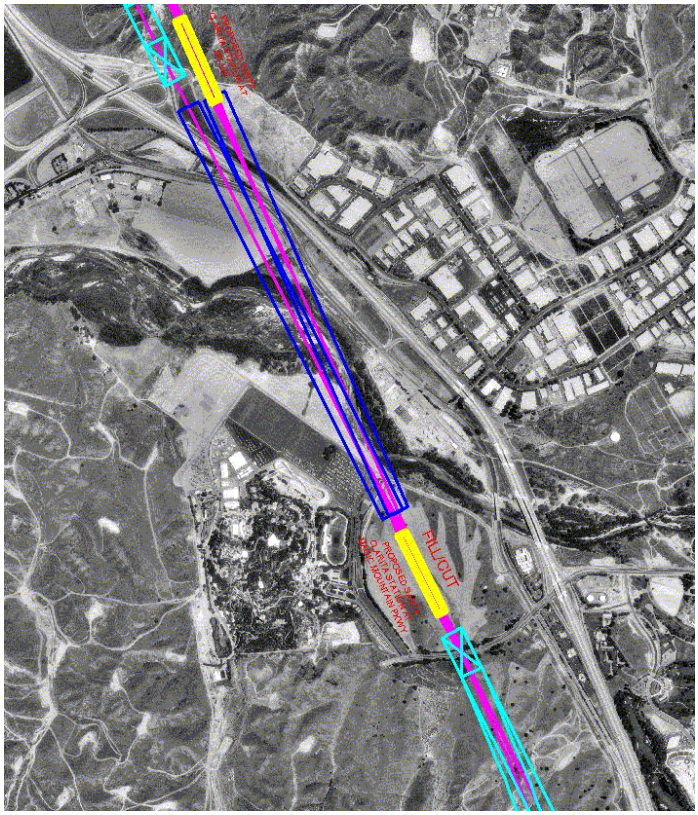

Figure 4.1-10 Santa Clarita Station Options 1 and 2, SR-126/I-5 and Magic Mountain Parkway/I-5

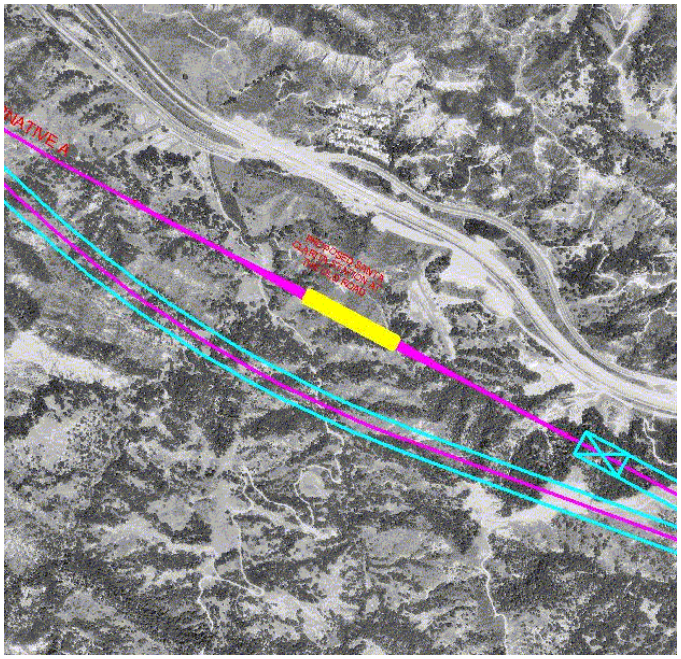

Figure 4.1-11 Santa Clarita Station Option 3, The Old Road

Figure 4.1-12 Santa Clarita Station Option 4, Via Princessa

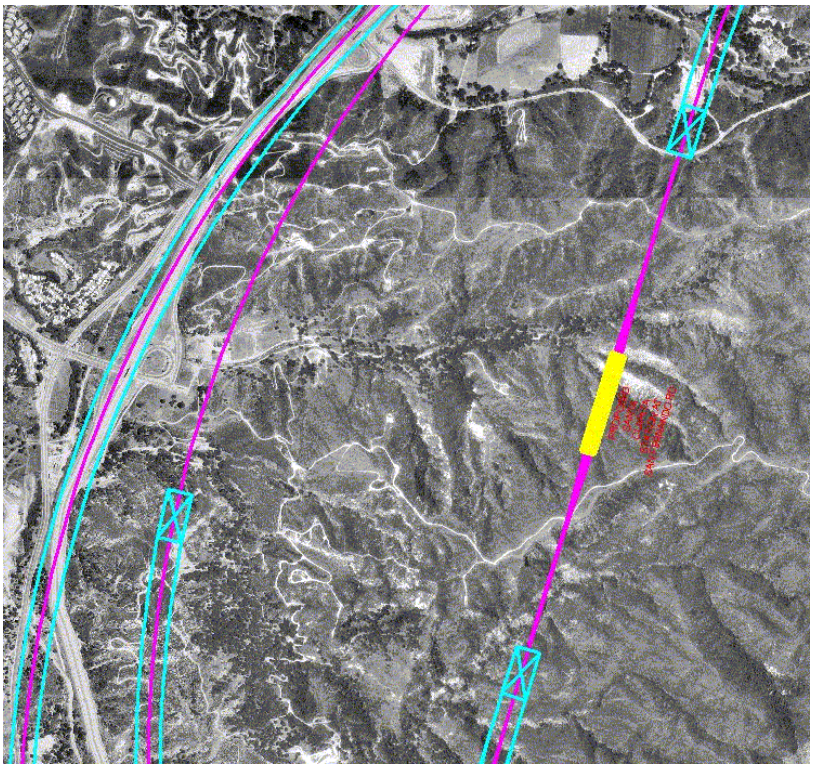

Figure 4.1-13 Santa Clarita Station Option 5, San Fernando Road/SR-14

approximately 27 minutes, Option 1, I-5, and Option 1A, I-5 via Comanche Point, which are the most direct routes between Bakersfield and Sylmar, offer the best (shortest) travel times. At a higher (3.5 percent) gradient profile, the projected travel time for each of these alignment options would be increased by approximately one minute due to reduced top train speeds.

Options 3 and 3A, Soledad Cn./SR-138, and SR-14/SR-138 have the longest travel time – at 39 minutes – due to the overall lengths of those alignments. Travel time for the balance of the alignments, including Options 2, 2A, 4, and 4A, are between 37 and 38 minutes each.

Length

Alignment Evaluation/Comparison: The overall length of the alignments ranges from 84 miles (135 km) for Option 1 to 127 miles (204 km) for Option 3A. Alignment Options 2, 2A, 4 and 4A have intermediate lengths in the 122-to-124 mile (195-198 km) range. The two I-5 alignments were the shortest, then the Aqueduct, then the SR-58 routes.

Population/Employment Catchment

Station Evaluation/Comparison: Based upon the available 1990 US Census data in the GIS mapping database, the 10-mile radius population/employment catchment for this segment is greatest for Santa Clarita Station Option 4, Via Princessa/SR-14 and Santa Clarita Station Option 5, San Fernando Rd./SR-14. The 1990 population/employment estimates in the 10-mile radius surrounding these potential stations are a population of 353,096 and 173,893 employees. Therefore, ridership potential for these stations is higher relative to the other stations in this segment. (Note: The Sylmar station sites, which have a much higher population/employment catchment, are not included in this segment.)

Located northeast of the two Santa Clarita stations, Antelope Valley Station Option 2, Palmdale Transportation Center and Antelope Valley Station Option 3, Palmdale Boulevard would be the next favorable alternatives to achieve the greatest ridership potential. The 1990 10-mile population/employment estimates for the area surrounding these stations are 195,660 and 86,755, respectively. These 1990 10-mile radius estimates are significantly lower than the population and employment estimates for Santa Clarita options 4 and 5 and represent a substantially lower catchment. The 10-mile radius ridership potential for the Palmdale stations is reduced by almost one-half when compared to the aforementioned Santa Clarita stations, based on population and employment estimates. Further, Antelope Valley Station Option 1, the Lancaster Metrolink Station, located to the north of the Palmdale stations has lower population and employment estimates and, therefore, lower ridership potential. The population estimate for the area surrounding the Lancaster station is 169,892 and 74,531 persons are employed in this area. The estimates for the Lancaster station are approximately 25,000 fewer persons and approximately 12,000 fewer persons employed in the area compared to the Palmdale stations. In addition to the 10-mile radius estimates, because the Antelope Valley stations are distant from Santa Clarita, the 1990 population and employment numbers for the two Palmdale station sites were calculated for a 20-mile radius and determined to be 252,151 people and 112,254 jobs.

Based on the 1990 census data, the least favorable potential stations are Santa Clarita Station Option 1, SR-126/I-5, Santa Clarita Option 2, Magic Mountain Parkway/I-5, and Santa Clarita Station Option 3, The Old Road/I-5 with 158,516 persons and 82,907 persons employed in the area surrounding these stations. However, these stations have a similar ridership potential to the Lancaster station with approximately only 11,000 fewer persons and approximately 8,000 more persons employed in the area surrounding these stations. Both the Lancaster station and the Santa Clarita station Options 1, 2 and 3 are the least favorable alternatives with regard to population/employment catchment and ridership potential for the Bakersfield-to-Sylmar segment.

However, all of the above population and employment estimates are based on 1990 data, and substantial population and employment growth has occurred in these areas since 1990. Populations in Santa Clarita, Palmdale, and Lancaster have increased significantly since 1990 and this is clearly reflected in the newly available Year 2000 Census data. In Santa Clarita, the total population increased 37 percent between 1990 and 2000, while in Palmdale the population increased 69 percent between 1990 and 2000. Comparing the two, the ridership potential in Palmdale has increased dramatically since 1990. Growth in both areas continues at a rapid pace today. Palmdale is a viable station location alternative but would not likely surpass Santa Clarita Station Options 4 and 5 as alternatives with the highest ridership potential. In Lancaster, the population increased 22 percent between 1990 and 2000. However, since the population increased 37 percent in Santa Clarita between 1990 and 2000, Santa Clarita Options 1, 2, and 3 would still likely surpass Lancaster and have more favorable ridership catchment than the Lancaster alternative. For a 20-mile radius, the catchment for the Palmdale station sites is also currently much larger than in it was in 1990. The current figures for the 20-mile radius of the Palmdale station sites are expected to be similar to the 1990 10-mile radius figures for the Via Princessa/SR-14 location in Santa Clarita.

B. MAXIMIZE CONNECTIVITY AND ACCESSIBILITY

Intermodal Connections

Station Evaluation/Comparison:

Antelope Valley Stations: Of the three Antelope Valley station locations, Option 2, the site at the proposed Palmdale Transportation Center provides the greatest opportunities for intermodal connections. It is close to Palmdale Airport, with the opportunity for convenient shuttle or people-mover service. Such service should be considered as Los Angeles World Airports begins the process of preparing a Master Plan for the airport. It is only 1.3 miles from the SR-14 freeway, connected by an existing arterial street network. SR-138 is planned to be relocated to an alignment immediately adjacent to the station site and Sierra Highway is planned to be realigned. These projects would improve arterial access and the highway connection between the Transportation Center and the Airport as well as the SR-14. As planned, the Transportation Center would also be a Metrolink station and a hub for local bus service. The Lancaster station site, Option 1 is the second best location from the perspective of connectivity, since it is an existing Metrolink stop and has local bus service, however it is 6.4 miles from Palmdale Airport and 2.3 miles from SR-14. The downtown Palmdale site has local bus service and could allow for a Metrolink stop, but the latter would be unlikely with the development of a stop at the Palmdale Transportation Center just a short distance to the north. This

location is 2.6 miles from Palmdale Airport and one mile from SR-14.

Santa Clarita Stations: The Via Princessa/SR-14 station site, Option 4, provides the greatest connectivity potential of the Santa Clarita station options. It is the only location in Santa Clarita with a potential Metrolink connection, although the current connection would have to be by shuttle bus to the existing station about one mile away. This site also has good freeway and arterial access. The San Fernando Road/SR-14 site, Option 5, and The Old Road/I-5 site, Option 3, both require extensive access road construction to get to the station sites. The SR-126/I-5 and Magic Mountain Parkway/I-5 locations, Options 1 and 2 respectively, are very close to the I-5 and near MTA Park and Ride facilities and would also be close to possible rail service from Ventura, including the planned reconnection of the Santa Paula Branch line to the Metrolink Antelope Valley Line. if it is implemented some time in the future. These two station sites were comparable for connectivity.

C. MINIMIZE OPERATING AND CAPITAL COSTS

Length

Alignment Evaluation/Comparison: Operating costs – including track and wayside maintenance – are closely related to overall alignment length. Given this (and assuming conservative grades), Option 1, which offers the shortest overall length at 87 miles (139 km), is the most favorable with respect to expected operating costs. At 89 miles (143 km), Option 1A is the next most favorable. The remaining alignments are less favorable, with lengths of 122 miles (195 km) to 124 miles (198 km).

Operational Issues

Alignment Evaluation/Comparison: The ability to achieve and efficiently maintain top operating speeds was a significant consideration in evaluating operating implications of alignment alternatives. Overall alignment length, as discussed above, curvature, and grades are all factors in operating and maintenance costs. Sustained grades and tunnel safety also present the most significant operating issues within this segment.

Each of the alignments would provide the desired maximum operating speeds along their entire length, subject to grade limitations. Top speeds over the Tehachapi Mountains would be reduced at 3.5 percent maximum grade profiles for alignment Options 1 (I-5) and 1A (I-5 via Comanche Point), as well as Options 2 (Soledad Cn./SR-58) and 2A (SR-14/SR-58). Top speed for the I-5 and I-5/Comanche alignments would be reduced to an average 170 mph (275 kph) for 11 miles (17 km) and 9 miles (14 km), respectively. Power consumption would also be expected to increase along the gradient lengths, resulting in a less favorable rating for steeper profiles with respect to operating costs. A 3.5 percent gradient would have less impact on speed and power consumption along the Soledad Cn/SR-58 and SR-14/SR-58 alignments, where top speeds on a steeper profile would be limited to 200 mph (325 kph) for a length of 4 miles (6 km).

Even for profile alternatives with grades limited to 2.5 percent, each alternative presents significant, sustained grades of greater 1.5 percent. The length and slope of grades may be refined in later stages of design to optimize earthwork and reduce operational impacts. Primarily due to its overall length, the SR-58 alternatives (Options 2 and 2A)

each feature three stretches of sustained grades that are 12.5-to-18.8 miles (20-30 km) long, at grades of up to 2.5 percent. Each of the rest of the alignment options includes two stretches of sustained grades of this length.

All alignments include tunneling and related safety concerns. For Options 2,2A, 3, 3A, 4, and 4A, tunnels are generally shorter, or closer to the surface thereby offering escape options at intermediate locations along the tunnel length. At 2.5 percent maximum grade, Options 1 and 1A, however, feature deep tunnels that would require adjacent evacuation tunnels along the entire tunnel length. The risk would be reduced at a higher 3.5 percent grade, where shorter individual tunnels and less overall tunnel length would be required. The 3.5 percent grade profile for Option 1, while including many short tunnels ranging in length from 1400 feet (475 meters) to 14,500 feet (4400 meters), would limit the total tunneling to 35 miles (56 km) as compared to 45 miles (72 km) of tunneling for the flatter gradient. An even more pronounced reduction in tunneling would be realized by utilizing a 3.5 percent rather than 2.5 percent grade for Option 2, where total tunnel length would be 16 miles (26 km) instead of 41 miles (66 km).

The alignments passing through Soledad Canyon and along SR-14, including each of the Antelope Valley alignments (Options 2 through 4A), feature more significant curvature than the I-5 alignments (Options 1 and 1A). This curvature would tend to increase the projected maintenance costs associated with the Antelope Valley alignments.

Station Evaluation/Comparison:

Antelope Valley Stations: Due to their location on the Antelope Valley lines, these station options serve the Antelope Valley alignment alternatives (Options 2 through 4A) and not the I-5 alignments (Options 1 and 1A). There are no significant operational issues presented by the two Palmdale station alternatives (Options 2 and 3). The Lancaster station site (Option 1) cannot serve alignment Options 4, or 4A.

Santa Clarita Stations: Three of the station alternatives evaluated (Santa Clarita Options 1, 2, and 3) serve the I-5 alignments (Option 1 and 1A), while two station sites (Santa Clarita Options 4 and 5) serve the various Antelope Valley alignments (Options 2 through 4A).

Because of the mountainous nature of the area, each Santa Clarita station option presents operational issues due to constraints of the terrain; however, this is most pronounced at The Old Road/I-5 (Option 3), Via Princessa/SR-14 (Option 4), and San Fernando Road/SR-14 (Option 5) sites. Option 3 and Option 4 require that a portion of the station platform be constructed in a widened tunnel area, which would limit area available for movement between tracks at that the tunnel end of the station. While Option 5 does not require that the platform be in tunnel, tunnels and curvature immediately adjacent to the station area would severely limit switching lengths.

For the Santa Clarita station sites, Options 1 and 2 present the fewest operating constraints for the I-5 alignments, while Option 4, at Via Princessa/SR-14, presents the fewest operational concerns for the Antelope Valley alignments.

Construction Issues

Alignment Evaluation/Comparison: By virtue of the mountainous terrain, the Bakersfield-to-Sylmar segment generally presents significant construction challenges as compared to

other segments of the high-speed train system. Construction access, major earthwork, and tunneling are the most significant construction issues within this segment.

Alignment Options 2A, 3A and 4A, which generally follow existing public rights-of-way (including State highways and the California Aqueduct), would offer the best construction access. Conversely, the I-5 alignments (Options 1 and 1A) would present the most challenges for access during construction.

The number and overall length of tunnels on each alignment would affect construction risk. Each of the alignment alternatives features more than 31 miles (50 km) of total tunneling. For the 2.5 percent maximum grade alternatives, Option 1 would require the greatest amount of tunneling at 44.8 total miles (72.1 km), while Options 3 and 4 would have the shortest total length of tunneling at 31.5 miles (50.7 km) each. By increasing profile grade to 3.5 percent for Options 1 and 2, tunneling length for Option 2 would be most favorable at 16 total miles (26 km).

Along with overall tunnel length, the total number of tunnels is also a construction issue. Because of the high mobilization costs of tunnel boring machines, constructibility concerns would be increased with the number of individual tunnels within each segment. Additionally, the construction of tunnel portals would require additional access, power supply and greater earthwork for widened portal areas, potentially increasing adverse environmental impacts as well. While reducing total length of tunneling, the application of steeper grades increases the total number of tunnels and total portal effects/impacts. In this respect, Option 2 at a 3.5 percent grade, which includes 18 separate tunnels, would present the most challenges. At 3.5 percent grade, Option 1 would require 13 tunnels. At a 2.5 percent maximum grade, Options 2, 3A, and 4A would include seven tunnels each, while Options 1, 1A, and 4 would each feature four total tunnels.

Each of the alignments within this segment would require a significant amount of earthwork – mostly cut. The excavation of rock and handling of spoil materials would be major issues during construction. The ripability of rock is an important factor in the construction of open cuts as well as bored tunnels. Readily excavatable soils would be anticipated along the I-5 alignments (Options 1 and 1A). Antelope Valley alignments that follow the existing rail routes (Options 2 and 2A) or the Aqueduct (4 and 4A) feature generally excavatable soils, with some deeper cuts likely to require heavy ripping. The most significant excavation challenges would be expected to be encountered at the SR-138 alignments (Options 3 and 3A), where excavation would likely be difficult due to anticipated presence of hard rock. Deep cuts – including the 31-32 miles (51-52 km) of tunneling – within the SR-138 and Aqueduct alignment alternatives would potentially require blasting.

Station Evaluation/Comparison:

Antelope Valley Stations: With no significant construction issues among them, each of the Antelope Valley station alternatives (Options 1, 2, and 3) offers favorable construction conditions. These station sites each have good access in moderately developed areas.

Santa Clarita Stations: Each of the station alternatives in the Santa Clarita area presents some construction challenges related to the mountainous terrain. The most favorable option with respect to construction issues is Option 2, which, although involving significant earthwork, provides good highway access. The nearby Option 1 is next most

favorable; however, its location within the floodplain of the Santa Clara River, is likely to require significant drainage considerations and present construction constraints. Options 3 and 4 have difficult access and will require widening of the tunnel mouth to accommodate the station platform within a limited area of tangent track. Option 5 is the least favorable location due to its difficult access and large amount of earthwork.

Capital Cost

Alignment Evaluation/Comparison: To cross the Tehachapi Mountains, the principal cost factor is tunneling. Although the longest, Option 2 at 3.5 percent grade has the lowest projected capital cost due to limited tunneling. The most expensive alternative is Option 1 at 2.5 percent grade, which is projected to cost $2 Billion more than the least expensive alternative. Option 1A (2.5 percent) is the next most expensive, with a projected capital cost of $200 Million less than Option 1 (2.5 percent). Options 1 (3.5 percent), 2 (2.5 percent), 3, 3A, 4, and 4A fall between these extremes.

In comparing flatter (2.5 percent maximum gradient) to steeper (3.5 percent) profiles for various alignments, reduced grade adds 20 percent to 40 percent to alignment capital costs. Longer tunnels associated with flatter profiles also require parallel evacuation tunnels, which add a significant cost to the alignments. Steeper grade profiles generally offer the most favorable construction costs. However, along the I-5 alignment a steeper grade may result in higher mitigation costs. This may occur due to the increased impacts of a higher number of tunnel portals located in remote or environmentally sensitive locations. More detailed analysis is required to fully determine this trade-off.

Station Evaluation/Comparison:

Antelope Valley Stations: Costs for the Antelope Valley station alternatives at Palmdale Transportation Center (Option 2) and Palmdale Blvd. (Option 3) are expected to be typical of a suburban station. The Lancaster site (Option 1) would be constructed on an aerial structure and would, therefore, likely be a more expensive alternative.

Santa Clarita Stations: Anticipated capital cost for the Santa Clarita station alternatives are driven by the terrain. Each would involve significant earthwork, although the SR-126/I-5 and Magic Mountain Parkway/I-5 sites (Options 1 and 2) are likely to require the least earthmoving. This, coupled with good highway access, makes Option 2 the most favorable site with respect to capital cost among the Santa Clarita options. With high earthwork and access road construction costs, the San Fernando Road/SR-14 site (Option 5) is the least favorable. Falling in between are The Old Road/I-5 and Via Princessa sites (Options 3 and 4), which each involve the construction of a widened tunnel and new access roads.

Right-of-Way Issues/Cost

Alignment Evaluation/Comparison: Alignments within this segment present a range of right-of-way challenges. The SR-58 alternatives (Options 2 and 2A), which generally follow existing highway and rail corridors along their full length, present the fewest concerns with respect to development and adjacent use; however, the relocation of railroad facilities between Palmdale and Mojave would be required. Maintenance of adjacent railroad traffic would be an issue for these alignments, both during construction and operations. The SR-138 alignments (Options 3 and 3A) also generally follow existing

transportation corridors. These alignments would require railroad relocation or modification through the Palmdale/Lancaster areas.

The Antelope Valley alignments that follow SR-14 (Options 2A, 3A, and 4A), rather than Soledad Canyon (Options 2, 3, and 4) would likely present fewer right-of-way challenges due to proximity to the State highway. However, the State highway right-of-way has been committed for construction of truck lanes, constricting available right-of-way. In addition, significant development is occurring along the SR-14 in Santa Clarita. On the other hand, the Soledad Canyon alignments would place the high-speed train system immediately adjacent to or within the Angeles National Forest.

The Aqueduct alignments (Options 4 and 4A) – as well as portions of the SR-138 alignments (Options 3 and 3A) – propose the sharing or use of land adjacent to California Department of Water Resources (DWR) land. This would present both opportunities and constraints for these alignments. Opportunities include jointly beneficial use of a State-owned corridor and existing access roads. Conversely, constraints could be made on the high-speed train use of the land due to proximity to the State Water Project. Options 1A, 3, 3A. 4 and 4A would also use a power easement at the south end of the Central Valley.

The I-5 alignments (Options 1 and 1A) would likely require the most new permanent public right-of-way – for the high-speed train alignment, proposed parallel evacuation tunnels, and access roads to tunnel evacuation points. Additionally, these alignments would likely impact or preclude some planned developments in the Santa Clarita area.

Station Evaluation/Comparison:

Antelope Valley Stations: Each of the Antelope Valley station alternatives lies within an existing railroad corridor, upon which the station construction would have some impact. These stations are each in moderately developed areas. The Lancaster site (Option 1) is the least developed, while the downtown Palmdale site (Option 3) is in the most urbanized area and a portion of the station site has been developed as a park and bikeway. The Palmdale Transportation Center site (Option2) is planned for transit development on the west site of the railroad, but is developed for road or commercial industrial use on the east. Some of the land east of the railroad is outside of the city of Palmdale in the County of Los Angeles' jurisdiction.

Santa Clarita Stations: The Santa Clarita station sites lie either adjacent to existing or planned development, or adjacent to regulated lands, including flood control areas and protected parklands. The SR126/I-5 site (Option 1) and Via Princessa/SR-14 site (Option 4) present the fewest right-of-way challenges. These alternatives, however, are not without constraint. Option 1 spans the Santa Clara flood zone and Option 2 sits on a site where proposed residential and commercial development is currently under review. The Old Road/I-5 site (Option 3) is the least favorable largely because its location would require a modification to the overall alignment that would result in tunneling under an existing residential development at the north of the station. The Magic Mountain Parkway/I-5 site (Option 2) faces issues related to existing development as well as an adjacent oil field. Finally, the San Fernando Road/SR-14 site (Option 5) would require the acquisition of additional parkland right-of-way in order to accommodate extensive access roads.

D. MAXIMIZE COMPATIBILITY WITH EXISTING AND PLANNED DEVELOPMENT

Land Use Compatibility and Conflicts

Alignment Evaluation/Comparison

Alignment Options 1, I-5, and 1A, I-5 via Comanche Point: In the Central Valley there are residential uses close to Bakersfield and agricultural lands to the south that will abut the alignments. There is an oil field at the toe of the north slope of the Tehachapis, that Option 1A crosses within an existing power easement. From the Tehachapis south to Santa Clarita, the major portion of Alignment Option 1, I-5, and Option 1A, I-5 via Comanche Point, is in tunnel and would not conflict with land uses adjacent to the tunnels. This is true to a greater degree for the 2.5 percent maximum grade variant than for the 3.5 percent maximum grade variant. The 3.5 percent variant has at-grade segments near the junction of I-5 and SR-138 in a rural area adjacent to an off-road vehicle park. It will require access roads to tunnel portals on National Forest lands. It also crosses at-grade through a developed area adjacent to Castaic Lagoon. Both alignments may indirectly impact mixed commercial and industrial areas in the City of Santa Clarita. The 3.5 percent maximum gradient variant crosses at-grade through a developing area adjacent to Pico Canyon Road in Santa Clarita, creating direct land use impacts.

Alignment Options 2, Soledad Canyon/SR-58, and 2A, SR-14/SR-58: From Bakersfield to the Tehachapis, this alignment follows the existing UP railroad right-of-way through the eastern edge of the city and across farmlands to the toe of the mountains. The portion of the alignment that parallels SR-58 would be located at grade and in tunnel sections. It crosses large tracts of grazing land in the Tehachapi Mountains. This alignment would be located approximately 0.4 mile (0.6 km) from the City of Tehachapi. The 2.5 percent maximum grade alignment is in a tunnel in this location; it would not impact any land uses in the City. The 3.5 percent maximum grade variant would be at-grade at this location and would indirectly impact residential, commercial and/or industrial land uses in the Rosamond. In the Antelope Valley, this alignment emerges from steep terrain and runs along the UPRR right-of-way; as a result it may indirectly impact abutting mixed commercial, industrial and residential land uses in Rosamond, Lancaster and Palmdale. There is some concern that this alignment could potentially create electromagnetic impacts to sensitive electronics at immediately adjacent industrial and research facilities in Palmdale; shielding may be necessary. The Soledad Canyon portion of the Option 2, Soledad Canyon/SR-58 alignment bridges the Santa Clara River and would be located adjacent to an existing concrete plant adjacent to the river near the City of Santa Clarita. For the 2.5 percent maximum grade variant, the portion of the Soledad Canyon section that runs through steep terrain would be located in a tunnel and would not therefore directly impact any recreational land uses in the Angeles National Forest. The 3.5 percent maximum grade variant would be at-grade in a portion of the National Forest and in some sensitive habitat areas.

The SR-14 portion of the Option 2A alignment would parallel SR-14 and cross this freeway in three places. At these crossings direct impacts to existing and planned land uses would occur. This alignment would potentially create indirect impacts on a mix of abutting residential, commercial and industrial land uses in the cities of Lancaster, Palmdale and Santa Clarita. The 2.5 percent maximum grade variant tunnels under much of the development areas, while the 3.5 percent gradient variant is at-grade for a substantial length. This alignment would also conflict with proposed commercial land uses included in a new development recently denied by the City of Santa Clarita that

would most likely be considered by the County of Los Angeles in the near future. The remaining sections of this alignment would have similar impacts to Option 2. The Soledad Canyon/SR-58 and SR-14/SR-58 alignments.

Alignment Options 3, Soledad Canyon/SR-138, and 3A, SR-14/SR-138: Close to Bakersfield, Options 3 and 3A traverse residential areas on structure and at-grade. Following existing railroad, highway and power rights-of-way, these alignments run at-grade adjacent to farmlands and oilfield operations to a tunnel portal at the base of the Tehachapi Mountains. The tunnel runs from the Central Valley to the Antelope Valley, exiting the Tehachapis adjacent to the California Aqueduct and SR-138. The SR-138 portion of Options 3 and 3A would create indirect impacts on existing residential and large ranch land uses west of Palmdale and in the City of Palmdale. The Palmdale and Soledad Canyon portions of alignment Option 3 have the same impacts on land use as these same sections of Option 2.

The SR-14 impacts of Option 3A are the same as Option 2A and would have the same effects on land use. There would be indirect impacts on a mix of residential, commercial and industrial land uses in the Palmdale and Santa Clarita areas. At bridge crossings the potential for direct impacts also exists. This alignment would also conflict with proposed commercial land uses included in a new development recently denied by the City of Santa Clarita that will most likely be considered by the County of Los Angeles in the near future. Both Options 3 and 3A were considered to be similar in terms of the magnitude of their impacts on land uses in the cities of Santa Clarita, Palmdale, Lancaster and Rosamond, in portions of unincorporated Los Angeles County and in Soledad Canyon.

Alignment Options 4, Soledad Canyon/Aqueduct, and 4A, SR-14/Aqueduct: Options 4 and 4A follow the same route out of Bakersfield as Options 3 and 3A, and therefore would have similar indirect impacts on adjacent residential, agricultural and oil field uses. Options 4 and 4A also include the same tunnel route under the Tehachapis. This alignment crosses the California Aqueduct in two places. Running parallel to the Aqueduct, it may also create indirect impacts on adjacent existing residential/large ranches west of Palmdale. The easternmost portion of the Option 4 alignment that parallels the California Aqueduct would create indirect impacts on abutting mixed residential, commercial and industrial land uses in Palmdale. The Soledad Canyon portion of alignment Option 4 is the same as Options 2 and 3, and would have the same impacts along the Santa Clara River near the City of Santa Clarita.

The SR-14 portion of Option 4A is the same as Options 2A and 3A and would create the same impacts on a mix of existing residential, commercial and industrial land uses in the Santa Clarita and Palmdale areas. Direct impacts are anticipated at freeway overcrossings. As noted above, this alignment would also conflict with proposed commercial land uses included in a new development recently denied by the City of Santa Clarita that will most likely be considered by the County of Los Angeles in the near future.

Station Evaluation/Comparison:

Antelope Valley Station Alternatives: Station Option 1 (Lancaster Metrolink Station) has the fewest conflicts with existing and planned land use. The Station Option 2 (Palmdale Transportation Center) site is zoned for industrial land use and planned to be the site of the Palmdale Transportation Center. However, residents of an existing residential neighborhood located nearby feel it would conflict with their community and with an

Antelope Valley Union High School District continuation high school planned for a close by location. Station Option 3 (Palmdale Boulevard) could create traffic and noise impacts on adjacent commercial and public facility land use. It is also close to an elementary school and a portion of the site is developed as a park and bikeway.

Santa Clarita Station Alternatives: Station Option 2 (Magic Mountain Parkway/I-5) has the fewest conflicts with existing and proposed land uses; the proposed station location is within visitor serving/resort, community commercial, and business park land use. Station Option 1 (SR-126/I-5) conflicts with the nearby Mineral/Oil Conservation Area open space. Station Option 3 (The Old Road/I-5) is within the Santa Susana Mountains Significant Ecological Area and therefore conflicts with existing conservation land use. Station Option 4 (Via Princessa/SR-14) conflicts with proposed residential and community commercial land use; this station also conflicts with the proposed Golden Valley Ranch development. Station Option 5 (San Fernando Road/SR-14) conflicts with the Mineral/Oil Conservation Area and also conflicts with a Significant Ecological Area.

Visual Quality Impacts

Alignment Evaluation/Comparison: Of the Bakersfield-to-Sylmar alignments, Options 3 and 3A are the most favorable because there are relatively few residences close to these alignment options that would have views of the alignments. However, a 2.25-mile bridge structure from the UPRR right-of-way to SR–138 would be visible for a long distance in the flat, rural landscape. Residences on the east side of Bakersfield would also have views of the alignment, on structure as it exits the station and at-grade as it runs to the south. Options 1, 1A, 2 and 2A would be less favorable than Options 3 and 3A. Options 1 and 1A both include an a-grade segment over rugged topography that crosses Towsley Canyon, which is being considered for Significant Ecological Area (SEA) status by the County of Los Angeles. Extensive earthwork would be required in this area. Options 2 and 2A each include an at-grade segment that would be within 200 feet of residences for a distance of 2 miles, and 400 feet of residences for 0.25 miles. Options 4 and 4A would be the least favorable regarding visual quality because each of these options includes a 9.5 mile-long elevated structure within 200 feet of existing residences for a distance of five miles on the west side of Palmdale.

Station Evaluation/Comparison: Option 1 is the most favorable because there are no nearby residential viewers. Option 3 is slightly less favorable because it is across Sierra Highway from the Palmdale Library and City Hall and there is a linear park immediately adjacent to the alignment. Existing residential viewers to the west and south make Option 2 the least favorable of the Antelope Valley station options.

Santa Clarita Stations: Option 2 is the most favorable because there are no residential viewers, while Option 4 is less favorable because residential viewers are located 0.5 mile across I-5 from this station. Option 1 is slightly less favorable than Option 4 because the north approach for this station would be on a bridge structure within 200 feet of residences for a distance of two miles. Options 3 and 5 are the least favorable because they are in rugged undeveloped areas being considered for SEA status. These options would require substantial earthwork.

E. MINIMIZE IMPACTS TO NATURAL RESOURCES

Water Resources

Alignment Evaluation/Comparison: The I-5 Alignment and the I-5 via Comanche Point Alternatives (Options 1 and 1A) would have the greatest potential impact to water resources, even with the 2.5 percent maximum gradient variant. Several resources rated as exhibiting moderate to high sensitivity would be potentially affected and a substantial number of low to moderately sensitive drainage courses and springs would also be crossed. The great portion of these alignments would cross well below these surface resources waters in a tunnel and consequently have a low potential to result in direct adverse effects. However, it is possible that some of these resources could be indirectly affected if the tunneling created a situation that caused a drawdown of surface waters through underground aquifers or faults, such that surface waters and associated habitat areas are depleted. The potential for such an effect could be greatly reduced or eliminated by lining the tunnels.

North from Castaic Creek, tunneled segments of alignment Options 1 and 1A cross under numerous tributary drainages and springs with low and low to moderate sensitivity. Also, the route crosses under a large basin on the east side of I-5 next to Pyramid Lake and crosses directly under or nearly adjacent to a 5-mile long section of Gorman Creek, each considered moderate to highly sensitive.

The I-5 and I-5 via Comanche Point Alignments cross directly under and/or adjacent to substantial drainage areas within Weldon Canyon, Pico Canyon and Gavin Canyon. These alignment alternatives also both include a 1-mile long bridge crossing over the Santa Clara River, and a 2 mile bridged section over or immediately adjacent to Castaic Creek, both of which are likely to displace jurisdictional waters and wetland or riparian resources due to the placement of bridge columns and footings. Although the total affected area in the river is not likely to be large, mitigation would be needed to replace any displaced habitat or waters at a minimum 3:1 ratio. Noise effects would also be potentially adverse on wildlife associated with riparian habitat bridged by the alignment in these areas.

In comparing the I-5 alignment with the I-5 via Comanche Point alignment, both cross below numerous tributary drainages and springs. Although the Comanche Point alignment crosses a slightly higher number of these low to moderately sensitive resources, the I-5 Alignment could entail a higher potential to adversely effect water resources because it also passes under the extreme southwestern edge of Castaic Lake, a resource considered highly sensitive.

At a maximum 2.5 percent grade, all of the routes through the Santa Clarita/Acton areas, the Soledad Canyon (Options 2,3 and 4) or SR-14 (Options 2A, 3A and 4A) routes, have the potential to substantially impact water resources but the Soledad Canyon route could have measurably greater adverse effects than the SR-14 route. Both routes cross over or under numerous tributary drainages with low to moderate sensitivity and both would include a bridge crossing over the Santa Clara River in an area of moderate to high sensitivity. However, the Soledad Canyon route tunnels under the Soledad Canyon drainage at several points and also crosses below numerous small "feeder" drainages. If tunneling affects surface waters in this area, then the hydrology in the Canyon could be altered, resulting in potentially adverse effects to the sensitive riparian resources associated with the major drainage in this canyon.

The three segments that cross the Antelope Valley (along the UPRR and then the SR-58, SR-138 and the California Aqueduct) to reach Bakersfield each would entail relatively minor potential impacts to drainages. There are few significant water resources in this arid part of the project study area, and most of the low to moderately sensitive tributary drainages and springs may not exhibit surface water for most of the year. Of these Alignments, the two Aqueduct Options, 4 and 4A, would impact the fewest number of drainages while the SR-138 (Options 3 and 3A) and SR-58 (Options 2 and 2A) Alignments are considered roughly equivalent in terms of their potential effects.

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Potential Impacts to Jurisdictional Waters Using a 3.5 Percent Grade Variant: Increasing the maximum grade from 2.5 percent to 3.5 percent for Options 1 and 2 will decrease the total length of tunneling. Decreasing the total tunnel length will increase the number of drainages that would be crossed at grade and will decrease the number of surface drainages and other surface water resources that could be affected by subterranean tunnels. As previously noted, the potential for a tunneled segment to affect surface waters is expected to be low, particularly if tunnels are lined to inhibit or prevent effects on surface hydrology, or if subterranean tunnels simply do not have any direct hydrological connection with surface waters. As a result, an increase in the number of at-grade crossings of jurisdictional waters would be expected to cause a proportionate increase of potentially adverse effects on these waters and associated riparian/wetland habitat resources. At-grade crossings would be likely to involve some displacement of these resources, while tunneling would not cause any displacement of surface waters. The potential for subterranean tunnels to reduce surface water supplies by infiltration is expected to be low, except in certain situations where there is considerable faulting or extensive aquifers.

Even in cases where the at-grade crossings of water resources may be bridged, rather than filled and culverted, the potential adverse effects of the 3.5 percent maximum grade scenario would still increase, as compared with the 2.5 percent grade scenario. Bridging watercourses and other surface waters would minimize or avoid displacement of these

resources, but other adverse effects involving noise and disturbance to wildlife habitat and reductions in water quality, would still occur.

Mitigation measures will be required to avoid, minimize, or compensate for all such adverse effects that involve displacement of jurisdictional area and/or reduction of habitat quality commensurate with the increased effect. Therefore, any alternative that would involve greater impacts to jurisdictional waters (particularly impacts involving wetlands), and would result less tunneling and more at-grade crossings, would require additional mitigation. Furthermore, the guidelines established by the Corps of Engineers and the EPA that pertain to permitting the discharge of fill material into jurisdictional waters of the U.S. (Section 404(b)(1) Guidelines) require that the applicant select the "least damaging practicable alternative" to achieve the project purpose. Therefore, if a less damaging feasible alternative is available, it would be more difficult to secure federal authorization for alternatives with greater impacts to waters under Section 404 of the Clean Water Act, unless other adverse environmental effects can be shown to be substantially reduced.

In total, the 3.5 percent grade scenario applied to Alignment Option 1 (I-5) would increase the number of at-grade crossings of low sensitivity water resources from 2 to 4, low to moderate sensitivity waters from 2 to 7, and moderate to high sensitivity resources from 1 to 6. Of course, 3.5 percent grade scenario applied to each of these alignment alternative options would also result in a commensurate decrease in the number of surface waters that would be tunneled under. However, where extensive cut and fill may be necessary, the earthwork could have a considerable adverse effect on these surface waters by displacing waters and destroying associated riparian/wetland habitat resources.

In the case of Alignment Options 2, the section that crosses the Tehachapi Mountains, would experience an increase in at-grade crossings of waters, using the 3.5 percent grade scenario, as compared with a 2 percent grade. The increase of potentially adverse effects to surface waters caused by an increase of at-grade crossings would not be as severe as the increase associated with Alignment Options 1 and 1A, however. For comparison, the total number of at-grade crossings of low sensitivity water resources associated with Alignment Options 2 and 2A would increase by 12 and at-grade crossings of low to moderate sensitivity waters would increase by 4. However, no moderate to high sensitivity resources occur in the area associated with the increased grade and decreased tunnel segment lengths. It is in Soledad Canyon that substantially increased impacts would occur for Option 2; Agua Dulce and 10 additional tributaries to the upper reaches of the Santa Clara River will be crossed at-grade instead of in tunnel. This at-grade construction would also occur parallel and in close proximity to the river, with a high potential for both habitat and water quality impacts.

Station Evaluation/Comparison: No impacts to water resources are apparent at either the Lancaster Metrolink, Palmdale Transportation Center or Palmdale Boulevard Station Alternative locations.

Of the Santa Clarita Station options, Station Option 1 (SR-126/I-5), Option 2 (Magic Mountain Parkway/I-5), and Option 4 (Via Princessa/SR-14) do not appear to impact water resources per se. However, this possibility cannot be entirely ruled out if extremely small drainages occur at these sites that are not mapped on the existing database. Small tributary drainages with low sensitivity occur at or in the immediate

vicinity of Station Option 3 (The Old Road/I-5) and 5 (San Fernando Rd/SR-14). It is possible that stations sited at either of these locations could avoid adverse effects on water resources by design or through mitigation measures. The alignment segments that approach these station sites also have somewhat different effects on water resources, particularly when the 2.5 percent and 3.5 percent maximum grade variants are considered.

Using the assumption that the 3.5 percent maximum grade variant would be constructed for Option 1, the alignment variation that does not support The Old Road/I-5 station site would involve an at-grade crossing (or a bridge) over the Pico Canyon drainage, which could involve a substantially greater water resources impact. This alignment variant would also involve three more at-grade crossings of low to moderately sensitive streambeds than would the alignment variant that supports all three station sites. (Of the three station sites, this alignment variant is only suitable for the Magic Mountain Parkway/I-5 station site.)

Floodplain Impacts

Alignment Evaluation/Comparison: Along the Bakersfield connectors for Options 1 and 1A, the I-5 and the I-5 via Comanche Point alignments, there are major flood prone areas. The connector alignments that run to I-5 and Comanche Point each traverse and abut more than 15 miles of flood prone area. Options 1 and 1A also cross several river and stream floodplains including that of the Santa Clara River. The I-5 alignment also tunnels under the western edge of Castaic Lake.

East of Bakersfield there is a 100-year floodplain at the toe of the Tehachapis that is crossed by Options 2 and 2A. They also cross a floodplain along SR-58, 100-year and 500-year floodplains in the Palmdale and Lancaster areas, and the Santa Clara River floodplain. There is an extensive 100-year floodplain north of Lancaster that affects these alignments for a distance of about 4 miles. Of these two alignments, Option 2 parallels the Santa Clara River for a longer distance and is affected by more of its floodplain. The 3.5 percent maximum grade variant of Option 1 crosses the Santa Clara River at-grade in an area of the Angeles National Forest, while the 2.5 percent variant traverses this area in tunnel.

Options 3 and 3A, along SR-138, cross 100-year floodplain areas along the Central Valley route to Bakersfield and near the west end of SR-138, just south of the Tehachapis. Along SR-138 near Lancaster they cross 100-year and 500-year floodplains. They also cross the Santa Clara River floodplain. Options 3 and 3A are affected by a total of about 15 miles of abutting or traversed floodplains. These alignments are similar to the SR-58 alignments south of Lancaster.

Options 4 and 4A, along the California Aqueduct, cross 100-year floodplain areas along the Central Valley route to Bakersfield. Just south of the Tehachapi Mountains, like the SR-138 alternatives (Options 3 and 3A) they are affected by 100-year floodplain areas. However, they avoid the floodplain areas in and north of Lancaster. Just west of Palmdale, these alignments cross areas of 100-year and 500-year floodplain. Like Options 2, 2A, 3 and 3A these alternatives cross the Santa Clara River floodplain.

Station Evaluation/Comparison: Of the three Antelope Valley station sites, both the Lancaster (Option 1) and Palmdale Boulevard (Option 3) locations are located within 500-

year floodplains. The Palmdale Transportation Center site (Option 2) is unaffected by floodplains.

In Santa Clarita the SR-126/I-5 station site (Option 1) may be affected by the Santa Clara River floodplain. Station Option 3, The Old Road/I-5, may be affected by small drainages, however, avoidance may be feasible. The other three station sites are unaffected by floodplains.

Threatened & Endangered Species Impacts

Alignment Evaluation/Comparison: Although greater than fifteen sensitive species are found within alignment Option 1 (I-5 alignment) and alignment Option 1A (I-5 via Comanche Pt.), there is lower potential to impact sensitive species on either alignment option due to the length of tunneling. Alignment Option 2 (Soledad Cn./SR-58) and alignment option 2A (SR-14/SR-58) both have a higher potential to impact fifteen or greater sensitive species since a larger portion of the alignments would be above ground. This also applies to the 3.5 percent maximum grade variants in contrast to the 2.5 percent variants. It is of special concern for Option 1, since this alignment is near the California condor sanctuary and within the range of these endangered birds. The increased amount of alignment at grade and the increased number of tunnel portals provide additional opportunities to run power to the alignment and lengthen the amount of catenary lines exposed in sensitive habitat areas. This concern arises from the number of condors that have been killed due to making contact with power lines. The minimize tunneling variant is at grade within the range of these birds.

Station Evaluation/Comparison: At the Antelope Valley stations no impacts are expected to occur on Option 1 (Lancaster Metrolink Station). There is a potential to impact several sensitive species on Option 2 (Palmdale Transportation Center). Minimal impact to native habitat and sensitive species is expected to occur on Option 3 (Palmdale Blvd.).

At the Santa Clarita station sites Option 1 (SR-126/I-5) and Option 2 (Magic Mt. Pkwy. /I-5) the surrounding areas are developed. Both stations are in the vicinity of the California condor sanctuary. There is potential at each station site to impact several sensitive species. At the Option 3 location (The Old Road/I-5), the surrounding area is less developed and there is a potential to impact several sensitive species. Option 4 (Via Princessa/SR-14) and Option 5 (San Fernando Rd/SR-14) would traverse a designated Sensitive Ecological Area. There is potential to impact several sensitive species at both the Option 4 and 5 locations.

F. MINIMIZE IMPACTS TO SOCIAL AND ECONOMIC RESOURCES

Environmental Justice Impacts (Demographics)

Alignment Evaluation/Comparison: Environmental justice is measured by the number of minority and low-income persons potentially impacted by each alignment. The fewer the number of potentially affected people the lower the impact. The connector segments from the Bakersfield station included in Options 1, 1A, 3, 3A, 4 and 4A all have the same minority and poverty populations, since these routes share a common alignment in Bakersfield and for some distance to the south. The 1990 minority population within a 1400-foot buffer area for the Central Valley portions of these options is 22,595. In 1990

there were also 262 households in poverty. The connector for Options 4 and 4A, running along the UP railroad parallel to SR-58, had a 1990 minority population of 13,744. It also had 262 households in poverty. South of the Central Valley, within the Los Angeles-to-Bakersfield corridor study area, the minority and poverty population is much lower. Because of this fact, Options 4 and 4A have the lowest overall potential effect on minority populations.

Within the Los Angeles-to-Bakersfield corridor study area, south of the Central Valley, the minority and poverty population is lowest along alignment Option 1A, I-5 Via Comanche Pt. The 1990 minority and poverty estimates within the defined area of 700 feet from this alignment are 3,049 and 74, respectively. Similarly, the 1990 minority and poverty estimates for alignment Option 1, I-5 alignment are 3,051 and 76, respectively. From the Tehachapi Mountains south, the total numerical difference between the I-5 alignment and the I-5 via Comanche Point alignment is only two minority persons and two households in poverty. When combined with the data for the Central Valley, however, for Option 1 the total potentially affected minority population is 25,646, with 338 potentially affected households in poverty. For Option 1A, total 1990 minority population is 25,644 with 336 households in poverty.

From the Tehachapis south, the minority and poverty estimates along the Option 4, Soledad Canyon/Aqueduct alignment, are 2,871 and 563, respectively. The 1990 minority and poverty estimates within the defined area along the Option 4A, SR-14/Aqueduct alignment, are 2,864 and 563, respectively. The total numerical difference between these alignments is seven minority persons. When combined with the data from the Central Valley, the total potentially affected minority population is 25,466 for Option 4 and 25,459 for Option 4A, along with 825 potentially affected households in poverty for both Options.

The 1990 minority and poverty estimates within the defined area along the Option 3, the Soledad Cn./SR-138 alignment, are 3,943 and 947, respectively. The 1990 minority and poverty estimates within the defined area along Option 3A, the SR-14/SR 138 alignment, are 3,936 and 947, respectively. When combined with data for the Central Valley, the total number of potentially affected minority individuals based on the 1990 Census is 26,538 for Option 3 and 26,531 for Option 3A. Both options potentially affect 1209 low-income households. The total numerical difference between these alignments is seven persons. However, the average difference between these two alignments and Alignment Option 4 and 4A discussed above is over 1,000 minority persons and close to 400 households in poverty. Alignment Options 3 and 3A are, therefore, slightly less favorable alternatives from an environmental justice standpoint.

The most favorable alignments overall with respect to potential effects on minority population are Option 2A, SR-14/SR-58, and Alignment Option 2, Soledad Cn./Sr-58. From the Tehachapi Mountains south, the 1990 minority and in-poverty household estimates for the SR-14/SR-58 alignment are 4,158 and 1,031, respectively. The 1990 minority and poverty estimates for the Soledad Cn./SR-58 alignment are 4,165 and 1,031, respectively. When the data for the Bakersfield connector in the Central Valley is added the potentially affected minority population increases to 17,909 for Option 2 and 17,902 for Option 2A. Similarly, the number of potentially affected low-income households increases to 1,293 for both Options 2 and 2A. The difference between the minority estimates of these two alignments is seven persons and the poverty estimates are identical. These alignments affect more low-income people than all of the other

considered alignments for this segment.

Station Evaluation/Comparison: Of the three Antelope Valley station sites, the Palmdale Transportation Center is less likely to adversely affect minority population and households in poverty, based on 1990 US Census data. Based on the 1990 Census, there were only 19 minority individuals and 5 households in poverty near this site. At the Lancaster site there were 622 minority individuals and 194 households in poverty and at the downtown Palmdale site there were 772 minority individuals and 216 households in poverty.

In the Santa Clarita area there are very low populations of minority persons and few households in poverty. The station location with the greatest number of minority individuals within a 1,400-foot radius in the SR-126/I-5 site, with a 1990 minority population of only 152 and one household in poverty.

Farmland Impacts

Alignment Evaluation/Comparison: The alignment between Bakersfield and the toe of the Tehachapis would impact existing farmlands and pockets of soil suitable for farming. Along its approach to Bakersfield, Option 1, I-5 via Comanche Point, affects a greater amount of existing and potential farmland than Option 1. Both of these options use alignments on existing rights-of-way to avoid severing existing fields. Access across the rail route may be made more circuitous in some locations. Much of the I-5 via Comanche Point alignment (Option 1A) is in a tunnel and would not impact farmland. However, the 3.5 percent maximum grade variant would run at grade through some areas currently used for grazing. Options 1 and 1A would encroach on a small amount of existing farmland near the Santa Clara River and SR-126. They would also traverse pockets of soils in the Santa Clara River and its tributary areas that could be farmed.

The portions of the Option 2 and 2A alignments that parallel SR-58 and SR-14 between Bakersfield and Palmdale would impact existing farmland between Bakersfield and the Tehachapi Mountains and would traverse pockets of soil suitable for farming in the Rosamond, Lancaster and Palmdale areas. As with the other approaches to Bakersfield, these alignments have been placed in an existing railroad right-of-way and will avoid severing fields. However, some access across the rail route may be made more circuitous. In the Tehachapi Mountains there is little prime farmland, with the vast majority of the area dedicated to livestock grazing. With the 3.5 percent variant, there is more alignment at grade, and a greater possibility of severing and adversely affecting access to grazing lots. The SR-14 portion of Options 2 and 2A does not impact a substantial amount of existing farmland, but would cross some pockets of soil suitable for farming in the Lancaster and Palmdale areas. Since most of the Soledad Canyon portion of Option 2 is in a tunnel it would not impact farmland on the surface above the tunnels. However, a 3.5 percent variant through this canyon would affect farmland with at-grade segments through the east end of the canyon.

The SR-138 portion of Options 3 and 3A and the connector to Bakersfield would traverse through lands that are currently being farmed. In the Antelope Valley and from the toe of the Tehachapis to Bakersfield, the alignment would also pass though areas of soil that could be farmed. In the Antelope Valley, these alignments do not impact a substantial amount of existing farmland but would travel through pockets of soil suitable for farming in the Lancaster and Palmdale areas. Since most of the Soledad Canyon portion of

Option 3 is in a tunnel it would not impact farmland on the surface above the tunnels. However, as with Option 2, a 3.5 percent variant through this canyon would affect farmland with at-grade segments through the east end of the canyon.

The Aqueduct portion of Options 4 and 4A would cross areas currently being farmed in the southern Antelope Valley and in the area between the toe of the Tehachapi Mountains and downtown Bakersfield. They would also traverse areas of soil suitable for farming. The SR-14 segment of Option 4A does not impact a substantial amount of existing farmland. Since most of the Soledad Canyon portion of Option 4 is in a tunnel it would not impact farmland on the surface above the tunnels. However, as with Options 2 and 3, a 3.5 percent variant through this canyon would affect farmland with at-grade segments through the east end of the canyon.

Station Evaluation/Comparison: All of the Antelope Valley station sites are located in an urbanized area with no developable farmland.

The Santa Clarita station locations, with the exception of the SR-126/I-5 site (Option 1) are all located in urbanized or mountainous areas not suitable for farming. Station Option 1, however, is located in an area with soil that could be farmed.

G. MINIMIZE IMPACTS TO CULTURAL RESOURCES

Cultural Resources Impacts

Alignment Evaluation/Comparison: Option 1, I-5, and Option 1A, I-5 via Comanche Point, would have the least potential impact to cultural resources, primarily due to the steep terrain and the route being almost entirely tunnel for the 2.5 percent maximum grade variant. If tunnels were minimized with a maximum 3.5 percent grade, there would be an increased possibility of finding cultural resources in the Tejon Pass.

Of the three routes that cross the Antelope Valley to reach the Bakersfield area, the SR-138 route has the lowest potential to impact cultural resources. This alignment passes through Palmdale, but then turns west to cross the desert floor, and proceeds northwest in tunnel. Although the route paralleling the California Aqueduct also proceeds through Palmdale, then turns west to reach Bakersfield, this route, at the base of the mountains crosses numerous stream channels that flow down from the mountain front. This interface zone of mountain front and desert has a high potential for prehistoric and historical cultural resources, probably the highest potential of all the proposed alignments.

Proceeding down Tehachapi Creek Canyon, Option 2 is primarily in tunnel. However, several structures across steep valleys, as well as tunnel entrance and exit cuts have a moderate potential to impact, visually if nothing else, the historic rail and road routes present in Tehachapi Creek Canyon. If the maximum grade for this alignment is increased to 3.5 percent, more of the alignment is at-grade resulting in an increased potential for impact. The 3.5 percent variant includes an at-grade segment immediately adjacent to the historic Tehachapi Loop, where the original 19th century rail route actually crosses over itself to allow it to climb a steep slope. Option 2, proceeding through the Tehachapi Mountains, largely in tunnel, and crossing the Antelope Valley on structure or at grade, has a high potential to impact cultural resources. Passing through the towns of Mojave and Tehachapi, near Edwards Air Force Base, and through

Rosamond, Lancaster and Palmdale, mostly on structure or at-grade, this alignment has a moderate to high potential to impact resources related to the historic era in these towns, and adjacent homestead and military sites. Prehistoric resources may also be present.

Of the ways to get from Palmdale to Santa Clarita, via SR-14 or Soledad Canyon, both routes have very low potential to impact cultural resources. However, the route through Soledad Canyon has slightly less potential for impacts than the route along SR-14. Although the route through Soledad Canyon follows the Santa Clara River valley, most of this alignment is in tunnel, with only two major crossings of the river on structure. The SR-14 Alignment is also in tunnel for most of the route, but crosses the Santa Clara River two times on structure, as well as crossing several smaller stream channels on structure. This comparative sensitivity would be reversed with an increased at-grade alignment associated with a 3.5 percent maximum grade variant. A much greater amount of surface disturbance would occur in Soledad Canyon, both crossing and parallel to the Santa Clara River resulting in an increased potential for impacts to cultural resources.

Station Evaluation/Comparison:

Antelope Valley Station Alternatives: The Palmdale Transportation Center has the lowest potential to impact cultural resources. No cultural resources are indicated on the Project GIS database in this location, and this area is away from older areas of the city.

The Palmdale Boulevard location has a slightly higher potential to impact cultural resources due to being located in the Palmdale city center, where older historical resources may exist.

The Lancaster Metrolink Station location has a high potential to impact cultural resources, due to being located in the Lancaster city center. Recorded historical resources are present a block west of this location, and these may suffer visual impacts from HSR trains on structure.

Santa Clarita Station Alternatives: The Old Road/I-5 location has the lowest potential to impact cultural resources due to being located on a landform with low potential for cultural sites. The San Fernando Road/SR-14 location has a low to moderate potential to impact cultural resources due to being located near several small stream channels. The Magic Mountain Parkway/I-5, the SR-126/I-5 and the Via Princessa/SR-14 locations have the highest potential to impact cultural resources, due to being located near the Santa Clara River.

Parks & Recreation/Wildlife Refuge Impacts

Alignment Evaluation/Comparison: With the 2.5 percent maximum grade variant, Options 1 and 1A, the I-5 Alignment and the I-5 via Comanche Point alignments would have the least potential impact to existing park resources, due to the route being almost entirely tunnel. However, with the 3.5 percent grade variant these options are at-grade adjacent to an off-road vehicle park at the junction of I-5 and SR-138 in Tejon Pass and near the California condor refuge. North of Santa Clarita, the eastern variant of this route may have some impact to Castaic Lake State Park due to a tunnel entrance. These routes also cross Towsley Canyon at-grade, an area being considered for Special Ecological Area status by the County of Los Angeles.

Of the ways to get from Palmdale to Santa Clarita, via SR-14 or Soledad Canyon, the Soledad Canyon route would have no impact on park resources should it be in tunnel. If the 3.5 percent maximum grade variant were preferred to minimize tunneling, however, this route would pass through National Forest Lands at-grade. The SR-14 route passes Vasquez Rocks County Park on structure, and may have some visual impacts.

Of the three routes that cross the Antelope Valley to reach the Bakersfield area, the SR-138 segment encounters no park resources. The SR-58 segment has a moderate potential to impact parks, passing the Sierra Highway Greenbelt Park in Palmdale on structure. The segment that parallels the California Aqueduct also passes the Sierra Highway Greenbelt Park, the Antelope Valley Poppy Preserve and a Joshua tree preserve at some distance at-grade, with a possible visual impact.

Station Evaluation/Comparison: No park resources are located at the Lancaster Metrolink Station location. A small park and bikeway are located at both of the Palmdale station alternatives. No park resources are located at the Santa Clarita Station Alternatives, however the San Fernando Road/SR-14 station site is within the Angeles National Forest boundary.

H. MAXIMIZE AVOIDANCE OF AREAS WITH GEOLOGIC AND SOILS CONSTRAINTS

Soils/Slope Constraints

Alignment Evaluation/Comparison: In general, all eight of the proposed alignments share relatively moderate soil constraints. The I-5 alignments through the vicinity of Tejon Pass received higher rankings primarily due to the presence of older geologic formations having less erosion and/or shrink swell potential.

Station Evaluation/Comparison: The Antelope Valley station locations are similar to most of the Santa Clarita station locations relative to soil constraints. Largely due to the presence of highly expansive soils at the Via Princessa/SR-14 station (Option 4) it is considered to present more soils constraints than the other sites. Steep slopes are found at the San Fernando Road/SR-14 and The Old Road/I-5 sites.

Seismic Constraints

Alignment Evaluation/Comparison: Seismically, all of the alignments received relatively low rankings due to the presence of the overall project in the seismically active Southern California setting. However, alignments along SR-58 were generally concluded to have the least seismic constraints and the route parallel to the California Aqueduct, which essentially coincides with the San Andreas Rift Zone, was concluded to have the highest risk. Liquefaction, ground rupture, and ground motion hazards would all generally coincide with these conclusions.

Station Evaluation/Comparison: The Antelope Valley and Santa Clarita stations are both located in areas of high potential ground motion and are both similarly given very low rankings. The only station that received higher rating was the Santa Clarita Station Option 4, Via Princessa/SR-14 due to its somewhat lower potential for ground motion.

I. MAXIMIZE AVOIDANCE OF AREAS WITH POTENTIAL HAZARDOUS MATERIALS

Hazardous Materials/Waste Constraints

Alignment Evaluation/Comparison: Alignment Option 1 (I-5 Alignment) and Alignment Option 1A (I-5 via Comanche Point) maximize avoidance of areas with potential hazardous materials. These alignments have the fewest CERCLIS, SPL, and SCL sites nearby. Both alignments are close to but do not go through the oil fields adjacent to Highway 126. Option 1A traverses and area of oil fields at the toe of the north slope of the Tehachapi Mountains; this portion of the alignment is in a power line easement. Alignment Option 3 (Soledad Canyon/SR-138) and Alignment Option 4 (Soledad Canyon/Aqueduct) are in a tunnel near a Superfund site that is adjacent to a concrete plant in the Santa Clarita River. Because of this Superfund site, both of these Alignment Options are the least favorable alignments of the Bakersfield-to-Sylmar Segment relative to potential hazardous materials impacts.

Station Evaluation/Comparison: All of the Antelope Valley Station Options (Lancaster Metrolink Station, Palmdale Transportation Center, and Palmdale Boulevard) and Santa Clarita Station Option 4 (Via Princessa/SR-14) maximize avoidance of areas with potential hazardous materials because there are no CERCLIS, SPL, or SCL sites listed near any of these proposed station locations. Antelope Valley Station Option 2 (Palmdale Transportation Center) is close to the United States Air Force Plant 42 near Palmdale Airport. There may be a higher potential for hazardous materials near this proposed station location than at the other proposed station locations. Santa Clarita Station Options 1, 2, 3 and 5 (SR126/I-5, Magic Mountain Parkway/I-5, The Old Road/I-5, and San Fernando Road/SR-14) are adjacent to existing oil fields or near existing natural gas/petroleum pipelines. These proposed station alternatives also have the potential for impacts associated with hazardous materials.

4.1.2 Sylmar-to-Los Angeles Segment

Two basic alignments and a hybrid of the two were evaluated between Sylmar and Los Angeles. All of the alignments are suitable for both steel wheel and maglev technology. The alignments were (Figure 4.1-3 on Page 70):

Alignment Option 1 – Metrolink/UPRR: Generally follows existing railroad between Sylmar and downtown Los Angeles. This alignment is suitable for all station locations under consideration. Station locations include Sylmar, Burbank and the Los Angeles Union Station area. There are two station location options in Sylmar: (1) Roxford Street and (2) Sylmar Metrolink Station. The Burbank station locations include: (1) Burbank Airport and (2) Burbank Metrolink Station. The downtown Los Angeles station locations include: (1) Existing Union Station, (2) Union Station South (Through), (3) Union Station South (Stub), (4) Los Angeles River West, (5) Los Angeles River East and (6) the Cornfield Site.

Alignment Option 2 – I-5 Freeway: This alignment option generally follows I-5 from Sylmar to downtown Los Angeles, but frequently diverges due to tight highway curvature that would severely compromise operating speed. Approaching downtown, it tunnels under Elysian Park. Station locations include Burbank and the Los Angeles Union Station area. There are no feasible Sylmar station sites. There is only one Burbank station location at Burbank Metrolink Station. There are two possible Los Angeles Station sites: (1) Existing Union Station and (2) Union Station South (Through).

Alignment Option 3 – Combined I-5/UPRR: Follows the UPRR from Sylmar to Burbank Metrolink Station

and then generally follows I-5 to a tunnel under Elysian Park to downtown Los Angeles. Station locations include Sylmar, Burbank and downtown Los Angeles. There are two station location options in Sylmar: (1) Roxford Street and (2) Sylmar Metrolink Station. The Burbank station locations include: (1) Burbank Airport and (2) Burbank Metrolink Station. The downtown Los Angeles station locations are limited to: (1) Existing Union Station and (2) Union Station South (Through).

The potential Sylmar station sites are (Figure 4.1-14):

Option 1 – Roxford Street
Option 2 – Sylmar Metrolink Station

The potential Burbank station sites are (Figures 4.1-15 and 4.1-16):

Option 1 – Burbank Airport
Option 2 – Burbank Metrolink/Media City

The potential Los Angeles Union Station area sites are:

Option 1 – Existing Union Station: This location would include provision of run through tracks to the south.

Option 2 – Union Station South (Through): Located south of SR-101 and straddling the Los Angeles River. This alternative could potentially be combined with Option 4 using an L-shaped platform layout.

Option 3 – Union Station South (Stub): Located south of SR-101 between Alameda Street and the Los Angeles River. This alternative could potentially be combined with Option 4 using an L-shaped platform layout.

Option 4 – Los Angeles River West: On the west bank of the Los Angeles River connected to the existing Union Station Complex by ancillary service and parking facilities and a pedestrian concourse to be located parallel to and south of SR-101. This alternative could be combined with either Option 2 or 3 using an L-shaped platform layout.

Option 5 – LA River East: On the east bank of the LA River north of SR-101, at MTA bus yard.

Option 6 – Cornfield Site: Former rail yard sought by the Environmental Defense Fund for park use.

As shown in Figures 4.1-4 and 4.1-5 each of these station locations requires different track configurations for station approaches.

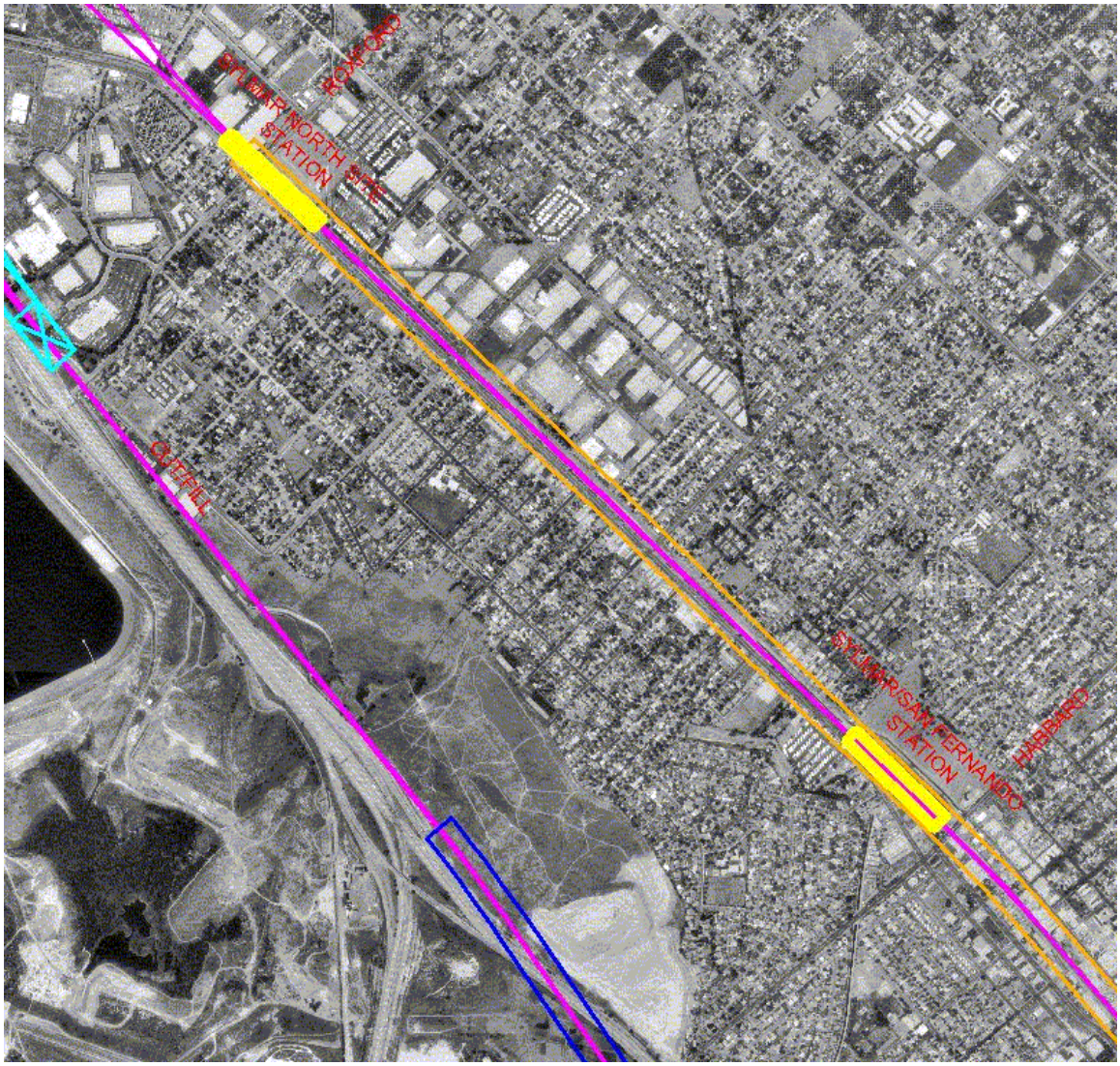

Figure 4.1-14 Sylmar Station Options 1 and 2, Roxford Street and Sylmar Metrolink Station.

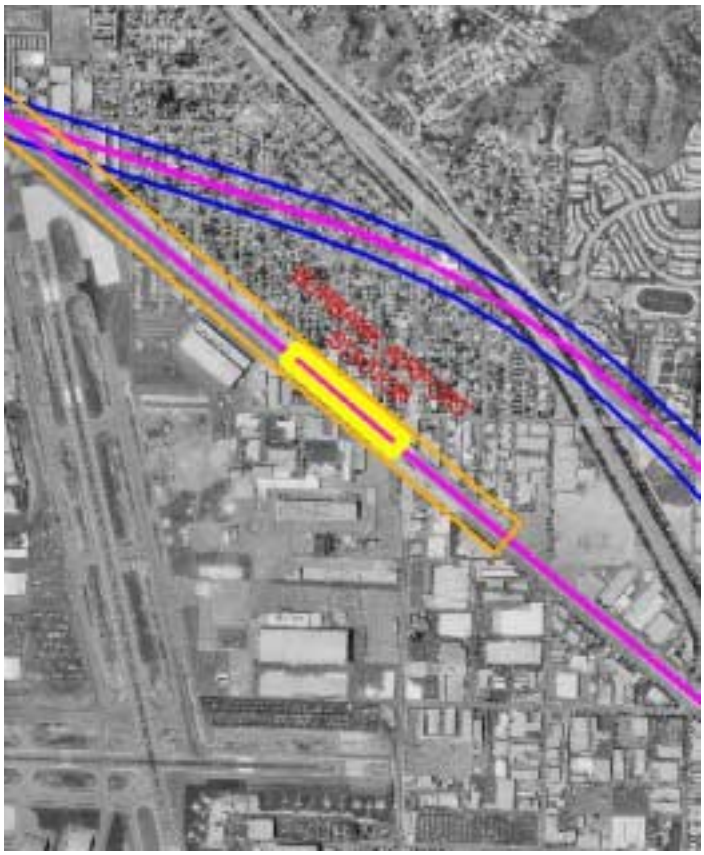

Figure 4.1-15 Burbank Station Option 1, Burbank Airport.

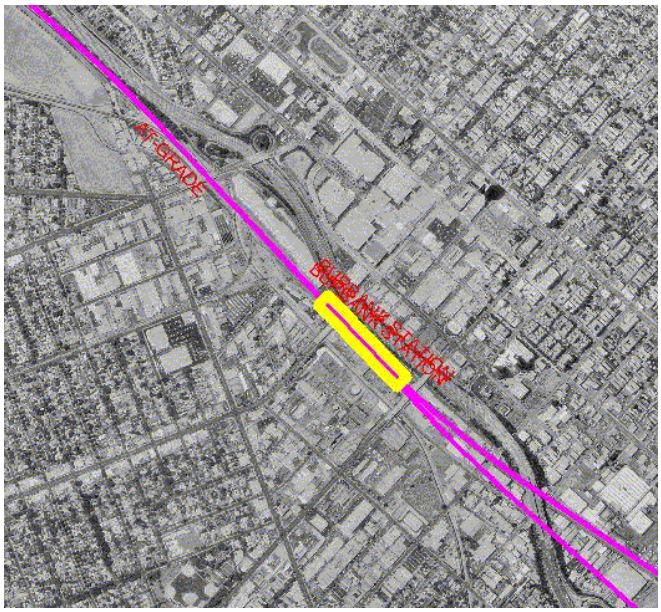

Figure 4.1-16 Burbank Station Option 2, Burbank Metrolink Station.

A. MAXIMIZE RIDERSHIP/REVENUE POTENTIAL

Travel Time

Alignment Evaluation/Comparison: Express travel time from Sylmar to Los Angeles is heavily dependent upon the selection of a site for Los Angeles Union Station (LAUS). Of the three alignment alternatives evaluated, the I-5 alignment (Option 2) offers the shortest travel time for this segment, at 11 minutes to either the existing LAUS station site (Station Option 1) or the LAUS South Thru site (Station Option 2). Use of Option 3 to these same station locations increases this travel time by only 1.7 minutes. The Metrolink/UPRR alignment (Option 1) coupled with LAUS Station South – Stub (Station Option 3) offers the least favorable travel time at nearly 32 minutes, largely due to the tight curvature in the vicinity of that station alternative. Travel times for alignment Option 1 are generally longer than the other Options, regardless of LAUS location, due to the horizontal curvature from Burbank to LAUS, where the alignment is constrained and average speed would be limited to 25 mph (40 kph) for nearly 9 miles (14 km) – including acceleration/decelerations times into LAUS. Pinch points north of LAUS (to avoid existing penal facilities and low-income housing developments) and in the vicinity of the Glendale Freeway (where reversing curves limit transition areas needed to develop full superelevation) cause the speed in between to be limited. Travel time for Option 1 could be improved by deviating from the Metrolink and San Fernando Road alignments; however, to accomplish this would require significant additional right-of-way acquisitions along this heavily developed corridor.

Length

Alignment Evaluation/Comparison: As with travel times described above, variation in the overall length of the Sylmar-to-Los Angeles segment results from the proposed location of LAUS. The shortest alternative is the Metrolink/UPRR alignment (Option 1) coupled with the Cornfield station site (Station Option 6), with a length of 22.8 miles (36.7 km). The balance of the alignment/LAUS alternatives have lengths between 23.6 mi. (37.9 km) and 24.7 mi. (39.8 km). Within this range, the station location is generally more important in determining length than the alignment itself.

Length

Alignment Evaluation/Comparison: As with travel times described above, variation in the overall length of the Sylmar-to-Los Angeles segment results from the proposed location of LAUS. The shortest alternative is the Metrolink/UPRR alignment (Option 1) coupled with the Cornfield station site (Station Option 6),

Table 4.1-1

Los Angeles to Bakersfield - High-Speed Train
Sylmar to Los Angeles Travel Times
for Various LAUS Options

Alignment Options	Los Angeles Union Station Options																	
	1 Existing Union Station			2 Union Station South (Thru)			3 Union Station South (Stub)			4 LA River West			5 LA River East			6 Cornfield Site		
	Travel Time	Distance		Travel Time	Distance		Travel Time	Distance		Travel Time	Distance		Travel Time	Distance		Travel Time	Distance	
	min	mi.	km	min	mi.	km	min	mi.	km	min	mi.	km	min	mi.	km	min	mi.	km
Sylmar to LAUS																		
1 Metrolink/UPRR	27.6	23.8	38.3	31.3	24.7	39.8	**31.6**	**24.8**	**39.9**	26.7	23.6	37.9	27.9	23.9	38.4	**23.6**	**22.8**	**36.7**
To 110 Fwy.	8.4	2.1	3.4	12.1	3.0	4.9	**12.4**	**3.1**	**5.0**	7.5	1.9	3.0	8.7	2.2	3.5	**4.4**	**1.1**	**1.8**
110 Fwy. to Sylmar	19.2	21.7	34.9	19.2	21.7	34.9	**19.2**	**21.7**	**34.9**	19.2	21.7	34.9	19.2	21.7	34.9	**19.2**	**21.7**	**34.9**
2 I-5 Fwy	**10.6**	**23.8**	**38.3**	11.2	24.7	39.8	N/A			N/A			N/A			N/A		
To 110 Fwy.	2.1	2.1	3.4	2.7	3.0	4.9												
110 Fwy. to Sylmar	8.5	21.7	34.9	8.5	21.7	34.9												
3 Combined I-5/UPRR	**12.3**	**23.8**	**38.3**	12.9	24.7	39.8	N/A			N/A			N/A			N/A		
To 110 Fwy.	2.1	2.1	3.4	2.7	3.0	4.9												
110 Fwy. to Sylmar	10.2	21.7	34.9	10.2	21.7	34.9												

Most Favorable (shortest distance/time)

Least Favorable (longest distance/time)

N/A — Station location and alignment not compatible

Population/Employment Catchment

Station Evaluation/Comparison: Among the station sites on the Sylmar-to-Los Angeles segment, the population/employment catchment is clearly greatest for Los Angeles Union Station Options 1-6. Due to the close proximity of these six stations, the 10-mile radius from which the catchment was calculated is the same for each of these six stations. The 1990 population/employment estimates in the 10-mile radius surrounding these potential stations are 3,300,815 and 1,427,974, respectively. The 1990 20-mile radius catchment for these same station sites is 7,280,856 people and 3,403,964 employees. These Union Station options are located at the southernmost part of the segment, in the densely developed downtown Los Angeles. One of these Union Station options would be the most favorable alternative to maximize ridership potential for this segment.

Located northwest of the Union Station options, Burbank Station Option 1, Burbank Airport and Burbank Station Option 2, Burbank Metrolink/Media City, would be the next favorable alternatives to achieve the greatest ridership potential. The 1990 population/employment estimates for the area surrounding these potential stations are 2,083,202 and 1,032,012, respectively. These estimates are substantially lower than the population and employment estimates for the Union Station options, and therefore reflect a lower ridership potential, however, still a feasible alternative with high catchment

estimates and great potential.

The least favorable alternatives in this segment are Sylmar Station Option 1, Roxford Road and Sylmar Station Option 2, Sylmar Metrolink Station. The 1990 population/employment estimates for the area surrounding these potential stations are 1,099,885 and 568,596, respectively. These estimates are substantially lower than the Burbank Stations, but high relative to the Santa Clarita and Antelope Valley locations in the Bakersfield-to-Sylmar Segment. The ridership potential for the Sylmar stations is reduced by approximately one-half when compared to the Burbank stations, based on both population and employment estimates, and would be less favorable alternatives for this segment if developed along with both the Burbank and Santa Clarita stations. However, if a Sylmar station site were to replace both the Santa Clarita and Burbank stations it would be expected to draw from a larger, 20-mile radius catchment area. In 1990 there were 3,291,879 people and 1,694,248 employees in the 20-mile radius around the Sylmar station sites.

B. MAXIMIZE CONNECTIVITY AND ACCESSIBILITY

Intermodal Connections

Station Evaluation/Comparison: Both Sylmar locations are less than 9 miles from Burbank Airport, with the Sylmar Metrolink Station site (Option 2) closer by about 1.5 miles. The Sylmar station sites are located in an area where a large number of freeways come together at the base of the I-5 crossing of Tejon Pass. The Sylmar station sites are both close to the I-5 freeway, however the Roxford Street location (Option 1) has more direct access. Station Option 1 is also closer to I-210 and SR-14. I-405 is a little over 2 miles from both station sites. The Sylmar Metrolink Station site is less than 2 miles from SR-118 and only 5.2 moles from SR-170. The Roxford Road site is 3.3 miles form SR-118 and almost 7 miles form SR-170. Both Sylmar station sites have bus service on adjacent San Fernando Road. One is an existing Metrolink Station and the other is along the Metrolink tracks.

The Burbank Airport station site (Option 1) is immediately adjacent to Burbank Airport and about 1.6 miles from the existing terminal, while the Burbank Metrolink/Media City site (Option 2) is approximately 2.4 miles from the existing terminal. Current airport master plans show development of a new terminal closer to the Option 1 station location. Shuttle bus service to the airport is currently provided from the Metrolink Station site (Option 2). Both station sites are close to the I-5 freeway, with quicker access afforded to the Metrolink Station site by immediately adjacent ramps. The two station sites are also close to the SR-170 and SR-134 freeways. Option 2 is an existing Metrolink Station with service to both the Antelope Valley and the San Fernando Valley. Although Metrolink tracks to Santa Clarita, Palmdale and Lancaster are adjacent, Option 1 has no existing Metrolink station and does not directly link to San Fernando Valley Metrolink service. Such connection would have to be made by shuttle bus to the Metrolink station at the south side of the airport. The Burbank Airport station site is adjacent to MTA bus service along San Fernando Road, while the Metrolink/Media City site is a hub for bus service in the Burbank area.

All of the downtown Los Angeles Union Station sites are approximately 12.5 miles from Los Angeles Airport (LAX). The SR-101 freeway is adjacent to Existing Union Station

(Option 1), Union Station South Thru (Option 2), Union Station South Stub (Option 3), Los Angeles River West (Option 4) and Los Angeles River East (Option 5); it is about 1 mile away from the Cornfield site (Option 6). The Union Station area is also a confluence of many freeways including the I-5, I-110, SR-60 and I-10 all within close proximity of the six candidate station sites. The existing Union Station site provides direct access to Amtrak, Metrolink, MTA rail (Red Line, Pasadena Line and Proposed Eastside LRT Extension), the El Monte Busway and local bus services. There are also plans to bring the Harbor Busway into this area some time in the future. The Union Station South Thru, Union Station South Stub and Los Angeles River East sites could also be provided access to these existing rail, transit and bus linkages by construction of a pedestrian bridge/plaza across the SR-101 freeway (to existing Union Station or to MTA's Patsouras Transit Plaza) in connection with development of ancillary station facilities. The Los Angeles River West station site is in a location that prevents easy pedestrian connections to Patsouras Transit Plaza due to intervening incompatible land uses, including the Los Angeles County Jail. The Cornfield site is remote from all of these facilities and would require shuttle service for connections to Amtrak, Metrolink and the El Monte Busway.

C. MINIMIZE OPERATING AND CAPITAL COSTS

Length

Alignment Evaluation/Comparison: There is little variation among alignment lengths from Sylmar to LAUS, with total length ranging from 22.8 mi. (36.7 km) to 24.7 mi. (39.8 km), depending upon LAUS location. The UPRR/Metrolink alignment (Option 1) offers both the shortest and longest lengths among the three alternatives. While train-mile figures are an important component of operating costs, length is not a discriminating factor among the alignments evaluated.

Station Evaluation/Comparison: The Sylmar/Burbank station alternatives do not have any implications on length. The location of LAUS; however, coupled with alignment options to the north and south, is a significant factor in the length of the system. Generally, the LAUS location alternatives that are further north would provide shorter connections to Sylmar and the eastern San Diego connections, such as the UPRR/El Monte alignment (San Diego Connection Option 1). LAUS alternatives with north/south orientations, including the existing LAUS (Option 1) and Los Angeles River alternatives (Options 4 and 5) favor the southerly San Diego connections, including UPRR/Whittier Jct. and BNSF/Hobart (Options 3 and 3A). Generally, the Los Angeles River West station site (Option 4) offers the shortest connection to the most Sylmar-LAUS and San Diego alignments. A summary of length and travel time implications for various LAUS location alternatives is presented in Table 4-1.

Operational Issues

Alignment Evaluation/Comparison: Alignments within this segment were compared with respect to operating flexibility and efficiency. Depending upon LAUS location, tight curvature into the downtown Los Angeles station could limit speeds at station approaches to yard speeds of 15 mph (25 kph). The UPRR/Metrolink alignment (Option 1) presents the most operating constraints, including reduced speeds and greater per-mile maintenance costs due to its tight curvature south of Burbank. From Glendale to Los Angeles Union Station, trains would be limited to a top operating speed of 45 mph

(75 kph) for nearly 7 miles (11 km). Conversely, both the I-5 and Combined I-5/UPRR alignments would offer the full design speed of 220 mph (350 kph) throughout their length.

The I-5 alternative (Option 2) is the most limited with respect to station locations, as it cannot accommodate the Sylmar Metrolink station option (Sylmar Station Option 1) nor the Burbank Airport location (Burbank Station Option 1). Additionally, both the I-5 (Option 1) and I-5/UPRR (Option 3) alternatives have more limited options with respect to LAUS locations.

Overall, the I-5/UPRR alignment (Option 3) would present the fewest operating constraints, following the straight Metrolink/UPRR corridor from Sylmar to Burbank, but bypassing the curvature of the railroad right-of-way south of Burbank. Option 3 could accommodate any of the four Sylmar and Burbank station alternatives.

Station Evaluation/Comparison:

San Fernando Valley Stations: Two stations in Sylmar and two in Burbank were compared with respect to operating issues. The most significant concern among the stations was the location of the Sylmar Roxford Station (Sylmar station Option 1), which is at the base of the mountains. A 1.5 percent grade lies immediately north of the station, which would impede acceleration and deceleration at this location for local service.

The Sylmar Option 2 and Burbank Option 1 sites cannot be accommodated on the I-5 Fwy. alignment (alignment Option 1).

Burbank Option 2 offers the greatest flexibility of alignment.

Los Angeles Union Station Sites: The location and orientation of LAUS is a significant operational issue, for connections to both the north (Sylmar and Bakersfield) and to the south (Orange County and San Diego via the Inland Empire). Situated in a dense urban setting, adjacent to existing freeways, rail facilities, the Los Angeles River, Elysian Park, and other public facilities, connection to LAUS presents an operating challenge. Because alignments with acceptable speeds are simply impractical, many location options are infeasible for certain north or south connection alternatives.

An LAUS option that rates poorly for one alignment option, however, may be well suited for another. This is of particularly issue for the San Diego connections. Generally, LAUS alternatives with a north-south orientation (including Options 1, 4, and 5) are best suited for the southerly connection to San Diego. Conversely, LAUS alternatives with an east-west layout (Options 2 and 3) favor an easterly connection to San Diego, via UPRR/El Monte.

The Cornfield Station site (Option 6) does not offer any operational advantages, regardless of connection points.

Table 4.1-2
Bakersfield-to-Los Angeles and San Diego Connection Travel Times
Comparison of Los Angeles Union Station Location and Connection Alternatives

	Alignment Options	Los Angeles Union Station Options																		
		1 Existing Union Station			2 Union Station South (Thru)			3 Union Station South (Stub)			4 LA River West			5 LA River East			6 Cornfield Site		
		Travel Time (min.)	Distance (mi.)		Travel Time (min.)	Distance (mi.)		Travel Time (min.)	Distance (mi.)		Travel Time (min.)	Distance (mi.)		Travel Time (min.)	Distance (mi.)		Travel Time (min.)	Distance (mi.)	
Bakersfield to Sylmar																				
1	I-5 Fwy Sac-Bak Connection Bakersfield to Sylmar	25.6 9.6 15.2	93.0 28.3 21.7	194.4 45.5 89.1	same as left			same as left			same as left			same as left			same as left		
1A	I-5/Comanche Pt. Sac-Bak Connection Bakersfield to Sylmar	25.2 9.6 15.6	93.0 34.1 21.7	198.6 54.9 85.7	same as left			same as left			same as left			same as left			same as left		
2	Soledad Cyn/SR-58 Sac-Bak Connection Bakersfield to Sylmar	37.1 9.9 31.1	86.5 14.8 21.7	288.3 23.8 174.7	same as left			same as left			same as left			same as left			same as left		
2A	SR14/SR-58 Sac-Bak Connection Bakersfield to Sylmar	37.2 5.9 31.2	86.3 14.8 21.7	299.0 23.8 179.2	same as left			same as left			same as left			same as left			same as left		
3	Soledad Cyn/SR-138 Sac-Bak Connection Bakersfield to Sylmar	37.5 11.2 26.3	93.8 34.1 21.7	202.9 54.9 148.0	same as left			same as left			same as left			same as left			same as left		
3A	SR14/SR-138 Sac-Bak Connection Bakersfield to Sylmar	37.6 11.3 26.4	93.8 34.1 21.7	203.5 54.9 148.6	same as left			same as left			same as left			same as left			same as left		
4	Soledad Cyn/Aqueduct Sac-Bak Connection Bakersfield to Sylmar	35.8 11.2 24.6	93.8 34.1 21.7	193.7 54.9 138.8	same as left			same as left			same as left			same as left			same as left		
4A	SR14/Aqueduct Sac-Bak Connection Bakersfield to Sylmar	35.9 11.2 24.7	93.8 34.1 21.7	194.3 54.9 139.4	same as left			same as left			same as left			same as left			same as left		
Sylmar to LAUS																				
1	Metrolink/UPRR to 110 Fwy. 110 Fwy. to Sylmar	27.6 8.4 19.2	23.8 2.1 21.7	38.3 3.4 34.9	31.5 12.1 19.2	24.7 3.0 21.7	35.8 4.8 34.9	31.6 12.4 19.2	24.8 3.1 21.7	35.9 5.0 34.9	26.7 7.5 19.2	23.6 1.9 21.7	37.8 3.0 34.9	27.8 8.7 19.2	25.5 2.2 21.7	39.4 3.5 34.9	25.6 6.4 19.2	22.8 1.1 21.7	36.7 1.8 34.9
2	I-5 Fwy to 110 Fwy. 110 Fwy. to Sylmar	33.5 2.1 9.5	23.8 2.1 21.7	38.3 3.4 34.9	31.3 2.7 9.5	24.7 3.0 21.7	35.8 4.9 34.9	N/A			N/A			N/A			N/A		
3	Combined I-5/UPRR to 110 Fwy. 110 Fwy. to Sylmar	32.3 2.1 10.2	23.8 2.1 21.7	38.3 3.4 34.9	12.9 2.7 10.2	24.7 3.0 21.7	35.8 4.9 34.9	N/A			N/A			N/A			N/A		
LAUS to San Diego Connection																				
1	East UPRR/El Monte/Colton To Soto St.	14.6	2.9	4.6	13.9	2.3	3.8	15.2	2.5	4.0	14.3	2.3	3.8	16.1	2.6	4.2	12.1	3.8	4.8
1A	East SR-60 To Soto St.	N/A			7.0	1.7	2.8	7.8	1.9	3.0	N/A			N/A			15.6	2.2	3.5
1B	East I-10 To Soto St.	7.6	1.9	3.0	N/A			N/A			4.8	2.3	3.8	2.9	1.4	2.3	13.4	3.8	4.8
2	West I-101 (LAX Connection) To Alameda St.	N/A			0.2	0.4	0.6	0.2	0.2	0.3	N/A			N/A			N/A		
3	South UPRR/Whittier Jct. To Soto St.	10.8	2.6	4.3	34.5	5.0	8.0	36.0	5.1	8.3	9.1	2.9	4.0	4.5	2.2	3.5	35.3	5.7	6.0
3A	South BNSF/Hobart To Soto St.	11.4	2.8	4.5	37.2	5.1	8.1	38.5	5.2	8.4	5.4	2.8	4.3	4.8	2.3	3.8	25.3	3.7	6.0
4	South I-5 To Soto St.	7.8	1.9	3.0	32.8	4.0	6.5	35.0	4.4	7.0	4.8	2.3	3.0	2.9	1.4	2.3	11.8	2.8	4.6
5	South BNSF/Harbor Dist. To Vernon Ave.	15.0	3.7	5.9	41.0	5.1	9.8	42.6	6.2	10.0	7.3	3.6	5.8	6.7	3.3	5.3	10.1	4.7	7.5

Most Favorable (shortest distance/time)

Least Favorable (longest distance/time)

N/A Station location and alignment not compatible

same as left Travel time not dependent upon LAUS location

Alignment alternatives along the Los Angeles River (Options 4 and 5) offer the most favorable operating conditions. As they sit along a straight north-south line, these options offer the shortest acceleration times for a southerly San Diego connection. These options also offer acceptable connections to the San Diego UPRR/El Monte alignment, particularly if a wye connection is provided for operational flexibility and potential future express service from San Diego that bypasses LAUS.

Construction Issues

Alignment Evaluation/Comparison: The alignments present a complete range of construction types, from completely aerial for I-5 (Option 2), to principally at-grade and below-grade for Metrolink/UPRR (Option 1). The Combined I-5/UPRR alignment (Option 3) lies in trench, then on aerial structure. With respect to construction methods, Option 1 presents the fewest challenges.

Each of the alignments is accessible from local roads or rail lines throughout its length. Access along the I-5 for the construction of Option 2 north of Burbank presents challenges along this busy freeway. Option 1 and the northerly half of Option 3 would require relocation of both Metrolink and UPRR rail operations, while maintaining rail traffic during construction.

Alignment Options 2 and 3 include a short tunnel under Elysian Park, which would add to the construction complexity and risk of those alternatives.

Station Evaluation/Comparison:

San Fernando Valley Stations: Each of the station site alternatives in the San Fernando Valley offers good construction access along existing highways and/or rail lines. The four station options considered are all generally in urbanized settings, although the Sylmar Roxford station site is in the least developed area.

Adjacent constraints at the Burbank Station alternatives (Burbank Option 1 and 2) would require more specialized design and construction. At Burbank Airport, the tracks would be in trench, with station facilities above, to stay clear of flight paths. The Burbank Metrolink/Media City station lies in a tightly constrained area, requiring an aerial platform adjacent to I-5 and existing rail facilities. There is also a flood control channel parallel to the railroad right-of-way in this location.

The Sylmar Roxford station (Sylmar Option 1), being in close proximity to the mountains, will require significant earthwork that will impact construction cost and progress. The Sylmar Metrolink station (Sylmar Option 2) presents the fewest construction issues.

Los Angeles Union Station Sites: Each of the LAUS station options would require specialized design and construction to fit within the urban constraints of downtown Los Angeles. Construction access is likely to present the greatest challenge for any of the LAUS alternatives. Although readily accessible from local streets, construction access would not be unconstrained due to the local transportation demands. Alternatives near existing Union Station (Options 1, 2, and 3) would require detailed construction phasing plans to avoid impacts to existing rail service and freeways. Options 2, 3 and 5 would be best implemented with a pedestrian crossing/plaza over the SR-101 freeway, again requiring detailed construction plans to prevent impacts to freeway operations. The

Cornfield Site (Option 6) would also require close coordination to avoid impacts to the Pasadena Blue Line maintenance yard.

Although existing rail service on the east bank would have to be accommodated, the Los Angeles River East alternative (Option 5) presents the fewest construction access constraints. Construction of the Los Angeles River options (Options 4 and 5 as well as Option 2, which would span the river), depending upon their configuration, will likely fall under the jurisdiction of the Army Corps of Engineers, who would further constrain construction activities according to permitting requirements. The Los Angeles River West site (Option 4), which is constrained by the river and existing penal facilities, does not provide good construction access.

All considered, the Union Station South alternatives (Options 2 and 3) and Los Angeles River East (Option 5) are the most favorable with respect to construction issues.

Capital Cost

Alignment Evaluation/Comparison: VHS capital cost ranges for each alignment alternative were developed to reflect the variety of alternative connections to LAUS. The Metrolink/UPRR alignment (Option 1) offers the most favorable capital cost. Due to both its tunnel and aerial structures, the I-5 Alignment (Option 2) is the most costly, about half a billion dollars more than Option 1. The projected capital cost of the Combined I-5/UPRR alignment (Option 3) falls in between the others.

Station Evaluation/Comparison:

San Fernando Valley Stations: The Sylmar Roxford station (Sylmar Option 1) would involve significant earthwork and/or retaining walls, adding to its cost. The Sylmar Metrolink station alternative (Sylmar Option 2) would offer the most favorable capital cost. Because of anticipated specialized construction, described above, the Burbank stations at Burbank Airport (Burbank Option 1) and Metrolink/Media City (Burbank Option 2) would require the greatest capital investment.

Los Angeles Union Station Sites: LAUS options at or adjacent to the current LAUS facility, including LAUS Options 1, 2, and 3, each require significant aerial structures to provide access over existing improvements. The Union Station South – Through alternative (Option 2) involves loop connections that add to the projected station cost. The station alternative with the highest capital cost would be the Cornfield Site (Option 6), which is on aerial structure with aerial connections.

Stations along the Los Angeles River (Options 4 and 5) present the lowest likely capital costs because the approaches can be constructed at-grade. Structures crossing the river will add to the cost of these options. Structures crossing the SR-101 to provide pedestrian access to existing Union Station and Patsouras Transit Plaza would also add to costs if implemented for Options 2, 3 and 5.

Right-of-Way Issues/Cost

Alignment Evaluation/Comparison: Among the Sylmar-to-Los Angeles segment alternatives, the greatest right-of-way challenges are faced by the I-5 alignment (Option 2), which proposes to share space along a portion of the alignment with the highly

constrained interstate freeway. CalTrans' plans to add a truck lane to this highway will further limit the right-of-way available for the high-speed train. Where the Option 2 alignment lies adjacent to, but not within, the freeway corridor, this alternative would require significant individual property acquisitions through a fully developed area. The tunnel under Elysian Park at the south end of the I-5 alignment would require close coordination with Dodger Stadium, CalTrans, and others to obtain subsurface easements.

While taking advantage of the linear, continuous right-of-way of the existing rail corridor, the Metrolink/UPRR alignment (Option 1) would require railroad relocation along nearly its entire length. This option would also require accommodation of the existing street network along its length through trenching and overhead bridges, and potential realignment of local streets. When in trench, the alignment also proposes to pass under Pacoima Wash, a regulated waterway.

The Combined I-5/UPRR alternative (Option 3) shares some of the right-of-way challenges of both Option 1 and Option 2.

Station Evaluation/Comparison:

San Fernando Valley Stations: All but one of the San Fernando station options – Roxford Street (Sylmar Option 1) would impact Metrolink and UPRR in some way, requiring railroad relocation. The Sylmar Roxford Street station site is in a less developed area with few apparent right-of-way constraints.

While requiring modification of existing railroad improvements, the Sylmar Metrolink Station site (Sylmar Option 2) offers opportunities for shared parking and other facilities with the existing commuter rail station.

The right-of-way at Burbank Airport (Burbank Option 1) is further constrained by the restrictions of airport operations. Configuration of the station at this site must also limit impacts on adjacent residential developments.

The Burbank Metrolink/Media City site (Burbank Option 2) lies adjacent to I-5 in an area where land is in high demand. Plans by CalTrans to widen the freeway to include truck lanes will further limit right-of-way available for station facilities and connections. A flood control channel and immediately abutting industrial properties also constrain this site.

Los Angeles Union Station Sites: Right-of-way concerns for LAUS include railroad and public transit relocation, existing and planned development, and jurisdictional waters.

Where access through LAUS is required (Options 1, 2, and 3), some railroad relocation would be involved. These alternatives would require negotiation and coordination with the property owner, Catellus, as well as Metrolink and Amtrak. Use of air space or platform space at LAUS would be contingent on compatibility with the plans of these stakeholders.

The Los Angeles River West site (Option 4) would require complete relocation of an existing MTA bus maintenance facility in order to accommodate the station. The use of this site would also be constrained by clearance requirements to existing penal facilities.

Several of the station alternatives involve spanning the Los Angeles River (including Options 2, 3 and 5) with the high-speed train platform, tracks and/or other facilities.

Because the river is a jurisdictional water under the control of the Army Corps of Engineers, certain limitations on station configuration could be imposed to avoid impacts on channel hydraulics or habitats.

Station alternatives that parallel US-101 south of existing Union Station would require relocation of existing businesses. These alternatives must also be coordinated with CalTrans' plans for freeway improvements. The development of station facilities south of US-101, however, is consistent with plans by the City of Los Angeles Community Redevelopment Agency (CRA), that could provide incentives beneficial to the station development.

D. MAXIMIZE COMPATIBILITY WITH EXISTING AND PLANNED DEVELOPMENT

Land Use Compatibility and Conflicts

Alignment Evaluation/Comparison: Alignment Option 1, Metrolink/UPRR, would abut areas of existing residential, commercial and industrial land uses adjacent to the Union Pacific Railroad. Use of this alignment would create indirect impacts on these land uses. In some locations, portions of the railroad right-of-way are being leased for storage and/or parking areas. Use of this right-of way for high-speed train facilities would impact these lessees. This alignment also traverses the runway safety area at the north end of Burbank Airport's north-south runway. This alignment has moderate potential conflicts with the residential, commercial and industrial land uses adjacent to the Metrolink/UPRR right-of-way.

A large portion of Alignment Option 2, I-5 Freeway, is elevated. Elevated segments within or alongside the I-5 Freeway and would create indirect impacts on existing adjacent residential, commercial and industrial land uses adjacent. However, there are significant locations where this alignment diverges from the freeway right-of-way to maintain the curvature necessary for high-speed train operations. In these areas substantial displacement would occur. This alignment also passes by a number of schools and parks. It precludes having a Sylmar station location, or one at the Burbank Airport site.

Alignment Option 3, Combined I-5/UPRR would abut areas of existing residential, commercial and industrial land uses adjacent to the Union Pacific Railroad north of downtown Burbank. Use of this alignment would create indirect impacts on these land uses. This alignment also traverses the runway safety area at the north end of Burbank Airport's north-south runway. It runs beneath Elysian Park in tunnel. It has fewer land use conflicts than the other two options.

Station Evaluation/Comparison:

Sylmar station Option 2 (Sylmar Metrolink Station) has the fewest conflicts with existing and proposed land uses because it is within a Transit Oriented District and has more compatible surrounding land uses than Sylmar station Option 1 (Roxford Street).

Burbank station Option 1, in an industrial area adjacent to existing Burbank Airport and Burbank station Option 2 (Burbank Metrolink/Media City) in downtown Burbank are both located at transportation hubs/facilities. While the Airport station site would require

special efforts to integrate it with the new airport master plan and the runway safety areas, the downtown Burbank Metrolink station site would require intensive development on a highly constrained site between the I-5 freeway and the edge of the Metrolink/UPRR right-of-way. Direct and indirect impacts to adjacent industrial uses could result.

Los Angeles Union Station Option 6 (Cornfield Site) is the least compatible with existing and proposed land uses. The Cornfield Site is proposed for development as a regional park. There is also less potential for intermodal connectivity at the Cornfield Site. Los Angeles Union Station Option 4 (Los Angeles River West) would conflict with existing use of the area as a bus maintenance facility (and future use as a maintenance facility for the Eastside LRT extension). In addition access from Option 4 through the adjacent penal facilities to intermodal connections at the existing Union Station would be difficult. Los Angeles Union Station Option 1 (Existing Union Station), Option 2 (Union Station South Through), Option 3 (Union Station South Stub), and Option 5 (Los Angeles River East) have similar potential for intermodal connectivity and have similar conflicts with surrounding land use. Because of their proposed through tracks, crossing SR-101 and running south through Little Tokyo, Options 1 and 6 conflict with existing Los Angeles Community Redevelopment plans for Little Tokyo. The Los Angeles River East Station, Option 5, would potentially with adjacent existing multifamily Residential Land Use.

Visual Quality Impacts

Alignment Evaluation/Comparison: Of the Sylmar-to-Los Angeles segment alignments, Option 1 is the most favorable regarding visual quality because the residences with views of this alignment are 1,000 to 1,500 feet away and only one school is adjacent to the alignment. Option 2 is the least favorable because it crosses through Griffith park on structure and is adjacent to residences in various areas for a total distance of 3 miles. From downtown Burbank to Sylmar Options 2 and 3 are in a trench. Option 3 is slightly more favorable than Option 2 because fewer residences would have close views of the project. There are adjacent residences along 2 miles of the Option 3 alignment, as opposed to 3 miles with Option 2.

Station Evaluation/Comparison: Sylmar station Option 1, the Roxford Street location, is in an industrial/commercial area with a few residential motels with views of the station site. New residential units have just been completed just across the road from the existing Sylmar Metrolink Station site, (Sylmar Option 2). These units have an existing view of a train station. The two Burbank station options are equally favorable regarding visual quality because there are no residential or other sensitive first tier viewers.

In downtown Los Angeles, Options 1, 3, 4, 5 and 6 are equally favorable because there are no residential or other sensitive first tier viewers in the immediate area. Option 2 is slightly less favorable than the other options because the approach for this station goes through the edge of a playground. Option 5(Los Angeles River East) lies adjacent to an existing multifamily residential complex that would experience the potential for visual impacts. However, these units are located in an area now dominated by existing industrial development.

E. MINIMIZE IMPACTS TO NATURAL RESOURCES

Water Resources

Alignment Evaluation/Comparison: Each of the three alignments, I-5 (Option 1), UPRR/Metrolink (Option 2), and the hybrid I-5/UPRR/Metrolink (Option) do not cross any moderate to highly sensitive water resources. They each cross several artificially lined channels including the Los Angeles River, the Burbank Western Channel, the Tujunga Channel, the Pacoima Channel and the East Canyon Channel (south of the Burbank/San Fernando station), which are all considered to be of nominal or low sensitivity. The I-5 and the Hybrid I-5/UPRR-Metrolink Alignments both cross or pass adjacent to two potentially unlined channels of low to moderate sensitivity north of the terminus of the bridged section of the Alignments, where I-405 joins I-5. It is not likely that these crossings would cause more than minimal adverse effects to riparian/wetland resources as both drainages occur within an urban setting immediately east of I-5.

Station Evaluation/Comparison: The Roxford Street (Sylmar Option 1) and the Burbank Airport (Burbank Option 1) station locations do not appear to potentially affect water resources. The Sylmar Metrolink Station (Sylmar Option 2) is located relatively near a minor tributary to the East Canyon Channel, which is likely to be concrete-lined and certainly in an urban setting. Impacts to this nominal or low sensitivity channel are may be readily avoided. The Burbank Metrolink/Media City Station (Burbank Option 2) location is immediately adjacent to the artificially lined Burbank Western Channel. Potential impacts to this nominally sensitive resource may be readily avoided and would be presumed to entail only minor potential effects to water quality during construction.

The platforms for Los Angeles Union Station Options 1 (Existing Union Station), 3 (Union Station South - Stub), Option 4 (Los Angeles River West) and 5 (Cornfield Site) do not appear to intersect any water resources, although all of them would require Los Angeles River crossings for accessing tracks. Platforms for Option 2 (Union Station South - Through) and ancillary facilities for Option 5 (Los Angeles River East) each may intersect the Los Angeles River. This channel, while substantial in size, is not considered sensitive as a biological resource, although potential reductions in water quality must be avoided. Each of the station location options that may be constructed over or immediately adjacent to the waterway could entail adverse impacts to this resource during construction. Such impacts may be avoided by implementing mitigation measures designed to prevent runoff and debris from entering the watercourse.

Floodplain Impacts

Alignment Evaluation/Comparison: These alignments are not affected by 100-year floodplains. They do cross the LA River and other channelized drainages that must be accommodated by appropriate design.

Station Evaluation/Comparison: There are no floodplain impacts for the Sylmar, Burbank and Los Angeles station sites. The Sylmar Metrolink, Burbank Metrolink/Media City and a number of the Los Angeles Union Station sites will require accommodation of adjacent channelized drainages in station design.

Threatened & Endangered Species Impacts

Alignment Evaluation/Comparison: No significant impacts are expected to occur along any of the alignment options.

Station Evaluation/Comparison: No impacts are expected to occur to sensitive species at any of the Sylmar, Burbank or Los Angeles Union Station sites.

F. MINIMIZE IMPACTS TO SOCIAL AND ECONOMIC RESOURCES

Environmental Justice Impacts (Demographics)

Alignment Evaluation/Comparison: The minority and poverty population is the lowest along Alignment Option 2, I-5. The 1990 minority population and in-poverty household estimates within the defined area of 700 feet from this alignment are 34,898 and 4,628, respectively. This alignment has the least number of minority/low-income persons in the 1.400 –foot wide corridor relative to the other potential alignments considered in this segment. However, one concern about this alignment is that acquisition of property will be necessary in many locations, resulting in displacement of residents and businesses. The next favorable alternative, relative to potential impacts on minority and low-income population, would be Alignment Option 3, Combined I-5/UPRR. The 1990 minority and poverty estimates for this alignment are 37,732 and 5,563, respectively. This difference is slight when compared to the total number of minority/low-income people impacted by these alternatives. The least favorable alternative from the perspective of potential effects on adjacent disadvantaged populations would be Alignment Option 1, Metrolink/UPRR. The 1990 minority and poverty estimates for this alignment are 53,047 and 8,213, respectively. This difference is substantial, making this alignment the least favorable alternative of the three relative to environmental justice impacts.

Station Evaluation/Comparison: In Sylmar there is a substantial difference in potentially affected minority and poverty population. At the Roxford Street site (Option 1) in 1990 there were 1,367 minority persons and 157 households in poverty, while at the Sylmar Metrolink Station site there were 4,138 minority persons and 501 households in poverty. Therefore, from the perspective of environmental justice, the Roxford Street location would create fewer impacts.

In Burbank, there is a higher minority and in-poverty population in the vicinity of the Burbank Airport station site than at the Burbank Metrolink Station site. In 1990 there were 3,172 minority people and 441 households in poverty at the Airport site versus 1,845 minority people and 408 households in poverty at the Metrolink Station site.

Because most of the area surrounding the Union Station sites is not developed in residential use, there are very few minority residents or households in poverty. Minority populations for Options 1 through 6 range from 1492 to 2823 and households in poverty range from 197 to 881. In 1990, the largest minority populations were found in the areas around the Los Angeles River West (Option 4), Los Angeles River East (Option 5) and the Union Station South (Stub) (Option 3) station sites. The smallest minority population was in the vicinity of the Cornfield (Option 6) and existing Union Station (Option 6) sites.

The highest numbers of in poverty households reflect the presence of a number of low-income housing projects close to the Los Angeles River West (Option 4), Los Angeles River East (Option 5) and Union Station South (Stub) station sites. Lowest numbers of poor households are found near Existing Union Station (Option 1) and the Cornfield Site (Option 6), with 231 and 197 respectively.

Farmland Impacts

Alignment Evaluation/Comparison: All of the Sylmar-to-Los Angeles alignments are located in an urban area with no developable farmland.

Station Evaluation/Comparison: The Sylmar, Burbank and Los Angeles stations are all located in an urbanized area with no developable farmland at the station sites.

G. MINIMIZE IMPACTS TO CULTURAL RESOURCES

Cultural Resources Impacts

Alignment Evaluation/Comparison: The I-5 Alignment has the lowest potential to impact cultural resources, primarily because the majority of this alignment follows the existing I-5 freeway on aerial structure, limiting ground disturbance. However, there are a number of locations where the alignment would diverge from the I-5 proper. In these areas, some potential for cultural resources might exist. The Metrolink/UPRR Alignment has the highest potential to disturb cultural resources due to at-grade or sub-grade construction in an urban area, where numerous historical, and possibly prehistoric, cultural resources may be encountered. The Combined I-5/UPRR Alignment, as a combination of these two routes, partly on structure and partly at-grade or sub-grade, has an intermediate potential to encounter cultural resources.

Station Evaluation/Comparison:

Sylmar and Burbank Station Options: These four locations, all in urban areas of the San Fernando Valley, have an unknown potential for cultural resources. No cultural resources are indicated for any of these locations on the GIS database. However, given the highly developed urban environment, some potential for impacts cultural resources exists.

Los Angles Union Station Options: The six Los Angeles Union Station Alternatives, being located in or near the oldest part of the City of Los Angels, all have a high potential to impact cultural resources. The Existing Union Station Location has the highest potential to impact cultural resources, since the terminal itself is a historic resource, and extensive historical and prehistoric cultural resources (not depicted on the GIS database) have been found at Union Station in the recent past.

The Los Angeles River West and the Los Angeles River East locations are considered to have a high to moderate potential to impact cultural resource, due to their location near the Los Angeles River, as well as in older neighborhoods of Los Angeles. The Union Station South (Through), Union Station South (Stub) and the Cornfield Site locations are all considered to have a moderate to high potential to impact cultural resources due to their location within the urbanized neighborhoods of downtown Los Angeles.

Parks & Recreation/Wildlife Refuge Impacts

Alignment Evaluation/Comparison: The Metrolink/UPRR Alignment has the lowest potential to impact park resources, passing one park at-grade, and three parks, including the El Pueblo de Los Angeles, on structure. The I-5 Alignment and the Combined I-5/UPRR Alignment both have a direct impact on park resources by exiting a tunnel in

Elysian Park, and proceeding to Union Station on structure. These two routes may also have visual impacts to four additional parks adjacent to the alignments.

Station Evaluation/Comparison: No park resources are located in the vicinity of the six Union Station alternatives, except for the El Pueblo de Los Angeles State Historic Park, which is located across the street from Existing Union Station. However, given the existing urban environment, none of the Los Angeles Union Station Alternatives would have an impact on this park unless the high-speed train guideway is constructed on an excessively tall structure.

Three of the station alternatives, LAUS South (Through), Los Angeles River West, the Cornfield Site all are included in Los Angeles River Greenbelt park planning areas. Although these plans are not finalized, a high-speed train station would alter or preclude a part of the Los Angeles River greenbelt parks.

H. MAXIMIZE AVOIDANCE OF AREAS WITH GEOLOGIC AND SOILS CONSTRAINTS

Soils/Slope Constraints

Alignment Evaluation/Comparison: In general, all three of the proposed alignments are in close proximity to one another and share relatively moderate soils constraints.

Station Evaluation/Comparison: The Sylmar, Burbank, and Union Station locations occur within younger alluvial soils that have low to moderate soil constraints.

Seismic Constraints

Alignment Evaluation/Comparison: Seismically, all of the alignments received relatively low rankings due to the presence of the overall project in the seismically active Southern California setting.

Station Evaluation/Comparison: Station locations were quite distinguishable from a seismic standpoint. The Sylmar station sites are the least favorable due to the presence of high probability of moderate earthquake. The most favorable station sites are in the downtown Los Angeles Union Station location due to their presence in an area that is essentially equidistant from major faults. In comparison, the Burbank station locations reflect an intermediate condition.

I. MAXIMIZE AVOIDANCE OF AREAS WITH POTENTIAL HAZARDOUS MATERIALS

Hazardous Materials/Waste Constraints

Alignment Evaluation/Comparison: There are fifty or greater CERCLIS, SPL or SCL sites near or adjacent to Alignment Options 1, 2 and 3. All of these alignment options pass close to the Burbank-Glendale-Pasadena Airport and, therefore, may be near areas with potential hazardous materials. None of these alignment options from Sylmar to Union Station maximizes avoidance of areas with potential hazardous materials. However, Alignment Option 2 (I-5 Freeway) is near or adjacent to fewer CERCLIS, SPL or SCL sites

than either Alignment Option 1 (Metrolink/UPRR) or Alignment Option 3 (Combined I-5/UPRR).

Station Evaluation/Comparison: Sylmar Station Options 1 and 2 are not close to any CERCLIS, SPL or SCL sites. These station options may have potential hazardous materials sites nearby because of industrial uses adjacent to the station locations.

Burbank Station Options 1 and 2 have few adjacent CERCLIS, SPL and SCL sites. Burbank Station Option 1 (Burbank Airport) is close to the Burbank-Glendale-Pasadena Airport and industrially developed areas and may therefore have a somewhat greater potential for hazardous materials sites than Burbank Station Option 2 (Metrolink/Media City) which is adjacent to industrial uses only.

There are few CERCLIS, SPL and SCL sites around any of the Los Angeles Union Station Options. However, there may be potential hazardous materials sites near railroad tracks and rail and bus yards.

Union Station Approach Segment

The Union Station approach segment alignment options are designated as follows:

Option 1 – UPRR/El Monte/Colton: Connects to the Inland Empire region, suitable for all Unions Station area sites.
Option 1A – SR-60: Connects to the Inland Empire region, suitable for Union Station Options 2, 3 and 6.
Option 1B – I-10: Connects to the Inland Empire region, suitable for Union Station Options 1, 4. 5 and 6.
Option 2 – SR-101: Connects to LAX and LOSSAN Corridor region, suitable for Union Station Options 2 and 3.
Option 3 – UPRR/Whittier Junction: Connects to the Inland Empire Region, Suitable for Union Station area sites.
Option 3A – BNSF/Hobart: Connects to LOSSAN Corridor region, suitable for all Union Station area sites.
Option 4 – I-5: Connects to LOSSAN Corridor region, suitable for all Union Station area sites.
Option 5 – BNSF/Harbor Division: Connects to LOSSAN Corridor region, suitable for all Union Station area sites.

There are no stations associated with these approach alignments, although they connect to the Los Angeles station to the north. Many of the evaluation parameters vary based on the site selected for the Los Angeles station. They are also related to the possible southerly connections. Some data gathered for the alignments to the south as a whole, have not been separately quantified for these short segments. The approach segments are discussed to the extent feasible given these limitations.

J. MAXIMIZE RIDERSHIP/REVENUE POTENTIAL

Travel Time

Travel time varies greatly depending upon the selected location for the Los Angeles station. The quickest time is achieved on Alignment Option 2 along SR-101, the next quickest is Option 1B along I-10. However, these travel times must be considered along with the appropriate connections to the south and the selected Los Angeles stop to provide a meaningful comparison.

Length

Similar to travel time, as discussed above, length varies based on the selected Los Angeles station site.

Population/Employment Catchment

Not applicable to approach alignments.

K. MAXIMIZE CONNECTIVITY AND ACCESSIBILITY

Intermodal Connections

Not applicable to approach alignments.

L. MINIMIZE OPERATING AND CAPITAL COSTS

Length

The implications of length on operating and capital costs will be highly dependent on the selection of the Los Angeles station site and the connections to the south.

Operational Issues

Option 1 (UPRR/El Monte/Colton) would allow flexibility in Los Angeles station alternatives, however it would require a stub-end station or slower speed operations with looping connections to San Diego. Option 1A on SR-60 limits Los Angeles station sites to those paralleling the south side of SR-101. On the other hand, the Los Angeles station sites south of the SR-101 are not compatible with the I-10 alignment (Option 1B). Option 2 (SR-101) is only appropriate for access through Los Angeles International Airport, and only works with the two Los Angeles station sites paralleling the south side of SR-101. Approach via the UPRR/Whittier Junction alignment (Option 3) and the BNSF/Hobart alignment (Option 3A) is best suited to Los Angeles station Options 1, 4 and 5. Option 4 (I-5) and Option 5 (BNSF/Harbor Division) is best suited to the Los Angeles River station options.

Construction Issues

All of the approaches require aerial structures. Option 5 (BNSF/Harbor Division) would require special aerial structures to provide access over the north end of the Alameda Corridor. Options 1A (SR-60), 1B (I-10), 2 (SR-101) and 4 (I-5) would all require construction in a constrained area.

Capital Cost

Cost is dependent on the location of the Los Angeles station and the selected connections to the south. Cost data has been provided for incorporation into studies for the two San Diego regions.

Right-of-Way Issues/Cost

Options 1, 3 and 3A would require railroad relocation. The latter two options are located in existing high volume freight corridors. Options 1A, 1B, 2 and 4 are located in existing constrained and congested freeway corridors. It is likely that additional right-of-way on one or both sides of the freeway would be necessary to implement them. Option 5 is located in a corridor owned by the MTA.

M. MAXIMIZE COMPATIBILITY WITH EXISTING AND PLANNED DEVELOPMENT

Land Use Compatibility and Conflicts

For the most part, Alignment Option 1 (UPRR/El Monte/Colton) follows the existing UPRR tracks. The alignment may create indirect impacts on adjacent mixed residential, commercial and industrial land uses. There are substantial stretches of residential land use on the north side of this alignment. The alignment also passes Lincoln Park.

Alignment Option 1A (SR-60) may create direct impacts on a mix of adjacent residential, commercial and industrial land uses. On the north side of SR-60 are residential land uses for a distance of two miles. This alignment would potentially have land use substantial impacts.

Like Option 1A, Alignment Option 1 B (I-10) would also have substantial land use impacts. It may directly impact a mix of adjacent residential, commercial and industrial land uses. There are residential land uses that stretch for two and a half miles along this alignment.

Alignment Option 2 goes towards Los Angeles International Airport on a route using the SR-101 freeway. This alignment may directly impact a mix of adjacent industrial, commercial, government and residential land uses. It passes through the Los Angeles Civic Center and is within 200 feet of Belmont High School and 200 to 400 feet of an elementary school. The alignment also passes by the historic Olivera Street area in downtown Los Angeles. It would, however, impact fewer residential land uses than other Los Angeles approach alignments under consideration.

Alignment Option 3 (UPRR/Whittier Junction) is an existing railroad right-of-way. The alignment may indirectly impact existing industrial and commercial land uses adjacent to the alignment. There are no adjacent residential land uses, however the alignment may traverse the grounds of an existing elementary school north of 4th Street.

Most of the right-of-way needed for Alignment Option 3A (BNSF/Hobart) is currently used for railroad purposes. The alignment may indirectly impact existing industrial and commercial land uses. This alignment may also traverse the grounds of an elementary school north of 4th Street.

Alignment Option 4 (I-5) would go through by an existing residential area for approximately one-half mile. The alignment is also adjacent to other residential areas for a length of 1.2 miles. Because of these adjacent residential uses this alignment would have substantial land use impact. Potential indirect impacts on adjacent commercial land uses would also be likely with this option.

Alignment Option 5, BNSF/Harbor Division, is an existing railroad right-of-way. The alignment would create indirect impact on existing industrial and commercial land uses. This alignment would have few land use impacts, since it is already used for railroad purposes and would not impact any residential land uses.

Visual Quality Impacts

Alignment Evaluation/Comparison: Alignment Evaluation/Comparison: Option 5 (BNSF/Harbor Division) of the Los Angeles Union Station – San Diego Approach Options is the most favorable alternative because there are no residential viewers along this alignment. Options 2, 3, 3A and 5 are slightly less favorable than Option 5 because they either cross through a school campus or are adjacent to one or more schools. Option 1A is less favorable than these options, as it is adjacent to some schools and is across SR-60 from a residential area for a distance of two miles. Option 1B and 4 are the least favorable because there are more residences with close views of these alignments than with other options. Option 1B is adjacent to residences for 2.5 miles, while Option 4 crosses an existing residential area for 0.5 miles and is adjacent to residences in another location for 1.2 miles.

N. MINIMIZE IMPACTS TO NATURAL RESOURCES

Water Resources

None of the alignments would result in impacts to natural watercourses. Several cross the Los Angeles River and existing flood control channels and would require permits from the Army Corps of Engineers.

Floodplain Impacts

Several of the alignments cross the Los Angeles River.

Threatened & Endangered Species Impacts

No threatened or endangered species are found in the urbanized area affected by these alignments.

O. MINIMIZE IMPACTS TO SOCIAL AND ECONOMIC RESOURCES

Environmental Justice Impacts (Demographics)

Data for these segments was compiled by each of the San Diego regions in conjunction with their analysis of complete segments south of the Los Angeles station. It has not been prepared separately for these short approaches.

Farmland Impacts

These alignments are located in an urban area with no developable farmland.

P. MINIMIZE IMPACTS TO CULTURAL RESOURCES

Cultural Resources Impacts

All of the approach alignments are expected to encounter cultural resources in the immediate vicinity of Los Angeles Union Station. Option 1 has a low to moderate likelihood for presence of cultural and historic resources since it follows existing railroad lines. Option 1A has a moderate to high likelihood for resources since it crosses part of downtown Los Angeles before following the existing freeway. Option 1B has a moderate potential for cultural resources impacts. Option 2 has a moderate to high potential for impacts since it follows an existing freeway through older neighborhoods. Option 3 and 3A parallel the course of the Los Angeles River before following a railroad right-of-way. Their potential for cultural resources impacts is moderate. Because it crosses part of downtown Los Angeles before following the existing I-5 freeway, Option 4 has a moderate to high potential for cultural resources impacts. Option 5 parallels the Los Angeles River before crossing urban neighborhoods and has a high potential for impacts.

Parks & Recreation/Wildlife Refuge Impacts

Option 1 passes Lincoln Park. Option 1A passes Boyle Heights Sports Center Park and Ramon Garcia Recreation Center. The recreation center is also passed by Option 4. Option 1B passes Ramona Gardens Park. Option 2 on the SR-101 crosses the edge of El Pueblo de Los Angeles State Historic Park. Options 3, 3A and 5 do not affect parks.

Q. MAXIMIZE AVOIDANCE OF AREAS WITH GEOLOGIC AND SOILS CONSTRAINTS

This area just south and east of Existing Union Station has relatively moderate soils and seismic constraints. These constraints are subject to investigation by the LOSSAN and Inland Empire corridor studies.

R. MAXIMIZE AVOIDANCE OF AREAS WITH POTENTIAL HAZARDOUS MATERIALS

Hazardous Materials/Waste Constraints

Of the approaches into Union Station, Alignment Option 2 (SR-101) and Alignment Option 4 (I-5) maximize avoidance of areas with potential hazardous materials because they are near the fewest CERCLIS, SPL, and SCL sites. These alignment options also do not pass though or around existing industrial uses that may have potential hazardous material sites. The other alignments follow existing railroad tracks and are close to existing industrial uses. Therefore, many of these are near potential hazardous materials sites and existing CERCLIS, SPL and SCL sites.

There are fewer than 10 CERCLIS, SPL or SCL sites adjacent to Options 2 and 4. There are approximately 10 CERCLIS, SPL or SCL sites adjacent to Options 1A, 1B and 3. There are approximately 20 CERCLIS, SPL or SCL sites adjacent to Options 1, 3A and 5.

Table 4.1-3
Bakersfield to Los Angeles- High-Speed Train Alignment Evaluation Matrix
Bakersfield-to-Sylmar Segment

Evaluation Criteria	Alignment Option 1 I-5 Alignment	Alignment Option 1A I-5 via Comanche Pt.	Alignment Option 2 Soledad Cn./SR-58	Alignment Option 2A SR-14/SR-58
Maximize Ridership/Revenue Potential				
Travel Time	2.5%: 26.6 min. 3.5%: 27.4 min. 2.5%: **5** 3.5%: **5**	27.2 min. **5**	2.5%: 37.7 min. 3.5%: 37.8 min. 2.5%: **1** 3.5%: **1**	37.8 min. **1**
Length	86.6 miles (139.3 km) 2.5%: **5** 3.5%: **5**	88.9 miles (143.0 km) **5**	123.4 miles (198.5 km) 2.5%: **2** 3.5%: **2**	123.7 miles (199.0 km) **2**
Population/Employment Catchment	• No Antelope Valley Population/employment catchment 2.5%: **1** 3.5%: **1**	• No Antelope Valley population/employment catchment **1**	• Provides Antelope Valley population/employment catchment 2.5%: **5** 3.5%: **5**	• Provides Antelope Valley population/employment catchment **5**
Maximize Connectivity and Accessibility.				
Intermodal Connections	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Minimize Operating and Capital Costs.				
Length	86.6 miles (139.3 km) 2.5%: **5** 3.5%: **5**	88.9 miles (143.0 km) **5**	123.4 miles (198.5 km) 2.5%: **2** 3.5%: **2**	123.7 miles (199.0 km) **2**

Evaluation Criteria	Alignment Option 1 I-5 Alignment	Alignment Option 1A I-5 via Comanche Pt.	Alignment Option 2 Soledad Cn./SR-58	Alignment Option 2A SR-14/SR-58
Operational Issues	2.5% • Achieves 220 mph (350 kph) operating speed throughout. • 4 tunnels - 44.8 mi. (72.1 km) total tunneling. • Includes single tunnel 36.3 mi. (58.5 km.) long requiring adjacent escape tunnel. • Sustained grades: 5 mi. (8km), 3.8 mi. (6km), 18.1 mi. (29km)>1.5% 5 mi. (8 km) > 2% 3.5% • Operating speeds reduced for 10 mi. (17 km) to average 165 mph (275 kph). • 13 tunnels – 34 mi. (54.8 km) total tunneling. • Longest tunnel length is 11.6 mi. (18.6 km) – 2 tunnels of this length require escape tunnels, while others would not. • Sustained grades of 4.4 mi. (7km) and 13.1 mi. (21km) at >3% and 3.8 mi. (6km) at >2% will require more power than flatter gradient alternative. • Potential to avoid tunnel at San Andreas fault – although still fault zone issues.	• Achieves 220 mph (350 kph) operating speed throughout. • 4 tunnels - 42.7 mi. (68.7 km) total tunneling. • Includes single tunnel 34.3 mi. (68.7 km) long, requiring adjacent escape tunnel. • Sustained grades: 5 mi. (8 km) & 18.8 (30 km) > 2%	2.5% • Achieves 220 mph (350 kph) operating speed throughout. • 6 tunnels - 41.2 mi. (66.3 km) total tunneling. • Sustained grades: 10.6 mi. (17km) >1.5% 8.8 mi. (14 km), 11.3 mi. (18 km), 4.4 mi. (7km)> 2% • Two tunnels longer than 6 mi. (9.7 km) require adjacent escape tunnel. • Many minimum-radius curves 3.5% • Operating speeds marginally reduced for 6 mi. (10 km) to 195 mph (325 kph). • 7 tunnels – 20.7 mi. (33.4 km) total tunneling. • Sustained grades of 5 mi. (8km) and 6.3 mi. (10 km) at >3% and 4.4 mi. (7km) at >2% require more power than flatter gradient alternative. • Longest tunnel is only 3.6 mi. (5.8 km) long • Many minimum-radius curves • Crosses Garlock Fault at grade rather than in tunnel.	• Achieves 220 mph (350 kph) operating speed throughout. • 9 tunnels – 42.0 mi. (67.6 km) total tunneling. • Longest tunnel is 11.7 mi. (18.8 km) long. • Three tunnels longer than 6 mi. (9.7 km) require adjacent escape tunnel. • Sustained grades: 11.3 mi. (18km), 12.5 mi. (20 km), 20.6 mi. (33 km) > 2% • Many minimum-radius curves
	2.5%: **3** 3.5%: **3**	**3**	2.5%: **2** 3.5%: **3**	**2**

Evaluation Criteria	Alignment Option 1 I-5 Alignment	Alignment Option 1A I-5 via Comanche Pt.	Alignment Option 2 Soledad Cn./SR-58	Alignment Option 2A SR-14/SR-58
Construction Issues	2.5% • Construction risk of long tunnel. • Limited access – some areas adjacent to I-5. • Readily excavatable soils. 3.5% • Shorter tunnels than 2.5% alternative reduces construction risk as compared to flatter grade. • Limited access for portal construction. • Readily excavatable soils.	• Construction risk of long tunnel. • Limited access. • Readily excavatable soils.	2.5% • Construction risk of tunnels. • Highway access. • Generally excavatable soils with deeper cuts in some areas requiring heavy ripping or blasting. 3.5% • Shorter tunnels than 2.5% grade alternative reduces construction risk as compared to flatter grade. • Highway access generally available to portal sites. • Generally excavatable soils with deeper cuts in some areas requiring heavy ripping or blasting.	• Construction risk of multiple tunnels. • Highway access. • Generally excavatable soils with deeper cuts in some areas requiring heavy ripping or blasting.
	2.5%: **1** 3/5%: **2**	**1**	2/5%: **3** 3.5%: **4**	**2**
Capital Cost	2.5% $8.1 Billion VHS $8.8 Billion Maglev 3.5% $7.0 Billion VHS $7.8 Billion Maglev	$7.8 Billion VHS $8.6 Billion Maglev	2.5% $6.9 Billion VHS $8.1 Billion Maglev 3.5% $5.7 Billion VHS $7.0 Billion Maglev	$7.0 Billion VHS $8.1 Billion Maglev
	2.5%: **1** 3.5%: **3**	**1**	2.5%: **3** 3.5%: **5**	**3**

Evaluation Criteria	Alignment Option 1 I-5 Alignment	Alignment Option 1A I-5 via Comanche Pt.	Alignment Option 2 Soledad Cn./SR-58	Alignment Option 2A SR-14/SR-58
Right-of-Way Issues/Cost	2.5% • BNSF Arvin Branch ROW. • New access roads required. • Potential impacts to new developments in Santa Clarita. • Tunneling minimizes impacts on forest lands • Alignment crosses Santa Clara river flood plain at Santa Clarita. • BNSF Arvin Branch ROW. • New access roads required to tunnels (28 portals). • Potential impacts to new developments in Santa Clarita. • Alignment crosses Santa Clara river flood plain at Santa Clarita.	• BNSF Arvin Branch ROW. • Power line easement from Comanche Point. • New access road required. • Potential impacts to new developments in Santa Clarita. • Tunneling minimizes impacts on forest lands. • Alignment crosses Santa Clara river flood plain at Santa Clarita.	2.5% • Relocation of UPRR/Metrolink from Palmdale to Mojave. • Small segment in Angeles National Forest in Soledad Canyon, alignment in tunnel. 3.5% • Relocation of UPRR/Metrolink from Palmdale to Mojave. • Small segment in Angeles National Forest in Soledad Canyon, alignment at-grade.	• Relocation of UPRR/Metrolink from Palmdale to Mojave.
	2.5%: **3** 3.5%: **2**	**3**	2.5%: **3** 3.5%: **2**	**3**

Evaluation Criteria	Alignment Option 1 I-5 Alignment	Alignment Option 1A I-5 via Comanche Pt.	Alignment Option 2 Soledad Cn./SR-58	Alignment Option 2A SR-14/SR-58
Maximize Compatibility with Existing and Planned Development.				
Land Use Compatibility and Conflicts	2.5% • Residential land uses approaching Bakersfield. • Farm impacts in Central Valley. • Major portion of alignment is in tunnel. • Impacts mixed commercial/industrial areas in the Santa Clarita area. • Crosses the Santa Clarita River. 3.5% • Residential land uses approaching Bakersfield. • Farm impacts in Central Valley. • Portion of alignment is in tunnel. • Requires access roads to tunnel portals in sensitive habitat areas. • Impacts mixed commercial/industrial areas in the Santa Clarita area. • Crosses the Santa Clarita River. • Crosses at-grade through developed area adjacent to Castaic Lagoon. • Crosses at-grade through developing area adjacent to Pico Canyon Road in Santa Clarita.	• Residential land uses approaching Bakersfield. • Farm impacts in Central Valley. • Oil field at toe of slope in Central Valley. • Major portion of alignment is in tunnel. • Impacts mixed commercial/industrial uses in the Santa Clarita area.	2.5% • Approaches Bakersfield in rail/highway corridor. • Grazing land impacts in Tehachapis. • May indirectly impact mixed commercial/industrial/ residential land uses in Palmdale and Lancaster. • Major portion of alignment in the Santa Clarita and Soledad Canyon areas in tunnel. • Adjacent to existing concrete plant in the Santa Clara River near Soledad Canyon. 3.5% • Approaches Bakersfield in rail/highway corridor. • Grazing land impacts in Tehachapis. • May indirectly Impact mixed commercial/industrial/ residential land uses in Palmdale and Lancaster. • Crosses rural estate area in Soledad Canyon at grade. • Traverses National Forest land in Soledad Canyon at grade. • Visible from rural campgrounds in Soledad Canyon. • Adjacent to existing concrete plant in the Santa Clara River near Soledad Canyon.	• Approaches Bakersfield in rail/highway corridor. • Grazing land impacts in Tehachapis. • May indirectly impact mixed commercial/industrial/ residential land uses in Palmdale/Lancaster/ Rosamond. • A portion of the alignment parallels/crosses SR-14 and affects adjacent rural estate uses in the Acton area. • Conflicts with proposed commercial land use in the Santa Clarita/LA County area.
	2.5%: **4** 3.5%:	**4**	2.5%: **4** 3.5%: **2**	**4**

Evaluation Criteria	Alignment Option 1 I-5 Alignment	Alignment Option 1A I-5 via Comanche Pt.	Alignment Option 2 Soledad Cn./SR-58	Alignment Option 2A SR-14/SR-58
Visual Quality Impacts	2.5% • Aerial structure at Bakersfield station and through urban area to east. • At grade through farmlands south of Bakersfield. • Visible from residential areas south of Bakersfield. • At grade for 1.5 mi. across vacant, rugged land, including Towsley Canyon which is being considered for SEA status. Will be visible to residences 0.75 away across I-5 at a lower elevation in Santa Clarita. There will be extensive visible earthwork. • Cut and fill thru center of Santa Clarita Sports Park site (unbuilt). • Balance tunnel, no impact. 3.5% • Aerial structure at Bakersfield station and through urban area to east. • Visible from residential areas south of Bakersfield. • At grade through farmlands south of Bakersfield. • At grade in rural area just south of San Andreas Fault. • At grade for 1.5 mi. across vacant, rugged land, including Towsley Canyon which is being considered for SEA status. • Will be visible to residences 0.75 away across I-5 at a lower elevation in Santa Clarita. There will be	• Aerial structure at Bakersfield station and through urban area to east. • Visible from residential areas south of Bakersfield. • At grade through farmlands south of Bakersfield. • At grade for 1.5 mi. across vacant, rugged land, including Towsley Canyon which is being considered for SEA status. Will be visible to residences 0.75 away across I-5 at a lower elevation in Santa Clarita. There will be extensive visible earthwork. • Cut and fill through center of Santa Clarita Sports Park site (unbuilt). • Balance tunnel, no impact.	2.5% • Aerial structure at Bakersfield station and through urban area to east. • Agriculture/vacant land along SR-158 south of tunnel under Tehachapis. • At grade and part of bridge near 5 widely scattered residences. • At grade w/in 200 ft. of residences for 2 mi. on west: w/in 400 ft. of residences for 0.25 mi. on east; w/in 0.25 mi. of residences for 0.75 on east. • At grade, Rosamond Park 1,000 ft. to west (first tier). • At grade, a few scattered residences (close as 100 ft.) south of Rosamond. • Lancaster, bridge for 5 mi. Mostly commercial area (w/in 100 ft.). May be some first tier residences on east. • Palmdale, at grade through mostly commercial area (w/in 100 ft.) for length of 1.5 mi. May be a few first tier residences. • Palmdale, bridge w/in 500 ft. of residential development for length of 1,000 ft. • Tunnel through Soledad Canyon. No impacts. 3.5% • Aerial structure at Bakersfield station and through urban area to east. • At-grade at some locations along SR-58. • At grade near UP Tehachapi	• Aerial structure at Bakersfield station and through urban area to east. • Agriculture/vacant land along SR-158 south of tunnel under Tehachapis. • At grade and part of bridge near 5 widely scattered residences. • At grade w/in 200 ft. of residences for 2 mi. on west: w/in 400 ft. of residences for 0.25 mi. on east; w/in 0.25 mi. of residences for 0.75 on east. • At grade, Rosamond Park 1,000 ft. to west (first tier). • At grade, a few scattered residences (close as 100 ft.) south of Rosamond. • Lancaster, bridge for 5 mi. Mostly commercial area (w/in 100 ft.). May be some first tier residences on east. • Palmdale, at grade through mostly commercial area (w/in 100 ft.) for length of 1.5 mi. May be a few first tier residences. • Palmdale, bridge w/in 500 ft. of residential development for length of 1,000 ft. • Bridge at Vasquez Park extends for 0.75 mi. along south edge of park. Negative for park users, positive for passengers. • Bridge east of Crown Valley Rd. w/in 1,000 ft. of Vasquez High School (first tier) and slightly further from a junior. high school. • Bridge at Santiago Road, may

Evaluation Criteria	Alignment Option 1 I-5 Alignment	Alignment Option 1A I-5 via Comanche Pt.	Alignment Option 2 Soledad Cn./SR-58	Alignment Option 2A SR-14/SR-58
	extensive visible earthwork. • Cut and fill through center of Santa Clarita Sports Park site (unbuilt). • At-grade through developed area adjacent to Castaic Lagoon. • At-grade through developing area in Santa Clarita. • Requires access roads to tunnel portals in sensitive habitat areas. Extensive visible earthwork. • Balance tunnel, no impact.		Loop. • At grade near community of Tehachapi. • Agriculture/vacant land along SR-158 south of tunnel under Tehachapis. • At grade and part of bridge near 5 widely scattered residences. • At grade w/in 200 ft. of residences for 2 mi. on west: w/in 400 ft. of residences for 0.25 mi. on east; w/in 0.25_mi. of residences for 0.75 on east. • At grade, Rosamond Park 1,000 ft. to west (first tier). • At grade, a few scattered residences (close as 100 ft.) south of Rosamond. • Lancaster, bridge for 5 mi. Mostly commercial area (w/in 100 ft.). May be some first tier residences on east. • Palmdale, at grade through mostly commercial area (w/in 100 ft.) for 1.5 mi. May be a few first tier residences. • Palmdale, bridge w/in 500 ft. of residential development for length of 1,000 ft. • At grade through rural estate area in Soledad Canyon. • At grade crossing National Forest land in Soledad Cn. • At grade near rural campgrounds in Soledad Cn.	be some residences w/in 200 to 300 ft.
	2.5%: **2** 3.5%: **1**	**2**	2.5%: **2** 3.5%: **1**	**2**

Evaluation Criteria	Alignment Option 1 I-5 Alignment	Alignment Option 1A I-5 via Comanche Pt.	Alignment Option 2 Soledad Cn./SR-58	Alignment Option 2A SR-14/SR-58
Minimize Impacts to Natural Resources.				
Water Resources Number and sensitivity level of waters and potential wetland/riparian resources crossed by alignment. Sensitivity of surface waters proximate (< 1 mile) to tunnel segments	2.5% • At-grade crossings: 2 low, 2 low/mod, 1 mod/high. • Tunnel overcrossings: 24 low, 10 low/mod, 6 mod/high. • Proximate to tunneled segments: 35 low, 7 low/mod, 1 high. 3.5% • At-grade crossings: 4 low, 7 low/mod, 6 mod/high. • Tunnel overcrossings: 23 low, 5 low/mod, 1 mod/high. • Proximate to tunneled segments: 31 low, 4 mod/low.	• At-grade crossings: 1 low, 2 low/mod,1 mod/high. • Tunnel overcrossings: 31 low, 12 low/mod, 5 mod/high. • Proximate to tunneled segments: 37 low, 5 low/mod, 1 high.	2.5% • At-grade crossings: 26 low, 12 low/mod, 2 mod/high. • Tunnel overcrossings: 41 low, 12 low/mod, 4 mod/high. • Proximate to tunneled segments: 5 low, 5 low/mod, 1 mod/high, 1 high. 3.5% • At-grade crossings: 39 low, 19 low/mod, 4 mod/high. • Tunnel overcrossings: 29 low, 13 low/mod, 2 mod/high. • Proximate to tunneled segments: 4 low, 4 low/mod, 1 mod/high, 1 high.	• At-grade crossings: 27 low, 14 low/mod, 1 mod/high(+1 mod/high bridged). • Tunnel overcrossings: 32 low, 4 low/mod, 1 mod/high. • Proximate to tunneled segments: 7 low, 5 low/mod.
	2.5%: **2** 3.5%: **1**	**2**	2.5%: **2** 3.5%: **1**	**3**
Floodplain Impacts	2.5% • Crosses major floodplain areas south of Bakersfield. • Crosses Santa Clara River Floodplain. 3.5% • Crosses major floodplain areas south of Bakersfield. • Crosses floodplains in Tehachapi Mountains. • Crosses tributaries to Pyramid Lake. • Crosses Santa Clara River Floodplain.	• Crosses major floodplain areas south of Bakersfield. • Crosses Santa Clara River floodplain.	2.5% • Major 100-year floodplain at toe of Tehachapis in Central Valley. • Extensive 100-year floodpains just north of Lancaster. • 500-year floodplains in Palmdale and Lancaster. • Crosses Santa Clara River floodplain. 3.5% • Major 100-year floodplain at toe of Tehachapis in Central Valley. • Extensive 100-year floodpains just north of Lancaster. • 500-year floodplains in Palmdale and Lancaster.	• Major 100-year floodplain at toe of Tehachapis in Central Valley. • Extensive 100-year floodpains just north of Lancaster. • 500-year floodplains in Palmdale and Lancaster. • Crosses Santa Clara River floodplain.

Evaluation Criteria	Alignment Option 1 I-5 Alignment	Alignment Option 1A I-5 via Comanche Pt.	Alignment Option 2 Soledad Cn./SR-58	Alignment Option 2A SR-14/SR-58
			• Crosses Santa Clara River floodplain in Santa Clarita and Soledad Canyon.	
	2.5%: **4** 3.5%: **3**	**4**	2.5%: **3** 3.5%: **2**	**3**
Threatened & Endangered Species Impacts	2.5% • 15 + sensitive species found within alignment, however, lower potential for impact due to length of tunneling. 3.5% • More at-grade alignment in native habitat areas creates higher potential for impacts. • Power lines to tunnel portals or along at-grade segments may impact California condors.	• 15 + sensitive species found within alignment, however, lower potential for impact due to length of tunneling.	2.5% • Higher potential to impact 15 + sensitive species due to length of at-grade alignment in undeveloped areas. 3.5% • Even higher potential to impact sensitive species due to increased alignment at-grade.	• Higher potential to impact 15 + sensitive species due to length of at-grade alignment in undeveloped areas.
	2.5%: **5** 3.5%: **3**	**5**	2.5%: **4** 3.5%: **3**	**4**
Minimize Impacts to Social and Economic Resources.				
Environmental Justice Impacts (Demographics)	Central Valley: 1990 Minority population: 22,595 1990 In-poverty households: 262 Tehachapis, south: 1990 Minority population: 3,051 1990 In-poverty households: 76 Total: 1990 Minority population: 25,646 1990 In-poverty households: 338	Central Valley: 1990 Minority population: 22,595 1990 In-poverty households: 262 Tehachapis, south: 1990 Minority population: 3,049 1990 In-poverty households: 74 Total: 1990 Minority population: 25,644 1990 In-poverty households: 336	Central Valley: 1990 Minority population: 13,744 1990 In-poverty households: 262 Tehachapis, south: 1990 Minority population: 4,165 1990 In-poverty households: 1,031 Total: 1990 Minority population: 17,909 1990 In-poverty households: 1,293	Central Valley: 1990 Minority population: 13,744 1990 In-poverty households: 262 Tehachapis, south: 1990 Minority population: 4,158 1990 In-poverty households: 1,031 Total: 1990 Minority population: 17,902 1990 In-poverty households: 1,293
	2.5%: **4** 3.5%: **4**	**4**	2.5%: **4** 3.5%: **4**	**4**

Evaluation Criteria	Alignment Option 1 I-5 Alignment	Alignment Option 1A I-5 via Comanche Pt.	Alignment Option 2 Soledad Cn./SR-58	Alignment Option 2A SR-14/SR-58
Farmland Impacts	• Alignment would impact existing farmlands south of Bakersfield before reaching the Tehachapi mountains. • Crosses grazing areas. • Alignment encroaches on a small amount of existing farmland near Santa Clara River/SR-126. • Alignment traverses soils in the Santa Clara River and its tributary areas that could be farmed.	• Alignment would impact existing farmlands south of Bakersfield before reaching the Tehachapi mountains. • Crosses grazing areas. • Alignment encroaches on a small amount of existing farmland near Santa Clara River/SR-126. • Alignment traverses soils in the Santa Clara River and its tributary areas that could be farmed.	• The alignment would impact prime soils and existing farmlands outside of the city of Bakersfield. • Crosses grazing areas. • The alignment would cross soils suitable for farming in the Rosamond, Lancaster and Palmdale areas.	• The alignment would impact prime soils and existing farmland outside the city of Bakersfield. • Crosses grazing areas. • The alignment would cross soils suitable for farming in the Rosamond, Lancaster and Palmdale areas.
	2.5%: **3** 3.5%: **3**	**3**	2.5%: **2** 3.5%: **2**	**2**
Minimize Impacts to Cultural Resources.				
Cultural Resources Impacts	2.5% • Few recorded resources on GIS. • Overall probable impact is low; route is primarily tunnel over Tehachapis. • Potential impacts at bridge crossings of Santa Clara River and Castaic Creek. 3.5% • Few recorded resources on GIS. • Overall probable impact is increased as more of the alignment is at-grade over Tehachapis. • Potential impacts at bridge crossings of Santa Clara River and Castaic Creek.	• Few recorded resources on GIS. • Overall probable impact is low; route is primarily tunnel over Tehachapis. • Potential impacts at bridge crossings of Santa Clara River and Castaic Creek.	2.5% • Few recorded resources on GIS. • Potential impacts during at-grade/bridge passage through Palmdale, Lancaster, Rosamond and near Edwards AFB, Mojave and Tehachapi, and crossings of Tehachapi Creek. Includes visual impacts to historical resources. • Overall probable impact is moderate along SR-58; route crosses open desert, is partially tunnel northwest of Mojave. • Overall probable impact is low in Soledad Canyon since route is mostly tunnel. • Potential impacts at at-grade/bridge crossings of Santa Clara River and Mill Creek. •	• Few recorded resources on GIS • Potential impacts during at-grade/bridge passage through Palmdale, Lancaster, Rosamond and near Edwards AFB, Mojave and Tehachapi, and crossings of Tehachapi Creek. Includes visual impacts to historical resources. • Overall probable impact is moderate along SR-58; route crosses open desert, is partially tunnel northwest of Mojave. • Overall probable impact is low along SR-14; route is mostly tunnel. • Potential impacts at at-grade/bridge crossings of Santa Clara River, Aqua Dulce Canyon, Escondido Canyon and Acton Canyon. • Four sites recorded at Vasquez

Evaluation Criteria	Alignment Option 1 I-5 Alignment	Alignment Option 1A I-5 via Comanche Pt.	Alignment Option 2 Soledad Cn./SR-58	Alignment Option 2A SR-14/SR-58
			3.5% • Few recorded resources on GIS. • At-grade adjacent to historic Tehachapi Loop on UPRR. • Potential impacts during at-grade/bridge passage through Palmdale, Lancaster, Rosamond and near Edwards AFB, Mojave and Tehachapi, and crossings of Tehachapi Creek. Includes visual impacts to historical resources. Longer at-grade segment near Tehachapi. • Overall probable impact is moderate along SR-58; crosses open desert, partially tunnel northwest of Mojave. • Overall probable impact is moderate in Soledad Canyon since a portion of the route is at-grade. • Potential impacts at at-grade/bridge crossings of Santa Clara River and Mill Creek.	Rocks County Park, possible visual impacts.
	2.5%: **5** 3.5%: **4**	**5**	2.5%: **2** 3.5%: **2**	**2**

Evaluation Criteria	Alignment Option 1 I-5 Alignment	Alignment Option 1A I-5 via Comanche Pt.	Alignment Option 2 Soledad Cn./SR-58	Alignment Option 2A SR-14/SR-58
Parks & Recreation/Wildlife Refuge Impacts	2.5% • Low potential for visual impacts. • Passes on bridge near Santa Clarita Sports Park, and bridge or tunnel at Castaic Lake State Recreation Area, tunnel under Angeles and Los Padres National Forests. • Crosses at grade through Towsley Canyon, which is being considered for SEA status. 3.5% • Some potential for visual impacts. • Passes on bridge near Santa Clarita Sports Park, and bridge or tunnel at Castaic Lake State Recreation Area, tunnel under Angeles and Los Padres National Forests. • Crosses at grade through Towsley Canyon, which is being considered for SEA status. • At grade adjacent to off-road vehicle park. • At grade near Condor refuge.	• Low potential for visual impacts. • Passes on bridge near Santa Clarita Sports Park, and bridge or tunnel at Castaic Lake State Recreation Area, tunnel under Angeles and Los Padres National Forests. • Crosses at grade through Towsley Canyon, which is being considered for SEA status.	2.5% • Crosses small area of National Forest in tunnel in Soledad Canyon. • No local or County public park resources located in Soledad Canyon. • Passes Sierra Highway Greenbelt in Palmdale. 3.5% • At-grade segment visible from rural town of Tehachapi. • Crosses small area of National Forest at-grade in Soledad Canyon. • Visible from rural campgrounds in Soledad Canyon. • No local or County public park resources located in Soledad Canyon. • Passes Sierra Highway Greenbelt in Palmdale.	• Low potential for visual impacts along SR-14. • Passes on bridge/at-grade near Vasquez Rocks County Park; potential for visual impacts. • Passes Sierra Highway Greenbelt in Palmdale.
	2.5%: **3** 3.5%: **2**	**3**	2.5%: **4** 3.5%: **3**	**3**

Evaluation Criteria	Alignment Option 1 I-5 Alignment	Alignment Option 1A I-5 via Comanche Pt.	Alignment Option 2 Soledad Cn./SR-58	Alignment Option 2A SR-14/SR-58
Maximize Avoidance of Areas with Geologic and Soils Constraints.				
Soils/Slope Constraints	• Medium – Intermediate hardness units considered unlikely to marginal relative to compressibility. • Low - Probably stable formations consisting of hard rock or granular continental deposits.	• Medium – Intermediate hardness units considered unlikely to marginal relative to compressibility. • Low – Probably stable formations consisting of hard rock or granular continental deposits.	• High – Low subsidence potential, high compressibility. • Medium – Formations with marginal stability including largely continental deposits and older (Paleozoic) marine sediments.	• High – Low subsidence potential, high compressibility. • Medium – Formations with marginal stability including largely continental deposits and older (Paleozoic) marine sediments.
	2.5%: **3** 3.5%: **3**	**3**	2.5%: **4** 3.5%: **4**	**4**
Seismic Constraints	• Lowl/Medium – Probable ground motion from earthquakes. • Medium – Active fault crossings. • Medium/High – Liquefaction potential. 2.5% • Crosses both San Andreas and Garlock Faults in deep tunnel. 3.5% • Crosses Garlock Fault in deep tunnel.	• Low/Medium – Probable ground motion from earthquakes. • Medium – Active fault crossings. • Medium/High – Liquefaction potential. • Crosses both San Andreas and Garlock Faults in deep tunnel.	• High – Probable ground motion from earthquakes. • High – Active fault crossings. • Low – Liquefaction potential. 2.5% • Crosses Garlock Fault in tunnel. 3.5% • Crosses both Garlock Fault and San Andreas Fault at grade.	• High – Probable ground motion from earthquakes. • High – Active fault crossings. • Low – Liquefaction potential. • Crosses Garlock Fault in tunnel; crosses San Andreas Fault at grade.
	2.5%: **3** 3.5%: **3**	**3**	2.5%: **4** 3.5%: **4**	**4**

Evaluation Criteria	Alignment Option 1 I-5 Alignment	Alignment Option 1A I-5 via Comanche Pt.	Alignment Option 2 Soledad Cn./SR-58	Alignment Option 2A SR-14/SR-58
Maximize Avoidance of Areas with Potential Hazardous Materials.				
Hazardous Materials/Waste Constraints	• There are approximately 3 CERCLIS, SPL, or SCL sites • There are oil fields adjacent to the I-5 near Highway 126.	• There are approximately 2 CERCLIS, SPL, or SCL sites • There are oil fields adjacent to the I-5 near Highway 126.	• There are approximately 20 CERCLIS, SPL, or SCL sites. • There are oil fields off of San Fernando Road.	• There are approximately 20 CERCLIS, SPL, or SCL sites. • There are oil fields off of San Fernando Road.
	2.5%: **4** 3.5%: **4**	**4**	2.5%: **3** 3.5%: **3**	**3**

1 2 3 4 5
Least Favorable Most Favorable

Table 4.1-3 (Con't.)
Bakersfield to Los Angeles- High-Speed Train Alignment Evaluation Matrix
Bakersfield-to-Sylmar Segment (Con't.)

Evaluation Criteria	Alignment Option 3 Soledad Cn./SR-138	Alignment Option 3A SR-14/SR-138	Alignment Option 4 Soledad Cn./Aqueduct	Alignment Option 4A SR-14/Aqueduct
Maximize Ridership/Revenue Potential				
Travel Time	38.5 min. **1**	38.6 min. **1**	36.8 min. **2**	36.9 min. **2**
Length	127.6 miles (205.3 km) **1**	128.0 miles (205.9 km) **1**	121.9 miles (196.1 km) **2**	122.2 miles (196.7 km) **2**
Population/Employment Catchment	• Provides Antelope Valley population/employment catchment. **5**	• Provides Antelope Valley population/employment catchment. **5**	• Provides Antelope Valley population/employment catchment. **5**	• Provides Antelope Valley population/employment catchment. **5**
Maximize Connectivity and Accessibility.				
Intermodal Connections	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Minimize Operating and Capital Costs.				
Length	127.6 miles (205.3 km) **1**	128.0 miles (205.9 km) **1**	121.9 miles (196.1 km) **2**	122.2 miles (196.7 km) **2**

Evaluation Criteria	Alignment Option 3 Soledad Cn./SR-138	Alignment Option 3A SR-14/SR-138	Alignment Option 4 Soledad Cn./Aqueduct	Alignment Option 4A SR-14/Aqueduct
Operational Issues	• Achieves 220 mph (350 kph) operating speed throughout. • 4 tunnels – 31.5 mi. (50.6 km) total tunnel length. • Longest tunnel is 14.2 mi. (22.8 km) long. • Two tunnels longer than 6 mi. (9.7 km) require adjacent escape tunnel. • Sustained grades: 18.8 mi.(30 km) > 2% • Many minimum-radius curves.	• Achieves 220 mph (350 kph) operating speed throughout. • 7 tunnels – 32.3 mi. (52.0 km) total tunnel length. • Longest tunnel is 14.2 mi. (22.8 km) long. • Two tunnels longer than 6 mi. (9.7 km) require adjacent escape tunnel. • Sustained grades: 11.3 mi. (18km) & 18.8 mi. (30 km) > 2% • Many minimum-radius curves.	• Achieves 220 mph (350 kph) operating speed throughout. • 4 tunnels – 31.5 mi. (50.7 km) total tunnel length. • Longest tunnel is 14.2 mi. (22.8 km) long. • Two tunnels longer than 6 mi. (9.7 km) require adjacent escape tunnel. • Sustained grades: 18.8 mi. (30 km) > 2% • Many minimum-radius curves.	• Achieves 220 mph (350 kph) operating speed throughout. • 7 tunnels – 32.3 mi. (52.0 km) total tunnel length. • Longest tunnel is 14.2 mi. (22.8 km) long. • Two tunnels longer than 6 mi. (9.7 km) require adjacent escape tunnel. • Sustained grades: 11.3 mi. (18km) & 18.8 mi. (30 km) > 2% • Many minimum-radius curves.
	3	**3**	**3**	**3**
Construction Issues	• Construction risk of tunnels. • Highway and rail access available. • Difficult excavation in areas where deeper cuts are proposed into rock may require blasting.	• Construction risk of multiple tunnels. • Highway access available. • Difficult excavation in areas where deeper cuts are proposed into rock may require blasting.	• Construction risk of tunnels. • Design/construction implications of seismic zone. • Generally excavatable soils with deeper cuts in some areas requiring heavy ripping or blasting.	• Design/construction implications of seismic zone. • Generally excavatable soils with deeper cuts in some areas requiring heavy ripping or blasting.
	3	**2**	**2**	**2**
Capital Cost	$6.9 Billion VHS $8.2 Billion Maglev	$7.0 Billion VHS $8.3 Billion Maglev	$7.0 Billion VHS $8.1 Billion Maglev	$7.0 Billion VHS $8.2 Billion Maglev
	3	**3**	**3**	**3**

Evaluation Criteria	Alignment Option 3 Soledad Cn./SR-138	Alignment Option 3A SR-14/SR-138	Alignment Option 4 Soledad Cn./Aqueduct	Alignment Option 4A SR-14/Aqueduct
Right-of-Way Issues/Cost	• BNSF Arvin Branch ROW. • Power line easement from Comanche Point • Adjacent to Angeles National Forest through Soledad Canyon. • Short segment traverses National Forest land.	• BNSF Arvin Branch ROW. • Power line easement from Comanche Point. • Generally follows existing transportation corridors, including State highways. • Requires some property acquisition along SR-14.	• BNSF Arvin Branch ROW. • Power line easement from Comanche Point. • CA DWR land. • Impacts development in Palmdale east of SR-14. • Adjacent to Angeles National Forest through Soledad Canyon. • Short segment traverses National Forest land.	• BNSF Arvin Branch ROW. • Power line easement from Comanche Point. • Generally follows existing transportation / public corridors. • CA DWR land. • Impacts development in Palmdale east of SR-14. • Requires some property acquisition along SR-14.
	4	**3**	**2**	**2**
Maximize Compatibility with Existing and Planned Development.				
Land Use Compatibility and Conflicts	• Residential land uses approaching Bakersfield. • Farm impacts in Central Valley. • Oil field at toe of slope in Central Valley. • May create indirect impacts on mixed residential/ commercial/industrial residential land uses in the Palmdale and Lancaster areas. • Most of Soledad Canyon portion of alignment is in a tunnel. • Alignment adjacent to on existing concrete plant in the Santa Clara River near Soledad Canyon. • Alignment bridges the Santa Clara River.	• Residential land uses approaching Bakersfield. • Farm impacts in Central Valley. • Oil field at toe of slope in Central Valley. • May create indirect impacts on mixed residential/ commercial/ industrial land uses in Palmdale. • The alignment crosses SR-14 twice. • A portion of the alignment parallels/crosses SR-14 and affects adjacent rural estate uses in the Acton area. • Conflicts with proposed commercial land use in the Santa Clarita/LA County area.	• Residential land uses approaching Bakersfield. • Farm impacts in Central Valley. • Oil field at toe of slope in Central Valley. • May create indirect impacts on the existing residential/ commercial/industrial land uses in Palmdale. • May create indirect impacts on residential/large ranches in Palmdale area. • Crosses the California aqueduct at two places. • Most of Soledad Canyon portion of alignment is in a tunnel. • Alignment adjacent to on existing concrete plant in the Santa Clara River near Soledad Canyon.	• Residential land uses approaching Bakersfield. • Farm impacts in Central Valley. • Oil field at toe of slope in Central Valley. • May create indirect impacts on a mix of residential/small ranches in Palmdale area. • Crosses the California aqueduct at two places. • A portion of the alignment parallels/crosses SR-14 and affects adjacent rural estate uses in the Acton area. • Conflicts with proposed commercial land use in the Santa Clarita/LA County area.
	4	**4**	**3**	**3**

Evaluation Criteria	Alignment Option 3 Soledad Cn./SR-138	Alignment Option 3A SR-14/SR-138	Alignment Option 4 Soledad Cn./Aqueduct	Alignment Option 4A SR-14/Aqueduct
Visual Quality Impacts	• On structure approaching Bakersfield station. • At grade through farmlands south of Bakersfield. • Visible from residential areas south of Bakersfield. • At grade through agriculture land along SR-138. 6 to 10 residences widely scattered w/in 200 ft. of alignment. • Bridge from SR-138 to UPRR is 2.25 mi. long and will be visible for a long distance in the flat, rural landscape. Few residences w/ large lots to east. Mobile home park 0.25 mi. west of bridge. Residences along length of 0.5 mi. will see bridge. • Lancaster, bridge for 5 mi. Mostly commercial area (w/in 100 ft.). May be some first tier residences on east. • Palmdale, at grade through mostly commercial area (w/in 100 ft.) for length of 1.5 mi. May be a few first tier residences. • Palmdale, bridge w/in 500 ft. of residential development for length of 1,000 ft. • Tunnel through Soledad Canyon. No impacts.	• On structure approaching Bakersfield station. • At grade through farmlands south of Bakersfield. • Visible from residential areas south of Bakersfield. • At grade through agricultural land along SR-138. 6 to 10 residences widely scattered w/in 200 ft. of alignment. • Bridge from SR-138 to UPRR is 2.25 mi. long and will be visible for a long distance in the flat, rural landscape. Few residences w/ large lots to east. Mobile home park 0.25 mi. west of bridge. Residences along a length of 0.5 mi. will see bridge. • Lancaster, bridge for 5 miles. Mostly commercial area (w/in 100 ft.). May be some first tier residences on east. • Palmdale, at grade through mostly commercial area (w/in 100 ft.) for a length of 1.5 mi. May be a few first tier residences. • Palmdale, bridge w/in 500 ft of residential development for length of 1,000 ft. • Bridge at Vasquez Park extends for 0.75 mi. adjacent to south edge of park. Negative for park viewers, positive for passengers. • Bridge at Santiago Road, may be some residences w/in 200 to 300 ft. • Bridge east of Crown Valley Rd. w/in 1,000 f. of Vasquez High School (first tier) and slightly further from a junior	• On structure approaching Bakersfield station. • At grade through farmlands south of Bakersfield. • Visible from residential areas south of Bakersfield. • Bridge 9.5 mi. long, less than 200 ft. from residences in Lancaster, Palmdale and L.A. County for 5 mi. length. Large lots, rural residential area. • Same bridge w/in 500 ft of Paraclete High School (first tier). • At grade w/ some cut and fill along aqueduct. Excellent view for high-speed rail passengers. • At grade w/in 800 ft. of SW corner of Antelope Valley Poppy Reserve. Alignment will be visible at greater distances along 0.25 mi. of the park. • Palmdale, at grade through mostly commercial area (w/in 100 ft.) for length of 1.5 mi. May be a few first tier residences. • Palmdale, bridge w/in 500 ft. of residential development for length of 1,000 ft. • Tunnel through Soledad Canyon. No impacts.	• On structure approaching Bakersfield station. • At grade through farmlands south of Bakersfield. • Visible from residential areas south of Bakersfield. • Bridge 9.5 mi. long, less than 200 ft. from residences in Lancaster, Palmdale and L.A. County for 5 mi. length. Large lots, rural residential area. • Same bridge w/in 500 ft. of Paraclete High School (first tier). • At grade w/ some cut and fill along aqueduct. Excellent view for high-speed rail passengers. • At grade w/in 800 ft. of SW corner of Antelope Valley Poppy Reserve. Alignment will be visible at greater distances along 0.25 mi. of the park. • Palmdale, at grade through mostly commercial area (w/in 100 ft.) for a length of 1.5 mi. May be a few first tier residences. • Palmdale, bridge w/in 500 ft. of residential development for length of 1,000 ft. • Bridge at Vasquez Park extends for 0.75 mi. at south edge of park. Negative for park users, positive for passengers. • Bridge at Santiago Road, may be some residences w/in 200 to 300 ft. • Bridge east of Crown Valley Rd. w/in 1,000 ft. of Vasquez

Evaluation Criteria	Alignment Option 3 Soledad Cn./SR-138	Alignment Option 3A SR-14/SR-138	Alignment Option 4 Soledad Cn./Aqueduct	Alignment Option 4A SR-14/Aqueduct
		high school.		High School and slightly further from a junior high school.
	3	**3**	**1**	**1**
Minimize Impacts to Natural Resources.				
Water Resources Number and sensitivity level of waters and potential wetland/riparian resources crossed by alignment. Sensitivity of surface waters proximate (< 1 mile) to tunnel segments.	• At-grade crossings: 11 low, 7 low/mod, 4 mod/high. • Tunnel overcrossings: 34 low, 11 low/mod, 3 mod/high. • Proximate to tunneled segment: 7 low, 9 low/mod, 1 mod/high1 high.	• At-grade crossings: 12 low, 10 low/mod, 3 mod/high (+ 1 mod/high bridged). • Tunnel overcrossings: 25 low, 3 low/mod. • Proximate to tunneled segment: 9 low, 12 low/mod.	• At-grade crossings: 25 low, 10 low/mod, 4 mod/high. • Tunnel overcrossings: 36 low, 10 low/mod. • Proximate to tunneled segment: 7 low, 9 low/mod, 1 mod/high, 1 high.	• At-grade crossings: 25 low, 10 low/mod, 3 mod/high (+ 1 mod/high bridged). • Tunnel overcrossings: 25 low, 2 low/mod. • Proximate to tunneled segments: 8 low, 10 low/mod.
	2	**4**	**3**	**5**
Floodplain Impacts	• Crosses major floodplains south of Bakersfield. • 100 and 500 year floodplains along east-west segment of SR-138 and on south side of the Tehachapis. • Extensive 100-year floodpains just north of Lancaster. • 500-year floodplains in Palmdale and Lancaster. • Crosses Santa Clara River floodplain.	• Crosses major floodplains south of Bakersfield. • 100 and 500 year floodplains along east-west segment of SR-138 and on south side of the Tehachapis. • Extensive 100-year floodpains just north of Lancaster. • 500-year floodplains in Palmdale and Lancaster. • Crosses Santa Clara River floodplain.	• Crosses major floodplains south of Bakersfield. • 100-year floodplain on south side of Tehachapis. • 100-year floodplain east of SR-14 and west of UPRR. • 500-year floodplains in Palmdale. • Crosses Santa Clara River floodplain.	• Crosses major floodplains south of Bakersfield. • 100-year floodplain on south side of Tehachapis. • 100-year floodplain east of SR-14 and west of UPRR. • 500-year floodplains in Palmdale. • Crosses Santa Clara River floodplain.
	3	**3**	**3**	**3**
Threatened & Endangered Species Impacts	• Traverses large agricultural areas. Mountainous areas tunneled. • Lower potential to impact sensitive species.	• Traverses large agricultural areas. • Mountainous area tunneled. • Lower potential to impact sensitive species.	• Traverses through several types of native habitat. Higher potential to impact range of sensitive species.	• Traverses through several types of native habitat. Higher potential to impact range of sensitive species.
	5	**5**	**4**	**4**

Evaluation Criteria	Alignment Option 3 Soledad Cn./SR-138	Alignment Option 3A SR-14/SR-138	Alignment Option 4 Soledad Cn./Aqueduct	Alignment Option 4A SR-14/Aqueduct
Minimize Impacts to Social and Economic Resources.				
Environmental Justice Impacts (Demographics)	Central Valley: 1990 Minority population: 22,595 1990 In-poverty households: 262 Tehachapis, south: 1990 Minority population: 3,943 1990 In-poverty households: 947 Total: 1990 Minority population: 26,538 1990 In-poverty households: 1,209	Central Valley: 1990 Minority population: 22,595 1990 In-poverty households: 262 Tehachapis, south: 1990 Minority population: 3,936 1990 In-poverty households: 947 Total: 1990 Minority population: 26,537 1990 In-poverty households: 1,209	Central Valley: 1990 Minority population: 22,595 1990 In-poverty households: 262 Tehachapis, south: 1990 Minority population: 2,871 1990 In-poverty households: 563 Total: 1990 Minority population: 25,466 1990 In-poverty households: 825	Central Valley: 1990 Minority population: 22,595 1990 In-poverty households: 262 Tehachapis, south: 1990 Minority population: 2,864 1990 In-poverty households: 563 Total: 1990 Minority population: 25,459 1990 In-poverty households: 825
	4	**4**	**4**	**4**
Farmland Impacts	• Alignment would impact existing farmlands south of Bakersfield before reaching the Tehachapi Mountains. • Crosses areas with soils that could be farmed in the Central Valley, the Lancaster and Palmdale areas, and in Soledad Canyon. • Crosses grazing areas.	• Alignment would impact existing farmlands south of Bakersfield before reaching the Tehachapi Mountains. • Crosses areas with soils that could be farmed in the Central Valley, and in the Lancaster and Palmdale areas. • The SR-14 portion of this alignment would not traverse through any areas currently being commercially farmed. • The SR-14 and SR-138 portions of this alignment would traverse a few areas with soils that could be farmed. • Crosses grazing areas.	• Alignment would impact existing farmlands south of Bakersfield before reaching the Tehachapi Mountains. • Crosses areas with soils that could be farmed in the Central Valley, and in the Lancaster and Palmdale areas. • The Soledad Canyon and Aqueduct portions of the alignment would traverse areas with soils that could be farmed. • Crosses grazing areas.	• Alignment would impact existing farmlands south of Bakersfield before reaching the Tehachapi Mountains. • Crosses areas with soils that could be farmed in the Central Valley, and in the Lancaster and Palmdale areas. • The SR-14 portion of the alignment would not traverse any areas that are currently being commercially farmed. • The Aqueduct portion of the alignment would traverse a few locations with soils that could be farmed. • Crosses grazing areas.
	4	**3**	**3**	**3**
Minimize Impacts to Cultural Resources.				
Cultural Resources Impacts	• Few recorded resources on GIS. • Overall probable impact is low to moderate along SR-138; route crosses open desert. • Potential impacts during at-grade/bridge passage through	• Few recorded resources on GIS • Overall probable impact is low to moderate along SR-138; route crosses open desert. • Potential impacts during at-grade/bridge passage through Palmdale and Lancaster,	• Few recorded resources on GIS. • Overall probable impact is high along Aqueduct, route crosses numerous streams at base of San Gabriel Mountains. • Potential impacts during at-grade/bridge passage through	• Few recorded resources on GIS. • Overall probable impact is high along Aqueduct, route crosses numerous streams at base of San Gabriel Mountains. • Potential impacts during at-grade/bridge passage through

Evaluation Criteria	Alignment Option 3 Soledad Cn./SR-138	Alignment Option 3A SR-14/SR-138	Alignment Option 4 Soledad Cn./Aqueduct	Alignment Option 4A SR-14/Aqueduct
	Palmdale and Lancaster, including visual impacts to historical resources. • Overall probable impact is low in Soledad Canyon; route is mostly tunnel. • Potential impacts at at-grade/bridge crossings of Santa Clara River and Mill Creek.	including visual impacts to historical resources. • Four sites recorded at Vasquez Rocks County Park. • Overall probable impact is low along SR-14; route is mostly tunnel. • Potential impacts at at-grade/bridge crossings of Santa Clara River, Aqua Dulce Canyon, Escondido Canyon and Acton Canyon.	Palmdale, including visual impacts to historical resources. • Overall probable impact is low in Soledad Canyon; route is mostly tunnel. • Potential impacts at at-grade/bridge crossings of Santa Clara River and Mill Creek.	Palmdale, including visual impacts to historical resources. • Four sites recorded at Vasquez Rocks County Park, possible visual impacts. • Overall probable impact is low along SR-14; route is mostly tunnel. • Potential impacts at at-grade/bridge crossings of Santa Clara River, Aqua Dulce Canyon, Escondido Canyon and Acton Canyon.
	4	**3**	**2**	**1**
Parks & Recreation/Wildlife Refuge Impacts	• No local or County public park resources located in Soledad Canyon. • Short segment traverses National Forest Lands in Soledad Canyon. • No park resources located along at-grade/bridge portion of SR-138 segment. • Passes under Los Padres National Forest in tunnel.	• Passes on bridge/at-grade near Vasquez Rocks County Park; potential for visual impacts. • No park resources located along at-grade/bridge portion of SR-138 alignment. • Passes under Los Padres National Forest in tunnel.	• No local or County public park resources located in Soledad Canyon. • Short segment traverses National Forest Lands in Soledad Canyon. • Very low potential for visual impacts along Aqueduct. • Passes on bridge near Hillside Park, at grade near Antelope Valley Poppy Preserve Park, and Joshua Tree Preserve, potential for visual impacts. • Passes under Los Padres National Forest in tunnel.	• Generally low potential for visual impacts along SR-14. • Passes on bridge/at-grade near Vasquez Rocks County Park; potential for visual impacts. • Very low potential for visual impacts along Aqueduct. • Passes on bridge near Hillside Park, at grade near Antelope Valley Poppy Preserve Park, and Joshua Tree Preserve, potential for visual impacts. • Passes under Los Padres National Forest in tunnel.
	4	**3**	**2**	**1**
Maximize Avoidance of Areas with Geologic and Soils Constraints.				
Soils/Slope Constraints	• Medium – Formations with marginal stability including largely continental deposits and older (Paleozoic) marine sediments.	• Medium – Formations with marginal stability including largely continental deposits and older (Paleozoic) marine sediments.	• Medium – Formations with marginal stability including largely continental deposits and older (Paleozoic) marine sediments.	• Medium – Formations with marginal stability including largely continental deposits and older (Paleozoic) marine sediments.
	4	**4**	**4**	**4**

Evaluation Criteria	Alignment Option 3 Soledad Cn./SR-138	Alignment Option 3A SR-14/SR-138	Alignment Option 4 Soledad Cn./Aqueduct	Alignment Option 4A SR-14/Aqueduct
Seismic Constraints	• Low/Medium – Liquefaction potential. • Medium – Active fault crossings. • Medium/High – Probable ground motion from earthquakes. • Crosses Garlock fault in tunnel; crosses San Andreas Fault at grade.	• Low/Medium – Liquefaction potential. • Medium – Active fault crossings. • Medium/High – Probable ground motion from earthquakes. • Crosses Garlock fault in tunnel; crosses San Andreas Fault at grade.	• Medium/High – Liquefaction potential. • Low - Active fault crossings. • Low – Probable ground motion from earthquakes. • Crosses Garlock Fault in tunnel. • Follows San Andreas Fault Zone for nearly 30 mi. (50 km).	• Medium/High – Liquefaction potential. • Low - Active fault crossings. • Low – Probable ground motion from earthquakes. • Crosses Garlock Fault in tunnel. • Follows San Andreas Fault Zone for nearly 30 mi. (50 km).
	3	**3**	**2**	**2**
Maximize Avoidance of Areas with Potential Hazardous Materials.				
Hazardous Materials/Waste Constraints	• There are approximately 3 CERCLIS, SPL, or SCL sites near this alignment. • This alignment is near a Super Fund site adjacent to a concrete plant in the Santa Clarita River near the City of Santa Clarita.	• There are approximately 3 CERCLIS, SPL, or SCL sites near this alignment.	• This alignment is near a Super Fund site adjacent to a concrete plant in the Santa Clarita River near the City of Santa Clarita. • There are approximately 4 CERCLIS, SPL, or SCL sites near this alignment. •	• There are approximately 4 CERCLIS, SPL, or SCL sites near this alignment.
	2	**4**	**2**	**4**

1 2 3 4 5

Least Favorable Most Favorable

Table 4.1-4
Bakersfield to Los Angeles- High-Speed Train Station Evaluation Matrix
Bakersfield-to-Sylmar Segment – Antelope Valley Station Options

Evaluation Criteria	Antelope Valley Station Option 1 Lancaster Metrolink Station	Antelope Valley Station Option 2 Palmdale Transp. Ctr.	Antelope Valley Station Option 3 Palmdale Blvd.
Maximize Ridership/Revenue Potential			
Travel Time	Not Applicable	Not Applicable	Not Applicable
Length	Not Applicable	Not Applicable	Not Applicable
Population/Employment Catchment	1990 10-mile radius: 169,892 persons; 74,531 employed Lancaster 1990-2000 population growth: 22%	1990 10-mile radius: 195,660 persons; 86,755 employed 1990 20-mile radius: 252,151 persons: 112,254 employed Palmdale 1990-2000 population growth: 69%	1990 10-mile radius: 195,660 persons; 86,755 employed 1990 20-mile radius: 252,151 persons: 112,254 employed Palmdale 1990-2000 population growth: 69%
	2	**3**	**3**
Maximize Connectivity and Accessibility			
Intermodal Connections	• Airport(Palmdale) – 6.4 mi. (10.2 km) • Freeways– SR-14: 2.3 mi. (3.7 km) • Local Bus route on Sierra Highway • Metrolink – existing station site	• Airport(Palmdale) – 2.3 mi. (3.7 km) • Freeways – SR-14: 1.2 mi. (1.9 km) • Local Bus – on Sierra Highway (Expected hub with Transportation Center Development) • Metrolink – on adjacent tracks	• Airport(Palmdale) – 2.6 mi. (4.2 km) • Freeways – 1 mi. (1.6 km) • Local Bus route on Sierra Highway • Metrolink – on adjacent tracks
	4	**4**	**3**
Minimize Operating and Capital Costs			
Length	• No implications.	• No implications.	• No implications.
	5	**5**	**5**

Evaluation Criteria	Antelope Valley Station Option 1 Lancaster Metrolink Station	Antelope Valley Station Option 2 Palmdale Transp. Ctr.	Antelope Valley Station Option 3 Palmdale Blvd.
Operational Issues	• Not suitable for Aqueduct alignments (Options 4 and 4A).	• No implications.	• No implications.
	4	**5**	**5**
Construction Issues	• No significant issues.	• No significant issues.	• No significant issues.
	5	**5**	**5**
Capital Cost	• Aerial, but no significant construction issues anticipated.	• At grade.	• At grade.
	4	**5**	**5**
Right-of-Way Issues/Cost	• Moderately developed area. • Railroad relocation • Requires modification to existing Metrolink facility	• Relatively undeveloped area. • Railroad relocation • Bikeway relocation	• Moderately urbanized area. • Railroad relocation • Park disturbance • Bikeway relocation
	5	**4**	**3**

Evaluation Criteria	Antelope Valley Station Option 1 Lancaster Metrolink Station	Antelope Valley Station Option 2 Palmdale Transp. Ctr.	Antelope Valley Station Option 3 Palmdale Blvd.
Maximize Compatibility with Existing and Planned Development			
Land Use Compatibility and Conflicts	• Sierra Highway and Lancaster Blvd. may need to be widened to accommodate traffic caused by the station. The capacity and size of the above roads are not mentioned in the Lancaster General Plan. • Commercial and light industry are the land uses adjacent to the track and station area that may be affected by the station location. • A Metrolink station is currently on the proposed station site. Bus access also exists.	• The station site is located along Sierra Highway, which is listed in the Palmdale General Plan as an existing or planned 8-lane Regional Arterial. Sierra Highway would have to be modified to accommodate the proposed station and the proposed HSR track as shown in the preliminary alignment diagrams. It is planned that Highway 138 (currently existing Palmdale Blvd.) be shifted north to Technology Drive (currently existing Avenue P-8). • Land use that is adjacent to the station location is zoned for industrial use. • Based on interviews with the City of Palmdale Planning Department, the City of Palmdale has developed plans for a transportation center adjacent to the planned high-speed train station site. This proposed transportation center would potentially provide intermodal connections such as connections to the potential Palmdale International Airport, bus, and Metrolink. • Antelope Valley Union High School District has plans for a continuation high school in the vicinity of the proposed station site. • There is existing residential development to the southwest of the proposed station location. There is an existing park approximately 0.4 miles away from the proposed station location. There is an existing elementary school approximately 0.75 miles from the proposed station location.	• Most of the arterial roads surrounding the proposed station are “Major Arterials” planned to be 6-lane roads. Palmdale Blvd. is a “Major Arterial” planned, according to the Palmdale General Plan, to be a 6-lane road. Sierra Highway is planned to be an 8-lane road. • The station would be on and adjacent to land use designated “Community Commercial” and “Commercial Manufacturing” and near “Public Facility” land use. The City of Palmdale City Hall and other government buildings are currently on the land designated “Public Facility”. • There is an existing elementary school approximately 0.5 miles away from the proposed station location. • There is the possibility of intermodal connections via the bus route along Highway 138 (Palmdale Blvd.). • The City of Palmdale has plans to relocate Highway 138 to Avenue P-8.
	4	**3**	**3**

Evaluation Criteria	Antelope Valley Station Option 1 Lancaster Metrolink Station	Antelope Valley Station Option 2 Palmdale Transp. Ctr.	Antelope Valley Station Option 3 Palmdale Blvd.
Visual Quality Impacts	Commercial first tier viewers along Sierra Hwy.	Residences west and south of station area. Station will be on vacant lot proposed for the Palmdale Transportation Center. Commercial uses across Sierra Highway.	Commercial area. Library and City Hall are across Sierra Highway. Bike trail adjacent to station site.
	5	**3**	**4**
Minimize Impacts to Natural Resources			
Water Resources	No impacts.	No Impacts.	No impacts.
	5	**5**	**5**
Floodplain Impacts	In a 500-year floodplain. Station would be elevated.	No impact.	In a 500-year floodplain.
	4	**5**	**3**
Threatened & Endangered Species Impacts	No impacts.	Potential for impact to several sensitive species.	Minimal impact to native habitat and sensitive species.
	5	**3**	**4**
Minimize Impacts to Social and Economic Resources			
Environmental Justice Impacts (Demographics)	1990 Minority population: 622 1990 In-poverty households: 194	1990 Minority population: 19 1990 In-poverty households: 5	1990 Minority population: 722 1990 In-poverty households: 216
	4	**5**	**5**
Farmland Impacts	The station is located in an urbanized area with no developable farmland.	The station is located in an urbanizing area with no developable farmland.	The station is located in an urbanized area with no developable farmland.
	5	**5**	**5**

Evaluation Criteria	Antelope Valley Station Option 1 Lancaster Metrolink Station	Antelope Valley Station Option 2 Palmdale Transp. Ctr.	Antelope Valley Station Option 3 Palmdale Blvd.
Minimize Impacts to Cultural Resources			
Cultural Resources Impacts	• Station is located one block from recorded historical site (Cedar Complex); may have some impact on visual quality. • Moderate potential for cultural resources due to location in city center.	• No resources recorded on the GIS. • Low to unknown potential for cultural resources.	• No resources recorded on the GIS. • Low to moderate potential for cultural resources due to location in city center.
	4	**5**	**4**
Parks & Recreation/Wildlife Refuge Impacts	No park resources located in the area.	Small park/bikeway by the Palmdale City Hall. Bikeway extends north to station site.	Small park/bikeway by the Palmdale City Hall.
	5	**4**	**4**
Maximize Avoidance of Areas with Geologic and Soils Constraint			
Soils/Slope Constraints	• Intermediate hardness units considered unlikely to marginal relative to compressibility. • Medium risk of subsidence potential. • Generally older, harder formations and rock not likely to be compressible.	• Intermediate hardness units considered unlikely to marginal relative to compressibility. • Medium risk of subsidence potential. • Generally older, harder formations and rock not likely to be compressible.	• Intermediate hardness units considered unlikely to marginal relative to compressibility. • Medium risk of subsidence potential. • Generally older, harder formations and rock not likely to be compressible.
	4	**4**	**4**
Seismic Constraints	• Medium risk of probable ground motion from earthquakes. • Medium to high liquefaction potential. • No active fault crossings.	• High probable ground motion from earthquakes. • Low potential for liquefaction. • No active fault crossings.	• High probable ground motion from earthquakes. • Low potential for liquefaction. • No active fault crossings.
	4	**3**	**3**

Evaluation Criteria	Antelope Valley Station Option 1 Lancaster Metrolink Station	Antelope Valley Station Option 2 Palmdale Transp. Ctr.	Antelope Valley Station Option 3 Palmdale Blvd.
Maximize Avoidance of Areas with Potential Hazardous Materials.			
Hazardous Materials/Waste Constraints	• There are no CERCLIS, SPL, or SCL sites near the station location.	• There are no CERCLIS, SPL, or SCL sites near the station location.	• There are no CERCLIS, SPL, or SCL sites near the station location.
	5	**5**	**5**

1 2 3 4 5
Least Favorable Most Favorable

Table 4.1-4 (Con't.)
Bakersfield to Los Angeles- High-Speed Train Station Evaluation Matrix
Bakersfield-to-Sylmar Segment – Santa Clarita Station Options

Evaluation Criteria	Santa Clarita Station Option 1 SR-126/I-5	Santa Clarita Station Option 2 Magic Mt. Pkwy./ I-5	Santa Clarita Station Option 3 The Old Road/ I-5	Santa Clarita Station Option 4 Via Princessa/ SR-14	Santa Clarita Station Option 5 San Fernando Rd./ SR-14
Maximize Ridership/Revenue Potential.					
Travel Time	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Length	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Population/Employment Catchment	1990 10-mile radius: 158,516 persons: 82,907 employed Santa Clarita 1990-2000 population growth: 37%	1990 10-mile radius: 158,516 persons: 82,907 employed Santa Clarita 1990-2000 population growth: 37%	1990 10-mile radius: 158,516 persons: 82,907 employed Santa Clarita 1990-2000 population growth: 37%	1990 10-mile radius: 353,096 persons: 173,893 employed Santa Clarita 1990-2000 population growth: 37%	1990 10-mile radius: 353,096 persons: 173,893 employed Santa Clarita 1990-2000 population growth: 37%
	2	**2**	**2**	**3**	**3**
Maximize Connectivity and Accessibility.					
Intermodal Connections	• Airport (Burbank) – 21 mi. (35 km) • Freeways– I-5: adjacent • MTA Bus/Park and Ride – 2.5 mi. (4.2 km)	• Airport (Burbank) – 21 mi. (35 km) • Freeways – I-5: adjacent • MTA Bus/Park and Ride – 1.6 mi. (2.7 km)	• Airport (Burbank) – 18 mi. (30 km) • Freeways – I-5: 2 mi. (3.3 km) • No existing local street access	• Airport (Burbank) – 21 mi. (35 km) • Freeways – SR-14: adjacent • MTA Bus at Park and Ride at Metrolink Station – 1 mi. (1.6 km) • Metrolink - 1 mi. (1.6 km) at existing station.	• Airport (Burbank) – 21 mi. (35 km) • Freeways – SR-14: 1.5 mi. (2.5 km) • MTA Bus at Park and Ride on San Fernando Rd. • No existing local street access
	2	**2**	**1**	**3**	**3**

Evaluation Criteria	Santa Clarita Station Option 1 SR-126/I-5	Santa Clarita Station Option 2 Magic Mt. Pkwy./ I-5	Santa Clarita Station Option 3 The Old Road/ I-5	Santa Clarita Station Option 4 Via Princessa/ SR-14	Santa Clarita Station Option 5 San Fernando Rd./ SR-14
Minimize Operating and Capital Costs.					
Length	• No implications.	• No implications.	• Requires localized modification to alignment.	• No implications.	• Requires localized modifications to alignment.
	5	**5**	**3**	**5**	**3**
Operational Issues	• Mountainous terrain.	• Mountainous terrain.	• Switching movements to south confined by tunnel. • Mountainous terrain.	• Switching movements to south confined by tunnel.	• Switching lengths severely limited by curvature and tunnels at either end.
	2	**2**	**1**	**3**	**1**
Construction Issues	• Deep cut/fill. • Drainage considerations. • Highway access.	• Significant earthwork. • Highway access.	• Partially in tunnel. • Requires construction of new access roads.	• Partially in tunnel. • Significant earthwork. • Difficult access.	• Difficult access. • Requires construction of new connection to San Fernando Rd. • Significant earthwork.
	3	**4**	**2**	**2**	**1**
Capital Cost	• Earthwork / retaining walls.	• Earthwork.	• Widened tunnel.	• Widened tunnel. • Access roads	• Earthwork. • Access roads. • Alignment modifications
	3	**4**	**2**	**2**	**1**
Right-of-Way Issues/Cost	• Agricultural lands. • Spans Santa Clara River floodplain.	• Constrained by adjacent development. • Oil field.	• Alignment required causes probable tunneling under existing developed area to north. • Identified as a Significant Ecological Area.	• Area of high growth – planned residential and commercial developments.	• Angeles National Forest lands. • Requires significant additional right-of-way for access. • Identified as a Significant Ecological Area.
	3	**2**	**1**	**3**	**2**

Evaluation Criteria	Santa Clarita Station Option 1 SR-126 / I-5	Santa Clarita Station Option 2 Magic Mt. Pkwy. / I-5	Santa Clarita Station Option 3 The Old Road / I-5	Santa Clarita Station Option 4 Via Princessa / SR-14	Santa Clarita Station Option 5 San Fernando Rd. / SR-14
Maximize Compatibility with Existing and Planned Development.					
Land Use Compatibility and Conflicts	• The proposed station location is at the intersection of SR 126 and Stanford Avenue. SR 126 is planned to be extended from this point to Sierra Highway. • The proposed station site is designated for Business Park land use and is near Residential Estate land use and a Mineral/Oil Conservation Area Open Space. • The City of Santa Clarita proposed extending the Union Pacific Railroad, adjacent to Highway 126, from Ventura County to the Existing Metrolink/UPRR adjacent to San Fernando Road.	• The proposed station location is located off of Magic Mountain Parkway. This road is planned to be a 6-lane Major Highway. • The land use surrounding the station location is Visitor Serving/Resort, Community Commercial, and Business Park. • The City of Santa Clarita proposed extending the Union Pacific Railroad, adjacent to Highway 126, from Ventura County to the Existing Metrolink/UPRR adjacent to San Fernando Road. • The proposed station location may conflict with existing County of Los Angeles plans for Stevenson Ranch.	• Currently the road leading to the proposed station site is an unpaved road called East Canyon Highway. This road and Old Road may have to be modified to accommodate traffic to the station. • The station is within land use designated Open Space and within the Santa Susana Mountains Significant Ecological Area. Towsley Canyon is proposed for County designation as a Significant Ecological Area. • There is no proposed or existing intermodal connection area near the proposed station location.	• The existing Via Princessa Road is a Major Highway planned to be a minimum of 6 lanes and to extend from Lost Canyon Road to San Fernando Road. Via Princessa would have to be extended to this point to accommodate the proposed station location. • The station is proposed to be on land designated for Residential Moderate and Community Commercial land use. The station bisects and covers several planned roads. The station would be close to a planned school. • There is no proposed or existing intermodal connection area near the proposed station location. • There is a residential development proposal to the County of Los Angeles for this station site.	• Currently San Fernando Rd. terminates at the Park & Ride adjacent to Whitney Canyon unpaved road. San Fernando Road may have to be extended to accommodate the proposed station location. • The proposed station site is designated Residential Estate land use in the Santa Clarita General Plan and an unincorporated area designated a Mineral/Oil Conservation Area. • There is no proposed or existing intermodal connection area near the proposed station location. • The area surrounding the proposed station location is being considered as a Significant Ecological Area by the County of Los Angeles.
	4	**5**	**2**	**3**	**2**

Evaluation Criteria	Santa Clarita Station Option 1 SR-126/I-5	Santa Clarita Station Option 2 Magic Mt. Pkwy./ I-5	Santa Clarita Station Option 3 The Old Road/ I-5	Santa Clarita Station Option 4 Via Princessa/ SR-14	Santa Clarita Station Option 5 San Fernando Rd./ SR-14
Visual Quality Impacts	• Station site is in undeveloped area adjacent to oil field; 0.5 mi. from commercial area and 1.5 mi. from residential area. Terrain is not rugged and will not require extensive earthwork. • North approach for station site has a bridge at Castaic w/in 200 ft. of residences for 2 mi.	• Station site is 900 ft. east of Magic Mountain; 1250 feet west of commercial area; and 0.5 mi. from closest commercial development to the east across I-5. No residential viewers.	• Station site is in vacant, rugged area. There will be extensive visible earthwork. Will be visible to residences 0.5 mi. away across I-5. May also be visible to other residences at greater distances in Santa Clarita. • North and south approaches cross the same type of vacant, rugged land, including Towsley Canyon that is being considered for Significant Ecological Area status. At grade thru this area for 3.5 mi.	• Station site is in undeveloped area 600 ft. from residences on the opposite side of SR-14, at approximately same elevation as the station. Terrain is not too rugged. • Earthwork will not be as extensive as San Fernando Road/SR-14 Option.	• Station site is in completely undeveloped area proposed for a Significant Ecological Area. Terrain is rugged requiring extensive earthwork. Nearest road stub is 1 mile distant. • Earthwork for new access roads will be required. Station may be visible from some distance to residences to the NW in Santa Clarita. Closest residences are 1.25 mi. to the NW.
	2	**5**	**1**	**3**	**1**
Minimize Impacts to Natural Resources.					
Water Resources	No impacts.	Potential minor impacts on relatively minor drainages, avoidance likely feasible.	Potential minor impacts on relatively minor drainages, avoidance likely feasible.	No impacts.	Potential minor impacts on relatively minor drainages, avoidance may or may not be feasible.
	5	**4**	**4**	**5**	**3**
Floodplain Impacts	Site may be affected by floodplain.	No impact.	Impact from small drainages can be avoided.	No impacts.	No impacts.
	3	**5**	**4**	**5**	**5**

Evaluation Criteria	Santa Clarita Station Option 1 SR-126/I-5	Santa Clarita Station Option 2 Magic Mt. Pkwy./ I-5	Santa Clarita Station Option 3 The Old Road/ I-5	Santa Clarita Station Option 4 Via Princessa/ SR-14	Santa Clarita Station Option 5 San Fernando Rd./ SR-14
Threatened & Endangered Species Impacts	• Surrounding area is already developed. • California condor sanctuary near station site. • Potential to impact several sensitive species.	• Surrounding area is already developed. • California condor sanctuary is near station site. • Potential to impact several sensitive species.	• Less developed lands surrounding station site. • Potential to impact several sensitive species.	• Station site approaches would traverse through a designated sensitive ecological area. • Potential to impact several sensitive species.	• Would traverse through a designated sensitive ecological area. • Potential to impact several sensitive species.
	4	**5**	**3**	**2**	**1**
Minimize Impacts to Social and Economic Resources.					
Environmental Justice Impacts (Demographics)	1990 Minority population: 152 1990 In-poverty households: 1	1990 Minority population: 4 1990 In-poverty households: 0	1990 Minority population: 4 1990 In-poverty households: 0	1990 Minority population: 58 1990 In-poverty households: 13	1990 Minority population: 2 1990 In-poverty households: 0
	4	**5**	**5**	**5**	**5**
Farmland Impacts	Located in an area with soil that could be farmed.	The station is located in an urbanized area with soils not suitable for farmland.	The station is located in a mountainous area with soils not suitable for farmland.	The station is located in an urbanized area with soils not suitable for farmland.	The station is located in a mountainous area with soils not suitable for farmland.
	3	**5**	**5**	**5**	**5**
Minimize Impacts to Cultural Resources.					
Cultural Resources Impacts	• No resources recorded on the GIS. • Moderate potential for cultural resources due to location near Santa Clara River.	• No resources recorded on the GIS. • Moderate potential for cultural resources due to location near Santa Clara River.	• No resources recorded on the GIS. • Low potential for undiscovered sites, due to location in steep canyon.	• No resources recorded on the GIS. • Moderate potential for cultural resources due to location near Santa Clara River.	• No resources recorded on the GIS. • Low to Moderate potential for cultural resources due to location near several small creek channels.
	3	**3**	**5**	**3**	**4**

Evaluation Criteria	Santa Clarita Station Option 1 SR-126/I-5	Santa Clarita Station Option 2 Magic Mt. Pkwy./ I-5	Santa Clarita Station Option 3 The Old Road/ I-5	Santa Clarita Station Option 4 Via Princessa/ SR-14	Santa Clarita Station Option 5 San Fernando Rd./ SR-14
Parks & Recreation/Wildlife Refuge Impacts	• No park resources located in the area.	• No park resources located in the area.	• No park resources located in the area. • North approach crosses Towsley Canyon which is being considered for Significant Ecological Area status by the County.	• No park resources located in the area.	• No park resources located in the area. • The station and approached cross Elsmere and Whitney Canyons which are being considered for Significant Ecological Area status.
	5	**5**	**1**	**5**	**1**
Maximize Avoidance of Areas with Geologic and Soils Constraints.					
Soils/Slope Constraints	• Intermediate hardness units considered unlikely to marginal relative to compressibility. • Medium Subsidence Potential. • Probably stable formations consisting of hard rock or granular continental deposits.	• Intermediate hardness units considered unlikely to marginal relative to compressibility. • Medium Subsidence Potential. • Probably stable formations consisting of hard rock or granular continental deposits.	• Intermediate hardness units considered unlikely to marginal relative to compressibility. • Medium Subsidence Potential. • Probably stable formations consisting of hard rock or granular continental deposits.	• Intermediate hardness units considered unlikely to marginal relative to compressibility. • Medium Subsidence Potential. • Formations with marginal stability including largely continental deposits and older (Paleozoic) marine sediments.	• Intermediate hardness units considered unlikely to marginal relative to compressibility. • Medium Subsidence Potential. • Probably stable formations consisting of hard rock or granular continental deposits.
	4	**4**	**4**	**3**	**4**
Seismic Constraints	• High probable ground motion from earthquakes. • No active fault crossings. • Low potential for liquefaction.	• High probable ground motion from earthquakes. • No active fault crossings. • Low potential for liquefaction.	• High probable ground motion from earthquakes. • No active fault crossings. • Low potential for liquefaction.	• Medium to high probable ground motion from earthquakes. • Medium to high liquefaction potential. • No active fault crossings.	• High probable ground motion from earthquakes. • No active fault crossings. • Low potential for liquefaction.
	4	**4**	**4**	**4**	**4**

Evaluation Criteria	Santa Clarita Station Option 1 SR-126/I-5	Santa Clarita Station Option 2 Magic Mt. Pkwy./ I-5	Santa Clarita Station Option 3 The Old Road/ I-5	Santa Clarita Station Option 4 Via Princessa/ SR-14	Santa Clarita Station Option 5 San Fernando Rd./ SR-14
Maximize Avoidance of Areas with Potential Hazardous Materials.					
Hazardous Materials/Waste Constraints	• There are no CERCLIS, SPL, or SCL sites near the station location. • There is an oil field adjacent to the station site.	• There are 2 CERCLIS, SPL, or SCL sites near the station location. • There is an oil field around Magic Mountain Theme Park which is adjacent to the station site.	• There are no CERCLIS, SPL, or SCL sites near the station location. • There may be a natural gas or petroleum pipeline along Old Road close to the proposed station location.	• There are no CERCLIS, SPL, or SCL sites near the station location.	• There is 1 CERCLIS, SPL, or SCL sites near the station location. • There is an oil field adjacent to San Fernando Road.
	4	**4**	**4**	**5**	**4**

1 2 3 4 5
Least Favorable Most Favorable

Table 4.1-5
Bakersfield to Los Angeles- High-Speed Train Alignment Evaluation Matrix
Sylmar-to-Los Angeles Union Station Segment

Evaluation Criteria	Alignment Option 1 Metrolink/UPRR	Alignment Option 2 I-5 Fwy.	Alignment Option 3 Combined I-5/UPRR
Maximize Ridership/Revenue Potential			
Travel Time	23.6 to 31.6 min. depending upon LAUS location **2**	10.6 to 11.3 min. depending upon LAUS location **5**	11.5 to 12.9 min. depending upon LAUS location **4**
Length	22.8 to 24.7 miles (36.7 to 39.8 km) depending upon LAUS location **3**	23.8 to 24.7 miles (38.3 to 39.8 km) depending upon LAUS location **3**	23.8 to 24.7 miles (38.3 to 39.8 km) depending upon LAUS location **3**
Population/Employment Catchment	Not Applicable	Not Applicable	Not Applicable
Maximize Connectivity and Accessibility.			
Intermodal Connections	Not Applicable	Not Applicable	Not Applicable
Minimize Operating and Capital Costs.			
Length	22.8 to 24.7 miles (36.7 to 39.8 km) depending upon LAUS location **3**	23.8 to 24.7 miles (38.3 to 39.8 km) depending upon LAUS location **3**	23.8 to 24.7 miles (38.3 to 39.8 km) depending upon LAUS location **3**
Operational Issues	• Speed limited to no more than 45 mph (75 kph) between LAUS and downtown Burbank. **1**	• Achieves 220 mph (350 kph) operating speed throughout. • More limited station location options throughout alignment. **3**	• Achieves 220 mph (350 kph) operating speed throughout. • More limited LAUS location options. **4**

Evaluation Criteria	Alignment Option 1 Metrolink/UPRR	Alignment Option 2 I-5 Fwy.	Alignment Option 3 Combined I-5/UPRR
Construction Issues	• Generally at-grade construction between LA and Burbank. • Trench and significant grade separations north of Burbank. • Generally excavatable with deeper cuts in some areas requiring heavy ripping or blasting.	• Significant aerial structures along constrained freeway corridor. • Tunnel through Elysian Park – 1.9 mi. (3.0 km) total tunnel length. • Generally excavatable with deeper cuts in some areas requiring heavy ripping or blasting.	• Tunnel through Elysian Park – 1.9 mi. (3.0 km) total tunnel length. • Trench and significant grade separations north of Burbank. • Generally excavatable with deeper cuts in some areas requiring heavy ripping or blasting.
	5	**1**	**3**
Capital Cost	$1.6 Billion VHS $1.8 Billion Maglev (varies by LAUS location)	$2.4 Billion VHS $2.5 Billion Maglev (varies by LAUS location)	$2.0 Billion VHS $2.2 Billion Maglev (varies by LAUS location)
	5	**1**	**3**
Right-of-Way Issues/Cost	• Shares Metrolink R/W – railroad relocation required within existing corridor. • Accommodation of adjacent street network through trenching / grade separation • Tunnel under Pacoima Wash	• Constrained freeway right of way requires substantial new right-of-way. • Tunnel under Elysian Park	• Shares Metrolink R/W north of Burbank – railroad relocation required within existing corridor. • Accommodation of adjacent street network through trenching / grade separation • Tunnel under Elysian Park
	3	**1**	**3**
Maximize Compatibility with Existing and Planned Development.			
Land Use Compatibility and Conflicts	• May create indirect impacts on a mix of industrial/commercial/residential land uses adjacent to the alignment. • Some industrial/commercial land uses use UPRR right-of-way for parking and storage areas.	• Bypasses Burbank Airport and both Sylmar station sites. • A large portion of the alignment is elevated which will conflict with adjacent residential/ commercial/industrial land uses. • Alignment passes by numerous schools and parks. • Significant new right-of-way acquisition is required due to tight freeway curvature. • Traverses neighborhood north of Elysian Park.	• May create indirect impacts on adjacent residential/commercial/ industrial land uses. • Some industrial/commercial land uses use UPRR right-of-way for parking and storage areas. • Traverses neighborhood north of Elysian Park.
	4	**2**	**4**

Evaluation Criteria	Alignment Option 1 Metrolink/UPRR	Alignment Option 2 I-5 Fwy.	Alignment Option 3 Combined I-5/UPRR
Visual Quality Impacts	<u>On bridge:</u> • Immediately east of L.A. River from Elysian Park. Minimal impact. • East of res. area, then east of L.A. River then east of rail yard. Residences along a length of 0.5 mi. in L.A. may have some views of bridge at a distance of 1,000 to 1,500 ft. • W/in less than 100 ft. of Cypress Park (Cypress Park), across street from San Fernando Ave. <u>At grade:</u> W/in 400 ft. of corner of Pelanconi Park (Glendale). <u>Trench:</u> • Adjacent to elementary school at Strathern and San Fernando Rd. (Sun Valley). <u>At grade:</u> • W/in 400 ft. of corner of Pelanconi Park (Glendale). • W/in 100 ft. of Recreation Park (San Fernando) • Immediately adjacent to senior high school (San Fernando).	<u>On Bridge:</u> • W/in 200 ft. of Cathedral High School Campus. • Extends 0.2 miles thru Elysian Park extension of Dodger Stadium, then tunnel portal. • North of Hwy 2 thru residential area for 1.25 mi. • East side of L.A. River through res. area for 0.55 mi. • Through Los Feliz Municipal Golf Course (L.A.). • Through North Atwater Park (L.A.). • Through Griffith Park just north of Harding Municipal Golf Course. • W/in 300 ft. of Autry Museum of Western Heritage (Griffith Park). • W/in 300 to 400 ft. of L.A. Zoo (Griffith Park). • Through soccer fields in Griffith Park. • Adjacent to west edge of Griffith Manor Park (Glendale). • Adjacent to east edge of res. area for 0.25 mi. (Glendale). • W/in 200 to 400 ft. of east edge of Woodbury University Campus (L.A.). • Adjacent to res. area for 1 mi. (LA). • W/in 400 ft. of elementary school . • W/in 500 ft. of elementary school (Sun Valley). (Unsure if 1st tier). • W/in 200 to 400 ft. of corner of Fernangeles Park (LA). • W/in 500 ft. of junior high school on Terra Bella in L.A. (Pacoima). May be 1st tier. • Though park south of Hwy. 118 and west of I-5. • Through high school campus at Rinaldi and Workman. • Immediately adjacent to sw edge of Carey Ranch Park in San Fernando.	Same as Option 2 from Union Station to intersection with Option 1 including: <u>On Bridge:</u> • W/in 200 ft. of Cathedral High School Campus. • Extends 0.2 mi. through Elysian Park extension of Dodger Stadium, then tunnel portal. • North of Hwy 2 through residential area for 1.25 mi. • East side of L.A. River through res. area for 0.55 mi. • Through Los Feliz Municipal Golf Course (L.A.). • Through North Atwater Park (L.A.). • Through Griffith Park just north of Harding Municipal Golf Course. • W/in 300 ft of Autry Museum of Western Heritage (Griffith Park). • W/in 300 to 400 ft. of L.A. Zoo (Griffith Park). • Through soccer fields in Griffith Park. • Adjacent to west edge of Griffith Manor Park (Glendale). • Adjacent to east edge of res. area for 0.25 mi. (Glendale). <u>Trench:</u> • Adjacent to elementary school at Strathern and San Fernando Rd. (Sun Valley). <u>At grade:</u> • W/in 100 ft. of Recreation Park (San Fernando). • Immediately adjacent to senior high school (San Fernando).
	4	**2**	**3**

Evaluation Criteria	Alignment Option 1 Metrolink/UPRR	Alignment Option 2 I-5 Fwy.	Alignment Option 3 Combined I-5/UPRR
Minimize Impacts to Natural Resources.			
Water Resources	No impacts. **5**	Minimal impacts - crossing 2 minor drainages in urban setting. **4**	Minimal impacts - crossing 2 minor drainages in urban setting. **4**
Floodplain Impacts	Crosses LA River. **4**	Crosses LA River. **4**	Crosses LA River. **4**
Threatened & Endangered Species Impacts	No impacts. **5**	No impacts. **5**	No impacts. **5**
Minimize Impacts to Social and Economic Resources.			
Environmental Justice Impacts (Demographics)	1990 Minority population: 53,097 1990 In-poverty households: 8,213 **1**	1990 Minority population: 34,898 1990 In-poverty households: 4,628 **1**	1990 Minority population: 37,732 1990 In-poverty households: 5,563 **2**
Farmland Impacts	• The alignment is located in an urban area with no developable farmland. **5**	• The alignment is located in an urban area with no developable farmland. **5**	• The alignment is located in an urban area with no developable farmland. **5**
Minimize Impacts to Cultural Resources.			
Cultural Resources Impacts	• Few recorded resources on GIS. • Overall probable impact is high; predominance of at-grade and sub-grade construction has high potential to expose buried cultural resources. **1**	• Few recorded resources on GIS. • Overall probable impact is moderate; predominance of structure/bridge and tunnel construction has moderate potential to expose buried cultural resources. **4**	• Few recorded resources on GIS. • Overall probable impact is moderate to high; combination of at-grade, structure/bridge, and tunnel construction has moderate potential to expose buried cultural resources. **3**

Evaluation Criteria	Alignment Option 1 Metrolink/UPRR	Alignment Option 2 I-5 Fwy.	Alignment Option 3 Combined I-5/UPRR
Parks & Recreation/Wildlife Refuge Impacts	• Low potential impact, to visual quality only. • Passes at-grade Recreation Park (San Fernando, on bridge/structure Cypress Park, Elysian Park and El Pueblo de Los Angeles State Historic Monument.	• Moderate potential impact, structures and tunnel cut in Elysian Park; visual quality only elsewhere. • Passes on structure/bridge Carey Ranch Park, Richie Valens Park, Fernangeles Park, Griffith Park, and El Pueblo de Los Angeles State Historic Monument. • Crosses Elysian Park in tunnel and structure.	• Low potential impact, to visual quality only. • Passes at-grade Recreation Park (San Fernando, and Sun Valley Park and Recreation Center • Passes on bridge/structure Griffith Park, and El Pueblo de Los Angeles State Historic Monument. • Crosses Elysian Park in tunnel and structure.
	5	**1**	**3**
Maximize Avoidance of Areas with Geologic and Soils Constraints.			
Soils/Slope Constraints	• Intermediate hardness units considered unlikely to marginal relative to compressibility. • Probably stable formations consisting of hard rock or granular continental deposits. • Low subsidence potential.	• Intermediate hardness units considered unlikely to marginal relative to compressibility. • Probably stable formations consisting of hard rock or granular continental deposits. • Low subsidence potential.	• Intermediate hardness units considered unlikely to marginal relative to compressibility. • Probably stable formations consisting of hard rock or granular continental deposits. • Low subsidence potential.
	4	**4**	**4**
Seismic Constraints	• Active fault crossings. • Medium probable ground motion from earthquakes. • Medium to high liquefaction potential.	• Active fault crossings. • Medium probable ground motion from earthquakes. • Medium to high liquefaction potential.	• Active fault crossings. • Medium probable ground motion from earthquakes. • Medium to high liquefaction potential.
	3	**3**	**3**
Maximize Avoidance of Areas with Potential Hazardous Materials.			
Hazardous Materials/Waste Constraints	• There are approximately 90 or more CERCLIS, SPL, or SCL sites.	• There are approximately 50 CERCLIS, SPL, or SCL sites.	• There are approximately 60 CERCLIS, SPL, or SCL sites.
	2	**3**	**2**

1 2 3 4 5
Least Favorable Most Favorable

Table 4.1-6
Bakersfield to Los Angeles- High-Speed Train Station Evaluation Matrix
Sylmar-to-Los Angeles Union Station Segment – Sylmar and Burbank Station Options

Evaluation Criteria	Sylmar Station Option 1 Roxford Street	Sylmar Station Option 2 Sylmar Metrolink Sta.	Burbank Station Option 1 Burbank Airport	Burbank Station Option 2 Burbank Metrolink/Media City
Maximize Ridership/Revenue Potential.				
Travel Time	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Length	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Population/Employment Catchment	1990 10-mile radius: 1,099,885 persons: 568,596 employed 1990 20-mile radius: 3,291,879 persons: 1,694,248 employed	1990 10-mile radius: 1,099,885 persons: 568,596 employed 1990 20-mile radius: 3,291,879 persons: 1,694,248 employed	1990 10-mile radius: 2,083,202 persons: 1,032,012 employed	1990 10-mile radius: 2,083,202 persons: 1,032,012 employed
	5	**5**	**5**	**5**
Maximize Connectivity and Accessibility.				
Intermodal Connections	• Airport (Burbank) – 8.9 mi. (14.2 km) • Freeways– I-5: 0.6 mi. (1.0 km); I-210: 1.2 mi. (1.9 km); SR-14: 2.6 mi. (4.2 km); I-405: 2.1 mi. (3.4 km); SR-118: 3.3 mi. (5.3 km); SR-170: 6.9 mi. (11.0 km). • MTA Bus on San Fernando Rd. • Metrolink - on adjacent tracks	• Airport (Burbank) – 7.4 mi. (11.8 km) • Freeways – I-5: 1.1 mi. (1.8 km); I-210: 2.2 mi. (3.5 km); SR-14: 4.2 mi. (6.7 km); I-405: 2.1 mi. (3.4 km); SR-118: 1.7 mi. (2.7 km); SR-170: 5.2 mi. (8.3 km) • MTA Bus on San Fernando Rd. • Metrolink – existing station site	• Airport (Burbank) – 1.6 mi. (2.6 km) • Freeways– I-5: 0.5 mi. (0.8 km); SR-170: 2.8 mi. (4.5 km); SR-134: 4.4 mi. (7.0 km) • Amtrak – 1.8 mi. (2.9 km) • MTA Bus on San Fernando Rdl • Metrolink – on adjacent tracks	• Airport (Burbank) – 2.4 mi. (3.8 km) • Freeways– I-5: adjacent; SR-170: 4.7 mi. (7.5 km); SR-134: 2 mi. (3.2 km) • Amtrak – 2.5 mi. (4 km) • MTA Bus terminal • Metrolink – existing station site
	3	**5**	**4**	**4**

Evaluation Criteria	Sylmar Station Option 1 Roxford Street	Sylmar Station Option 2 Sylmar Metrolink Sta.	Burbank Station Option 1 Burbank Airport	Burbank Station Option 2 Burbank Metrolink/Media City
Minimize Operating and Capital Costs.				
Length	• No implications.	• No implications.	• No implications.	• No implications.
	3	**3**	**3**	**3**
Operational Issues	• 1.5% grade immediately north of station.	• Not suitable for Alignment Option 2.	• Not suitable for Alignment Option 2.	• No implications.
	3	**4**	**4**	**5**
Construction Issues	• Earthwork. • Highway access.	• At grade. • Highway and rail access.	• Below-grade platform. • Highway and rail access. • Urbanized area.	• Aerial platform in constrained area. • Tightly constrained by I-5 and existing rail facilities. • Highway and rail access.
	4	**5**	**3**	**2**
Capital Cost	• Significant earthwork and/or retaining walls.	• Modification of Metrolink facility and parking area	• At-grade facilities in constrained area.	• Modification of Metrolink facility. • Significant aerial facilities and connections.
	3	**4**	**2**	**1**
Right-of-Way Issues/Cost	• Less developed area.	• Railroad relocation required. • Potential to share/expand Metrolink parking.	• Constrained area between airport, San Fernando Road, rail corridor. • Nearby residential development • Implications of Burbank airport flight path restrictions • Railroad relocation	• Highly constrained area between rail corridor and I-5. • Railroad relocation
	3	**4**	**3**	**1**
Maximize Compatibility with Existing and Planned Development.				
Land Use Compatibility and Conflicts	• Roxford Road and San Fernando Road are both Major Highway Class II and planned to be at least 4 lanes wide. These roads may have to be expanded to accommodate the	• The proposed station location is adjacent to San Fernando Road at the corner of 1st Street and Hubbard. These roads may have to be expanded to accommodate traffic to the	• The proposed station location is located along San Fernando Road south of Strathern Street. San Fernando road is a Major Highway Class II planned to be at least 4 lanes wide. San	• The proposed station location is off of Magnolia Blvd. and N. Front St. Magnolia Blvd is designated an Approach way planned to be 4 to 6 lanes wide. Both Magnolia and Front may

Evaluation Criteria	Sylmar Station Option 1 Roxford Street	Sylmar Station Option 2 Sylmar Metrolink Sta.	Burbank Station Option 1 Burbank Airport	Burbank Station Option 2 Burbank Metrolink/Media City
	proposed station location. • The proposed station site is within an area designated for Limited Manufacturing Industrial, Light Manufacturing Industrial, and Commercial Manufacturing Industrial land use. • The station location is close to Low Density Residential and Neighborhood Commercial land uses. • There is no proposed or existing intermodal connection area near the proposed station location.	station site. • The surrounding land uses are Light Manufacturing Industrial, Community Commercial and Multi-family Residential. • There is an elementary school approximately 0.25 miles from the station location. • The station is within an area described to be a Transit Oriented District. There is a high potential for multimodal connections.	Fernando Road and some roads surrounding the site may have to be widened to accommodate the proposed station location. • The proposed station is located within an area designated for Limited Industrial and Light Industrial land use. • Low Density Residential land use is nearby. • Intermodal connections would be possible through existing and proposed Burbank Airport Facilities.	have to be expanded to accommodate the station location. • The station would be located within an area designated for General Manufacturing land use. • The existing Metrolink station and bus facilities provide intermodal connections.
	3	**4**	**4**	**4**
Visual Quality Impacts	• Commercial area. No sensitive first tier viewers.	• Existing Metrolink station. Commercial area. No sensitive first tier viewers.	• Industrial/commercial area. No sensitive first tier viewers.	• Existing Metrolink station Industrial area. No sensitive first tier viewers.
	5	**5**	**5**	**5**
Minimize Impacts to Natural Resources.				
Water Resources	Potential minor impacts on relatively minor drainages, avoidance likely feasible.	No impacts.	No Impacts.	No impacts.
	4	**5**	**5**	**5**
Floodplain Impacts	No impacts.	No impacts.	No impacts.	Not in floodplain. Adjacent to flood control channel.
	5	**5**	**5**	**4**

Evaluation Criteria	Sylmar Station Option 1 Roxford Street	Sylmar Station Option 2 Sylmar Metrolink Sta.	Burbank Station Option 1 Burbank Airport	Burbank Station Option 2 Burbank Metrolink/Media City
Threatened & Endangered Species Impacts	No impacts. **5**	No impacts. **5**	No impacts. **5**	No impacts. **5**
Minimize Impacts to Social and Economic Resources.				
Environmental Justice Impacts (Demographics)	1990 Minority population: 1367 1990 In-poverty households:157 **3**	1990 Minority population: 4138 1990 In-poverty households: 501 **1**	1990 Minority population: 3172 1990 In-poverty households: 441 **2**	1990 Minority population: 1845 1990 In-poverty households: 408 **3**
Farmland Impacts	No impacts. **5**	No impacts. **5**	No impacts. **5**	No impacts **5**
Minimize Impacts to Cultural Resources.				
Cultural Resources Impacts	• No resources recorded on the GIS. • Unknown, probably low potential for undiscovered sites, due to location in urban area. **5**	• No resources recorded on the GIS. • Unknown, probably low potential for undiscovered sites, due to location in urban area. **5**	• No resources recorded on the GIS. • Unknown, probably low potential for undiscovered sites, due to location in urban area. **5**	• No resources recorded on the GIS. • Unknown, probably low potential for undiscovered sites, due to location in urban area. **5**
Parks & Recreation/Wildlife Refuge Impacts	No park resources located in the area. **5**	No park resources located in the area. **5**	No park resources located in the area. **5**	No park resources located in the area. **5**

Evaluation Criteria	Sylmar Station Option 1 Roxford Street	Sylmar Station Option 2 Sylmar Metrolink Sta.	Burbank Station Option 1 Burbank Airport	Burbank Station Option 2 Burbank Metrolink/Media City
Maximize Avoidance of Areas with Geologic and Soils Constraints.				
Soils/Slope Constraints	• Intermediate hardness units considered unlikely to marginal relative to compressibility. • Medium subsidence potential. • Probably stable formations consisting of hard rock or granular continental deposits.	• Intermediate hardness units considered unlikely to marginal relative to compressibility. • Medium subsidence potential. • Probably stable formations consisting of hard rock or granular continental deposits.	• Intermediate hardness units considered unlikely to marginal relative to compressibility. • Medium subsidence potential. • Probably stable formations consisting of hard rock or granular continental deposits.	• Intermediate hardness units considered unlikely to marginal relative to compressibility. • Medium subsidence potential. • Probably stable formations consisting of hard rock or granular continental deposits.
	4	**4**	**4**	**4**
Seismic Constraints	• High probable ground motion from earthquakes. • Crosses active faults. • Low potential for liquefaction.	• High probable ground motion from earthquakes. • Crosses active faults. • Low potential for liquefaction.	• Medium probable ground motion from earthquakes. • Medium to high liquefaction potential. • No active fault crossings.	• Medium probable ground motion from earthquakes. • Medium to high liquefaction potential. • No active fault crossings.
	3	**3**	**4**	**4**
Maximize Avoidance of Areas with Potential Hazardous Materials.				
Hazardous Materials/Waste Constraints	• There are no CERCLIS, SPL, or SCL sites near the station location. • There may be some sites adjacent to the station due to the location of industrial uses nearby.	• There are no CERCLIS, SPL, or SCL sites near the station location. • There may be some sites adjacent to the station due to the location of industrial uses nearby.	• There are 3 CERCLIS, SPL, or SCL sites near the station location. • Due to the proposed station location's proximity to the Burbank-Glendale-Pasadena Airport and industrial uses, there may be other sites near the station location.	• There are 2 CERCLIS, SPL, or SCL sites near the station location. • There may be some sites adjacent to the station due to the location of industrial uses nearby.
	4	**4**	**4**	**4**

1 2 3 4 5
Least Favorable Most Favorable

Table 4.1-6 (Con't.)
Bakersfield to Los Angeles - High-Speed Train Station Evaluation Matrix
Sylmar-to-Los Angeles Union Station Segment – Los Angeles Union Station Options

Evaluation Criteria	Los Angeles Union Station Option 1 Existing Union Station	Los Angeles Union Station Option 2 Union Sta. South (Thru)	Los Angeles Union Station Option 3 Union Sta. South (Stub)	Los Angeles Union Station Option 4 LA River West
Maximize Ridership/Revenue Potential.				
Travel Time	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Length	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Population/Employment Catchment	1990 10-mile radius: 3,300,815 persons; 1,427,974 employed 1990 20-mile radius: 7,280,856 persons: 3,403,964 employed	1990 10-mile radius: 3,300,815 persons; 1,427,974 employed 1990 20-mile radius: 7,280,856 persons: 3,403,964 employed	1990 10-mile radius: 3,300,815 persons; 1,427,974 employed 1990 20-mile radius: 7,280,856 persons: 3,403,964 employed	1990 10-mile radius: 3,300,815 persons; 1,427,974 employed 1990 20-mile radius: 7,280,856 persons: 3,403,964 employed
	5	**5**	**5**	**5**
Maximize Connectivity and Accessibility.				
Intermodal Connections	• Airport (LAX) – 12.5 mi. (20.0 km) • Freeways – SR-101: adjacent; I-5: 1.2 mi. (1.9 km); I-110: 0.9 mi. (1.4 km); SR-60: 2.1 mi. (3.4 km); I-10: 0.7 mi. (1.1 km) • Amtrak – at site • MTA Bus – at site • El Monte Busway – at site • MTA Rail – Red Line, Pasadena Blue Line and proposed Eastside LRT: at site • Metrolink – at site	• Airport (LAX) – 12.5 mi. (20.0 km) • Freeways - SR-101: adjacent; I-5: 1.4 mi. (2.2 km); I-110: 0.9 mi. (1.4 km); SR-60: 2.1 mi. (3.4 km); I-10: 0.7 mi. (1.1 km) • Amtrak – 0.2 mi. (0.3 km) • MTA Bus – adjacent • El Monte Busway – 0.2 mi (0.3 km) • MTA Rail – Red Line and Pasadena Blue Line: across SR-101; proposed Eastside LRT: adjacent • Metrolink – 0.2 mi. (0.3 km)	• Airport (LAX) – 12.5 mi. (20.0 km) • Freeways - SR-101: adjacent; I-5: 1.2 mi. (1.9 km); I-110: 1.2 mi. (1.9 km); SR-60: 1.9 mi. (3.0 km); I-10: 0.6 mi. (1.0 km) • Amtrak – 0.2 mi. (0.3 km) • MTA Bus – 0.1 mi. (0.2 km) • El Monte Busway – 0.2 mi. (0.3 km) • MTA Rail – Red Line and Pasadena Blue Line: across SR-101; proposed Eastside LRT: 0.1 mi. (0.2 km) • Metrolink – 0.2 mi. (0.3 km)	• Airport (LAX) – 12.5 mi. (20.0 km) • Freeways - SR-101: adjacent; I-5: 1.2 mi. (1.9 km); I-110: 1.2 mi. (1.9 km); SR-60: 1.9 mi. (3.0 km); I-10: 0.6 mi. (1.0 km) • Amtrak – 0.4 mi. (0.7 km) • MTA Bus – 0.2 mi. (0.3 km) • El Monte Busway – 0.4 mi (0.7 km) • MTA Rail – Red Line and Pasadena Blue Line: 0.4 mi. (0.7 km); proposed Eastside LRT: 0.2 mi (0.3 km) future • Metrolink – 0.4 mi. (0.7 km)
	5	**4**	**4**	**3**

Evaluation Criteria	Los Angeles Union Station Option 1 Existing Union Station	Los Angeles Union Station Option 2 Union Sta. South (Thru)	Los Angeles Union Station Option 3 Union Sta. South (Stub)	Los Angeles Union Station Option 4 LA River West
Minimize Operating and Capital Costs.				
Length	• Shortest distance to northerly I-5 (Options 2 and 3) connections to Bakersfield.	• Long, looping alignment required to southerly (Option 3, 3A, 4, and 5) connections to San Diego.	• Shortest distance to UPRR/El Monte (Option 1) connection to San Diego. • Long, looping alignment required to southerly (Option 3, 3A, 4, and 5) connections to San Diego.	• Shortest length to most connections to Bakersfield and to San Diego.
	3	**2**	**2**	**5**
Operational Issues	• Not suitable for easterly SR-60 (Option 1A) and westerly SR-101 (Option 2) connections to San Diego and LAX, respectively. • Connection to easterly UPRR/El Monte (Option 1) alignment requires stub-end station.	• Best Station Location alternative for easterly UPRR/El Monte (Option 1) alignment connection. • Slow approach speeds. • Not suitable for easterly I-10 (Option 1B) connection to San Diego. • Requires loop around UP Los Angeles Yard to provide through-track to southerly (Options 3, 3A, 4, and 5) connections to San Diego.	• Not suitable for easterly I-10 (Option 1B) connection to San Diego. • Not suitable for northerly I-5 (Options 2 and 3) connections to Bakersfield. • Offers through-track alternative for westerly SR-101 (Option 2) connection to LAX.	• Offers high-speed alignment through station. • Not suitable for northerly I-5 (Options 2 and 3) connections to Bakersfield. • Not suitable for easterly SR-60 (Option 1A) and westerly SR-101 (Option 2) connections to San Diego and LAX, respectively. • Connection to easterly UPRR/El Monte (Option 1) alignment requires stub-end station.
	4	**3**	**2**	**5**
Construction Issues	• Requires modification of existing LAUS approaches (Amtrak, Metrolink), under live track conditions • Maintenance of adjacent rail and highway traffic.	• Construction over LA River. • Access through existing LAUS. • Maintenance of adjacent rail and highway traffic.	• Highway access • Maintenance of adjacent rail and highway traffic.	• Rail access, but difficult highway access.
	2	**3**	**3**	**3**
Capital Cost	• Significant aerial structures.	• Significant aerial structures. • Loop connections add to cost.	• Significant aerial structures.	• At-grade approaches, aerial facilities.
	2	**1**	**1**	**3**

Evaluation Criteria	Los Angeles Union Station Option 1 Existing Union Station	Los Angeles Union Station Option 2 Union Sta. South (Thru)	Los Angeles Union Station Option 3 Union Sta. South (Stub)	Los Angeles Union Station Option 4 LA River West
Right-of-Way Issues/Cost	• Catellus property. • Railroad relocation. • At grade. • Through tracks in CRA redevelopment area affect major development parcel.	• Span of Los Angeles River. • CRA redevelopment area. • Relocation of existing businesses.	• CRA Redevelopment area. • Relocation of existing businesses.	• Requires relocation of existing MTA bus facility. • Adjacent to penal facilities and law enforcement center.
	2	**2**	**3**	**1**
Maximize Compatibility with Existing and Planned Development.				
Land Use Compatibility and Conflicts	• The proposed station location would be located at the existing Union Station site at Alameda and Cesar Chavez Avenue. Both are Major Class II Highways planned to at least 4 lanes wide. These streets may have to be expanded to accommodate the station. • The station site is proposed within the Alameda Specific Plan area. In order not to conflict with the buildout of the Alameda Specific Plan, the station support facilities could be located south of the station in the Little Tokyo area. The location of support facilities in Little Tokyo may conflict with Los Angeles Community Redevelopment Agency Plans for Little Tokyo. The station would also be located within an area designated for Light Industrial land use. • Station can be configured to provide a new pedestrian connection over SR-101 directly into existing Union Station. • Plans for station through	• Station platform would straddle the Los Angeles River. • The proposed station location is along E. Commercial St. and Alameda Blvd. Both may have to be expanded to accommodate the station location. • The surrounding land use is Light Industrial and Commercial Manufacturing and Open Space. • The station site can be configured to be compatible with Los Angeles Community Redevelopment Plans for Little Tokyo. The plans concur with MTA plans. • The station site can be configured to provide a new pedestrian connection over SR-101 to Patsouras Transit Plaza. • With a pedestrian connection there is a high potential for intermodal transfers to/from Union Station Amtrak and Metrolink, MTA Red Line, Pasadena Blue Line, proposed Eastside LRT, El Monte Busway and MTA Gateway. • Area is included in Los Angeles River Greenbelt planning effort.	• The proposed station location is along E. Commercial St. and Alameda Blvd. Both may have to be expanded to accommodate the station location. • The surrounding land use is Light Industrial and Commercial Manufacturing and Open Space. • Because it abuts Alameda Street, this station site may conflict with Los Angeles Community Redevelopment Agency Plans for Little Tokyo. • The plans may not be compatible with MTA plans for the Eastside LRT. • Station can be configured to provide a new pedestrian connection over SR-101 to Patsouras Transit Plaza. • With a pedestrian connection there is a high potential for intermodal transfers to/from to Union Station Amtrak and Metrolink, MTA Red Line, Pasadena Blue Line, proposed Eastside LRT extension, El Monte Busway and MTA Gateway. • Development of this station site conflict with CalTrans plans for	• The proposed station location may require the expansion of Cesar Chavez Avenue. • The surrounding land use is Light Industrial. The station site would conflict with existing use of part of the area as a bus facility. The proposed station location would also conflict with the bus yard's proposed use as an MTA light rail repair facility in conjunction with the Eastside LRT extension. • Access to the intermodal facilities through adjacent area occupied by penal and law enforcement facilities may prove difficult. • There is a potential for intermodal connections with Union Station Amtrak and Metrolink, MTA Red Line, Pasadena Blue Line, proposed Eastside LRT, El Monte Busway and MTA Gateway. • Area is included in LA River Greenbelt planning effort.

Evaluation Criteria	Los Angeles Union Station Option 1 Existing Union Station	Los Angeles Union Station Option 2 Union Sta. South (Thru)	Los Angeles Union Station Option 3 Union Sta. South (Stub)	Los Angeles Union Station Option 4 LA River West
	tracks crossing SR-101 may conflict with CalTrans plans for through tracks for Amtrak. • There is a very high potential for convenient intermodal connections due to presence of Union Station Amtrak and Metrolink, MTA Red Line, Pasadena Blue Line, proposed Eastside LRT, El Monte Busway and MTA Gateway at the site.		through tracks for Amtrak.	
	4	**4**	**4**	**3**
Visual Quality Impacts	• Commercial /industrial area. No sensitive viewers.	• Industrial area. • On north end, both sides of Spring Street, approach goes through the edge of Downey Playground.	• Commercial /industrial area. No sensitive viewers.	• Industrial area. No sensitive viewers.
	5	**4**	**5**	**5**
Minimize Impacts to Natural Resources.				
Water Resources	No Impacts.	No Impacts.	No impacts.	Potential minor impacts to water quality during construction, avoidance feasible.
	5	**5**	**5**	**4**
Floodplain Impacts	No impacts.	Requires construction of approach tracks across Los Angeles River.	Requires construction of approach tracks across Los Angeles River.	Requires construction of approach tracks across Los Angeles River.
	5	**3**	**3**	**3**
Threatened & Endangered Species Impacts	No impacts.	No impacts.	No impacts.	No impacts.
	5	**5**	**5**	**5**

Evaluation Criteria	Los Angeles Union Station Option 1 Existing Union Station	Los Angeles Union Station Option 2 Union Sta. South (Thru)	Los Angeles Union Station Option 3 Union Sta. South (Stub)	Los Angeles Union Station Option 4 LA River West
Minimize Impacts to Social and Economic Resources.				
Environmental Justice Impacts (Demographics)	1990 Minority population: 1912 1990 In-poverty households: 231	1990 Minority population: 2156 1990 In-poverty households: 414	1990 Minority population: 2603 1990 In-poverty households: 752	1990 Minority population: 2823 1990 In-poverty households:881
	3	**3**	**3**	**3**
Farmland Impacts	No impacts.	No impacts.	No impacts.	No impacts.
	5	**5**	**5**	**5**
Minimize Impacts to Cultural Resources.				
Cultural Resources Impacts	• Recorded historical sites on the GIS. • High potential for undiscovered sites, due to location of known sites in the area.	• No resources recorded on the GIS. • Unknown, probably high to moderate potential for undiscovered sites, due to location near the Los Angeles River and in an urban area.	• No resources recorded on the GIS. • Unknown, probably high to moderate potential for undiscovered sites, due to location in an urban area close center early settlement.	• No resources recorded on the GIS. • Unknown, probably high to moderate potential for undiscovered sites, due to location on Los Angeles River and in an urban area.
	1	**2**	**2**	**2**
Parks & Recreation/Wildlife Refuge Impacts	• No park resources located in the area.	• No park resources located in the area. • Area is included in Los Angeles River Greenbelt planning effort.	• No park resources located in the area.	• No park resources located in the area. • Area is included in Los Angeles River Greenbelt planning effort.
	5	**2**	**4**	**3**
Maximize Avoidance of Areas with Geologic and Soils Constraints.				
Soils/Slope Constraints	• Intermediate hardness units considered unlikely to marginal relative to compressibility. • Medium subsidence potential. • Probably stable formations consisting of hard rock or granular continental deposits.	• Intermediate hardness units considered unlikely to marginal relative to compressibility. • Medium subsidence potential. • Probably stable formations consisting of hard rock or granular continental deposits.	• Intermediate hardness units considered unlikely to marginal relative to compressibility. • Medium subsidence potential. • Probably stable formations consisting of hard rock or granular continental deposits.	• Intermediate hardness units considered unlikely to marginal relative to compressibility. • Medium subsidence potential. • Probably stable formations consisting of hard rock or granular continental deposits.
	4	**4**	**4**	**4**

Evaluation Criteria	Los Angeles Union Station Option 1 Existing Union Station	Los Angeles Union Station Option 2 Union Sta. South (Thru)	Los Angeles Union Station Option 3 Union Sta. South (Stub)	Los Angeles Union Station Option 4 LA River West
Seismic Constraints	• Low to medium liquefaction potential. • No active fault crossings. • Low probable ground motion from earthquakes.	• Low to medium liquefaction potential. • No active fault crossings. • Low probable ground motion from earthquakes.	• Low to medium liquefaction potential. • No active fault crossings. • Low probable ground motion from earthquakes.	• Low to medium liquefaction potential. • No active fault crossings. • Low probable ground motion from earthquakes.
	4	**4**	**4**	**4**
Maximize Avoidance of Areas with Potential Hazardous Materials.				
Hazardous Materials/Waste Constraints	• There are 5 CERCLIS, SPL, or SCL sites near the station location. • There may be some sites adjacent to the station due to the location of industrial uses nearby the station.	• There are 3 CERCLIS, SPL, or SCL sites near the station location. • There may be some sites adjacent to the station due to the location of industrial uses nearby the station.	• There are 4 CERCLIS, SPL, or SCL sites near the station location. • There may be some sites adjacent to the station due to the location of industrial uses nearby the station.	• There are 2 CERCLIS, SPL, or SCL sites near the station location. • There may be some sites adjacent to the station due to the location of industrial uses nearby the station and due to the existing MTA bus yard.
	4	**4**	**4**	**4**

1 2 3 4 5
Least Favorable Most Favorable

Table 4.1-6 (Con't.)
Bakersfield to Los Angeles - High-Speed Train Station Evaluation Matrix
Sylmar-to-Los Angeles Union Station Segment – Los Angeles Union Station Options

Evaluation Criteria	Los Angeles Union Station Option 5 LA River East	Los Angeles Union Station Option 6 Cornfield Site
Maximize Ridership/Revenue Potential		
Travel Time	Not Applicable	Not Applicable
Length	Not Applicable	Not Applicable
Population/Employment Catchment	1990 10-mile radius: 3,300,815 persons: 1,427,974 employed 1990 20-mile radius: 7,280,856 persons: 3,403,964 employed	1990 10-mile radius: 3,300,815 persons: 1,427,974 employed 1990 20-mile radius: 7,280,856 persons: 3,403,964 employed
	5	**5**
Maximize Connectivity and Accessibility		
Intermodal Connections	• Airports – LAX: 12.5 mi. (20.0 km) • Freeways– SR-101: adjacent; I-5: 1.2 mi. (1.9 km); I-110: 1.4 mi. (2.2 km); SR-60: 1.6 mi. (2.6 km); I-10: 0.4 mi. (0.6 km) • Amtrak – 0.4 mi. (0.7 km) • MTA Bus – 0.2 mi. (0.3 km) • MTA Rail – Red Line: 0.4 mi. (0.7 km); proposed Eastside LRT: 0.2 mi. (0.3 km) • Metrolink – 0.4 mi. (0.4 km)	• Airport – LAX: 12.5 mi. (20.0 km) • Freeways - SR-101: 1.0 mi. (1.6 km); I-5: 0.8 mi. (1.3 km); I-110: 0.3 mi. (0.5 km); SR-60: 2.8 mi. (4.5 km); I-10: 1.2 mi. (1.9 km) • Amtrak – 0.9 mi. (1.5 km) • MTA Bus – 0.2 mi. (0.3 km) • MTA Rail – Pasadena Blue Line: 0.2 mi. (0.3 km); Red Line: 0.9 mi. (1.5 km) • Metrolink – 0.9 mi. (1.5 km)
	3	**2**
Minimize Operating and Capital Costs		
Length	• Shortest length to many connections to Bakersfield and to San Diego.	• Longer length to San Diego connections.
	4	**3**

Evaluation Criteria	Los Angeles Union Station Option 5 LA River East	Los Angeles Union Station Option 6 Cornfield Site
Operational Issues	• High speed alignment through station. • Not suitable for northerly I-5 (Options 2 and 3) connections to Bakersfield. • Not suitable for easterly SR-60 (Option 1A) and westerly SR-101 (Option 2) connections to San Diego and LAX, respectively.	• Slow approach speeds. • Not suitable for northerly I-5 (Options 2 and 3) connections to Bakersfield. • Not suitable for westerly SR-101 (Option 2) connection to LAX.
	5	**1**
Construction Issues	• Construction over Los Angeles River.	• Highly congested approaches (topographic, railroad operations).
	3	**3**
Capital Cost	• At-grade with structures crossing river and aerial facilities.	• Significant aerial structure.
	3	**2**
Right-of-Way Issues/Cost	• Relocation of railroad from East Bank of Los Angeles River.	• Open land. • Public support for development as parkland.
	3	**3**

Evaluation Criteria	Los Angeles Union Station Option 5 LA River East	Los Angeles Union Station Option 6 Cornfield Site
Maximize Compatibility with Existing and Planned Development		
Land Use Compatibility and Conflicts	• Santa Fe Center St. and First St. may have to be expanded to accommodate the station. • Surrounding land uses are Commercial Industrial, Light Industrial, and nearby Medium Density Multifamily Residential. Station site can be configured to provide a new pedestrian connection over SR-101. • The station site can be configured to be compatible with Los Angeles Community Redevelopment Plans for Little Tokyo. The plans concur with MTA plans. • There is no proposed or existing intermodal connection site near the proposed station location. However, with appropriate configuration of ancillary and pedestrian facilities there is a high potential for intermodal connections due to nearby presence of Union Station Amtrak and Metrolink, MTA Red Line, Pasadena Blue Line, proposed Eastside LRT, and MTA gateway - 0.5mi. (0.8 km).	• N. Broadway Ave. and Spring St. may have to be expanded to accommodate the station. • Surrounding land use is Light Industrial. The station location would conflict with plans for a Regional Park. • There is no proposed or existing intermodal connection site at the proposed station location. However the site is near a Pasadena Blue Line station - 0.2 mi. (0.3 km). • Area is included in LA River Greenbelt planning effort.
	4	**2**
Visual Quality Impacts	Industrial area. No sensitive viewers.	Industrial area. No sensitive viewers.
	5	**5**

Evaluation Criteria	Los Angeles Union Station Option 5 LA River East	Los Angeles Union Station Option 6 Cornfield Site
Minimize Impacts to Natural Resources.		
Water Resources	Potential minor impacts to water quality during construction, avoidance feasible. **4**	No impacts. **5**
Floodplain Impacts	Access tracks cross Los Angeles River. **4**	No impacts. **5**
Threatened & Endangered Species Impacts	No impacts. **5**	No impacts. **5**
Minimize Impacts to Social and Economic Resources.		
Environmental Justice Impacts (Demographics)	1990 Minority population: 2747 1990 In-poverty households: 836 **3**	1990 Minority population: 1492 1990 In-poverty households: 197 **3**
Farmland Impacts	No impacts. **5**	No impacts. **5**

Evaluation Criteria	Los Angeles Union Station Option 5 LA River East	Los Angeles Union Station Option 6 Cornfield Site
Minimize Impacts to Cultural Resources.		
Cultural Resources Impacts	• No resources recorded on the GIS. • Unknown, probably high to moderate potential for undiscovered sites, due to location on Los Angeles River and in an urban area. **2**	• No resources recorded on the GIS. • Unknown, probably high to moderate potential for undiscovered sites, due to location in urban area and former railroad yard. **2**
Parks & Recreation/Wildlife Refuge Impacts	• No park resources located in the area. **4**	• No park resources located in the area. • Area is included in LA River Greenbelt planning effort. **4**
Maximize Avoidance of Areas with Geologic and Soils Constraints.		
Soils/Slope Constraints	• Intermediate hardness units considered unlikely to marginal relative to compressibility. • Medium Subsidence Potential. • Probably stable formations consisting of hard rock or granular continental deposits. **4**	• Intermediate hardness units considered unlikely to marginal relative to compressibility. • Medium Subsidence Potential. • Probably stable formations consisting of hard rock or granular continental deposits. **4**
Seismic Constraints	• Low to Medium Liquefaction Potential. • No active fault crossings. • Low probable ground motion from earthquakes. **4**	• Low to Medium Liquefaction Potential. • No active fault crossings. • Low probable ground motion from earthquakes. **4**

Evaluation Criteria	Los Angeles Union Station Option 5 LA River East	Los Angeles Union Station Option 6 Cornfield Site
Maximize Avoidance of Areas with Potential Hazardous Materials		
Hazardous Materials/Waste Constraints	• There are no CERCLIS, SPL, or SCL sites near the station location. • There may be some sites adjacent to the station due to the location of industrial uses nearby the station.	• There are no CERCLIS, SPL, or SCL sites near the station location. • There may be some sites adjacent to the station due to the location of industrial uses nearby the station.
	4	**4**

1 2 3 4 5
Least Favorable Most Favorable

Table 4.1-7
Bakersfield to Los Angeles- High-Speed Train Alignment Evaluation Matrix
Los Angeles Union Station – San Diego Approach Segments

Evaluation Criteria	Alignment Option 1 UPRR/El Monte/Colton	Alignment Option 1A SR-60	Alignment Option 1B I-10	Alignment Option 2 SR-101
Maximize Ridership/Revenue Potential				
Travel Time	9.6 to 17.1 min. depending upon LAUS location **3**	6.6 to 14.7 min. depending upon LAUS location **3**	2.7 to 11.7 min. depending upon LAUS location **3**	0.2 min. **5**
Length	2.3 to 3.0 miles (3.8 to 4.8 km) depending upon LAUS location **3**	1.7 to 2.2 miles (2.8 to 3.5 km) depending upon LAUS location **3**	1.7 to 3.0 miles (2.7 to 4.9 km) depending upon LAUS location **4**	0.2 to 0.4 miles (0.3 to 0.6 km) depending upon LAUS location **5**
Population/Employment Catchment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Maximize Connectivity and Accessibility.				
Intermodal Connections	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Minimize Operating and Capital Costs.				
Length	2.3 to 3.0 miles (3.8 to 4.8 km) depending upon LAUSD location **4**	1.7 to 2.2 miles (2.8 to 3.5 km) depending upon LAUS location **5**	1.7 to 3.0 miles (2.7 to 4.9 km) depending upon LAUS location **4**	0.2 to 0.4 miles (0.3 to 0.6 km) depending upon LAUS location **5**
Operational Issues	• Allows flexibility in LAUS location alternatives. • Requires stub-end station at LAUS or slower speed, looping connections to San Diego. **3**	• Limited LAUS station site alternatives. **2**	• South of 101 LAUS station alternatives (Options 2 and 3) not suitable for this alignment. **2**	• Appropriate for access through LAX only. • Limited LAUS site alternatives for this alignment **1**

Evaluation Criteria	Alignment Option 1 UPRR/El Monte/Colton	Alignment Option 1A SR-60	Alignment Option 1B I-10	Alignment Option 2 SR-101
Construction Issues	• Aerial structures **3**	• Aerial structures • Constrained area **2**	• Aerial structures • Constrained area **2**	• Aerial structures • Constrained area **2**
Capital Cost	$0.1 to $0.3 Billion VHS $0.2 to $0.3 Billion Maglev depending upon LAUS location **3**	$0.2 Billion VHS $0.2 Billion Maglev depending upon LAUS location **3**	$0.1 to $0.3 Billion VHS $0.1 to $0.3 Billion Maglev depending upon LAUS location **3**	$.010 to $0.3 Billion VHS $.02 to $0.3 Billion Maglev depending upon LAUS location **3**
Right-of-Way Issues/Cost	• Railroad relocation. **3**	• Follows existing, constrained freeway corridor. **1**	• Follows existing, constrained freeway corridor. **1**	• Follows existing, constrained freeway corridor. **1**
Maximize Compatibility with Existing and Planned Development.				
Land Use Compatibility and Conflicts	• May create indirect impacts on mixed residential/ commercial/industrial land uses adjacent to this alignment. • Some residential land uses on the north side of this alignment. • Alignment passes by Lincoln Park. **2**	• May create indirect impacts on a mix of residential/ commercial/industrial land uses adjacent to this alignment. • North side of SR-60 is a residential area for two miles in length. **1**	• May directly impact a mix of residential/commercial/ industrial land uses adjacent to this alignment. • Adjacent to residential area for a distance of 2.5 miles. **1**	• Alignment goes to LAX. • May directly impact a mix of industrial/ commercial/ government/ residential land uses adjacent to this alignment. • Within 200 feet of Belmont High School. • Within 200 to 400 feet of an elementary school. • Passes by 0lvera Street in downtown Los Angeles. **3**
Visual Quality Impacts	• At grade along south edge of Lincoln Park. Existing rail line. Balance of first tier viewers are commercial/industrial.	• May go through an elementary school north of 4th St. • Immediately adjacent to elementary school on south side of SR-60. • Adjacent to Boyle Heights Sports Park. • W/in 400 ft. of elementary school. • Ramon Garcia Recreation Center on north side of SR-60. Little impact. • North side of SR-60, res. Area for 2 mi. in length. (SR-60 is	• At grade along south side of I-10: • Adjacent to res. area for distance of 2.5 mi. • W/in 250 feet of Prospect Park. • W/in 500 feet of elementary school.	• At grade along south side of SR-101: • W/in 200 ft. of high school. • W/in 200 to 400 ft. of elementary school. • Ends just before Echo Park.

Evaluation Criteria	Alignment Option 1 UPRR/El Monte/Colton	Alignment Option 1A SR-60	Alignment Option 1B I-10	Alignment Option 2 SR-101
		between res. area and Option 1A).		
	5	**3**	**2**	**3**
Minimize Impacts to Natural Resources.				
Water Resources	No Impacts (closely approaches one potential wetland).	No Impacts.	No impacts.	No impacts.
	4	**5**	**5**	**5**
Floodplain Impacts	Crosses LA River.	Crosses LA River.	Crosses LA River.	Crosses LA River.
	4	**4**	**4**	**4**
Threatened & Endangered Species Impacts	No impacts.	No impacts.	No impacts.	No impacts.
	5	**5**	**5**	**5**
Minimize Impacts to Social and Economic Resources.				
Environmental Justice Impacts (Demographics)	To be determined by Inland Empire and LOSSAN Corridor teams.	To be determined by Inland Empire and LOSSAN Corridor teams.	To be determined by Inland Empire and LOSSAN Corridor teams.	To be determined by Inland Empire and LOSSAN Corridor teams.
Farmland Impacts	• The alignment is located in an urban area with no developable farmland.	• The alignment is located in an urban area with no developable farmland	• The alignment is located in an urban area with no developable farmland.	• The alignment is located in an urban area with no developable farmland.
	5	**5**	**5**	**5**

Evaluation Criteria	Alignment Option 1 UPRR/El Monte/Colton	Alignment Option 1A SR-60	Alignment Option 1B I-10	Alignment Option 2 SR-101
Minimize Impacts to Cultural Resources.				
Cultural Resources Impacts	• No recorded resources on GIS, except at Union Station. • Overall probable impact is low to moderate; follows existing railroad lines. **5**	• No recorded resources on GIS, except at Union Station. • Overall probable impact is moderate to high; crosses part of downtown before following existing freeway. **2**	• Few recorded resources on GIS. • Overall probable impact is moderate; follows existing freeway. **4**	• Numerous recorded resources on GIS. • Overall probable impact is moderate to high; follows existing freeway through older neighborhood. **2**
Parks & Recreation/Wildlife Refuge Impacts	• Low Potential Impact, Visual Quality Only. • Passes Lincoln Park. **3**	• Low Potential Impact, Visual Quality Only. • Passes Boyle Heights Sports Center Park, Ramon Garcia Recreation Center. **2**	• Low Potential Impact, Visual Quality Only. • Passes Ramona Gardens Park. **3**	• High Potential Impact. • Crosses over El Pueblo de Los Angeles State Historic Park. **1**
Maximize Avoidance of Areas with Geologic and Soils Constraints.				
Soils/Slope Constraints	To be determined by Inland Empire and LOSSAN Corridor teams.	To be determined by Inland Empire and LOSSAN Corridor teams.	To be determined by Inland Empire and LOSSAN Corridor teams.	To be determined by Inland Empire and LOSSAN Corridor teams.
Seismic Constraints	To be determined by Inland Empire and LOSSAN Corridor teams.	To be determined by Inland Empire and LOSSAN Corridor teams.	To be determined by Inland Empire and LOSSAN Corridor teams.	To be determined by Inland Empire and LOSSAN Corridor teams.
Maximize Avoidance of Areas with Potential Hazardous Materials.				
Hazardous Materials/Waste Constraints	• There are approximately 20 CERCLIS, SPL, or SCL sites. **3**	• There are approximately 10 CERCLIS, SPL, or SCL sites. **4**	• There are approximately 10 CERCLIS, SPL, or SCL sites. **4**	• There are fewer than 10 CERCLIS, SPL, or SCL sites. **4**

1 2 3 4 5
Least Favorable Most Favorable

Table 4.1-7 (Con't.)
Bakersfield to Los Angeles- High-Speed Train Alignment Evaluation Matrix
Los Angeles Union Station – San Diego Approach Segments

Evaluation Criteria	Alignment Option 3 UPRR/Whittier Jct.	Alignment Option 3A BNSF/Hobart	Alignment Option 4 I-5	Alignment Option 5 BNSF/Harbor Div.
Maximize Ridership/Revenue Potential				
Travel Time	4.2 to 36.0 min. depending upon LAUS location **2**	4.5 to 36.3 min. depending upon LAUS location **2**	2.7 to 33.0 min. depending upon LAUS location **2**	6.3 to 40.2 min. depending upon LAUS location **1**
Length	2.1 to 5.1 miles (3.5 to 8.3 km) depending upon LAUS location **3**	2.3 to 5.2 miles (3.8 to 8.4 km) depending upon LAUS location **2**	1.4 to 4.0 miles (2.3 to 6.5 km) depending upon LAUS location **3**	3.3 to 6.2 miles (5.3 to 10.0 km) depending upon LAUS location **1**
Population/Employment Catchment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Maximize Connectivity and Accessibility.				
Intermodal Connections	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Minimize Operating and Capital Costs				
Length	2.1 to 5.1 miles (3.5 to 8.3 km) depending upon LAUS location **3**	2.3 to 5.2 miles (3.8 to 8.4 km) depending upon LAUS location **2**	1.4 to 4.0 miles (2.3 to 6.5 km) depending upon LAUS location **3**	3.3 to 6.2 miles (5.3 to 10.0 km) depending upon LAUS location **1**
Operational Issues	• Alignment best suited to LAUS and River station alternatives (Options 1, 4, and 5). • Poor alignment for South of 101 LAUS location alternatives (Options 2 and 3). **4**	• Alignment best suited to LAUS and River station alternatives (Options 1, 4, and 5). • Poor alignment for South of 101 LAUS location alternatives (Options 2 and 3). **4**	• Alignment best suited to River station alternatives (Options 4 and 5). • Poor alignment for South of 101 LAUS location alternatives (Options 2 and 3). **3**	• Alignment best suited to River station alternatives (Options 4 and 5). • Poor alignment for South of 101 LAUS location alternatives (Options 2 and 3). **1**

Evaluation Criteria	Alignment Option 3 UPRR/Whittier Jct.	Alignment Option 3A BNSF/Hobart	Alignment Option 4 I-5	Alignment Option 5 BNSF/Harbor Div.
Construction Issues	• Aerial structures.	• Aerial structures.	• Aerial structures. • Constrained area.	• Special aerial structures to provide access over north end of Alameda Corridor.
	5	**4**	**2**	**1**
Capital Cost	$0.1 to $0.3 Billion VHS $0.1 to $0.3 Billion Maglev depending upon LAUS location	$0.1 to $0.3 Billion VHS $0.1 to $0.3 Billion Maglev depending upon LAUS location	$0.1 to $0.3 Billion VHS $0.1 to $0.3 Billion Maglev depending upon LAUS location	$0.2 to $0.4 Billion VHS $0.2 to $0.4 Billion Maglev depending upon LAUS location
	3	**3**	**3**	**1**
Right-of-Way Issues/Cost	• Requires railroad relocation high-volume freight corridor.	• Requires railroad relocation high-volume freight corridor.	• Follows existing constrained freeway corridor.	• Corridor owned by MTA.
	2	**2**	**1**	**4**
Maximize Compatibility with Existing and Planned Development.				
Land Use Compatibility and Conflicts	• Alignment is an existing railroad ROW. • Alignment may indirectly impact existing industrial/ commercial land uses. • May go through an elementary school north of 4th street.	• Most of the ROW needed for this alignment is already used for railroad purposes. • Alignment may import existing industrial/ commercial land uses. • May go through an elementary school north of 4th street.	• Goes through existing residential area for 0.5 miles. • Adjacent to residential areas for length of 1.2 miles. • Some commercial land uses adjacent to this alignment.	• Alignment is an existing railroad ROW. • Alignment is currently abutted by existing industrial/commercial land uses.
	4	**4**	**2**	**5**
Visual Quality Impacts	• May go through an elementary school site north of 4th St. • Balance of alignment is industrial.	• May go through an elementary school site north of 4th St. • Balance of alignment is industrial.	• May go through an elementary school site north of 4th St. • Goes through an existing residential area for 0.5 mi. along I-5. • Adjacent to residential area for length of 1.2 mi. • Immediately adjacent to south edge of Ramon Garcia Recreation Center. • Immediately adjacent to elementary school.	• May go through an elementary school site north of 4th St. • Balance of alignment is commercial/industrial.
	4	**4**	**2**	**4**

Evaluation Criteria	Alignment Option 3 UPRR/Whittier Jct.	Alignment Option 3A BNSF/Hobart	Alignment Option 4 I-5	Alignment Option 5 BNSF/Harbor Div.
Minimize Impacts to Natural Resources				
Water Resources	No Impacts	No Impacts	No Impacts	No Impacts
	5	**5**	**5**	**5**
Floodplain Impacts	• Crosses Los Angeles River.	• Crosses Los Angeles River.	• Crosses Los Angeles River.	• Crosses Los Angeles River.
	4	**4**	**4**	**4**
Threatened & Endangered Species Impacts	No impacts	No impacts	No impacts	No impacts
	5	**5**	**5**	**5**
Minimize Impacts to Social and Economic Resources.				
Environmental Justice Impacts (Demographics)	To be determined by Inland Empire and LOSSAN Corridor teams.	To be determined by Inland Empire and LOSSAN Corridor teams.	To be determined by Inland Empire and LOSSAN Corridor teams.	To be determined by Inland Empire and LOSSAN Corridor teams.
Farmland Impacts	• The alignment is located in an urban area with no developable farmland.	• The alignment is located in an urban area with no developable farmland.	• The alignment is located in an urban area with no developable farmland.	• The alignment is located in an urban area with no developable farmland.
	5	**5**	**5**	**5**

Evaluation Criteria	Alignment Option 3 UPRR/Whittier Jct.	Alignment Option 3A BNSF/Hobart	Alignment Option 4 I-5	Alignment Option 5 BNSF/Harbor Div.
Minimize Impacts to Cultural Resources				
Cultural Resources Impacts	• Few recorded resources on GIS. • Overall probable impact is moderate; parallels course of Los Angeles River before following existing railroad tracks.	• Few recorded resources on GIS. • Overall probable impact is moderate; parallels course of Los Angeles River before following existing railroad tracks.	• Few recorded resources on GIS. • Overall probable impact is moderate to high; crosses part of downtown before following existing freeway.	• Few recorded resources on GIS. • Overall probable impact is high; parallels Los Angeles River before crossing urban neighborhoods.
	3	**3**	**2**	**1**
Parks & Recreation/Wildlife Refuge Impacts	• No park resources located.	• No park resources located.	• Low Potential Impact, Visual Quality Only. • Passes Ramon Garcia Recreation Center.	• No park resources located.
	5	**5**	**4**	**5**
Maximize Avoidance of Areas with Geologic and Soils Constraints.				
Soils/Slope Constraints	To be determined by Inland Empire and LOSSAN Corridor teams.	To be determined by Inland Empire and LOSSAN Corridor teams.	To be determined by Inland Empire and LOSSAN Corridor teams.	To be determined by Inland Empire and LOSSAN Corridor teams.
Seismic Constraints	To be determined by Inland Empire and LOSSAN Corridor teams.	To be determined by Inland Empire and LOSSAN Corridor teams.	To be determined by Inland Empire and LOSSAN Corridor teams.	To be determined by Inland Empire and LOSSAN Corridor teams.
Maximize Avoidance of Areas with Potential Hazardous Materials.				
Hazardous Materials/Waste Constraints	• There are approximately 10 CERCLIS, SPL, or SCL sites	• There are approximately 20 CERCLIS, SPL, or SCL sites	• There are fewer than 10 CERCLIS, SPL, or SCL sites	• There are approximately 20 CERCLIS, SPL, or SCL sites
	4	**3**	**4**	**3**

1 2 3 4 5
Least Favorable Most Favorable

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6.0 PERSONS AND AGENCIES CONSULTED

The following is a list of people contacted during the preparation of this report.

Fager, Dan. Engineer, Burbank-Glendale-Pasadena Airport. Telephone interview by Jennifer Hobbs, P&D Consultants. March 6, 2001.

Gill, Victor. Director of Public Affairs, Burbank-Glendale-Pasadena Airport. Telephone interview by Jennifer Hobbs, P&D Consultants. March 6, 2001.

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Ogee, Tom. Chief Engineer, Union Pacific Railroad. Telephone conversation with Rachel Vandenberg, DMJM+HARRIS. January 11, 2001.

Stone, Tom. Chief Project Officer, Los Angeles to Pasadena Metro Blue Line Construction Authority. Telephone conversation with Zinovy (Zoric) Sheynman, DMJM+HARRIS. April 17, 2001.

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APPENDICES

APPENDIX – A
Travel Time Estimates

Bakersfield to Los Angeles Connection

STATION TO STATION ALIGNMENTS

ALIGNMENT NUMBER	ALIGNMENT ROUTE SEGMENTS	LINE SEGMENTS	TOTAL DISTANCE (miles)	TOTAL DISTANCE (kilometers)	TIME VHS (minutes)	TIME MAGLEV (minutes)
A7181	S71 Bakersfield Truxton to Grapevine Connection	709, 713, 720	26.460	42.584	9.11	7.98
A7182	S71 Bakersfield Truxton to Comanche Connection	709, 714, 715, 716, 722	32.288	51.962	10.70	9.43
A7183	S71 Bakersfield Truxton to Mojave Connection	724, 704, 705	13.390	21.549	5.55	4.71
A7281	S72 Bakersfield Golden State to Grapevine Connection	706, 709, 713, 720	28.302	45.547	9.62	8.44
A7282	S72 Bakersfield Golden State to Comanche Connection	706, 709, 714, 715, 716, 722	34.129	54.925	11.21	9.89
A7283	S72 Bakersfield Golden State to Mojave Connection	702, 704, 705	14.799	23.816	5.93	5.06
A7381	S73 Bakersfield Airport to Grapevine Connection	701, 706, 709, 713, 720	33.298	53.588	10.98	9.69
A7382	S73 Bakersfield Airport to Comanche Connection	701, 702, 710, 718, 722	40.597	65.335	12.97	11.51
A7383	S73 Bakersfield Airport to Mojave Connection	701, 702, 704, 705	19.795	31.857	7.30	6.31
A7481	S74 Bakersfield West to Grapevine Connection	708, 711, 720	31.883	51.310	10.59	9.33
A7482	S74 Bakersfield West to Comanche Connection	708, 712, 715, 716, 722	38.121	61.350	12.29	10.89
A7483	S74 Bakersfield West to Mojave Connection	Not Applicable				
A7581	S75 Bakersfield East to Grapevine Connection	Not Applicable				
A7582	S75 Bakersfield East to Comanche Connection	Not Applicable				
A7583*	S75 Bakersfield East to Mojave Connection	705	6.976	11.227	3.71	3.11
A7681	S76 Bakersfield Old Amtrak to Grapevine Connection	707, 724, 710, 718, 721	31.236	50.270	10.42	9.17
A7682	S76 Bakersfield Old Amtrak to Comanche Connection	707, 724, 710, 718, 722	35.646	57.366	11.62	10.27
A7683	S76 Bakersfield Old Amtrak to Mojave Connection	Not Applicable				
A7781	S77 Bakersfield South to Grapevine Connection	711, 720	18.388	29.592	6.91	5.96
A7782	S77 Bakersfield South to Comanche Connection	712, 715, 716, 722	24.626	39.632	8.61	7.52
A7783	S77 Bakersfield South to Mojave Connection	Not Applicable				

* For VHS, train is still accelerating towards full speed. Speed at end of segment 705 is: 189.94 mph

ALIGNMENT					LOCAL TRAVEL							
OPTION	DESCRIPTION	APPROACH TIME MIN.	APPROACH TIME MAX	STATION	DISTANCE KM	SPEED KM/HR	TRAVEL TIME MIN. Ta	Tv	Td	Tss	Tt	DISTANCE KM
	SYLMAR TO UNION STATION SEGMENT											
1	**METROLINK/UPRR**	**4.56**	**16.17**	**110FWY**								
					1.25	25	0	3	0		3	1.25
					10.00	75.00	0.40	7.47	0.00		7.87	10.00
					3.00	100.00	0.2	1.23	0.79		2.22	3.00
				BURBANK								
	6% Schedule Recovery Allowance										0.79	
	Subtotal				**14.25**						**13.88**	**14.25**
				BURBANK						2.00		
					1.00	100.00	0.79	0.20	0.00		0.99	1.00
					7.40	250.00	1.88	0.40	0.00		2.28	7.40
					12.25	250.00	0.00	0.49	3.50		3.99	12.25
				SYLMAR								
	6% Schedule Recovery Allowance										0.44	
	Subtotal				**20.65**						**7.70**	**20.65**
	TOTAL				**34.90**						**21.57**	**34.90**
2	I-5 FWY	1.85	4.35	110FWY	14.25	200.00	0.00	3.40	1.75		5.15	14.25
				BURBANK						2.00		
					20.65	300	3.5	0.77	1.75		6.02	20.65
				SYLMAR								
	6% Schedule Recovery Allowance										0.67	
	TOTAL										11.84	
3	COMBINED - I-5/UPRR	1.85	4.35	110FWY	14.25	200.00	0.00	0.98	1.84		2.82	14.25
											0.17	
	6% Schedule Recovery Allowance										0.18	
	TOTAL										3.17	
				BURBANK						2.00		
					1.00	100.00	0.79	0.20	0.00		0.99	1.00
					7.40	250.00	1.88	0.40	0.00		2.28	7.40
					12.25	250.00	0.00	0.49	3.50		3.99	12.25
	6% Schedule Recovery Allowance										0.44	
	TOTAL				20.65						7.70	20.65
				SYLMAR						2.00		

Los Angeles to Bakersfield - High-Speed Train
Bakersfield to LAUS and San Diego Connection Travel Times
Comparison of Los Angeles Union Station Location and Connection Alternatives

Alignment Options		Los Angeles Union Station Options														
		1 Existing Union Station			2 Union Station South (Thru)			3 Union Station South (Stub)			4 LA River West			5 LA River East		
		Travel Time	Distance		Travel Time	Distance		Travel Time	Distance		Travel Time	Distance		Travel Time	Distance	
		min.	mi.	km.	min.	mi.	km.	min.	mi.	km.	min.	mi.	km.	min.	mi.	km.
Bakersfield to Sylmar																
1	I-5 Fwy Sac-Bak Connection Bakersfield to Sylmar	25.8 9.6 16.2	50.0 28.3 21.7	134.6 45.5 89.1	same as left			same as left			same as left			same as left		
1A	I-5/Comanche Pt. Sac-Bak Connection Bakersfield to Sylmar	**25.2** **9.6** **15.6**	**55.8** **34.1** **21.7**	**140.6** **54.9** **85.7**	**same as left**			**same as left**			**same as left**			**same as left**		
2	Soledad Cyn/SR-58 Sac-Bak Connection Bakersfield to Sylmar	37.1 5.9 31.1	36.5 14.8 21.7	198.5 23.8 174.7	same as left			same as left			same as left			same as left		
2A	SR14/SR-58 Sac-Bak Connection Bakersfield to Sylmar	37.2 5.9 31.2	36.5 14.8 21.7	199.0 23.8 175.2	same as left			same as left			same as left			same as left		
3	Soledad Cyn/SR-138 Sac-Bak Connection Bakersfield to Sylmar	37.5 11.2 26.3	55.8 34.1 21.7	202.9 54.9 148.0	same as left			same as left			same as left			same as left		
3A	SR14/SR-138 Sac-Bak Connection Bakersfield to Sylmar	**37.6** **11.2** **26.4**	**55.8** **34.1** **21.7**	**203.5** **54.9** **148.6**	**same as left**			**same as left**			**same as left**			**same as left**		
4	Soledad Cyn/Aqueduct Sac-Bak Connection Bakersfield to Sylmar	35.8 11.2 24.6	55.8 34.1 21.7	193.7 54.9 138.8	same as left			same as left			same as left			same as left		
4A	SR14/Aqueduct Sac-Bak Connection Bakersfield to Sylmar	35.9 11.2 24.7	55.8 34.1 21.7	194.3 54.9 139.4	same as left			same as left			same as left			same as left		
Sylmar to LAUS																
1	Metrolink/UPRR To 110 Fwy. 110 Fwy. to Sylmar	27.6 8.4 19.2	23.8 2.1 21.7	38.3 3.4 34.9	31.3 12.1 19.2	24.7 3.0 21.7	39.8 4.9 34.9	**31.6** **12.4** **19.2**	**24.8** **3.1** **21.7**	**39.9** **5.0** **34.9**	26.7 7.5 19.2	23.6 1.9 21.7	37.9 3.0 34.9	27.9 8.7 19.2	23.9 2.2 21.7	38.4 3.5 34.9
2	I-5 Fwy To 110 Fwy. 110 Fwy. to Sylmar	**10.6** 2.1 8.5	**23.8** 2.1 21.7	**38.3** 3.4 34.9	11.2 2.7 8.5	24.7 3.0 21.7	39.8 4.9 34.9	**N/A**			**N/A**			**N/A**		
3	Combined I-5/UPRR To 110 Fwy. 110 Fwy. to Sylmar	**12.3** 2.1 10.2	**23.8** 2.1 21.7	**38.3** 3.4 34.9	12.9 2.7 10.2	24.7 3.0 21.7	39.8 4.9 34.9	**N/A**			**N/A**			**N/A**		
LAUS to San Diego Connection																
1	East UPRR/El Monte/Colton To Soto St.	14.6	2.9	4.6	13.9	2.3	3.8	**10.2**	**2.5**	**4.0**	14.3	2.3	3.8	**18.1**	**2.6**	**4.3**
1A	East SR-60 To Soto St.	**N/A**			**7.0**	**1.7**	**2.8**	7.0	1.9	3.0	**N/A**			**N/A**		
1B	East I-10 To Soto St.	7.6	1.9	3.0	**N/A**			**N/A**			4.8	2.3	3.8	**2.9**	**1.4**	**2.3**
2	West I-101 (LAX Connection) To Alameda St.	**N/A**			0.2	0.4	0.6	**0.2**	**0.2**	**0.3**	**N/A**			**N/A**		
3	South UPRR/Whittier Jct. To Soto St.	10.8	2.6	4.3	34.5	5.0	8.0	**36.0**	**5.1**	**8.3**	5.1	2.5	4.0	**4.5**	**2.2**	**3.5**

APPENDIX – B
Biological Resources

Bakersfield to Los Angeles Corridor
Biological Constraints in the Bakersfield to Sylmar Segment
(Excluding Central Valley floor)

I-5/Alignment Option 1 and 1A

Threatened and endangered species:

1) California red-legged frog **FT**
Critical habitat designation - LA watersheds

2) Arroyo toad **FT**
Critical habitat designation - LA County watersheds

3) Least Bell's vireo **FE/SE**
Proposed critical habitat - Santa Clara River LA/Ventura Counties

4) Yellow-billed cuckoo **SE**
Scientific review in process to determine federal listing - Santa Clara River, LA County

5) California condor **FE/SE**
Sespe Condor Sanctuary

6) Swainson's hawk **ST**
Nesting pair Kern County and LA County
Protected by the Migratory Bird Treaty Act

1) Tipton kangaroo rat **FE/SE**
Kern County

7) Tehachapi slender salamander **ST**
Tehachapi Mountains Kern County
Possibly in LA County

8) Blunt-nosed leopard lizard **FE/SE**
Tehachapi Mountains Kern County
Antelope Valley foothill region

9) California jewel flower **FE/SE**
Foothills of Kern County

10) San Joaquin kit fox **FE/ST**
Bakersfield area

11) San Joaquin antelope squirrel **ST**
San Joaquin valley

12) Southern steelhead **FE**
Santa Clara River

13) Egret rookery
Protected by the Migratory Bird Treaty Act

Parks and Recreation / Wildlife Refuges:

1) Castaic Lake State Recreation Area

2) Los Padres National Forest

3) Angeles National Forest

4) Pyramid Lake Recreation Area

5) Ft. Tejon State Historic Park

6) Hungry Valley State Vehicular Recreation Area

Major Water Crossings:

Edison channel, Tecuya Creek, California Aqueduct, Grapevine Creek, Apple Canyon, Pyramid Lake, Cherry Canyon, Canton Canyon, Violin Canyon, Castaic Lake, Castaic Creek, Santa Clara River, Pico Canyon, Gavin Canyon, Newhall Canyon

Alignment Option 2 and 2A (SR-14)

Threatened and endangered species:

1) California red-legged frog **FT**
   Critical habitat designation LA watersheds

2) Unarmored threespine stickleback **FE / SE**
   Soledad canyon portion of the Santa Clara River
   Upper San Fransiquito Canyon

3) Southern steelhead **FE**
   Santa Clara River

4) Mohave ground squirrel **ST**
   Lancaster

5) Desert tortoise **FT / ST**
   Corridor along SR-14

6) San Joaquin kit fox **FE / ST**
   Bakersfield area

7) San Joaquin antelope squirrel **ST**
   San Joaquin valley

8) Bakersfield cactus **FE**
   Vicinity of Bakersfield

9) San Joaquin woolly-threads **FE**
Bakersfield area

10) Proposed ESA

Parks and Recreation / Wildlife Refuge:

1) Vasquez Rocks City Park

Major Water Crossings:

Rodeo Canyon, Tweedy Creek, Whiterock Creek, Cache Creek, LA Aqueduct, Oak Creek, Amargosa Creek, Lake Palmdale, Palmdale Ditch, California Aqueduct, Kentucky Springs Canyon, Soledad Canyon, Bee Box Canyon, Bootlegger Canyon, Hughes Canyon, Bobcat Canyon, Long Canyon, Aqua Dulce Canyon, Bee Canyon, Oak Spring Canyon, Santa Clara River, Soledad Canyon, Placerita Creek, Whitney Canyon.

Alignment Option 3 and 3A / 4 and 4A

Threatened and endangered species :

1) California red-legged frog **FT**
Critical habitat designation LA watersheds

2) Unarmored threespine stickleback **FE / SE**
Soledad canyon portion of the Santa Clara River
Upper San Fransiquito Canyon

3) Southern steelhead **FE**
Santa Clara River

4) Bald eagle **ST**
Inland Lakes

5) Peregrine falcon **ST**
Inland Lakes

6) Tehachapi slender salamander **ST**
Tehachapi Mountains of Kern County
Possibly in LA County

7) Blunt-nosed leopard lizard **FE / SE**
Tehachapi Mountain Kern County
Antelope Valley foothill region

8) California jewel flower **FE / SE**
Foothills of Kern County

9) San Joaquin kit fox **FE / ST**

Bakersfield area

10) San Joaquin antelope squirrel **ST**
Bakersfield area

11) Bakersfield cactus **FE**
Vicinity of Bakersfield

12) San Joaquin woolly-threads **FE**
Bakersfield area

13) Proposed ESA

Parks and Recreation / Wildlife Refuge:

2) Vasquez Rocks City Park

3) Antelope Valley Poppy Reserve Park

4) Angeles National Forest

5) Hungry Valley State Vehicular Recreation Area

Major Water Crossings:

Eastside Canal, Edison Channel, Tecuya Creek, Grapevine Creek, Pastoria Creek, Los Alamos Creek, Little Sycamore Canyon, Big Sycamore Canyon, Myrick Canyon, Willow Springs Canyon, Amargosa Creek, Lake Palmdale, Palmdale Ditch, Kentucky Springs Canyon, Soledad Canyon, Bee Box Canyon, Bootlegger Canyon, Hughes Canyon, Bobcat Canyon, Long Canyon, Aqua Dulce Canyon, Bee Canyon, Oak Spring Canyon, Santa Clara River, Soledad Canyon, Placerita Creek, Whitney Canyon.

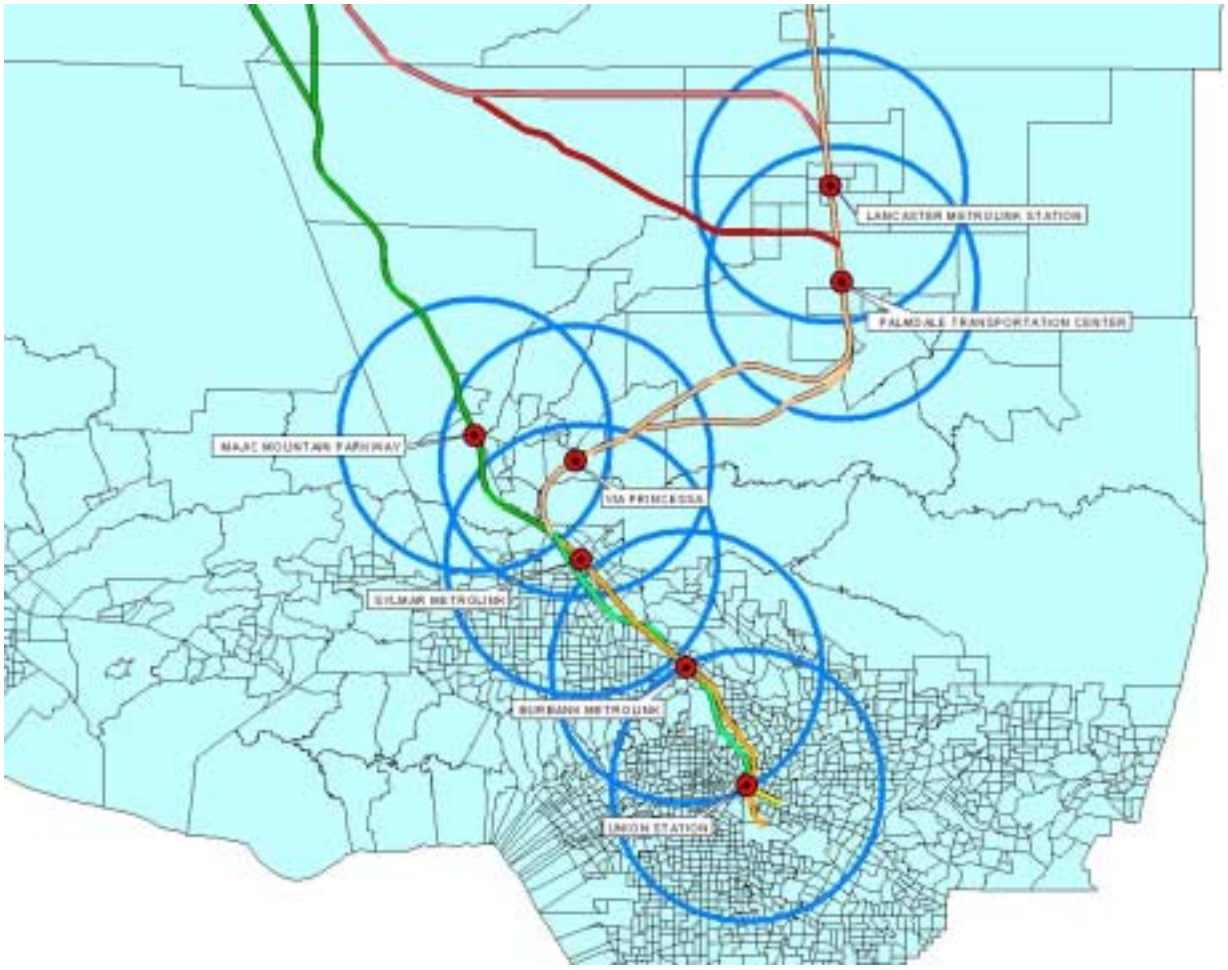
FE- federally endangered

FT-federally threatened

SE-state endangered

ST-state threatened

APPENDIX – C
Demographic Data



HSR Census: All Stations with 1400' buffer

STATION_ID	MINORITY	INPOVRTY
Burbank Airport	3172	441
Burbank Metrolink	1845	408
Downtown Palmdale	772	216
Lancaster Metrolink	622	194
Magic Mountain Pkwy	4	0
Palmdale Transportation Cntr	19	5
Roxford Road	1367	157
San Fernando Rd	2	0
SR 126 / I-5	152	1
Sylmar Metrolink	4138	501
The Old Road	4	0
Union Station 1	1912	231
Union Station 2	2156	414
Union Station 3	2603	752
Union Station 4	2823	881
Union Station 5	2747	836
Union Station 6	1492	197
Via Princessa	58	13

Clip1 SYLMAR METROLINK

RECORD_ID	KEY	TRACT90	PERSONS	EMPLOYED
249	06.037.1011	1011	2992	1605
250	06.037.1012	1012	5192	2716
252	06.037.1014	1014	2138	1165
253	06.037.102101	102101	2995	1365
254	06.037.102102	102102	6452	3448
255	06.037.103101	103101	2629	1408
256	06.037.103102	103102	4189	2082
257	06.037.1032	1032	5280	2701
258	06.037.1033	1033	3881	2156
259	06.037.1034	1034	5940	3176
260	06.037.104101	104101	6734	3081
261	06.037.104102	104102	8769	3656
262	06.037.104201	104201	4318	1913
263	06.037.104202	104202	5758	2413
264	06.037.1043	1043	8769	3288
265	06.037.104401	104401	4216	1781
266	06.037.104402	104402	4847	2013
267	06.037.1045	1045	4474	1775
268	06.037.1046	1046	7012	2623
269	06.037.104701	104701	4694	1269
270	06.037.104702	104702	4970	2217
271	06.037.1048	1048	9562	4184
272	06.037.1060	1060	8443	4313
273	06.037.106102	106102	7124	3417
274	06.037.106111	106111	3473	1944
275	06.037.106112	106112	4171	1900
276	06.037.106401	106401	7005	3337
277	06.037.106402	106402	5689	2991
278	06.037.1065	1065	7893	3564
279	06.037.106601	106601	9758	4416
280	06.037.106602	106602	5099	2722
281	06.037.106603	106603	3189	1778
282	06.037.106641	106641	2684	1585
283	06.037.106642	106642	2441	1332
284	06.037.106643	106643	3012	1597
285	06.037.1070	1070	6649	2917
286	06.037.108101	108101	2419	1388
287	06.037.108102	108102	3526	1986
288	06.037.108103	108103	3611	1751
289	06.037.108104	108104	1901	1086
290	06.037.1082	1082	2907	1829
291	06.037.1091	1091	2545	1079
292	06.037.1092	1092	2882	1426
293	06.037.1093	1093	3269	1747
294	06.037.1094	1094	4037	1948
295	06.037.1095	1095	2734	1220
296	06.037.109601	109601	2909	1360
297	06.037.109602	109602	3698	1918
298	06.037.1097	1097	3875	2070

299	06.037.1098	1098	4989	2573
300	06.037.1111	1111	5247	2793
301	06.037.111201	111201	2495	1395
302	06.037.111202	111202	4466	2361
303	06.037.111203	111203	6737	3635
304	06.037.111204	111204	5620	3138
305	06.037.111301	111301	6057	3783
306	06.037.111302	111302	4670	2910
307	06.037.1114	1114	6647	3618
308	06.037.1131	1131	6357	3355
309	06.037.113202	113202	1146	660
310	06.037.113211	113211	2575	1519
311	06.037.113212	113212	3010	1638
312	06.037.113213	113213	3808	2324
314	06.037.113232	113232	691	386
315	06.037.113233	113233	4230	2617
316	06.037.113234	113234	4459	2465
317	06.037.113301	113301	1982	869
318	06.037.113303	113303	3691	1983
319	06.037.113321	113321	4992	3207
320	06.037.113322	113322	4064	2262
321	06.037.113401	113401	4698	2555
322	06.037.113421	113421	4713	2741
323	06.037.113422	113422	5025	3046
324	06.037.115101	115101	4808	2406
325	06.037.115102	115102	2912	1832
326	06.037.115201	115201	5317	3305
327	06.037.115202	115202	5773	3487
328	06.037.115301	115301	3421	1888
329	06.037.115302	115302	4579	2099
330	06.037.115401	115401	5143	2669
331	06.037.115402	115402	5292	2745
332	06.037.1171	1171	3990	2256
333	06.037.1172	1172	4877	2300
334	06.037.117301	117301	3476	1931
335	06.037.117302	117302	4713	2379
336	06.037.117303	117303	2939	1592
337	06.037.117401	117401	9135	4364
338	06.037.117404	117404	3432	1922
339	06.037.1175	1175	10067	4827
340	06.037.1190	1190	5199	2442
341	06.037.1191	1191	4644	2233
342	06.037.1192	1192	3717	1815
343	06.037.1193	1193	14059	6747
344	06.037.1194	1194	5901	2888
345	06.037.1197	1197	4087	1990
346	06.037.1198	1198	4675	2331
347	06.037.1199	1199	5174	2625
348	06.037.1200	1200	10242	4681
349	06.037.120101	120101	5584	2832
350	06.037.120102	120102	7307	3541
351	06.037.1203	1203	3902	1926

352	06.037.1204	1204	4857	2369
353	06.037.1210	1210	7075	3462
354	06.037.1211	1211	4018	1967
355	06.037.1212	1212	7449	3460
356	06.037.1216	1216	2474	1269
357	06.037.1218	1218	6055	3048
358	06.037.1219	1219	3824	1734
359	06.037.1220	1220	4704	2392
360	06.037.1221	1221	7621	3414
361	06.037.1222	1222	5405	2416
362	06.037.1224	1224	8591	4101
363	06.037.1230	1230	7654	3441
364	06.037.123102	123102	7989	4255
365	06.037.123201	123201	7477	3507
366	06.037.123202	123202	5462	2387
367	06.037.123301	123301	3938	2259
368	06.037.123302	123302	6291	3138
369	06.037.1234	1234	8700	4073
370	06.037.1235	1235	6839	3234
371	06.037.123601	123601	4504	2318
372	06.037.123602	123602	3097	1731
373	06.037.1237	1237	3552	1825
374	06.037.1238	1238	4971	2895
375	06.037.1239	1239	5885	3039
376	06.037.1240	1240	4160	2362
377	06.037.124101	124101	6193	2880
378	06.037.124102	124102	3825	1973
379	06.037.124201	124201	3069	1461
380	06.037.124202	124202	5235	2600
381	06.037.1243	1243	4052	1930
382	06.037.1244	1244	3895	2073
383	06.037.1245	1245	2697	1516
384	06.037.1246	1246	4305	2390
385	06.037.1247	1247	4450	2455
386	06.037.124901	124901	5366	3076
387	06.037.1251	1251	5307	3325
388	06.037.1252	1252	3019	1810
389	06.037.1253	1253	5123	2386
390	06.037.1254	1254	1219	847
391	06.037.1255	1255	23	15
393	06.037.127101	127101	5977	3027
394	06.037.127102	127102	4031	2118
395	06.037.1272	1272	8152	4268
396	06.037.1273	1273	4280	2210
397	06.037.1274	1274	3622	1885
398	06.037.1275	1275	7626	4240
399	06.037.127601	127601	4507	2348
400	06.037.127602	127602	4941	2724
401	06.037.1277	1277	4836	2772
402	06.037.127801	127801	5657	2931
403	06.037.127802	127802	6344	3140
404	06.037.1279	1279	7631	3984

405	06.037.1281	1281	6231	3377
406	06.037.1282	1282	7049	3559
407	06.037.128301	128301	8349	3615
408	06.037.1284	1284	3880	2177
409	06.037.1285	1285	3512	1950
410	06.037.1286	1286	5223	2877
411	06.037.128701	128701	1374	781
412	06.037.128702	128702	5407	3012
413	06.037.1288	1288	6467	4226
414	06.037.1289	1289	3306	2124
415	06.037.1310	1310	9726	5210
416	06.037.1311	1311	2780	1421
417	06.037.1312	1312	2986	1575
418	06.037.1313	1313	4263	2263
419	06.037.1314	1314	4485	2428
420	06.037.1316	1316	4075	2009
421	06.037.1317	1317	6223	3670
422	06.037.1318	1318	3875	1967
423	06.037.1319	1319	3511	1940
424	06.037.1320	1320	5702	3085
425	06.037.1321	1321	4347	2851
426	06.037.1323	1323	5570	2967
427	06.037.1325	1325	6279	3255
428	06.037.1327	1327	4227	2222
429	06.037.1329	1329	3286	1667
430	06.037.1330	1330	5374	2755
431	06.037.133101	133101	4944	2287
432	06.037.1340	1340	1754	929
433	06.037.134101	134101	4149	2264
434	06.037.134102	134102	7046	3978
435	06.037.134201	134201	3040	1689
436	06.037.134301	134301	518	279
443	06.037.1347	1347	8048	4556
444	06.037.1348	1348	4932	2544
445	06.037.134901	134901	923	555
446	06.037.134902	134902	105	61
454	06.037.137101	137101	79	44
465	06.037.1390	1390	4738	2789
466	06.037.1392	1392	4823	2887
467	06.037.139301	139301	1754	1003
468	06.037.139302	139302	4047	2455
469	06.037.139303	139303	3687	2509
470	06.037.1394	1394	1150	585
471	06.037.139501	139501	7450	3794
472	06.037.139502	139502	1417	727
473	06.037.1396	1396	3806	2100
474	06.037.139701	139701	3320	1702
475	06.037.139702	139702	208	106
479	06.037.1411	1411	2264	1482
480	06.037.1412	1412	3982	2409
481	06.037.141301	141301	4316	2742
482	06.037.141302	141302	5019	3398

483	06.037.1414	1414	4133	2284
484	06.037.1415	1415	248	129
485	06.037.1416	1416	8	4
489	06.037.1433	1433	430	263
490	06.037.143401	143401	3475	2036
491	06.037.143402	143402	119	90
492	06.037.1435	1435	47	29
996	06.037.3101	3101	2353	1213
998	06.037.3103	3103	1329	662
999	06.037.3104	3104	3235	1689
1000	06.037.3105	3105	3045	1495
1001	06.037.3106	3106	3245	1768
1004	06.037.3109	3109	1066	557
1005	06.037.3110	3110	3398	1671
1006	06.037.3111	3111	3546	1776
1007	06.037.3112	3112	1397	798
1008	06.037.3113	3113	410	216
1015	06.037.3201	3201	5840	2512
1016	06.037.3202	3202	9242	3985
1017	06.037.3203	3203	7492	2964
1874	06.037.910801	910801	5104	2755
1875	06.037.910802	910802	74	36
1878	06.037.920003	920003	10575	5196
1881	06.037.920013	920013	1244	711
1882	06.037.920021	920021	831	456
1883	06.037.920022	920022	2207	1128
1884	06.037.920023	920023	1996	1192
1885	06.037.920024	920024	2960	1684
1886	06.037.920025	920025	9800	5658
1887	06.037.920101	920101	39	21
1890	06.037.920303	920303	547	328
1891	06.037.920311	920311	11314	6327
1892	06.037.920312	920312	4284	2201
1893	06.037.920313	920313	5315	2989
1894	06.037.920321	920321	7320	4264
1895	06.037.920322	920322	2803	1666
1896	06.037.920324	920324	5708	3294
1897	06.037.920325	920325	593	396
1899	06.037.9301	9301	2	0
1900	06.037.9302	9302	623	272
		TOTAL	**1,099,885**	**568,596**

Clip2 VIA PRINCESSA

RECORD_ID	KEY	TRACT90	PERSONS	EMPLOYED
257	06.037.1032	1032	431	221
258	06.037.1033	1033	26	15
260	06.037.104101	104101	6734	3081
261	06.037.104102	104102	6049	2522
262	06.037.104201	104201	4318	1913
263	06.037.104202	104202	5758	2413
264	06.037.1043	1043	8769	3288
265	06.037.104401	104401	4216	1781
266	06.037.104402	104402	4847	2013

267	06.037.1045	1045	1659	658
268	06.037.1046	1046	4828	1806
269	06.037.104701	104701	4694	1269
270	06.037.104702	104702	2011	897
272	06.037.1060	1060	8443	4313
273	06.037.106102	106102	7124	3417
274	06.037.106111	106111	3473	1944
275	06.037.106112	106112	4171	1900
276	06.037.106401	106401	7005	3337
277	06.037.106402	106402	5689	2991
278	06.037.1065	1065	7893	3564
279	06.037.106601	106601	9758	4416
280	06.037.106602	106602	5099	2722
281	06.037.106603	106603	3189	1778
282	06.037.106641	106641	2684	1585
283	06.037.106642	106642	2441	1332
284	06.037.106643	106643	3012	1597
285	06.037.1070	1070	6649	2917
286	06.037.108101	108101	2419	1388
287	06.037.108102	108102	2632	1483
288	06.037.108103	108103	3611	1751
289	06.037.108104	108104	1901	1086
290	06.037.1082	1082	1311	825
291	06.037.1091	1091	2545	1079
292	06.037.1092	1092	2882	1426
293	06.037.1093	1093	3269	1747
294	06.037.1094	1094	4037	1948
295	06.037.1095	1095	2734	1220
296	06.037.109601	109601	2408	1126
297	06.037.109602	109602	2780	1442
298	06.037.1097	1097	3875	2070
299	06.037.1098	1098	1843	950
300	06.037.1111	1111	5247	2793
301	06.037.111201	111201	2495	1395
302	06.037.111202	111202	4445	2350
303	06.037.111203	111203	2604	1405
304	06.037.111204	111204	71	40
305	06.037.111301	111301	2797	1747
307	06.037.1114	1114	3725	2027
341	06.037.1191	1191	2227	1071
342	06.037.1192	1192	998	487
1015	06.037.3201	3201	5840	2512
1016	06.037.3202	3202	9242	3985
1017	06.037.3203	3203	7492	2964
1874	06.037.910801	910801	10441	5636
1875	06.037.910802	910802	1187	578
1878	06.037.920003	920003	10575	5196
1879	06.037.920011	920011	5373	3007
1880	06.037.920012	920012	13398	7212
1881	06.037.920013	920013	3733	2132
1882	06.037.920021	920021	9241	5074
1883	06.037.920022	920022	4453	2276

1884	06.037.920023	920023	1996	1192
1885	06.037.920024	920024	2960	1684
1886	06.037.920025	920025	11691	6750
1887	06.037.920101	920101	7393	4107
1888	06.037.920102	920102	829	441
1889	06.037.9202	9202	6855	143
1890	06.037.920303	920303	283	169
1891	06.037.920311	920311	11501	6432
1892	06.037.920312	920312	4284	2201
1893	06.037.920313	920313	5315	2989
1894	06.037.920321	920321	9936	5787
1895	06.037.920322	920322	2803	1666
1896	06.037.920324	920324	10691	6170
1897	06.037.920325	920325	1200	801
1900	06.037.9302	9302	558	243
		TOTAL	**353,096**	**173,893**

Clip3 MAJIC MOUNTAIN PARKWAY

RECORD_ID	KEY	TRACT90	PERSONS	EMPLOYED
1	06.111.0001	0001	0	0
2	06.111.0002	0002	835	375
124	06.111.008302	008302	4839	2786
128	06.111.008402	008402	3692	2173
129	06.111.008501	008501	51	29
272	06.037.1060	1060	14	7
277	06.037.106402	106402	1168	614
278	06.037.1065	1065	5092	2299
279	06.037.106601	106601	617	279
280	06.037.106602	106602	1021	545
281	06.037.106603	106603	3189	1778
282	06.037.106641	106641	1998	1180
284	06.037.106643	106643	1524	808
286	06.037.108101	108101	9	5
287	06.037.108102	108102	1382	778
288	06.037.108103	108103	2091	1014
289	06.037.108104	108104	1901	1086
290	06.037.1082	1082	2283	1437
1874	06.037.910801	910801	288	156
1878	06.037.920003	920003	10163	4994
1879	06.037.920011	920011	4977	2785
1880	06.037.920012	920012	13398	7212
1881	06.037.920013	920013	3733	2132
1882	06.037.920021	920021	4995	2743
1883	06.037.920022	920022	4453	2276
1884	06.037.920023	920023	1996	1192
1885	06.037.920024	920024	2960	1684
1886	06.037.920025	920025	11691	6750
1887	06.037.920101	920101	7393	4107
1888	06.037.920102	920102	4758	2527
1889	06.037.9202	9202	8748	183
1890	06.037.920303	920303	892	534
1891	06.037.920311	920311	11501	6432
1892	06.037.920312	920312	4284	2201

1893	06.037.920313	920313	5315	2989
1894	06.037.920321	920321	9936	5787
1895	06.037.920322	920322	2803	1666
1896	06.037.920324	920324	10691	6170
1897	06.037.920325	920325	1702	1137
1900	06.037.9302	9302	132	58
		TOTAL	**158,516**	**82,907**

Clip4 LANCASTER METROLINK STATION

RECORD_ID	KEY	TRACT90	PERSONS	EMPLOYED
1849	06.037.9002	9002	648	253
1850	06.037.9003	9003	1972	753
1851	06.037.9005	9005	19713	9025
1852	06.037.900601	900601	8707	3764
1853	06.037.900602	900602	5075	1921
1854	06.037.900603	900603	7477	3338
1855	06.037.900701	900701	4667	2171
1856	06.037.900702	900702	11365	5920
1857	06.037.900801	900801	7321	3122
1858	06.037.900802	900802	7684	3202
1859	06.037.9009	9009	1984	935
1860	06.037.901001	901001	12067	4175
1861	06.037.901002	901002	11098	5353
1862	06.037.9011	9011	7151	3072
1863	06.037.901201	901201	1955	751
1865	06.037.9100	9100	0	0
1866	06.037.9101	9101	1175	430
1867	06.037.9102	9102	6961	3195
1868	06.037.9103	9103	7145	3589
1869	06.037.9104	9104	12000	5330
1870	06.037.9105	9105	14325	5757
1871	06.037.9106	9106	17851	7784
1872	06.037.910701	910701	977	462
1873	06.037.910702	910702	184	89
1875	06.037.910802	910802	1	1
1999	06.029.005506	005506	99	37
2001	06.029.0057	0057	98	20
2002	06.029.0058	0058	191	82
		TOTAL	**169,892**	**74,531**

APPENDIX – D
Geotechnical Report

SCREENING EVALUATION REPORT
GEOLOGIC, SEISMIC, AND SOILS ISSUES
PROPOSED LOS ANGELES –
BAKERSFIELD SEGMENT
CALIFORNIA HIGH SPEED RAIL

May 31, 2001

May 31, 2001
File: 79-200026-002

Ms. Sylvia Salenius
P&D Environmental
999 Town & Country Road, 4th Floor
Orange, California 92608

Subject: Alternative Alignment/Station Screening Evaluation Report
Proposed California High Speed Rail
Los Angeles – Bakersfield Segment, California

Dear Ms. Salenius:

Kleinfelder, Inc. (Kleinfelder) is pleased to provide this letter-report summarizing the results of our Alignment/Station Screening Evaluation for the Los Angeles to Bakersfield segment of the California High Speed Rail (HSR). Our evaluation was performed in general accordance with our proposal dated _____ and the final contract dated _____. Our analysis of the proposed alternative alignments and stations was performed by comparing these locations with compiled, existing geologic, seismic, and soils maps in GIS format. Alignments and stations were provided by P&D Environmental. The following report summarized the proposed project, methodology and scope of services, general geologic, seismic, and soils conditions, results of the screening evaluation, and conclusions and recommendations regarding future studies.

Based on the results of this evaluation, it appears that the proposed HSR segment can be effectively designed and constructed provided the following conditions are taken into consideration:

- **Fault Crossings** – Ground rupture is probable where the proposed alignment crosses active faults. Magnitude, direction(s), probability, and location of displacement can be predicted based on detailed investigation of these crossings during the early design stage of the project. Where these fault crossings cannot be avoided by project planning, they will require design to accommodate this ground rupture to the extent practical as well as early warning and emergency systems.
- **Ground Motion** – Several portions of the proposed alignments and stations are located in areas identified as high probability and magnitude of ground motion from earthquakes. Project planning should avoid these areas to the extent practical and alignments and stations should be designed to accommodate this potential ground motion.
- **Slope Stability** – Steeper slope areas underlain by weaker geologic formations may be susceptible to slope failure that may impact the proposed alignment and stations. Two conditions of instability exist including unstable existing (natural) slopes and unstable geologic materials that are prone to failure when excavated to form cut slopes. These areas have been identified in this screening evaluation and should be avoided to the extent practical through planning efforts and, where not avoided, will require detailed investigation and mitigation design. This condition is most notable in areas where existing, large landslides exist and where proposed design includes steep cut slopes and/or retaining structures.

- **Liquefaction** – Areas underlain by younger geologic units such as alluvium, where shallow groundwater and high ground motions coexist, may be susceptible to rapid settlement or flowing of the ground surface known as "liquefaction". These areas should be avoided by project planning to the extent practical and, where unavoidable, should be investigated in detail and mitigated, as required. Alternative methods of liquefaction mitigation are discussed herein.
- **Construction and Maintenance Issues** – Several other geologic, seismic, and/or soils conditions exist along the proposed alignments/stations that may influence the cost of construction and/or will require unusual maintenance. These conditions include ripability (i.e. difficulty of excavation), compressible soils, subsidence, and other typical geotechnical engineering factors. Areas where these conditions are most prevalent and/or severe are approximated and mitigation alternatives are outlined herein.

We sincerely appreciate the opportunity to be of service to P&D Environmental and it's team members and the California HSR Authority. Should you have any questions or require additional information, please do not hesitate to contact either of the undersigned professionals.

Respectfully,

KLEINFELDER, INC.

Bruce R. Hilton RG, CEG
Senior Engineering Geologist

John S. Lohman PE, GE
Los Angeles Regional Manager

BRH:JSL:mh

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Introduction

Kleinfelder has performed an evaluation of the alternative alignments and stations for the Los Angeles to Bakersfield segment of the proposed California High Speed Rail (HSR). The HSR has been considered in California and has been declined funding a number of times in the past tow decades. This study has been undertaken to address several alternative technologies, alignments, and station locations to provide high speed transit to Californians. This initial study is focused on screening level analysis of major issues in an attempt to "steer" future planning and design elements of the proposed project.

Kleinfelder's role in this initial screening-level study is to provide input regarding geologic, seismic, and soils (i.e. geotechnical engineering) issues that may influence the planning, design, construction, and/or maintenance of the proposed project. With the assistance of others on the project team, we have compiled geologic, seismic, and soils maps that cover the proposed alignment and station areas in GIS (Geographic Information Systems) format using ArcView version 3.2. This information was developed in order to compare the relative impact of these issues on each alternative alignment and station.

The following report summarizes the results of that evaluation and provides recommendations for future planning, design, construction, and maintenance stages of the proposed project. Alternatives for mitigation of issues that, if not avoidable via project planning, may influence performance of the project.

PROJECT DESCRIPTION

California High Speed Rail History and Previous Studies

The California Intercity High-Speed Rail Commission (Commission) was established in 1993 by Senate Concurrent Resolution (SCR) 6 to investigate the feasibility of high-speed rail for California, specifically, a system connecting the San Francisco Bay Area, Los Angeles, San Diego, and Sacramento. To address this question of feasibility, the Commission successfully conducted a series of technical studies encompassing ridership and revenue forecasts; economic impact and benefit cost analyses; institutional and financing options; corridor evaluation and environmental impacts and constraints analyses; and preliminary engineering feasibility studies. Based on these studies, the Commission determined that a high-speed train system is technically, environmentally,

and economically feasible and set forth recommendations for the technology, corridors, financing, and operation for this system.

The California High-Speed Rail Authority was created by the state Legislature in 1996 (Chapter 796 of the Statutes of 1996 — Senate Bill 1420, Kopp and Costa) to be an implementing agency that would construct, operate, and fund a statewide, intercity high-speed passenger train system. Based on recently completed studies, evaluations, and previous analysis, the Authority has developed a plan to implement a statewide high-speed train system in California. The current proposal is presented in the Authority's Business Plan. 2 The plan describes a 700-mile (1,126-kilometer) -long system capable of speeds in excess of 200 miles per hour (mph) (320 kilometers per hour [km/h]) on dedicated, fully grade-separated tracks with state-of-the-art safety, signaling, and automated train control systems. The system would serve the major metropolitan centers of California.

Beginning in 1992, three planning and engineering studies have been completed under the direction of the California Department of Transportation (Caltrans), the past Commission, and the current Authority. While the studies differed in terms of their specific scopes of work, they all shared the common focus of identifying potential corridors for the implementation of high-speed train lines and evaluating the feasibility and viability of these corridors.

It is important to note that several other studies and analyses were also completed, under the direction of the Commission and Authority, pertaining to ridership, financing, public outreach, and economic impacts. These previous studies included:

- Parsons Brinckerhoff. Los Angeles - Bakersfield High-Speed Ground Transportation Preliminary Engineering Feasibility Study Final Report. Prepared for Caltrans, December 1994.

- Parsons Brinckerhoff. California High-Speed Rail Corridor Evaluation and Environmental Constraints Analysis. Prepared for California Intercity High-Speed Rail Commission, June 1996.

- Parsons Brinckerhoff. California High-Speed Rail Corridor Evaluation. Prepared for California High-Speed Rail Authority, December1999.

Proposed Alignments and Stations

The Authority has defined alternative corridors for consideration in the preparation of a program EIR/EIS (Authority Resolution 99-5, July 1999). These four corridors and associated station locations are defined by region, as follows:

- San Diego to Los Angeles
- Los Angeles to Bakersfield
- Sacramento to Bakersfield
- Merced to the Bay Area

This evaluation addresses the second alignment from Los Angeles to Bakersfield, as shown on Plate 1. The following potential station locations were defined in previous planning and engineering studies: San Diego, Mira Mesa, Escondido, Temecula, Riverside, Ontario International Airport (ONT), East San Gabriel Valley, University Town Center (La Jolla), Oceanside, Irvine, Anaheim, Norwalk, Los Angeles International Airport (LAX), Los Angeles Union Station, Burbank, Santa Clarita, Palmdale, Bakersfield, Tulare County/Visalia, Fresno, Merced, Modesto, Stockton, Sacramento, Los Banos, Gilroy, San Jose, Redwood City, San Francisco International Airport (SFO), San Francisco, Fremont/Newark, Oakland International Airport (OAK), and Oakland. The potential sites listed represent general locations for planning purposes. Specific siting for stations will be refined through the program environmental process. Station placement will be determined based on ridership potential, system-wide needs, and local planning constraints/conditions. Station placement will be coordinated with local and regional planning agencies, and will provide for seamless connectivity with other modes of travel.

There are two principal types of stations: terminus and intermediate. Terminus stations are those where all trains are planned to stop. San Diego, Los Angeles Union Station, LAX, San Francisco, Oakland, and Sacramento are all planned as terminus stations. All other potential stations are intermediate stations. Intermediate stations will provide off-line passenger platforms allowing for pass-through express services on the dual track mainline. The specific features and amenities will vary between stations, depending on passenger demand and station type (i.e., terminal or intermediate). Amenities should be focused on convenience and ease of transfer to and from other modes of transportation.

System Performance Criteria

System design criteria are to include electric propulsion system, fully grade-separated guideway, and fully access-controlled guideway with intrusion monitoring systems. Track geometry must maintain passenger comfort criteria (smoothness of ride, lateral acceleration less than 0.1g). The system capabilities are to include:

- All weather/all season operation,
- Capable of sustained vertical gradient of 3.5 percent without significant degradation in performance,
- Capable of operating parcel and special freight service as a secondary use,
- Capable of safe, comfortable and efficient operation at speeds of over 200 mph (320 km/h),
- Capable of maintaining operations at three-minute headways, and
- High-capacity and redundant communications systems capable of supporting fully automatic train control.

At a minimum, the system infrastructure is to include dual track/guideway mainline with off-line station stopping tracks and other special trackwork as required for safe and efficient operation. The system must be capable of accommodating a wide range of passenger demand (up to 26,000 passengers per hour per direction). The system must accommodate normal maintenance activities without disruption to daily operations. Daily service level estimates are shown for the entire HSR on Plate 2.

System Technology

The design, cost and performance parameters defined in this document are based on two technology groups. The groups are classified by their speed (both currently obtainable speeds as well as targeted speeds that may result from further research and development) and by similar design characteristics. The Very High Speed (VHS) group includes trains capable of maximum operating speeds near 220 mph (350 km/h) utilizing steel-wheel-on-steel-rail technology, as shown on Figure 1. To operate at high speeds, a dedicated, fully grade-separated right-of-way is necessary with more stringent alignment requirements than those needed for lower speed lines. However, it is possible to integrate VHS systems

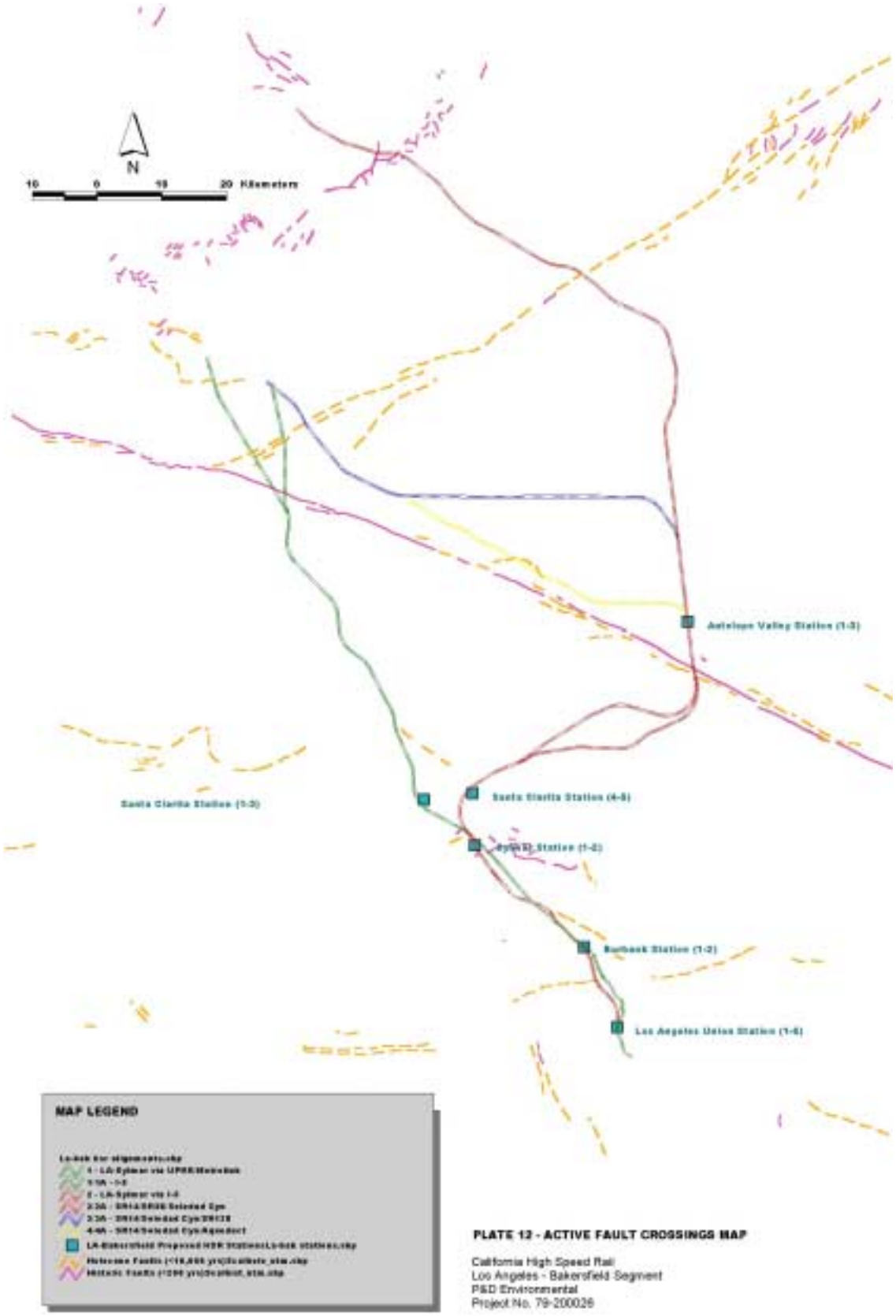

PLATE 12 - ACTIVE FAULT CROSSINGS MAP

California High Speed Rail
Los Angeles - Bakersfield Segment
P&D Environmental
Project No. 79-200026

into existing conventional rail lines in the congested urban areas given resolution of certain equipment and operating compatibility issues. All VHS systems in operation use electric propulsion with overhead catenary and include the Train à Grande Vitesse (TGV) in France operating at 186 mph (300 km/h) and the InterCity Express (ICE) in Germany, which operates at 155 mph (250 km/h).

The magnetic levitation (maglev) group utilizes either attractive or repulsive magnetic forces to lift and propel the train along a guideway. Current systems under development are designed for maximum operating speeds above that of VHS technology. The Federal Railroad Administration's (FRA's) Maglev Deployment Plan is currently considering maximum operating speeds of 240 mph (385 km/h) for the implementation of a maglev demonstration project in this country. Magnetic levitation allows the vehicles to hover or "float" a small distance above the guideway, thereby eliminating friction and rolling resistance. Due to the unique, dedicated guideway required, the shared use of rack by conventional steel wheel systems is not possible although right-of-way may be shared.

Design Criteria

There are generally three alignment configurations that are proposed including Grade Separation, horizontal alignment, and vertical alignment. These designs are illustrated in Plates 3 through 9 and are defined as follows:

- **Grade Separation:** Due to the safety and performance requirements, there will be no grade crossings permitted on the dedicated high-speed train lines. No unauthorized vehicles or pedestrians will be permitted to enter the corridor or cross the tracks at grade, which would expose them to a possible collision with a train. In addition, the right-of-way will be fully access controlled (fenced) in areas of high-speed operation to avoid intrusion by pedestrians, wildlife and livestock. This requirement applies to both the dedicated and shared use operation alternatives.

- **Horizontal Alignment:** The horizontal alignment design parameters are based on passenger comfort; limiting the lateral force on the passenger. To limit the discomfort caused by excessive lateral force, the track is superelevated (tilted) toward the inside of the curves. Minimum lengths of tangents and curves are required for VHS, and spiral transition curves are applied to assure a gradual introduction of lateral force. The steady state lateral forces are limited to 0.1g or 3.2 ft/s 2 (1 m/s 2) in the design parameters described below for both technology

groups. Table 3.2-3 includes formulae for determining superelevation and minimum lengths of tangents, curves, and transition curves for the two technology groups.

- **Vertical Alignment:** The vertical alignment, also known as the profile, traces the elevation of the top of rail or top of the maglev guideway running surface. Maximum profile gradients are based on trainset performance. The length of vertical curves is governed by the vertical force that passengers can comfortably experience in profile crests and sags. According to standard U.S. passenger rail practices, the allowable forces in sags (downward 0.03g) is slightly greater than that for crests (upward 0.02g) and are practically the same from a standpoint of minimum and desirable criteria. There is also a minimum length of profile tangent and vertical curves, which prevent a roller coaster effect in profiles.

Several key factors are considered in the identification of potential station stops along the system, including ability to maintain approach and through service speed; cost; ridership potential; operating policy; local access times; intermodal connectivity; and the distribution of population and major destinations along the route. All intermediate stations incorporate siding tracks for stopping trains, allowing through movement of express trains. This assumption directly addresses speed and operating issues. In general, stations are spaced following the pattern of urban centers (about 50 miles [80.5 kilometers] apart in rural areas), with overall average spacing at approximately 30 miles (48.3 kilometers), and an average spacing of 15 miles (24.1 kilometers). Closer spacing would have significant impacts on the ability to operate express and local traffic on the same dual track system in these areas due to substantial differences in operating speeds.

There are two principal types of stations: terminus and intermediate. Terminus stations are those where all trains are planned to stop and perhaps lay-over during non-peak periods. San Diego, Los Angeles Union Station, LAX, San Francisco, Oakland, and Sacramento are all planned as terminus stations. All other potential stations are intermediate stations. Intermediate stations will provide off-line passenger platforms allowing for pass-through express services on the dual track mainline. Each Regional Team is responsible for proposing station configurations that best meet the criteria defined herein for any shared use options considered in their region. Table 3.2-7 illustrates the forecasted daily boardings for each station in the year 2040, based on

Sensitivity Analysis Scenario 6B by Charles River Associates. This scenario represents the assumed conditions for the purposes of the environmental process.

Geologic, Seismic, and Soils Setting

The proposed Los Angeles to Bakersfield segment of the HSR will traverse widely varied geologic and tectonic terrane. This vicinity is situated primarily within the Transverse Ranges geomorphic province characterized by northwest-trending faults and folds and deformed Cenozoic sediments and Late Paleozoic plutonic rocks. The geology in the vicinity of the proposed alignment segment is shown on Plate 10. This map shows the alignments to be located within an area underlain primarily by older Precambrian plutonic and metamorphic rocks and younger Mesozoic intrusive rocks forming basement terrane. Mesozoic marine and recent continental deposits form blankets overlying these bedrock units. Shallow surficial soils have developed overlying these geologic units by residual weathering and/or colluviation and alluviation. Mapped soil units by the Soil Conservation Service are mapped on the basis of shallow (i.e. 0-6.5 feet deep) hand borings and aerial and field reconnaissance and are shown on Plate 11.

Tectonically, this segment of the HSR is situated within an historically active seismic area, as shown on Plate 12 due to the presence of several major and geologically young faults. This seismic activity is largely the result of the presence of the San Andreas Fault Zone which bisects the alignment/stations area in a northwest-trend and represents the boundary between the North American continental and Pacific oceanic tectonic plates. Although this boundary primarily manifests itself in right-lateral, strike slip sense of movement, several other active faults are generated by rotation and shearing of the boundaries of these two plates and are discussed in greater detail later in this report.

Alternative Alignment/Stations Screening Evaluation

As part of the program environmental process, a number of overall system modal alternatives (no-build, air, highway, rail) are required to be considered and compared to the proposed high-speed train system. Within the overall High-Speed Train Alternative, a range of alignment and station location options are to be considered. The majority of these options have been evaluated in previous studies and have been presented to the previous Intercity High-Speed Ground Transportation Commission and the current High-Speed Rail Authority. Some options were carried forward for further consideration and other options were removed from further consideration, based on their relative merit and viability for potential implementation as part of a statewide high-speed train system. The purpose of the Alignment Screening Evaluation is to consider all reasonable and practical alignment and station options at a consistent level of analysis and focus the program environmental analysis on the most viable of these alignment and station options. This screening process and information differentiating the most viable options will be presented to the Authority in June 2001.

This screening evaluation considers the following key activities: 1) Previous studies and past screening decisions, 2) alignment and station options not previously evaluated, 3) fatal flaws or inherent limitations and constraints, and 4) relative merit and viability as part of the proposed statewide high-speed train system.

Our evaluation of geologic, seismic, and soils included the following potential issues:

- Ripability (i.e. difficult of excavation)
- Potentially compressible soils
- Slope stability re natural and proposed cut slopes
- Subsidence potential
- Active fault crossings re ground rupture potential
- Probabilistic ground motion values
- Liquefaction potential

Each of these conditions is described in the following text along with our source of data, methodology, findings, and associated maps and graphics references. Table 1, Summary of Relative Ratings of Alternative Alignments/Stations. As requested, ratings were based on relative ratings by comparison of one alignment/station to the others. Ratings were given numerical values of 1 to 5; least favorable to most favorable, respectively.

RIPABILITY

Ripability is a term used by the construction industry to describe the difficulty of excavation of encountered earth units. Of course, ripability is wholly dependent upon the type and condition of excavation equipment and depth; neither of which are known at this planning stage for this project. However, relative hardness of earth units has been estimated based upon geologic information including age, lithology, and previous experience within this formation and/or area. Ripability was estimated based upon Jennings (1977) Geologic Map of California (Plate 10) which was available as a GIS file with a table of attributes. The attribute table was amended to include other data fields pertinent to this analysis. Ripability ratings were estimated for each formation from low to high, defined as follows:

- Low – Readily excavatable with typical earthwork equipment in good condition
- Medium – Generally excavatable with deeper cuts in some areas requiring heavy ripping or blasting
- High – Difficult excavation in areas where deeper cuts are proposed into rock may require blasting

The Ripability Constraints Map is included as Plate 13. Ratings included in Table 1 are based upon the relative portion of proposed alignments within the high ripability areas. Similarly, stations are rated based upon their presence within these high ripability areas. These ratings would primarily apply to alignments/stations where deeper cuts or tunnels are proposed.

Available Mitigation Options:

Ripability is a construction cost issue and not a project constraint. In order to reduce the impact of ripability on project costs, site-specific studies should be performed to assess the refractive velocity of underlying rock in comparison with proposed depths of

Alignment Alternatives:	"Soil/Slope Constraints": Compressible Soils (Plate 3) see Note 2 below	Slope Stability (Plate 4) see Note 3 below	Ripability (Plate 2) see Note 1 below	Subsidence Potential (Plate 5) see Note 4 below	"Seismic Constraints": Active Fault Crossings (Plate 7) see Note 5 below	Probable Ground Motion from Earthquakes (Plate 8) see Note 6 below	Liquefaction Potential see Note 7 below	Soil/Slope Overall Rating	Seismic Overall Rating
Alignment Option 1/I-5 Alignment	3	1	5	5	3	2	4	3.5	3
Alignment Option 1A/I-5 via Comanche Pt.	3	1	5	5	3	2	4	3.5	3
Alignment Option 2/Soledad Cn./SR-58	5	3	3	4	5	5	1	3.75	3.6667
Alignment Option 2A/SR-14/SR-58	5	3	3	4	5	5	1	3.75	3.6667
Alignment Option 3/Soledad Cn./SR-138	5	3	1	5	3	4	2	3.5	3
Alignment Option 3A/SR-14/SR-138	5	3	1	5	3	4	2	3.5	3
Alignment Option 4/Soledad Cn./Aqueduct	5	3	3	5	1	1	4	4	2
Alignment Option 4A/SR-14/Aqueduct	5	3	3	5	1	1	4	4	2
Alignment Option 1/Metrolink/UPRR	3	5	3	5	3	3	4	4	3.3333
Alignment Option 2/I-5 Fwy.	3	5	3	5	3	3	4	4	3.3333
Alignment Option 3/Combined I-5/UPRR	3	5	3	5	3	3	4	4	3.3333
Alignment Option 1/UPRR/El Monte/Colton									
Alignment Option 1A/SR-60									
Alignment Option 1B/I-10									
Alignment Option 2/SR-101									
Alignment Option 3/UPRR/Whittier Jct.									
Alignment Option 3A/BNSF/Hobart									
Alignment Option 4/I-5									
Alignment Option 5/BNSF/Harbor Div.									
Station Alternatives:									
Antelope Valley Station Option 1/Lancaster Metrolink Station	3	5	5	3	5	3	4	4	4
Antelope Valley Station Option 2/Palmdale Transp. Ctr.	3	5	5	3	5	1	5	4	3.6667
Antelope Valley Station Option 3/Palmdale Blvd.	3	5	5	3	5	1	5	4	3.6667
Santa Clarita Station Option 1/SR-126/I-5 North	3	5	5	3	5	1	5	4	3.6667
Santa Clarita Station Option 2/Magic Mt. Pkwy./I-5 South	3	5	5	3	5	1	5	4	3.6667
Santa Clarita Station Option 3/The Old Road/I-5	3	5	5	3	5	1	5	4	3.6667
Santa Clarita Station Option 4/Via Princessa/SR-14	3	3	3	3	5	2	4	3	3.6667
Santa Clarita Station Option 5/San Fernando Rd./SR-14	3	5	3	3	5	1	5	3.5	3.6667
Sylmar Station Option 1/Roxford Rd.	3	5	5	3	3	1	5	4	3
Sylmar Station Option 2/Sylmar Metrolink Sta.	3	5	5	3	3	1	5	4	3
Burbank Station Option 1/Burbank Airport	3	5	5	3	5	3	4	4	4
Burbank Station Option 2/Burbank Metrolink/Media City	3	5	5	3	5	3	4	4	4
Los Angeles Union Station Option 1/Existing Union Station	3	5	5	3	5	5	2	4	4
Los Angeles Union Station Option 2/Union Sta. South (Thru)	3	5	5	3	5	5	2	4	4
Los Angeles Union Station Option 3/Union Sta. South (Stub)	3	5	5	3	5	5	2	4	4
Los Angeles Union Station Option 4/LA River West	3	5	5	3	5	5	2	4	4
Los Angeles Union Station Option 5/LA River East	3	5	5	3	5	5	2	4	4
Los Angeles Union Station Option 6/Cornfield Site	3	5	5	3	5	5	2	4	4

Notes:

1. Earth unit hardness rating based on Jennings, 1977 geologic map of California
2. Earth unit compressibility rating based on Jennings, 1977 geologic map of California
3. Earth unit slope stability rating based on Jennings, 1977 geologic map of California and topographic base re gradients
4. Subsidence potential based on Poland, 1975 map of subsidence in San Joaquin Valley
5. Number of active (i.e. Holocene; <10,000 year old) fault crossings
6. CDMG ground motion map re soft rock, 10% excedance in 50 years (10% @ 100 yrs considered applicable but values relative)
7. Computed by adding compressibility and ground motion potential ratings.

excavation. This data should be compared to subsurface data for "ground truthing" or verification of the validity of refraction data. Comparison of this information with known excavation characteristics as in existing deep cuts is extremely beneficial in assessing ripability.

Mitigation options may include:

- Avoiding areas of known ripability
- Reducing the depth of cuts
- Use of large, earthwork equipment rather than excavators or smaller equipment
- Pre-blasting or pre-fracturing of rock prior to excavation where deemed economically beneficial

POTENTIALLY COMPRESSIBLE SOILS

Younger, unconsolidated formations such as alluvium exist along generally gentler and low-lying areas of the proposed alignments and stations. In areas where these sediments are low density, they may be susceptible to settlement under proposed loads associated with alignments and stations. Therefore, this potential is very dependant upon proposed loads which are unknown at this time. However, relative ratings of alignments/stations can be assessed by comparing the relative presence of potentially compressible formations.

Compressibility was estimated based upon Jennings (1977) Geologic Map of California (Plate 10) which was available as a GIS file with a table of attributes. The attribute table was amended to include other data fields pertinent to this analysis. Compressibility ratings were estimated for each formation from low to high, defined as follows:

- Low – Generally older, harder formations and rock unlikely to be compressible
- Medium – Intermediate hardness units considered unlikely to marginal relative to compressibility
- High – Generally younger, unconsolidated deposits considered most likely to be compressible

The Compressible Soils Constraints Map is included as Plate 14. Ratings included in Table 1 are based upon the relative portion of proposed alignments within the high compressibility areas. Similarly, stations are rated based upon their presence within these high compressibility areas. These ratings would primarily apply to alignments/stations where heavy loads such as columns or deep fills are proposed.

Available Mitigation Options:

Compressible soils generally require removal or in place densification to improve their load capacity. In general, this condition is an impact to construction costs and not a project constraint. In order to reduce the impact of compressible soils on project costs, site-specific studies should be performed to assess the density and support characteristics in comparison with proposed project loads. Mitigation options may include:

- Avoiding areas of known compressibility
- Reducing proposed loads
- Improving soil density by in-place densification or removal and replacement as engineered fill

SLOPE STABILITY ISSUES

Slope stability ratings were estimated assuming that younger alluvial and soil deposits, although generally weak and unstable, occur in low-lying areas where slope gradients are relatively gentle and where primarily fills and not deep cuts would be proposed. Mio-Pliocene marine sedimentary formations and the Franciscan melange of the coast ranges are generally California's least stable formations and were rated in that manner. Although these formations generally form moderate topography, these units were not compared to slope gradients and therefore will vary from one location to the next. In addition, proposed cut slopes and retaining structures will need to be designed to accommodate lateral loads but, as yet, have not been designed. Relative ratings of the alignments/stations were assessed by comparing the relative presence of potentially unstable geologic formations. In this area, the Mio-Pliocene marine formations received the lowest rating for stability. Stability ratings were estimated based upon Jennings (1977) Geologic Map of California (Plate 10) which was available as a GIS file with a table of attributes. The attribute table was amended to include other data fields pertinent

to this analysis. Slope stability ratings were estimated for each formation from low to high, defined as follows:

- Low – Probably stable formations consisting of hard rock or granular continental deposits
- Medium – Formations with marginal stability including largely continental deposits and older (Paleozoic) marine sediments
- High – Potentially unstable formations consisting largely of Mio-Pliocene marine sediments

The Slope Stability Constraints Map is included as Plate 15. Ratings included in Table 1 are based upon the relative portion of proposed alignments within the high slope stability prone areas. Similarly, stations are rated based upon their presence within these high instability areas. These ratings would primarily apply to alignments/stations where steeper natural topography or deep cuts are proposed.

Available Mitigation Options:

Areas of potential instability have been estimated on the basis of the presence of formations known to have poor slope stability performance. As project design is developed, site-specific investigations should be performed to evaluate the stability of existing natural slopes, proposed cuts, and/or existing landslides. In general, this condition is an impact to construction costs and not a project constraint. In order to reduce the impact of unstable slopes on project costs, site-specific studies should be performed to assess the existing and proposed grades and slope gradient to subsurface earth unit strength characteristics and present/anticipated future groundwater conditions. Mitigation options may include:

- Avoiding areas of known instability such as steep slopes or known landslides
- Control of surface and groundwater conditions
- Offloading of upper areas of potential driving forces and/or loading of toes
- Design and construction of retaining systems

SUBSIDENCE POTENTIAL

Subsidence has occurred throughout California as a result primarily of groundwater and/or oil and gas extraction. As much as 28 feet of subsidence has been recorded in some severe areas. Hydrocompaction, the densification of deep soils resulting from removal of fluid pressures, has resulted in dramatic ground deformation, as shown in Figure 2. As shown on Plate 16, Poland (1975) has mapped land subsidence throughout the Central Valley and extending south of Bakersfield to the boundary of the alluvial basin. Subsidence mapped in this vicinity is estimated to be less than 1 foot at the northern end of the SR-58 alignment. The potential for subsidence in this area was used as a basis for rating alignments/stations.

Available Mitigation Options:

Subsidence areas have been identified on the basis of historic subsidence and may not reflect current conditions. As the project design is developed, further research regarding the recency and extent of subsidence should be performed. generally require removal or in place densification to improve their load capacity. In general, this condition is a regional problem that would be virtually impossible to mitigate at a project level and thus should be viewed as a maintenance issue. In order to reduce the impact of subsidence, if present, on maintenance costs, the following mitigation options could be incorporated:

- Avoiding areas of known subsidence potential
- Control of future withdrawal of groundwater and/or oil and gas
- Improving the resistance of that portion of the alignment to broadly distributed settlements

ACTIVE FAULT CROSSINGS

As described earlier herein, the Los Angeles-Bakersfield segment of the proposed HSR is located in a highly active tectonic region. The presence of active faults generally represents a project risk relative to the potential for ground rupture, strong ground motions (earthquakes), and liquefaction. Ground motion and liquefaction are addressed in subsequent sections herein. Ground rupture potential is generally estimated on the basis of the presence of geologically young faults with proven, significant displacements. Faults are classified in California by the recency of known displacement based upon aligned seismicity and/or surface/subsurface evidence of ground rupture associated with fault activity. These classifications include: 1) Active: Holocene activity (<10,000 years),

2) Potentially Active: Quaternary activity (<1,600,000 years) but no known evidence of Holocene activity, and 3) Inactive: No evidence of displacement during Quaternary time. For purposes of this evaluation, Active fault crossings were used as a basis for comparison of alignments/stations.

Jennings 1994 Fault Activity Map of California in digital (GIS) format was used as a basis for evaluation of Active fault crossings. Several Active faults occur within this area and include the following faults and associated recency of movement (from south to north):

- Hollywood-Raymond Fault – Holocene
- Verdugo Fault – Holocene
- San Fernando Fault – Historic (1971)
- San Gabriel Fault – Holocene
- San Andreas Fault – Historic (1857)
- Garlock Fault – Holocene
- Pleito Fault – Holocene
- White Wolf Fault – Historic (1952)

These faults and their associated activity are shown on Plate 17. This plate was used as a basis for counting the number of crossings at each alignment/station alternative. Overall ratings are shown on Table 1. The least favorable rating was given to alignments having the greatest number of Active fault crossings and the most favorable to those with the least number. Stations were compared on a similar basis.

This condition may be the most influential of all of the evaluated issues. These ground rupture potential crossings will be difficult to reduce the impact to a high speed train, but also represent the source of earthquakes resulting in strong ground motion and potential liquefaction discussed later herein.

Available Mitigation Options:

Ground rupture is generally thought of as an unmitigatable condition that requires project consideration to reduce the influence of the occurrence of ground rupture. In order to reduce the impact of ground rupture, site-specific research of existing, detailed studies in the area and possible site-specific investigation would be required to estimate the probability, location, direction, and magnitude of displacement along fault crossings. Once defined, the impact of fault crossings on the performance of the project could be improved by the following options:

- Avoiding areas of known fault crossings
- Design of rail alignments along fault crossings to be more resistant to ground displacement
- Incorporation of early-warning systems and emergency programs such as telecommunications and central operations controls

PROBABILISTIC GROUND MOTIONS

Ground motion generated by earthquakes has been evaluated in detail throughout California by the California Division of Mines and Geology (CDMG). As a result of the Seismic Hazards Mapping Program, the CDMG has generated statewide maps identifying potential ground motions and liquefaction potential. This program is intended to augment the Alquist-Priolo program that was performed and updated by the CDMG since 1971 for ground rupture potential.

Since 1996, ground motions are estimated on the basis of probability and magnitude. This is generally computed using a database of faults and historic earthquakes that combine to define the frequency and magnitude of earthquakes along with the slip rate of associated faults. Slip rate is defined as the known net displacement along a fault divided by the period of rupturing and is generally thought to be equivalent to probability of displacement. Using this method, ground motions are estimated spatially throughout the State for the Design Basis Earthquake (DBE and roughly equivalent to the former Maximum Probable Earthquake) and the Upper Bound Earthquake (UBE and generally equivalent to the former Maximum Credible Earthquake). These events are defined probabilistically as follows:

- DBE: 10% probability of exceedence in 50 years or recurrence interval of 450 years
- UBE: 10% probability of exceedance in 100 years or recurrence interval of 949 years

For purposes of this study, the soft rock map for the DBE event was used. Although the UBE event is considered more applicable for a lifeline facility such as the proposed HSR, DBE maps were readily available and were used to assess the relative ground motions.

Plate 18 shows the distribution of the estimated ground motions throughout the proposed alignment and station areas. An average acceleration value was computed for each alignment and used as the basis for rating the least and most favorable alignments, as presented in Table 1. Actual values for each station were used as the basis for comparison of station alternatives.

Since DBE values are only considered appropriate for preliminary planning of alignments and station selections, the UBE should be used once preliminary design is undertaken.

Available Mitigation Options:

Strong ground motions due to earthquakes can generally be mitigated by project design to include earthquake-resistant structures. Although this level of design effort should be performed, it is not expected practical to fully mitigate the potential for derailment of the train cars from the track or the track from the ground surface. The HSR technology selection should take the high seismic potential of much of California into consideration. Beyond this, the potential for and influence of ground motion can be reduced for the project by the following options:

- Avoiding areas of known high ground motions
- Planning stations on either side of high ground motion areas where train speed is reduced
- Incorporation of early-warning systems and emergency programs such as telecommunications and central operations controls

LIQUEFACTION POTENTIAL

Liquefaction is defined as the rapid loss of soil strength as a result of excess fluid pressures developed in response to strong ground motions. Therefore, liquefaction occurs when low-density, saturated soils are subjected to strong earthquake loading. The result is a sudden loss of soil support and flowing of soils, thus behaving as a liquid. Liquefaction has historically occurred along portions of the proposed alignments and generally occurs in areas where Active faults are capable of generating large earthquakes and low-density, saturated soils coexist. For purposes of this screening analysis, the ground motion rating was added to the potentially compressible soils rating to generate a corresponding, hybrid rating. These ratings are provided in Table 1. Although this rating may serve as a valuable tool for screening alignments and station alternatives, the potential for liquefaction should be investigated on a site-specific basis based upon geotechnical engineering analyses using current methods.

Available Mitigation Options:

Liquefaction is generally a construction cost issue that can be mitigated once identified through site-specific geotechnical engineering investigations. Once investigated, the influence of liquefaction potential on the project can be mitigated by one or a combination of the following options:

- Avoiding areas of known areas of liquefaction potential
- In-place densification of soils or removal and replacement as engineered fill
- Design of structures to accommodate potential resulting settlements

APPENDIX – E
Alignment Maps
(In Separate Oversize Volume)