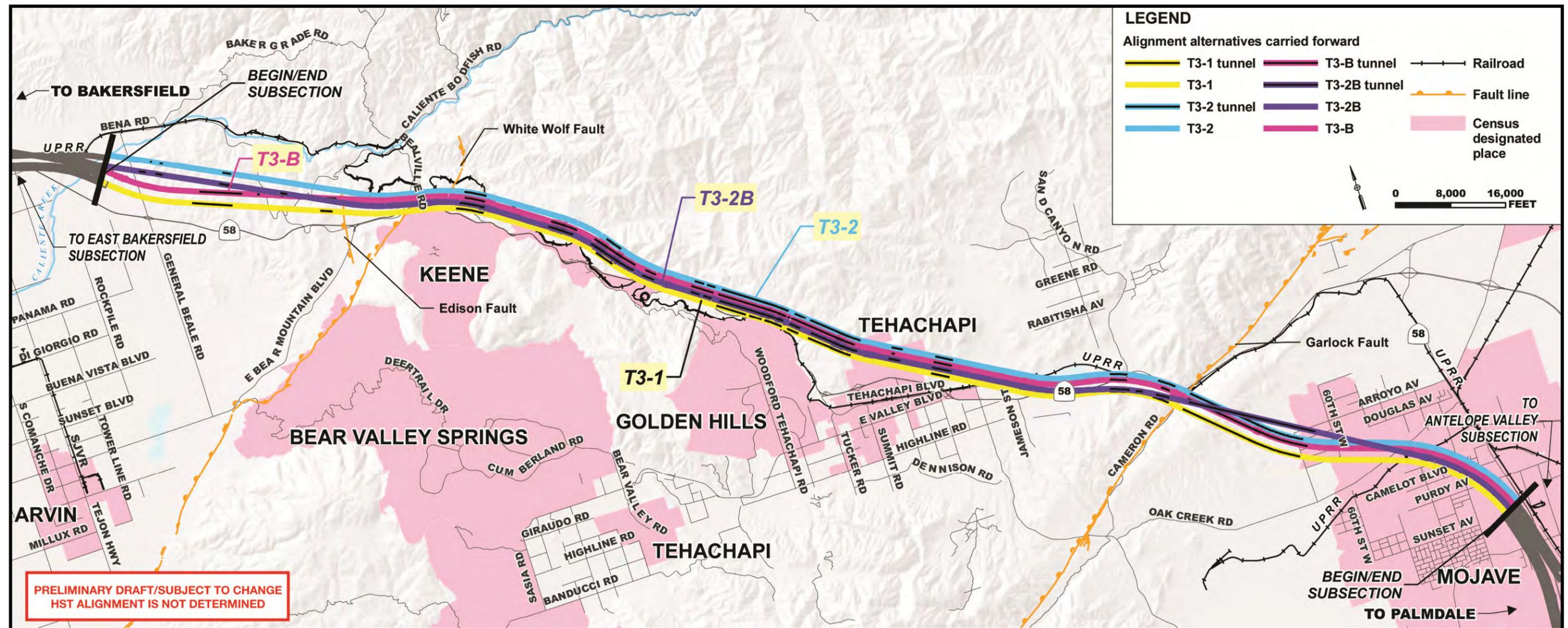
Figure 4: Tehachapi Subsection – Alignment Alternatives Initially Considered



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Figure 5: Tehachapi Subsection – Alignment Alternatives Carried Forward



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Figure 6: Antelope Valley Subsection – Alignment Alternatives Carried Forward

