4.0 Detailed Evaluation of Alternatives

The evaluation process for the LLCS included a detailed evaluation of the alternatives advanced from the screening analysis discussed in Section 3. The detailed evaluation phase includes the refinement of the roadway alignment and design features of each alternative advanced from the screening phase. After refinements are made, each alternative is evaluated in greater detail. The evaluation process considered traffic performance, preliminary drainage design, right-of-way needs, and cost. In addition, each alternative was assessed for its effects on neighborhoods, environmental resources, and cultural resources. The findings of the evaluation are summarized in this section.

4.1 Alternatives

Of the eight alternatives evaluated in the initial phase, six were eliminated based on the findings of the screening analysis. Two alternatives — the S-1 Alternative and the S-5 Alternative — were advanced for further evaluation. Following the screening analysis, the two remaining alternatives were refined and then renamed to improve public recognition of their general alignments. The S-1 Alternative was renamed the *Miller A Alternative*, and the S-5 Alternative was renamed the *Morris B Alternative.* A general description of each alternative is provided below.

Miller A Alternative

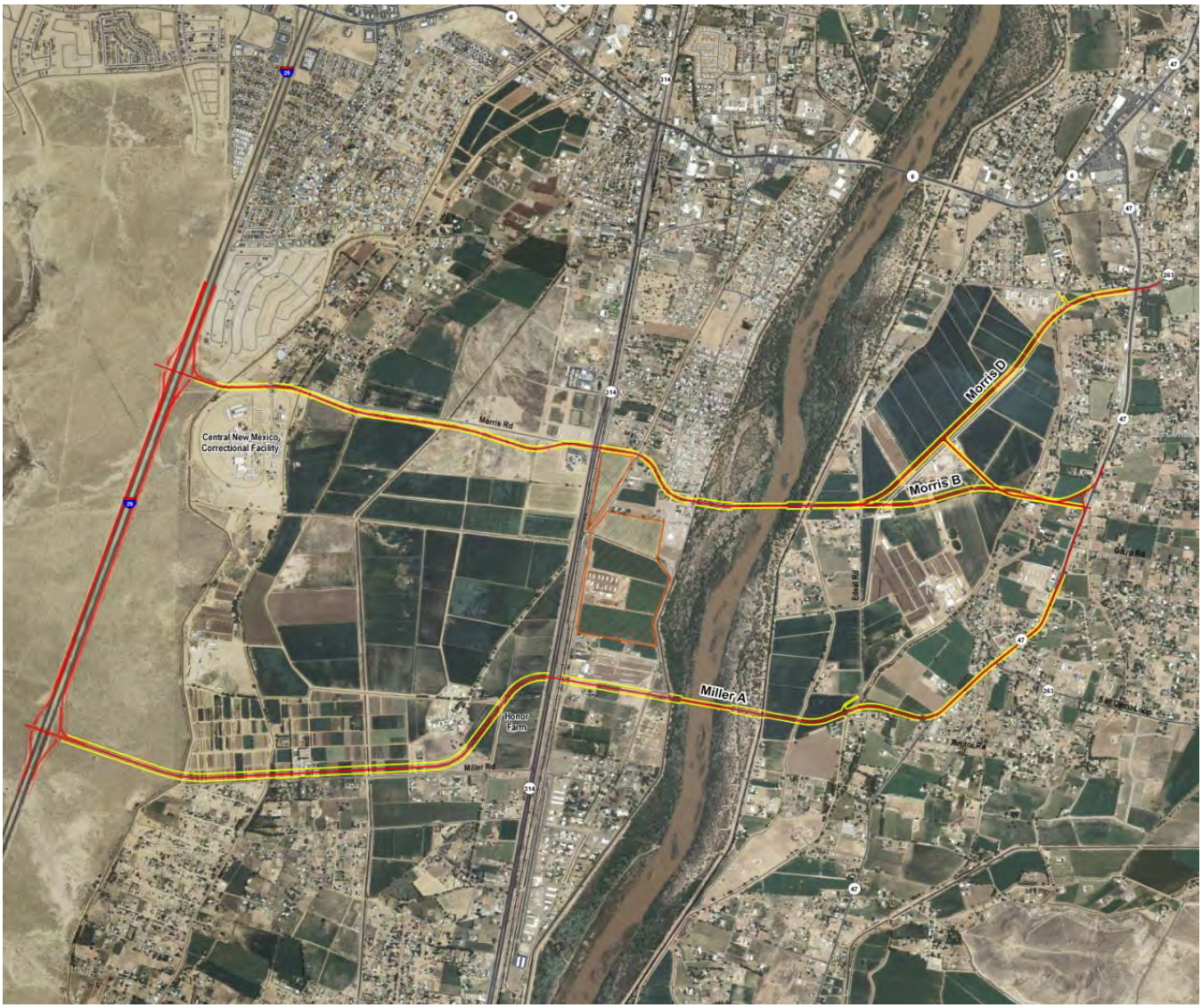
The Miller A Alternative is located at the southern edge of the study area. It begins at I-25 approximately 3.3 miles south of the existing I-25/NM 6 interchange, intersects NM 47 approximately 2.8 miles south of the NM 6/NM 47 intersection, and then follows NM 47 north for approximately one mile to the intersection of NM 47 and Otero Road. This alternative consists of a 4-lane arterial roadway with an interchange at I-25, frontage roads that connect to the I-25/NM 6 interchange, and at-grade intersections at NM 314, Edeal Road, and NM 47. In addition, intersections and/or driveways are provided at Miller Road, the NMSU Agricultural Science Center, and Los Lentes Road. Dual left-turn lanes are assumed at each major intersection. The general alignment of this alternative is illustrated in Figure 16 on the following page. Figures 17-A through 17-H illustrate the route alignment in greater detail.

Morris B Alternative

The Morris B Alternative begins at I-25 approximately 1.6 miles south of the existing I-25/NM 6 interchange and terminates at NM 47 approximately 1.6 miles south of the NM 6/NM 47 intersection. The general alignment of this route is illustrated in Figure 16 on the following page. Figures 18-A through 18-H illustrate the route in greater detail. The typical section of this alternative is generally the same as described for the Miller A Alternative and is proposed as a 4-lane arterial roadway. Major intersections include an interchange at I-25 and at-grade intersections at Sichler Road, Morris Road (approximately 1,000 feet west of NM 314), NM 314, Los Lentes Road, and Edeal Road. Frontage roads are also provided between the new interchange and the I-25/NM 6 interchange. Future access is also proposed between Edeal Road and NM 47 as part of an approved large subdivision in this area. As described for Miller A, dual left-turn lanes are included at each major intersection.

An optional alignment for the Morris B Alternative east of Edeal Road was developed in response to public comments. This option shifts the route in a northeasterly direction after crossing Edeal Road and terminates at NM 47 at the intersection of NM 263 and NM 47. This option, referenced as Morris D Alternative, includes two connections to NM 47: a four-lane connection that intersects NM 47 at NM 263 and two-lane connections at the same locations as the Morris B Alternative. The alignments of the Morris D Alternative optional connections to NM 47 are illustrated in Figures 19 A through 19 F.

Figure 16: General Alignments for Miller A and Morris B/D Alternatives



4.2 Roadway Design Features

The basic design features assumed for each alternative are the same and consist of the roadway, bridge structure across the Rio Grande, roadside buffers, pedestrian and bicycle facilities, and roadway drainage. Each of these elements is described below.

Roadway Typical Section

The proposed typical sections for the various alternatives consist of a four-lane roadway and bridge, center medians, and parallel multi-use pathways. Landscaped buffers, varying in width from 5 to 15 feet, are included in the typical sections to provide added separation between the roadway and adjacent properties. Because the Miller A Alternative is outside of the Los Lunas urban area, the roadway typical west of the Rio Grande is based on a rural roadway character, i.e., it does not include curb and gutter. In contrast, the Morris B/D Alternatives and eastern segments of the Miller A Alternative include curb and gutter to provide a more compact roadway. Typical sections for each major segment are shown in Figures 20 and 21.

Figure 17 A: Miller A Alternative

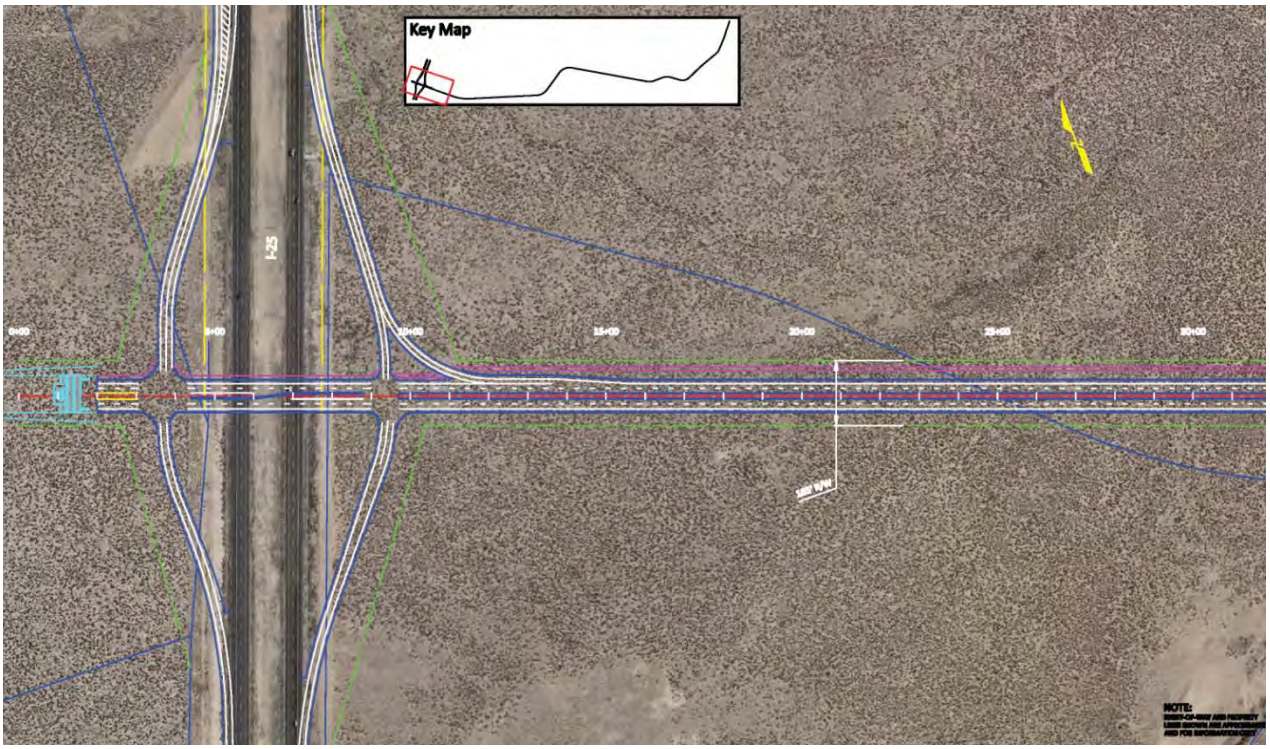


Figure 17 B: Miller A Alternative

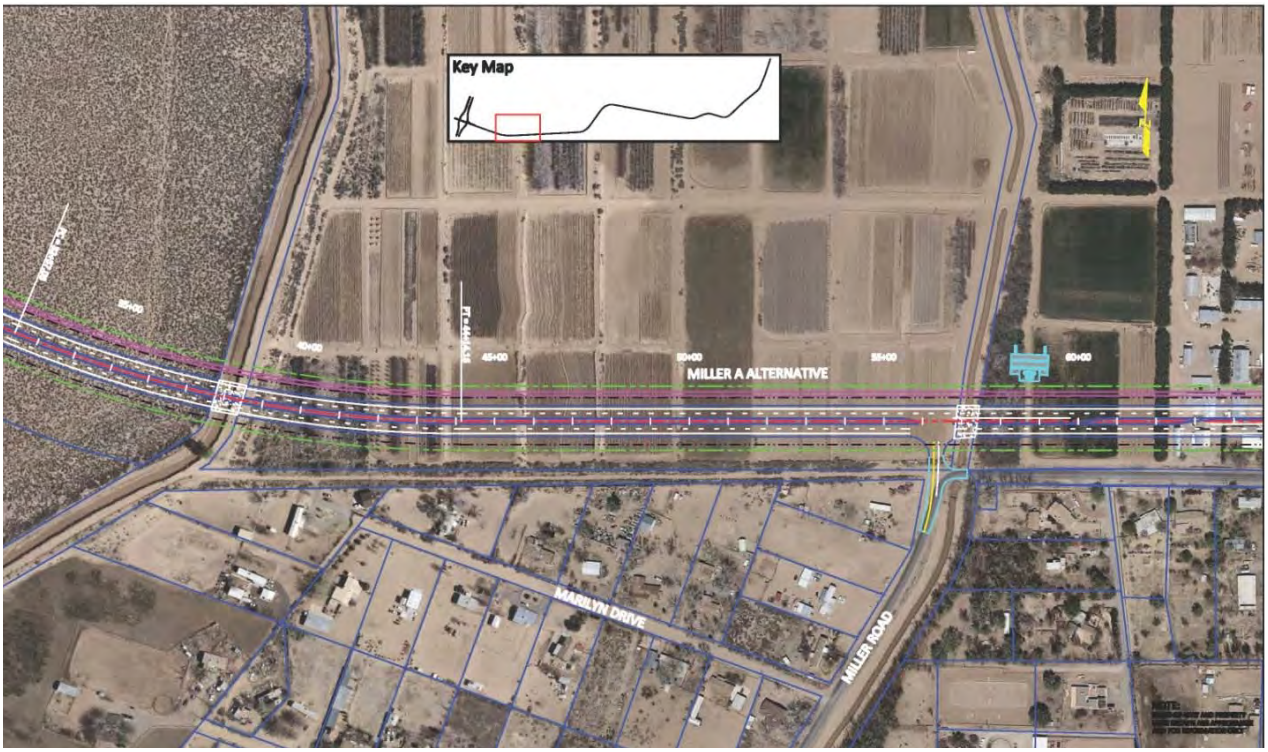


Figure 17 C: Miller A Alternative

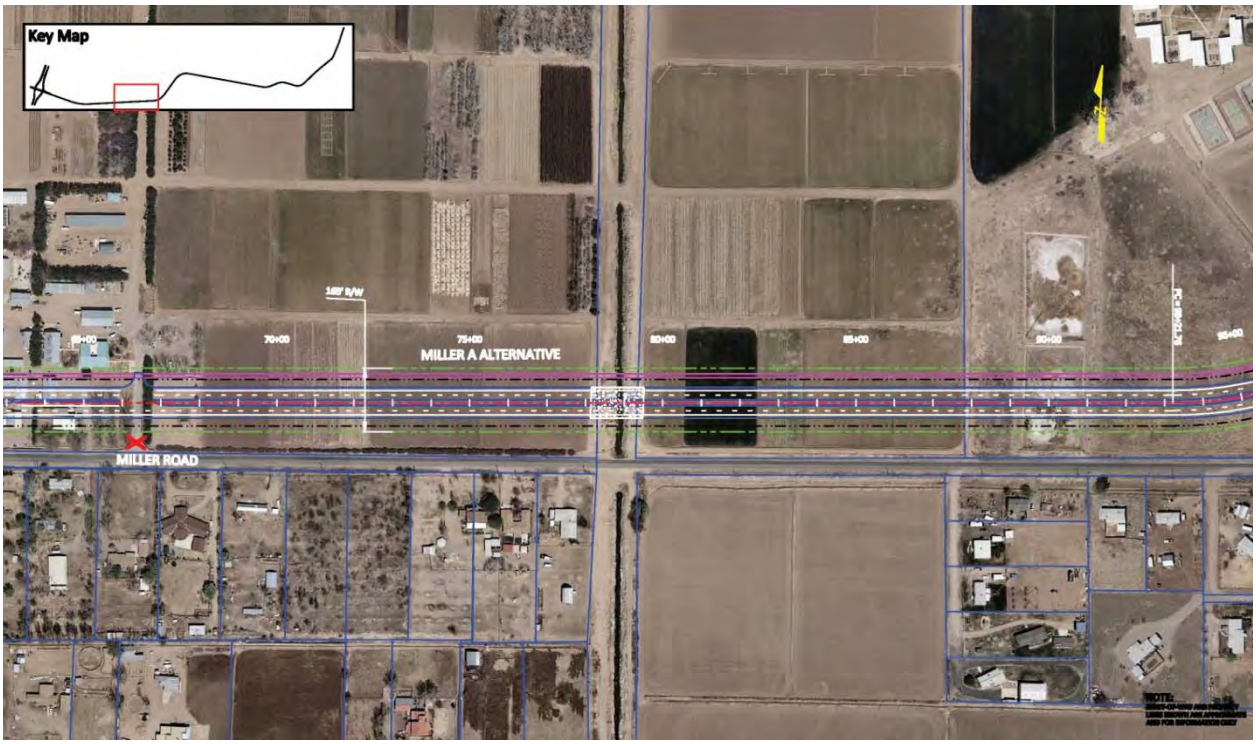


Figure 17 D: Miller A Alternative

Figure 17 E: Miller A Alternative

Figure 17 F: Miller A Alternative

Figure 17 G: Miller A Alternative

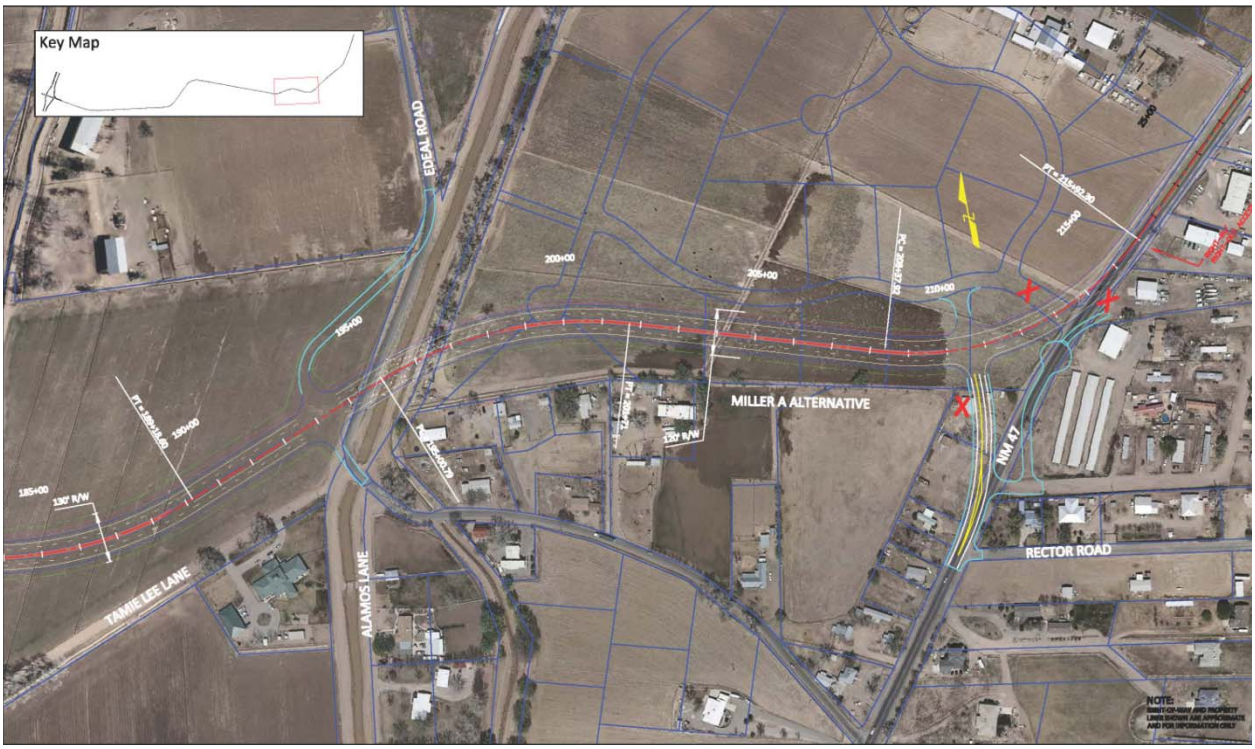


Figure 17 H: Miller A Alternative

Figure 18 A: Morris B/D Alternatives

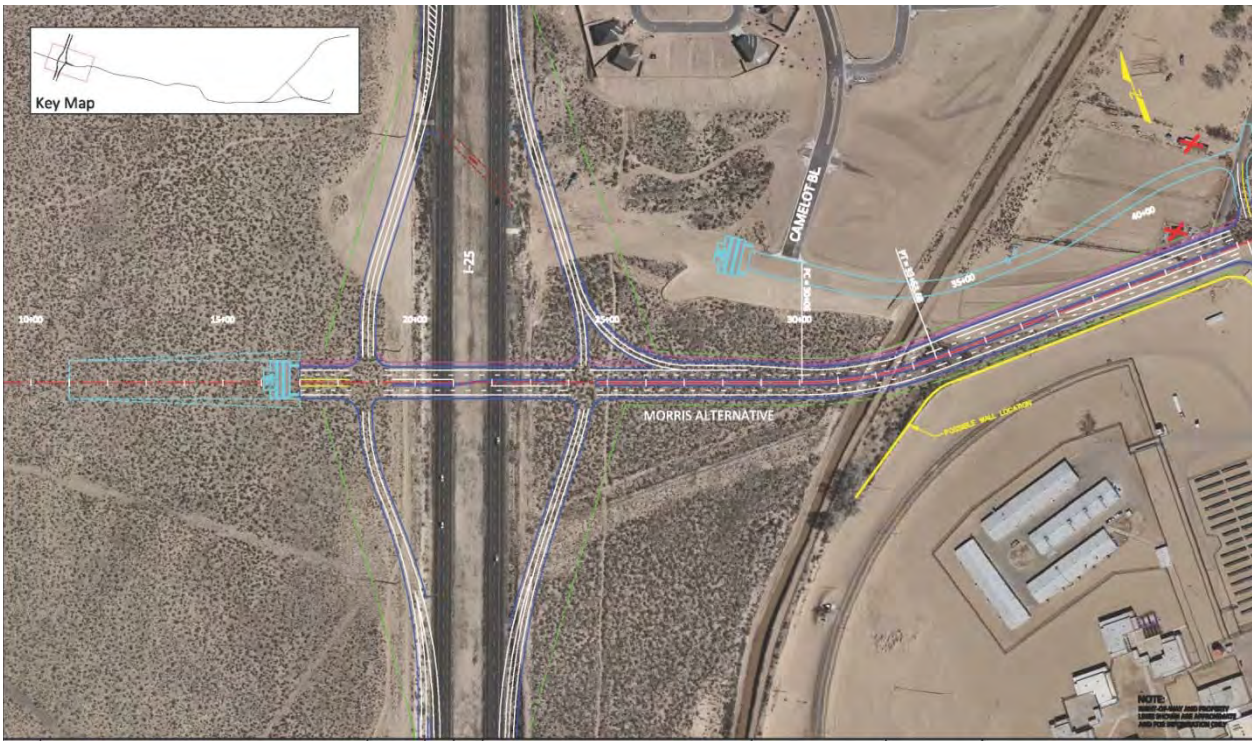


Figure 18 B: Morris B/D Alternatives

Figure 18 C: Morris B/D Alternatives

Figure 18 D: Morris B/D Alternatives

Figure 18 E: Morris B/D Alternatives

Figure 18 F: Morris B/D Alternatives

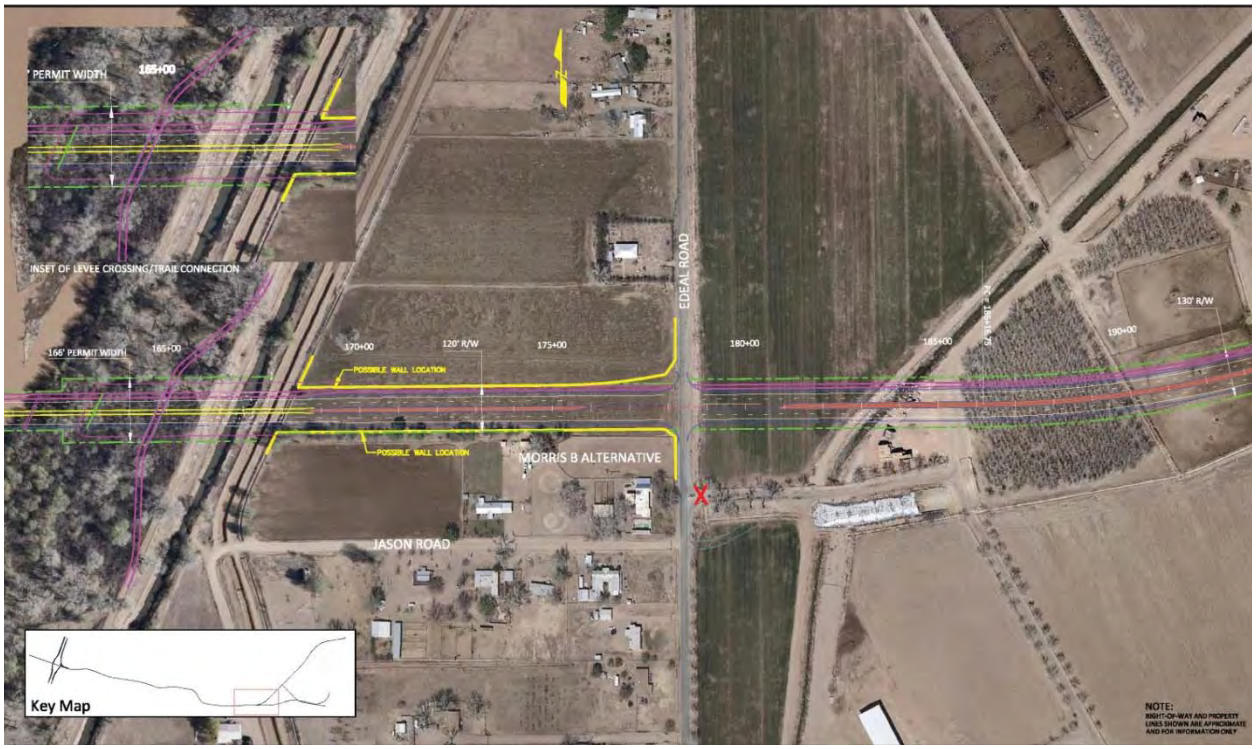


Figure 18 G: Morris B Alternative

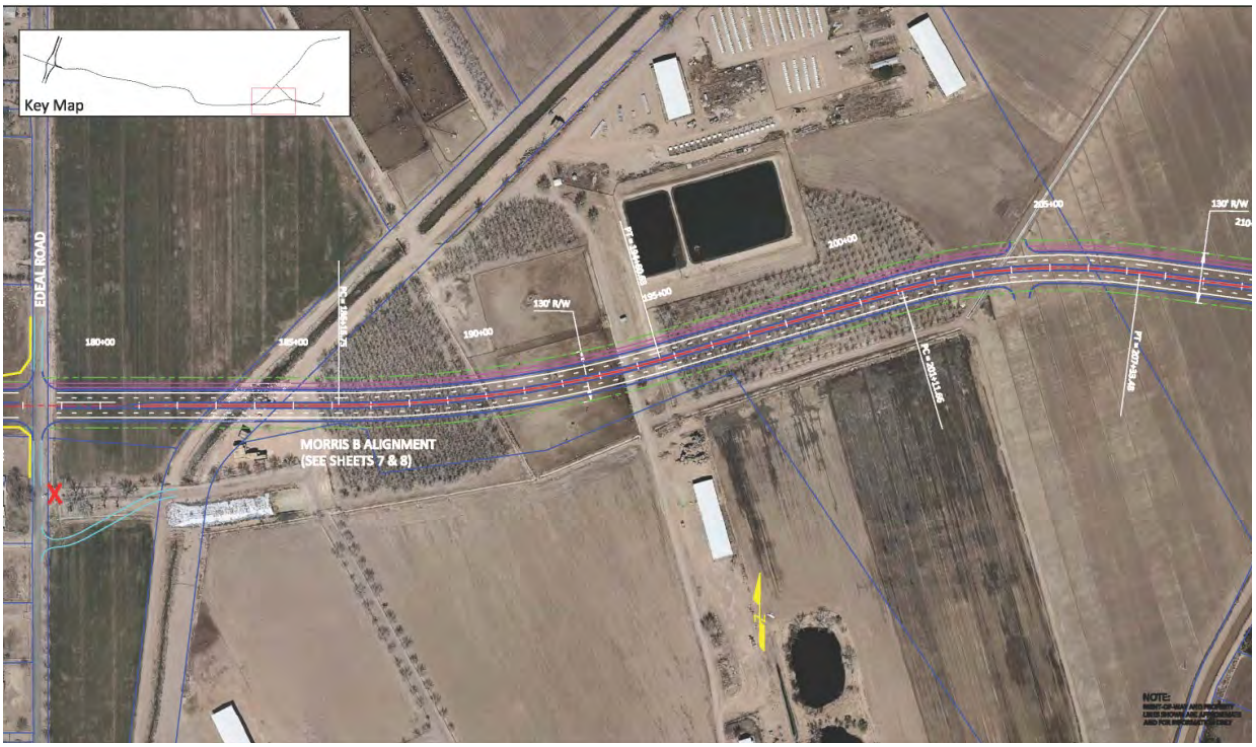


Figure 18 H: Morris B Alternative

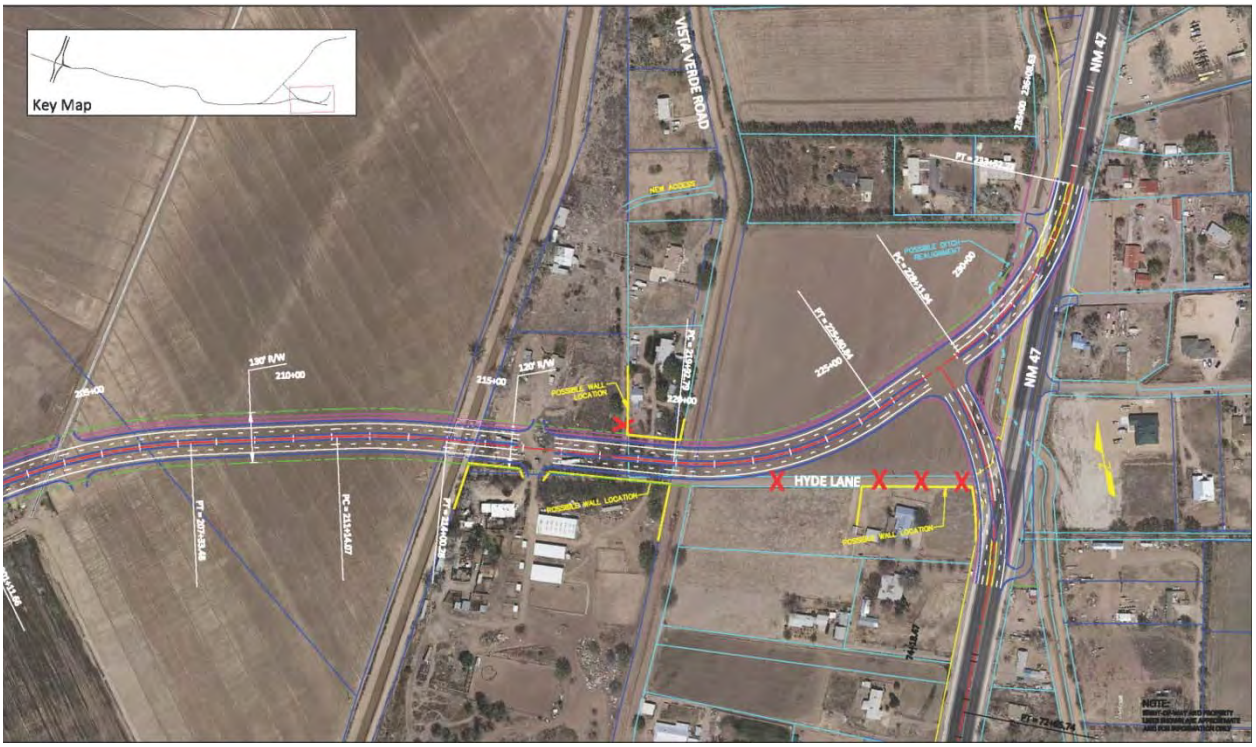


Figure 19 A: Morris D Alternative

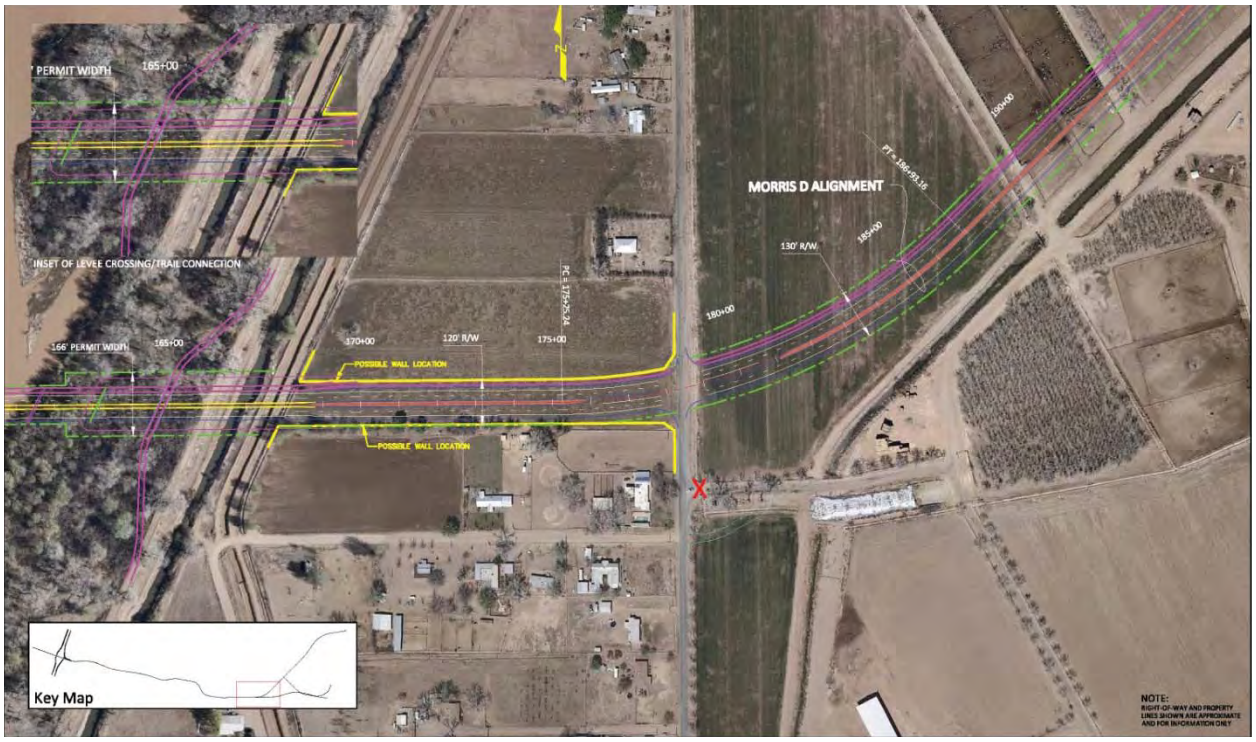


Figure 19 B: Morris D Alternative

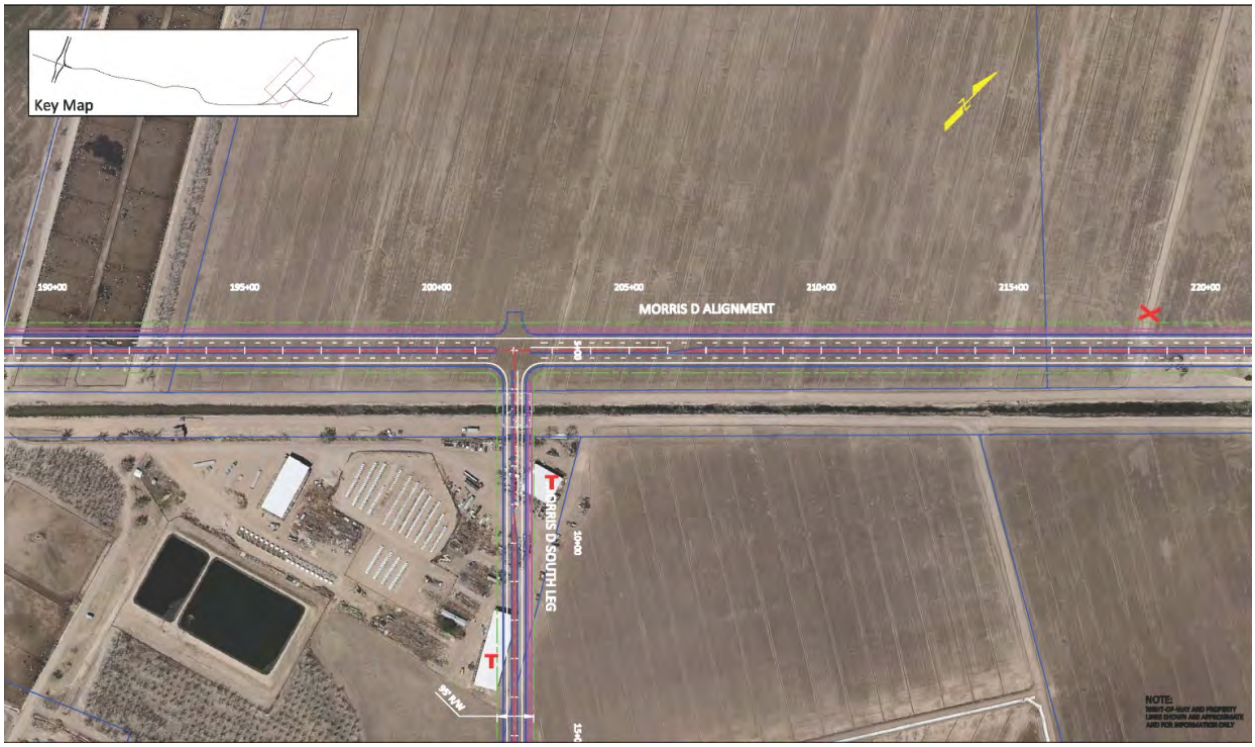


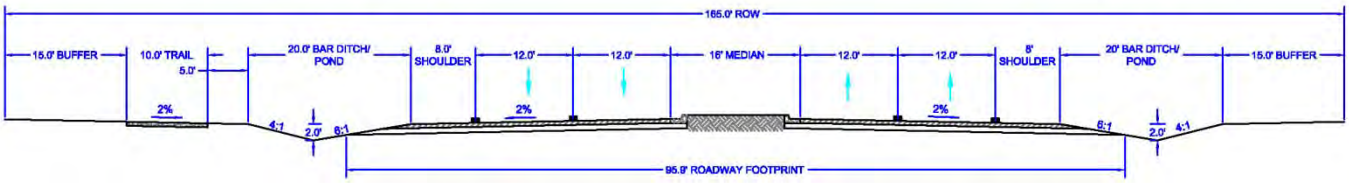
Figure 19 C: Morris D Alternative

Figure 19 D: Morris D Alternative (Main Intersection with NM 47)

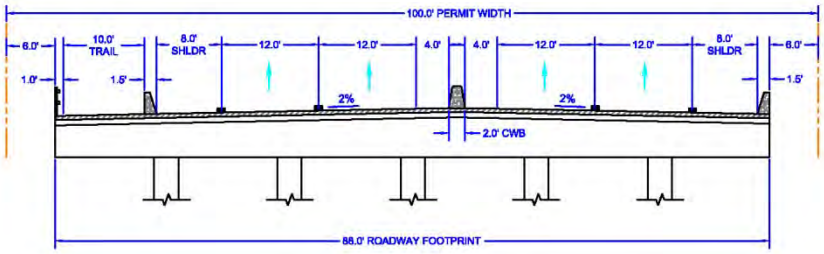
Figure 19 E: Morris D Alternative (South Leg)

Figure 19 F: Morris D Alternative (South Intersection with NM 47)

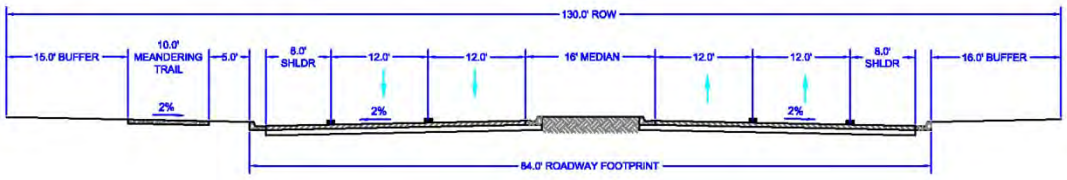
Figure 20: Miller A Alternative Typical Sections



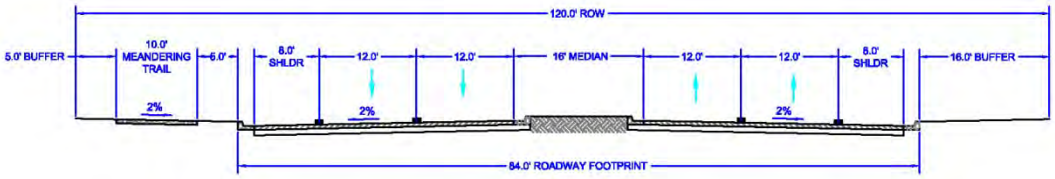
I-25 to the Rio Grande



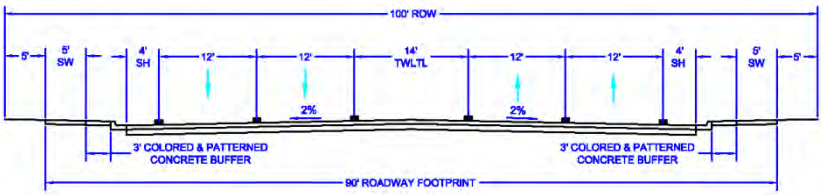
Rio Grande Bridge



Rio Grande Bridge to Edeal Road

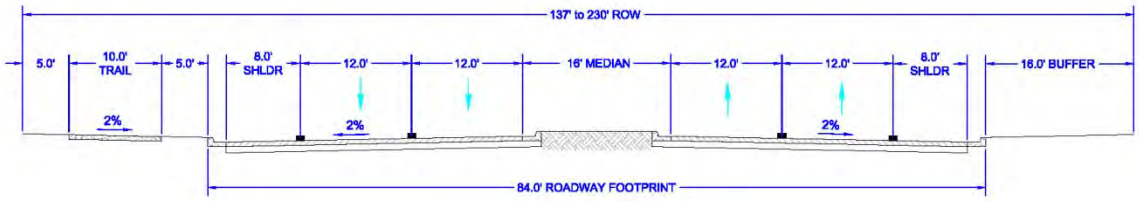


Edeal Road to NM 47

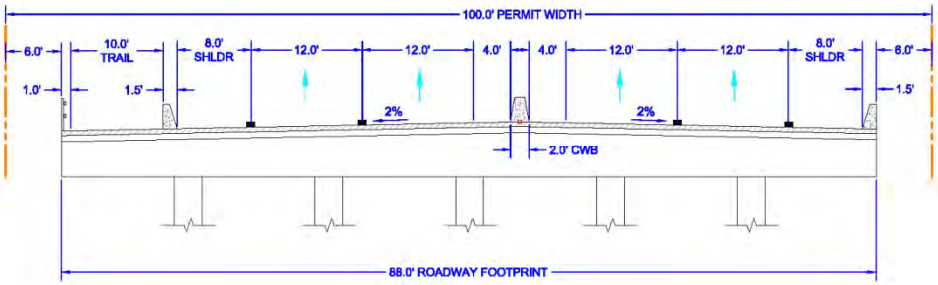


NM 47 from End of New Roadway to Otero Road

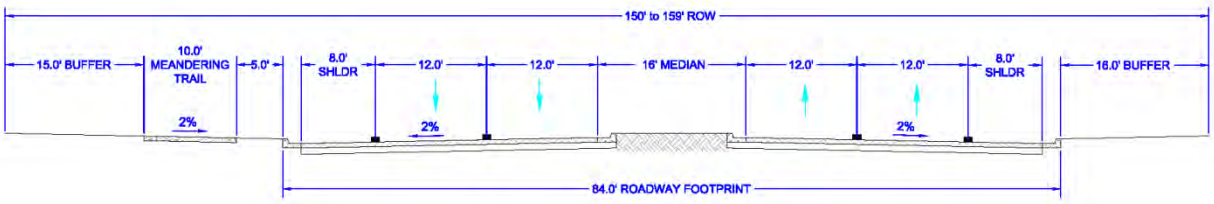
Figure 21: Morris B/D Alternatives Typical Sections



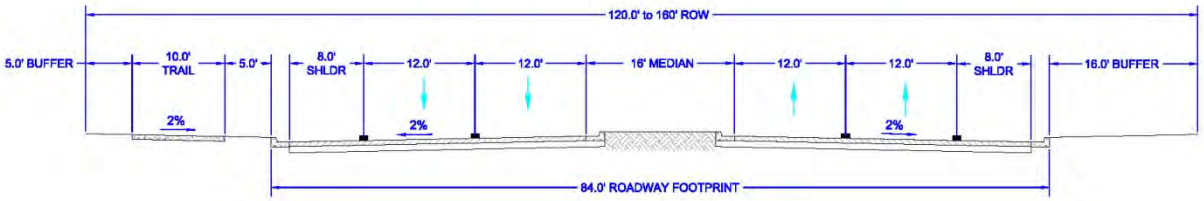
I-25 to Rio Grande Bridge



Rio Grande Bridge



Rio Grande Bridge to Las Cercas Acequia

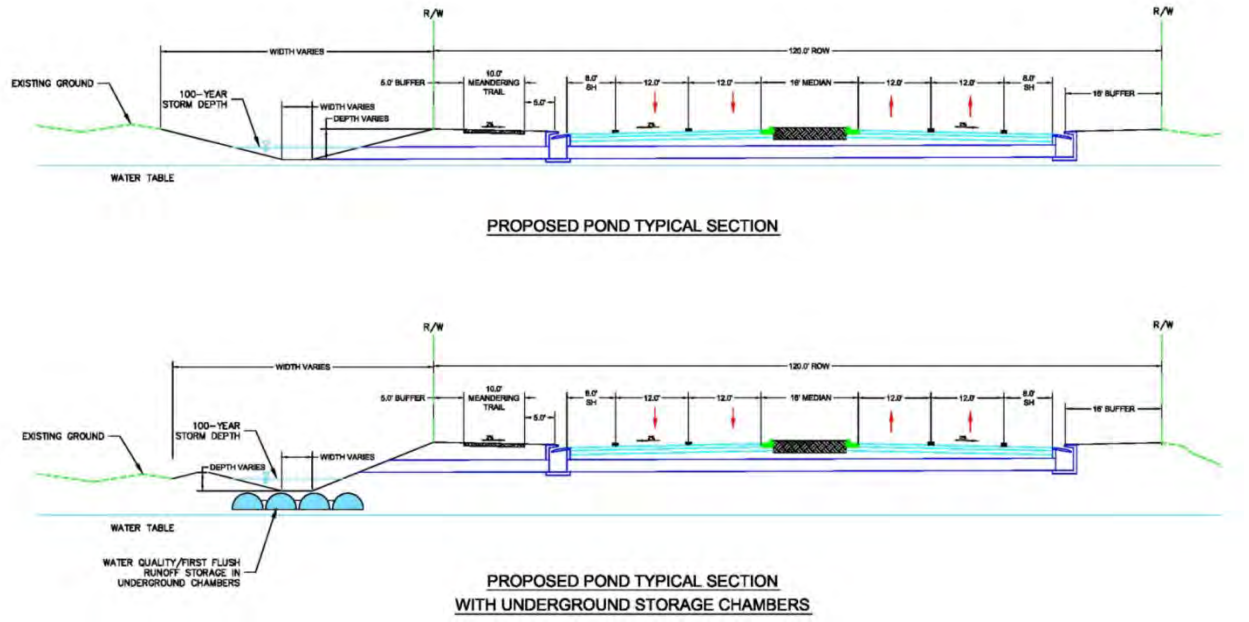


Las Cercas Acequia to NM 47

4.3 Drainage

Two drainage options were considered for the stormwater management in support of the proposed roadway improvements. The first option assumes roadway runoff is managed in ponds outside of the roadway right-of-way. With this option, storm drain systems will collect and carry the roadway runoff to drainage ponds at locations along the roadway. Because of the flat terrain and the shallow depth to groundwater through most of the study area, storm drain trunk lines are limited to 1,000 foot to 1,500 foot lengths. Using this approach, the 2-year and 100-year storm runoff would have a depth of approximately 1 foot to 2 feet, respectively. The total pond depth, as compared to the adjoining ground will be approximately 5 feet. As an alternative to reducing the depth of drainage ponds and to minimize water ponding, the roadway can be perched by approximately 2 to 3 feet. This option would allow underground storage chambers to be installed below the ponds to eliminate or reduce the depth of water during the typical storms. Figure 22 illustrates cross sections for the pond option.

Figure 22: Potential Pond Concepts



The second drainage option consists of using pump stations to carry roadway drainage to the Rio Grande. Two pump stations would be required — one on each side of the river. Gravity storm drain systems with 24 to 54 inch pipes would be used to convey runoff to the pump stations. A pressure flow main line would carry the water from the pump stations to the river. Preliminary analysis show that the wet well for the pump stations would be 15 to 20 feet deep. This depth would be within the groundwater table and would require a dewatering system.

A comparison of the two drainage options found the following:

- Construction Cost – The pond option would have substantially lower cost than the pump station, especially because of the need for a dewatering system for the pump stations. The cost of the pump station option is also higher due to the required larger trunk lines. While drainage ponds would require additional right-of-way, most of the needed property for the ponds would be available in the properties acquired for the roadway.

- Maintenance – Both options would require maintenance. Due to the number of ponds needed, maintenance costs are likely higher for the pond option.
- Public Acceptance – Input obtained from the communities and CAC identified concerns with the visual and nuisance aspects of drainage ponds. Considering this perspective, pump stations would have less potential for visual and nuisance problems. Based on community input, the design concept for the pond system uses narrow and shallow ponds that resemble roadside ditches and that minimize the time water is impounded. If underground storage chambers are used with the ponds, roadway run-off would be underground for most storm events. In addition, ponds located outside of the roadway right-of-way could be designed and developed for joint use as parks and/or athletic fields.
- Permitting – The pump station option would require stormwater treatment features such as water quality inlets, manholes, and stormceptors before discharging into the river. Discharges to the river will require a permit from the USACE and NMED. The pond option would require coordination with NMED to obtain a groundwater permit.

Based on the cost and complexity, and because of the potential for greater right-of-way, the ponding option was assumed in the preliminary design plans for the project. The drainage design assumed is shown in the plan sheets in Appendix B.

4.4 Right-of-Way Acquisition

All of the alternatives under consideration would acquire private and public properties for the proposed roadway right-of-way. In addition to the property for right-of-way, several structures would be acquired. These structures include residential dwellings; other structures such as garages, barns, and storage buildings; and buildings associated with businesses. Table 11 summarizes the acres of right-of-way and the number and type of buildings acquired with each alternative.

Table 11: Right of Way Acquisition

Alternative	Right-of-Way	Non-ROW Parcels	Residential Dwellings	Other Structures	Businesses
Miller A	88 acres	6.1 acres	10 residences	5 buildings	1 business
Morris B	91 acres	27 acres	7 residences	1 buildings	0 businesses
Morris D	115 acres	38 acres	11 residences	2 buildings	2 businesses

Note: Non-ROW includes parcels that are acquired due to lack of access as a result of the new roadway

As shown in Table 11, the Miller A Alternative would acquire the least amount of right-of-way, even though it includes about one mile of NM 47. This is primarily due to the larger parcels along this alignment that allow for partial takes. In contrast, Morris B affects smaller parcels that must be completely acquired. Morris D has significantly more right-of-way than either of the other two alternatives.

All three alternatives would acquire residences and out-buildings such as storage buildings and garages. Miller A would acquire the greatest number of residences and buildings followed closely by Morris D. Morris B would acquire about one-half the total number of residences and buildings as the other two alternatives. All property acquired for the proposed project would follow federal and state laws.

4.5 Cost

The preliminary cost estimates for project alternatives are summarized in Table 12. These data are based on average costs at the time of the study and do not reflect future escalation, if any. The costs are separated into major project elements. Cost estimate sheets for each alternative are included in Appendix B.

Table 12: Preliminary Cost Estimates

Element/Alternative	Miller A	Morris B	Morris D
Interchange and Frontage Roads	$8,317,640	$6,833,130	$6,833,130
I-25 to NM 314	$6,683,490	$6,289,820	$6,289,820
NM 314 to Rio Grande Bridge	$1,815,540	$2,401,570	$2,401,570
Rio Grande Bridge	$14,471,600	$15,730,000	$15,730,000
Rio Grande Bridge to NM 47	$2,498,055	$4,454,445	$7,667,065
NM 47 Widening	$1,356,425	N.A.	N.A.
Drainage (Ponding Option)	$5,300,000	$5,200,000	$6,600,000
Miscellaneous	$6,114,100	$6,155,800	$6,873,300
Subtotal	$46,556,850	$47,064,765	$52,394,885
30% Contingency	$13,967,055	$14,119,429	$15,718,465
Engineering & Design Contingency	$3,724,548	$3,765,181	$4,191,591
Total without NMGRT	**$64,248,453**	**$64,949,375**	**$72,304,940**

Note: the above costs do not include right-of-way. It is anticipated that some right-of-way may be acquired through early acquisition for corridor preservation purposes. These acquisitions would use existing funds. An additional $3.4 million is estimated to acquire the remaining r/w.

4.6 Traffic Performance

As discussed in Chapter 2, reducing congestion and providing efficient access to major developing areas within the Los Lunas area are important elements of the purpose and need for the proposed new roadway. All of the alternatives provide significant congestion relief of NM 6. Figures 23 through 25 illustrate the traffic LOS at the major intersections along NM 6 and the proposed roadways for the No-Build Condition and the two build alternatives (see Chapter 2 Section 2.3 for a description of LOS and the analyses methods used to assess traffic operations). The Morris B/D Alternatives provide the best performance as they achieve LOS D or better at all locations. The Miller A Alternative also provides good performance, although two ramp terminal intersections at the existing I-25/NM 6 interchange will continue to be congested. LOS D or better is achieved at all other intersections.

Both build alternatives also provide access to the master planned areas within and near the Village of Los Lunas. However, the Morris B/D Alternatives best achieve this criterion as it provides direct access to the developing areas along Morris Road and to the area east of the river, whereas the Miller A Alternative does not provide this direct access. Both alternatives also achieve the objective of improved access for safety purposes.

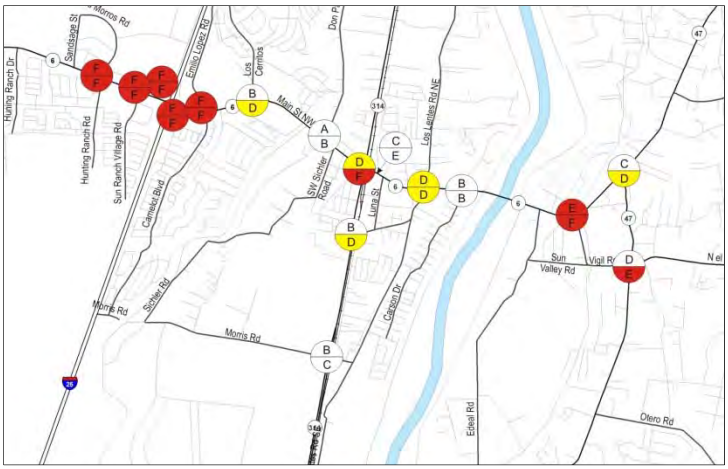


Figure 23: Traffic LOS for No-Build Condition (Year 2035)

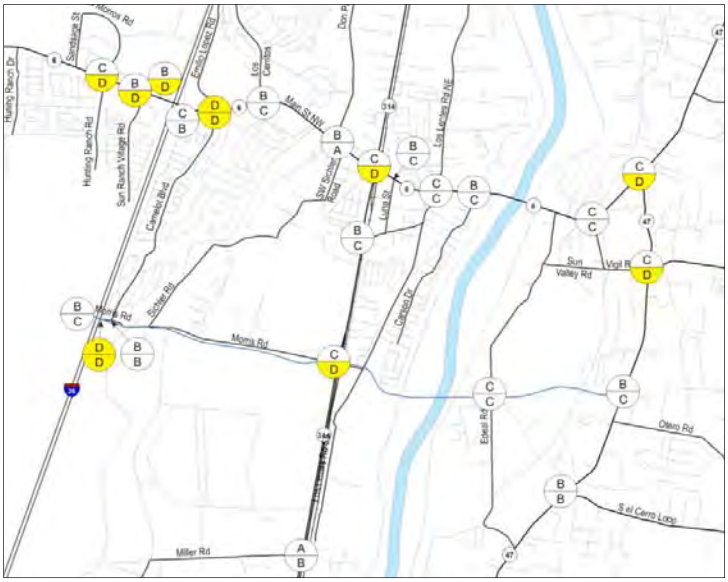


Figure 24: Traffic LOS for Morris B/D Alternatives (Year 2035)

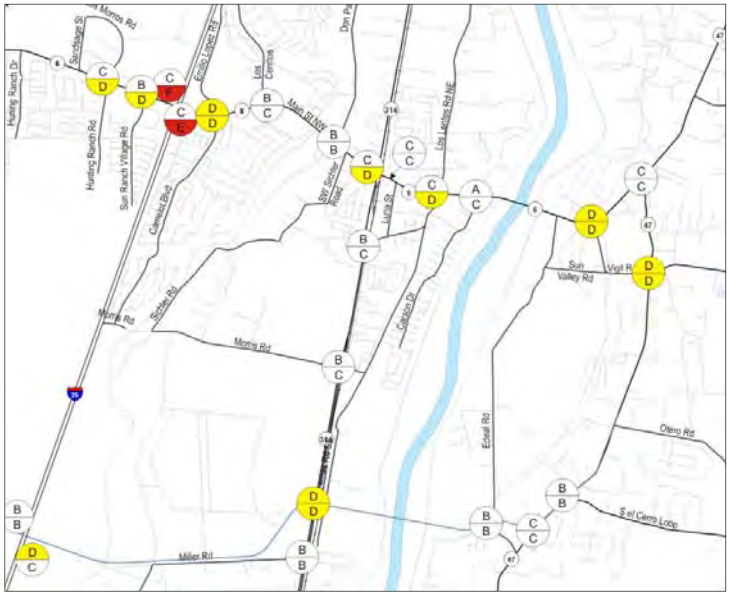


Figure 25: Traffic LOS for Miller A Alternative (Year 2035)

4.7 Environmental Resources

The study corridor for the LLCS is within a developed area, although the level of development varies. Existing development consists of agricultural farmlands, single family residential uses, and institutional uses that include a municipal sewage treatment facility and the CNMCF. Development is more intense immediately north of the study corridor and consists of a mixture of residential, commercial, and institutional uses typical of a small urban area.

The primary environmental resources within the study area include the various habitat, vegetation communities, and wildlife resources found along the mesa edges and river valley and wetlands and riparian habitat associated with the Rio Grande and canal/ditch system.

Vegetation and Habitat

Vegetation communities within the study area include three resource types: plains/mesa sand scrub, rural residential/agricultural disclimax, and lower floodplain riparian forest. Each of these resource types is described below.

Plains/Mesa Sand Scrub

Plains/Mesa Sand Scrub vegetation occurs on the mesa slopes above the floodplain of the Rio Grande. In undisturbed condition it is dominated by sand sage (Artemisia filifolia) intermixed with broom dalea (Psorothamnus scoparius) with scattered four-wing saltbush (Atriplex canescens) often present. Some of the most common herbaceous species within this community type include Indian ricegrass (Acantherum hymenoides) and spectacle pod (Dimorphocarpa wislizenii). Within the study area, this community type is restricted to the extreme western terminus of both the Miller and Morris Alternatives, just east and west of I-25. This community rapidly transitions to the Rural Residential/Agriculture Disclimax zone when it enters the floodplain of the Rio Grande. Approximately 8.12 acres of this community type occur along the Miller A Alternative and approximately 3.6 acres occurs along the Morris B Alternative.

Rural Residential/Agricultural Disclimax

The vast majority of the vegetation impacted by the project falls within the Rural Residential/Agricultural Disclimax zone which is within the historic floodplain of the Rio Grande. This resource consists of agricultural fields, rural residences, and a network of irrigation canals and drains providing water for the agricultural fields. All of these ditches and drains support wetland vegetation such as Canada rye (Elymus canadensis), scouring rush (Equisetum spp.), Baltic rush (Juncus balticus), and a variety of sedges (Carex spp.). Some of the drains and ditches support emergent wetland vegetation such as cattails (Typha latifolia), bulrushes such as hardstem bulrush (Schoenoplectus acutus), and chairmaker's rush (Schoenoplectus americanus). A few also support trees such as the Rio Grande cottonwood, native scrub/shrub vegetation such as coyote willow, and invasive species of shrubs and small trees such as salt cedar and Russian olive. The agricultural fields between these ditches and drains are generally planted with forage crops, in particular alfalfa (Medicago sativa), corn, and various grass hay crops. The rural residential areas usually support a complex mixture of native riparian trees and invasive trees as well as non-native landscape species. Approximately 35 acres of this disclimax community type occur along the Miller A Alternative and approximately 38.7 acres along the Morris B/D Alternatives.

Lower Floodplain Riparian Forest

This plant community consists of Rio Grande cottonwood, Goodding's willow, and coyote willow. It is restricted to a narrow belt between the channel of the Rio Grande and the levees. Exotics such as Russian

olive, Siberian elm, and salt cedar also exist in relatively high numbers and have altered the composition of the forest community. Siberian elm is a canopy tree that, unlike the native cottonwood, does not require seasonal flooding to become established. In many areas along the Rio Grande, it has become an ecological equivalent to the cottonwood trees, becoming the dominant canopy tree. If it becomes established, Siberian elm has a tendency to form dense stands that can crowd out all other woody species. Russian olive is a subcanopy species that also does not require flooding to establish. Structurally, it is an ecological equivalent of the Goodding's willow and can establish and grow on much drier soils than Goodding's willow. Finally, salt cedar fills a niche that is occupied by coyote willow, but it is also capable of thriving in less hydric conditions than coyote willow and can form large stands, not only adjacent to the hydric zone along the river bank, but also in drier areas of the floodplain more remote from the hydric zone. Although these exotic species provide cover and structure for wildlife, they do not provide the same quality of habitat as the native species. Avian studies have determined that native cottonwood and willow forests support more unique bird species than areas dominated by salt cedar.

The non-native species within the riparian forest often form much denser thickets than do the native species. These thickets provide fuel loads sufficient to sustain forest fires within the riparian woodland. None of the native tree and shrub species in the Rio Grande riparian forest are fire successional. Fires quickly kill the native species. Moreover, the controlled flows of the Rio Grande, which do not allow for overtopping of the bank of the river, do not provide flooding necessary to re-establish the native species. Over time the repeated cycles of fires in the bosque and the lack of flooding have facilitated the spread of thickets of exotic species. In an effort to control these exotics, programs have been implemented in the Middle Rio Grande Valley to remove non-native woody species. Unfortunately, the removal of exotics often leaves only scattered cottonwood trees with little or no canopy cover and no subcanopy or shrubby vegetation. Such areas provide far less structure for wildlife than the historic stratified riparian forest that once dominated the area. The combined east and west banks of the Miller and Morris Alternatives cross through vegetation patches that reflect most of the above conditions.


Miller A Alternative – West side of Rio Grande


Miller A Alternative – Also on West side of Rio Grande

The best example of the native stratified riparian forest found within the study area occurs along the Miller A Alternative west of the Rio Grande. A grove of old growth cottonwood forest occurs at this location. Most of the trees at this location have trunks 18-36 inches in diameter, and a few trees approach 60 inches in diameter. There are also large numbers of native Goodding's

willows forming a subcanopy zone subtended by scattered patches of shrubby coyote willows. This stand thins out near the river where it is replaced by a dense stand of coyote willows that edge the riverbank. A well-developed emergent wetland band, approximately 20 feet wide, occurs within the river channel just below the bank. This emergent wetland is dominated by obligate wetland species such as bulrush, Nebraska sedge (Carex nebrascensis), Baltic rush, and chairmakers bulrush as well as less facultative wetland indicators such as cocklebur barnyard grass (Echinochloa crus-galli), scratchgrass (Muhlenbergia asperifolia), and common reed (Phragmites australis). In aggregate, the combination found along the Miller A Alternative, which consists of the stratified old growth cottonwood forest, the willow scrub/shrub zone along the bank of the river, and the emergent wetland below the bank, constitute the most natural and stratified of the vegetation communities encountered within the study area.


Miller A Alternative – East side of Rio Grande

The east floodplain of the Miller A Alternative has a much less diversified and stratified structure than the west floodplain. Most of the east floodplain along the Miller A Alternative is dominated by young cottonwood trees (generally 12-20 inches in diameter) that form an open forest with no subcanopy or scrub/shrub structure. This area of non-stratified, open canopy forest is approximately 700 feet wide. The herbaceous vegetation beneath the trees at this location consists principally of a ground cover of alkali sacaton (Sporobolus airoides). Near the Rio Grande this open canopy cottonwood forest is supplanted by a dense and dry thicket of salt cedar nearly 300 feet wide. At the river's west edge a swath of salt cedar and coyote willow extends along the bank. The east bank of the river drops abruptly into the channel and, although there is a narrow band of wetland vegetation on the slope of the bank, there is only minimal wetland development present.


Morris B Alternative – West side of Rio Grande

Most of the west floodplain of the Morris Alternative is dominated by a young, non-stratified, open cottonwood forest. This forest extends from the levee eastward for approximately 930 feet. There is no subcanopy or subtending scrub/shrub zone present, and the associated herbaceous vegetation consists of species such as alkali sacaton, squirreltail (Elymus elymoides) and non-grassy species such as flatspine bur ragweed (Ambrosia acanthicarpa) and sunflower (Helianthus annuus). It appears this area may have suffered a burn in the past, and it also appears to have been cleared of exotic vegetation. As such, it has very little structure for wildlife. Closer to the river, the open canopy cottonwood forest grades into a dense band of Russian olive, Siberian elm, and scattered mulberry (Morus sp.) approximately 300 feet wide. At the river's

edge, a band of coyote willow (approximately 35 feet wide) lines the riverbank. There are no emergent wetlands present below the top of the bank or within the river channel.


Morris B Alternative – East side of Rio Grande

Most of the east floodplain of the Morris Alternative passes through a gap in the cottonwood forest where the cottonwood trees have been replaced by an old stand of coyote willow adjacent to the east levee and a dense band of Siberian elm, Russian olive, and mulberry over 300 feet wide toward the edge of the river. The riverbank at this location drops abruptly into the channel. No shrub zone exists along the riverbank, and wetland development is minimal. The 150 foot wide patch of coyote willow adjacent to the levee is somewhat anomalous as there is almost no willow near the river, nor is there any indication that the river overtops the banks to flood the coyote willow patch. Coyote willow is an obligate wetland species and usually needs shallower ground water than is normally present within the wooded portions of the floodplain. A test pit was excavated to ascertain if shallow groundwater was present; the soil beneath this site was found to be completely dry within 24 inches of the surface. It is possible these willows formed from past conditions when surface water was present. Since many of these coyote willows appear to be dying, it is likely that this area was wetter in the past.

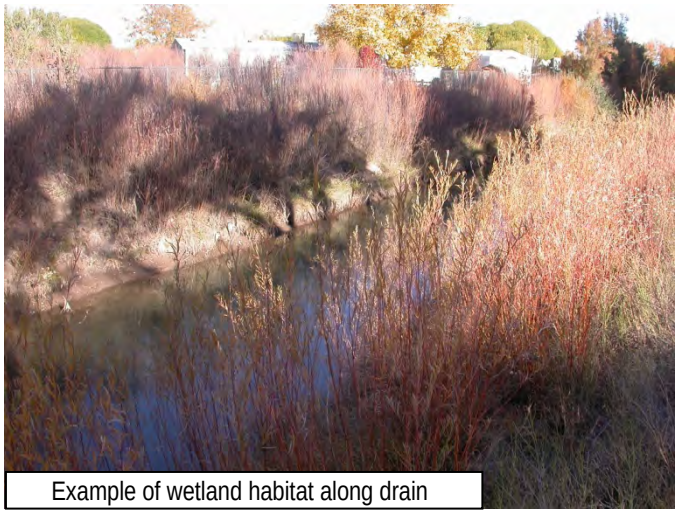
Although the west floodplain of the Miller A Alternative is the most stratified and natural riparian forest community in the study area, both of the alternatives, on both sides of the river, support some native stands of vegetation favorable for wildlife use. The construction of the Morris B Alternative would remove more riparian forest (approximately 5.3 acres) than the Miller A Alternative (approximately 3.8 acres), but the old growth stratified forest and natural emergent wetlands on the Miller A Alternative provide better quality habitat, including old growth cottonwoods and a larger wetland along the river. The total number of cottonwood trees affected is estimated to be 152 trees for the Miller A Alternative and 121 trees for the Morris B Alternative.


Wetland habitat along Miller A Alternative at river edge

Wetlands

Potential wetlands within the study area fall into two distinct types: those that occur within natural waterways and those associated with man-made features. Natural wetland habitats occur within the Floodplain Riparian Forest vegetation zone along the banks of the Rio Grande at both the Miller and Morris Alternatives. These potential wetlands derive their hydrology wholly from surface stream flow of the Rio Grande and associated perched water stored within the banks of the river. Wetlands associated with man-made features include potential wetlands along the ditch (irrigation canals) and drain systems and detention basins. The potential wetlands in the ditch system derive their

hydrology from seasonal flows that are channeled into the ditches by the Middle Rio Grande Conservancy District. The drains rely on groundwater and return flow from irrigation to support wetland vegetation year-round. There are also a few spots within the study area where surface water collects from street runoff in neighborhoods, or agricultural runoff collects in small basins. These ponded areas support some wetland vegetation, but they are small and provide little of the habitat and water quality benefits of natural wetlands. Figure 26 illustrates the location of ditches within the project alternatives.


Example of wetland habitat along drain

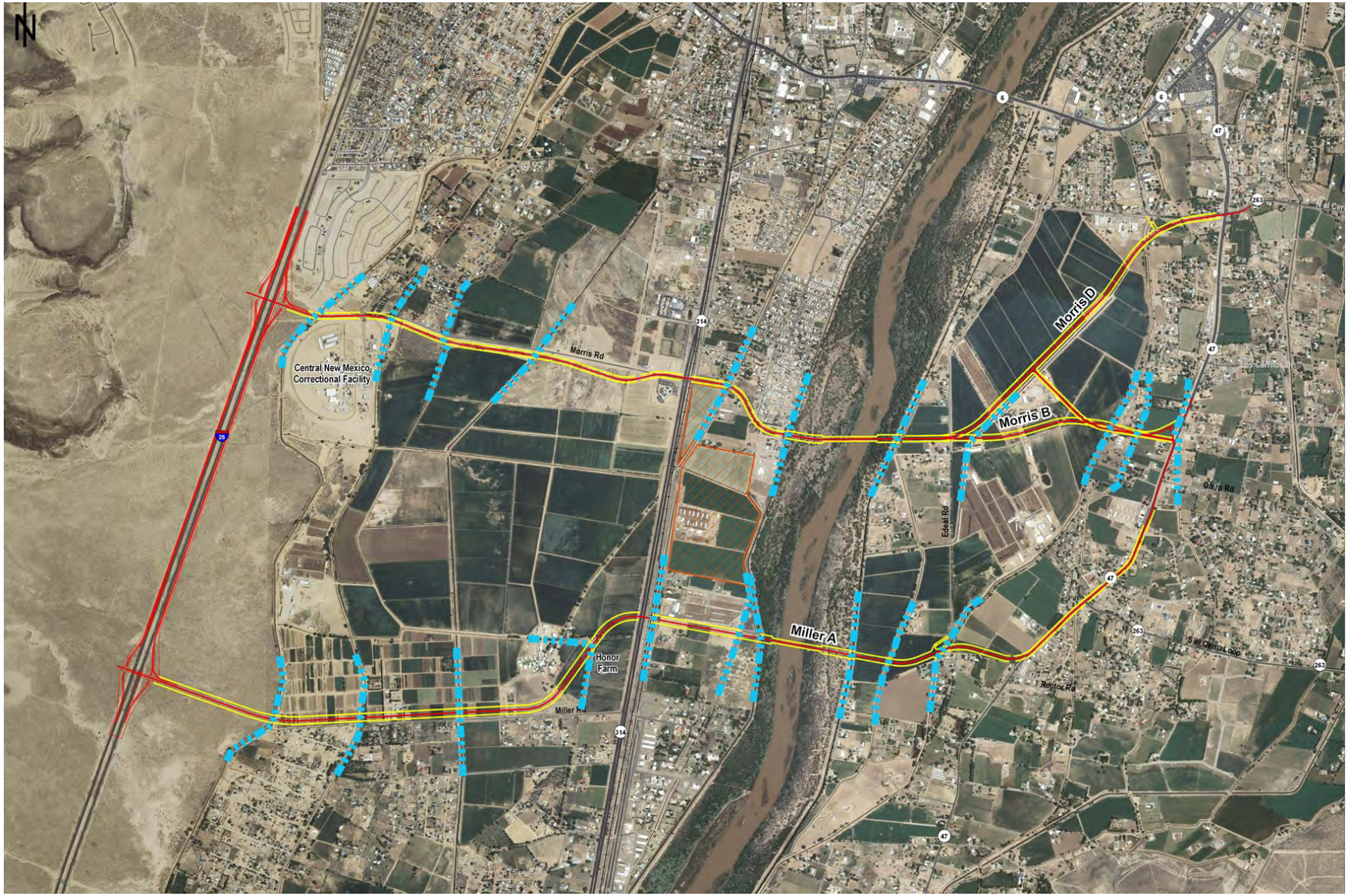
The affect of the proposed roadway on irrigation ditches and drains is essentially the same for both alternatives. The Morris B/D Alternatives cross a total of 11 canals and drains and the Miller A Alternative crosses ten. Thus, their impact on any wetland habitat that is adjacent to these ditches and drains is approximately equal. In all instances, the wetlands along the ditches/drains are limited to a few feet immediately adjacent to each side of the waterway. All of the ditches affected appear to ultimately connect, directly or indirectly, to the Rio Grande. The ultimate determination of whether these ditches and drains are jurisdictional will be made by the USACE when a project is advanced.

In addition to the ditches and drains, there is a detention basin that collects storm water runoff from a residential subdivision between NM 47 and the river (just west of the Upper Belen Riverside Drain). Because the detention facility is not within a waterway and does not discharge to the river, it is not thought to be jurisdictional.

Formal wetland determinations were not completed as part of this project; however, many of the areas meet the criteria for a wetland based on observation alone. The wetland habitats along the banks of the Rio Grande support a complete dominance of wetland indicator species and were at least partially inundated for more than a month during the growing season in the spring of 2011. Thus, they meet both the hydrology and hydric soil criteria for a wetland. The drains on both sides of the river also have perennial surface water present and are dominated by emergent obligate and facultative wetland species. Although no large emergent wetlands exist along the ditch system, many of the ditches support narrow bands of wetland vegetation (2-4 feet wide) along their edges and some are likely to have soil reduction suitable to meet wetland soil requirements.

The best wetland habitat observed within the study area occurs along the banks of the Rio Grande on the west side of the river at the Miller A Alternative. In addition to the coyote willow shrub/scrub zone that lines the river, there is also a large patch of emergent vegetation on an elevated sand bar in the river at the west bank of the river channel. The upper part of this emergent wetland supports hydrophytic grasses that are potential habitat for species such as the New Mexico meadow jumping mouse.

Figure 26: Ditches and Other Potential Wetland Habitat within the LLCS Project Area



Wildlife

Seventy-six avian or terrestrial vertebrates were found in the study area including 65 species of birds, 7 species of mammals, and 4 species of reptiles. In addition, 18 species of fish have been reported in this general reach of the Rio Grande.

Birds

Sixty-five species of birds were identified within the study area, most of which were observed within the riparian habitat along the river or along the riverside drains. Upland and agricultural habitats accounted for the remainder of the birds observed in the study area. The most common birds within the Plains-Mesa Sand Scrub community and rural residential agricultural habitats included mourning dove (Zenaida macroura), northern mockingbird (Mimus polyglottos), turkey vulture (Chathartes aura), American robin (Turdus migratorius), western kingbird (Tyrannus verticalis), American crow (Corvus brachyrhynchos), and house finch (Carpodacus mexicanus). The majority of the remaining birds found within the project area occurred within the riparian zone between the riverside drains. Waterfowl were observed both in the river and within the riverside drains.

Five bird-of-prey species were observed in the project area. During the winter months bald eagles were present and at least two adults and one juvenile were noted in the project area. Cooper's hawk (Accipiter cooperii) and red-tailed hawk (Buteo jamicensis) were also present within the riparian woodland along the river. A solitary Swainson's hawk (Buteo swainsonii) was seen in the upland habitats west of the river, an American kestrel (Falco sparverius) were observed at several locations both east and west of the river, and a barn owl (Hirundo rustica) was observed within the riparian forest along the river.

Mammals

Seven species of mammals were present in the study area. These included desert cottontail rabbit (Sylvilagus audubonii), Botta's pocket gopher (Thomomy's bottae), beaver (Castor Canadensis), coyote, striped skunk (Mephitis mephitis), raccoon (Procyon lotor), and muskrat (Ondatra zibethicus). It is likely that other species of small mammals such as mice and rats occur within the study area but none of these were directly observed.

Bats are also likely to occur within the study area. Several species of bats are known to occur within the central Rio Grande Valley. They roost under bridges, on structures, or in trees. There were no indications of either day or night bat roosts, but bats almost certainly hunt over the river in the study area and likely occasionally night roost in the trees adjacent to the river. Bats previously reported and likely to occur in the area include little brown bat (Myotis lucifugus), Yuma myotis (Myotis yumanensis), hoary bat (Lasiurus cinerus), Mexican free-tailed bat (Tadarida brasiliensis), and pallid bat (Antrozous pallidus).

Reptiles

Four species of reptiles were present in the study area. These were most abundant in the upland habitats located near the western terminus of both roadway alternatives. Within this area both little striped whiptail (Aspidoscelis inornata) and New Mexico whiptail (Cnemidophorus neomexicanus) were common. Southwestern fence lizard (Sceloporus cowlesi) occurred both within the upland habitats and on the floodplain. Bullsnakes (Pituophis melanoleucus) were noted along both of the project alignments within the rural residential floodplain area. No amphibians were present at the times of the biological surveys of the study area, but it is expected that species such as New Mexico spadefoot toad (Spea

multiplicata), Great Plains toad (Bufo cognatus), Woodhouse's toad (Bufo woodhousii), and bullfrog (Rana catesbeiana) could occur within suitable habitats on the floodplain or adjacent to the river.

Fish

Various fish species exist within the Rio Grande and the drains. The Rio Grande is not considered as a major fishery resource, but it does provide habitat for Rio Grande silvery minnow, a federally-listed endangered species. No specific fish studies were performed within the study area for this project, but a number of studies have been completed in the Rio Grande within and near Albuquerque upstream of the study area, and the species and habitat present are well documented.

Threatened and Endangered Species

Two animal species currently listed as federally endangered occur within the project area: the Southwestern willow flycatcher and the Rio Grande silvery minnow. The Southwestern willow flycatcher is protected as an endangered species by the USFWS. In New Mexico, the southwestern willow flycatcher is found in close association with dense groves of coyote willow, arrow weed (Pluchea sericea), buttonbush (Cephalanthus sp.), tamarisk, and Russian olive. Flycatchers nest in thickets of trees and shrubs approximately 6 to 23 feet in height or taller with a densely vegetated understory from ground or water surface level to 13 feet or more in height. Migrant individuals and nesting pairs of Southwestern willow flycatcher have been observed along the Rio Grande within the Middle Rio Grande Valley. Since 2000, 6 to 14 territories have been located at Isleta Pueblo. Potential habitat for both migrant and nesting Southwestern willow flycatchers occurs within the riparian forest areas along both the Miller and Morris Alternatives. In both cases stands of coyote willows with adjacent cottonwood or Russian olive groves occur along the riverbanks at these locations. Protocol flycatcher surveys of both alignments were conducted during the 2010 season and no Southwestern willow flycatchers were present. In addition, the Bureau of Reclamation has conducted protocol surveys for Southwestern willow flycatcher for many years along the Rio Grande within Valencia County, and Southwestern willow flycatchers have not been found in the study area.

Rio Grande silvery minnow (*Hybognathus amarus*) occurs within the Rio Grande between Cochiti Dam and Elephant Butte Reservoir. The USFWS designated critical habitat for the silvery minnow from Cochiti Dam to a utility line crossing the Rio Grande in southern Socorro County. The width of critical habitat along the Rio Grande is defined as those areas bound by existing levees or, in areas without levees, within 300 feet of the riparian zone adjacent to the bankfull stage of the river. The LLCS is within the designated critical habitat. Specific surveys for the Rio Grande silvery minnow were not conducted for the LLCS, as sufficient evidence exists that this species occurs above, within, and downstream of the study area.

Environmental Impacts

Because both build alternatives cross the valley and river, their impacts to aquatic resources, riparian habitat, wetlands, and threatened species are similar. Table 13 summarizes the impacts to these resources. The assessment of impacts was estimated using preliminary design plans and the following assumptions:

- Impact to aquatic resources was based on the number of bridge piers constructed within the river channel.
- The loss of riparian habitat was calculated on the area displaced by the bridge, bridge abutments, and fill slopes. For the Miller A Alternative, the total distance between the levees is

Table 13: Summary Comparison of Impacts to Aquatic, Riparian, and Wetland Resources

Alternative	Aquatic Habitat	Riparian Habitat	Wetland Habitat
Miller A Alternative	4-5 piers (560')	3.8 acres	0.18 acre
Morris B Alternative	3-4 piers (450')	5.3 acres	0.15 acre

approximately 1,950 feet. Of this distance, the bridge would be on fill material for approximately 725 feet and on piers for 1,225 feet, 560 feet of which is across the open river channel. The Morris B Alternative bridge length is approximately 2,325 feet with 1,025 feet on fill and 1,300 feet supported by piers. Approximately 450 feet is across the open river channel. For both bridges, the loss of riparian habitat was assumed as the width of the bridge fill plus the width of the bridge deck for the area supported by piers.

- The loss of wetland habitat was calculated assuming an average width of 3 feet along each ditch bank and the area disturbed by pier construction (for the wetland along the river edge of the Miller A Alternative). The extent and quality of wetlands along the ditches is highly variable, with the areas along drainage ditches and the two riverside drains having the best quality habitat. All of the alignments cross these ditches. Thus, the primary difference between the alternatives was the total number of ditches crossed and the larger wetlands found along the Miller A alignment next to the west bank of the Rio Grande. Only jurisdictional wetlands are included in the comparison.

As shown in Table 13, the Morris B Alternative affects 1.5 acres more riparian habitat than the Miller A Alternative. However, the riparian forest along the western side of the river for the Miller alignment consists of old growth stratified-cottonwood forest that provides better wildlife habitat than the forest along the Morris B Alternative. Thus, the impact of the greater quantity of riparian forest along the Morris B Alternative is offset by the higher quality habitat found along the Miller A Alternative.

The Miller A Alternative would have greater impacts to the aquatic environment than the Morris B Alternative. This is due to the greater width of the active river channel at the Miller crossing. For this discussion, the active river channel width is assumed as the demarcation between the water and the mature vegetation. The varying water level of the Rio Grande results in numerous sand bars that can support vegetation during low flow periods. However, these deposits and vegetation are washed away during high flow events. In contrast, the bank areas that support mature vegetation including grasses, shrubs, and trees are more stable and withstand the typical fluctuations in water flows. As shown in Table 13, the active channel width for the Miller A Alternative is approximately 110 feet greater than the Morris B Alternative. This additional width requires the construction of additional bridge piers within the aquatic environment.

The Miller A Alternative would impact approximately 0.03 acres more wetland habitat than the Morris B Alternative. This difference is due to the presence of a relatively large patch of emergent vegetation along the west bank of the river channel. Overall, the difference in wetland habitat between the alternatives is very small, and the impacts to wetlands are generally the same.

Impacts to special status species are similar for both alternatives. Impact to the Rio Grande silvery minnow would be slightly greater with the Miller A Alternative due to the greater disturbance to aquatic environment from pier construction. Likewise, the potential for impact to Southwestern willow flycatcher would be slightly more with the Miller A Alternative because of the stratified-cottonwood forest habitat found along this route. While some differences in impact could occur, the differences are slight and the potential impact on these two species is essentially the same.

4.8 Cultural Resources

An assessment of historic properties within the project area was undertaken and included a review of records, field reconnaissance, and analysis of historic aerial photography. Records reviews included searches of the National Register of Historic Places (NRHP), the New Mexico State Register of Cultural Properties (SRCP), and the New Mexico Cultural Resources Information System (NMCRIS). Initial checks of NMCRIS were performed in the initial stages of the LLCS in 2009 and were updated and revised in 2011. These searches were performed to identify any previous surveys and previously recorded cultural properties in the project area and to develop expectations for the number and type of sites likely to be found in the project area. Checks of the NRHP and the New Mexico State Register of Cultural Properties (NMSCRP) were also performed to determine the presence of listed historic properties in the project area.

The project area is surrounded by several historic communities. The communities closest to the project area include Los Lunas, Los Lentes, Valencia, Tomé, and Peralta. The review of records did not identify any listed properties within the LLCS project area, although four listed properties were identified within the project vicinity. These include the AT&SF Railway Depot on NM 314, the Valencia Church on NM 47, Valencia Pueblo, and El Cerro Tomé Site. All of these properties are outside of the project area of potential effect.

Archaeological sites in the project area and project vicinity belong primarily to the late Puebloan and Historic periods. Most consist of small artifact scatters or residential sites, although larger sites such as Valencia Pueblo are also in the vicinity. Tomé Hill, located just south of the project area, is known for several prehistoric and historic petroglyph sites, and the hill was an important marker for travelers along the Camino Real de Tierra Adentro, or Royal Road from Mexico City of Santa Fe. Tomé Hill is also an important religious site for Catholics today. On Good Friday, Catholics pilgrimage to the top of Tomé Hill and often leave crosses, rosaries, or other items.

No listed properties exist within the Miller A alignment. Two archaeological sites were identified along the alignment including a Pueblo IV artifact scatter and the La Constancia Ditch, an historic, in-use acequia. The artifact scatter would be affected by the roadway and depending on current condition and eligibility, could require mitigation. The La Constancia Ditch LA 111368 would not likely be adversely affected. The Miller A Alternative crosses several other historic acequias between I-25 and NM 47. Acequias included in the historic MRGCD irrigation and flood control system are eligible for inclusion in the NRHP. As contributing elements to the MRGCD system, individual ditches would be treated as eligible properties. New crossings of most, if not all, of the acequias would be required. These crossings would likely be in the form of culvert pipes or boxes that would carry the acequia under the new roadway. All of these acequias are currently carried under other existing roadways in culvert pipes. Because these are in-use historic features that are continually maintained, a new culvert crossing would not likely have an adverse effect on these properties.

Based on preliminary field reconnaissance, it is likely that the Miller A alignment would affect numerous historic buildings along NM 47 as well as several historic structures on the western half of the alignment along Miller Road. Impacted buildings would include the NMSU Agricultural Science Center and several homes along NM 47. This alternative would also indirectly impact the "Honor Farm" portion of the CNMCF due to this route's close proximity to this site. The Honor Farm is a potentially historic site.

There are no listed properties on the Morris B alignment and only one previously recorded archaeological site, the Las Cercas Ditch. This ditch, which is an in-use historic acequia, would likely not be adversely affected by the new roadway. The Morris B alignment also crosses several other historic acequias included in the historic MRGCD irrigation and flood control system that is eligible for inclusion in the NRHP. The impacts to these facilities, and the mitigation requirements, would be the same as described for the Miller A Alternative. The Morris B Alternative does not directly affect any sites with potential historic eligibility.

The Morris D Alternative would affect the same known cultural resources as described for the Morris B Alternative except that this alternative could affect historic structures along NM 263 west of NM 47.

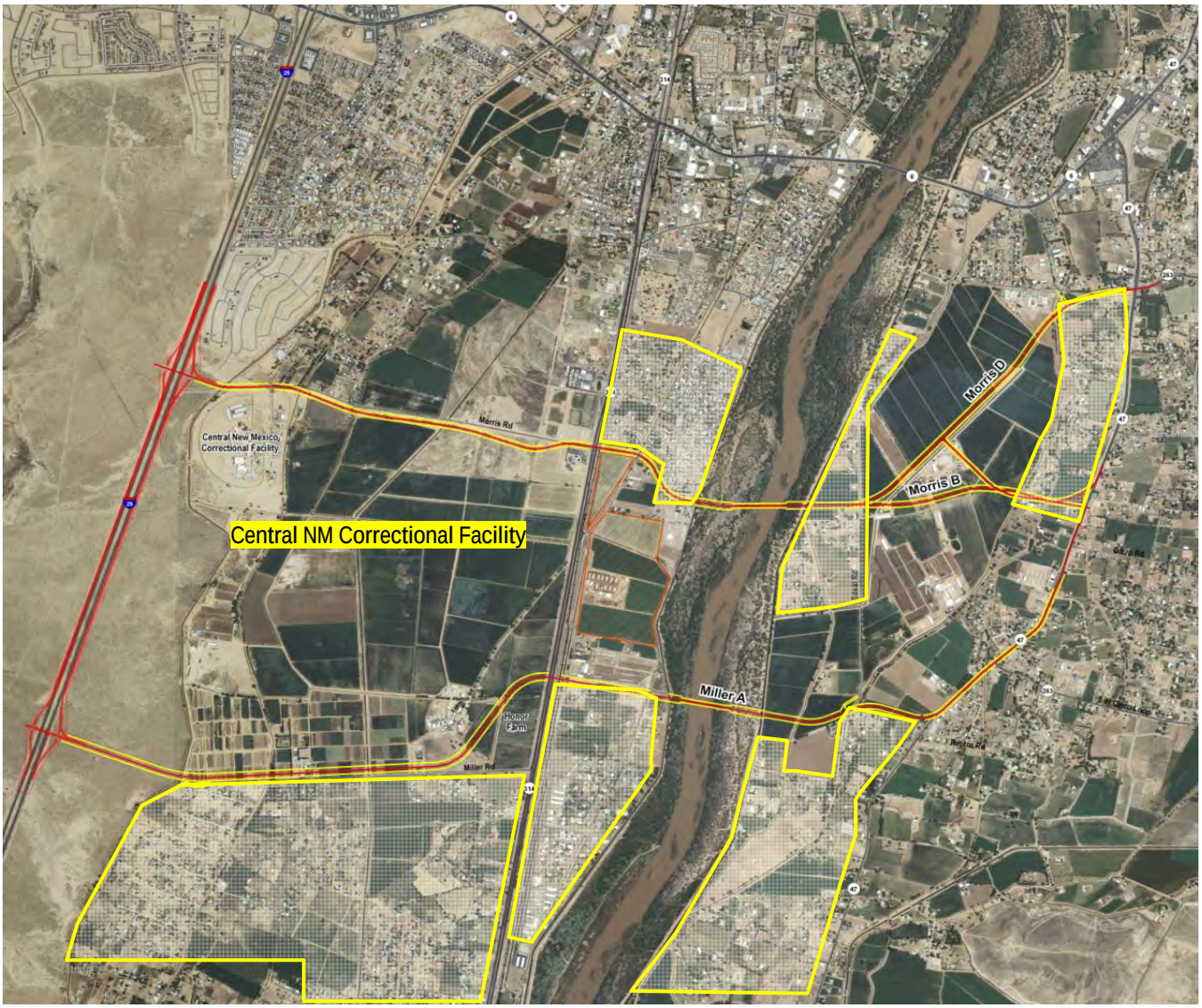
4.9 Communities and Neighborhoods

Avoiding densely developed areas, to the extent practical, was a primary objective during the development of alternatives. For this reason, most of the alternatives do not pass directly though residential communities and do not adversely impact schools, churches, community centers, or other community facilities. Still, several communities and neighborhoods are within the vicinity of the project alternatives (see Figure 27). The CNMCF is also within the project area and is immediately adjacent to the west end of the Morris Alternatives. The Morris B/D Alternatives are adjacent to residential areas north of Morris Road between I-25 and the Rio Grande and neighborhoods along Edeal Road and NM 47 east of the river. The Miller A Alternative is adjacent to the Los Chavez community just south of Miller Road and small residential clusters along both sides of the Rio Grande. This alternative also passes through the neighborhoods along NM 47.

While some changes in access will occur, all of the alternatives maintain direct access from neighborhoods to the existing street system. Access to area schools, churches, and other community facilities is maintained. Moreover, all of the alternatives under consideration would improve access to the local and regional destinations.

The project alternatives will result in an increase in traffic noise, especially for the neighborhoods located on residential streets away from I-25, NM 314, and NM 47. Impacts from traffic noise will be reduced somewhat by the buffer areas between the roadway and edge of right-of-way and by trees and other vegetation included in the buffer areas. Based on a preliminary analysis, the need for a noise wall is likely for the Morris B/D Alternatives along the north side of the roadway between Los Lentes Road and the Rio Grande. The need for screen walls has been identified in other locations where the roadway passes near homes. It is unlikely that federal and state noise abatement cost-effectiveness criteria would be met in these low density neighborhoods; however, privacy walls of approximately six-feet in height may be warranted. The need for a security wall adjacent to the CNMCF Facility has also been identified. A determination of the need for these walls will be made in future project phases.

Figure 27: Neighborhoods Near Route Alternatives



Existing air quality is likely good due to the semi-rural character of the project area. Major sources of industrial pollutants do not occur within the project area, and mobile source emissions from motor vehicles are relatively low compared to the larger Albuquerque metropolitan area to the north of Valencia County. Higher mobile source emission rates are typically associated with congested areas. Because the proposed project will help mitigate congestion along NM 6/Main Street, net improvements to overall air quality would likely result within the project area from project implementation. Higher localized concentrations of carbon monoxide (CO) can occur near intersections of major streets. However, problem levels of CO are unlikely to occur from roadways with the traffic volume and operational characteristics expected with the proposed roadway.

4.10 Hazardous Waste

A Preliminary Initial Site Assessment (PISA) was completed for the alternatives to identify areas in the vicinity of the project site that are likely to impact the project because of a known or likely release of a hazardous substance or petroleum product. The presence of hazardous materials can result in special

considerations in the acquisition of right-of-way and/or may impose special requirements on the project during construction, such as worker protection measures, regulated disposal of hazardous substances, and the removal of underground storage tanks. The PISA review included review of historical aerial photographs (1935, 1947, 1955, 1963, 1974, 1984, 1996 and 2010); interviews with municipal, county, and state agencies; a review of State and Federal regulatory database information; and a site and adjoining property reconnaissance.

The PISA for the Miller A Alternative identified recognized environmental concerns. These include:

- An Underground Storage Tank (UST) facility located on NM 47 at South El Cerro Loop Road. Releases have not been reported at this facility; however, the presence of a UST facility adjoining the site is considered a potential environmental concern for the project.
- A leaking underground storage tank (LUST), former dairy operations, and two former sanitary sewage lagoons at the CNMCF Honor Farm site.
- Asbestos containing water distribution pipe present in the Village of Los Lunas area.
- Sanitary sewer lines are present within the vicinity of the project. Potential releases from these pipes and construction interception of the waste water collection system is considered a potential environmental concern for the project.
- Properties to be acquired may require evaluations for asbestos and lead-based paint, plugging and abandonment of water wells, and/or closure of septic systems.

The PISA for the Morris B/D Alternatives identified recognized environmental concerns. These include:

- An historical gas station located at the intersection of NM 47 and North El Cerro Loop Road is listed as an active LUST facility. Based on NMED files, a release of petroleum hydrocarbons has affected soil and groundwater in the vicinity of this intersection. This site affects the Morris D Alternative only.
- Potential nitrate/nitrite groundwater impacts from a dairy farm located between Edeal Road and NM 47.
- Potential nitrate/nitrite soil and groundwater impacts from former sanitary sewage lagoons, located within the Los Lunas Waste Water Treatment Plant area.
- Potential nitrate/nitrite soil and groundwater impacts from a former dairy and slaughterhouse operation associated with the CNMCF Honor Farm site.
- Asbestos containing water distribution pipes are present in the vicinity of the project.
- Sanitary sewer lines are present within the vicinity of the project. Potential releases from these pipes and construction interception of the waste water collection system is considered a potential environmental concern for the Project.
- Properties to be acquired may require evaluations for asbestos and lead-based paint, plugging and abandonment of water wells, and/or closure of septic systems.

Based on the results of the PISA, an Initial Site Assessment will be needed during the next phase of the project. While recognized environmental concerns were identified by the PISA, the investigations did not identify any sites or issues that affect the viability of any alternative.