

2.0 Alternatives

DesertXpress Enterprises, LLC (Applicant) proposes to construct and operate an interstate high-speed passenger train between southern California and Las Vegas, Nevada along an approximately 200 mile corridor. The Applicant proposes to construct nearly all of the fully grade-separated, dedicated double track, passenger-only railroad either in the median or immediately alongside Interstate 15 (I-15). Limited portions of the rail alignment alternatives considered would be located within existing railroad corridors or rights-of-way (ROW).¹

Alternatives evaluated and analyzed in this Environmental Impact Statement (EIS) include action alternatives for construction of the proposed high-speed train, and a “No Action” alternative.

2.1 SUMMARY OF ALTERNATIVES

2.1.1 NO ACTION ALTERNATIVE

The No Action Alternative is being studied as the baseline for comparison with the proposed action alternatives. The high-speed train and associated facilities would not be constructed. Under the No Action Alternative, access to Las Vegas would be via existing access utilizing highway (I-15) and airport (McCarran International Airport [LAS]) access. The No Action Alternative is detailed in **Section 2.3.1** below.

2.1.2 ACTION ALTERNATIVES

The Action Alternatives considered in this EIS have been categorized into two primary sets: Action Alternative A and Action Alternative B. These are based on potential alignment routings for the 200-mile corridor. For analytical purposes in this Final EIS, **each of the alignments is divided into segments. The Federal Railroad Administration’s (FRA) intent in organizing the document in this manner is to allow for Lead and Cooperating Agencies to “mix and match” various segments in composing a preferred alternative.**

¹ The use of any private railroad ROWs would be subject to approval by owner railroads. STB approval of the Project would not convey the authority to force any private railroad to sell, lease, or otherwise allow DesertXpress to use the ROW of an existing railroad.

- **Alternative A** consists primarily of rail alignment segments that would be within the **median** of the I-15 freeway.
- **Alternative B** consists primarily of rail alignment segments that would be within the **fenced area** of the I-15 freeway, adjacent to automobile travel lanes.

The remainder of this chapter is organized into the following sections:

- **Section 2.1** gives a brief summary of alternatives considered.
- **Section 2.2** describes the development of alternatives.
- **Section 2.3** describes the development of alternatives in detail.
- **Section 2.4** describes the selection of the Preferred Alternative.
- **Section 2.5** describes the Environmentally Preferred Alternative.

Preliminary engineering drawings of these components are included within **Appendix A** of the Draft EIS. **Appendix A** of the Draft EIS includes the following:

- **Appendix A-1:** Plan and profile drawings scale at 1 inch = 1,000 feet of the various rail alignment routings and ancillary facilities.
- **Appendix A-2:** Seven large-scale maps (each 36 inches by 48 inches) depicting the proposed rail segments and ancillary facilities at a large scale on maps features Township, Range, and Section detail from the Public Lands Survey System (PLSS).
- **Appendices A-3 and A-4:** Large sized site plans for proposed stations and maintenance facilities, identifying the proposed footprints of buildings, tail tracks, fuel storage facilities, radio signal towers, power substations, and other related features.
- **Appendix A-5:** Plan drawings at 1 inch = 1,000 feet showing footprints of the 17 proposed autotransformers sites and typical autotransformer layout.

The Supplemental Draft EIS included the following additional illustrative appendices:

- **Appendix S-A-1:** Plan and profile drawings at 1 inch = 1,000 feet of Segment 2C – Side Running and Median Options.
- **Appendix S-A-2 :** Plan and profile drawings at 1 inch = 1,000 feet of the Segment 4C Alignment.
- **Appendix S-A-3 :** Plan drawings of the Relocated Sloan MSF Site.
- **Appendix S-A-4 :** Plan drawings of the Wigwam Avenue MSF Modification.

This Final EIS includes the following additional illustrative appendices:

- **Appendix F-B:** Highway Interface Manual
- **Appendix F-C:** Plan and profile drawings of the Preferred Alternative.

2.1.2.1 Alignment Options

The Action Alternatives are subdivided into Action Alternative A alignments and Action Alternative B alignments for each of the seven segments comprising the entire project.

Action Alternative A alignments are identified as the “Median Alternatives” in that from Yermo, California, northeasterly to Clark County/Las Vegas (Segments 3 through 7), the alignments would primarily be located within the median of the I-15 freeway.

Action Alternative B alignments are identified as the “Right-of-Way Alternatives” in that for most of the distance between Victorville and Clark County/Las Vegas (Segments 1 through 7); the tracks would be located within or immediately adjacent to the ROW of the I-15 freeway.

Action Alternative A and B alignments would originate at one of the three Victorville Station alternatives and terminate at one of the four Las Vegas station alternatives.

A third alignment option was considered for Segments 6 and 7, Option C. The Option C alignment would diverge from the I-15 corridor near the community of Sloan in unincorporated Clark County and generally follow, or be located within, the existing Union Pacific Railroad (UPRR) ROW.² Option C would terminate at one of three Las Vegas Station options, Central A, Central B or Downtown (one station option, the Southern Station, could not be utilized in conjunction with the Option C alignment).³

In addition, in response to public and agency comments, the Supplemental Draft EIS also included an evaluation of a third alignment option for Segments 2 and 4, Segment 2C and Segment 4C. Two routing options were considered for Segment 2C, the Segment 2C Side Running and Segment 2C Median alignment options. Both alignment options would follow the I-15 freeway corridor through Barstow, located on the western and northern side of the I-15 and within the median, respectively. Segment 4C would diverge from the I-15 freeway corridor in the same location as Segment 4B considered in the Draft EIS. Segment 4C would extend to the north of the Clark Mountains through undeveloped lands, just west of the proposed Segment 4B alignment option, and re-connect with the I-15 freeway corridor in the vicinity of Primm.

Table F-2-1 summarizes the alignment options for the Action Alternatives. **Figures S-2-1 through S-2-5** of the Supplemental Draft EIS illustrate the alignment options for the Action Alternatives.

Action Alternative A alignments would provide median crossings for the segments located within the median of I-15 (Segments 3 through 7). For these portions, specifically between Yermo, California and Clark County/Las Vegas, the barriers and fencing along Action

² Option C would require approval by the UPRR.

³ Station options are discussed in further detail below in Section 2.4.9.3.

Alternative A Segments 3, 5, 6, and 7 would incorporate cross medians that would provide an opening for emergency access to the high-speed rail ROW. To provide access across the I-15 median for authorized emergency vehicles, such as police, fire, and paramedics, Action Alternative A rail alignments would provide culverts under the railroad ROW for the exclusive use of emergency vehicles. In addition to the existing accessible highway overpasses and underpasses, the cross medians would be located approximately every 10 miles, or as required by the respective State Highway Patrols and state Departments of Transportation. **Figure 2-2** of the Draft EIS shows the design concept of the cross median emergency access. Action Alternative B would not require the implementation of cross median emergency access, as these rail alignments would be located alongside the existing I-15 freeway, within the I-15 ROW. Emergency access across the I-15 median would thus be unaffected.

Table F-2-1 Summary of Action Alternatives

Segment	Action Alternative A	Action Alternative B	Option C	Preferred Alternative
1: Victorville to Lenwood	From any VV station alternative, Segment 1 would run along west side of I-15 corridor for 21 to 29 miles	From any VV station alternative, Segment 1 would run along west side of I-15 corridor for 21 to 29 miles	NA	Segment 1
2: Lenwood to Yermo	Segment 2 A/B, would cross the Mojave River and run through northern Barstow, then Segment 2A would run about 1 mile north of I-15 past Yermo	Segment 2 A/B, would cross the Mojave River and run through northern Barstow, then Segment 2B would run less than 0.5 mile north of I-15 past Yermo	Segment 2C alignment within the I-15 corridor through Barstow (side running and median options considered); then same as 2A from Old Hwy 58 to Yermo. .	Segment 2C Side Running
3: Yermo to Mountain Pass	Segment 3A: Within I-15 median	Segment 3B: West of I-15, running alongside freeway, except for a modification to the East side near Halloran Springs RD	NA	Segment 3B (Modified)
4: Mountain Pass to Primm	Segment 4A: Includes approx. 2 mile portion of MNP, then east of I-15	Segment 4B: Through new tunnels in mountains northwest of I-15, then overland until rejoining I-15 corridor at Primm	Segment 4C, similar to Segment 4B, but avoids planned solar energy projects	Segment 4C, absent legislation action to allow Segment 4A

Segment	Action Alternative A	Action Alternative B	Option C	Preferred Alternative
5: Primm to Sloan Road	Segment 5A: Within I-15 median	Segment 5B: Along east side of I-15	NA	Segment 5B
6: Sloan Road to Las Vegas (Southern or Central A/B Stations) ⁴	Segment 6A: Within I-15 median	Segment 6B: Varying from east to west side of I-15, except for 1.5 miles in an adjacent county transportation corridor	Segment 6C: UPRR Corridor	Segment 6B
7: West Twain Avenue to Downtown Station	Segment 7A: Within I-15 median	Segment 7B: West side of I-15	Segment 7C: UPRR Corridor	NA

Source: CirclePoint, 2009-2011.

2.1.2.2 Facility Options

The Action Alternatives would also include one of each of the following permanent physical facilities. This Final EIS examines multiple site options for these facilities.

Similar to the consideration of rail segments noted above, FRA's intent is to allow for the Lead and Cooperating Agencies to compose their preferred alternative by incorporating one each of the following permanent physical facilities. With very few exceptions, these physical facilities can connect to all rail alignment segments.

- **Victorville passenger station:** Two site options, Victorville Station Sites 1 and 2 (VV1 and VV2), immediately west of the I-15 freeway in the vicinity of Stoddard Wells Road and a third site option, Victorville Station Site 3 (VV3), at Dale Evans Parkway were considered.
- **Victorville Operations, Maintenance, and Storage Facility (OMSF):** Two site options (OMSF Site Option 1 (OMSF 1) and OMSF Site Option 2 (OMSF 2)) immediately west of the I-15 freeway were considered.
- **Maintenance of Way (MOW) facility:** One site option adjacent to the I-15 freeway near the community of Baker was considered.
- **Las Vegas area Maintenance and Storage Facility (MSF):** Four site options (Sloan Road MSF, Relocated Sloan Road MSF, Wigwam Avenue MSF, and Robindale Avenue MSF) were considered.

⁴ If Option C is selected for Segment 6, the terminus would be either Central Station A or B or the Downtown Station, via Segment 7A, 7B or Option C. Segment 6 Option C would not terminate at the Southern Station.

- **Las Vegas area passenger station:** Four site options in Clark County/City of Las Vegas (Southern Station, Central Station A, Central Station B, and Downtown Station) were considered.
- **Frias Substation:** To provide electrical power in the Las Vegas area in the event the electric multiple unit (EMU) train technology is selected.

2.1.2.3 Technology Options

The Applicant proposed two possible train technologies (referred to as “technology options”), detailed in **Section 2.3.2.4** of this Final EIS, which are each fully applicable to any set of the Action Alternatives.

- Diesel-Electric Multiple Unit Train (DEMU)
- Electric Multiple Unit Train (EMU)

The two technology options would have similar ROW width requirements and largely the same construction footprint. However, the EMU option would also include overhead catenary wires and supports (located along the length of the rail alignment), three electrical substations (one at an OMSF, one at the MOW, and one at an MSF), and approximately 17 transformers (each located on 4,000 to 5,000 square foot parcels at 10 mile intervals along the rail corridor). The EMU option would also require three electrical utility connections from the existing electrical grid: one in Victorville, one in Baker, and one near Sloan. Several train technologies for the DesertXpress project were considered but rejected from analysis in this Final EIS. Refer to **Section 2.2.3.3** of this Final EIS for further discussion.

2.1.3 APPLICANT’S PROPOSED ALTERNATIVE

A significant portion of the DesertXpress project would lie within Federal lands managed by the Bureau of Land Management (BLM). Construction and operation of an Action Alternative would require a ROW permit from the BLM. BLM required the project applicant to submit a preliminary ROW permit application. While this application included all alternatives and options considered, BLM required the applicant to designate an “Applicant’s Proposed Alternative.” **Section 2.1.2** of the Draft EIS identified the Applicant’s Proposed Alternative.

The Applicant’s Proposed Alternative has been updated since the publication of the Draft and Supplement Draft EIS and is detailed below.

Note that pursuant to 40 CFR 1502.14, this Final EIS identifies a distinct Preferred Alternative identified by FRA and the Cooperating Agencies (see **Section 2.4, Preferred Alternative**, below), which slightly varies from the Applicant’s Proposed Alternative, as described below.

The Applicant's Proposed Alternative has been identified by DesertXpress Enterprises, LLC as follows:

- **Rail Alignments**
 - Segment 1
 - Segment 2C Side Running
 - Segment 3B (as originally proposed, not Modified)
 - Segment 4C (*absent legislation allowing implementation of Segment 4A*)
 - Segment 5B
 - Segment 6B
- **Victorville Station Site Option:** Victorville Station Site 3, Parking Option B (VV3B)
- **Las Vegas Station Site Option:** Las Vegas Central Station B or Las Vegas Southern Station
- **Victorville OMSF Site Option:** OMSF 2
- **Las Vegas MSF Site Option:** Wigwam Avenue MSF
- **Las Vegas MSF Substation:** Frias Substation
- **Train Technology:** Electric Multiple Unit (EMU)

2.1.4 PREFERRED ALTERNATIVE

FRA, Federal Highway Administration (FHWA), BLM, National Park Service (NPS), and the Surface Transportation Board's (STB) Office of Environmental Analysis (OEA) have considered analysis of the No Action Alternative, Action Alternatives, and project modifications and additions presented in the Supplemental Draft EIS, as well as all public and agency comments received during the review periods for both the Draft EIS and Supplemental Draft EIS. Based on the foregoing, these bodies have identified a complete Preferred Alternative, composed of certain rail alignments, facilities, and a technology.

Section 2.4, Preferred Alternative, of this Final EIS identifies all components of the Preferred Alternative. **Figure F-1-1** shows an overview map of the Preferred Alternative, which includes:

- **Rail Alignments**
 - Segment 1
 - Segment 2C Side Running
 - Segment 3B (Modified)
 - Segment 4C (*absent legislation allowing implementation of Segment 4A*)
 - Segment 5B
 - Segment 6B

- **Victorville Station Site Option:** VV3B
- **Las Vegas Station Site Option:** Las Vegas Central Station B or Las Vegas Southern Station
- **Victorville OMSF Site Option:** OMSF 2
- **Las Vegas MSF Site Option:** Wigwam Avenue MSF
- **Las Vegas MSF Substation:** Frias Substation
- **Train Technology:** Electric (EMU)

2.2 CONSIDERATIONS IN THE DEVELOPMENT OF ALTERNATIVES

2.2.1 NO ACTION ALTERNATIVE

The No Action Alternative includes the system physical characteristics and capacity as they exist at the time of the Draft EIS and Supplemental Draft EIS (2006-2010) and, where possible, the planned and funded improvements that would be in place by the planning horizon year of 2030. **Section 2.3.1** below describes these improvements in detail.

A decision to select the No Action Alternative would mean that no high-speed passenger rail project would be constructed. As a private entity, the Applicant has neither an obligation nor authority to entertain alternative transportation investments other than its proposed action.

2.2.2 ACTION ALTERNATIVES

A number of the alignment alternatives for the proposed project have been studied by the Applicant and FRA. Technical criteria were developed largely by the Applicant and agreed to by the FRA. Environmental criteria were developed by FRA. This section describes the process used by the Applicant to evaluate conceptual alignment alternatives and to make feasibility and practicability determinations in consultation with the FRA and Cooperating Agencies during the environmental review process. **Table F-2-2** lists the key criteria used to distinguish among alignment alternatives. These criteria include technical and alignment factors, including connectivity, ROW constraints and compatibility, ridership potential, constructability, and environmental impacts. Agency criteria also included a review of project consistency with adopted plans and programs in effect in the project area and the minimization of any potential conflicts such as at-grade crossings of any roads, or conflicts with transportation purposes of the I-15 freeway corridor. Such criteria are used to screen the number of reasonable and practical potential alternatives, which are further reviewed against the technical criteria evaluated in the technical sections of this Final EIS.

In addition, the FRA and Cooperating Agencies in this EIS process have developed criteria for consideration of alternatives. **Table F-2-3** identifies the federal agency alternatives criteria.

In consultation with FRA and other Cooperating Agencies, the Applicant has removed some alternatives from further consideration based on technical and environmental criteria. See **Section 2.2.3** below for further discussion of such alternatives removed from further consideration.

Table F-2-2 Alternatives Criteria

Technical and Alignment Criteria
Travel-time competitive with highway travel (1 hour and 45 minutes or less)
Reliable and convenient mode of travel
Proven steel wheel on steel track technology
Maximize return on investment for this privately sponsored project
Minimize the need for private land acquisition
Limited restrictions on track geometry for reduced travel time and increased passenger comfort
Maximum vertical gradient of 4.5% and maximum 6.0-inch actual super elevation (Ea)
Capable of accommodating normal maintenance activities without disruption to daily operations of adjacent highway or rail operations
Tunnels less than one mile in length
Adequate space for emergency access and maintenance and inspection access to the trackway
Adequate trackbed drainage
Able to provide acceptable horizontal clearance from existing and proposed railroad tracks, and existing and proposed highway lanes
Environmental Criteria
Minimize impacts to parklands, including the Mojave National Preserve (Preserve)
Minimize impacts to known cultural resources, wetlands, habitat area for threatened and endangered species, nature preserves
Minimize the relocation of residences and commercial properties
Minimize noise to residential properties and sensitive receptors
Maximize connectivity with other transportation modes, including airports, monorail, and bus routes
Maximize ridership and mode shift from auto to improve air quality, energy use and safety along I-15 corridor.

Source: FRA, 2009.

Table F-2-3 Federal Agency Alternatives Criteria

Alternatives Criteria
Consistent with goals and objectives of approved policies and plans
Minimize conflicts while preserving safety and efficiency of existing highways and railroads
Minimize significant effects to environmental values
Minimize impacts to threatened and endangered species

Source: FRA, 2009.

Projected ridership was another important consideration. The Applicant has prepared a ridership study⁵ which was independently reviewed by qualified specialists under the exclusive direction of the FRA.⁶ **The Applicant's ridership study and FRA's ridership review are included as Appendix F-D to this Final EIS.**

The ridership projections with adjustments based on FRA's review were used as the basis for analysis in several sections of the Draft EIS, Supplemental Draft EIS, and Final EIS, including Sections 3.2, Growth; 3.5, Traffic and Transportation; 3.11, Air Quality and Global Climate Change; 3.12, Noise and Vibration; 3.13, Energy; and 3.16, Cumulative Effects. The ridership projections utilized in the Draft EIS, Supplemental Draft EIS, and Final EIS analysis are also shown in **Table F-2-4** below. **The FRA's ridership review also included a recommended three-year ramp-up period, to account for the time anticipated necessary to reach a higher level of ridership.**

Table F-2-4 Ridership Projections Utilized in EIS Analyses

Timeline	Diesel-Electric Multiple Unit (DEMU) Ridership Estimate	Electric Multiple Unit (EMU) Ridership Estimate
Opening Year		
Friday	8,334	10,574
Average Daily	5,335	6,773
Annually	1,947,478	2,472,305
Year 3 (following ramp-up)		
Friday	15,624	19,824
Average Daily	10,003	13,020
Annually	3,651,080	4,635,012
Buildout Year		
Friday Riders	21,925	27,818
Average Daily	14,037	17,820
Annual Riders	5,123,418	6,504,131

Source: Cambridge Systematics, 2008; URS, 2005

2.2.2.1 Alignment

At locations where the DesertXpress alignment would be within the I-15 corridor, it is assumed that continuous concrete vehicle barriers, as well as American Railway Engineering Maintenance of Way Association (AREMA) crash barriers, would be built at all supporting columns of bridges at freeway interchanges and overpasses. Tracks would be spaced 15 feet apart. Median alignments (Alternative A) would include drainage bunds, channels, and utilities. Final design for all segments of the project in the median or the

⁵ Desert Xpress Updated Ridership and Revenue Study, URS Corporation, December 2005.

⁶ DesertXpress Ridership Forecast Review, Cambridge Systematics, January 2008.

freeway ROW (Alternative B) would be reviewed and approved by the California Department of Transportation (Caltrans), Nevada Department of Transportation (NDOT), and FHWA. The project would also be consistent with FRA Safety regulations, as further discussed in **Section 2.3.2.6, Safety and Security**, of this Final EIS.

The system would use #20 high-speed switches to facilitate recovery and bypass strategies. The #20 switch utilizes two machines for switch point movement and permits a maximum tangent speed of 125 miles per hour (mph) and a maximum turnout speed of 50 mph. Switches for the sidings would be #10.

As a fully grade-separated passenger railway, structures and bridges would be constructed at major crossings of roads, rail tracks,⁷ and waterways or floodways. In addition, switch tracks may require additional crossings over I-15 or any of the noted major features. River crossings would require approval of the United States Army Corps of Engineers (404(b)1 approval).

2.2.2.2 Facilities

In addition to the passenger stations, OMSF, MSF, and MOW, other facilities would be required by selection of the EMU technology option. Specifically, the EMU technology option would require additional facilities in order to deliver and regulate electric power. These additional facilities include utility corridors, substations, and autotransformers. There are three proposed utility corridors listed below and shown on **Figures 2-1.1, 2-1.4, and 2-1.6** of the Draft EIS.

- **Victorville OMSF:** A utility corridor parallel to I-15 that would provide connection to either OMSF 1 or OMSF 2.
- **Baker MOW:** A utility corridor from the Southern California Edison substation at Nickel Mountain Road following Silver Lane to Arnold Avenue to the Baker MOW Facility Site.
- **Relocated Sloan Road MSF:** A utility corridor from the Nevada Power Transmission Line, served by the Nevada Power Big Horn Substation located north of Primm, to the Relocated Sloan Road MSF site adjacent to I-15.

The utility corridor ROW would have a typical width of approximately 100 feet. The access road contained in the corridor would be approximately 10 feet wide. The tower height of the elevated utility lines would range from 95 feet to 135 feet, depending upon land mark clearance. Tower spacing would range from 440 feet to 940 feet depending on tower height and necessary clearance. Each tower footprint would be approximately 24

⁷ Once the STB has authorized a rail construction, no other rail carrier can block the construction by refusing to permit the carrier from crossing its property as long as the construction does not unreasonably interfere with the operation of the crossed line; the operation does not materially interfere with the operation of the crossed line; and the owner of the crossing line compensates the owner of the crossed line, 49 U.S.C. 10901(d)(1).

square feet to 59 square feet in size, depending on the height of the tower. Typical tower configurations are shown in Draft EIS **Appendix A**. The utility towers would use a typical voltage of 230 kilovolt transmission, with 66 kilovolt for power distribution.

There are two potential electricity source options for the utility corridor to the Victorville OMSF site options. One option would be to connect to the existing Southern California **electric transmission “grid,” while the second option would connect to a proposed** substation that is planned to be built by the Victorville Municipal Utilities District on the west side of the Mojave River. Both of these electricity source options would utilize the same utility corridor.

Three substations would be needed along the entire route, one near each end of the rail line and one near the midpoint. The substations near the ends of the rail line would be located on the corresponding OMSF/MSF sites. The three electrical substations would be needed:

1. South end: At the Victorville OMSF
2. Midpoint: At the Baker MOW
3. North end: At the Relocated Sloan Road MSF or the Frias Substation site, depending on the selection of the Las Vegas MSF.⁸

Notably, the Frias Substation would not require the construction of a separate utility corridor, due to its location immediately adjacent to an existing Nevada Energy electrical transmission line (the Arden-Tolson Transmission line).

Substation diagrams and layouts are as shown on the detailed site plan drawings for the referenced maintenance facilities within Draft EIS **Appendix A**.

Preliminary engineering identified the need for a total of 17 autotransformers, spaced at 10 to 12 mile intervals along the alignment. These autotransformers help to maintain and regulate the voltage along the line. Each autotransformer would require a physical footprint of about one-tenth to one-fifth of an acre. Locations for these autotransformers are shown in Draft EIS **Figures 2-1.1** through **2-1.7, Appendix A** of the Draft EIS also provides detailed locations of the autotransformers, as seen in the Plan and Profile drawings and the large-scale maps. **Figures F-2-3** through **F-2-6** show locations of the autotransformers incorporated in the Preferred Alternative.

2.2.2.3 Technology

For the Action Alternatives, the Applicant has selected existing intercity high-speed trains, customized for the unique setting of the corridor. Both DEMU and EMU train sets are being considered as high-speed train technology options. The Applicant has identified two

⁸ The Frias Substation was evaluated in the Supplemental Draft EIS. The Frias Substation would serve the Wigwam or Robindale MSF sites under the EMU option.

Bombardier train sets, the Meridian and Regina, as representative examples of the respective DEMU and EMU technology options. Meridian DEMU trains are currently operating in the United Kingdom; various derivations of the Regina EMU trains are currently operating in Sweden and China. The DEMU train set is projected to operate at a maximum speed of 125 mph. The EMU train set could have a maximum speed of 125 mph or 150 mph.

2.2.3 ALTERNATIVES CONSIDERED BUT DISMISSED FROM FURTHER EVALUATION

2.2.3.1 Alignment

Two existing transportation corridors exist between Victorville and Las Vegas: the I-15 freeway and the UPRR railroad. An alternative alignment was investigated that would follow the existing mainline UPRR alignment across the Mojave National Preserve (Preserve) through Cima and Kelso. While a UPRR alternative would enable the trains to avoid the steep grades along I-15, it would be a much longer, less direct route that would require the construction of new tracks through the Preserve alongside the UPRR tracks. Based on discussions with the National Park Service (NPS), the Applicant determined that the alignment through the Preserve would increase the severity and potential for environmental impacts than following the median and/or north side of the I-15 alignment, which minimizes, to the greatest extent, any potential direct impacts to the I Preserve. The Applicant also found this alternative would be significantly longer, with many speed-restricting curves. Such a route would add substantial travel time and thus fail to attract sufficient ridership.

Similarly, it was considered that any alignment alternative within the urbanized portions of the Las Vegas Valley that would not follow existing major transportation corridors (i.e., existing freeways and railroad ROWs) would have the potential to result in substantial adverse impacts to urban/suburban areas (such as displacement of residents and businesses, increased noise and visual impacts, and impacts to property access). Such impacts would result largely from the incompatibility of high-speed train operations within existing residential and/or commercial developments. This resulted in the elimination of routes that would divert from major transportation corridors and instead follow existing streets and boulevards. For non-urbanized areas, it was assumed that any alignment alternative substantially deviating from the I-15 freeway corridor would result in much more substantial adverse environmental effects to sensitive resources, including but not limited to threatened and endangered species (including habitat areas), cultural resource sites, hydrological features, and scenic vistas.

Several other alternatives were eliminated for particular sections of the route, which are detailed in **Table F-2-5**, along with the rationale for their elimination. A subsequent key is provided to read **Table F-2-5**.

Table F-2-5 Reasons for Elimination of Potential Alignment Segments

Segment/Description	Length (Miles)	Reasons for Elimination						Concerns
		C	I	ROW	C/A	R/R	E	
1-A Victorville to Lenwood (south of Barstow, California). This alignment would have been constructed west of the Mojave River, following the existing Burlington Northern Santa Fe (BNSF) railroad corridor and Route 66 to a point just south of Barstow.	22						P	The alignment would have directly converted 8 acres Prime Farmland/Farmland of Statewide Importance and would indirectly affect more than 600 acres of such farmland. This alignment would have also impacted biological resources, riparian habitat, and archeological resources along the Mojave River. The alignment would have also traversed a section of the Mojave Fishhook Cactus ACEC. In addition, the alignment would have traveled in close proximity to the Route 66-Mojave River Corridor Historic District, and would have resulted in the demolition or major alteration of approximately 20 historic architectural resources, including portions of Route 66. The communities of Oro Grande and Helendale would have also been affected in terms of environmental justice impacts.
1-J Victorville Station to Barstow via BNSF ROW. This alignment would have followed the BNSF ROW and would have placed an intermodal terminal station west of the Mojave River.	29.6				P		S	This alternative location would have been too far from I-15, which reduces visibility and accessibility, hence negatively impacts ridership and financial viability. Adjacent uses would have been industrial. The alternative would have required a new access road from I-15 with new road bridge over Mojave River with impacts to wetlands, habitat, biological resources, and floodplains. This alternative would have also involved the grade separation of the highway crossings and relocation of a section of BNSF tracks.

Segment/Description	Length (Miles)	Reasons for Elimination						Concerns
		C	I	ROW	C/A	R/R	E	
2-J This alignment would have traversed private, generally open land through Barstow and Yermo. Portions of the route would have passed through the BNSF Barstow Yard and through residential neighborhoods.	24.6		P	S			P	The alignment would have been incompatible with the future BNSF Barstow Yard expansion. The alignment would have caused noise and visual impacts to residential properties.
3-JA Yermo to Mountain Pass in I-15 Freeway corridor. This alignment would have been constructed entirely along the south side of the I-15 Freeway ROW along the Preserve	84.2			S			P	An alignment entirely on the south of the I-15 ROW would have been located in close proximity to the northern boundary of the Preserve for approximately 40 miles and would likely encroach into the Preserve at specific points, presenting permit constraints in this environmentally sensitive area; also, additional ROW (outside of existing I-15 ROW) would be required.
4-JA Mountain Pass to Primm via I-15 in the freeway median. This alignment would have been located within the I-15 median between Mountain Pass and Primm.	13.5	P		S			P	The grades on I-15 in a 4-mile section approach 6 percent. The maximum allowable grade for the project is 4.5 percent, and this alignment would have required a tunnel or very deep excavation with high retaining walls over a significant length to allow construction within the existing I-15 ROW. Because the grade would have been too steep for train operation, this alignment alternative was eliminated from further consideration. Potential adverse environmental impacts of this alternative and constructability constraints within the I-15 median also eliminated this alternative from further consideration.

Segment/Description	Length (Miles)	Reasons for Elimination						Concerns
		C	I	ROW	C/A	R/R	E	
3/4-J Barstow to Primm via UPRR ROW. This alignment would have roughly paralleled Segments 3 and 4, but the alignment would have been solely in UPRR ROW or adjacent property.	120			S		P	P	This alignment alternative would have been approximately 23 miles longer than the I-15 corridor and would add running time to the project. Longer, slower route would reduce ridership, revenue, and financial viability. This alignment alternative would have also involved relocation of existing UPRR tracks and major grading. With greater length and relocation of rail facilities and passing through the Preserve, this alternative would have resulted in noise, visual and biological impacts within the Preserve, a probable Section 4(f) use of the Preserve, and impacts to UPRR operations during construction.
5-JA Primm to Las Vegas via I-15 Freeway. This alignment would have generally deviated from the I-15 ROW and passed through areas with existing and planned residential or commercial development.	39.5		S	P			P	An alignment that would not have followed existing transportation corridors would result in a need to acquire properties with existing residential or commercial development, which would be very costly and have noise and visual impacts incompatible with adjacent land uses.
5-JB Primm to Las Vegas via UPRR corridor. This alignment would have deviated from the UPRR ROW and passed through existing residential development areas.	40.1		S	P			P	Acquiring properties that comprise existing residential or commercial development would have been very costly and would have been incompatible with adjacent land uses from noise and visual disruption of passing trains.

Source: DesertXpress; CirclePoint, 2008-2011.

Definitions: Reason for Elimination: (P) Primary and (S) Secondary

C=Construction: Engineering and construction complexity; initial and/or recurring costs that would render the project impractical; logical constraints.

I=Incompatibility: Conflicts with land use designations or has insurmountable long term impact to highway or railroad operation.

ROW=Right-of-way: Significant land cost.

C/A=Connectivity / Accessibility: Inhibits or precludes convenient transfer to other modes or access to terminal station facilities.

R/R=Revenue / Ridership: Severe long term operation or maintenance cost; significant increase in running time over a more direct alignment.

E=Environment: High potential for significant impacts to natural resources, including streams and wetlands and habitat of threatened or endangered species.

2.2.3.2 Facilities

During review of the Draft EIS, the Clark County Department of Aviation (CCDOA) submitted comments indicating that the original Sloan Road MSF evaluated in the Draft EIS would be in direct conflict with the location of a proposed **“super arterial” roadway** that would provide future vehicle access to the planned Southern Nevada Supplemental Airport (SNSA) to be located north of Primm. As described in **Section 2.2.5** of the Supplemental Draft EIS, the Applicant proposed a modified location for the Sloan Road MSF in response to comments on the Draft EIS. The Supplemental Draft EIS evaluated **the “Relocated Sloan MSF,” located approximately two miles south of the Sloan Road MSF** considered in the Draft EIS. The Relocated Sloan MSF site was developed to replace the Sloan Road MSF evaluated in the Draft EIS.

2.2.3.3 Technology

The Applicant considered various train technologies for the DesertXpress project, and sought to particularly identify a train with proven reliability that could be readily adapted to the unique desert environment of the Mojave/Las Vegas region and deliver reliable and rapid performance on the long and relatively steep grades along portions of the route. The Applicant found that steel-wheel train systems with distributed propulsion (with most of the passenger cars on the train being powered) the only viable technology and rejected other train technologies including magnetic levitation so as to allow for potential future system expansion without concerns regarding potentially proprietary technology, while **ensuring the project’s economic viability**. The Applicant also found magnetic levitation technology to be cost-prohibitive for a project implemented by a private entity. For a proposed route between Anaheim and Las Vegas that would use maglev technology (top speed 311 mph), the total estimated cost is \$12 billion, or about \$48 million per route mile.⁹ In comparison, the Applicant has estimated the total capital cost of DesertXpress (Victorville to Las Vegas) at \$6.0 to \$6.5 billion (up to \$33 million per route mile).

A conventional locomotive-hauled train with non-motorized passenger cars was initially studied by the Applicant, but eliminated after train simulation models showed **unsatisfactory results in performance and predicted reliability on the route’s long, steep grades**.

Discussion of the DEMU and EMU technologies can be found in **Section 2.3.2.4** of this Final EIS.

⁹ High Speed Rail (HSR) in the United States. Congressional Research Service, December 8, 2009.

2.3 ALTERNATIVES IN DETAIL

2.3.1 NO ACTION ALTERNATIVE

The No Action Alternative includes the system physical characteristics and capacity as they exist at the time of the Draft EIS and Supplemental Draft EIS (2006-2010) and where possible, the planned and funded improvements that would be in place by the planning horizon year of 2030.

Other transportation improvements near Victorville and within Clark County are being studied and are not currently funded; as a result, these are not included in the baseline analysis for the No Action Alternative. These are instead considered in the cumulative analysis (see **Section 3.16, Cumulative Impacts**, of this Final EIS).

As of January 2011, existing roadway conditions on I-15 from Victorville to Las Vegas are as follows:

- **Victorville to State Route 58 (SR 58) (Barstow):** Three lanes each way with a 4th southbound truck lane coming out of Barstow up to the summit;
- **SR 58 to Interstate 40 (I-40) (Barstow):** Three lanes each way plus some auxiliary lanes;
- **I-40 to Baker:** Two lanes each way;
- **Baker to California/Nevada state line:** Two lanes each way with a truck lane northbound approaching Halloran Summit (about 17 miles north of Baker) and southbound at Mountain Pass (about 15 miles south of the state line);
- **California/Nevada state line to Interstate 215 (I-215):** Three southbound lanes and two northbound lanes, with an additional northbound lane currently being constructed;
- **I-215 to Flamingo Road (Clark County):** Three lanes each way plus auxiliary lanes; and
- **North of Flamingo Road (Clark County and City of Las Vegas):** Four lanes each way.

Between 1995 and 2006, annual average daily traffic (AADT) at the California/Nevada state line rose steadily. Over the twelve years measured, AADT increased by 27 percent, at an average annual increase of about 2 percent. Over a typical year, travel demand is highest in the summer months of June, July, and August, and slightly above average in November and December. On a weekly basis, traffic volumes are heaviest on Sunday, followed by Friday and Saturday, with Monday through Thursday volumes markedly lower. The direction of traffic flow on I-15 is predominantly southbound on Sunday and Monday, relatively even on Tuesday through Thursday, and predominantly northbound on Friday and Saturday.

Under free flow traffic conditions, the trip on I-15 from Victorville to Las Vegas takes about three hours to travel the 192 mile distance, if moving consistent at posted speed limits. Recent studies estimated that the delay related to peak-period congestion was 1.25 hours in 2002, but will grow significantly, despite planned improvements. Delays associated with congestion are projected by Caltrans and the FHWA to increase to 3.19 hours by 2012, 7.03 hours by 2022, and 5.78 hours by 2032, even with planned lane widening in place.¹⁰ With these projected travel delays, total trip times from Victorville to Las Vegas would increase substantially.

2.3.1.1 Planned and Programmed Transportation Improvements

Caltrans and the NDOT are planning for future highway improvements along I-15 between Victorville and Las Vegas. Certain transportation improvements have been programmed for funding in a State Transportation Improvement Plan (STIP) or Long Range Transportation Plan (LRTP) or are otherwise understood to be reasonably foreseeable. For the purposes of this Final EIS, these planned transportation improvements are assumed to occur under both the No Action Alternative and the Action Alternatives by 2030. For a discussion of other planned projects that may occur in the project area but are not considered as part of the No Action Alternative nor the Action Alternatives, please refer to **Section 1.6, Relationship to Other Transportation Projects and Plan in the Study Area**, of this Final EIS. These other planned projects are also considered in the cumulative analysis contained in this Final EIS at **Section 3.16, Cumulative Effects**.

As discussed in Section 2.0 of the Traffic Impact Analysis (**see Appendix F-G** of this Final EIS), I-15 will remain in its existing configuration for the vast majority of the distance between Victorville and Las Vegas, except for capacity improvements in the urban areas. All of the planned and programmed improvements are identified below, along with their status as of January 2011. The following improvements are anticipated to be operative within the No Action and Action Alternatives:

Caltrans

- Widen the bridge crossing over the Mojave River in Victorville: Construction completed.
- Reconstruct the D Street, E Street, and South Stoddard Wells Road interchanges along I-15: Preliminary engineering and environmental review underway.
- Near Barstow, widen a 1-mile segment of I-15 to 6 lanes and reconstruct an I-15 interchange in Barstow. No start date for any project work at present.

¹⁰ Initial Study/Environmental Assessment, Victorville to Barstow, Add Southbound Mixed Flow Lane. Caltrans, FHWA, County of San Bernardino, May 2001.

- Add truck climbing lanes on I-15 in sections with steep grades. Construction completed.
- High Desert Corridor roadway project, which would develop a new freeway/expressway from State Route 14 (SR 14) to I-15: Preliminary engineering and environmental review underway.
- I-15 Joint Point of Entry: new commercial vehicle enforcement/agricultural inspection facility to be constructed between Nipton Road and Yates Well Road: Preliminary engineering and ROW acquisition underway.

NDOT

- **“NEON” project: Preliminary engineering and environmental review underway.**
 - Reconstruct the I-15/Charleston interchange
 - Implement local access improvements
 - Add a High Occupancy Vehicle (HOV) direct connector lane from U.S. Route 95 (U.S. 95) to I-15.
- **The “I-15 South” project: (Sloan Road to Tropicana Avenue): Preliminary engineering, right of way acquisition, and construction underway from between Silverado Boulevard and Tropicana Avenue (first phase of design-build project);** ¹¹
 - New flyover at Blue Diamond Boulevard, new overpasses at Sunset Road, Warm Springs Road, and Pebble Road
 - New interchanges on I-15 at:
 - Bermuda Road
 - Starr Avenue
 - Cactus Road
 - Widening of:
 - I-15 mainline from Sloan Road to Blue Diamond Road (6 lanes to 10 lanes)
 - Las Vegas Boulevard
 - Reconstruct the Sloan Road and I-15 interchange
 - New sound barriers and other improvements along I-15 corridor
- **Other New I-15 Interchanges:**
 - At Milepost 3 (new interchange to serve future airport): Funding for environmental review, preliminary engineering, and ROW acquisition.

¹¹ Project as a whole spans from Sloan Road in the south to Tropicana Avenue in the north.

- Other Road Widening:
 - I-15 between Russell Road and Sahara Avenue (widen from 8 to 10 lanes): preliminary engineering and ROW acquisition underway.
 - I-15 between I-215 and Interstate 515 (I-515) (widen from 10 to 14 lanes): preliminary engineering underway.

2.3.1.2 Planned but Unprogrammed Transportation Improvements

Other transportation improvements near Victorville and within Clark County are anticipated but not currently funded, not found to be reasonably foreseeable, and thus not taken into account in the traffic impact study for the DesertXpress project. These projects are, however, considered in the cumulative analysis in **Section 3.16, Cumulative Effects**, of this Final EIS.

These projects are typically included in long-range transportation planning documents, (such as a Regional Transportation Plan (RTP) or similar document), but are not funded in the current year (through a Regional Transportation Improvement Program (RTIP) or similar).

Victorville

- Desert Gateway Specific Plan

Clark County

- Urban Resort Corridor Study (upgrades to I-15 and parallel roadways between I-215 and U.S. 95)
- Supplemental Commercial Airport in Ivanpah Valley – Southern Nevada Supplemental Airport (SNSA)
- Southern Nevada Regional Heliport
- New roads:
 - Starr Avenue: Construction of a six lane roadway from I-15 to St. Rose Parkway
 - I-15 at I-215: Construction of new direct connector high-occupancy vehicle ramps
- Road widening:
 - I-15 from California state line to Sloan Road: Widen from six to eight lanes
 - Dean Martin Drive: Widen to four lanes for approximately one mile between Blue Diamond Road and Warm Springs Road
 - Tropicana Boulevard: Add 4th westbound lane between Decatur Boulevard and Polaris Avenue

- Other projects:
 - Intermodal Transport Terminal near Downtown Las Vegas
 - Las Vegas Managed Lanes Demonstration Project (trial of high occupancy toll (HOT) lanes on I-15 from the intersection of I-215 in the south to north of Downtown Las Vegas, and beyond the proposed terminus of the DesertXpress project)
 - NDOT Intelligent Transportation System (ITS) Project: Various in-freeway improvements, including electronic message signs, ramp metering, and HOV lanes along I-15 in metropolitan Las Vegas area. Also includes off-site traffic management center.

2.3.2 ACTION ALTERNATIVES

The project corridor between Victorville and Las Vegas has been divided into seven segments for analysis purposes.

The proposed action would include the construction of one passenger station at each end of the rail corridor (Victorville plus one in Clark County or the City of Las Vegas). Stations would meet accessibility requirements of the Americans with Disabilities Act (ADA). A major maintenance, storage, and operations facility would be located in Victorville, southeast of the Victorville station site options. A secondary maintenance and storage facility would be located in Clark County. These are discussed in detail in **Section 2.3.2.2** of this Final EIS. With the exception of Segment 7 and the associated Las Vegas Downtown Station, none of the station or maintenance facility options are attached to a single project alternative. Any of the proposed alignments would utilize the station and maintenance facility options.

2.3.2.1 Alignment Options

The following sections discuss in detail each rail alignment that was studied.

Segment 1, Victorville to Lenwood

Only one alignment is being evaluated in this Final EIS for Segment 1.

Segment 1 would depart from three possible Victorville Station sites and head north generally following the west side of the I-15 corridor for a distance of about 21 to 29 miles, depending on whether the alignment starts at VV1, VV2, or VV3 (see **Figure S-2-1** of the Supplemental Draft EIS). The Victorville Station site options are further discussed in **Section 2.3.2.2** of this Final EIS. Selection of VV1 would result in the greatest length for Segment 1, while VV3 would result in the shortest length of the rail alignment.

The length of Segment 1 would also depend on the rail alignment option selected for Segment 2, as described in **Section 2.3.2.1** below. If the Segment 2A or Segment 2B rail alignment options are selected, the Segment 1 rail alignment would diverge from the I-15 corridor near Hodge Road then head northerly toward Barstow, and continue in a path near (but not within) the existing Burlington Northern Santa Fe (BNSF) railroad corridor. If the Segment 2C rail alignment option is selected, the Segment 1 rail alignment would terminate near Hodge Road and connect with the Segment 2C rail alignment. The length of Segment 1 would thus be reduced by approximately 12 miles with the selection of Segment 2C.

Segment 1 would include a new bridge over or under the Mojave Northern Railroad and a second bridge over the BNSF mainline tracks, as well as eight roadway overpasses (to provide a fully grade-separated alignment).¹² Segment 1 would have a maximum grade of about 2.5 percent. **Figure 2-3** of the Draft EIS shows a typical section alongside I-15 where the DesertXpress tracks would fit within the existing I-15 right of way without requiring modification or reconstruction of the existing I-15 freeway. This typical cross section would also allow for potential future widening of the I-15 freeway. **Figure 2-4** of the Draft EIS shows a typical section of the DesertXpress tracks situated on a retained embankment alongside I-15. **Figure 2-5** of the Draft EIS shows a typical aerial structure design where the new tracks would need to be grade separated. Segment 1 would use the grade separated tracks where the alignment would cross the existing I-15 interchanges.

Segment 2A/2B, Lenwood to Barstow

From Lenwood to east of Barstow, Segments 2A and 2B would share the same alignment for 12 miles, then diverge for the next 9 miles (as further detailed below). Throughout the Draft EIS and Supplemental Draft EIS, this portion of the alignment is referred to as Segment 2A/2B and the alternatives are combined for analysis. The remaining portion of Segment 2 where Action Alternative A and B alignments diverge is then referred to as Segment 2A and Segment 2B. Refer to **Appendix A** of the Draft EIS for the large-scale maps showing the detailed location of Segments 2A and 2B. **Figure 2-1.2** of the Draft EIS also shows the location of Segments 2A and 2B. The first five miles of the combined alignment for Segment 2A/2B would be on newly created tracks for exclusive high-speed rail use and would cross the Mojave River and turn east through the City of Barstow. Through the City of Barstow, the alignment would utilize a former Atchison Topeka &

¹² Once the STB has authorized a rail construction, no other rail carrier can block the construction by refusing to permit the carrier from crossing its property as long as the construction does not unreasonably interfere with the operation of the crossed line; the operation does not materially interfere with the operation of the crossed line; and the owner of the crossing line compensates the owner of the crossed line, 49 U.S.C. 10901(d)(1).

Santa Fe (AT&SF) railroad corridor along the north side of the Mojave River, for approximately three miles before reaching the vicinity of the I-15/Old Highway 58 interchange on the east side of Barstow.¹³

The combined Segment 2A/2B would require a bridge over the Mojave River, a bridge (or underpass) for roadways in the I-15/Old Highway 58 interchange area, and a bridge (or underpass) over or under the westbound lanes of I-15 near the agricultural inspection station, as well as seven grade-separated roadway overpasses. In this section, the design concept requires about 50 feet of width for the DEMU alternative and 60 feet for the EMU alternative and the cross streets in this segment would need to be grade separated using overpasses. **Figures 2-3** and **2-4** of the Draft EIS represent typical sections of the at-grade and retained embankment DesertXpress tracks. While I-15 is shown in these figures, the typical track cross-sections also apply to portions of Segment 2A and 2B that would be created on the new ROW for high-speed rail outside of the I-15 ROW. **Figure 2-5** of the Draft EIS presents the typical design for the grade separated tracks used in Segments 2A and 2B as well. Additionally, **Appendix F-B**, the Highway Interface Manual developed for this project in coordination with FHWA, Caltrans, and NDOT includes additional design information regarding grade separated track and other project features.

The Supplemental Draft EIS identified several Alignment Adjustment Areas (AAAs) applicable to Segment 2A/2B. The AAAs represent minor lateral shifts of the rail alignment intended to avoid or minimize impacts to identified resources or improve operating conditions. The Segment 2A/2B rail alignment includes two AAAs (AAA1 and AAA2), which would shift a portion of the rail alignment approximately 200 feet to the south. **Table S-2-2** of the Supplemental Draft EIS summarizes the location and rationale for the two AAAs incorporated into the Segment 2A/2B rail alignment. **Figure S-2-2** of the Supplemental Draft EIS also illustrates the location of the Segment 2A/2B AAAs.

Segment 2A, Barstow to Yermo

Segment 2A would follow a northerly course outside of the I-15 freeway corridor for 9.3 miles upon emerging from the combined portion of Segment 2A/2B near the I-15/Old Highway 58 interchange on the east side of Barstow. See Draft EIS **Figure 2-1.2** for the full extent of Segment 2A.

¹³ This portion of the former AT&SF right of way fell out of use when the railroad constructed a new line at the west end of their yard near Highway 58. Tracks were removed from this area at an unknown date. Because the tracks in question fell out of use due to realignment, no petition for formal abandonment was required to be filed with or approved by the Surface Transportation Board. Personal communication, Don Bratton (Staubach Company; acting property managers for BNSF Railroad, 1/19/07; Christine Glaab, Surface Transportation Board Librarian 1/4/07.

Segment 2B, Barstow to Yermo

Upon emerging from Segment 2A/2B near the I-15/Old Highway 58 interchange on the east side of Barstow, Segment 2B would run along the north side of the I-15 corridor past the community of Yermo, to a point just east of the agricultural inspection station on I-15. Segment 2B is approximately 9.2 miles. See Draft EIS **Figure 2-1.2** for the full extent of Segment 2B.

Segment 2C, Lenwood to Yermo

In response to comments by the City of Barstow, the Applicant proposed a new alignment following the I-15 freeway through Barstow, referred to as Segment 2C. The Segment 2C rail alignment was evaluated as part of the Supplemental Draft EIS.

The Applicant has proposed two alignment options for Segment 2C, both of which would be located within the I-15 freeway corridor.

- **Side Running (2C Side Running):** From the end of Segment 1 approximately 7 miles southwest of Lenwood, the 2C Side Running alignment would run along the north and west side of the I-15 freeway through Lenwood, central Barstow, and eastward to Yermo, where it would join Segment 3.
- **Median Option (2C Median):** From the end of Segment 1, this alignment would run along the north and west side of the I-15 freeway through Lenwood. As the alignment approaches Central Barstow it would transition into the I-15 freeway median for approximately 3 miles from H Street to East Main Street. At East Main Street, the alignment would transition back to the north and west side of the I-15 freeway and then connect with Segment 3.

Both Segment 2C options would follow the same alignment as Segment 2A in the vicinity of the I-15/SR 58 interchange just west of Yermo. This portion of the rail alignment would divert from the existing I-15 freeway corridor (outside of the existing ROW) and would follow a northerly course outside of the I-15 freeway corridor for approximately 9.3 miles. The Segment 2C rail alignment would reconnect with the I-15 freeway corridor near the I-15/Yermo Road interchange, where the alignment would connect with the Segment 3B rail alignment.

Figure S-2-2 and **S-2-7** of the Supplemental Draft EIS depicts the 2C Side Running and Median options. **Appendix S-A-1** of the Supplemental EIS includes detailed plans of the Segment 2C alignment options.

Within central Barstow, both alignment options would be constructed on elevated structures and would cross over local interchanges and overpasses. Implementation of either Segment 2C alignment would result in a 12-mile reduction in the length of Segment 1 because the portion of Segment 1 that extends away from the I-15 corridor to travel around the west and northern edges of Barstow would not be required. Both Segment 2C alignments would follow a more direct route than Segment 2A/2B.

Either alignment option for Segment 2C would also require one temporary construction area (TCA) along the proposed alignment for construction staging equipment. TCA 2C1 would have a total area of one acre and would be located between the cities of Lenwood and Barstow. The Supplemental Draft EIS examines the potential effects of the TCA as part of the alignment options.

Segment 3A, Yermo to Mountain Pass

Segment 3A would be located entirely within the median of the I-15 freeway, running 84.9 miles. Generally, the existing median is approximately 100 feet wide (between edge of traveled way to edge of traveled way). The exception is in the community of Baker where the median narrows considerably, here the I-15 freeway would need to be widened to the outside to provide room for the rail in the median, or alternatively, the alignment would need to diverge from the median or be placed on an aerial structure. The Plan and Profile Drawings in **Appendix A** of the Draft EIS show Action Alternative A diverging from the I-15 freeway median west of Baker and re-entering the freeway median east of East Baker Boulevard.

It is assumed that a continuous concrete vehicle barrier would be required on both sides of the tracks, as well as AREMA crash barriers at all supporting columns of bridges at freeway interchanges and overpasses. Bridges for tracks would also have to be constructed where significant waterways cross I-15. Drainage for the trackway would be designed to integrate with the existing I-15 drainage system.

Draft EIS **Figure 2-6** shows the proposed typical cross-section in the median of I-15, which includes full median shoulders, barriers, the two DesertXpress tracks, and a parallel inspection and maintenance access road. This cross-section would also allow future widening of the I-15 freeway. Grade-separated crossovers for California Highway Patrol and other authorized vehicles would be provided. Draft EIS **Figure 2-7** shows the design concept of the grade separated DesertXpress tracks that would be used within the I-15 median at interchanges and overpasses to avoid conflicts with the existing overpass columns. A typical section of the design of the retained embankment of the DesertXpress tracks within the I-15 median is also shown in Draft EIS **Figure 2-8**. Draft EIS **Figure 2-9** shows the typical median drainage treatment where the drainage from the median is tied into the existing I-15 drainage system. Also see the typical section diagrams provided within **Appendix F-B**, the Highway Interface Manual.

Segment 3B (Modified), Yermo to Mountain Pass

Segment 3B would be located along the north side of I-15 within the existing freeway ROW from Fort Irwin Road to Mountain Pass, running 84.8 miles. Draft EIS **Figures 2-3** and **2-4** show the typical design concept alongside I-15, which for the most part enables the DesertXpress tracks, drainage, parallel access road, and separation barrier to be constructed within the existing I-15 right of way, while still leaving sufficient space for

future I-15 widening. Draft EIS **Figure 2-5** shows the typical design concept of the grade separated aerial structures for the DesertXpress tracks that would be used for crossing roadways and at the I-15 interchanges, from the on-off ramps.

The Supplemental Draft EIS incorporated AAAs into Segment 3B. The AAAs represent minor lateral shifts of the rail alignment to avoid or minimize impacts to identified resources and/or to improve train operating conditions. The Segment 3B rail alignment includes four AAAs (AAA3 through AAA6), which would shift portions of the rail alignment by approximately 50 to 400 feet. Supplemental Draft EIS **Table S-2-2** summarizes the location and rationale for the alignment modification for the four AAAs that were incorporated into the Segment 3B rail alignment.

Based on additional consultation following publication of the Supplemental Draft EIS, an approximately 10 mile portion of Segment 3B would be further modified to reduce or avoid impacts to sensitive resources in the area. This portion of the Segment 3B rail alignment near the I-15/Halloran Springs Road interchange would shift to the south side of the I-15 freeway within the existing I-15 ROW. The Segment 3B rail alignment would then cross under the I-15 freeway in an open cut back to the north side of the freeway. This modification is reflected in the Segment 3B (Modified) alternative. This alternative differs from the Applicant's **Preferred Alternative, which identifies the Segment 3B** alternative following the north side of the I-15 freeway within the existing I-15 ROW, as described in more detail in the Draft EIS **Section 2.4.3**.

Segment 4A, Mountain Pass to Primm

Segment 4A extends for 14 miles. Segment 4A would leave the I-15 freeway corridor at the point that the grade exceeds 4.5 percent, just east of Mountain Pass. Segment 4A would head south for approximately four miles before returning to the I-15 freeway corridor south of Primm. An approximately 1.55 mile portion of this alignment may encroach on the Mojave National Preserve near the intersection of Nipton Road and Ivanpah Road, all within about 0.5 miles of I-15. While portions of Segment 4A would not be adjacent to I-15 or within the I-15 ROW, Draft EIS **Figure 2-3** represents a typical section of the DesertXpress tracks in this segment.

As with Segment 3, when in the median, a continuous concrete truck barrier would be required on either side of the tracks, as well as AREMA crash barriers at all supporting columns of bridges at freeway interchanges and overpasses (same as shown in Draft EIS **Figure 2-6**). Bridges for tracks would also be constructed over the northbound lanes of I-15 at each end of the dogleg into and out of the median and over Nipton Road. Also, a portion of the alignment would follow (and bridge over where necessary) a significant drainage way running parallel to I-15 from Mountain Pass.

Segment 4B, Mountain Pass to Primm

Segment 4B would leave the I-15 freeway ROW and head northeast, passing through two new dual track tunnels (one approximately 5,000 feet long and the other approximately 1,300 feet long), then descend along the eastern slope of the Clark Mountains on a 4.5 percent grade, before returning to the I-15 corridor south of Primm where the tracks would pass over the southbound lanes of I-15 to enter the median. The proposed tunneling activities would be administered through monitored targeted blasts and charges. Spoil material that would result from tunneling would be used for fill material for other segments of track. At Primm, the track would cross over the northbound lanes of I-15 and continue northward along the east side of the I-15 corridor. **Figure 2-4** of the Draft EIS shows the typical design concept for a significant portion of this segment, where the alignment would be on a side slope and some use of retaining walls likely would be required both above the tracks and below them. The retained embankment in Segment 4 would not, however, be located adjacent to the existing I-15 freeway, as shown in **Figure 2-4** of the Draft EIS. Segment 4B is approximately 12.9 miles in length.

Segment 4C, Mountain Pass to Primm

Segment 4C, as described in the Supplement Draft EIS, would be approximately 20.7 miles long, or about 7 miles longer than Segment 4A and 8 miles longer than Segment 4B. The west end of Segment 4C would follow the same alignment as Segment 4B, as it moves away from the I-15 freeway corridor and through a series of three tunnels to be constructed through the Clark Mountains.¹⁴ Segment 4C would then travel north of the planned solar energy projects and the Ivanpah Dry Lake bed before connecting back to the I-15 freeway corridor in the vicinity of Primm.

Segment 4C would connect with Segment 5 north of Primm, where the rail alignment would cross over from the west side of I-15 to the east side of I-15 on an aerial structure. Supplemental Draft EIS **Figures S-2-10** and **S-2-11** show the cross sections where Segment 4C would connect with Segment 5 and cross over the I-15 freeway corridor.

Segment 4C would also require five additional TCAs for construction staging equipment. TCA 4C1 through TCA 4C5 would range in size from 1 to 9.7 acres. Supplemental Draft EIS **Figure S-2-3** shows the locations of these new TCAs.

Supplemental Draft EIS **Appendix S-A-2** includes detailed plans of the Segment 4C alignment, including TCAs.

Segment 5A, Primm to Sloan

Segment 5A would be entirely within the median of I-15, running 24.6 miles. The design concept is similar to the median alternative in Segment 3 (see Draft EIS **Figure 2-6**). In sections where the median would be too narrow to achieve the required median cross

¹⁴ The Applicant has estimated the tunneling volume for Segment 4C at about 282,000 cubic yards.

section, the I-15 shoulders would be extended on both sides to create the required median width in accordance with NDOT and FHWA geometric design requirements or the train would be placed on an aerial structure.

Segment 5B, Primm to Sloan

Segment 5B would continue along the east side of the I-15 corridor between Primm and Jean within the existing freeway ROW for 24.6 miles. The design concept for this segment is essentially similar to that shown in Draft EIS **Figure 2-3**, except that the train would be on the east instead of west side of I-15.

Segment 6A, Sloan to Las Vegas

Segment 6A would continue in the median of I-15 into the Southern, Central A or Central B passenger stations, a distance of about 14 miles.

After entering the urbanized area, a significant portion of this alternative would be located on an aerial structure, due to the large number of major interchanges and overpasses that would need to be traversed, as well as the proximity of urbanized development to the existing freeway right of way. Where the tracks are feasible in the median, a continuous concrete vehicle barrier would be provided on either side of the tracks, as well as AREMA crash barriers at all supporting columns of bridges at freeway interchanges. Draft EIS **Figure 2-5** shows the typical elevated design concept that would be applied in the median within the urbanized areas of this segment. Specific locations within the alignment where elevated structures would be used can be seen in the plan and profile drawings included in Draft EIS **Appendix A**.

Segment 6B, Sloan to Las Vegas

Segment 6B would cross the I-15 corridor from the east side to the west side and continue along the west side of the I-15 corridor until the metropolitan Las Vegas area. Bridges for tracks would be constructed over the northbound lanes of I-15 just north of Sloan and over the UPRR.¹⁵ Near the site of the Wigwam Avenue MSF, AAA8 would modify a 5 mile portion of Segment 6B (see Supplemental Draft EIS **Table S-2-2**). The modification would place portions of the alignment (approximately 1.5 miles) outside the I-15 right of way, and into the adjacent County transportation corridor, including Industrial Road/Dean Martin Drive. It is assumed that significant sections of this alignment could require placing the tracks on elevated structures to provide sufficient space for railroad operations and account for the proximity of adjacent urban development. Draft EIS **Figure 2-5** shows the typical elevated design concept that would be applied on the side of

¹⁵ Once the STB has authorized a rail construction, no other rail carrier can block the construction by refusing to permit the carrier from crossing its property as long as the construction does not unreasonably interfere with the operation of the crossed line; the operation does not materially interfere with the operation of the crossed line; and the owner of the crossing line compensates the owner of the crossed line, 49 U.S.C. 10901(d)(1).

the freeway within the urbanized areas of this segment. Specific locations within the alignment where elevated structures would be used can be seen in the plan and profile drawings included in **Appendix F-C** of this Final EIS.

The following portions of Segment 6B would be located outside the NDOT right-of-way:

- Between West Sunset Road and West Patrick Lane
- Between Hacienda Avenue and Tropicana Avenue

Supplemental Draft EIS **Table S-2-2** summarizes the location and rationale for the alignment modification for the two AAAs that were incorporated into the Segment 6B rail alignment.

Segment 6C, Sloan to Las Vegas

Option C would diverge from Segment 6A/6B near the community of Sloan and generally follow the existing UPRR corridor (primarily within the UPRR ROW) into either of the Central passenger station options, a distance of about 16 miles, depending on the terminus.¹⁶ Option C would not connect to the Southern station option.

In some sections of this segment, there appears to be sufficient width for the two new DesertXpress tracks to be constructed alongside the UPRR tracks, but with elevated or underground grade separations over or under all UPRR spur tracks.¹⁷ DesertXpress tracks would be a minimum of 50 feet from the UPRR tracks, as there is a high-pressure gasoline pipeline in the UPRR ROW. In some sections of Option C, it would be necessary for the DesertXpress tracks to be placed on a new aerial structure. Draft EIS **Figure 2-5** represents the typical aerial structures used for the grade separated DesertXpress tracks in this segment.

Segment 7A

The Segment 7 options would be necessary only if the Las Vegas Downtown Station is selected as the northern terminus of the project. The Segment 6 Action Alternatives would terminate at either the Las Vegas Southern, Central A, or Central B station options (excepting Option C, which would only serve the Central A or Central B station options). If the Segment 7 alignment option is utilized, Segment 6 would bypass the Las Vegas Southern Station option and terminate at West Twain Avenue. Segment 7 would then originate at West Twain Avenue and continue into the proposed Las Vegas Downtown Station.

¹⁶ The use of any private railroad ROWs would be subject to approval by owner railroads.

¹⁷ Once the STB has authorized a rail construction, no other rail carrier can block the construction by refusing to permit the carrier from crossing its property as long as the construction does not unreasonably interfere with the operation of the crossed line; the operation does not materially interfere with the operation of the crossed line; and the owner of the crossing line compensates the owner of the crossed line, 49 U.S.C. 10901(d)(1).

From West Twain Avenue, Segment 7A would continue the pattern from Segment 6, with the alignment in the I-15 median. Segment 7A would bypass the Las Vegas Central A and Central B station sites, and continue in the I-15 median toward the Las Vegas Downtown Station, crossing under existing I-15 overpasses en route, a total distance of about 4.9 miles. Portions of Segment 7A could be placed on aerial structures due to limited width of the I-15 median in this urbanized corridor. Draft EIS **Figure 2-7** shows the typical elevated design concept within the median for this segment.

Segment 7B

From West Twain Avenue, Segment 7B would continue the pattern from Segment 6, with the alignment in the I-15 corridor. Segment 7B would bypass the Las Vegas Central A and Central B station sites, and would continue in the I-15 corridor toward the Las Vegas Downtown Station, crossing under existing I-15 overpasses en route, a total of about 5.0 miles. Portions of Segment 7B would be placed on aerial structures due to limited width of the I-15 median in this urbanized corridor. Draft EIS **Figure 2-5** represents the typical aerial structures used for the grade separated DesertXpress tracks in this segment.

Segment 7C

Segment 7C would be utilized only if Segment 6C was also selected. Segment 7C would begin at West Twain Avenue within the UPRR corridor and would continue within the UPRR corridor to the Las Vegas Downtown Station.¹⁸ Portions of this option would be placed on aerial structures due to the urbanized nature of this corridor; the typical aerial structures used for the grade separated DesertXpress tracks are illustrated in Draft EIS **Figure 2-5**. Segment 7C would be about 4.5 miles in length.

2.3.2.2 Facilities

Stations have been laid out by the Applicant to initially develop and use two tracks and accommodate the addition of a third track in the future when peak operating frequencies greater than one train departing every 20 minutes may be required. The station footprints provide sufficient space for future expansion to include a third track and platform. Current travel forecasts indicate that peak period operating frequencies of 20 minutes could suffice for many years as peak pricing policies are adopted.

The Applicant has not proposed any midpoint station or Barstow station. Accordingly, **FRA has not included analysis of any such station. The applicant's ridership projections** indicated that the anticipated number of passengers boarding at a potential Barstow station would be insufficient to support a station. Moreover, VV1, VV2, and VV3 are all located within 17 to 25 miles of Barstow, and thus in reasonable proximity to serve any

¹⁸ The use of any private railroad ROWs would be subject to approval by owner railroads.

demand originating from the Barstow area. There are no other logical midpoint areas with a substantial population base to justify the addition of a station anywhere else along the route.

Victorville Station Options

Segment 1 of the alignment would initiate from the selected Victorville Station site. The Victorville Station would offer train ticketing, baggage handling, and hotel room check-in for Las Vegas resorts. The train station would be compatible with land use plans already proposed by the City of Victorville for mixed-use development served by local transit, and with highway access.

The three station site options are all north of central Victorville, immediately west of the I-15 freeway.

- VV1 would be located just north of the southern Stoddard Wells Road exit (Exit #154).
- VV2 would be located to the northwest of the northern Stoddard Wells Road exit (Exit #157).
- VV3 would be located near the I-15/Dale Evans Parkway interchange (Exit #161).

VV1 and VV2 would be located approximately 1.5 miles apart from one another. VV3 would be located 6 miles north of VV1 and 4.5 miles north of VV2. Draft EIS **Figures 2-10** through **2-13** and Supplemental Draft EIS **Figure S-2-6** show site plans and section views for the three Victorville Station site options.

The facilities directly associated with VV1 or VV2 would occupy about 100 acres, inclusive of the tail tracks connection the station facility to Segment 1. VV1 and VV2 would each have a parking capacity for approximately 13,000 to 18,000 vehicles in self-parking lots, valet parking areas, and a proposed parking structure. The facilities associated with VV3 would occupy up to 218 acres, inclusive of the tail tracks connecting VV3 to Segment 1. The VV3 site requires a larger footprint than VV1 and VV2 because VV3 emphasizes surface parking areas instead of structured/garage parking relative to plans for VV1 and VV2. As a result, the parking structure at VV3 would have a smaller capacity than the VV1 and VV2 parking structures. A larger footprint is thus required to accommodate the surface parking area needed to meet anticipated parking demands.

VV3 includes two options for surface parking. Option A (or VV3A) includes approximately 16,000 surface parking spaces to the south and east of the station building, beneath electrical utility lines located in an easement owned by the Los Angeles Department of Water and Power (LADWP). This option would require an agreement between the **Applicant and LADWP to allow parking within LADWP's utility easement**. Because such an agreement is not currently in place, the Applicant has also proposed a site plan with a different surface parking option. Option B (VV3B) would place approximately 12,700 surface parking spaces in areas north and west of the station building. Both VV3A and

VV3B would include structure parking for approximately 1,650 vehicles in addition to the surface parking areas, representing a parking capacity of 16,650 with VV3A and 14,350 under VV3B. Supplemental Draft EIS **Figure S-2-6** depicts the site plans for VV3A and VV3B.

Victorville Operations, Maintenance, and Storage Facility Options

Each of the Victorville station site options was paired with a particular site for an OMSF. Both OMSF site options fall within the vicinity of Segment 1 and could serve either Action Alternative A or Action Alternative B alignments. The facility would require approximately 50 acres¹⁹ and would include a train washing facility, repair shop, parts storage, operations control center, and a fueling station (for the DEMU option only).

Within the OMSF, the Operations Control Center (OCC) would provide continuous monitoring of the train operations. Central control room personnel would have the ability to communicate directly with each train and with emergency response personnel throughout the route. Additionally, once inside the OMSF maintenance yard, the trains would be manually operated and moved with a tractor to minimize locomotive emissions within the yard. Approximately 400 employees would be based at the maintenance facility and operations center.

- OMSF 1, which would function with VV1, would be located in the City of Victorville on a site that lies within the Desert Gateway Specific Plan to the southwest of proposed VV1. Draft EIS **Figure 2-14** provides a plan view of OMSF 1.
- OMSF 2, which would function with any of the Victorville station sites, would be located north of OMSF 2, near the intersection with Dale Evans Parkway. A portion of OMSF 2 would fall within the jurisdiction of the City of Victorville; the entire site is under the jurisdiction of San Bernardino County.

The Draft EIS analyzed the impacts of an approximately 260 acre site envelope for the OMSF 2 facility. As part of the Supplemental Draft EIS, the Applicant conducted further engineering studies and proposed to reduce the footprint for OMSF 2 approximately 68 acres. Supplemental Draft EIS **Figure S-2-1** depicts OMSF 2 at its reduced size. The proposed operations at the OMSF 2 site would not change as a result of the reduced site size. Refer to Draft EIS **Appendix A-4** for a detailed layout of OMSF 2.

Las Vegas Area Station Options

Four options were considered for the Las Vegas Station:

- Southern Station, along Polaris Road, between West Russell Road and West Hacienda Drive, across I-15 from the Mandalay Bay Resort and Casino (as shown in Draft EIS **Figures 2-16** and **2-17**), approximately 62 acres in area.

¹⁹ Site envelopes for the OMSF range in size from about 95 acres to 260 acres. Entire sites were analyzed in this EIS, although the final footprint of the OMSF is expected to be notably smaller than the areas surveyed.

- Central Station A, between West Flamingo Road and West Twain Avenue, adjacent to the Rio Suites Hotel property (as shown in Draft EIS **Figures 2-18** and **2-19**), approximately 33 acres in area.
- Central Station B, south of West Flamingo Road, in an area along the UPRR right of way that is currently occupied industrial/light industrial uses. (Draft EIS **Figures 2-20** and **2-21**), approximately 37 acres in area.
- Downtown Station, in the City of Las Vegas, along South Main Street between West Bonneville Avenue and Boulder Avenue (see Draft EIS **Figures 2-22** and **2-23**), approximately 23 acres in area.

The Las Vegas Southern, Central A, or Central B stations would be utilized with Segments 6A or 6B and serve as the terminus for those segments and the rail line as a whole. Only one station will be selected as the Preferred Alternative in the FRA Record of Decision.

Segment 6C could extend only to the Las Vegas Central A and Central B station sites. Segments 7A, 7B, and 7C would be needed if, and only if, the Las Vegas Downtown Station is selected as the terminus for the preferred alternative.

All potential Las Vegas Station options are in close proximity to the Las Vegas Strip and related attractions. Each station would include parking for approximately 2,000 vehicles and passenger pick-up/drop off areas. Transportation to and from each Las Vegas station would be via taxis, buses, and private automobile. In addition, while not proposed as part of this project, there is the potential for future extension(s) of the existing Las Vegas Monorail to serve any of the Las Vegas station sites.

Las Vegas Area Maintenance and Storage Facility

A light maintenance, storage, cleaning, and inspection facility would also be built near the northern terminus of the project. The facility would require approximately 7 to 10 acres.

A total of four site options were under consideration for the Las Vegas area MSF. Draft EIS **Figures 2-25** through **2-27** depict site plan options for the Las Vegas area MSF. Detailed facility footprints and elevation drawings are included in Draft EIS **Appendix A**.

- Sloan Road: The Relocated Sloan Road MSF would be located approximately nine miles south of Sloan. The Relocated Sloan Road MSF was developed to replace the Sloan Road MSF identified in the Draft EIS. The location of the Sloan Road MSF would have conflicted with planned transportation infrastructure associated with the SNSA. The Relocated Sloan Road MSF would include a utility corridor that would connect an electrical substation (incorporated within the MSF site) to electrical transmission lines to the west under the EMU technology option.

The Relocated Sloan Road MSF would be located on the east side of the I-15 freeway corridor. The associated proposed utility corridor would cross over the I-15 freeway and continue approximately 1 mile to the west in order to connect with an existing Nevada

Energy electric transmission line. Supplemental Draft EIS **Appendix S-A-3** includes detailed drawings of the Relocated Sloan Road MSF site. During construction, this site would also serve as an additional TCA.

- Wigwam Avenue and Robindale Avenue: These two sites are located in unincorporated Clark County, west of the I-15 freeway, and about one half mile south of Blue Diamond Boulevard (Nevada State Route 160 (SR 160)).

As analyzed in the Draft EIS, neither the Wigwam Avenue nor Robindale Avenue options included electrical utility corridors that could serve any on-site substation that would be required under the EMU technology option. Accordingly, the Applicant identified a stand-alone substation site that could be utilized in the event that both the EMU technology option and the Wigwam Avenue or Robindale Avenue options were incorporated into the Preferred Alternative. The applicant duly identified the Frias Substation site, as shown in Supplemental Draft EIS **Figure S-2-5**. The site is west of the I-15 freeway at the intersection of West Frias Avenue and South Dean Martin Drive in unincorporated Clark County. Supplemental Draft EIS **Figure S-2-8** shows a detailed site plan of the Frias Substation.

The Frias Substation would be located immediately adjacent to an existing Nevada Energy electrical transmission line (the Arden-Tolson Transmission line) on undeveloped land in an area of sparse residential development and open lands. Plans for the Frias Substation thus include overhead electrical connections between the substation and the transmission line. The substation would be constructed on two separate sites: 1) a 3.2 acre substation on the west side of South Dean Martin Drive; and 2) a 1.4 acre substation to the east side of South Dean Martin Drive. Other components of the Frias Substation include undergrounded 25 kilovolt feeder lines, which would connect to a new autotransformer that would be located immediately adjacent to the I-15 freeway. The autotransformer at Frias would be in addition to the 17 autotransformers identified in Draft EIS **Section 2.4.9.4**.

Baker Maintenance of Way Facility

The proposed action also includes the Baker MOW facility. The Baker MOW facility would be located on a 2.4 acre site containing a 5,200 square foot building, plus tail tracks, a radio signal tower, fuel storage, and other related facilities that would serve as a headquarters for DesertXpress employees charged with daily inspection of tracks and associated facilities to ensure ongoing safe operations. See Draft EIS **Appendix A-4** of the for a detailed site plan diagram.

With any Action Alternative, this facility would be located on the same land as is designated for TCA 9, near Baker, California.

2.3.2.3 Components of Project Construction

Table F-2-6 identifies the proposed TCAs and their locations, and the segments that each would serve. Several TCAs would be located in part or in whole on proposed sites for stations and/or maintenance facilities, or would otherwise be within an area the proposed alignment would permanently impact. Other TCAs are located outside any permanent impact area. **Table F-2-6** distinguishes between these two types of TCAs.

Table F-2-6 Temporary Construction Areas

TCA No.	Location	Within a Permanent Impact Area?	Size	Segment(s) Served
1A	At proposed site of Victorville OMSF Site 1	Partially	142.06 acres	1
1B	At proposed site of Victorville OMSF Site 2	No	68 acres	1
2	At proposed Victorville station site #2	Partially	14.14 acres	1
2C1	Along I-15, near Lenwood Road	No	1.01 acres	2C
3	Near Lenwood, on northern bank of Mojave River at proposed new bridge	No	0.9 acre	2A/2B
4	Barstow, adjacent to BNSF spur line	No	14.82 acres	2A/2B
5	Yermo, east of Yermo Road/I-15 interchange	No	5.23 acres	2A/B
6	Along I-15, southwest of Field Road interchange	No	5.82 acres	3A/3B
7	Along I-15, north of Basin Road interchange	No	3.50 acres	3A/3B
8	West of Baker, between I-15 and Baker Blvd	No	1.9 acres	3A/3B
9	East of Baker, between I-15 and Baker Blvd	Yes	9.35 acres	3A/3B
10	North of I-15 at Cima Road	No	5.67 acres	3A/3B
11	West of I-15 at Yates Well Road	No	10.22 acres	4A
12	Northwest of I-15/Yates Well Road interchange	No	10.42 acres	4B
4C1	Along I-15, near Mountain pass south of Clark Mountains	No	5.2 acres	4C
4C2	North of Mountain Pass in Clark Mountains	No	1 acre	4C
4C3	North of Mountain Pass in Clark Mountains	No	1 acre	4C

TCA No.	Location	Within a Permanent Impact Area?	Size	Segment(s) Served
4C4	North of Clark Mountains, west of Ivanpah Dry Lake	No	9.7 acres	4C
4C5	Along I-15, north of California-Nevada state line near Primm	No	6.1 acres	4C
13	South of Sloan Road near UPRR undercrossing of I-15	No	9.1 acres	5A/5B
14	Along UPRR Corridor @ Le Baron Avenue in unincorporated Clark County	No	32.49 acres	Segment 6, Option C
15	South of West Twain Avenue at West Flamingo Road; site of proposed Central Station A	Yes	10.32 acres	6A/6B, Option C
16	Between Russell Road and Hacienda; site of proposed Southern Station	Yes	57.09 acres	6A, 6B
17	South of Bonneville Avenue in City of Las Vegas; site of proposed Downtown Station	Yes	24.08 acres	7A, 7B, Option C
18 + 19	At openings of proposed tunnel #1 northeast of Mountain Pass	No	2.15 acres	4B
20 + 21	At openings of proposed tunnel #2 northeast of Mountain Pass	No	2.22 acres	4B
22	West of I-15 between Polaris Street and Aldebaran Avenue at site of proposed Central Station B	Yes	10.0	6A, 6B

Source: CirclePoint, 2010.

Scaled drawings (1' = 1000') of the TCAs were provided within the Plan and Profile drawings included with the Draft EIS and Supplemental Draft EIS (see **Appendices A-1, S-A-1, and S-A-2**). Several other figures within the Draft and Supplemental EIS also depicted the TCAs, but at a smaller scale (1" = 5 miles). Supplemental Draft EIS **Figure S-2-3** has been revised to show the correct location of TCA 7. The revised figure is included in this Final EIS as **Figure F-2-1**.

Appendix F-C (Final EIS Plan and Profile Drawings) shows all TCAs included as part of the Preferred Alternative at a larger scale (1" = 200 feet). **Figures F-2-3** through **F-2-7** also show TCAs associated with the Preferred Alternative. Acreages of certain TCAs have been updated since publication of the Draft EIS and Supplemental Draft EIS; the table reflects these updates.

The Applicant has indicated that the contractor for project construction would develop a construction water program as part of the design-build process. **The Applicant's plans to date** do not call for water wells, either on the TCAs or in any other locations. Where needed, water would be trucked in to the construction areas or supplied by adjacent existing pipelines.

Several of the TCAs are directly associated with tunnels proposed as part of Segment 4B and Segment 4C. Depending upon the approved design-build method, the tunnels would be either bored using a tunnel boring machine (TBM) or excavated using a drill and blast method. If a TBM, they most likely will be twin bored tunnels, with roughly a 17-foot radius each; or if using drill and blast excavation, most likely with a single large excavated horseshoe shaped tunnel approximately 31 feet tall.

The material removed from a mile of twin bored tunnel will be approximately 123,000 cubic yards. The material will be removed by truck back along the trackway corridor to be crushed and processed in one of TCAs. The geology and geotechnical conditions of the area indicate that due to the relatively high quality of the material, most or all of it will be used for fill material and sub-ballast for the construction of the project, thereby reducing the imbalance between excavated and filled sections of the project alignment. The Applicant has estimated that the maximum amount of material that would be removed from the tunnels to be 282,000 cubic yards – representing all three tunnels associated with Segment 4C. Segment 4B, with one less tunnel, would result in a smaller volume of material.

The Applicant has estimated total earthwork quantities as follows: excavation (exclusive of tunnels): 4.6 million cubic yards; tunnel excavation in Segment 4C: 282,000 cubic yards; embankments: 10.5 million cubic yards.

2.3.2.4 Technology

The Applicant has proposed using existing intercity high-speed train technology, customized for the unique setting of the corridor. Both DEMU and EMU train sets are being considered as high-speed train technology options. The Applicant has identified two Bombardier train sets, the Meridian and Regina, as representative examples of the respective DEMU and EMU technology options. Meridian DEMU trains are currently operating in the United Kingdom; various derivations of the Regina EMU trains are currently operating in Sweden and China. The DEMU train set is projected to operate at a maximum speed of 125 mph. The EMU train set could have a maximum speed of 150 mph.

Detailed train simulation studies for the alignment alternatives were conducted for 10-car trains under both train technology options. The 10-car train length was based on the peak travel demand forecast. Simulation results showed that seven to eight of the train cars would be powered, although all train cars could be self-propelled. This configuration

provides the high power-to-weight ratio and distributed traction needed to follow the I-15 corridor and negotiate the steep grades through the two desert mountain passes (the Applicant's design criteria limits slopes to a 4.5 percent maximum grade).

The EMU trains are wider and longer than the DEMU trains, which enable each EMU train to carry approximately 41 percent more passengers than a DEMU train. As previously noted, the EMU option would require the addition of 17 autotransformers and three electrical substations along the route. The autotransformers would be located at approximately 10-mile intervals along the rail alignment. Locations for these autotransformers are shown in Supplemental Draft EIS **Figures S-2-1** through **S-2-5**. Draft EIS **Appendix A** and Supplemental Draft EIS **Appendix S-A-1** and **S-A-2** also provides detailed locations of the autotransformers, as seen in the Plan and Profile drawings and the large-scale maps. The three electrical substations would be located on the sites of the Victorville OMSF, Baker MOW, and Relocated Sloan MSF facilities. The substation diagrams and layouts are as shown on the detailed site plan drawings for the referenced maintenance facilities within Draft EIS **Appendix A** and Supplemental Draft EIS **Appendix S-A-3** and **S-A-4**. EMU and DEMU train lengths, platform width requirements, and other differing features of the train sets are identified in **Table F-2-7** below.

Table F-2-7 Summary of Key Operating Features, DEMU and EMU

Criteria	DEMU (Meridian)	EMU (Regina)
Train Length	232 meters (±761.2 feet)	267 meters (±876.0 feet)
Platform Length Required	250 meters (±820.2 feet)	280 meters (±918.6 feet)
Passenger Capacity Per Ten-Car Train	478	675
Top Speed	125 miles per hour	150 miles per hour
Average Speed	100 mph	125 mph
Approximate One-Way Travel Time Between Victorville and Las Vegas	116 minutes	100 minutes at 125 mph top speed; 84 minutes at 150 mph top speed

Source: DesertXpress Enterprises, 2008.

As a standard gauge steel-wheel on steel-rail system, DesertXpress would be readily expandable and could accommodate other models of standard-gauge passenger trains.

Trains would be operated under manual control and would be equipped with cab signaling that enables the train operator to receive speed commands for each section of the route, with an automatic train protection system that includes over-speed detection and automatic braking in the event a train operator were to exceed the allowable speed command. A central OCC, located within the Victorville OMSF, would control the routing of trains, cab signals and track switches. Each train would be equipped with state-of-the-

art safety features, including backup emergency communications in the event of a primary loss of power. By selecting a distributed power system rather than a locomotive-hauled train, the train technology would be inherently very reliable, such that loss of propulsion within any car would not materially affect the safe and reliable performance of the entire train.

2.3.2.5 Operations

Detailed train performance simulations have been completed to estimate travel time. The travel time results were incorporated into a preliminary operations plan, which was reviewed by FRA as part of this EIS. Draft EIS **Appendix C** contained the FRA review of the operations plan.

The operations plan examined both technologies under consideration, the EMU option represented by the Regina trainset and the DEMU option represented by the Meridian trainset.

The plan estimates that the peak operational fleet required to meet the peak daily demand would be range from 12 (EMU) to 16 (DEMU) trains of 10 cars each, plus spares, in the first full year of operation.

The entire mainline section between Victorville and Las Vegas would incorporate dual tracks, one northbound and one southbound, to support the high ridership and frequency of train operation. The nominal direction of travel would follow the North-American practice of right-hand running. All tracks would be signaled for bi-directional operation should operating in reverse on a track be necessary.

The preliminary Operations Plan assumes that trains would operate between approximately 0600 hours and 2200 hours (6 AM to 10 PM), 365 days per year. The hours of service could be extended if passenger demand should warrant additional operation.

The initial train composition is a ten vehicle train. Passenger capacities for DEMU trains would be about 478; for EMU trains, which have slightly longer and wider cars, capacity would be about 675 passengers. On either train, one of the ten cars would be configured as an entertainment car.

Supervision of train movements, station operation, and wayside equipment would be provided by authorized personnel in the OCC located at the Victorville facility in the administration building. The OCC staff would be responsible for all functions and procedures performed on the main line. Accordingly, the OCC staff would have the capability to monitor and govern various aspects of the system through dynamic displays, status reports, voice and visual communication, and through commands/instructions via their computer interfaces.

At the maintenance facility and layover yards, speed commands and OCC supervision would extend into the entry point of the yard. From the entry of the yard to the storage tracks, the trains would be operated manually (15 mph maximum). The switches in yards would still be interlocked and controlled by the OCC. Switches at the direct leads to the maintenance building would not be under the supervision of the OCC and would be manually operated as trains are moved in and out of the maintenance building.

Bombardier, as well as the Applicant's independent technology consultants, Interfleet Technologies Ltd. from the United Kingdom, has performed a preliminary analysis and simulation of the DesertXpress High-Speed Rail System using the following maximum parameters applicable to the EMU operating system:

- Maximum cruise speed of 125 mph (and, for the EMU option only, alternate top speed of 150 mph)
- Maximum acceleration rate of 1.8 mph/second (mph/s)
- Maximum deceleration rate of 2.5 mph/s; and
- Maximum actual super elevation of 6.0 inches.

Depending upon the direction of travel and the specific alignment and station locations, one-way travel times are in the range of 84 to 100 minutes for the EMU technology option, to 116 minutes for the DEMU technology option. DEMU average speeds would be approximately 100 mph while EMU average speeds would be approximately 112 mph with a 125 mph top speed. At a top speed of 150 mph the average speed would be approximately 130 mph. Shorter alignments would enable a shorter travel time.

To meet the projected ridership, trains would depart from both ends of the line on 20 to 30 minute frequencies during peak weekend hours and up to approximately once per hour during the week.

FRA's review of the operations plan (Draft EIS Appendix C) found that the operating proposals set forth by DesertXpress were reasonable and set forth suggestions for the Applicant to consider as operating plans continue to evolve.

2.3.2.6 Safety and Security

All alignment routings would include several cross-track switches at prescribed intervals to enable continuity of high-speed train service in the event of a track blockage.

Equipment redundancy, high reliability, daily service and inspection in conjunction with preventive maintenance schedules, failure monitoring of vehicle and wayside equipment, and corrective responses would ensure a high level of DesertXpress service availability. In the event of minor failures, trains would continue to operate with little or no impact on service. In addition, a failure and emergency response system would be in place to govern response to partial or full system stoppages requiring immediate intervention by authorized personnel. Response personnel would be on call 24 hours a day to quickly

address such failures and emergencies. The DesertXpress failure management system would also rely on a variety of strategies to minimize the downtime and passenger inconvenience caused by vehicle and wayside failures. These would include:

- Automatic responses at the subsystem and/or the system level;
- Local (manual) reset of equipment;
- Remote reset of equipment by the OCC;
- Recovery/removal of a failed train with a revenue train or a recovery train;
- Replacement of failed train with hot standby train;
- Alternate routing using shuttles and bypass routes; and
- Appropriate inspection checks on tracks before service is restored.

If service must be suspended around a problem site for any extended period, the OCC would implement a shuttle, bypass or short turnback strategy to provide reduced service for the remainder of the system.

Peak demand is met by providing the train length (number of cars per train) and frequency of service required to meet the projected demand. The preliminary ridership and revenue forecasts indicate that 10-car trains would be sufficient to carry the demand for the foreseeable future. Thus, **the Applicant's Operating Plan shows that** each train would consist of ten cars with service operating at 20-minute frequencies during the highest demand periods. As ridership demand increases over time, peak period ticket pricing strategies would be used, such that 20-minute service frequency is anticipated by the Applicant to be sufficient for many years. If necessary at some point to meet additional demand, longer trains could be used, or additional 10-car trains would be put in service to provide higher capacity through more frequent scheduling.

Any fault occurring on any vehicle unit would be regarded as a train fault. There are numerous types of faults that possibly could occur with varying degrees of (potential) impact to system availability or threat to passenger safety. For this reason, onboard faults are characterized by the responses they would invoke, both by the OCC and by the train crew. Responses to train faults would range from the fault being noted and fixed at the next scheduled maintenance period to the emergency braking of the train. In the event of a train obstructing the alignment for extended periods, a degraded service mode would be implemented and the hot standby train, a recovery train, or the nearest in-service train, would be sent to clear the track. In the very infrequent event of an emergency requiring immediate train evacuation, train passengers would be evacuated to the 10 foot wide minimum maintenance road area that would run adjacent to the trackway or other suitable location, following review and approval of the System Safety Plan by the appropriate emergency services organizations.

The DesertXpress tracks in either the DEMU or EMU technology option would be fenced. To protect against guideway or ROW entry by unauthorized persons or objects, chain link fencing, at a minimum of six feet in height, would be provided between any barrier structure and the train tracks, at a distance of approximately 30 inches from the centerline of the barrier. In some segments, fencing may also be mounted on top of the barrier, with a combined minimum height of six feet. Fencing would not be required where any barrier or retaining wall would exceed six feet in height. Transformers placed at regular intervals along the route would be located within the median of the fenced alignment, preventing unauthorized access. If the EMU technology option is selected, additional safety features would be integrated into the project. For example, fencing would be provided to restrict access to electrical equipment. The three substations required in the EMU technology option would be separately fenced and secured.

All fenced areas of the DesertXpress ROW that could be accessed on foot would incorporate an intrusion detection system. The intrusion detection system would include continuity wire loops that are capable of detecting large objects that may strike or rupture the chain link fence. The intrusion detection system would be tied into the train control system to allow either warning of train stop, as detailed in the Safety and Security Plan and Hazards Analysis being prepared by the Applicant. The Safety and Security Plan and detailed Hazards Analysis would be incorporated into the DesertXpress standard operating procedures.

Intrusion detection systems would also be provided as part of the DesertXpress project as required by the FRA. To protect the DesertXpress tracks against intrusion by unguided automotive vehicles, including motorcycles, automobiles, and trucks, barriers would be placed near the edge of the highway shoulder lanes. For the at-grade DesertXpress tracks adjacent to or within the median of the I-15 freeway, permanent concrete barriers would **be installed between the tracks and the roadway, per Caltrans' and NDOT requirements.** Where the DesertXpress tracks are located on an elevated structure more than 6 feet above grade, no barrier would be required.

Overhead highway structures adjacent to or crossing the DesertXpress ROW would be protected by crash walls surrounding the base piers. The crash walls would be specifically designed to withstand the impact of a derailed train and to deflect a derailed train away from the supporting structure. At a minimum, these crash walls would be installed per the requirements of AREMA Manual for Railway Engineering. Curved overhead highway structures would also include highway barriers in compliance with Caltrans and NDOT standards. Additionally, any overpass crossing the DesertXpress tracks would require a minimum clearance of approximately 16 feet, 9 inches. Chain link fencing on the roadway overpasses would also be constructed to protect objects from falling onto the DesertXpress trackway.

Under 49 U.S.C. 20101 et seq., the FRA has authority over the safety of railroads. The proposed project would use trains and other features that do not comply with current FRA safety regulations, including track and locomotive safety regulations. However, this inconsistency with the FRA safety regulations would be made consistent through promulgation of a rule of particular applicability or a waiver process that would set safety standards specifically for the project. As such, the Applicant shall ensure DesertXpress Project adheres to all applicable FRA Safety regulations.

In addition, FHWA has authority to ensure the Project does not adversely affect the safety of the Interstate highway system in approving the project to occupy or use the I-15 rights-of-way. FHWA intends to execute a Memorandum of Agreement with the Applicant to retain any necessary stewardship and oversight of the project during the design process, as well as to address design issues that avoid, minimize, and mitigate any remaining potential adverse impacts to Interstate operations, maintenance, and safety.

A design safety working group consisting of FRA, FHWA, Caltrans, NDOT and the Applicant developed the Highway Interface Manual, included as **Appendix F-B** of this Final EIS, to begin addressing safety and security issues for the proposed project. It is anticipated that the Manual will be further developed and refined during the design process to ensure consistency with FRA and FHWA safety obligations. In addition, the Applicant shall complete an Emergency Preparedness Plan for FRA Office of Safety review and approval as required under 49 CFR Part 239.

2.4 PREFERRED ALTERNATIVE

FRA, FHWA, BLM, NPS and the STB's OEA have considered analysis of the No Action Alternative, Action Alternatives, and project modifications and additions presented in the Draft EIS and the Supplemental Draft EIS, as well as all public and agency comments received during the review periods for both the Draft EIS and Supplemental Draft EIS, in defining the Preferred Alternative. The Draft EIS and Supplemental Draft EIS provided a thorough comparative analysis of the various action alternatives and the no action alternative. After comparing the potential impacts of the alternatives, FRA and the Cooperating Agencies selected the Preferred Alternative as described below which the Agencies believe would fulfill their statutory missions and responsibilities, giving consideration to economic, environmental, technical and other factors. This Preferred Alternative differs from the Applicant's Proposed Alternative (see **Section 2.1.3 above) in the selection of Segment 3, which is described in more detail above in **Section 2.3.2.1** and below in **Section 2.4.1**.**

The Preferred Alternative consists of an approximately 200-mile rail corridor between Victorville and Las Vegas consisting of the following rail alignments and station/maintenance facilities:

- Victorville Station Site Option: VV3B
- Victorville OMSF Site Option: OMSF 2
- Segment 1
- Segment 2C Side Running
- Segment 3B²⁰
- Segment 4C, absent legislation allowing implementation of Segment 4A
- Segment 5B
- Segment 6B²¹
- Las Vegas Station Site: Las Vegas Southern Station or Las Vegas Central Station B
- Las Vegas MSF Site Option: Wigwam MSF
- Las Vegas MSF Substation: Frias Substation
- Train Technology: EMU

As discussed in **Section 1.5, Relationship to Other Federal Agency Policies, Plans, and Programs**, of the Draft EIS, in addition to FRA as the lead federal agency, the Cooperating Agencies involved with the project and responsible for signing Records of Decision following publication of this Final EIS include the BLM, STB, FHWA, and the NPS. In addition, Caltrans and NDOT have participated in an EIS Working Group.

The Preferred Alternative is the alternative which FRA, FHWA, BLM, NPS and OEA believe would most closely align with their statutory mission and responsibilities, giving consideration to economic, environmental, technical and other factors. FRA held regular meetings with the Cooperating Agencies and EIS Working Group throughout preparation of the Draft EIS and Supplemental Draft EIS (refer to **Chapter 4.0, Comments and Coordination** of this Final EIS) and during preparation of this Final EIS.

FRA, FHWA, BLM, NPS and OEA recommended the alternative that would best meet the **agency's defined plans, policies, and regulations and also considered the environmental effects** identified in the Draft EIS and Supplemental Draft EIS and other technical factors. As lead agency, FRA was responsible for considering the recommendations of FHWA, BLM, NPS and OEA in selecting the Preferred Alternative.

²⁰ The Segment 3B rail alignment as part of the Preferred Alternative incorporates the alignment adjustments per Alignment Adjustment Areas 3 through 6 in the Supplemental Draft EIS.

²¹ The Segment 6B rail alignment as part of the Preferred Alternative incorporates the alignment adjustments per Alignment Adjustment Areas 7 and 8 in the Supplemental Draft EIS.

2.4.1 ALIGNMENT

Segment 1

Starting in Victorville, the rail alignment would follow Segment 1, heading north following the west side of the I-15 freeway corridor. No additional action alternatives were studied in depth for Segment 1, but as shown in **Table F-2-5** above, other alignments were considered and ultimately rejected from further analysis based on feasibility constraints and possible substantially adverse environmental impacts.

In Segment 1, the rail alignment would have a maximum grade of about 2.5 percent and would incorporate retained embankments alongside the I-15 freeway and aerial structures where the rail alignment would need to be grade separated (i.e., at I-15 interchanges). Segment 1 would connection with the Segment 2C Side Running rail alignment just south of the community of Lenwood.

Segment 2C Side Running

The Segment 2C Side Running rail alignment was selected as part of the Preferred Alternative as a result of reduced adverse environmental effects as compared to Segment 2A/2B and as a result of public comment and agency coordination. As concluded in the Supplemental Draft EIS, the Segment 2C Side Running rail alignment would have fewer adverse land use effects; would avoid impacts to farmland and grazing lands; would affect fewer sensitive cultural resources; would affect fewer linear feet of surface water resources; and would result in fewer impacts to sensitive biological resources, including plant and wildlife species.

During the Draft EIS public review period (March 18, 2009 – May 22, 2009), the City of Barstow submitted comments requesting that Segment 2 be relocated within the I-15 freeway corridor to avoid potential impacts to a planned industrial park in the Lenwood area. The Segment 2C Side Running rail alignment would avoid such land use conflicts in Lenwood.

In addition, Segment 2C would allow for a more direct route of travel relative to Segment 2A and Segment 2B. The Segment 2C Side Running rail alignment would also better accommodate future I-15 widening or improvements by Caltrans relative to the Segment 2C Median rail alignment.

The Segment 2C Side Running rail alignment would commence from a point in Segment 1 near Lenwood Road approximately 7 miles southwest of the community of Lenwood. The rail alignment would run along the north and west side of the I-15 freeway within the existing ROW through Lenwood, central Barstow, and eastward to Yermo. The rail alignment would change from an at-grade to an elevated configuration near Lenwood Road. Through central Barstow, the rail alignment would be on an elevated structure immediately north of the I-15 freeway and would cross over local interchanges and overpasses. The rail alignment would maintain a side-running configuration along the

west and north sides of the I-15 freeway through central Barstow and would cross over the Mojave River on a new bridge immediately adjacent to the existing southbound I-15 bridge.

The Segment 2C rail alignment would follow the same alignment as Segment 2A in the vicinity of the I-15/SR 58 interchange just west of Yermo. This portion of the rail alignment would divert from the existing I-15 freeway corridor (outside of the existing ROW) and would follow a northerly course outside of the I-15 freeway corridor for approximately 9.3 miles. The Segment 2C rail alignment would reconnect with the I-15 freeway corridor near the I-15/Yermo Road interchange, where the alignment would connect with the Segment 3B rail alignment.

Segment 3B (Modified)

The Segment 3B rail alignment was selected as part of the Preferred Alternative because it would be located immediately adjacent to the I-15 freeway and would allow for possible future widening and improvement activities on I-15.

Based on additional consultation following publication of the Supplemental Draft EIS, an approximately 10 mile portion of Segment 3B would be further modified to reduce impacts to sensitive resources in the area. This portion of the Segment 3B rail alignment near the I-15/Halloran Springs Road interchange would cross over the I-15 freeway from the north side to the south side, staying within the existing I-15 ROW. As the rail alignment heads east toward Halloran Summit, it would cross back under the I-15 freeway from the south to the north side in an open cut in the vicinity of the Halloran Summit interchange.

With the exception of the Halloran Springs to Halloran Summit area, the Segment 3B rail alignment would run alongside the north side of the I-15 freeway within the existing freeway ROW from Fort Irwin Road to Mountain Pass. Grade-separated elevated structures would be incorporated for crossing roadways and at the I-15 interchanges, from the on-off ramps. The Segment 3B rail alignment would also incorporate the AAAs and profile modification as evaluated in the Supplemental Draft EIS. In the Mountain Pass area, the Segment 3B rail alignment would connect with the Segment 4C rail alignment.

Notably, the Segment 3B (Modified) alignment alternative selected by the FRA and **Cooperating Agencies is a variance between the Preferred Alternative and the Applicant's Proposed Alternative**, as described in **Section 2.1.3** of this Final EIS. As explained above, the Agencies are requiring this modification to avoid sensitive resource areas.

Segment 4C

The Segment 4C rail alignment was selected as part of the Preferred Alternative because it would avoid land use conflicts associated with Segment 4A and Segment 4B. The Draft EIS identified that a 1.55 mile portion of Segment 4A would traverse the Mojave National Preserve near Nipton Road as well as a portion of the nearby Ivanpah Desert Wildlife Management Area (DWMA), an important resource area for the desert tortoise (see **Figure 3-14.5** of the Draft EIS). The Draft EIS also identified that Segment 4B would

conflict with a planned solar power project located to the west of Ivanpah Dry Lake. With the selection of the Segment 4C rail alignment, no adverse effects to the Ivanpah DWMA or future development of the planned solar power energy project would occur.

The Segment 4C rail alignment would be approximately 20.7 miles long. In Mountain Pass, the west end of the Segment 4C rail alignment would be located immediately north of I-15 within the freeway ROW. The rail alignment would then leave the I-15 freeway ROW and head northeast, passing through three new dual track tunnels through the Clark Mountain range. The Segment 4C rail alignment would travel northwardly from the Clark Mountains and would turn east to cross the California-Nevada state line and connect back to the I-15 freeway corridor in the vicinity of Primm. The Segment 4C rail alignment would be located on the western side of the I-15 freeway. The Segment 4C rail alignment would cross over the I-15 freeway on an elevated structure to the east side of the I-15 freeway within the vicinity of Primm, where the Segment 4C rail alignment would connect with the Segment 5B rail alignment.

The Segment 4A rail alignment would provide the most direct route of the Segment 4 rail alignment options. As stated in **Section 2.3.2.1** above, Segment 4A extends for 14 miles, following the I-15 freeway corridor. While Segment 4A would encroach upon the Preserve for an approximately 1.55 mile portion, the Segment 4A rail alignment would be primarily located within the existing I-15 freeway ROW and would avoid effects to sensitive environmental resources associated with Segment 4C since the I-15 freeway ROW is already disturbed by the existing transportation corridor. However, legislative action is required to grant a ROW through the Mojave National Preserve to implement Segment 4A. As of January 2011, no legislation is pending to facilitate any such grant. In a February 2011 letter to FRA, the NPS acknowledged the lack of legislative authority at present to grant such a ROW, but indicated a preference for Segment 4A over Segment 4C insofar as the vicinity of Segment 4A adheres more closely to the I-15 corridor and traverses lands that have been largely disturbed.

As a result, Segment 4A was not selected over Segment 4C for the Preferred Alternative. However, should legislative action allow ROW access to the Preserve or modify the Preserve boundaries to enable implementation of Segment 4A, it is recognized that while not legally possible at this time, Segment 4A is the superior alignment alternative in consideration of the economic, environmental, technical factors used to select the Preferred Alternative. Please see **Section 2.5, Environmentally Preferred Alternative**, below for further discussion of Segment 4A and associated impacts.

Segment 5B

The Segment 5B rail alignment was selected because it would be located immediately adjacent to the I-15 freeway and would allow for future widening and improvement activities on I-15.

The Segment 5B rail alignment would start along the east side of I-15 within the freeway ROW between Primm and Jean. In this segment, the rail alignment would be largely at-grade and would cross back to the west side of I-15 at the northern portion of Segment 5B, crossing over I-15 and the existing UPRR tracks.²² Upon crossing over to the west side of I-15, the Segment 5B rail alignment would connect with the Segment 6B rail alignment.

Segment 6B

The Segment 6B rail alignment would run along the west side of the I-15 freeway primarily within the freeway ROW. Segment 6B was determined to be the most feasible option for allowing future NDOT widening and improvements to I-15 in the Las Vegas metropolitan area. Segment 6A was not considered compatible with planned future improvements on I-15. As compared to Segment 6, Option C, Segment 6B would provide the most direct route between Las Vegas and Victorville.

The Segment 6B rail alignment would be constructed at existing grade until reaching the I-15/Blue Diamond Road interchange in the Las Vegas metropolitan area. Here the rail alignment would transition to an elevated structure and would remain elevated until reaching the passenger station.

The Segment 6B rail alignment incorporates AAAs 7 and 8 as detailed in the Supplemental Draft EIS. With AAA8, portions of the Segment 6B would be located outside of the I-15 freeway ROW and into a ROW owned by Clark County in three areas – between I-15/State Route 215 interchange and West Russell Road, between West Russell Road and West Tropicana Avenue, and between West Tropicana Avenue and the Las Vegas Central Station B site. Between West Russell Road and West Tropicana Avenue, the elevated rail alignment would be located within the median of Dean Martin Drive/Industrial Road.

2.4.2 FACILITIES

Victorville Station and Maintenance Facility Site Options - Victorville Station Site 3B and OMSF2

VV3B was selected as part of the Preferred Alternative due to the reduced traffic impacts at local intersections and cumulative effects as compared to VV1 and VV2. Furthermore, VV3B was selected insofar as it avoids locating any parking areas or structures beneath the Los Angeles Department of Water and Power (LADWP) electric utility corridor that parallels I-15 in this area. LADWP regulations prohibit parking under its facilities for

²² Once the STB has authorized a rail construction, no other rail carrier can block the construction by refusing to permit the carrier from crossing its property as long as the construction does not unreasonably interfere with the operation of the crossed line; the operation does not materially interfere with the operation of the crossed line; and the owner of the crossing line compensates the owner of the crossed line, 49 U.S.C. 10901(d)(1).

extended periods (greater than 24 hours). As parking demands of the Victorville Station were assumed to require extended periods, VV3A, which included parking beneath the LADWP corridor, was not incorporated into the Preferred Alternative.

The Draft EIS concluded that VV1 would result in adverse traffic impacts at local intersections and would significantly contribute to future adverse cumulative effects, even with the implementation of mitigation measures. The Draft EIS also concluded that VV2 would result in potentially significant effects to existing intersections, but that mitigation measures (included in the Draft EIS) could reduce the significance of these impacts such that affected intersections would operate at acceptable service levels. VV3 would also result in a reduced travel time as compared to implementation of VV1 or VV2, since the rail alignment would be shortened by approximately 7 miles which FRA determined would not substantially affect ridership. The VV3 and OMSF 2 tail tracks would connect to the Segment 1 rail alignment.

With the selection of VV3, OMSF 2 would be required since OMSF 1 would not function with VV3 due to distance between the two sites. OMSF 2 would be located immediately south of VV3. Based on further engineering studies following publication of the Draft EIS, OMSF 2 would utilize the reduced footprint as identified in the Supplemental Draft EIS.

Las Vegas Station and Maintenance Facilities – Southern Station or Central Station B; Wigwam Avenue MSF, and Frias Substation

Both the Las Vegas Southern Station as well as the Central Station B sites have been included in the Agency Preferred Alternative. This has been done to allow flexibility to further evaluate the cost/benefit of the two station sites before selecting one for construction and operation. Both station sites are in close proximity of major attractions in Las Vegas and both would have relatively similar environmental effects.

Advantages of the Southern Station include its proximity to southern end of the Las Vegas Strip as well as McCarran International Airport. The Southern Station site is undeveloped and would not require displacement or demolition of any existing development. The Southern Station would also result in an overall shorter alignment length of about 2 to 6 miles when compared to the Central or Downtown station sites. As most of Segment 6B through metropolitan Las Vegas would be placed on elevated structures within or immediately adjacent to the I-15 corridor, the Southern Station would avoid the need to construct a substantial amount of elevated trackway that would be needed to access the Central or Downtown station sites.

Central Station B is located at about the middle of the Las Vegas Strip in close proximity to many major attractions in Las Vegas. Central Station B site would result in reduced construction costs as the property owner has performed extensive site planning and entitlement work for use of the property. Similar to the Southern Station, the Central Station B site does not include any known biological or cultural resources, and both are located outside the 100-year floodplain. Both Central Station B and the Southern Station would result in reduced traffic impacts at local intersections relative to Central Station A.

At 37 acres in area, Central Station B features a more compact footprint relative to the Southern Station (62 acres) but is larger than the Downtown (23 acres) and Central Station A (32 acres) options.

The Wigwam Avenue MSF site option was selected as part of the Preferred Alternative because it would result in fewer impacts to sensitive biological resources as compared to the Relocated Sloan Road MSF and Robindale Avenue MSF site options. The Wigwam Avenue MSF would be located between to the west of the I-15 freeway at the Dean Martin Drive and Wigwam Avenue intersection.

As the Wigwam Avenue MSF would not include a substation or utility corridor on site, the Frias Substation would be required in conjunction with this MSF to provide electricity to the rail alignment. The Frias Substation would be located west of the I-15 freeway at the intersection of West Frias Avenue and South Dean Martin Drive.

2.4.3 TEMPORARY CONSTRUCTION AREAS

Construction of the Preferred Alternative would require the use of the TCAs. **Table F-2-8** identifies the TCAs for the Preferred Alternative, their locations, and the segments each would serve.

Table F-2-8 Temporary Construction Areas – Preferred Alternative

TCA No.	Location	Within a Permanent Impact Area?	Size	Segment(s) Served
1B	OMSF 2	Yes	68 acres	1
2C1	Along I-15, near Lenwood Road	No	1 acre	2C
5	Yermo, east of Yermo Road/I-15 interchange	No	5.23 acres	2C/2A
6	Along I-15, southwest of Field Road interchange	No	5.82 acres	3B
7	Along I-15, north of Basin Road interchange	No	3.5 acres	3A/3B
8	West of Baker, between I-15 and Baker Blvd	No	1.9 acres	3B
9	East of Baker, between I-15 and Baker Blvd (Baker MOW)	Yes	9.63 acres	3B
10	North of I-15 at Cima Road	No	5.67 acres	3B
4C1	Along I-15, near Mountain Pass south of Clark Mountains	No	5.2 acres	4C
4C2	North of Mountain Pass in Clark Mountains	No	1 acre	4C
4C3	North of Mountain Pass in Clark Mountains	No	1 acre	4C
4C4	North of Clark Mountains, west of Ivanpah Dry Lake	No	9.7 acres	4C
4C5	Along I-15, north of California-Nevada state line near Primm	No	6.1 acres	4C

TCA No.	Location	Within a Permanent Impact Area?	Size	Segment(s) Served
13	South of Sloan Road near UPRR undercrossing of I-15	No	9.1 acres	5B
16	Between Russell Road and Hacienda; site of proposed Southern Station	Yes	57.09 acres	6A, 6B
22	Site of Central Station B	Yes	10.0	6B

Source: CirclePoint, 2010.

2.4.4 TECHNOLOGY

The Preferred Alternative would utilize the EMU train technology option because it was determined to be the preferable technology with fewer resultant environmental effects as compared to the DEMU technology option. The EMU technology option would allow for faster train speeds, which would reduce the overall travel time and increase ridership. The EMU technology option also results in lesser effects relative to air quality and GHG emissions, would result in a greater reduction in energy consumption, and would result in fewer severe noise impacts relative to the DEMU technology option.

2.5 ENVIRONMENTALLY PREFERABLE ALTERNATIVE

The Council on Environmental Quality (CEQ) regulations implementing NEPA require that “the alternative or alternatives which were considered to be environmentally preferable” be identified²³. Environmentally preferable is defined as “the alternative that will promote the national environmental policy as expressed in the NEPA, Section 101. Ordinarily this means the alternative that causes the least damage to the biological and physical environment; it also means the alternative that best protects, preserves, and enhances historic, cultural, and natural resources.”²⁴

FRA, FHWA, BLM, NPS and OEA have identified an environmentally preferable alternative. This is the combination of rail alignments and project features that result in the fewest or least intensive adverse effects. Numerous economic, environmental, technical and other factors led the Lead Agency and Cooperating Agencies, to forego the environmentally preferred alternative in favor of the Preferred Alternative identified in detail in **Section 2.4, Preferred Alternative**, of this Final EIS. Components of the environmentally preferable alternative are identified below.

Victorville Station Site Option: VV2. This site has a smaller footprint than VV3 and avoids potential conflicts with overhead electrical utility lines. The inclusion of VV2 would result in significant traffic impacts to the Stoddard Wells Road interchange, but these

²³ Council on Environmental Quality Regulations, Section 1505.2

²⁴ Council on Environmental Quality, 1981

impacts could be mitigated successfully. VV3 was identified as preferable insofar as Caltrans expressed concern about VV2 having potential conflicts with planned freeway improvements in the area.

Victorville OMSF Site Option: OMSF 2 (Same as Preferred Alternative)

Segment 1: (Same as Preferred Alternative)

Segment 2: 2C, Median Option. Segment 2C would be side running until L Street in Barstow, where the median option would begin. The median option of Segment 2C reduces the degree of noise, vibration, and visual effects from the perspective of the northern side of the I-15 corridor through Barstow. However, in the median option, noise and vibration impacts would be on both sides of the I-15 corridor, not solely the north side. In addition, constructing the train in the median is more costly, is more difficult to construct and maintain, and poses more highway and rail operational and safety concerns than the side-running options in general.

Segment 3: 3A, Median. Outside urbanized areas, the median option typically results in fewer impacts to biological and cultural resources, insofar as the median of the freeway is usually a highly disturbed area with relatively few resources. However, the median option is more costly and difficult to construct and maintain and poses more highway and rail operational and safety concerns than side-running options.

Segment 4: 4A (Via Nipton Road). Segment 4A is the shortest of the three options for Segment 4, but would traverse a 1.55 mile portion of the Mojave National Preserve near Nipton Road. Segment 4A would avoid and/or minimize the impacts associated with Segment 4C, including fragmentation of wildlife/habitat areas, severance of grazing lands, and impacts to hydrological features. Segment 4C had been designed to go around the approved Ivanpah Solar Electric Generating System (ISEGS) solar energy project. Segment 4A was not identified as the Preferred Alternative, as at present there is no mechanism for the NPS to grant a ROW through the Mojave National Preserve and no legislation is pending as of January 2011 to facilitate any such grant.

Segment 5: 5A Median. Outside urbanized areas, the median option typically results in fewer impacts to biological and cultural resources, insofar as the median of the freeway is usually a highly disturbed area with relatively few resources. However, the median option is more costly and difficult to construct and maintain and poses more highway and rail operational and safety concerns than side-running options.

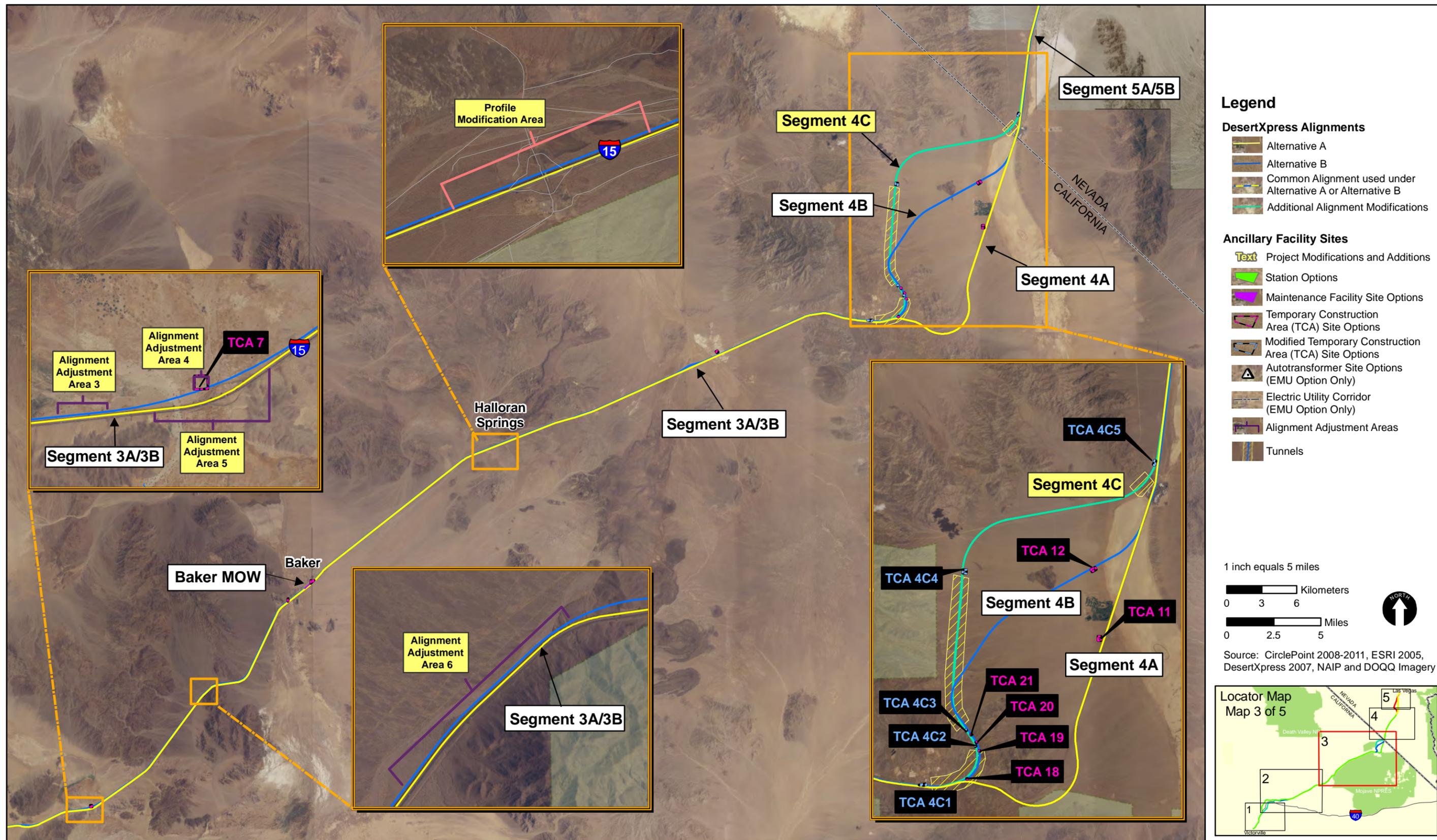
Segment 6: 6A Median. Segment 6 comprises an area that transitions from relatively undeveloped desert in the south to the heart of metropolitan Las Vegas in the north. However, the median option is more costly and difficult to construct and maintain and poses more highway and rail operational and safety concerns than side-running options.

Las Vegas Station: Generally, the four Las Vegas Station Site options do not substantially differ in terms of potential environmental impacts. All Las Vegas Station options would be located within the existing urban context of the metropolitan Las Vegas area. However, the Las Vegas Central Station B and Las Vegas Downtown Station sites would result in the displacement of industrial uses, where as the Las Vegas Central Station A and Las Vegas Southern Station site options would be developed on either an existing surface parking area or undeveloped parcel with no business displacements. The Southern Station would allow for the shortest overall rail length while achieving reasonable proximity to the visitor-serving attractions of the Las Vegas Strip and also proximity to McCarran International Airport.

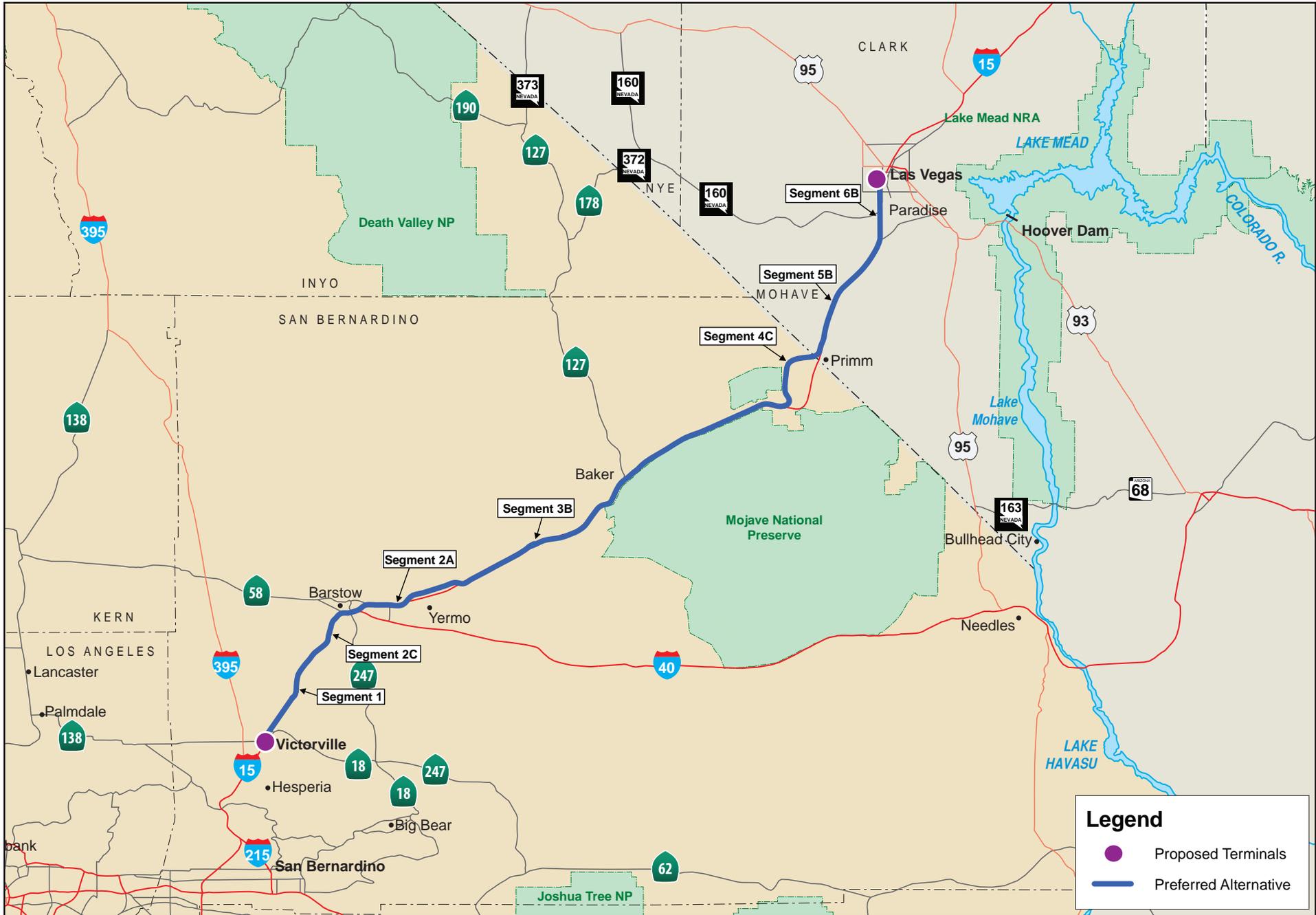
Las Vegas Maintenance and Storage Facilities: Wigwam MSF and Frias Substation (Same as Preferred Alternative). Although the Wigwam MSF option requires the relocation of existing businesses, the Robindale MSF site is closer to residential development, posing a potential land use conflict. Moreover, the Relocated Sloan Road MSF site is outside the boundary of urban infrastructure districts, such as water and wastewater, thus requiring either connections to urban infrastructure or costly transport of water/sewage to and from the site.

Technology Option: EMU (Same as Preferred Alternative).

Temporary Construction Areas: (Same as Preferred Alternative).



* This figure, originally in the Supplemental Draft EIS, has been revised to show the correct location of TCA 7.



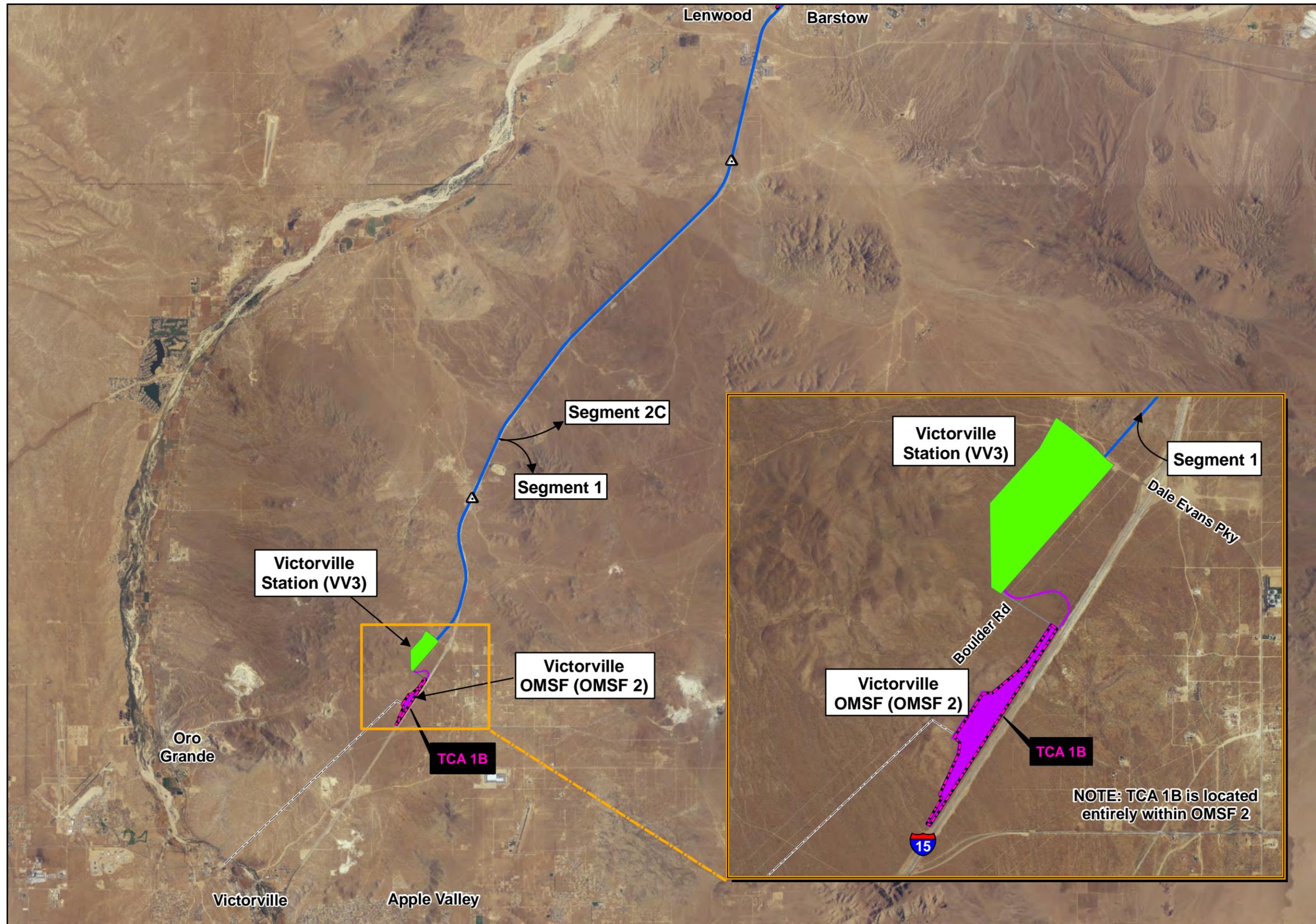
Legend

- Proposed Terminals
- Preferred Alternative



**DesertXpress
Final EIS**

Source: CirclePoint, 2011.



Legend

DesertXpress Alignment

- Preferred Alternative

Ancillary Facilities

- Stations
- Maintenance Facility Sites
- Temporary Construction Area (TCA)
- Autotransformer
- Electric Utility Corridor

1 inch equals 3 miles

0 2 4 Kilometers

0 1.5 3 Miles



Source: DesertXpress 2008, ESRI 2005, CirclePoint 2008-2011, NAIP 2003-2006,



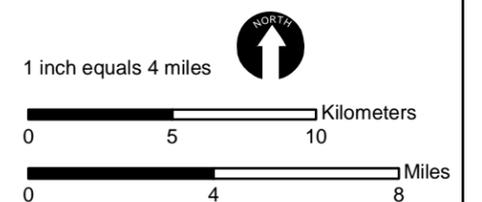
NOTE: TCA 1B is located entirely within OMSF 2



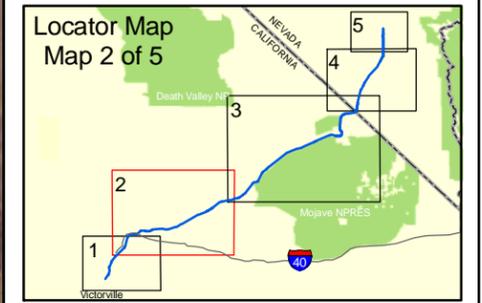
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DesertXpress Alignment
 Preferred Alternative

- Ancillary Facilities**
- Stations
 - Maintenance Facility Sites
 - Temporary Construction Area (TCA)
 - Autotransformer
 - Electric Utility Corridor

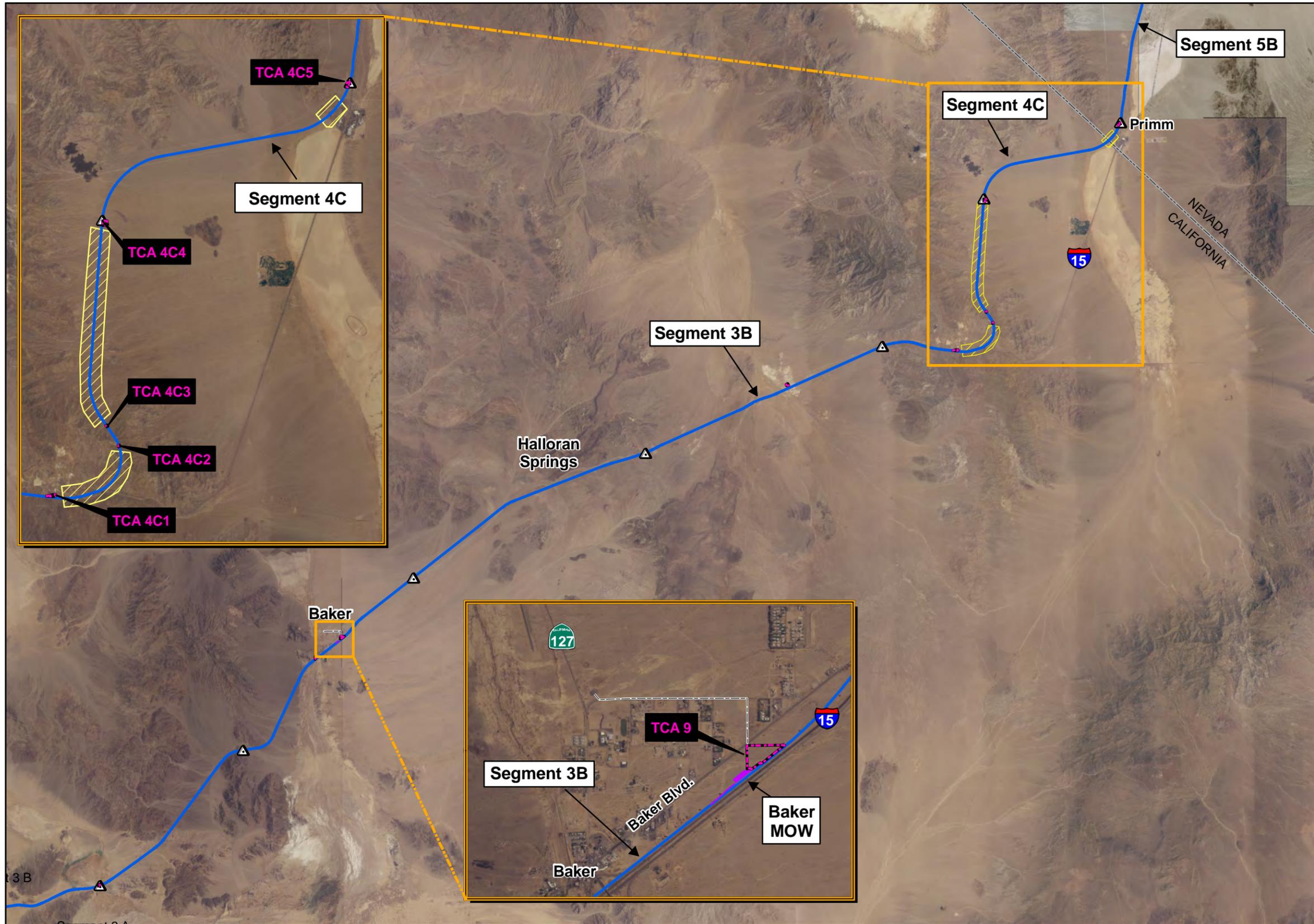


Source: DesertXpress 2008, ESRI 2005, CirclePoint 2008-2011, NAIP 2003-2006,



**DesertXpress
Final EIS**

Geografika Consulting 01.11.11



Legend

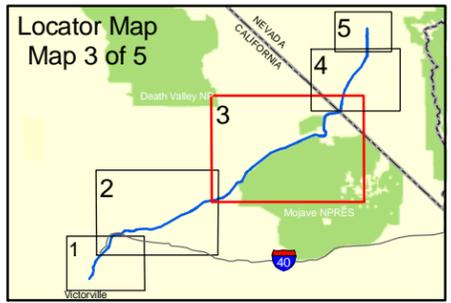
- DesertXpress Alignment**
- Preferred Alternative
- Ancillary Facilities**
- Stations
 - Maintenance Facility Sites
 - Temporary Construction Area (TCA)
 - Autotransformer
 - Electric Utility Corridor
 - Tunnels

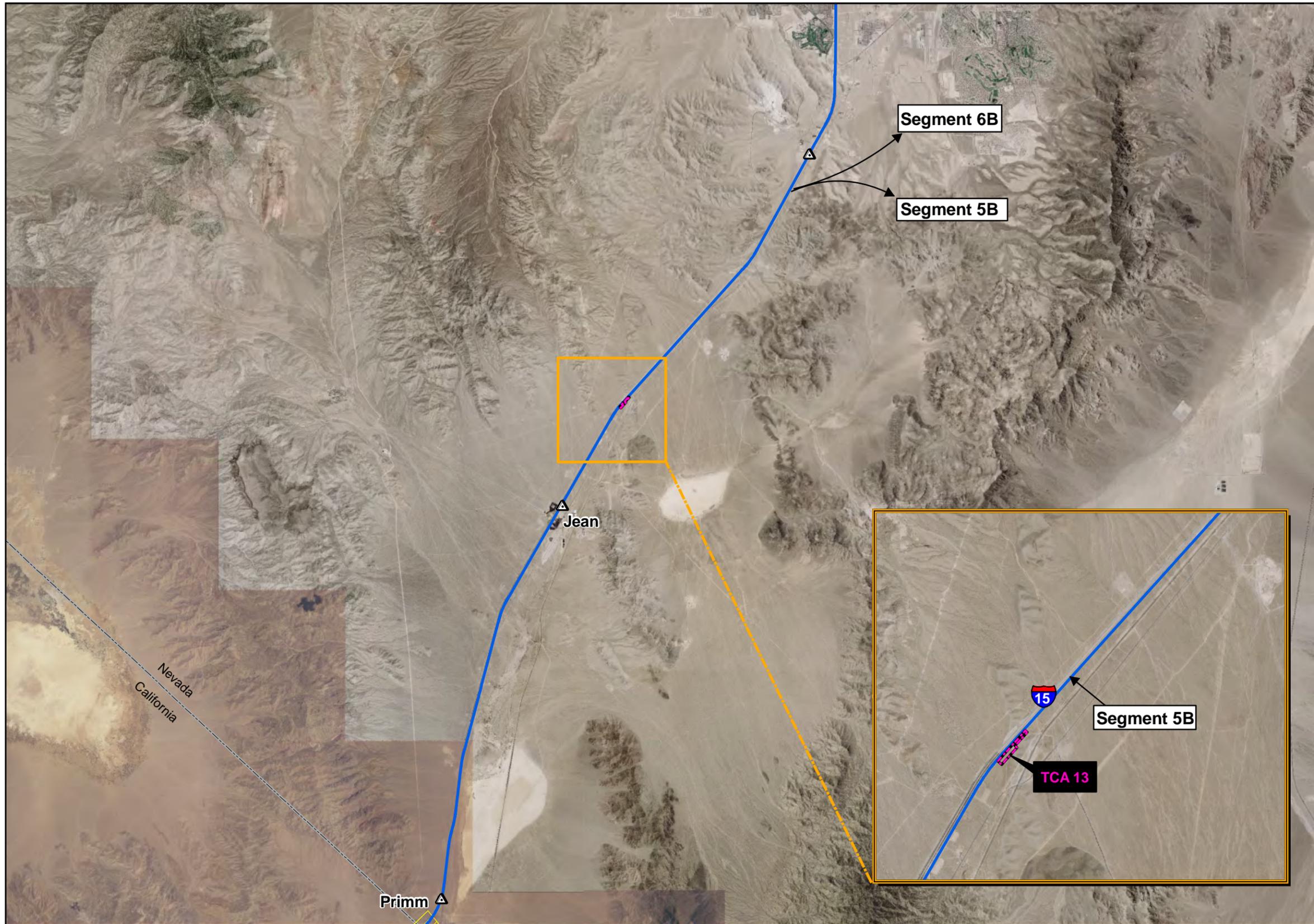
1 inch equals 5 miles

0 3 6 Kilometers

0 2.5 5 Miles

Source: CirclePoint 2008-2011, ESRI 2005, DesertXpress 2007, NAIP and DOQQ Imagery





Legend

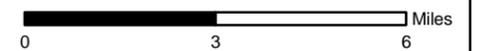
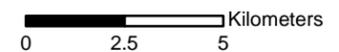
DesertXpress Alignment

Preferred Alternative

Ancillary Facilities

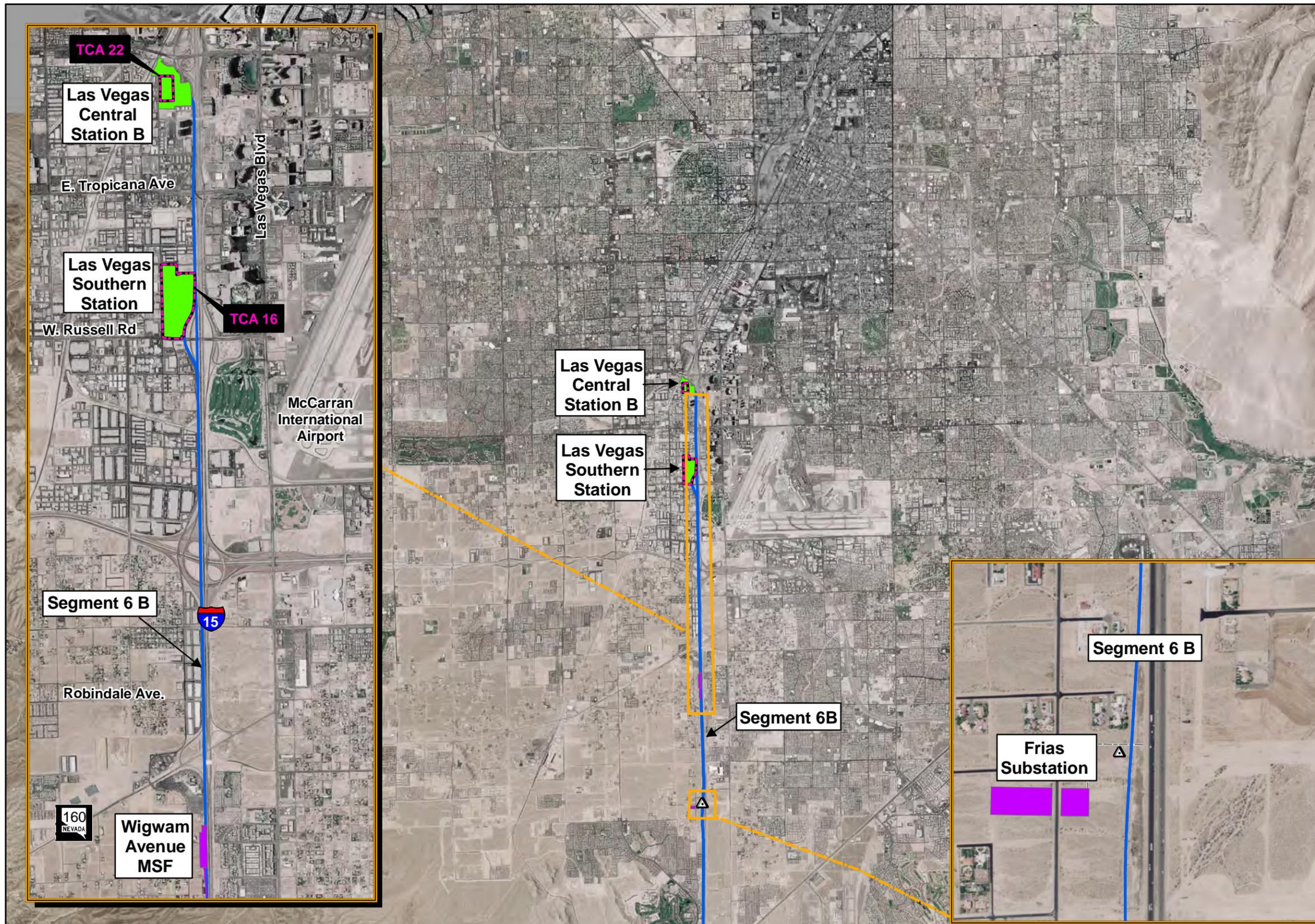
- Stations
- Maintenance Facility Sites
- Temporary Construction Area (TCA)
- Autotransformer
- Electric Utility Corridor
- Tunnels

1 inch equals 3 miles



Source: CirclePoint 2008-2011, ESRI 2005, DesertXpress 2007, NAIP and DOQQ Imagery





Legend

DesertXpress Alignment

Preferred Alternative

Ancillary Facilities

- Stations
- Maintenance Facility Sites
- Temporary Construction Area (TCA)
- Autotransformer
- Electric Utility Corridor

1 inch equals 2 miles

Kilometers
0 1.25 2.5

Miles
0 1 2



Source: CirclePoint 2008-2011, ESRI 2005, DesertXpress 2007, NAIP and DOQQ Imagery



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