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NMDOT

Phase A/B: Initial and Detailed Evaluation of Alternatives

Cibola County Road C084

(Old US 66), 0.25 Mi. West of MP 2.10 on NM 6

New Mexico Department of Transportation

Control/Project No: 6101000

February, 2017

HDR

Draft Phase A/B Report: Initial & Detailed Evaluation of Alternatives

Cibola County Road C084 (old US 66)

PN/CN 6101000

Valencia County, NM

February, 2017

PHASE A/B REPORT

for

CIBOLA COUNTY ROAD C084 (OLD US 66)

CN 6101000

THIS PROJECT INCLUDES THE FOLLOWING: DETAILED ANALYSIS OF IDENTIFIED ROADWAY CONSTRAINTS AND SAFETY ANALYSIS TO DETERMINE THE RECOMMENDED IMPROVEMENTS FOR CIBOLA COUNTY ROAD C084 (OLD US 66) OVER BNSF RAILWAY. PROJECT LIMITS INCLUDE CIBOLA COUNTY ROAD C084 BETWEEN THE INTERSECTION OF NM 6 AND EXTENDS ONE MILE WEST. STUDY INCLUDES THE EVALUATION OF ALIGNMENT ALTERNATIVES ON CIBOLA COUNTY ROAD C084. CONSTRUCTION PROJECT WILL ENTAIL ROADWAY, BRIDGE, DRAINAGE, AND TRAFFIC AND ASSOCIATED WORK.

Prepared For:

NMDOT

NEW MEXICO DEPARTMENT OF TRANSPORTATION

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I. Introduction

The New Mexico Department of Transportation (NMDOT) is evaluating potential improvements to Cibola County Road C084 (Old US 66) to improve C084 from MP 0.0 to MP 1.0 to current standards for a rural collector roadway, including the rehabilitation or replacement of a bridge over the Burlington Northern Santa Fe (BNSF) railway. This proposed project has been assigned NMDOT Control Number (CN) 6101000.

The project area is located in Valencia County in the western portion of the state (Figure 1). The project is focused on improvements to Bridge No. 0002 (also referred to as Suwanee Bridge), which carries Cibola County Road C084 over the BNSF Railway. Roadway and drainage improvements are also being evaluated as part of this project. Bridge No. 0002 is located in or near Correo, Valencia County, New Mexico (0.25 Miles West of MP 2.10 on NM 6). The project area includes the intersection of NM 6 and Cibola County Road C084 and extends west for 1 mile (See Figure 2). Even thought the project area is in Valencia County, the majority of the considered roadway is in Cibola County. The County designated the roadway “C” for Cibola.

The BNSF railway is a major east-west railroad route with two tracks and frequent trains. Bridge No. 0002 was constructed in 1934 and partially reconstructed in 1995. It is a treated-timber structure with a rolled steel girder center span over the BNSF railroad tracks. The timber deck, which is overlayed with a bituminous material, is 23-feet wide. The existing bridge has two 11.5-foot lanes with no shoulders. The timber beams have been reinforced with steel to bridge cracks, spread loads and reinforce the timber members.

Cibola County Road C084 begins at NM 6 and extends westward into Cibola County and Laguna Pueblo, following the original Route 66 alignment. Local communities include Correo and Suwanee. Residents of Highland Meadows Estates, Alamo and eastern Laguna Pueblo use C084 regularly and many commute to the Albuquerque area and Los Lunas for work, goods, and services. Trucks travel on C084 to access a large materials pit located southwest of the project area. C084 also provides an alternate route to the village of Mesita in eastern Laguna Pueblo. The bridge provides the only safe crossing over the BNSF railway in this area. The alternative route for residents to exit/enter the area would be to travel 10 miles west to Mesita and I-40.

Pueblo Indians have lived in the region since the 13th Century. As with other pueblos, Laguna Pueblo residents lived in adobe structures and cultivated corn, beans, squash, and other crops. Laguna Pueblo was named by Spanish Governor Pedro Rodriguez Cubero in 1699. The pueblo includes communities such as Casa Blanca, Encinal, Paraje, Santa Ana, and Seama. Mesita, the nearest Laguna Pueblo community, is located approximately seven miles west of the project area. Pueblo members traveled this route between the Rio Grande and pueblos to the west such as Hopi and Zuni. This area was also the route for the mid-1860s Navajo Long Walk, where the Navajo were forced to relocate from their lands in western New Mexico and eastern Arizona to an encampment at Bosque Redonde near Fort Sumner.

Transportation routes played an important role in the region's history. San Jose was established along the railroad and was renamed Suwanee in 1902 because there was another town along the railroad named San Jose in Oklahoma. The US Geological Survey Correo Quadrangle map shows Correo located near the NM 6/C084 intersection and Suwanee located approximately 2.5 miles south on the west side of the railroad and NM 6. The NM 6/C084 intersection was formerly the junction of US 66 from Albuquerque and US 66 from Los Lunas, known as the Laguna Cutoff. A general store, bar, and post office were once located next to the junction at Correo, but the construction of I-40 to the north led to the eventual abandonment of the town. Most nearby residents currently live south of the project area in an unincorporated portion of Valencia County. Cibola County was created from western Valencia County in 1981.

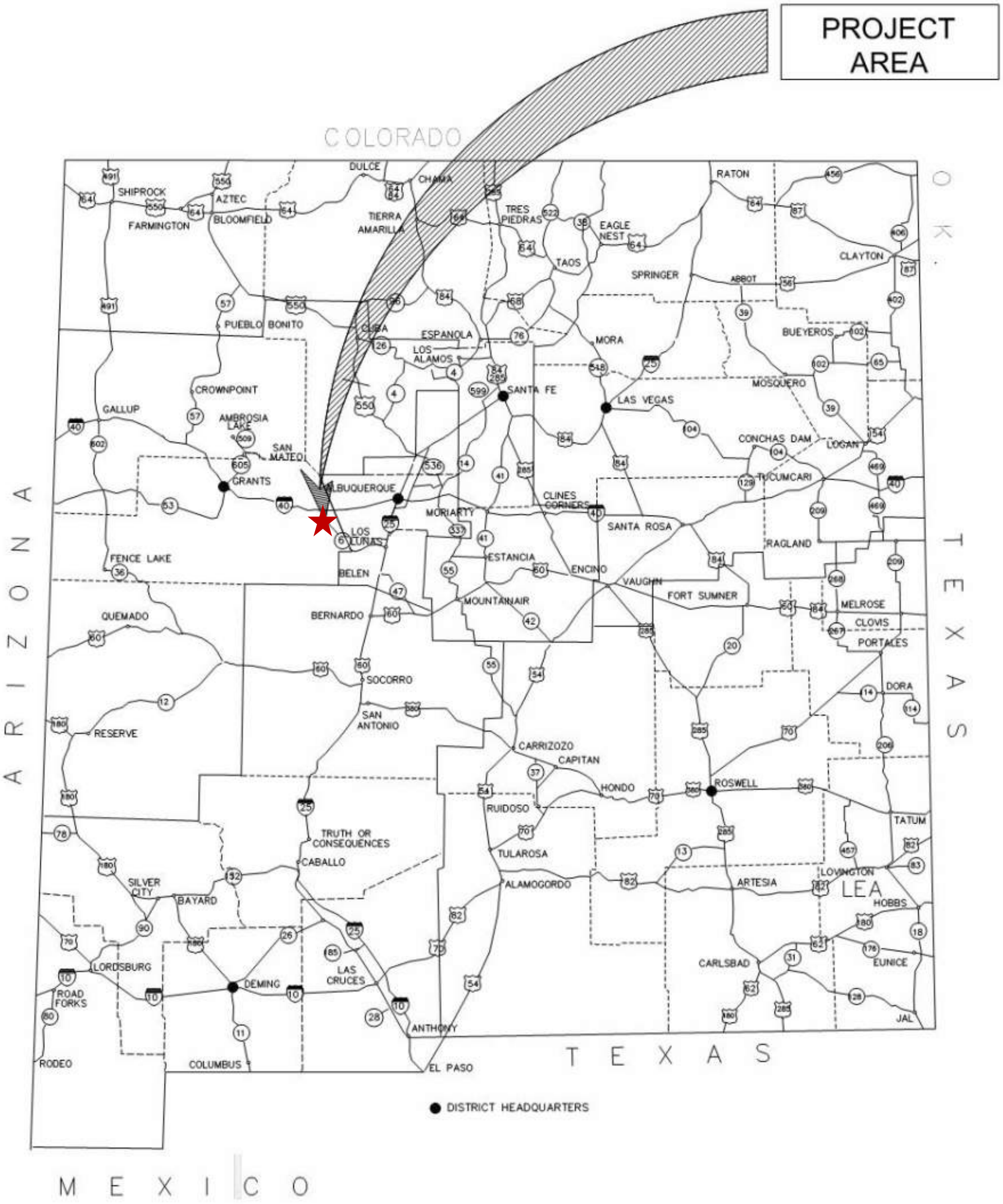

Figure 1. Location Map

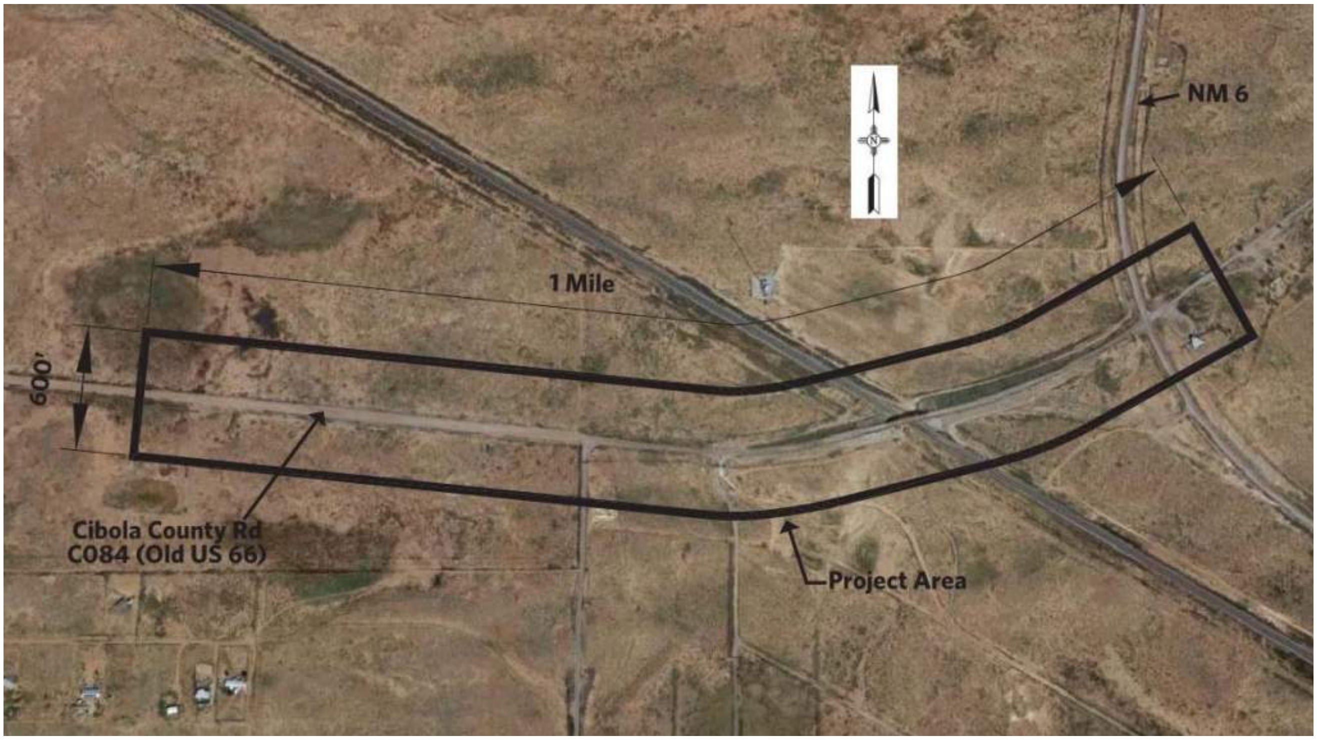

Figure 2. Project Area Map

II. History of Project

The project area includes the "State & Locally Maintained Rt. 66: Correo to Laguna" segment of Route 66. The Correo to Laguna segment was listed on the State Register of Cultural Properties in 1997 (SR 1686) and includes portions of both the 1926 and 1937 alignments of Route 66. This segment extends for 14.8 miles between the villages of Laguna and Correo. The period of significance defined for this segment is 1926 to 1956 under the category of transportation.

The grade separation at the railroad crossing (Bridge No. 0002) marks where the 1937 realignment of Route 66 (the Laguna Cut-off) intersected with the original 1926 route (Kammer 1996: Sec. 7, p. 2). Bridge No. 0002 was originally constructed in 1934. Bridge No. 0002 has been called the Suwannee Bridge though Suwannee, a siding along the Atchison, Topeka, & Santa Fe Railroad, is located 2.88 miles southeast of the bridge (Byszewski et al. 2016). Built in 1934 as part of the state and federal effort to eliminate at-grade railroad crossings from all Federal Aid highways (Parker et al. 2012), Bridge No. 0002 was built as a Federal Recovery Highway Project (Project Number NRH4Reo).

In 1933 the railroad, then Atchison Topeka and Santa Fe Railway Company, granted permission to the State Highway Commission (Contract No. CL35619) to locate U.S. Highway 66 over the railroad and established the first agreement for the construction of the roadway and bridge. In a Feb. 24, 1961 State Highway Commission Meeting, due to the construction of Interstate 40, the State Highway Commission abandoned the roadway in question for this project and was certified back to the County of Valencia. At that point the roadway was not considered a State Highway. The State of New Mexico does remain the responsible party for the crossing, bridge structure, with the Railroad company due to being named in the original agreement for the crossing.

Thirty-one grade-separation bridges were built in NM between 1926 and 1935 (Biennial Reports), and ten of them were timber stringer bridges like Bridge No. 0002. Timber construction was the most common bridge-building technology of the period. Over railroads, timber bridges were creosoted and had concrete piers on each side of the track and the stringers of the main span across the tracks were steel. In 2014 NMDOT and NMSHPO determined the bridge not eligible for listing to the National Register of Historic Places (NRHP) as an individual entity (HPD Log #99232) because the superstructure (the bridge) is reconstructed. The bridge is eligible for listing to the NRHP as a contributing element of Route 66.

In 1995, NMDOT used state funds to completely reconstruct the bridge superstructure using pressure-treated wood and steel stringers (CN 2950). Some wood members of the substructure were also replaced with pressure-treated wood (estimated 16 of an estimated 132 total timber members in the substructure = 12%). The approach widths were expanded and the rock slope armoring and metal guard rails added. Details of this work are available in the 1995 As-Built plans. The 1995 pressure treated wood members are visually distinct from the original pieces because of marks left from the treatment process. In 2003 or 2004, two timber stringers in the superstructure (possibly two originals that had been reused in the 1995 reconstruction) were repaired and Type III Paddles & Narrow Bridge signs installed. In June of 2007, NMDOT maintenance crews repaired 21 damaged timber girders in the superstructure using steel plates, straps, and cradles, with asphalt and concrete patches on the travel surface covering the repair plates: G11 in Span 2; G8, 9, 10, 11 in Span 3; G8, 9, 11 in Span 4; G6, 7, 9, 10 in Span 6; G7, 8, 9 in Span 7; G7, 9, 10 in Span 8; G7, 8, 9 in Span 9.

III. Agency Coordination and Public Involvement

A. Public Involvement Plan/Context Sensitive Solutions Plan

In order to provide a unified approach to public involvement and context sensitive solutions, a Public Involvement (PIP) Plan and Context Sensitive Solutions (CSS) Plan was prepared for the project. See Appendix D. The major goals of the PIP/CSS Plan for this project are as follows:

1. To establish the project context and identify major issues;
2. To identify project stakeholders;
3. To facilitate efficient development of project plans; and
4. To develop a decision-making process that is sensitive to the project context, involves stakeholders in a meaningful way, and leads to development of a preferred alternative that is consistent with transportation, environmental, cultural, community, land use, and economic contexts in the project area.

The last goal is directed at identifying the role of stakeholders in the project development process, including methods to inform and obtain input from stakeholders, and establishing protocols to resolve issues, concerns, and conflicts that may arise.

The NMDOT Location Study Procedures, CSS, and public involvement will be fully integrated with the intention of developing alternatives and designing a project that best responds to the needs of the local community and the traveling public. Table 1 presents an overview of the communication strategy for public involvement as established by NMDOT. HDR will oversee the communication and implement the communications strategy. Marron and Associates (Marron) will be responsible for meeting FHWA and NMDOT public involvement requirements under the National Environmental Policy Act (NEPA) and maintaining an administrative record of the public involvement process.

Table 1. Summary of Public Involvement Milestones

Study Phase	Study Development	Public Involvement Events	Approximate Dates
Phase A/B – Development and Evaluation of Alternatives	(1) Present project to public, identify issues, develop purpose and need statement, and present initial concepts	• Public information meeting with notification mailings and ads in two local newspapers. • Study team meeting	Oct. 13, 2016
	(2) Develop initial alternatives, collect data, and develop screening criteria	• Study team meeting	April 2016 – Nov. 2016
	(3) Prepare detailed alternatives	• Study team meeting • Landowner and agency coordination meetings	Oct. 2016
	(4) Review and revise alternatives	• Study team meeting	Oct. 2016
	(5) Rank alternatives using screen criteria and recommend preferred alternative; prepare and present Phase A/B report	• Study team meeting • Landowner and agency coordination meetings	Nov. 2016
	(6) Conduct biological and cultural resource field studies; collect environmental data	• Landowner and agency coordination meetings as needed • Study team meetings	March 2017
Phase C – Environmental Analysis and Documentation	(7) Prepare environmental documentation	• Public involvement meeting Study team meeting	Schedule dependent upon funding.

B. BNSF Coordination

A coordination meeting with BNSF was scheduled and held on September 21, 2016 at the project site. The following individuals attended the meeting:

- Rais Rizvi, NMDOT CRD
- Lisa Boyd Vega, NMDOT District 6
- Bryan D. Peters, NMDOT District 6 TSE
- Stephanie Parra, NMDOT District 6
- Bob Crossno, NMDOT Bridge
- Genevieve Head, NMDOT Env
- Isaac Chavez, NMDOT CRD
- Rob Fine, NMDOT Rail
- Jerome Maestas, NMDOT Rail
- Danton Bean, HDR
- Antonio Nunez, HDR
- Patrick Hoskins, BNSF

The overall purpose of the meeting was to coordinate with BNSF on project development. Discussion centered on the scope of work, including the background and history of the bridge, deficiencies, and current limitations of the structure. BNSF discussed future plans, including a future third track, crossings, and considerations to evaluate in the study. See Appendix M for meeting notes.

C. Public Meeting, October 13, 2016, Highland Meadows Volunteer Fire Department

A Public Involvement Meeting was scheduled and held on Thursday October 13, 2016 at the Highland Meadows Volunteer Fire Department. The meeting summary is located in Appendix E.

The following project team members were present:

- Rais Rizvi, NMDOT Central Design
- Steven Gisler, NMDOT Environmental Development Section
- Genevieve Head, NMDOT Environmental Development Section
- Danton Bean, HDR
- Paul Molina, HDR
- Antonio NunezTovar, HDR
- Eric Johnson, Marron and Associates

Rais Rizvi introduced the project. Danton Bean described the existing conditions, project purpose and need, and initial project concepts. Eric Johnson went over the environmental process. The Project Team received comments from the public and responded to questions from the attendees.

IV. Determination of Need

A. Existing Transportation System

C084 is a two-lane undivided highway that connects NM 6 to the residential development of Highland Meadows and continues west approximately 8.6 miles to the I-40 interchange located at Mesita. C084 is classified as a Class I highway facility. As stated in the 2010 Highway Capacity Manual (HCM), Class I highways are two-lane highways on which motorists expect to travel at relatively high speeds. Refer to Figures 1 and 2 for C084 Location and Project Area Maps. The functional classification for C084 is a Rural Minor Collector. Currently there is no speed limit posted.

B. Physical Condition of Existing Facility

The following subsections summarize the physical and geometric conditions of the existing roadway, structures, drainage, and appurtenances.

1. Roadway Typical Section

The existing typical section was obtained from the Old US 66 Bridge over the AT&SF Railway Bridge Repair As-Built Construction Drawings (SP-B0-7506 [210] PCN 2950). Visual observations of the roadway layout/typical section were conducted onsite on June 22, 2016. The existing roadway typical section can be viewed in Figure 3 and is defined as follows:

- 2-Lane undivided roadway, 40-foot typical pavement section (including 4.5-foot taper)
    - 2-inch plant mix bituminous pavement – Type I. Gr. B
    - 6-inch untreated base course. Type I-B (nominal depth) 1-lift
- 11-foot all purpose roadway lanes
- 4.5-foot paved shoulders
- 4.5-foot taper from shoulder to grading
- Grading slope varies

It should be noted that severe weathering and overgrowth have deteriorated the paved taper and shoulders, which has reduced the 40-foot pavement section to varying widths.

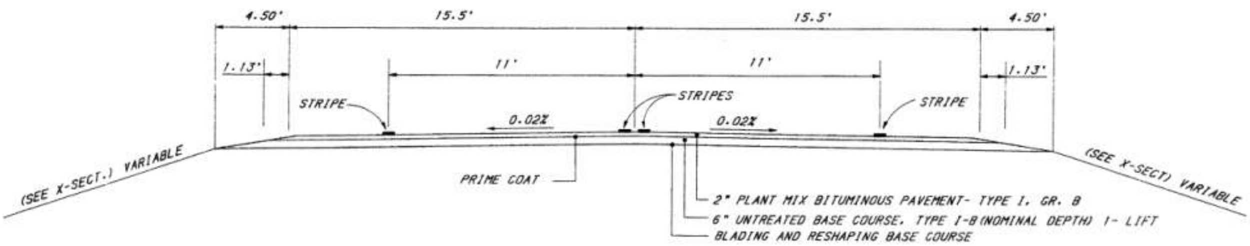

Figure 3. Existing Typical Section

2. Pavement Management and Condition Assessment

A pavement condition assessment was performed to provide a general overview of the existing pavement conditions along C084 based primarily on visual observation supplemented with an existing surface model analysis. The surface model was created using aerial survey obtained for this study. This assessment was conducted without the benefit of pavement/soil borings, physical distress testing, or other mechanical means of identifying pavement condition or remaining service life.

In general, the C084 pavement appears to be thin, in poor condition, and subject to ongoing repair. Visual inspection of the roadway reveals the surface is severely weathered and appears to have areas of delamination. Widespread cracking is observed throughout the pavement surface and large pavement pieces have been and will continue to be displaced. Potholes are evident and in some areas the base course layer is exposed. Patching and minor overlay repair is evident throughout. Extreme weathering and vegetative overgrowth has overtaken the paved shoulders, which in some areas has reduced the shoulder width to the outer edge of the general purpose lane. Saver undulation is observed in both the longitudinal slope and cross slope. The undulation is likely due to unsatisfactory subgrade conditions.

Aerial survey was used to create an existing surface model of C084 within the limits in question to compare to the visual observations. The existing vertical profile and cross sections created using the existing surface model confirm extreme settling and undulation throughout. As stated above, the undulation is likely due to unsatisfactory subgrade conditions. Examples of pavement condition can be viewed in Figures 4 through 6.

Figure 4. Wide/Deep Lateral and Transverse Pavement Surface Cracking (Alligator Cracking)

Figure 5. Exposed Base Course and Pavement Patching

Figure 6. Lateral Cracking and Deterioration of Pavement Shoulder (Vegetative Overgrowth/Encroachment)

At the Highland Boulevard/C084 intersection located on the west side of the project limits, the pavement has deteriorated to a partially unpaved gravel roadway due to age and lack of maintenance. Rehabilitation of the roadway west of this intersection is not included within the scope of this project. Examples of pavement condition can be viewed in the Figure 7.

Figure 7. Transition to Gravel roadway

At the NM 6/C084 intersection located on the northeast end of the project limits, rehabilitation/ reconstruction of NM 6 is anticipated under a separate project. This construction is anticipated to occur in the near future prior to construction of this project. Further coordination will need to be conducted at this intersection during final design.

3. Existing Roadway Geometry

C084 currently has no posted speed limit, so an assumed design speed of 35 miles per hour (mph) was used to evaluate the existing roadway geometry and compare it to current standards outlined in AASHTO's, *A Policy on Geometric Design of Highways and Streets - 2011 edition (The Green Book).* The existing geometry was evaluated by means of onsite investigation along with orthophotographic images and aerial survey, which was conducted and provided by AeroTech Mapping Inc. in June 2016. The aerial survey was uploaded into 2014 Autodesk Civil 3D CAD software and used to create model of the existing corridors. The following subsections summarize the primary attributes for C084.

A) HORIZONTAL ALIGNMENT

Utilizing 2014 Autodesk Civil 3D software, the aerial survey and orthophtographic imagery was uploaded and used to create a "best fit" existing horizontal alignment along the existing roadway centerline. The following is a summary of the existing horizontal alignment:

- Existing Horizontal Alignment Length = 0.54-mile (Sta:10+00 to Sta:38+62.36)

- Number of Curves = 2
  - Curve 1:
    - Assumed posted speed = 35-mph
    - Approximate Existing PC = Sta:15+06.84
    - Approximate Existing PT = Sta:21+50.37
    - Radius at CL = 1800-feet
    - Radius at Inside Lip = 1789-feet
    - Curve Length at CL = 643.5-feet
    - Approximate Cross Slope/Superelevation (Left/Right) = (2.0%/0.9%)
    - Minimum Permissible Superelevation(%) at lip (AASHTO Design)** = 3.0%
    - Is Existing Curve Deficient(Left/Right)?* = Yes/Yes
  - Curve 2:
    - Assumed posted speed = 35-mph
    - Approximate Existing PC = Sta:27+73.83
    - Approximate Existing PT = Sta:37+40.10
    - Radius at CL = 3048-feet
    - Radius at Inside Lip = 3037-feet
    - Curve Length at CL = 966.2-feet
    - Approximate Cross Slope/Superelevation (Left/Right) = (4.3%/3.3%)
    - Minimum Permissible Superelevation(%) at lip (AASHTO Design)** = 2.0%
    - Is Existing Curve Deficient(Left/Right)?* = No/No

**Based on AASHTO's design criteria using an assumed speed of 35-mph. Refer to Section IV.B.3.a) – Roadway Horizontal Alignment. (2011 AASHTO Geometric Design of Highway and Streets)

Using AASHTO's Green Book, the approximate superelevation for each horizontal curve was analyzed. Due to extreme weathering and the undulating nature of the existing roadway, the existing superelevation was difficult to determine. The existing curves were found to have variable cross slopes, not only through the approaches or transitions, but within the curve and the inside/outside lanes. A best fit slope was applied to the existing cross sections where full superelevation was expected to occur. Both lanes (Left/Right) were individually evaluated and compared to acceptable values provide by AASHTO's Green Book. The results are summarized above.

The analysis of the existing superelevation for Curve 1 indicates that the existing superelevation slope for both the inside and outside lanes (Left/Right) is not adequate at the assumed design speed given the existing slope and horizontal curve radius. Curve 2 appears to be adequate for both the inside and outside lanes.

The existing horizontal alignment can be viewed in Appendix A.

B) VERTICAL ALIGNMENT

Using the existing horizontal alignment and C084 surface model, an existing vertical profile was created. The existing vertical profile's longitudinal slope varies significantly and shows significant undulation throughout the length of the project limits. These variances may be caused by subgrade settling, inadequate or poorly graded subgrade, maintenance overlay variation, and extreme weathering/deterioration due to age. The existing vertical profile can be viewed in Appendix A.

Due to the undulating nature of the existing vertical profile, a "best fit" vertical profile (BF Profile) was created, which is used to compare the existing vertical profile to current AASHTO standards along the roadway centerline (existing horizontal alignment). Vertical curves for the BF Profile were placed on the existing vertical profile surface model connecting approximate tangent locations. In a similar fashion, vertical curve stations, lengths, radius, and tangent slopes were approximated to create a vertical profile that represents the existing surface along the roadway centerline. The BF Profile can be viewed in Appendix C.

After creating the BF Profile, potential deficient vertical curves were identified and analyzed by comparing the Civil 3D generated curve data "K-Values" to AASHTO's "K-Value" guidelines for crest or sag vertical curves at a speed of 35-mph. A total of four curves have been identified within the project limits. The following summarizes the results.

- AASHTO Guidelines at 35-MPH:
  - K-Value (Sag) = 49.0
  - K-Value (Crest) = 29.0
  - Associated Stopping Sight Distance = 250-feet
  - Maximum Grade on tangent(level terrain) = +/-7.0%
- Vertical Curve 1:
  - Type = Sag
  - PVI Sta: 14+21.70
  - K-Value = 100.12
  - Length = 200.0-feet
  - Incoming/Outgoing Grade (in/out) = (-0.61%/1.39%)
- Vertical Curve 2:
  - Type = Sag
  - PVI Sta: 19+30.34
  - K-Value = 72.05
  - Length = 200.0-feet
  - Incoming/Outgoing Grade (in/out) = (1.39%/4.16%)

- Vertical Curve 3:
  - Type = Crest
  - PVI Sta: 25+61.80
  - K-Value = 98.78
  - Length = 750.0-feet
  - Incoming/Outgoing Grade (in/out) = (4.16%/-3.43%)
- Vertical Curve 4:
  - Type = Sag
  - PVI Sta: 36+22.32
  - K-Value = 46.24
  - Length = 200.0-feet
  - Incoming/Outgoing Grade (in/out) = (-3.43%/0.87%)

The vertical curve analysis of the BF profile concludes that vertical curves 1, 2, and 3 approximate vertical geometries comply with AASHTO guidelines. The K-Value for Vertical curve 4 is slightly less than that of the AASHTO Guidelines (46.24 < 49) for a sag vertical curve. As stated earlier, the actual existing vertical profile shows significant undulation throughout the length of the project limits.

4. Drainage Structures

Within the project corridor there are two 24-inch corrugated metal pipes (CMP) along NM 6, near the intersection with CO84. One of the CMPs is located approximately 210 feet north of the intersection of NM 6 and CO84. The other CMP is located approximately 42 feet south of the same intersection. The pipes drain runoff eastward along Old Highway 66. Field reconnaissance indicates both pipes are in poor condition and partially filled with debris and sediment. It should be noted that the culvert north of the intersection does not appear to be efficient at capture and conveyance of storm water runoff. Due to the natural gradient of the existing terrain, a majority of the runoff will bypass the culvert and pond at the northwest corner of the intersection.

There is a cattle guard crossing approximately 100 feet west of the NM 6 and CO84 intersection as well. It appears that it may have been utilized as an overflow structure for discharge ponding at the associated intersection corners. However, field investigation indicates the pipe within the structure is clogged and inoperable at this time.

There is a 48-inch concrete pipe beneath the BNSF railroad approximately 275 feet northwest of Suwanee Bridge. The pipe drains from south to north conveying discharge towards the NM 6 and CO84 intersection. It has a concrete headwall on the southern inlet side and a metal end section on the outfall. The pipe is free of debris and appears to be in relatively good condition.

Currently, the roadway drainage is allowed to sheet flow off of the roadway edge and down the roadway embankment slopes. At the toe of the slope, runoff is conveyed east or west along naturally occurring swales and depressions in the existing terrain. Figures 8 and 9 are photographic evidence of the conditions and size of the existing drainage features in the project corridor.

Figure 8. Existing Cross Culverts at NM 6

Figure 9. Existing BNSF Cross Culvert

5. Bridge Structures

Bridge No.0002 has nine simple spans with a treated timber deck. Eight of the nine spans are treated timber girders (length = 21 ft. & 19 ft.) with the span over the railway being a rolled steel girder span (length = 52.74 ft.). The vertical clearance above the railway to the rolled steel girders is approximately 20'-10".

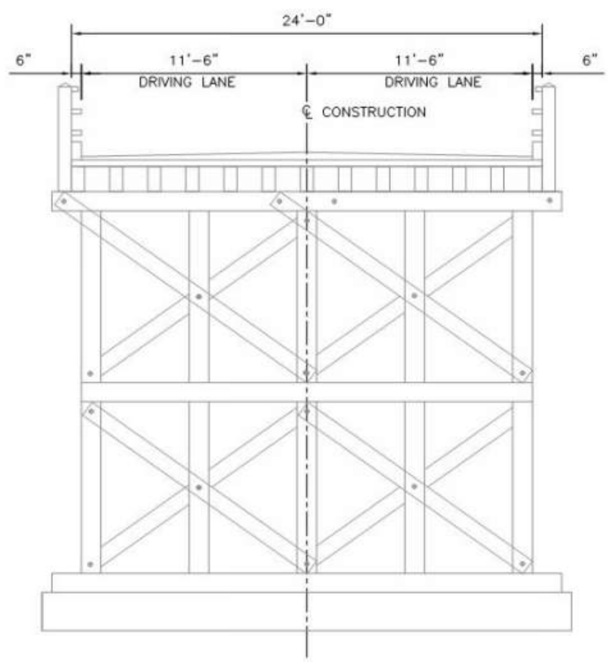

Figure 10. Existing Typical Section - Bridge No. 0002

The bridge has two (2) 11'-6" driving lanes and a total deck width of 24'-0". The deck is overlaid with an asphalt pavement.

The steel girder span over the railway is supported with concrete pier walls and cap. The timber girders are supported with timber pier and abutments. The timber pier and abutments are normal to the roadway. The timber girders have been reinforced with steel plates, straps and cradles.

The concrete pier walls are supported on a shallow spread footing foundation. The concrete pier walls are skewed approximately 45 degrees to the roadway and parallel to the tracks. The timber pier elements are normal to the roadway and skewed the tracks. There is approximately 10’-2” horizontal clearance between the pier wall and the center of the adjacent track. The timber pier columns and abutments are also founded on shallow concrete footings. The abutment slopes spill-through and are covered with rock riprap.

Figure 11. Bridge Elevation View

Figure 12. Bridge Typical Section

The latest inspection reports evaluate the condition of the structures as satisfactory. The structure has been posted for heavy loads. The posting is shown on a Weight Limit sign. See figure 14. The limits are less than today's standard design loads.

The top of the timber deck is covered and is unobservable due to the asphalt overlay. The concrete patches cover a steel plate which anchors straps and cradles used to repair the girders. The underside of the deck has some areas of decay and some minor weathering and water staining.

Figure 13. Girders with Straps and Cradles

The steel girders over the railway are in good condition. The timber girders have been repaired. The girders have been reinforced with steel plates, straps and cradles. The timber girders do show signs of crushing, diagonal splitting, checks and weathering. The bridge is posted with a weight limit (See Figure 14 for Weight Limit) and the latest inspection report says the Inventory Rating is HS12.1 and the Operating Rating is HS 17.2.

Figure 14. Weight Limit Sign

The pier timber columns have heavy checks and splits with moderate weathering and water stains, areas of surface rot and discoloration.

Figure 15. Pier Timber Columns

The pier walls have isolated horizontal, vertical and map cracks and spalls.

Figure 16. Pier Concrete Walls

The abutment timbers have moderate checks and splits and heavy weathering and minor water stains.

Figure 17. Abutments with Slope faced with Riprap

The capacity of the foundation members is unknown and an analysis has not been completed on the foundation elements as part of this report.

The bridge structure has several geometric deficiencies compared to current standards. Those deficiencies are:

- The deck width (24’-0”) does not meet current standards as specified in the NMDOT Bridge Procedures and Design Guide, which calls for no bridge on a rural highway to be designed with a shoulder less than 4 feet wide.
- The vertical clearance (21’-3”, according to bridge inspection report) does not meet current standards as specified in the BNSF Guidelines for Railroad Grade Separation Projects, which calls for a minimum vertical clearance of 23’-4”.
- The horizontal clearance (10’-2”) between the existing track and the pier walls, also does not meet the current standards as specified in the BNSF Guidelines for Railroad Grade Separation Projects, which calls for a minimum horizontal clearance of 25’-0”.

6. Geotechnical

It appears that there has been some settlement within the existing roadway approach embankment. There is no known existing geotechnical data for the site. It is understood that the existing embankment and bridge were constructed in 1934, and the embankment was widened when the guardrail was constructed in 1994.

The settlement appears to have occurred behind the abutments at the highest portions of the embankments. It is unclear if this settlement is a function of the consolidation of foundation soils beneath the embankment, or consolidation of the embankment soils, or potentially a combination of both. The most likely cause of the settlement is long-term consolidation of fine grained silt or clay soils in the embankment and/or in the subgrade.

Figure 18. Settlement

7. Lighting

There is no existing lighting infrastructure within the project limits.

8. Pedestrian Facilities

There are no pedestrian facilities or appurtenances within the project limits. A 4.5-foot shoulder was originally designed; however, it has for the most part been deteriorated entirely back to the general purpose lane limits (Outside lane stripe).

V. Purpose and Need Statement

The purpose of the CO 84 Bridge Project is to safely and efficiently convey traffic across the BNSF tracks in a manner that achieves current design standards. The bridge was constructed in 1934 and partially reconstructed in 1995. The existing bridge has two 11.5-foot lanes with no shoulders or space for pedestrians and bicyclists. The bridge is currently rated for 15-ton vehicular limit, which is below the current standard design load for a 36-ton truck. The bridge clearance over the railway is 21.25 feet according to the bridge inspection report, which should be 23.5 feet under current standards. The bridge's opening width (horizontal distance) is not adequate for the request by BNSF to add an additional track to their system. The roadway surface of the bridge approaches exhibits signs of embankment and subgrade failures.

Residents of the Correo, Suwanee, Highland Meadows Estates, Alamo, and eastern Laguna Pueblo communities use the bridge to access NM 6 and I-40. The commercial material pit on the southwest side of the railway and bridge is hindered by the load posting on the structure. This bridge is the only crossing of the BNSF railroad in the area for these communities. I-40 can also be accessed by traveling on CO 84 to Mesita, approximately 10 miles northwest of the bridge. Thus, the bridge is a critical access point for Correo and Suwanee residents, especially in an emergency. The bridge crossing is the quickest route for emergency responders to the communities south of the railway.

VI. EXISTING CONDITIONS AND CONSTRAINTS

A. Environmental Features

1. Geology and Soils

The C084 Project Area is in the eastern part of the Acoma-Zuni Section of the Colorado Plateau Physiographic Province. Elevation is approximately 5,010 to 5,020 feet above mean sea level on mostly flat terrain. Hills and mesas are nearby. Geologic material consists of Quaternary alluvium and basaltic to andesitic rock (New Mexico Bureau of Geology and Mineral Resources, 2003; Williams, 1985).

Two soil mapping units occur in the Project Area: Grieta-Shiprock association and Grieta-Kiki sandy loams (see Table 2). These soils have a somewhat high wind erosion risk. Because of the open terrain, the Project Area is vulnerable to erosion during high winds. The water erosion risk is average. Since the landscape is mostly level, the water erosion risk is reduced.

Table 2. Soil and Erosion Risks

Soil Map Unit	Percent of Project Area	Soil Erosion Risk
Grieta-Shiprock association, 1 to 10% slopes	14%	Somewhat high wind erosion risk and average water erosion risk
Grieta-Kiki sandy loams, 3 to 15% slopes	76%	Somewhat high wind erosion risk and average water erosion risk

Source: Natural Resources Conservation Service (NRCS) (2016)

2. Water

The project area is within the Rio San Jose watershed. The Rio San Jose is an ephemeral stream located approximately 4,300 feet north of the Project Area. The Rio San Jose empties into the Rio Puerco, which is a Rio Grande tributary. No waterways or wetlands are located within the project area. Groundwater is the principal water source in this part of Valencia County. The depth to groundwater ranges from 75 to 145 feet (New Mexico Office of the State Engineer, 2016).

3. Biological Resources

Natural vegetation consists of grasses, such as blue grama, and herbaceous plants, such as snakeweed. Most areas are grazed by cattle. Wildlife is limited by a lack of water sources. Grassland bird species, such as Swainson's hawk, common raven, Say's phoebe, western meadowlark and white-crowned sparrow, occur in the area. Based on experience with other bridges in central New Mexico, the bridge provides potential nest sites for cliff swallows and roost sites for bats, but train traffic may limit swallow nesting and bat roosting. A variety of small mammal and reptile species are present on surrounding lands. No protected species are anticipated in the project area (see Table 3).

Table 3. Protected Species with the Potential to be Present in Study Area

Group	Common/Scientific Names	Agency Status	Habitat	Comment
Plants				
	Pecos sunflower (Helianthus paradoxus)	USFWS E State E	Alkaline wetlands and seeps	No suitable habitat present
Fishes				
	Rio Grande silvery minnow (Hybognathus amarus)	USFWS E NMDGF E	Rio Grande	No suitable habitat present
Amphibians				

Group	Common/Scientific Names	Agency Status	Habitat	Comment
		Not Applicable		
		Reptiles		
		Not Applicable		
		Birds		
	Southwestern willow flycatcher (*Empidonax traillii extimus*)	USFWS E NMDGF E	Willow / cottonwood riparian and wetland habitat	No suitable habitat present
	Yellow-billed cuckoo (*Coccyzus americanus*)	USFWS T	Riparian woodlands with high canopy and dense understory	No suitable habitat present
	Mexican spotted owl (Strix occidentalis lucida)	USFWS T	Woodland and forests, nests in old growth conifer habitat	No suitable habitat present
	Broad-billed hummingbird (Cynanthus latirostris magicus)	NMDGF T	Nests in canyons near waterways	No suitable habitat present
	Peregrine falcons (Falco peregrinus anatum/tundrius)	NMDGF T	Steep mountain or shore cliffs near water	No suitable habitat present
	Common Blackhawk (Buteogallus anthracinus)	NMDGF T	Large isolated riparian woodlands with layered canopy	No suitable habitat present
	Neotropical cormorant (Phalacrocorax Brasilianus)	NMDGF T	Lakes, reservoirs and large rivers	No suitable habitat present

Group	Common/Scientific Names	Agency Status	Habitat	Comment
	Common ground dove (*Columbina passerina*)	NMDG E	Southernmost New Mexico	No suitable habitat present
	Gray vireo (Vireo vicinior)	NMDGF T	Rolling pinyon-juniper habitat	No suitable habitat present
	Bell's vireo (*V. bellii*)	NMDGF	Riparian woodlands and canyons in southern NM and lower Rio Grande Valley.	No suitable habitat present
	Baird's sparrow (Ammodramus bairdi)	NMDGF T	Grasslands	Habitat unsuitable due to human development and activity
	Bald eagle (Haliaeetus leucocephalus alascanus)	BGEPA NMDGF T	Nests along large lakes and rivers, winters in bosque forest in NM	No suitable winter roost habitat present
Mammals				
	Spotted bat (Euderma maculatum)	NMDGF T	Ponderosa pine and juniper habitats	No suitable habitat present
	New Mexico meadow jumping mouse (*Zapus hudsonius luteus*)	USFWS E NMDGF E	Grassy, lush riparian meadows	No suitable habitat present

Sources: New Mexico Department of Game and Fish (2016), New Mexico State Forestry (2016), and US Fish and Wildlife Service (2016)

4. Cultural Resources

A records search was completed for the proposed project. To conduct the file search, cultural resource data were downloaded from the New Mexico Cultural Resources Information System (NMCRIS) managed by the Archaeological Resource Management Section (ARMS) of the New

Mexico Historic Preservation Division (HPD). As required, a 0.5 kilometer (km) (0.3 mile [mi]) radius of the project area was searched.

Two previously recorded sites are within a 0.5 km (0.3 mi) radius of the project area (Table 4; See Appendix F). One site is a small segment of Route 66 and is within the project area. The other site is an historic artifact scatter with features that include a trading post and house foundation. Updates of the sites will be required during the Phase C portion of the project.

The listings of the National Register of Historic Places (NRHP) and the State Register of Cultural Properties (SRCP) were reviewed (Table 5; See Appendix F). One registered property is located within a 0.5 km (0.3 mi) radius of the project area. The property is a segment of Route 66 from Correo to Laguna (SR 1686), listed on the SRCP, is within the project area and will need to be addressed in the Phase C portion of the project.

The railroad crosses under Bridge No. 002, and this segment of the Burlington, Northern, and Santa Fe (BNSF) railroad has been recorded as Historic Cultural Property Inventory (HCPI) 31896 (Table 6; See Appendix F). The bridge was built in 1934 and is located on a segment of pre-1937 Route 66. A preliminary letter report was completed for the New Mexico Department of Transportation's use to start consultation with the State Historic Preservation Officer (SHPO) and the National Park Service, due to their jurisdiction over eligible segments of Route 66. In addition, another HCPI is within the project area (HCPI 42112). This is the Highland Meadows Store.

Finally, 10 cultural resource surveys have been previously conducted within 0.5 km (0.3 mi) radius (Table 7; See Appendix F). The surveys were conducted from 1986 to 2009.

Table 4. Previously Recorded Sites within 0.5 km (0.3 mi) of the Project Area

LA No.	Description	Cultural Affiliation	Eligibility
138162	Route 66 – road/trail	Anglo: NM Statehood to Recent (ad 1933 – 2001)	Eligible, A, HPD Log No. 10430
103719	Artifact scatter with features – house foundation, structure foundation, water catchment, trading post	Anglo: NM Statehood to Recent (AD 1940 – 1969)	Unevaluated, HPD Log No. 43102

Table 5. Registered Properties within 0.5 km (0.3 mi) of the Project Area

File No.	Name of Property	Address	SRCP Listing Date	NRHP Listing Date
1686	State and Locally Maintained Route 66: Correo to Laguna	State Road 6, Laguna, Bernalillo and Cibola Counties, New Mexico	09-May-1997	Not listed

Table 6. Previously Recorded Built Environment within 0.5 km (0.3 mi) of the Project Area

HCPI No.	Type
31896	Railroad
42112	Highland Meadows Store

Table 7. Previous Archaeological Surveys within 0.5 km (0.3 mi) of the Project Area

NMCRIS No.	Description	Acres	No. of Sites	Author, Date
12788	Two Proposed Borrow Pits Near Correo, New Mexico Project No. IR-040-2(43)117	51.70	0	Haecker, Charles M., 1986
26694	Survey Along State Road 6 Near Correo District Six Maintenance Project	224.24	5	Marshall, Sandra L., 1989
44910	Survey on Old US 66 Over the AT&SF Near Suwanee	124.18	4	Evans, Laurie G., 1994

NMCRIS No.	Description	Acres	No. of Sites	Author, Date
49349	Survey of .48 Acres of Private Land near the Suwanee Railroad Bridge, Valencia County, New Mexico	0.48	0	Condie, Carol J., 1995
49350	Survey of Three Areas of State and Private Land near Correo, Valencia County, New Mexico	3.58	0	Condie, Carol J., 1995
56495	Inventory Along State Highway 6 South of the Suwanee Bridge in District 6, Valencia County, NM CN 9052	2.87	0	Messerli, Thomas F., 1997
65412	Proposed Fire Department Substation Location in the Village of Folsom Union County, New Mexico	5165.00	1	Townsend, Stephen, 1999
67433	Survey of 5.2 Acres of Private Land in T8N R3W Near Correo, Valencia County, New Mexico	5.20	0	Condie, Carol J., 2000
107502	A Class I (Intensive) Pedestrian Cultural Resources Assessment Survey of Proposed Roadway Reparations Located along Highland Blvd. Near Correo in Valencia County, New Mexico (FEMA PW #918)	0.25	0	Moses, James, 2007
112699	Survey for Two Office/Equipment Yards, a Hot Mix Plant, and a Pond Site in Bernalillo and Cibola Counties, New Mexico Associated with New Mexico Department of Transportation Project No. AC-GRIP-(NH)-040-2(8)126 Control No. G1436ER	12.33	2	Marshall, Michael P., 2009

Route 66, officially commissioned as a national highway in 1926, includes a network of roads stretching from Chicago to Los Angeles. The establishment of the route coincided with a boom in automobile tourism during the 1920s as Americans began taking cross-country road trips. The official “66” designation was assigned by the Joint Board on Interstate Highways as part of an effort to create a consistent national numbering system for highway routes across the country.

The 1928 path of Route 66 in New Mexico stretched from Glenrio near the New-Mexico-Texas border southeast through Tucumcari to Santa Rosa, headed northwest to Santa Fe (passing through Romeroville, Pecos, and Rowe), turned south and treacherously descended La Bajada before extending through Albuquerque, continued south to Los Lunas, and then headed northwest through Laguna, Grants, and Gallup (see figure below). Throughout the 1930s and 1940s, large federal public spending programs allowed New Mexico to modernize and improve its highway system, including making major changes to Route 66 in 1937. These changes included realignments that excluded 107 miles of previous roadway and included paving the entire length of the highway within the state. Importantly, the post-1937 Route 66 bypassed Santa Fe and Los Lunas, thereby taking a more direct east-west route through the state. In the western portion of New Mexico, this realignment was known as the "Laguna Cut-off." Construction of a modern interstate highway system in New Mexico began in 1956 with the passage of the Federal Aid Highway Act. By 1970, most of Route 66 in the state was superseded by Interstate 40.

Figure 19. Bridge No. 0002 with Railroad Tracks

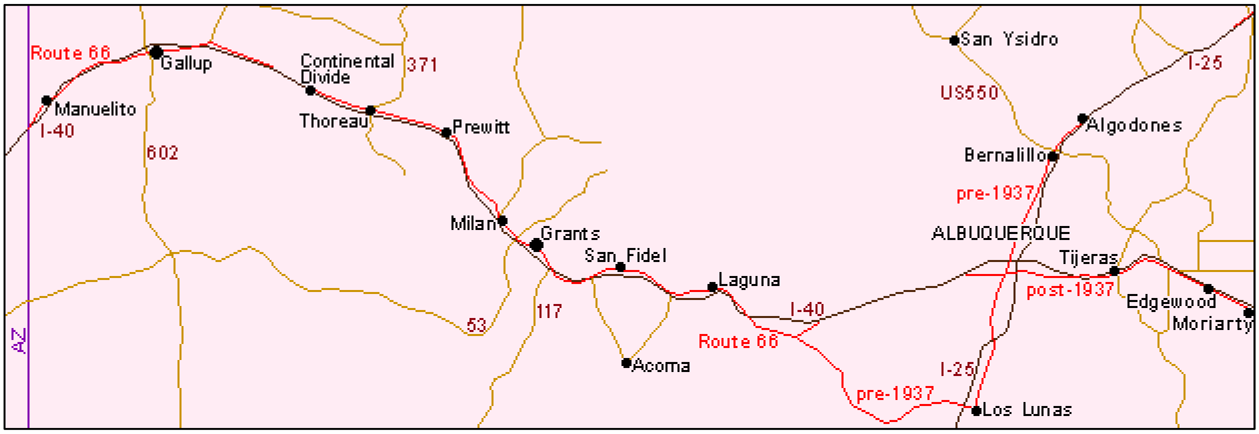

Figure 20. Pre- and Post-1937 Route 66 through Western New Mexico
(Courtesy of www.americansouthwest.net, accessed April 2014)

In 1994, portions of Old Route 66 that were still drivable were designated as a National Scenic Byway. Numerous segments and associated resources are also listed on the SRCP, including 10 state-maintained segments (SR Nos. 1577, 1581, 1674-1678, 1683, 1686, and 1914), 1 locally maintained segment (SR 1578), 1 abandoned segment (SR 1576), multiple property listings for the Historic and Architectural Resources of Route 66 through New Mexico (SR 1564) and Neon Signs along Route 66 (SR 1811), and 2 national historic districts—the Route 66 and National Old Trails Road Historic District at La Bajada (SR 1822) and the Route 66 Rural Historic District from Laguna to McCarty's (SR 1589).

The current project area includes the Correo to Laguna (SR 1686) segment. The Correo to Laguna segment was listed on the SRCP in 1997 (SR 1686) and includes portions of both 1926 and 1956 alignments of Route 66. As described by Kammer (1996), the eastern 8.1 miles of the segment is graveled and contains a crossing of the Santa Fe Railroad consisting of a wood laminated deck, concrete and timber piers, and wood and cable guardrails. The grade separation at the railroad crossing, constructed in 1933, marks the location where the 1937 realignment of Route 66 (the Laguna Cut-off) intersected with the original 1926 route (1996:2). Farther to the west, the road includes 2 bridges with creosote-treated timbers and 4 concrete box culverts. After crossing over I-40, the road follows NM 124 along its pre-1937 alignment as it approaches Laguna Pueblo. Reflecting its use throughout the history of Route 66, the period of significance defined for this segment is 1926 to 1956 under the category of transportation. In his discussion of the significance of the Correo to Laguna segment, Kammer (1996:2) notes that "the striking landscape of the area marked by polychromatic sandstone mesas and the Laguna tribal villages with their flat-roofed stone houses and nearby irrigated fields conveyed to many motorists a feeling that they had finally arrived in the Southwest."

Construction of the first railroad, the Atlantic and Pacific (A&P) Railroad, in the Rio Puerco valley in 1880 followed this same corridor. Segments of the railroad were abandoned as early as 1908 (Myrick 1990:17–24).

The A&P Railroad was established in 1866, but grading for the Western Division of the railroad at Isleta Pueblo did not occur until April 8, 1880. Train service was established in December 1880 between Albuquerque and Acoma Pueblo. An additional 200 miles of track was completed in 1881, crossing the New Mexico State line into Arizona. The railroad made a connection with the Southern Pacific Railroad at Mojave, California in 1883 (Robertson 1986:75). The A&P was sold to the Santa Fe Pacific Railroad on July 1, 1897 and in 1902, it was absorbed by its parent company, the Atchison, Topeka and Santa Fe (AT&SF) Railway (Myrick 1990:17).

The construction in 1908 of the Belen Cutoff from Texico to Belen included a 19-mile extension of the AT&SF from Belen to the Dalies and the Rio Puerco sidings where it joined the old A&P tracks. Construction also included an alternate track from the Sandia siding to the Dalies siding. This resulted in the 1908 abandonment of an 11.2-km (7-mi) section of the old A&P line east of the Rio Puerco Valley to the present AT&SF and NM 6 overpass west of Cerro de Los Lunas (Myrick 1990:24). By 1919, the abandoned railroad grade was used as an automobile road. The present NM 6 alignment incorporates portions of the former railroad grade (Marshall 2003:45, 48).

When Route 66 was first created in the 1920s, much of it followed along AT&SF alignments (Kammer 1992:17). In 1996, the AT&SF officially ceased operations and merged with BNSF.

5. Climate and Air Quality

The Project Area experiences a warm, semi-arid climate. Precipitation is highest during the summer monsoons in July and August. Table 8 shows climate statistics for the Laguna. Average annual maximum temperature is 69.2 degrees Fahrenheit (°F), and the average annual minimum temperatures is 37.7°F. Average annual precipitation is 9.89 inches.

Table 8. Climate Characteristics of Laguna

Climate Parameter	Laguna
Average Maximum Temperature	69.2°F
Average July Maximum Temperature	90.1°F
Average Minimum Temperature	37.7°F
Average December Minimum Temperature	19.4°F
Average Total Annual Precipitation	9.89 inches

Climate Parameter	Laguna
Months with More than 1 inch Precipitation	July, August, and September

Source: Western Climatic Data Center (2016)

Air quality is good near the proposed project area because surrounding lands have low-density development, and air emissions sources are dispersed. The open terrain allows for wind dispersal of pollutants. Both Cibola and Valencia counties are in attainment with the Clean Air Act (New Mexico Environment Department [NMED], 2016; U.S. Environmental Protection Agency [USEPA], 2016). When the vegetation cover is removed, soils are vulnerable to wind erosion and can result in dust storms.

6. Noise

Traffic volumes can vary with time of day and, along with trains, are the main noise sources within the project area. Highest volumes occur during the daytime hours, including periods when residents are traveling to and from work and school. Trains travel under the bridge at regular intervals during the day and night. There are no residences or other receptors located adjacent or within 0.2 miles of the Project Area.

7. Social Features

The project area is within northwestern Valencia County next to eastern Cibola County. Based on the 2010 Census, Valencia County's population was 76,569 and Cibola County's population was 27,213 (see Table 9). For the years 2015 to 2020, Valencia County has a strong growth rate of 1.34 percent, and Cibola County has a modest growth rate of 0.63 percent. The population's age is similar to the state average (36.7 years) with a median age of 37.7 years in Valencia County and 36.6 years in Cibola. The Hispanic/Latino population represents 58.3 percent of Valencia County's population, 36.5 percent of Cibola County's population, and 46.3 percent of New Mexico's population. Cibola County also has a large Native American population comprising 41.0 percent of the county's population (U.S. Census Bureau, 2016).

Two Census Tracts provide local socioeconomic data for areas near the project area. Census Tract 9713 occupies western Valencia County, and Census Tract 9461 occupies eastern Cibola County, including Laguna Pueblo. Tract 9713 has a population with a median age of 39.4 years and a sizeable Hispanic/Latino population (46.9 percent). Tract 9461 has a median age of 33.8 years and a large Native American population (95.5 percent), which shows the tract's Laguna Pueblo population. Homeowner occupancy rates are higher than the state rate of 68.5 percent. The homeowner occupancy rates is 83.5 percent in Tract 9713 and 82.4 percent in Tract 9461 (U.S. Census Bureau, 2016).

During 2016, unemployment rates near the Project Area have been higher than the state average. The July 2016 statewide unemployment rate was 7.1 percent. Cibola County's unemployment rate was 9.2 percent, and Valencia County's rate was 7.7 percent (New Mexico Department of Workforce Solutions, 2016).

Table 9. Demographic Characteristics of Areas Near C084 Project Area

Characteristics	New Mexico	Cibola County	Valencia County	Cibola County Census Tract 9461	Valencia County Census Tract 9713
Location Description	Statewide	West of Project Area	Project Area	West of Project Area	Project Area
	2010 Population:				
- Total Population	2,059,179	27,213	76,569	4,093	2,077
- Median Age – years	36.7	36.6	37.7	33.8	39.4
- Percent Under 18	25.2%	25.1%	26.4%	28.2%	24.9%
- Percent Over 64	13.2%	12.8%	12.7%	12.7%	13.0%
- Percent Population Growth 2010-2015	1.34%	0.74	1.48	--	--
- Percent Population Growth 2015-2020	1.26%	0.63	1.34	--	--
	2010 Race Status:				
- White	68.3%	41.8%	73.2%	1.7%	66.6%
- Black/African American	2.1%	1.0%	1.4%	0.1%	2.6%
- Native American	9.4%	41.0%	3.8%	95.5%	7.8%
- Asian	1.4%	0.5%	0.5%	0.5%	0.3%

Characteristics	New Mexico	Cibola County	Valencia County	Cibola County Census Tract 9461	Valencia County Census Tract 9713
- Hawaiian/Pacific Islander	0.1%	0.1%	0.1%	0.0%	0.0%
- Some other race	15.0%	12.4%	17.0%	0.7%	19.5%
- Two or more races	3.7%	3.1%	4.0%	1.5%	3.3%
2010 Hispanic/Latino	46.3%	36.5%	58.3%	4.9%	46.9%
	2010 Housing Units:				
- Owner-occupied Units	68.5%	74.2%	80.0%	82.4%	83.5%
- Renter-occupied Units	31.5%	25.8%	20.0%	17.6%	16.5%
	2010-2014 Income and Poverty:				
- Median Family Income	$54,801	$42,998	$50,263	$39,630	$46,944
- Family Poverty Rate	16.1%	26.2%	20.1%	29.4%	24.8%
- Per Capita Income	$23,948	$16,362	$19,646	$11,995	$17,970
- Per Capita Poverty Rate	20.9%	29.0%	24.8%	34.3%	30.41%

Sources: Bureau of Business and Economic Research (2012); U.S. Census Bureau (2016)

8. Section 4(f)

As part of the Section 4(f) requirements, FHWA evaluates projects for impacts on public parks, recreation areas, wildlife and waterfowl refuges, and historic sites. FHWA projects are required to avoid such properties unless there is no prudent and feasible alternative to using that property. If a 4(f) property is used, the project must take steps to minimize harm to that property. Route 66 is a potential 4(f) property. Project uses of Route 66 will receive further review during the cultural resources investigation and review process.

9. Visual Resources

The views near the project area consist of a rural flat landscape with hills and mesas in the background. The bridge is the highest point in the immediate area (see Figure 21). From the top of the bridge, extensive views of the Rio San Jose valley and surrounding hills are visible (see Figure 22). West of the bridge, the road passes through a flat landscape, with hills and mesas in the background (see Figure 233).

The bridge is visible from surrounding lands including from I-40 located two miles north of the bridge. The bridge appears as a noticeable rise in the surrounding flat landscape. The bridge has a wood deck and numerous wood trusses that are not found in modern highway bridges. The bridge has a deteriorated appearance.

Figure 21. View of C084 Bridge from NM 6

Figure 22. Looking east from top of C084 Bridge

Figure 23. Looking east along C084 from west end of project area

10. Land Use and Communities

Most lands near the project area are undeveloped. The Valencia County Comprehensive Land Use Plan shows a mixture of single family residential and rangeland in this part of the county (Valencia County, 2005). Most development in the county occurs in the Rio Grande valley near the cities of Los Lunas and Belen. Other parts of the county are experiencing little growth. Lands near the C084/NM 6 intersection are suited for commercial development, but such development depends on the local economy. Remaining lands along C084 will likely continue to be used as rangeland. Additional residential development may occur in lands south of C084.

11. Farmland

The soils within and adjacent to the study are classified as not prime farmland (NRCS, 2016). No lands within or adjacent to the Project Area are currently used for crop production.

12. Hazardous Materials

Since lands along most of the Project Area have had rangeland use, the number of hazardous materials sites may be limited. The highest potential for sites will be near the CO 84/NM 6 intersection where former service stations were located to serve travelers on Route 66. The NMDOT Environmental Geology Section will investigate hazardous materials sites in the Project Area.

13. Floodplains

No floodplains are located at the Project Area. The Federal Emergency Management Agency (FEMA) classifies the Project Area and surrounding lands as Zone X, Area of Minimal Flood Hazards (FEMA, 2016).

14. Wilderness Area

There are no federal lands along this section of CO 84, and wilderness areas are not found in this part of Valencia County. There are no wilderness areas within or adjoining the Project Area.

15. Wild and Scenic Rivers

No wild and scenic rivers occur within or near the Project Area.

B. Engineering Features

1. Traffic Operations and Safety

The existing traffic data was collected in the project area by Mike Henderson Consulting, LLC, on May 11th and 12th, 2016. The NMDOT Traffic Bureau also provided traffic volume annual average daily traffic (AADT) information as well as future traffic volume estimates. Due to significant differences in the data, it was decided to use the actual traffic counts collected in May of 2016. The date of the traffic counts on C084 reported by NMDOT is unknown. The traffic numbers for the projection year were calculated using the growth factor from the NMDOT data. The existing traffic data and the growth factor calculation used are shown below. The AADT was calculated using the growth factor 1.11 percent, which was calculated based on 2017 and 2037 AADTs obtained from NMDOT. Table 10 shows the AADT Volumes for the year 2017 and 2037 for NM 6 and C084.

Table 10. Growth Factor Calculation

	2017 AADT	2037 AADT	Growth Factor
NM 6	1287	1606	1.11%
C084	96	99	0.154%

A) ANALYSIS OF EXISTING AND FUTURE TRAFFIC CONDITIONS

Table 11 shows the existing 2016 and projected year 2037 AADT for NM 6 and the ADT for C084. The future ADT for C084 was calculated using the traffic growth factor and is based on the existing ADT's collected by Henderson.

Table 11. Projected Traffic Volume (Future Year 2037)

		Annual Growth Factor	2016 AADT	2016 ADT	2037 AADT	2037 ADT	% Heavy Vehicle
NM 6		1.11%	1273	-	1606	-	18.01%
C084	Eastbound	0.154%	-	214	-	221	12.87%
	Westbound	0.154%	-	253	-	261	12.87%

B) CRASH & SAFETY ANALYSIS

Crash data for 2012, 2013 and 2014 was obtained from the NMDOT Traffic Safety Bureau (See Table 12). There have been two crashes reported on NM 6 within the Project Area since 2012.

Table 12. Reported Crashes – 2012 to 2014

Crash	Date	Time	Location	Crash Severity	Highest Contributing Factor in Crash	Lighting	Visible Injury	Crash Analysis
No.1	6/22/2012	8:39 PM	600 feet north of the NM6/C084 intersection on NM 6	Property Damage Only Crash	Driver Inattention	Dark-Not Lighted	0	Non-Collision - All Other/Not Stated
No.2	4/21/2012	7:30 PM	At the intersection of NM 6/C084	Injury Crash	Alcohol/Drug Involved	Dusk	2	Overturn/Rollover - On The Road

The first crash was property damage only crash and likely due to driver inattention. According to the record, it was dark and not lighted when the crash happened. The second crash was an injury crash, which had two visible injuries. Alcohol was a contributing factor for one of the crashes.

C) INTERSECTION TURNING LANES

The need for deceleration lanes for left turning and right turning vehicles was analyzed using the requirement in the State Access Management Manual (SAMM) criteria. Based on the current and future turning vehicle peak hour traffic volumes, deceleration lanes are not warranted for left and right turning vehicles.

During a public meeting, the public reported accidents and dangerous conditions at the NM 6 intersection and requested consideration of a turn lane or relocation of the intersection out of the curve. Primarily, the concern was related to the westbound traffic on NM 6 and the left turn movement to C084. No supporting data was discovered for this issue now, but the need for turning lanes on NM 6 will be evaluated in the future.

Towards the west end of the project limits on C084 there are two intersections, Archway Blvd. and Highland Blvd. These two local streets provide access to the residents to the south of C084. Highland Blvd. is at the west termini of project and Archway Blvd. is approximately 660 feet east of Highland Blvd. The spacing of the two intersections meet the SAMM requirements for Rural Collector Highways, Chapter 4 Section J.

As part of this project, it is not anticipated that new intersections will be provided within the project limits.

Access to these intersections will have to be maintained during construction. The community south of C084 will need access at all times during construction of the project. C084 is currently the only facility that provides a reasonable access for the commuters and the emergency response providers.

2. Maintenance of Traffic

The maintenance of traffic during construction will be essential for the community south of C084. Bridge No. 0002 and the C084 road are currently the only way to exit the neighborhood and communities south of the project. Traffic could be maintained on the existing bridge structure during construction or an at-grade crossing could be constructed for a traffic detour.

Concern has been expressed by the local public members that the trains park in the area of the crossing for long periods of time and may block access. Should an at-grade crossing be implemented for construction, an agreement with BNSF will be pursued to ensure that the access not be blocked.

A BNSF representative, who attended the September 21, 2016 project meeting, stated that they typically request the closure of two (2) at-grade crossings for every one that is opened.

3. Access

Any driveway or other point of access such as a street, road, or highway that connects to the Cibola County Road C084 is considered an access. Currently the access points are west of the bridge structure. One access is used by BNSF to access their railway facilities. Another access is an entrance to the major Land & Cattle Co. Highland Meadows Estates. Highland Blvd. is also on the west side of the bridge and within the project area. Coordination with adjacent property owners and BNSF will be required to properly design desired access points.

4. Drainage Analysis

Drainage patterns within the project area generally flow from west to east toward the Rio San Jose. The Rio San Jose is an ephemeral stream which drains into the Rio Puerco. The existing land use in the area is predominately unimproved desert grassland with large depressions in the terrain on either side of the existing CO84 alignment. Existing drainage structures within the project area were identified through field visits, survey, and as-built data provided by the NMDOT.

Based on the field investigation, there is limited existing drainage infrastructure controlling off site and on-site drainage within the project area. Contours indicate storm water runoff will accumulate in several of the depressed areas within the project area. These would include the southwest and southeast corner of the Old Highway 66/CO84 intersection and additional areas in the surrounding terrain including the outfall of the BNSF existing culvert, and northeast of the CO84 Bridge.

Preliminary hydrologic and hydraulic analysis was completed using the NMDOT's "Drainage Manual – Volume 1, Hydrology, 1995", "Drainage Manual – Volume 2, Hydraulics, Sedimentation and Erosion, 1998" and "Drainage Design Criteria for NMDOT Projects, 2007".

The road is classified as a rural minor collector. According to NMDOT Drainage design criteria the design event for culverts and roadside ditches are the 25-year and 10-year storm events, respectively.

To ascertain potential drainage impacts to proposed roadway alternative alignments, offsite sub-basins were delineated using a combination of survey data, USGS maps, and aerial imagery. Based on the size of the sub-basins delineated, the Rational Method was used to estimate peak discharges in the project area. The "c" coefficient for the Rational Method calculations was estimated using Figure 3-12 from the NMDOT hydrology drainage manual. The land use component was determined from a combination of aerial imagery and field photos. In order to develop site specific Intensity Depth Frequency (IDF) curves for the hydrologic calculations, precipitation values for the project site were downloaded from the NOAA Atlas 14 website. Table 13 provides a summary of the existing sub-basin peak discharges for the 10-year and 25-year design storm events.

See Appendix H for maps of existing sub-basin delineations, watershed characteristics, and ponding areas within the existing terrain.

Table 13: Existing Conditions Peak Discharges

Basin ID	Area (acre)	Q_{10} (cfs)	Q_{25} (cfs)
001	4.96	4	5
005	0.70	1	1
010	4.07	4	5
020	1.35	2	2
030	5.83	5	7
040	8.14	7	10
050	6.77	6	8

Basin ID	Area (acre)	Q_{10} (cfs)	Q_{25} (cfs)
060	1.91	2	3
070	0.77	1	1
080	0.71	1	1
090	2.90	3	4
100	2.98	3	4
110	0.57	1	1
120	2.45	2	3
130	33.82	19	28

5. Geology and Soils

The existing roadway embankment shows signs of failure with significant settlement and disbursement of the supporting material. Currently, it is not known if the failure has occurred with in the approach embankment or the underlying material. The new bridge and roadway will require an increase in the approach embankment heights, which would likely trigger additional settlement in the existing material. The planned geotechnical investigation will test the existing subgrade and existing embankment material and provide further data to develop a plan to correct the failure. If the investigation indicates that the subgrade material consists of compressible clay, it may be recommended to remove compressible material and replace it with granular fill and/or chemically stabilize the clay or mechanically stabilize it with geogrid. Based on the limited available information, it is recommended that the existing embankment will need to be removed completely. The cost estimates have been developed assuming the embankment is not suitable for new construction.

6. Constructability

Due to the proximity of the project to the BNSF railway and the number of trains (50 to 80 per day) that cross the area, the construction activity will be altered from what may be typical for a similar project away from a railway. During construction, all workers and equipment will be required to be at a safe distance from the tracks when a train approaches and remain at a safe distance until the train passes. A BNSF flag man will be present on site at all times to monitor the activities and to ensure the interests of BNSF are maintained.

Coordination with BNSF during construction will be critical, especially during construction activities that are completed over the railway system. These operations include the demolition of the bridge, hanging of new bridge girders, and placing of the deck. These operations will require windows of no train traffic. Close coordination with BNSF during construction will establish allowable windows of construction. BNSF will not allow train traffic interruptions during the fourth quarter of the year.

Construction of a bridge over a BNSF railway is feasible, but their requirements need to be considered in the development of a project to meet all permit agreements. The construction requirements will increase the efforts required by a contractor and will most likely increase the cost of the project.

7. Right-of-Way Impacts

The property owners adjacent to the project area are private owners, Laguna Pueblo and the New Mexico State Highway Commission. See Appendix G for the project property ownership maps. The existing right-of-way widths vary along the project area.

In an agreement, dated December 1933, the Atchison, Topeka and Santa Fe Railway Company allowed the State of New Mexico to construct an overpass for the US Highway 66 over the right-of-way and tracks of the Railway Company. At the time of the agreement, the railway right-of-way width was 100ft on each side of the centerline (200ft. total) and the roadway width was 75ft on each side of the centerline (150ft. total).

New right-of-way will be redefined for each alternative.

8. Utility

Overhead power poles run parallel to C084 the length of the project limits. The power poles are offset from C084 at a varying distance ranging from 40 feet to 100 feet. The poles are located on the north side of C084 from NM 6 to the east side of the BNSF Railroad, where they turn northwest. The poles are located on the south side of C084 from the west side of the BNSF Railroad to the end of the project limits.

There are no known existing underground utilities at this time. Potential underground utilities pertaining to the BNSF Railroad may exist, but will need to be located using subgrade exploratory methods prior to final design.

9. Bridge

In an effort to preserve the appearance of the structure, as many of the features of the existing structure as possible will be incorporated into the new bridge. Some of the existing features that may be included into the proposed bridge are the metal bridge railing and concrete pier walls. The existing bridge has a three rail metal bridge barrier system. The Metal Railing Type A42 is similar to the existing railing with three railings and is proposed to be used for the new bridge.

The existing bridge has concrete pier walls adjacent to the railway and the new bridge structure is proposed to have pier wall adjacent to the railway also.

Per the NMDOT Bridge Procedures and Design Guide, the full width of the approach roadway should be maintained across the entire structure. Therefore, the bridge width will consist of two (2) 12 ft. driving lanes, two (2) 6 ft. shoulders and bridge railing.

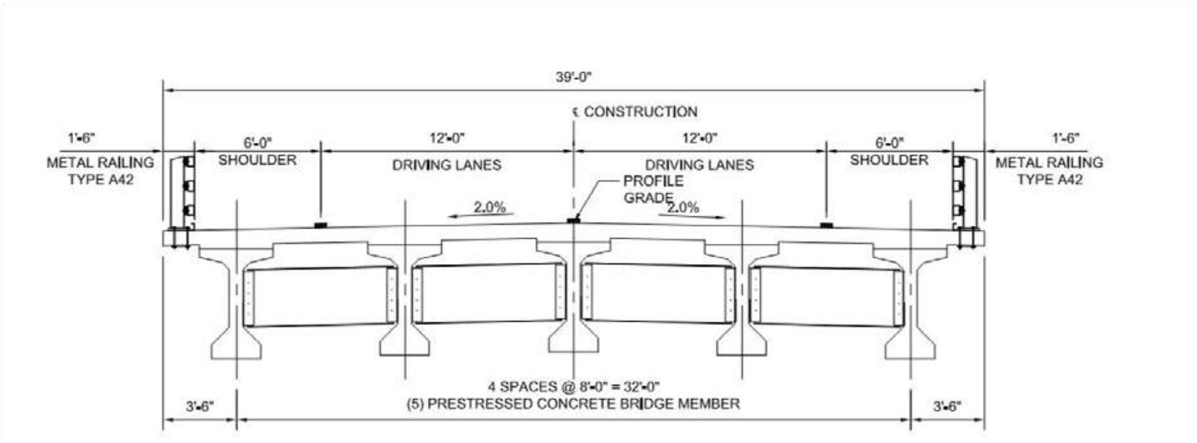

Figure 24. Proposed Bridge Typical Section

BNSF has requested that enough room under the bridge be provided for a future track. In accordance with the BNSF Grade Separation Guidelines, 20-ft. minimum will be provided between the existing and proposed railway tracks and 25-ft. minimum clearance between the centerline of the track and the pier wall will be provided in the new structure. See Appendix C for the roadway plan and profiles, which show the bridge layouts.

The BNSF guidelines also specify 23'-6" (BNSF) vertical clearance above the railway tracks. The vertical clearance will be increased from the existing to meet the required clearance value.

The use of MSE walls supporting roadways above track level is not acceptable within the railroad right-of-way or within 50 feet of the centerline of existing or future tracks.

VII. ALTERNATIVES

Nine alternatives have been developed and evaluated for C084. The nine alternatives are comprised of a No-Build Alternative, Rehabilitation Alternative, and seven Build Alternatives (Build Alternatives A through G). The seven Build Alternatives can be viewed in Appendix B. The following subsections discuss the C084 design criteria, Proposed Typical Section and the nine Alternatives.

A. No-Build Alternative

The No-Build Alternative leaves the roadway and bridge structure in their existing condition and configuration. No improvements would be made to the geometry or condition of the roadway and bridge. The deficiencies that exist today would remain.

B. Rehabilitation Alternative

The Rehabilitation Alternative would maintain the existing geometry and would improve or restore the physical strength or condition of the materials related to the roadway and bridge elements. It does not correct the geometric deficiencies of the roadway or the bridge. The horizontal and vertical alignment of the roadway would not be reconstructed to current standards. The bridge opening would not be increased to meet the current vertical clearance requirements and the width would not be adequate for the proposed future railway.

C. Build Alternatives Design Criteria

A combination of the New Mexico Department of transportation (NMDOT) guidelines, AASHTO's *A Policy on Geometric Design of Highways and Streets - 2011 edition (The Green Book),* and *AASHTO's Roadside Design Guide – 2011 edition* were used to establish the C084 Build Alternatives design criteria. Table 14 summarizes the proposed design criteria for the C084 Build Alternatives.

Table 14. Design Criteria

Design Criteria	
Functional Classification	Rural Collector
Terrain	Level
Design Speed	35 mph
Posted Speed	30 mph
Number of Lanes	2
Width of Lane	12 feet
Width of Shoulders	6 feet
Normal Crown Slope	2%
Maximum Superelevation Slope	6%

Design Criteria	
Vertical Alignment Maximum Grade	7.0%
Vertical Alignment Minimum Grade	0.3%
K-Value, Crest Curve	29
Stopping Sight Distance, Crest Curve	250 feet
K-Value, Sag Curve	49
Stopping Sight Distance, Sag Curve	250 feet

D. Build Alternatives Proposed Typical Section

The Proposed Roadway Typical Section is designed in compliance with AASHTO standards for Rural Collectors. All seven of the proposed Build Alternatives implement this typical section. The Proposed Roadway Typical Section can be viewed in Figure 25 and is defined as follows:

- 2-Lane undivided roadway, 47-foot typical pavement section
    - 5-inch asphalt - HMS SP III complete
    - 6-inch base course
    - 12-inch subgrade preparation
- 12-foot all purpose roadway lanes
- 6-foot paved shoulders
- 12-foot pavement taper at 6:1 slope
- Grading varies

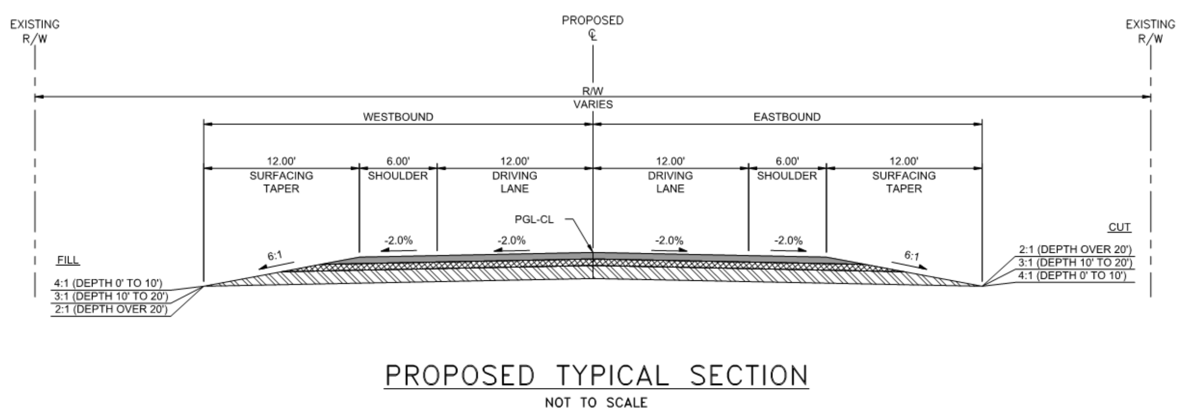

Figure 25: Proposed Typical Section

E. Build Alternatives Proposed Bridge Railing

In effort to maintain the appearance of the existing railing and keep a similar appearance as the existing railing, the proposed bridge railing will be a Metal Railing, Type A42. This will maintain the three railing bridge barrier concept. Please, see NMDOT standard drawings 543-07 for details.

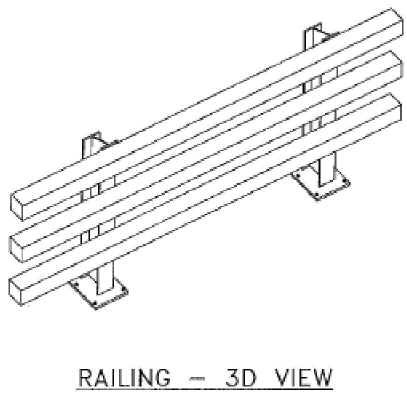

Figure 26: Proposed Bridge Railing

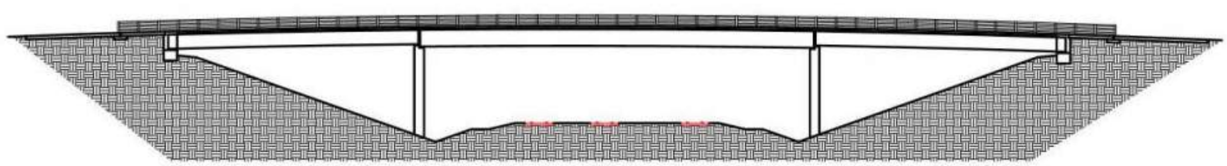

Figure 27: Bridge Elevation & Proposed Bridge Railing

F. Build Alternative A

1. Roadway Improvements

The original objective of Build Alternative A was to alleviate the construction cost associated with the embankment removal by leaving the existing embankment in place and reusing it for the proposed construction.

The proposed roadway layout for Build Alternative A follows the existing roadway horizontal alignment along the existing roadway centerline. The proposed BNSF railroad bridge crossing is located at the current existing location and crosses the railroad at a 45 degree skew. The proposed roadway intersections at Highland Boulevard/C084 and NM 6/C084 are located at the existing locations. This alternative will require a temporary at-grade railroad crossing and railroad signalization for vehicular traffic during construction of the proposed bridge, roadway and embankment.

After further analysis of the earthen embankment, it was determined that the existing embankment may not be suitable for future construction. It is assumed that the existing embankment will need to be completely removed and reconstructed due to undesirable subgrade conditions.

The horizontal and vertical alignments for Build Alternative A are designed using the design criteria outlined in Table 14, and can be viewed in Appendix C.

2. Bridge Improvements

The bridge structure for Alternative A would be a three-span structure with spill through abutments. The bridge structure is skewed at 45 degrees. The span lengths would be 78 ft., 124 ft., and 78 ft. The center span would provide adequate space for the existing two BNSF tacks and the future track and the required horizontal clearance to the pier walls. The specified horizontal clearance to the pier walls would provide appropriate space for an access road or standard “V” ditch as required by BNSF. The girder types for the proposed span configuration would be a prestressed concrete member type BT-54 (Span 1), type 63 (Span 2) and type BT-54 (Span 3). The proposed profile and superstructure depth would provide the minimum specified vertical clearance of 23’-6”.

3. Traffic Control

The traffic would be detoured to an at-grade crossing during the construction of alternative A. The construction activities would conflict with the flow of traffic in its existing location, so a detour would be required to maintain the flow of traffic during construction. The proposed detour would be constructed to the north of the existing alignment and would require the construction of flashers and gates for the railroad crossing. A permanent crossing may be constructed at a different location and used for the detour during construction. The crossing would be left in place after the project is completed and used as the second exit point for local residents. Agreements with BNSF would be needed for this approach to be acceptable.

G. Build Alternative B

1. Roadway Improvements

The original objective of Build Alternative B is to alleviate the need for an at-grade crossing, and railroad signalization for vehicular traffic during construction of the proposed bridge, roadway and embankment. This would be achieved by constructing the proposed bridge off-line while maintaining traffic on the existing bridge during construction. Once the bridge is constructed, traffic would then be diverted along the constructed bridge while demolition and final roadway construction is completed. Additionally, construction cost would be reduced by leaving the existing embankment in place and reusing part of it for the proposed bridge and roadway.

The proposed roadway layout for Build Alternative B is located slightly south of the existing roadway horizontal alignment. The proposed BNSF railroad crossing is offset approximately 42-feet south of the existing crossing and crosses the railroad at a 45 degree skew. The proposed roadway intersections to Highland Boulevard/C084 and NM 6/C084 are located at the current existing locations.

After further analysis of the earthen embankment, it was determined that the existing embankment may not be suitable for future construction. It is now assumed that the existing embankment will need to be completely removed and reconstructed due to undesirable subgrade conditions, which eliminates the cost savings originally identified with the embankment removal for this alternative.

The horizontal and vertical alignments for Build Alternative B are designed using the design criteria outlined in Table 14. Design Criteria, and can be viewed in Appendix CAppendix H. .

2. Bridge Improvements

The bridge structure for Alternative B would be a three-span structure with spill through abutments. The bridge structure is skewed at 45 degrees. The span lengths would be 78 ft., 124 ft., and 78 ft. The center span would provide adequate space for the existing two BNSF tracks and the future track and the required horizontal clearance to the pier walls. The specified horizontal clearance to the pier walls would provide appropriate space for an access road or standard “V” ditch as required by BNSF. The girder types for the proposed span configuration would be a prestressed concrete member type BT-54 (Span 1), type 63 (Span 2) and type BT-54 (Span 3). The proposed profile and superstructure depth would provide the minimum specified vertical clearance of 23’-6”.

3. Traffic Control

The traffic would be detoured to an at-grade crossing during the construction of alternative B. The construction activities would conflict with the flow of traffic in its existing location, so a detour would be required to maintain the flow of traffic during construction. The proposed detour would be constructed to the north of the existing alignment and would require the construction of flashers and gates for the railroad crossing. A permanent crossing may be constructed at a different location and used for the detour during construction. The crossing would be left in place after the project is completed and used as the second exit point for local residents. Agreements with BNSF would be needed for this approach to be acceptable.

H. Build Alternative C

1. Roadway Improvements

Build Alternative C is similar to Alternative B, but is located on the north side of the existing alignment in lieu of the south.

The horizontal and vertical alignments for Build Alternative C are designed using the design criteria outlined in Table 14 and can be viewed in Appendix C.

2. Bridge Improvements

Build Alternative C is similar to Alternative B, but is located on the north side of the existing alignment in lieu of the south.

3. Traffic Control

The traffic would be detoured to an at-grade crossing during the construction of Alternative C. The construction activities would conflict with the flow of traffic in its existing location, so a detour will be required to maintain the flow of traffic during construction. The proposed detour would be constructed to the south of the existing alignment and would require the construction of flashers and gates for the railroad crossing. A permanent crossing may be constructed at a different location and used for the detour during construction. The crossing would be left in place after the project is completed and used as the second exit point for local residents. Agreements with BNSF would be needed for this approach to be acceptable.

I. Build Alternative D

1. Roadway Improvements

The objective of Build Alternative D is to reduce the construction cost of the proposed bridge by shortening its length. Shortening the length of the bridge is achieved by increasing the interior angle of the crossing to 90 degrees (perpendicular to railroad) in lieu of the existing 45 degree skew. This alternative would require a temporary at-grade railroad crossing, and railroad signalization for vehicular traffic during construction of the proposed bridge, roadway and embankment.

The proposed roadway layout for Build Alternative D spans both north and south of the existing roadway horizontal alignment. The proposed BNSF railroad bridge crossing is located at the current existing location and crosses the railroad at a 90 degree skew (perpendicular to railroad). The proposed roadway intersection at Highland Boulevard/C084 is located at the current existing intersection. The proposed roadway intersection at NM 6/C084 is located approximately 160-feet north of the existing intersection. Offsetting the intersection from the existing location is not preferred due to the opposing leg not being aligned.

It should be noted that although the length and associated cost of the bridge is reduced, the length and cost of the roadway would be increased in order to develop the revised angle at the railroad crossing. Large horizontal reverse curves would be required to achieve the 90 degree angle at the crossing, which increase the roadway construction cost as well as the amount of additional right of way (ROW) required.

The horizontal and vertical alignments for Build Alternative D are designed using the design criteria outlined in Table 14 and can be viewed in Appendix C.

2. Bridge Improvements

The bridge structure for Alternative D will be a 3 span structure with spill through abutments. The bridge structure is normal to the railway. The span lengths will be 62 ft., 88 ft., and 62 ft. The center span provides adequate space for the existing two BNSF tracks, the future track and the required horizontal clearance to the pier walls. The specified horizontal clearance to the pier walls provides appropriate space for an access road or standard “V” ditch as required by BNSF. The girder types for the proposed span configuration will be a prestressed concrete member type 45. The proposed profile and superstructure depth provides the minimum specified vertical clearance of 23’-6”.

3. Traffic Control

The traffic will be detoured to an at-grade crossing during the construction of alternative D. The construction activities would conflict with the flow of traffic in its existing location, so a detour will be required to maintain the flow of traffic during construction. The proposed detour would be constructed to the north of the existing alignment and north of the proposed improvements. The detour would require the construction of flashers and gates for the railroad crossing. A permanent crossing may be constructed at a different location and used for the detour during construction. The crossing would be left in place after the project is completed and used as the second exit point for local residents. Agreements with BNSF would be needed for this approach to be acceptable.

J. Build Alternative E

1. Roadway Improvements

Build Alternative E is similar to Build Alternative D, but the intent is to reduce the amount of roadway and ROW required for Build Alternative D. As discussed in Build Alternative D, the length of the proposed bridge would be reduced by increasing the interior angle of the crossing; however, increasing the interior angle at the crossing would also increase the length of roadway and area of ROW required. This alternative seeks to balance shortening the bridge length and the amount of roadway /ROW required by increasing the interior angle of the crossing to 20 degrees in lieu of the existing 45 degree skew (Build Alternative D rotates the crossing to perpendicular). This alternative would require a temporary at-grade railroad crossing, and railroad signalization for vehicular traffic during construction of the proposed bridge, roadway and embankment.

The proposed roadway layout for Build Alternative E would span both north and south of the existing roadway horizontal alignment. The proposed BNSF railroad bridge crossing is located at the current existing location and crosses the railroad at a 20 degree skew. The proposed roadway intersections to Highland Boulevard/C084 and NM 6/C084 are located at the existing locations.

It should be noted that although the length and associated cost of the bride is reduced, the length and cost of the roadway would be increased in order to develop the revised angle at the railroad crossing. Horizontal reverse curves are required to achieve the 20 degree angle at the crossing, which increase the roadway construction cost as well as the amount of additional ROW required.

The horizontal and vertical alignments for Build Alternative E designed using the design criteria outlined in Table 14 and can be viewed in Appendix C.

2. Bridge Improvements

The bridge structure for Alternative E would be a three-span structure with spill through abutments. The bridge structure is skewed at 20 degrees. The span lengths would be 66 ft., 95 ft., and 66 ft. The center span would provide adequate space for the existing two BNSF tracks, the future track and the required horizontal clearance to the pier walls. The specified horizontal clearance to the pier walls would provide appropriate space for an access road or standard “V” ditch as required by BNSF. The girder types for the proposed span configuration would be a prestressed concrete member type 54. The proposed profile and superstructure depth would provide the minimum specified vertical clearance of 23’-6”.

3. Traffic Control

The traffic would be detoured to an at-grade crossing during the construction of alternative E. The construction activities would conflict with the flow of traffic in its existing location, so a detour would be required to maintain the flow of traffic during construction. The proposed detour would be constructed to the north of the existing alignment and would require the construction of flashers and gates for the railroad crossing. A permanent crossing may be constructed at a different location and used for the detour during construction. The crossing would be left in place after the project is completed and used as the second exit point for local residents. Agreements with BNSF would be needed for this approach to be acceptable.

K. Build Alternative F

1. Roadway Improvements

The objective of Build Alternative F is to alleviate the construction cost associated the need for an at-grade crossing, and railroad signalization for vehicular traffic during construction. This was achieved by offsetting the proposed bridge, roadway and embankment far enough north to avoid all conflicts with the existing embankment. This also allows for the existing bridge to remain in use throughout the construction process.

The proposed roadway layout for Build Alternative F is located north of the existing roadway horizontal alignment. The proposed BNSF railroad crossing is offset approximately 186-feet north of the existing crossing and crosses the railroad at a 45 degree skew. The proposed roadway intersections to Highland Boulevard/C084 and NM 6/C084 are located at the current existing locations. Additional ROW will be required due to the large offset proposed in this alternative.

The horizontal and vertical alignments for Build Alternative F designed using the design criteria outlined in Table 14 and can be viewed in Appendix C.

2. Bridge Improvements

The bridge structure for Alternative F would be a three-span structure with spill through abutments. The bridge structure is skewed at 45 degrees. The span lengths would be 78 ft., 124 ft., and 78 ft. The center span provides adequate space for the existing two BNSF tracks and the future track and the required horizontal clearance to the pier walls. The specified horizontal clearance to the pier walls would provide appropriate space for an access road or standard “V” ditch as required by BNSF. The girder types for the proposed span configuration would be a prestressed concrete member type BT-54 (Span 1), type 63 (Span 2) and type BT-54 (Span 3). The proposed profile and superstructure depth would provide the minimum specified vertical clearance of 23’-6”.

3. Traffic Control

The traffic would remain on the existing lanes during the construction of alternative F. The construction activities would not conflict with the flow of traffic in its existing location, so a detour would not be required.

L. Build Alternative G

1. Roadway Improvements

The objective of Build Alternative G is to remove the construction cost of the proposed bridge, proposed embankment, and existing embankment removal. This is achieved by implementing an offset at-grade crossing.

The proposed roadway layout for Build Alternative G is located slightly north of the existing roadway horizontal alignment. The proposed BNSF railroad crossing is offset approximately 100-feet north of the existing crossing and crosses the railroad at a 45 degree skew. The proposed roadway intersections to Highland Boulevard/C084 and NM 6/C084 are located at the current existing locations.

Although Build Alternative G appears to be the most cost effective alternative, it is also considered the most dangerous and least efficient due to railroad traffic. An agreement with BNSF would have to be reached preventing the parking of trains at the crossing, which would prevent access to the community. BNSF has reported that they typically require the closure of two crossings for one opening. NMDOT indicated that they do not have two crossing available for closure.

The horizontal and vertical alignments for Build Alternative G designed using the design criteria outlined in Table 14 and can be viewed in Appendix C.

2. Bridge Improvements

A bridge structure is not needed for Alternative G.

3. Traffic Control

The traffic would remain on the existing lanes during the construction of Alternative G. The construction activities would not conflict with the flow of traffic in its existing location, so a detour would not be required.

VIII. EVALUATION OF ALTERNATIVES

Each alternative has been developed and evaluated against engineering and environmental criteria. The evaluation process will assign a factor value to the different criteria for each alternative. The factors are as follows:

++ = very positive effects
+ = positive effects
0 = negligible or no effects
- = negative effects
-- = very negative effects

The following discussion details the scoring of those factors for each alternative and determines the preferred alternative for advancement into Phase C of the study.

A. Purpose and Need and Analysis

1. No-Build Alternative

The No-Build Alternative does not meet the Purpose and Need of the project. The geometric deficiencies and aging infrastructure would not be corrected with this alternative. Due to not meeting the Purpose and Need of the project it is valued as very negative effects.

2. Rehabilitation Alternative

The Rehabilitation Alternative does not meet the Purpose and Need of the project. The life of the aging infrastructure may be extended, but the geometric deficiencies would not be corrected with this alternative. Due to not meeting the Purpose and Need of the project it is valued as very negative effects.

3. **Build Alternatives**

The build alternatives do meet the Purpose and Need of the project. The geometric deficiencies and aging infrastructure will be corrected and will be valued as very positive effects.

Alternative G does not fully meet the Purpose and Need of the project by its inability to efficiently convey traffic across the tracks as a train passes the crossing or when a train is parked at the crossing. An at-grade crossing inherently introduces safety concerns due to the possibility of an accident with the rail and roadway crossing. Alternative G will be valued as Negative Effect.

B. Cost and Analysis

There is a constant request and need for funding to improve infrastructure and construct new projects. With so many needs and requests for funding, each available dollar is greatly valued and requested. The evaluation of alternatives under this factor will consider the cost to produce the alternative. The more the alternative will cost, the greater the negative effect. The costs have been developed by considering the major items for the project. Some of the items are estimated using a lump sum approach. The estimated quantities and construction cost development are shown in Appendix K. Each alternative also has maintenance costs that are typically borne by the District and should be considered in the evaluation. Maintenance costs for new structures are expected to be less than the costs for maintaining old and aging infrastructure. The Maintenance Costs will not be quantified below, but will be factored into the evaluation. The railway flagging and inspection costs are estimated to be $1,800/day. The right-of-way costs are estimated to be $14,000/acre. These costs are estimates and are developed for planning purposes and should not be valued as actual costs.

The estimated cost for the No-Build Alternative is:

Estimated Construction & Detour Cost:	$0.00
Estimated Railway Flagging & Inspection Cost:	$0.00
Estimated Right-of-Way Cost:	$0.00
Total Estimated Cost:	$0.00

The cost for the No-Build alternative is valued as negative effect due to expected cost for maintenance on an old and aging infrastructure.

The estimated cost for the Rehabilitation Alternative is:

Estimated Construction & Detour Cost:	$1,500,000
Estimated Railway Flagging & Inspection Cost:	$215,000
Estimated Right-of-Way Cost:	$0.00
Total Estimated Cost:	$1,715,000

The cost for the Rehabilitation alternative is valued as negative effect due to expected cost for maintenance on an old and aging infrastructure.

The estimated cost for the Build Alternative A is:

Estimated Construction & Detour Cost:	$7,495,000
Estimated Railway Flagging & Inspection Cost:	$490,000
Estimated Right-of-Way Cost:	$35,000
Total Estimated Cost:	$8,020,000

The estimated cost for the Build Alternative B is:

Estimated Construction & Detour Cost:	$7,747,000
Estimated Railway Flagging & Inspection Cost:	$490,000
Estimated Right-of-Way Cost:	$50,000
Total Estimated Cost:	$8,287,000

The estimated cost for the Build Alternative C is:

Estimated Construction & Detour Cost:	$7,824,000
Estimated Railway Flagging & Inspection Cost:	$490,000
Estimated Right-of-Way Cost:	$50,000
Total Estimated Cost:	$8,364,000

The estimated cost for the Build Alternative D is:

Estimated Construction & Detour Cost:	$7,898,000
Estimated Railway Flagging & Inspection Cost:	$490,000
Estimated Right-of-Way Cost:	$315,000
Total Estimated Cost:	$8,703,000

The estimated cost for the Build Alternative E is:

Estimated Construction & Detour Cost:	$7,007,000
Estimated Railway Flagging & Inspection Cost:	$490,000
Estimated Right-of-Way Cost:	$186,000
Total Estimated Cost:	$7,683,000

The estimated cost for the Build Alternative F is:

Estimated Construction & Detour Cost:	$6,378,000
Estimated Railway Flagging & Inspection Cost:	$490,000
Estimated Right-of-Way Cost:	$126,000
Total Estimated Cost:	$6,994,000

The estimated cost for the Build Alternative G is:

Estimated Construction & Detour Cost:	$2,233,000
Estimated Railway Flagging & Inspection Cost:	$270,000
Estimated Right-of-Way Cost:	$57,000
Total Estimated Cost:	$2,560,000

Table 15 summarizes the estimated costs and the respective assigned satisfaction score.

Table 15. Summary of Estimated Costs and Factor

Alternative	Cost
No-Build	$0.00 + Maintenance Costs
Rehabilitation	$1,715,000 + Maintenance Costs
Build - Alignment A	$8,020,000
Build - Alignment B	$8,287,000
Build - Alignment C	$8,364,000
Build - Alignment D	$8,703,000
Build - Alignment E	$7,683,000
Build - Alignment F	$6,994,000
Build - Alignment G	$2,560,000

C. Engineering Factors and Analysis

1. Traffic Operations and Safety

The evaluation of alternatives under this factor will consider the operation of traffic and pedestrians within the proposed design. The operational performance of a highway segment is described by level of service (LOS). It will consider how well the traffic flows within the travel lanes and turning lanes and the safety of that operation. The pedestrian accessibility and safety will also be included in the evaluation for the alternatives. See the Transportation Needs Analysis Report in Appendix J for analysis.

The No-Build and Rehabilitation alternatives are given a factor score of Very Negative Effect due to the safety concern of the bridge’s condition. Alignments D and E introduce several horizontal curves into the corridor, which will raise concern for accidents especially during snow and icy weather and will be scored as Negative Effect. Alignments A, B, C and F are scored at Very Positive Effects because of their high safety levels. Alignment G is scored at Very Negative Effects due to safety concerns of the at grade railway crossing.

Table 16. Safety Score Summary

Alternative	Factor
No-Build	- -
Rehabilitation	- -
Build - Alignment A	+ +
Build - Alignment B	+ +
Build - Alignment C	+ +
Build - Alignment D	-
Build - Alignment E	-
Build - Alignment F	+ +
Build - Alignment G	- -

2. Maintenance of Traffic

Work zone traffic control is an important function necessary in providing a safe environment in those areas where workers and transportation modes may compete for common or adjacent space. Every reasonable effort will be made to reduce the risk of injury to both the worker and transportation user along the corridor. The sequencing of the construction and the work area has a great influence toward the safety of the workers and corridor users. This factor will consider the alternatives abilities to maintain traffic and access during construction.

The No-Build Alternative will have no impact to traffic and there will be no need for any Maintenance of Traffic considerations, so subsequently the factor has been valued negligible or no effect. However, the no-build alternative will still have a deferred, negative effect on maintenance of traffic in the future, since future maintenance projects will be needed and will obstruct traffic when they take place.

The Rehabilitation Alternative will impact traffic with a single lane closure during construction and will put vehicular traffic adjacent to the construction activities, so subsequently the factor has been valued very negative effect.

All of the Build Alternatives except F and G will require a detour and maintenance of traffic setup. The separation of the traffic from the construction will be greater for some of the alignments than others. The alternative with the greater impacts and less separation has been valued with more negative effects.

Table 17. Maintenance of Traffic Score Summary

Alternative	Factor
No-Build	0
Rehabilitation	- -
Build - Alignment A	-
Build - Alignment B	-
Build - Alignment C	-
Build - Alignment D	-
Build - Alignment E	-
Build - Alignment F	0
Build - Alignment G	0

3. Access Management

Alternatives that combine or eliminate direct access points provide better driveway design and locations have been scored higher than those that do not.

The access points will be maintained for all Alternatives. There will be no changes to the access points and there will not be a substantial change to the driveway design or location in all alternatives. The factor for those alternatives has been valued as Negligible or No Effects.

Table 18. Access Management Score Summary

Alternative	Factor
No-Build	0
Rehabilitation	0
Build - Alignment A	0

Alternative	Factor
Build - Alignment B	0
Build - Alignment C	0
Build - Alignment D	0
Build - Alignment E	0
Build - Alignment F	0
Build - Alignment G	0

4. Drainage Impacts

The evaluation of alternatives under this factor will consider the impacts to existing drainage patterns and the mitigation required to maintain storm water discharge values leaving the project limits at or below identified existing flow rates. Additionally controlling on site discharge along the proposed alignment is crucial in maintaining a safe passage for motorist. Therefore each alignment is evaluated for on site drainage elements to control discharge within the right-of-way.

A) NO-BUILD ALTERNATIVE

The No-Build alternative would not change or improve any current physical characteristics of the bridge or roadway. On- and off-site drainage patterns would remain the same as existing conditions; therefore no mitigation would be required. However, it should be noted the pipes identified as sediment or debris laden during the field visit would still remain at reduced capacity, particularly at the NM 6/ CO84 intersection. Ponding at locations previously identified can be expected to continue. The factor for this alternative is valued at Negligible or No Effect.

B) REHABILITATION ALTERNATIVE

The rehabilitation alternative would maintain the existing roadway geometry; however, the bridge would be improved. On- and off-site drainage patterns would remain the same as existing conditions therefore no additional drainage elements would be warranted in this alternative. The factor for this alternative is valued at Negligible or No Effect.

C) BUILD ALTERNATIVE A

Alternative A would be a similar alignment to the existing alignment; however, the bridge would be replaced and widened to meet current design criteria and allow for future BNSF railroad improvements. Offsite drainage patterns would remain the same as existing conditions. An incremental increase in on site discharge can be expected due to widening of the bridge and existing roadway in order to accommodate the new bridge approach sections. Newly developed rundowns at the end of the bridge deck can be expected. The factor for this alternative is valued as Very Positive Effect.

D) BUILD ALTERNATIVE B

The alternative B alignment is shifted slightly south compared to the existing alignment. The new bridge would be wider, meet current design criteria and allow for future BNSF railroad improvements. Offsite drainage patterns will be minimally impacted with additional discharge conveyed northward along existing contours patterns. The northeastern abutment will require a small conveyance ditch to maintain existing drainage patterns. In the event that the Alternative B fill slopes significantly reduce existing pond volumes, as identified within this study, additional grading may be required for compensatory volume. On-site drainage will be incrementally increased due to bridge widening. Rundowns at the bridge approach sections will be required to control roadway runoff. Additional drainage elements in the form of ditches and swales may be required to control and convey roadway runoff. The factor for this alternative is valued as Very Positive Effect.

E) BUILD ALTERNATIVE C

The alternative C alignment is shifted slightly north compared to the existing alignment. The new bridge would be wider, meet current design criteria and allow for future BNSF railroad improvements. Offsite drainage patterns will be minimally impacted with additional discharge conveyed eastward along existing contours patterns. The northeastern abutment will require a small conveyance ditch to maintain existing drainage patterns. In the event that the Alternative C fill slopes significantly reduce existing pond volumes, as identified within this study, additional grading may be required for compensatory volume. On-site drainage will be incrementally increased due to bridge widening. Rundowns at the bridge approach sections will be required to control roadway runoff. Additional drainage elements in the form of ditches and swales may be required to control and convey roadway runoff. The factor for this alternative is valued as Very Positive Effect.

F) BUILD ALTERNATIVE D

The proposed configuration will impede existing offsite flow patterns both east and west of the BNSF rail alignment. However, based on a preliminary assessment of the calculated peak discharges the impeded flows could be controlled and conveyed with relatively small (1- to 2-ft deep) roadside ditches at the edge of the proposed fill slopes. Collected discharge would be conveyed around the proposed abutments and discharged to their pre-existing outfall locations.

Additionally, the relocation of the intersection of CO84/NM 6 would require a cross culvert to be constructed along the northwestern corner of the intersection to allow concentrated storm water to maintain existing flow patterns. It should be noted that pre-existing ponding occurring at the existing intersection will remain. However, due the configuration of the proposed alignment the ponding at the existing northwest corner of the intersection will most likely be reduced due to a reduction in overall size of watershed contributing to the area.

On-site discharge patterns will be altered due to the roadway section requiring super elevated typical sections in order to align the roadway perpendicular to the existing BNSF railroad track. However, the overall increase in discharge will be incremental due to the minimal change in overall width of the roadway section. Based on preliminary estimates the ponds could be accommodated within the proposed right-of-way expansions.

Approach sections of the newly aligned bridge with require embankment spillways to control concentrated discharge. Additionally in the event that embankment fill material proves to be highly erodible then embankment curbs may be required along guardrail. The curbs would be drained by proposed spillways in order to control spread and depth of concentrated storm water along the roadway edge. The factor for this alternative is valued as Very Positive Effect.

G) BUILD ALTERNATIVE E

The proposed configuration will impede existing offsite flow patterns both east and west of the BNSF rail alignment. However, similarly to Alternative D, developing peak discharges could be controlled and conveyed with relatively small (1- to 2-ft deep) roadside ditches at the edge of the proposed fill slopes. Collected discharge would be conveyed around the proposed abutments and discharged to their pre-existing outfall locations.

Alternative E utilizes the existing intersection of NM 6/CO84. However it should be noted fill slope may reduce a portion of the ponding capacity at the northwest corner of the intersection. Additional grading may be required to maintain existing capacities.

On-site discharge patterns will be altered in a similar manner as Alternative D due to the proposed roadway geometry. However, the overall increase in discharge will be incremental due to the minimal change in overall width of the roadway section. Based on preliminary estimates the ponds could be accommodated within the proposed right-of-way expansions.

Approach sections of the newly aligned bridge with require embankment spillways to control concentrated discharge. Additionally in the event that embankment fill material proves to be highly erodible then embankment curbs may be required along guardrail. The curbs would be drained by proposed spillways in order to control spread and depth of concentrated storm water along the roadway edge. The factor for this alternative is valued as Very Positive Effect.

H) BUILD ALTERNATIVE F

The proposed configuration will impede existing offsite flow patterns both east and west of the BNSF rail alignment. However, based on a preliminary assessment of the calculated peak discharges, the impeded flows could be controlled and conveyed with relatively small (1- to 2-ft deep) roadside ditches at the edge of the proposed fill slopes. Collected discharge would be conveyed around the proposed abutments and discharged to their pre-existing outfall locations.

Due to the adjusted alignment of the CO84/ NM6 intersection, additional capacity of the ponding area will be reduced. Additional grading may be required for compensatory volume.

An extension of the Archway Boulevard connection at CO84 will require a small (24-in) cross culvert to convey developing discharges related to both on- and off- site drainage.

There is an overall increase in on-site discharge due to a widening of the typical roadway section. Based on preliminary estimates the ponds could be accommodated within the proposed right-of-way expansions.

Approach sections of the newly aligned bridge with require embankment spillways to control concentrated discharge. Additionally in the event that embankment fill material proves to be highly erodible then embankment curbs may be required along guardrail. The curbs would be drained by proposed spillways in order to control spread and depth of concentrated storm water along the roadway edge. The factor for this alternative is valued as Very Positive Effect.

I) BUILD ALTERNATIVE G

The proposed configuration will impede existing offsite flow patterns both east and west of the BNSF rail alignment. However, based on a preliminary assessment of the calculated peak discharges, the impeded flows could be controlled and conveyed with relatively small (1- to 2-ft deep) roadside ditches at the edge of the proposed fill slopes. Collected discharge would be conveyed around the proposed abutments and discharged to their pre-existing outfall locations.

Due to the adjusted alignment of the CO84/ NM6 intersection, additional capacity of the ponding area will be reduced. Additional grading may be required for compensatory volume.

An extension of the Archway Boulevard connection at CO84 will require a small (24-in) cross culvert to convey developing discharges related to both on- and off- site drainage.

There is an overall increase in onsite discharge due to a widening of the typical roadway section. Based on preliminary estimates the ponds could be accommodated within the proposed ROW expansions.

Approach sections of the newly aligned bridge with require embankment spillways to control concentrated discharge. Additionally in the event that embankment fill material proves to be highly erodible then embankment curbs may be required along guardrail. The curbs would be drained by proposed spillways in order to control spread and depth of concentrated storm water along the roadway edge. The factor for this alternative is valued as Very Positive Effect.

All of the build alternatives have been scored as Very Positive Effect because they all incorporate ditches and rundowns and other drainage-related infrastructure per NMDOT standards, whereas the no-build and rehab alternatives remain substandard for drainage due to lack of such improvements. The Drainage Factors are summarized in Table 19.

Table 19. Drainage Score Summary

Alternative	Factor
No-Build	0
Rehabilitation	0
Build - Alignment A	+ +
Build - Alignment B	+ +
Build - Alignment C	+ +
Build - Alignment D	+ +
Build - Alignment E	+ +
Build - Alignment F	+ +
Build - Alignment G	+ +

5. Geology and Soils

Geologic and soil impacts would depend on the amount of ground disturbance and excavation. The new bridge requires an increase in the approach embankment heights, which would likely trigger additional settlement in the existing material. Based on the limited available information it is recommended that the existing embankment not be incorporated into the proposed roadway section. It is recommended that the planned geotechnical investigation adequately tests the existing subgrade and existing embankment material. If the investigation indicates that the subgrade material consists of compressible clay, it may be recommended to remove compressible material and replace it with granular fill and/or chemically stabilize the clay or mechanically stabilize it with geogrid. In all cases for the Build Alternatives, the existing roadway embankment will be removed. The impacts to the geology and soils are the same for all the alternatives with a bridge structure and will be valued as Negative Effect. Alternaitve G, will not require as much approach embankment as the other build alternatives, so it will be valued as Negligible or No Effect.

Table 20. Geology and Soil Score Summary

Alternative	Factor
No-Build	0
Rehabilitation	0
Build - Alignment A	-
Build - Alignment B	-
Build - Alignment C	-
Build - Alignment D	-
Build - Alignment E	-
Build - Alignment F	-
Build - Alignment G	0

6. Constructability

The evaluation of constructability considers the Alternatives' feasibility to be built. This factor will consider how construction will impact residential and business access, utilities, and ROW. It will also consider whether the alternative can be constructed using methods, materials, and equipment common to the construction industry and area. Higher scores have been given to alternatives that minimize impacts and are more easily constructed.

There will be no construction with the No-Build Alternatives, so the Factor has been value as Negligible or No Effect. The No-Build Alternative will also have deferred constructability impacts due to future maintenance needs.

The Rehabilitation Alternative will be difficult due to the adjacent traffic and the requirement of maintaining traffic flow during construction, Negative Effect.

The Build Alternatives A, B, C, D and E will need to construct a detour (at-grade crossing) prior to proposed plan improvements and will require the removal of the existing roadway embankment and construction of new embankment, so the Factor is Negative Effect.

Build Alternatives F and G may be constructed using typical construction methods with no unordinary requirements. The existing roadway embankment will be removed, so the Factors is Negligible or No Effect.

Table 21. Constructability Score Summary

Alternative	Factor
No-Build	0
Rehabilitation	-
Build - Alignment A	-
Build - Alignment B	-
Build - Alignment C	-
Build - Alignment D	-
Build - Alignment E	-
Build - Alignment F	0
Build - Alignment G	0

7. Right-of-Way Impacts

The need for additional ROW for the considered alternatives is a factor to be considered with each alternative. The location of the needed property and the impacts that the acquisition brings to the project is a factor to consider when evaluating alternatives. The adjacent properties are all similar and nature and are valued the same. No property will be valued greater, so the score has been based on solely on the quantity of needed property. The alternatives with lower impacts will receive higher scores.

Table 22. Right-of-Way Score Summary

Alternative	Needed ROW
No-Build	0.0 Acres
Rehabilitation	0.0 Acres

Alternative	Needed ROW
Build - Alignment A	2.5 Acres
Build - Alignment B	3.6 Acres
Build - Alignment C	3.6 Acres
Build - Alignment D	22.5 Acres
Build - Alignment E	13.3 Acres
Build - Alignment F	9.0 Acres
Build - Alignment G	4.1 Acres

8. Utility Conflicts

Conflicts with the existing overhead utilities are a factor considered for each alternative. The score is based on whether or not the existing utilities will need to be relocated. Alternatives D and E will have the greatest effect on the utilities.

Table 23. Utility Conflicts Score Summary

Alternative	Factor
No-Build	0
Rehabilitation	0
Build - Alignment A	-
Build - Alignment B	-
Build - Alignment C	-
Build - Alignment D	- -
Build - Alignment E	- -
Build - Alignment F	-
Build - Alignment G	-

9. Bridge Design

A summary of the Bridge Type Selection evaluation criteria is provided below (see the Bridge Type Selection Report for full discussion, Appendix L).

A) EXISTING SITE CONDITIONS/GEOMETRIC CONSTRAINTS

The proposed structure alternatives were evaluated on how well they fit into the existing conditions and proposed conditions and proposed geometry. The existing conditions include the topography, hydrology, and geology. The geometric constraints include span lengths, number of spans, structure width, vertical clearances, horizontal clearances, etc.

B) STRUCTURAL REQUIREMENTS

The proposed structure was evaluated on how well it performs structurally due to the constraints and loads that are produced from the existing conditions and proposed geometry.

C) ECONOMICS

The initial construction cost and long term maintenance must be carefully weighed to determine the most economic alternative from a life cycle perspective. Historic data was used to evaluate the relative costs of superstructure types in an effort to determine the most efficient.

D) CONSTRUCTABILITY

The proposed project geometry is conducive to construction of all types. This structure crossing is not located near existing infrastructure that will limit or hinder constructability, therefore, access is not considered problematic for any of the structure types.

E) AESTHETICS

With any project, aesthetics are a concern. For this bridge structure, it is desired to incorporate the appearance of the existing bridge structure into the new bridge structure as much as possible.

The No-Build Alternative leaves the bridge structure with inadequacies in its load carrying capacity, so its factor has been valued as Very Negative Effect. The Rehabilitation Alternative may improve the structural capacity of the bridge and extend the life of the bridge, but it will not be new structure that meets towards standards. The bridge structure for alternatives A, B, C and F have a significant skew and the factor is valued Negligible or No Effect. Alternative D has normal skew and is valued at Very Positive. The skew of Alternative E has a moderate skew and is valued as Positive Effect

Table 24. Bridge Design Score Summary

Alternative	Factor
No-Build	- -
Rehabilitation	-
Build - Alignment A	0
Build - Alignment B	0
Build - Alignment C	0
Build - Alignment D	+ +
Build - Alignment E	+
Build - Alignment F	0
Build - Alignment G	- -

D. Environmental Factors and Analysis

1. Water Resources

Water is a natural resource that needs to be managed. Since there are no surface waters within or adjacent to the Project Area, water impacts will be the same for all alternatives. There would be no impacts to waterways or wetlands under any alternative.

Table 25. Water Impacts Score Summary

Alternative	Factor
No-Build	0
Rehabilitation	0
Build - Alignment A	0
Build - Alignment B	0
Build - Alignment C	0

Alternative	Factor
Build - Alignment D	0
Build - Alignment E	0
Build - Alignment F	0
Build - Alignment G	0

2. Biological Resources

Biological resources are critical for life and need to be protected. Vegetation and wildlife are part of those resources that are being considered in the evaluation of alternatives. Vegetation and habitat impacts would depend on the amount of ground disturbance and excavation. Alternatives A, B, C, F and G would have slight impacts. Alternatives D and E would have the greatest impacts and clear a larger area of vegetation and habitat and would have a moderate impacts. All disturbed and/or abandoned areas will be revegetated, so vegetation impacts will be temporary. No impacts to federal or state listed endangered and threatened species are anticipated. To minimize impacts to migratory birds, mitigation measures, such as construction scheduling or a pre-construction bird survey, may be needed for the build alternatives.

Table 26.Vegetation and Habitat Impacts Score Summary

Alternative	Factor
No-Build	0
Rehabilitation	0
Build - Alignment A	-
Build - Alignment B	-
Build - Alignment C	-
Build - Alignment D	- -
Build - Alignment E	- -
Build - Alignment F	-
Build - Alignment G	-

3. Cultural Resources

Cultural Resource Management considers the protection of historic places, architecture and interests and considers such places and things in compliance with environmental and historic preservation laws. An alternative that impacts a historic building, location, or thing will be evaluated lower than one which protects it. For this proposed project, it is recommended to maintain the look of the bridge. In addition, maintaining the original height of the bridge will allow drivers to view the surrounding landscape.

The No-Build and Rehabilitation Alternatives result in a negligible effect to the cultural resource. Future impacts are expected and will accumulate with these two alternatives overtime as necessary maintenance takes place.

Build Alternatives A, B, C and F will reconstruct the bridge and route 66 without drastic changes. Alternatives D, E and G would change the bridge angles and alter landscape views with significant impacts.

Table 27. Cultural Resource Impacts Score Summary

Alternative	Factor
No-Build	0
Rehabilitation	0
Build - Alignment A	-
Build - Alignment B	-
Build - Alignment C	-
Build - Alignment D	- -
Build - Alignment E	- -
Build - Alignment F	-
Build - Alignment G	- -

4. Climate and Air Quality

Climate change and air pollution are closely coupled. Just as air pollution can have adverse effects on human health and ecosystems; it can also impact the Earth's climate. The alternatives would not affect Valencia County's attainment status under the Clean Air Act. The project would not affect vehicle emissions or result in an increase in greenhouse gas emissions, which contribute to climate change. Dust during construction would be the main air quality impact and that impact will only be a concern until seeded vegetation grows. The dust impacts would vary with the amount of vegetation clearance leaving soil exposed. The difference in disturbed area between the alternatives is not significant enough to value the alignments differently.

The impact associated with all the alternatives except G is negligible or no effect. Alternative G will have a negative effect due to the increase in cars idling at the closed crossing gates when trains are present.

Table 28. Air Quality Score Summary

Alternative	Factor
No-Build	0
Rehabilitation	0
Build - Alignment A	0
Build - Alignment B	0
Build - Alignment C	0
Build - Alignment D	0
Build - Alignment E	0
Build - Alignment F	0
Build - Alignment G	-

5. Noise

Noise means any unwanted sound that disturbs people or makes it difficult to hear. Since there are no residences or other receptors located adjacent to or within 0.2 miles of the Project Area, the build and No-Build alternatives will have a negligible effect. The project will not change noise levels.

Table 29. Noise Score Summary

Alternative	Factor
No-Build	0
Rehabilitation	0
Build - Alignment A	0
Build - Alignment B	0
Build - Alignment C	0
Build - Alignment D	0
Build - Alignment E	0
Build - Alignment F	0
Build - Alignment G	0

6. Social Features

Social features refer to the immediate physical and social setting in which people live or in which something happens or develops. It includes the culture that the individual was educated or lives in, and the people and institutions with whom they interact. The Build Alternatives would benefit the residents west of the railroad by providing an improved railroad crossing for vehicle travel. The bridge would provide space for pedestrians and bicyclists. The new bridge would also provide an improved route for emergency situations for evacuation by residents or for access by emergency vehicles. The public predominantly supported Alternative F at the public meeting and will be valued as Very Positive Effect.

The at-grade crossing (Alignment G) will have a significant impact to the social features if trains park at the crossing and blocks the access. The No-Build Alternative would also have a significant impact as it may deteriorate to a condition where safe travel is no longer possible and drivers would need to travel on CO 84 to Mesita, approximately 9.5 miles northwest of the bridge.

Table 30. Socioeconomic Impacts Score Summary

Alternative	Factor
No-Build	- -
Rehabilitation	-
Build - Alignment A	+
Build - Alignment B	+
Build - Alignment C	+
Build - Alignment D	+
Build - Alignment E	+
Build - Alignment F	+ +
Build - Alignment G	- -

7. Visual Resources

Impacting visual resources negatively in and around the corridor will result in a negative evaluation for the alternative. Likewise, improvements may also enhance the visual resources in the area and will be evaluated likewise. The build alternatives would result in an improved appearance to the bridge structure by replacing old and dilapidated structure with a new structure. The build alternatives will maintain elevated views of the landscape afforded by grade separation, which is an important element of the existing Route 66 corridor. Alternative A would keep the bridge on the current alignment with no impact. Alternatives B, C and F would modify the bridge location slightly with a low visual impact. Alternatives D, E, and G would modify the bridge angles and alter landscape views with a significant visual impact.

Table 31. Visual Impacts Score Summary

Alternative	Factor
No-Build	0
Rehabilitation	0

Alternative	Factor
Build - Alignment A	+ +
Build - Alignment B	+
Build - Alignment C	+
Build - Alignment D	-
Build - Alignment E	-
Build - Alignment F	+
Build - Alignment G	- -

8. Land Use and Communities

The build alternatives would benefit land use. Communities west of the railroad tracks would benefit from an improved and safer bridge across the railroad road tracks. This would ensure continued dependable access to the communities of Correo and Suwanee. The bridge would also be accessible to bicyclists and pedestrians, which would benefit area communities. Under the No-Build there is a risk that the bridge would deteriorate to a condition where safe travel is no longer possible and drivers would need to travel on CO 84 to Mesita, approximately 9.5 miles northwest of the bridge. The Rehabilitation option would be in slightly better condition than the No-Build alternative, but would eventually deteriorate to a condition that is also unsafe for travel. The build alternatives would have a Very Positive Effect on the land use and community. Alternative G will be valued as Positive Effect as it will provide a new crossing, but the at-grade crossing will be an unwelcome inconvenience to the community.

Table 32. Land Use and Community Impacts Score Summary

Alternative	Factor
No-Build	- -
Rehabilitation	-
Build - Alignment A	+ +
Build - Alignment B	+ +

Alternative	Factor
Build - Alignment C	+ +
Build - Alignment D	+ +
Build - Alignment E	+ +
Build - Alignment F	+ +
Build - Alignment G	+

9. Farmland

Farmland is simply land used for farming. There is currently no cultivated farmland within the Project Area. No farmland impacts are expected under any alternative. All alternatives are valued as Negligible or No Effect.

E. Evaluation of Alternatives

The table below shows the evaluation of the Alternatives.

Table 33. Evaluation of Alternatives

Evaluation Factor	No Build	Rehabilitation	Build Alternative A	Build Alternative B	Build Alternative C	Build Alternative D	Build Alternative E	Build Alternative F	Build Alternative G
Purpose and Need	- -	- -	+ +	+ +	+ +	+ +	+ +	+ +	-
Cost	Maintenance Costs	Maintenance Costs	$8,020,000	$8,287,000	$8,364,000	$8,703,000	$7,683,000	$6,994,000	$2,560,000
Traffic Operations and Safety	- -	- -	+ +	+ +	+ +	-	-	+ +	- -
Maintenance of Traffic	0	- -	-	-	-	-	-	0	0
Access	0	0	0	0	0	0	0	0	0
Drainage	0	0	+ +	+ +	+ +	+ +	+ +	+ +	+ +
Geology and Soils	0	0	-	-	-	-	-	-	0
Constructability	0	-	-	-	-	-	-	0	0
Right-of-Way Impacts	0.0 Acres	0.0 Acres	2.5 Acres	3.6 Acres	3.6 Acres	22.5 Acres	13.3 Acres	9.0 Acres	4.1 Acres
Utility Conflicts	0	0	-	-	-	- -	- -	-	-
Bridge	- -	-	0	0	0	+ +	+	0	- -
Water	0	0	0	0	0	0	0	0	0
Biological Resources	0	0	-	-	-	- -	- -	-	-
Cultural Resources	0	0	-	-	-	- -	- -	-	- -
Climate and Air Quality	0	0	0	0	0	0	0	0	-
Noise	0	0	0	0	0	0	0	0	0
Social Features	- -	-	+	+	+	+	+	+ +	-
Visual Resources	0	0	+ +	+	+	-	-	+	- -
Land Use	- -	-	+ +	+ +	+ +	+ +	+ +	+ +	+
Farmland	0	0	0	0	0	0	0	0	0

IX. RECOMMENDATIONS

Based upon the discussion and analysis documented above and the comments from the Public Meeting, it is recommended that the Build Alternative F be advanced to Phase I-C, Environmental Documentation. Alternative F fulfills the Purpose and Need of the project and does not significantly impact the traveling public during its construction. Traffic will remain on the existing roadway and bridge while the new bridge and roadway is being constructed.

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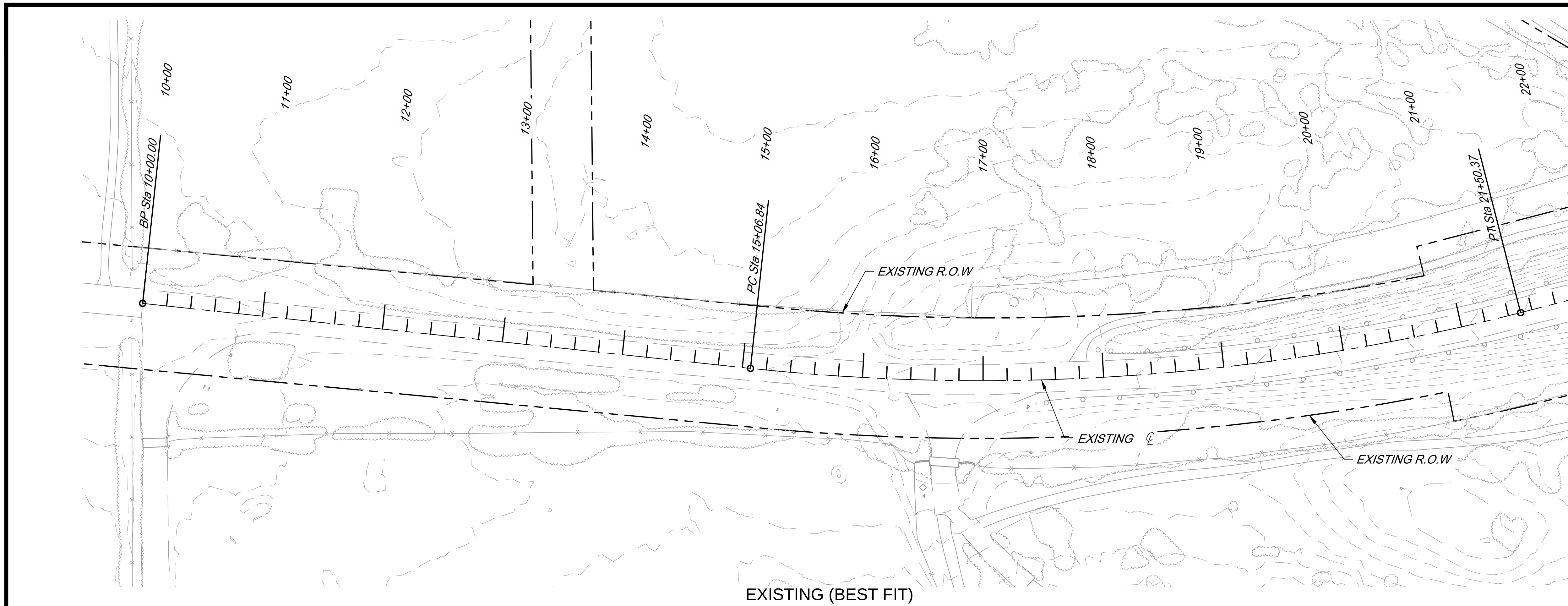
APPENDICES

Appendix A. Existing Plan and Profile Sheets

HDR
2155 LOUISIANA BLVD
NE, SUITE 9500
ALBUQUERQUE
NM, 87110
(505) 830-5400



PRELIMINARY
NOT FOR CONSTRUCTION
11/2016

EXISTING (BEST FIT)

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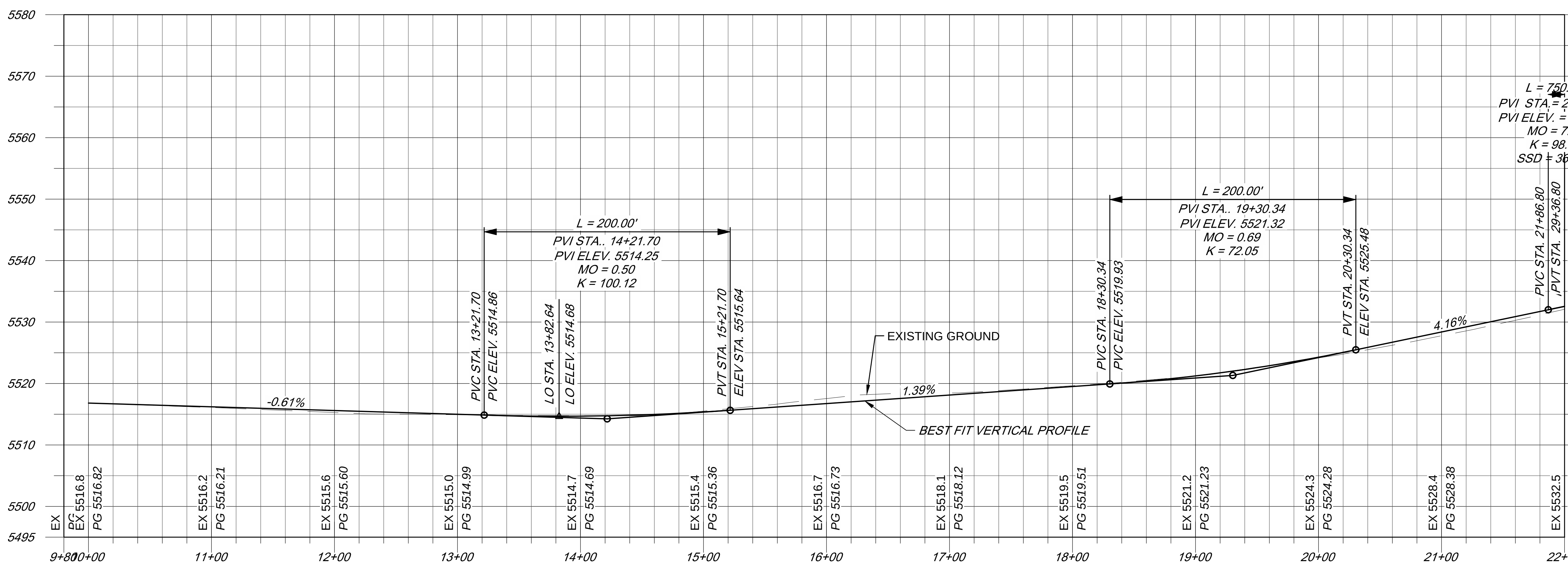
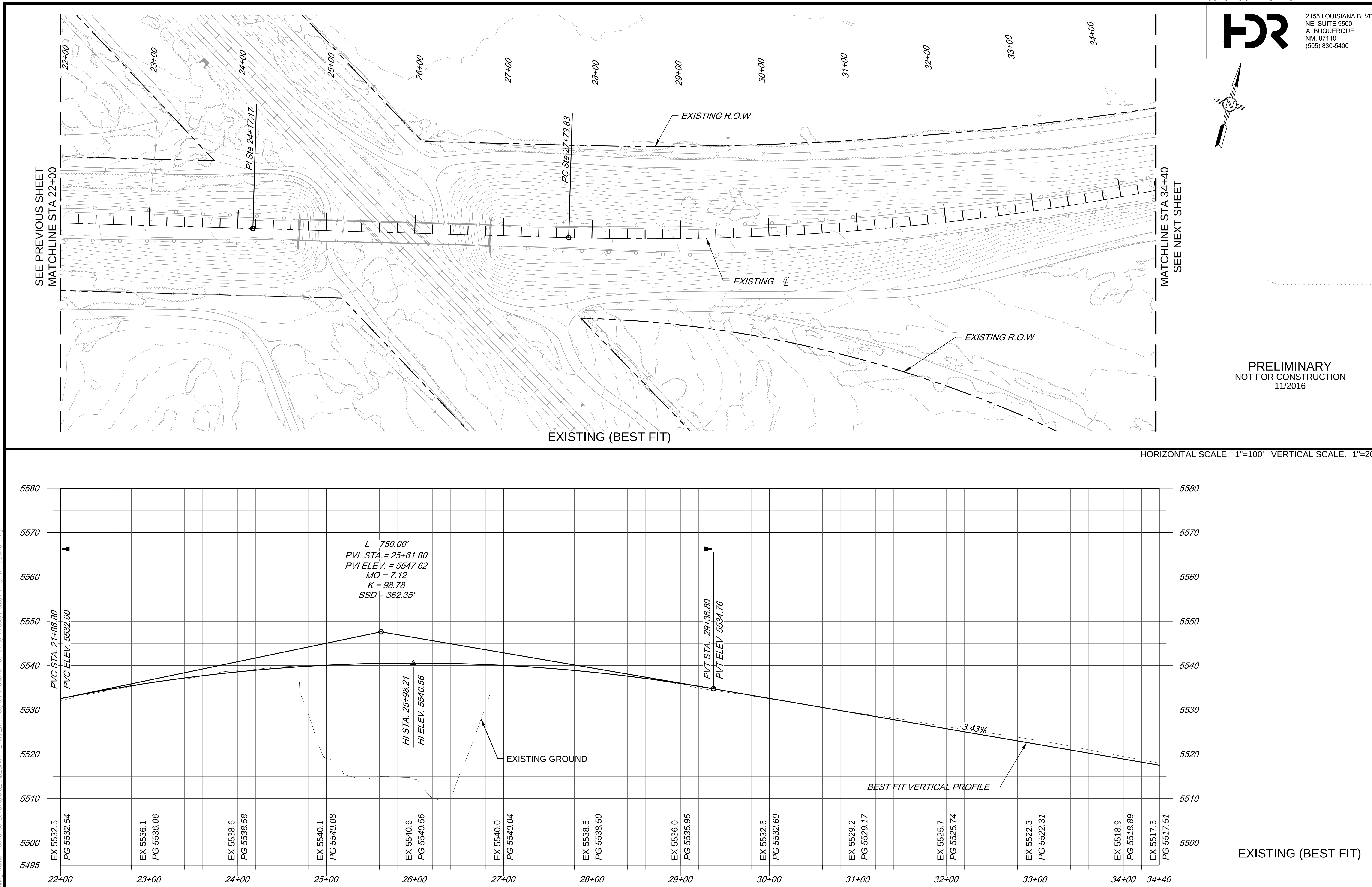
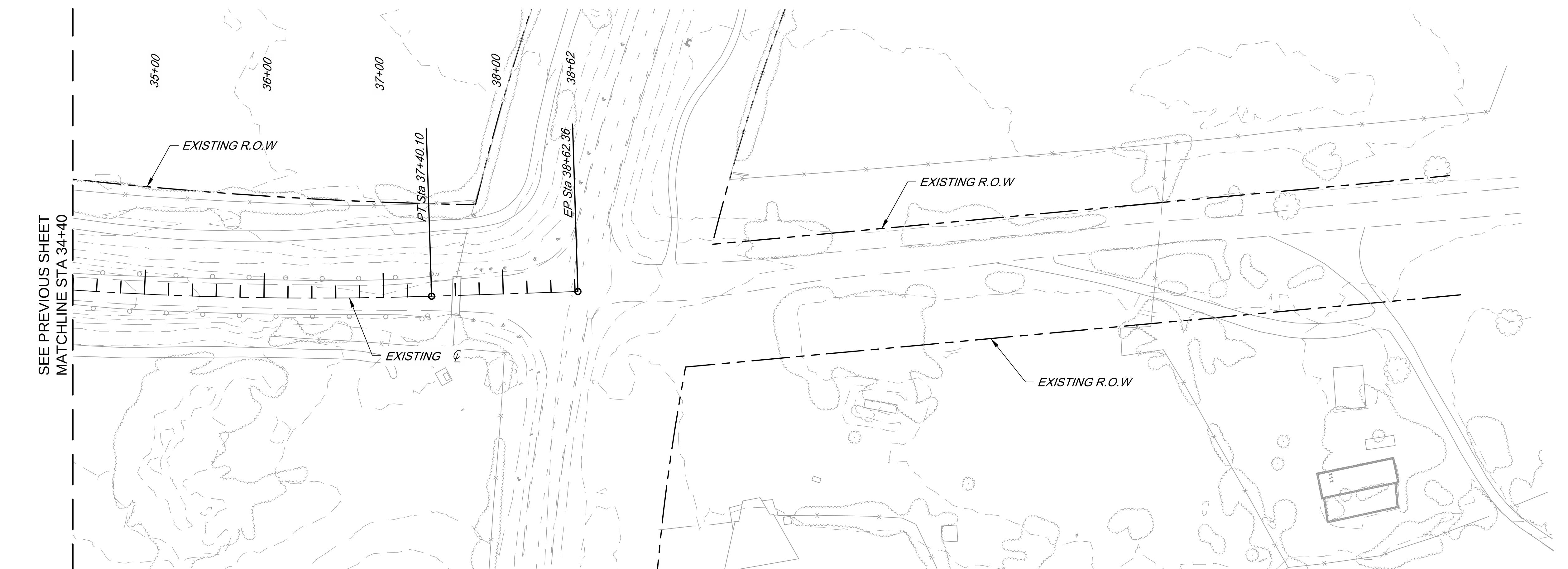


EXISTING (BEST FIT)


2155 LOUISIANA BLVD
NE, SUITE 9500
ALBUQUERQUE
NM, 87110
(505) 830-5400
SEE PREVIOUS SHEET
MATCHLINE STA 22+00
MATCHLINE STA 34+40
SEE NEXT SHEET
22+00
23+00
24+00
25+00
26+00
27+00
28+00
29+00
30+00
31+00
32+00
33+00
34+00
PI Sta 24+17.17
PC Sta 27+73.83
EXISTING R.O.W
EXISTING ℄
EXISTING R.O.W
PRELIMINARY
NOT FOR CONSTRUCTION
11/2016
EXISTING (BEST FIT)
HORIZONTAL SCALE: 1"=100' VERTICAL SCALE: 1"=20'
L = 750.00'
PVI STA.= 25+61.80
PVI ELEV. = 5547.62
MO = 7.12
K = 98.78
SSD = 362.35'
PVC STA. 21+86.80
PVC ELEV. 5532.00
PVT STA. 29+36.80
PVT ELEV. 5534.76
HI STA. 25+98.21
HI ELEV. 5540.56
-3.43%
EXISTING GROUND
BEST FIT VERTICAL PROFILE
5580
5570
5560
5550
5540
5530
5520
5510
5500
5495
EX 5532.5 PG 5532.54
EX 5536.1 PG 5536.06
EX 5538.6 PG 5538.58
EX 5540.1 PG 5540.08
EX 5540.6 PG 5540.56
EX 5540.0 PG 5540.04
EX 5538.5 PG 5538.50
EX 5536.0 PG 5535.95
EX 5532.6 PG 5532.60
EX 5529.2 PG 5529.17
EX 5525.7 PG 5525.74
EX 5522.3 PG 5522.31
EX 5518.9 PG 5518.89
EX 5517.5 PG 5517.51
22+00
23+00
24+00
25+00
26+00
27+00
28+00
29+00
30+00
31+00
32+00
33+00
34+00
34+40
EXISTING (BEST FIT)

2155 LOUISIANA BLVD
NE, SUITE 9500
ALBUQUERQUE
NM, 87110
(505) 830-5400



PRELIMINARY
NOT FOR CONSTRUCTION
11/2016

EXISTING (BEST FIT)

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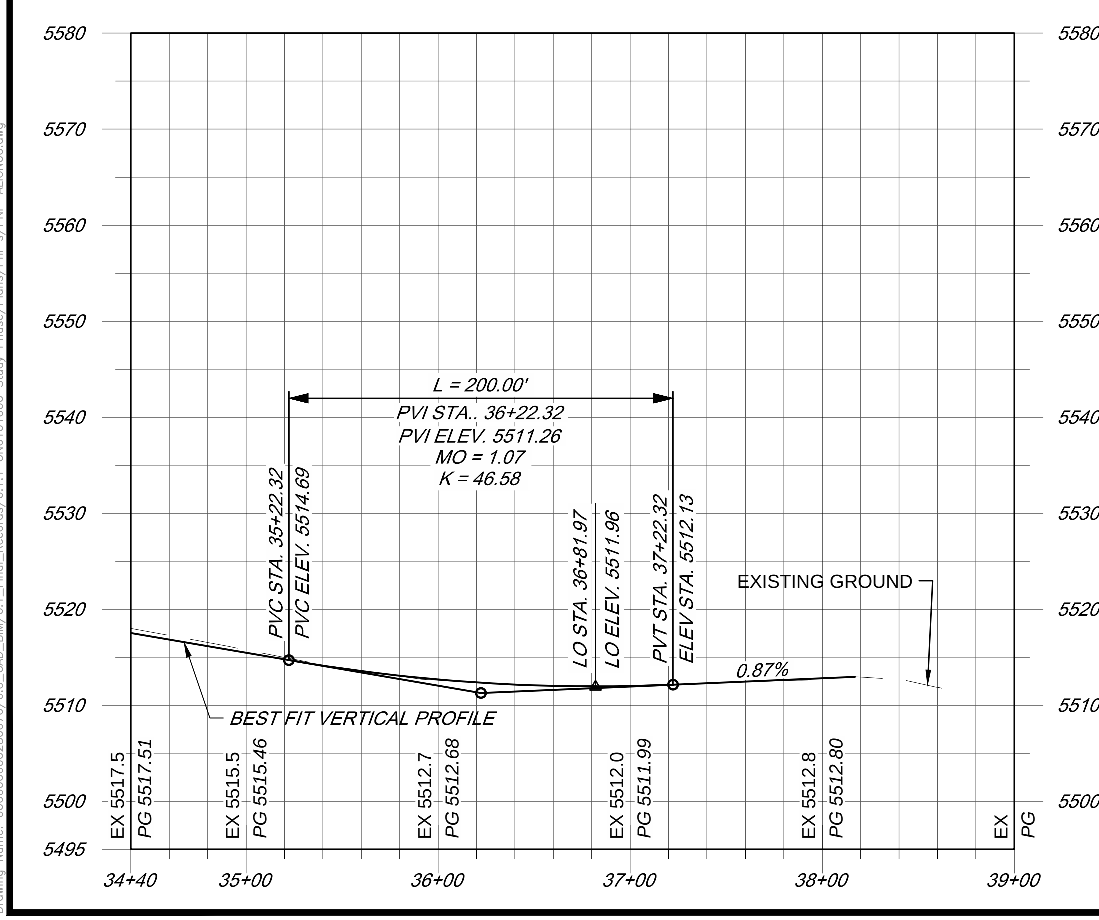
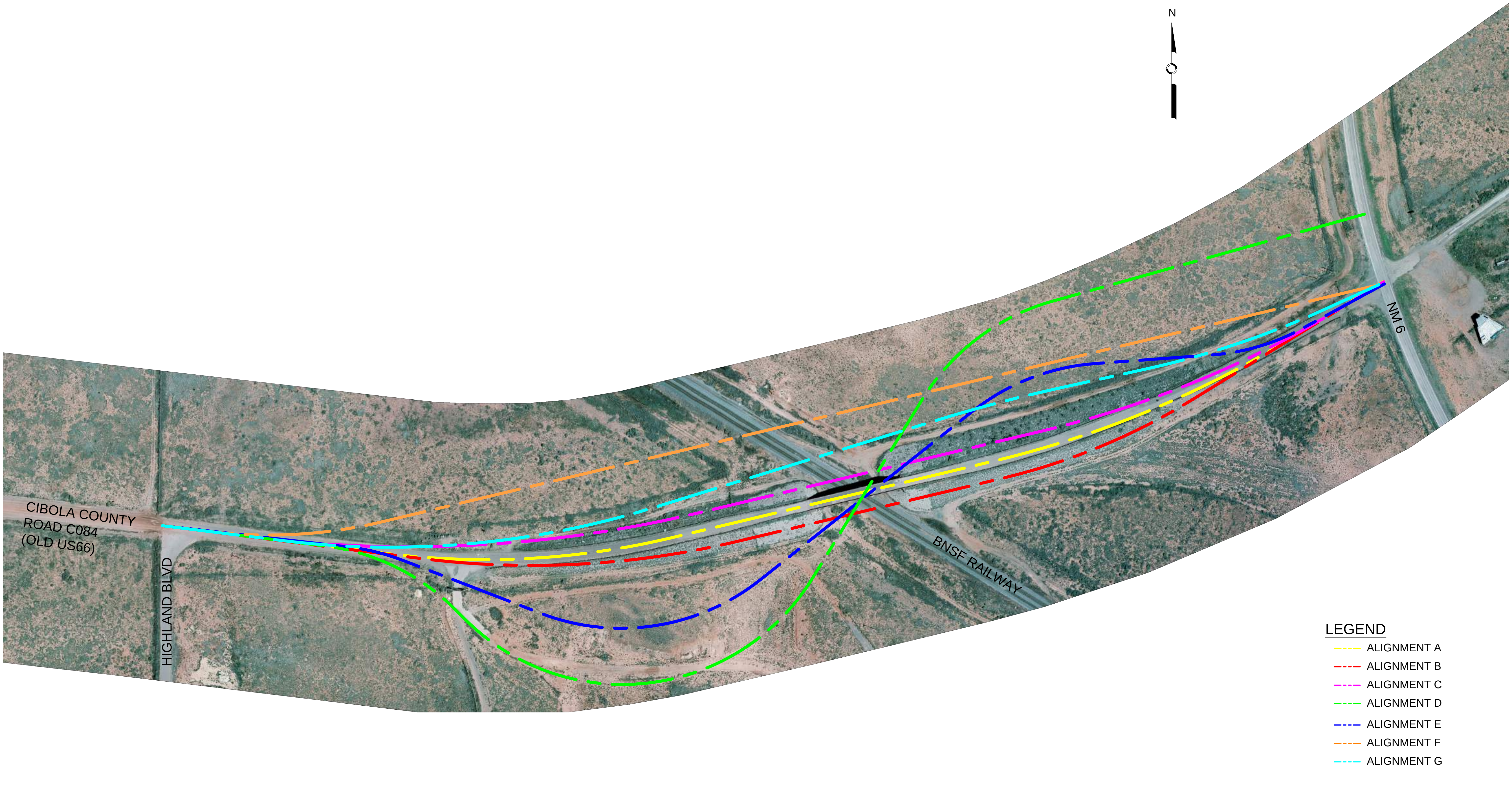


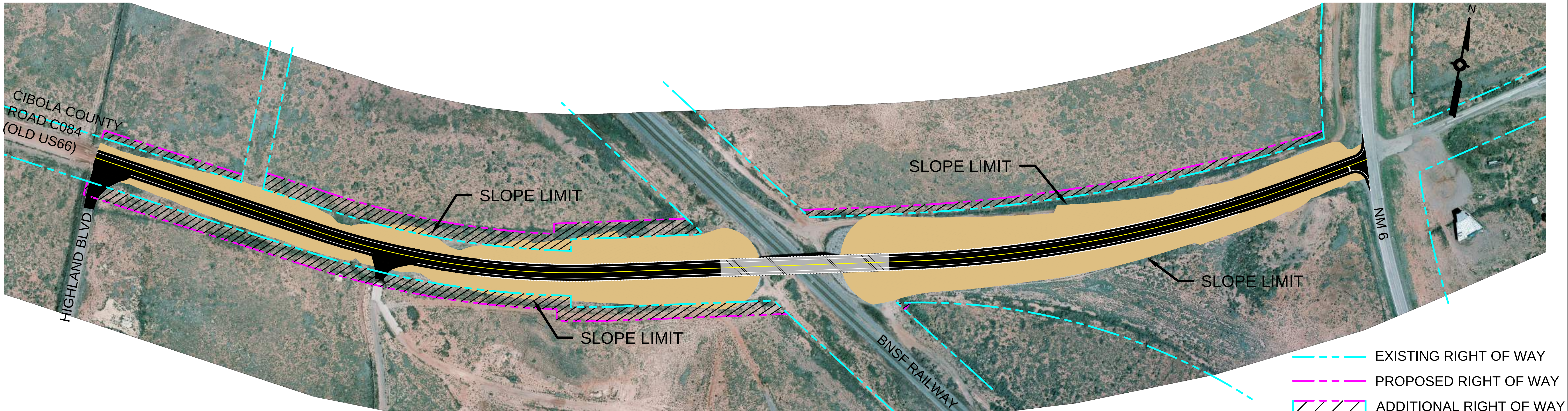
EXISTING (BEST FIT)

Appendix B. Alignment Alternatives

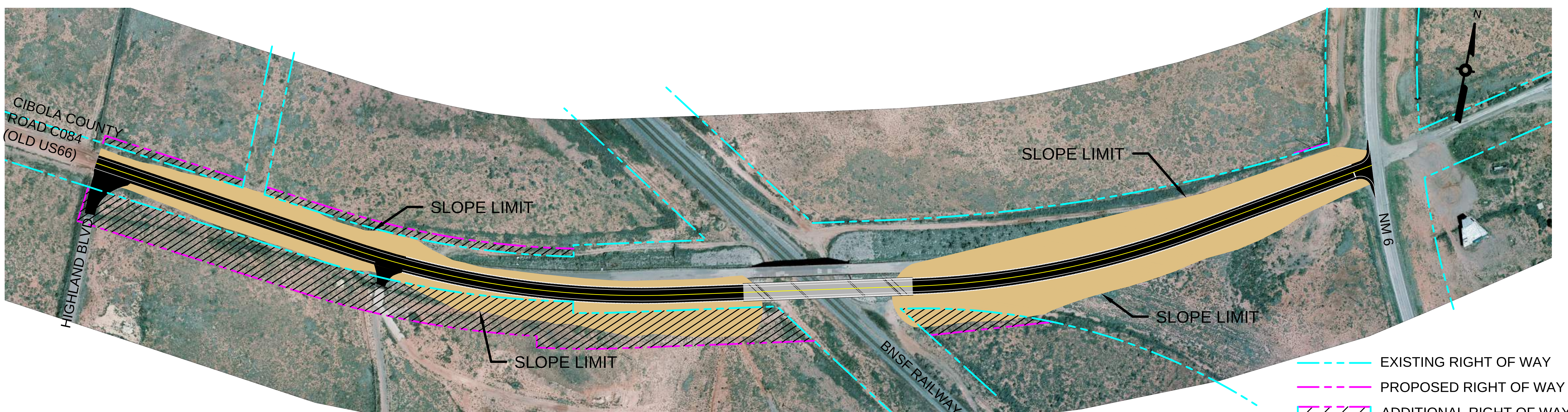


NMDOT DISTRICT 6
CIBOLA COUNTY ROAD C084 PROJECT
Alignment Alternatives

DATE 10/2016
FIGURE 1



Build Alternative A



Build Alternative B

NMDOT

HDR

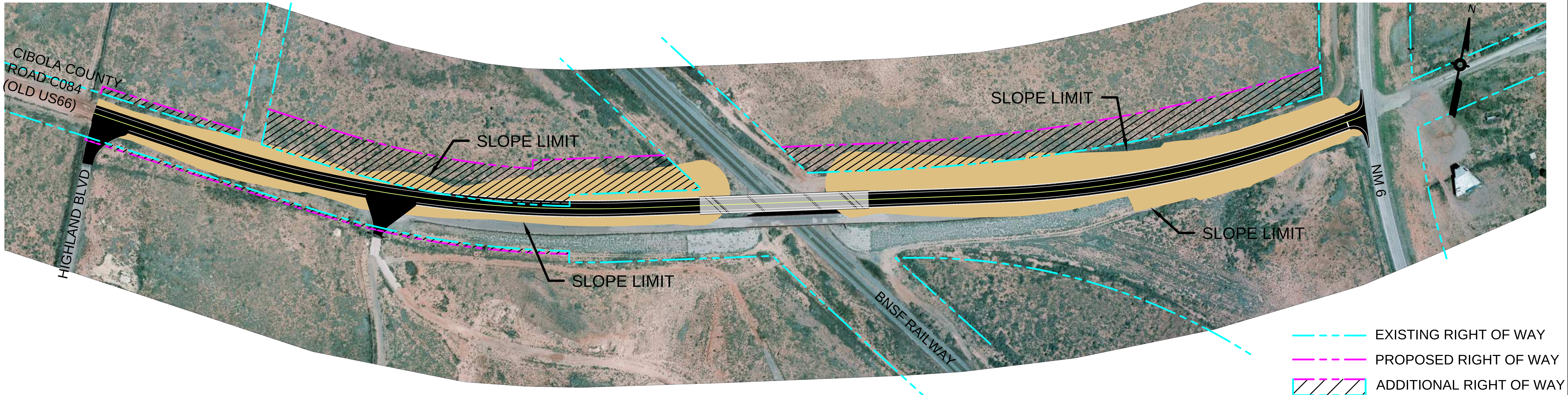
NMDOT DISTRICT 6

CIBOLA COUNTY ROAD C084 PROJECT

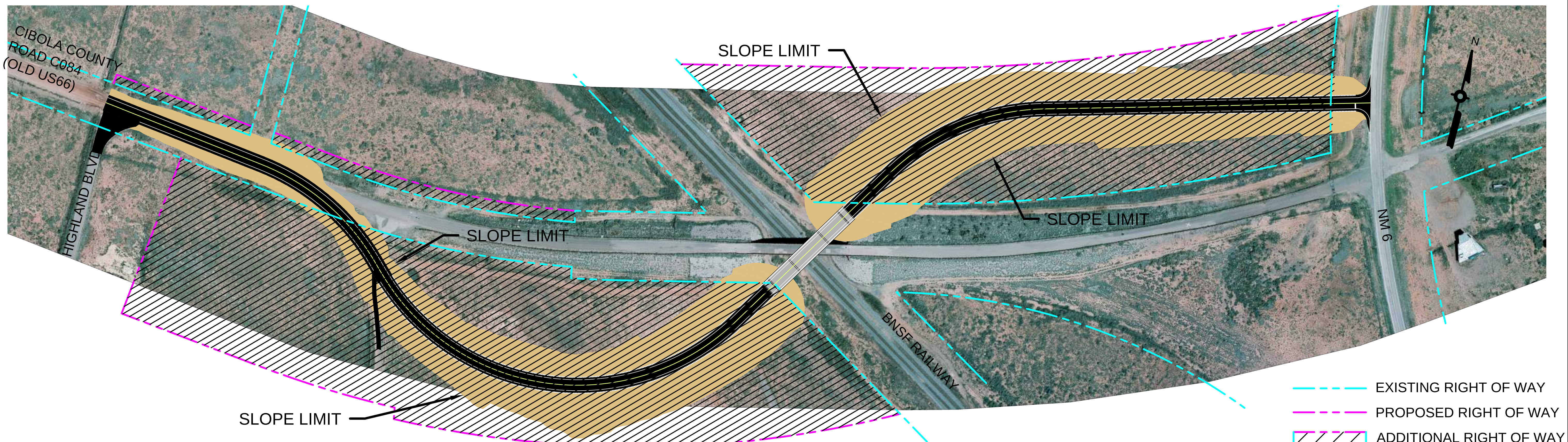
Build Alternatives

DATE 10/2016

FIGURE 2



Build Alternative C



Build Alternative D

NMDOT

HDR

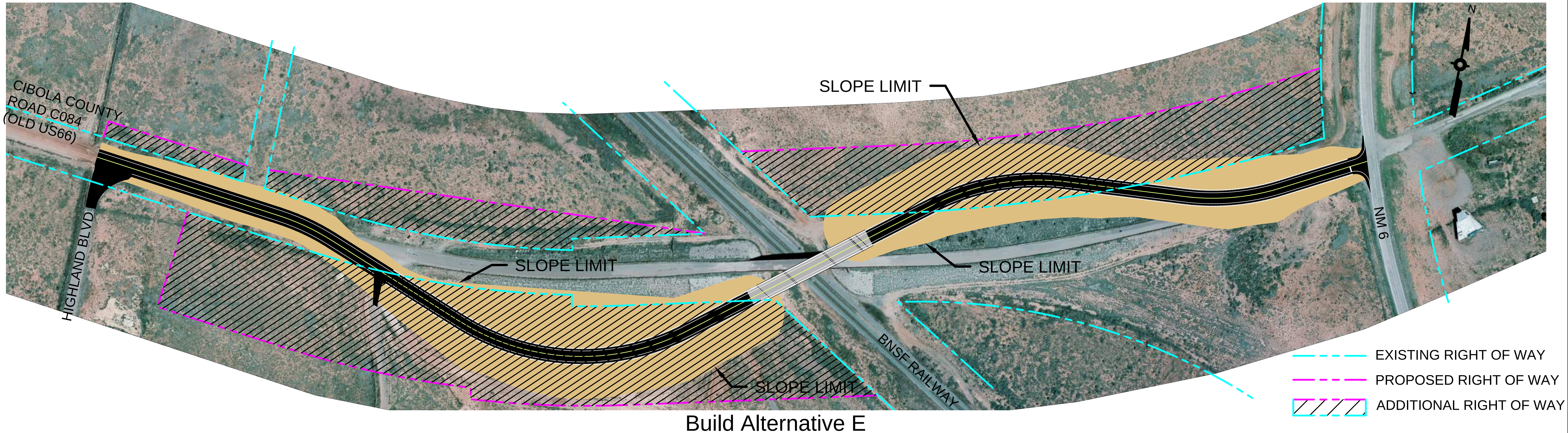
NMDOT DISTRICT 6

CIBOLA COUNTY ROAD C084 PROJECT

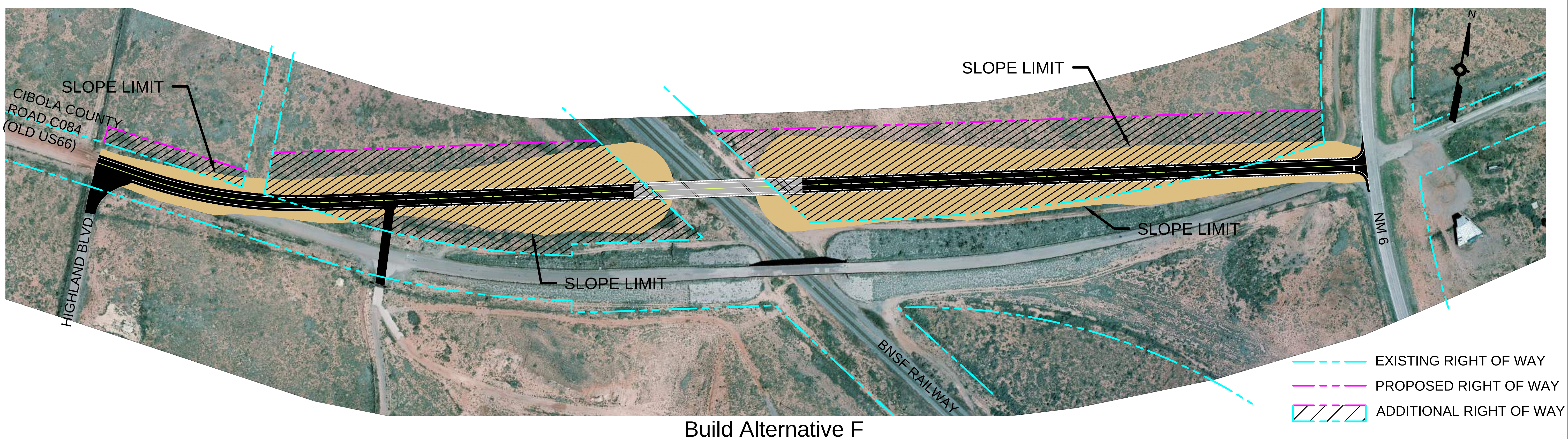
Build Alternatives

DATE 10/2016

FIGURE 3



Build Alternative E



Build Alternative F

NMDOT

HDR

NMDOT DISTRICT 6

CIBOLA COUNTY ROAD C084 PROJECT

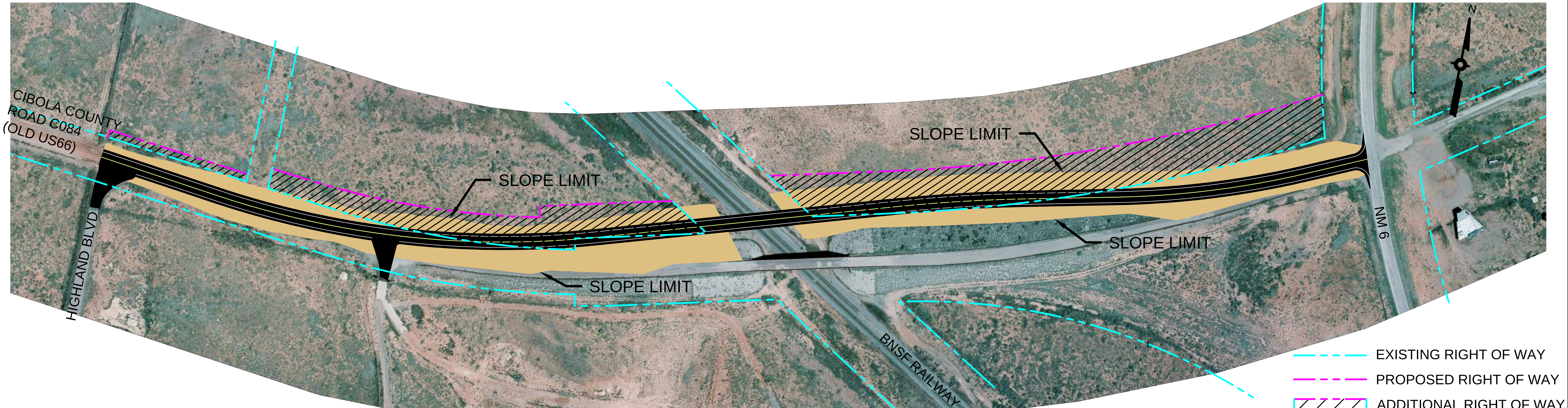
Build Alternatives

DATE

10/2016

FIGURE

4



Build Alternative G

NMDOT

HDR

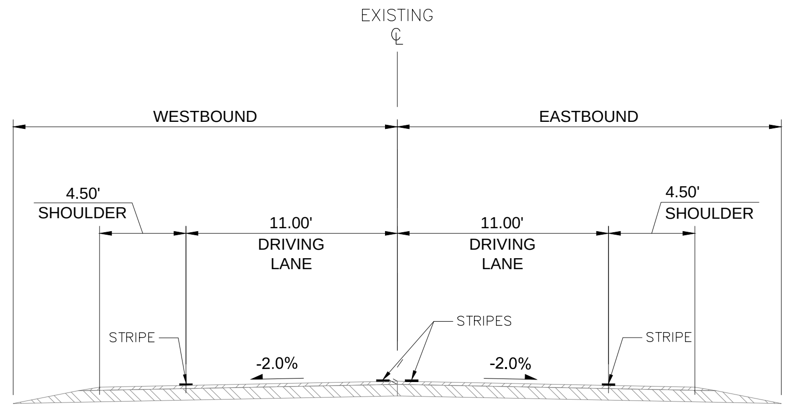
NMDOT DISTRICT 6

CIBOLA COUNTY ROAD C084 PROJECT

Build Alternatives

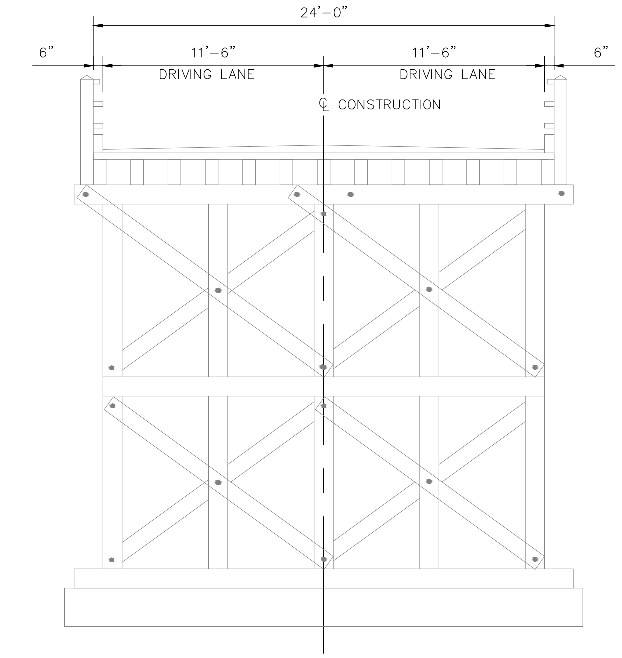
DATE 10/2016

FIGURE 5



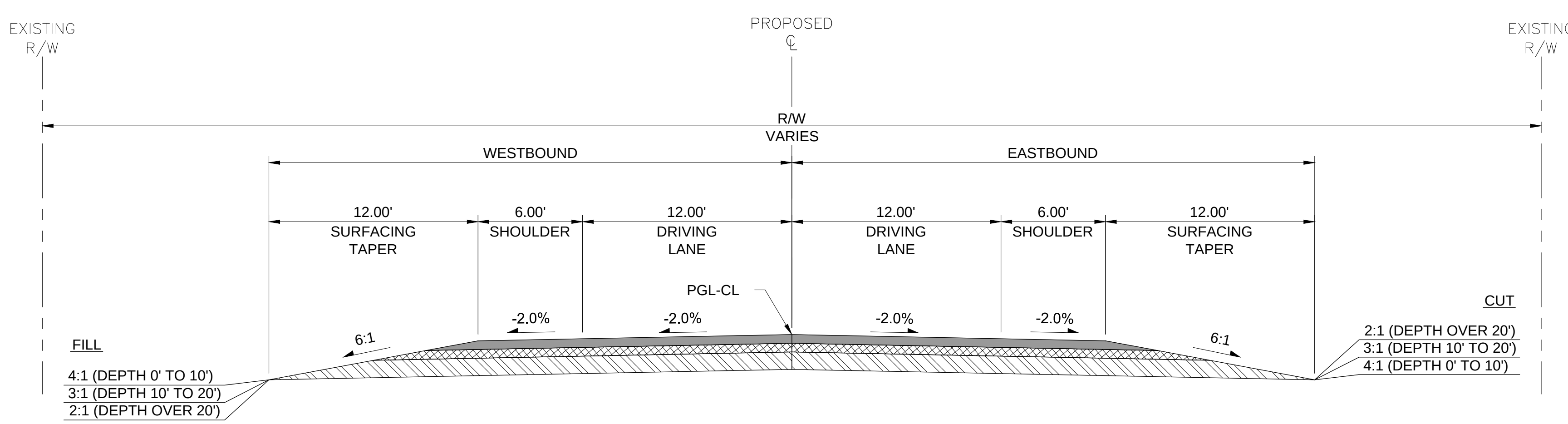
EXISTING TYPICAL SECTION

NOT TO SCALE



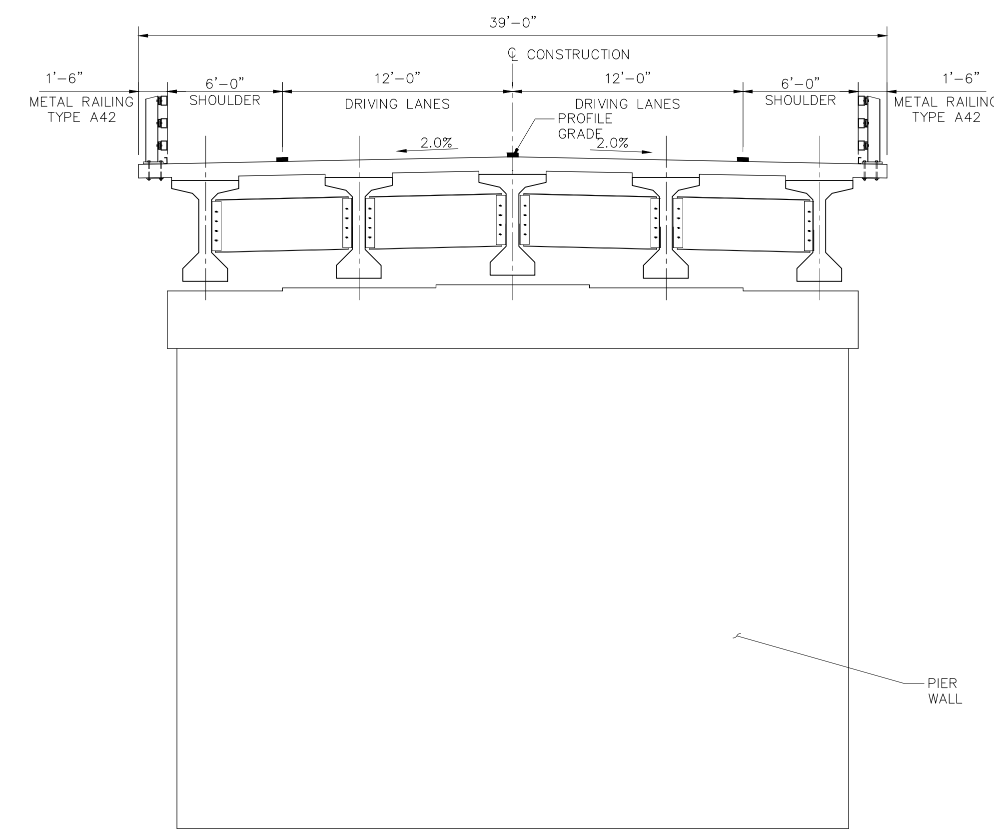
EXISTING TRANSVERSE SECTION—PIER

NOT TO SCALE



PROPOSED TYPICAL SECTION

NOT TO SCALE



PROPOSED TRANSVERSE SECTION—PIER

NOT TO SCALE

NMDOT

HDR

NMDOT DISTRICT 6

CIBOLA COUNTY ROAD C084 PROJECT

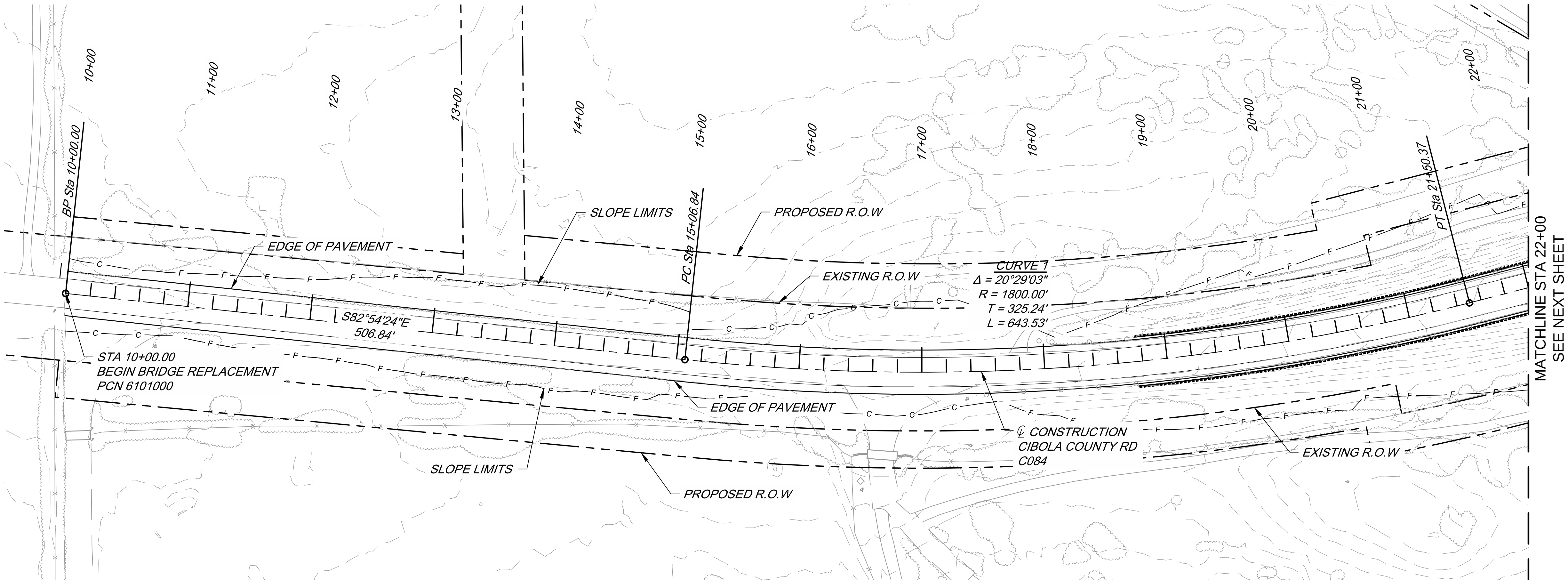
Typical Sections

DATE 10/2016

FIGURE 6

Appendix C. Proposed Plan and Profile Sheets

HDR
2155 LOUISIANA BLVD
NE, SUITE 9500
ALBUQUERQUE
NM, 87110
(505) 830-5400



ALTERNATIVE A

PRELIMINARY
NOT FOR CONSTRUCTION
11/2016

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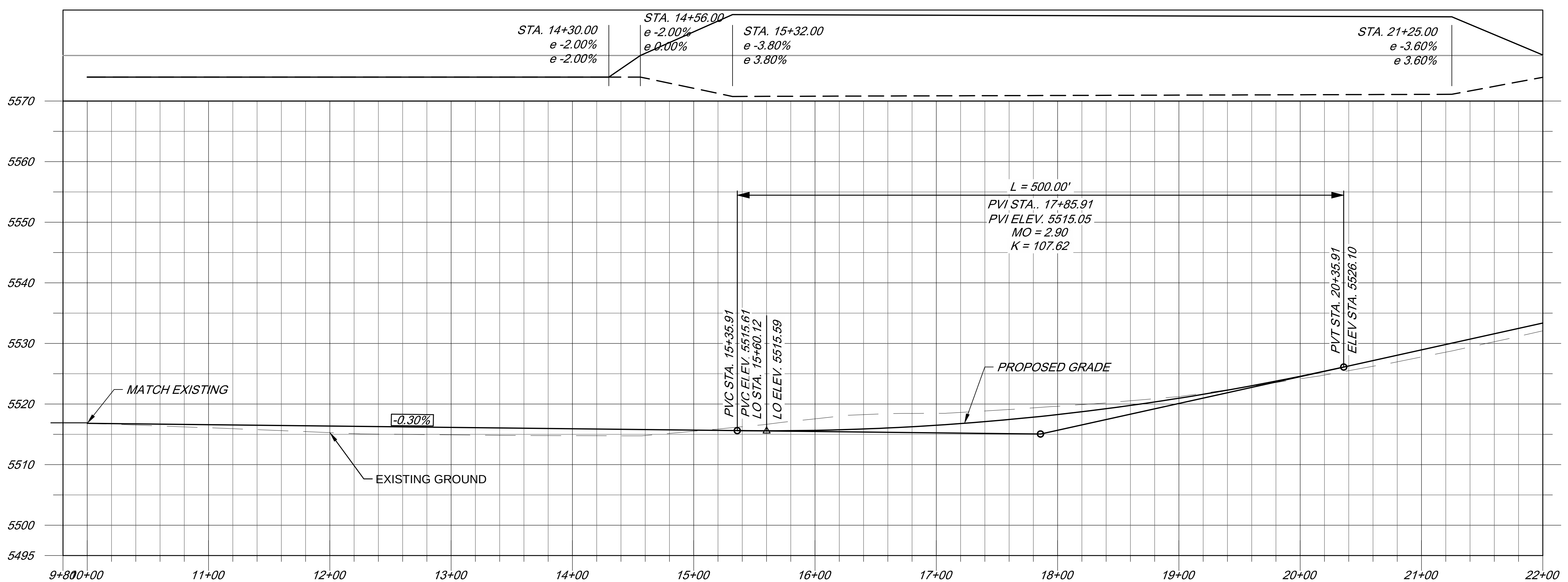
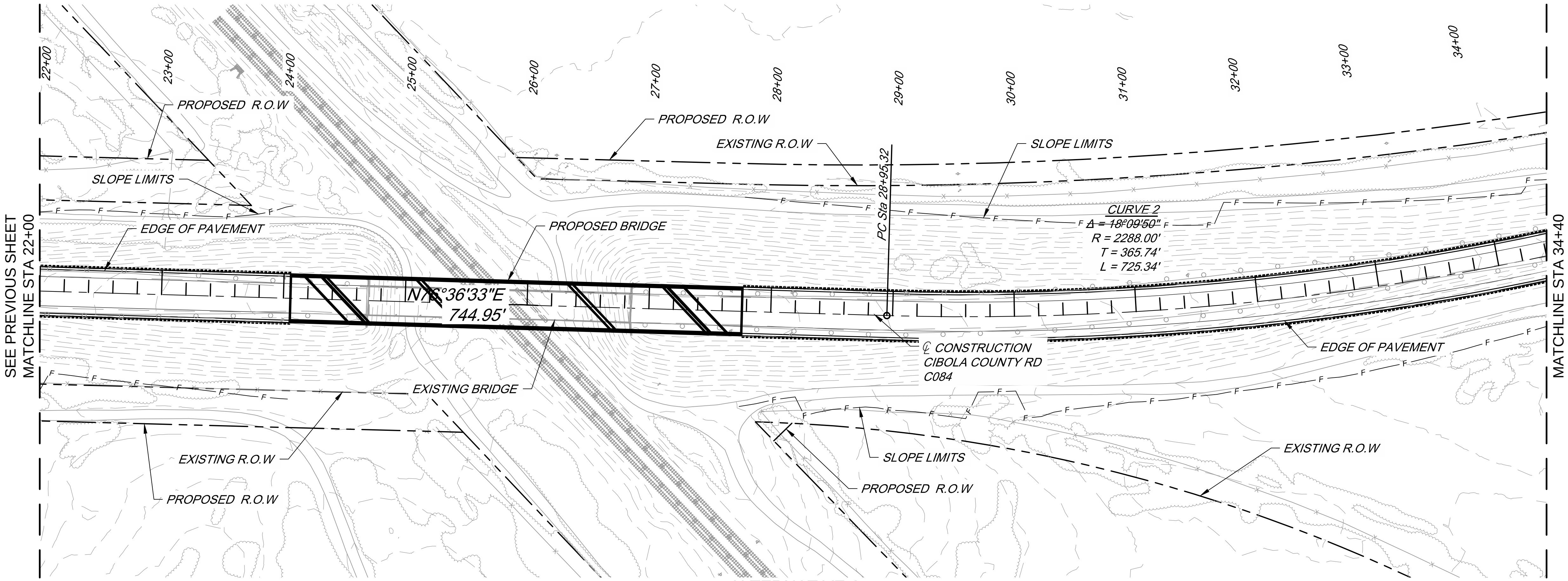


ALTERNATIVE A

PROJECT CONTROL NUMBER: 6101000

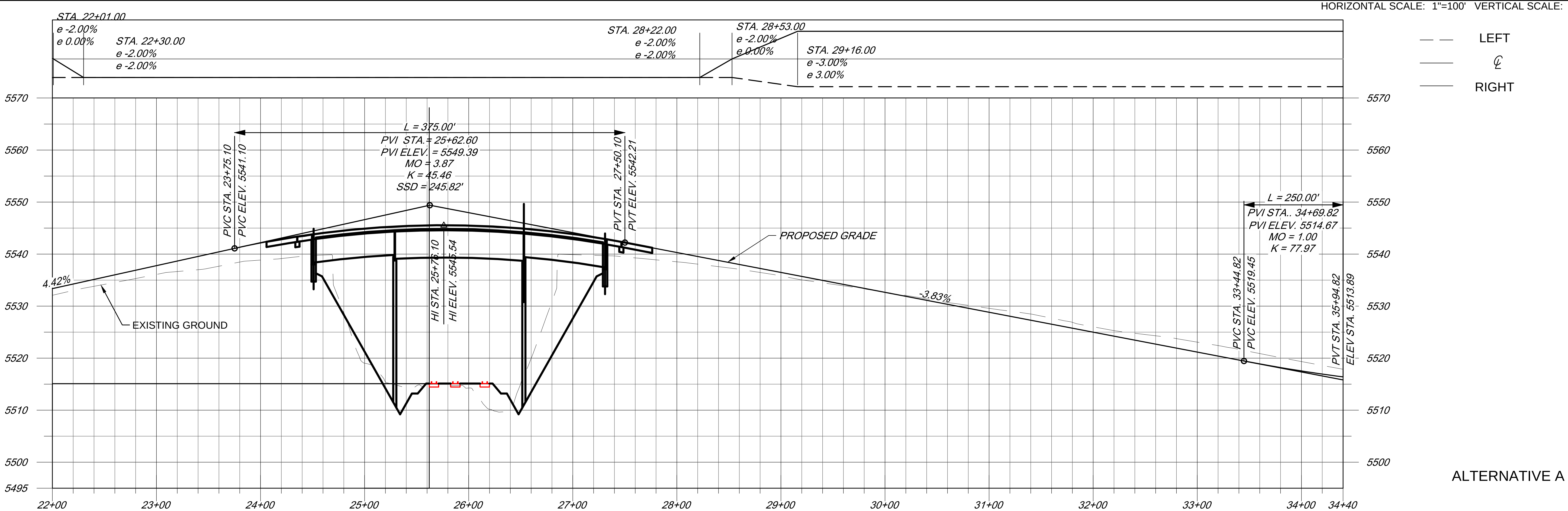
HDR
2155 LOUISIANA BLVD
NE, SUITE 9500
ALBUQUERQUE
NM, 87110
(505) 830-5400



PRELIMINARY
NOT FOR CONSTRUCTION
11/2016

ALTERNATIVE A

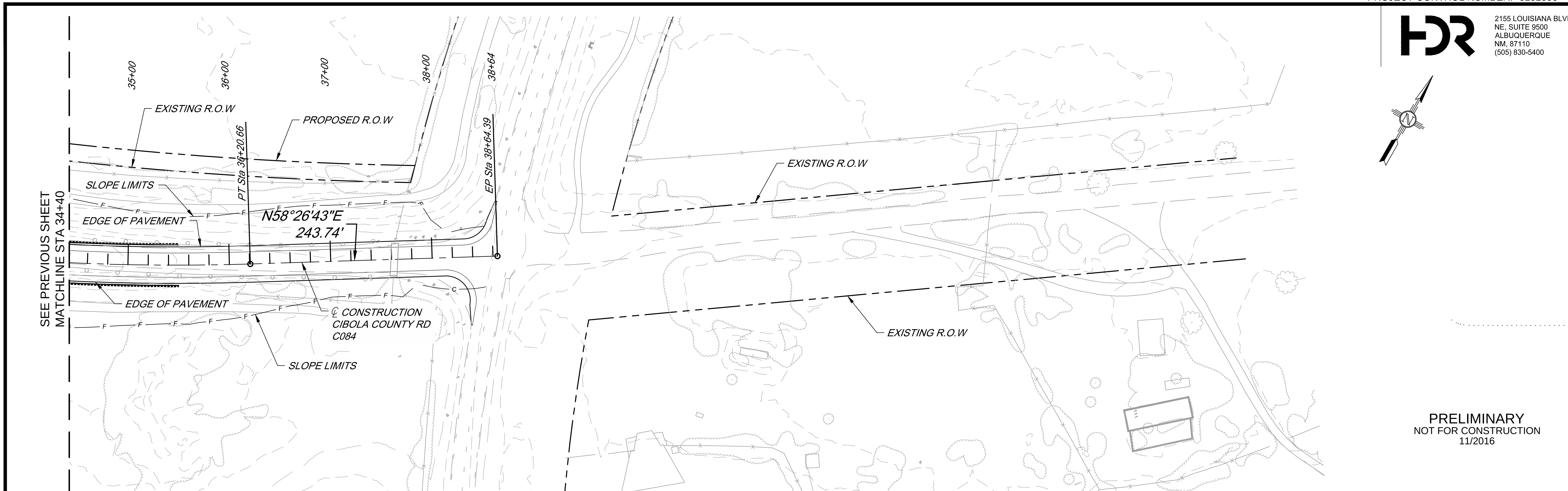
HORIZONTAL SCALE: 1"=100' VERTICAL SCALE: 1"=20'



ALTERNATIVE A

DESIGNED BY: ANT NEW MEXICO PROJECT NO. 6101000 SHEET NO. 3 - 2

HDR
2155 LOUISIANA BLVD
NE, SUITE 9500
ALBUQUERQUE
NM, 87110
(505) 830-5400



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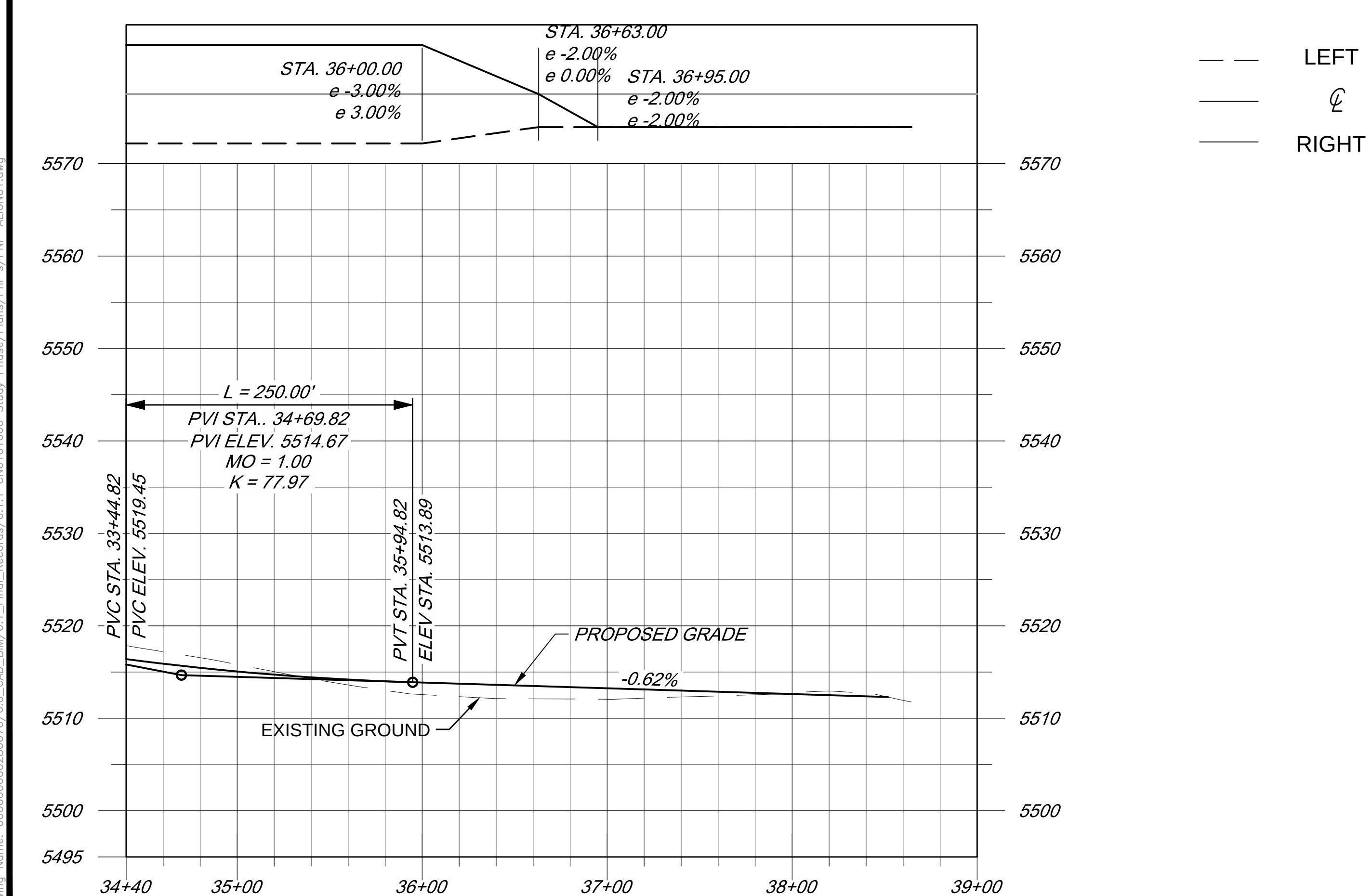
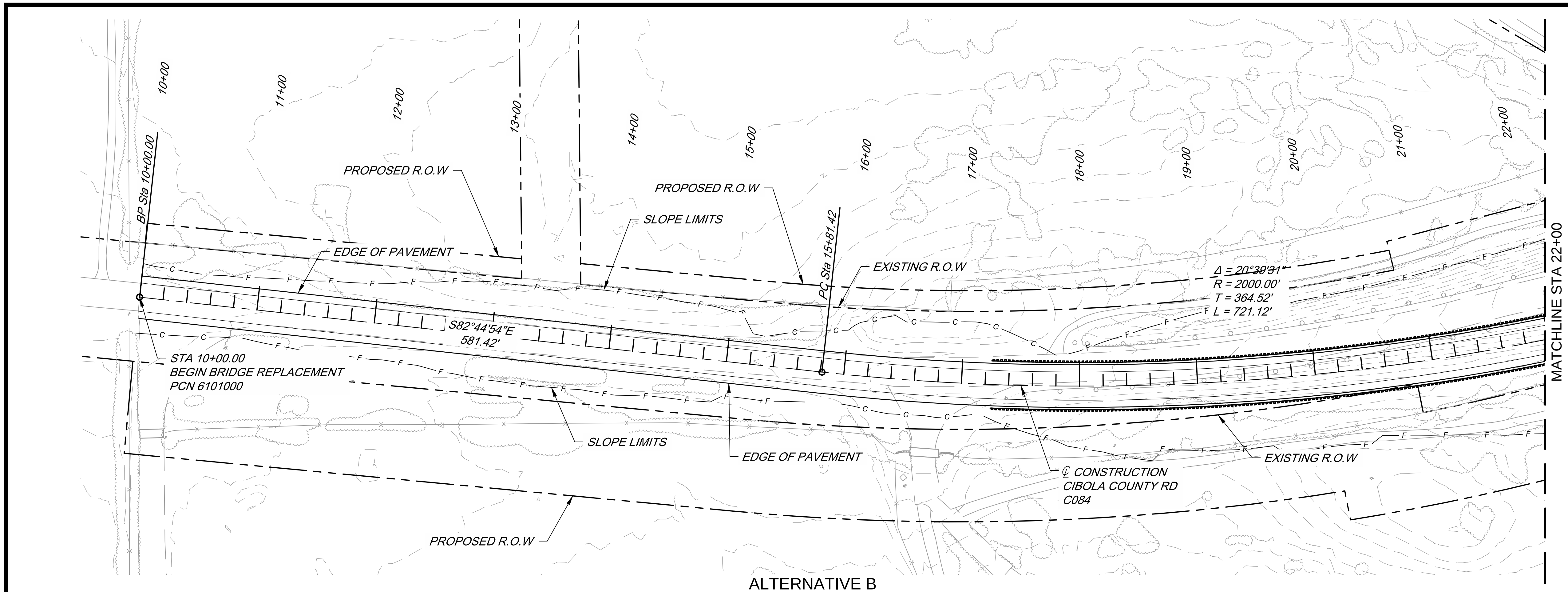


ALTERNATIVE A

HDR
2155 LOUISIANA BLVD
NE, SUITE 9500
ALBUQUERQUE
NM, 87110
(505) 830-5400



ALTERNATIVE B

PRELIMINARY
NOT FOR CONSTRUCTION
11/2016

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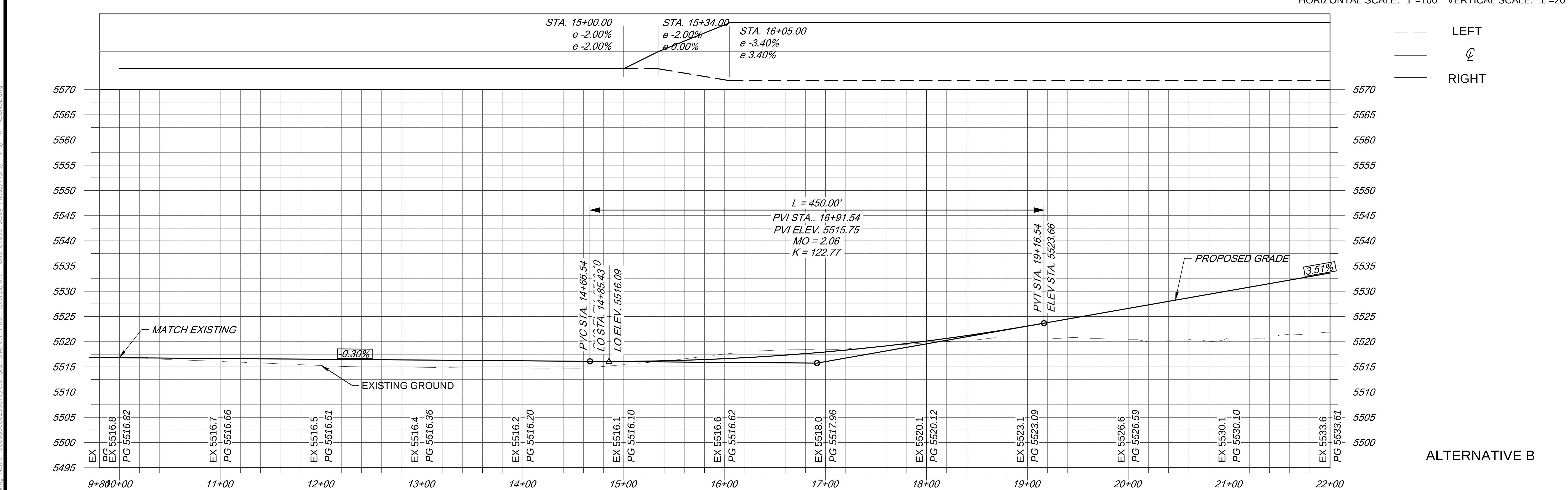
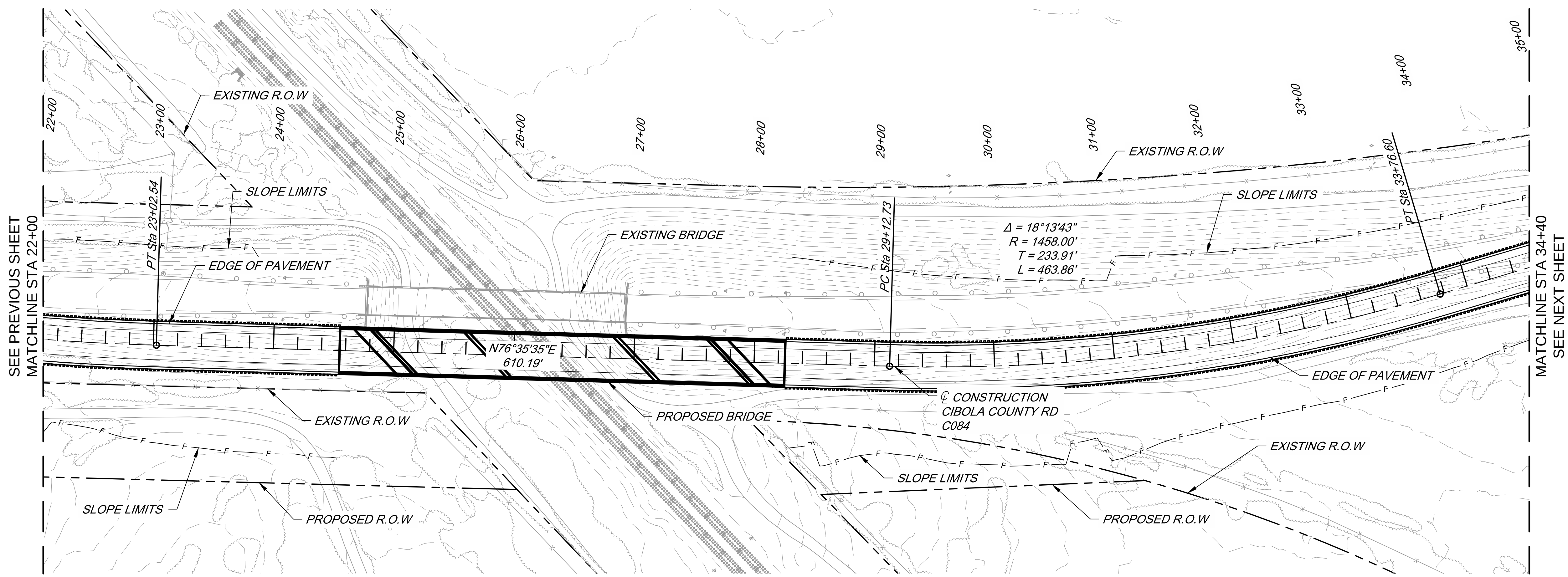


ALTERNATIVE B

HDR
2155 LOUISIANA BLVD
NE, SUITE 9500
ALBUQUERQUE
NM, 87110
(505) 830-5400



PRELIMINARY
NOT FOR CONSTRUCTION
11/2016

ALTERNATIVE B

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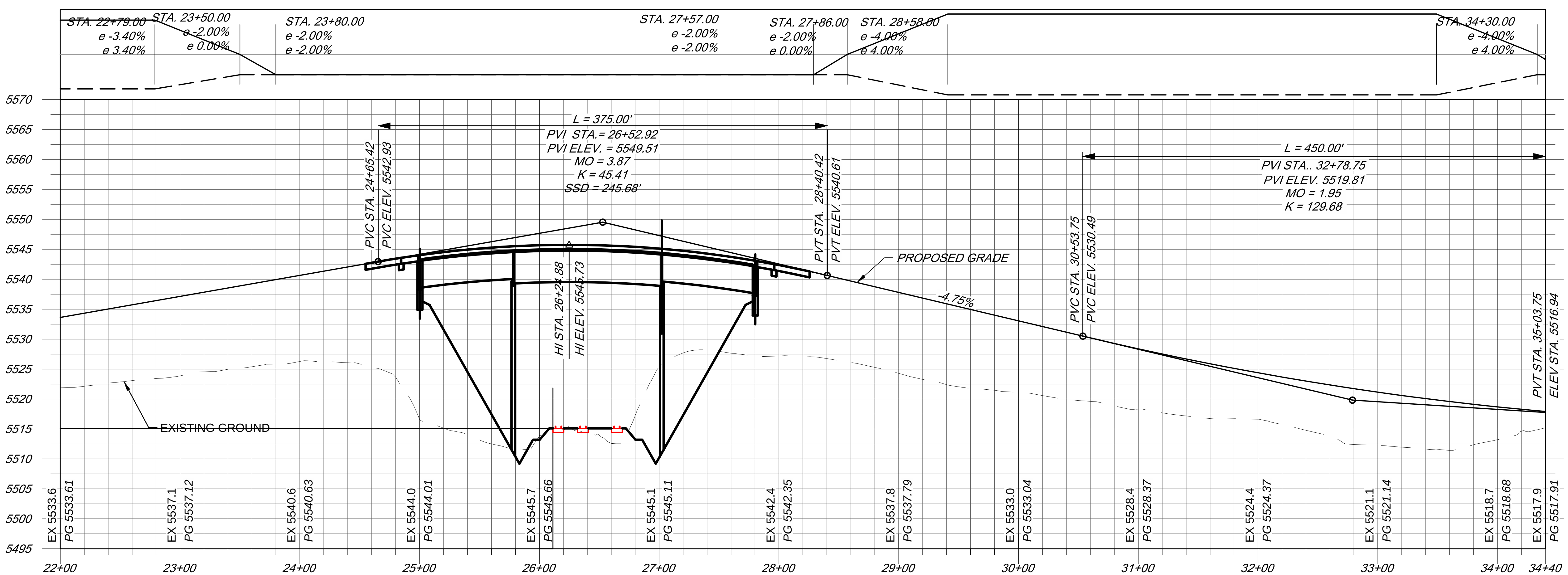
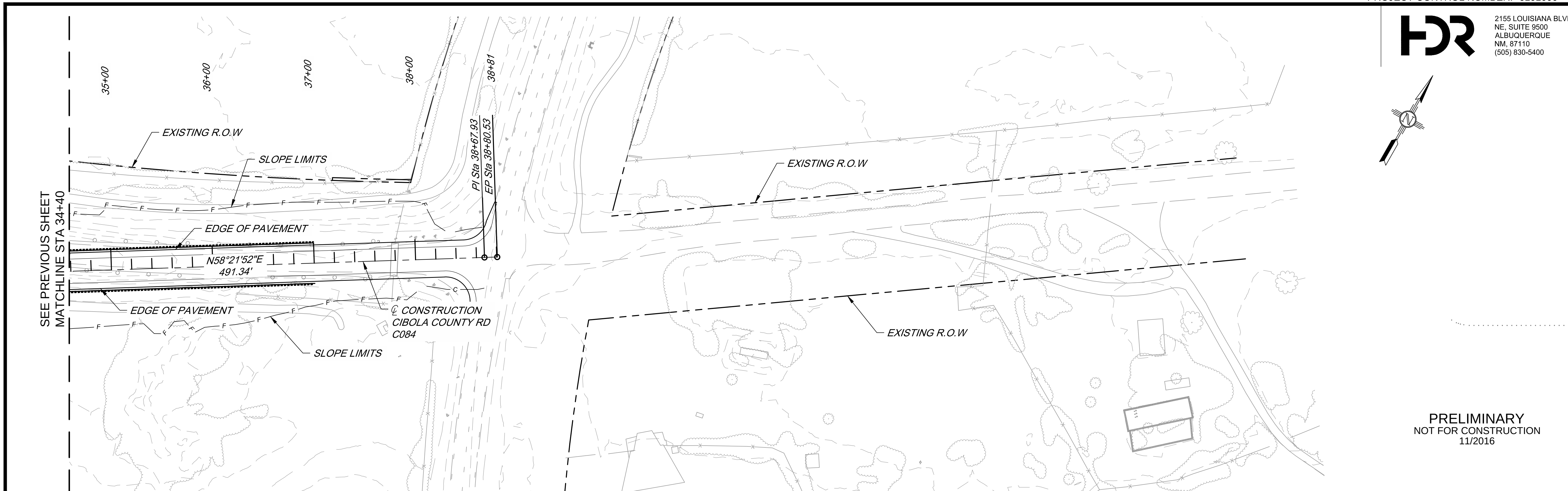


ALTERNATIVE B

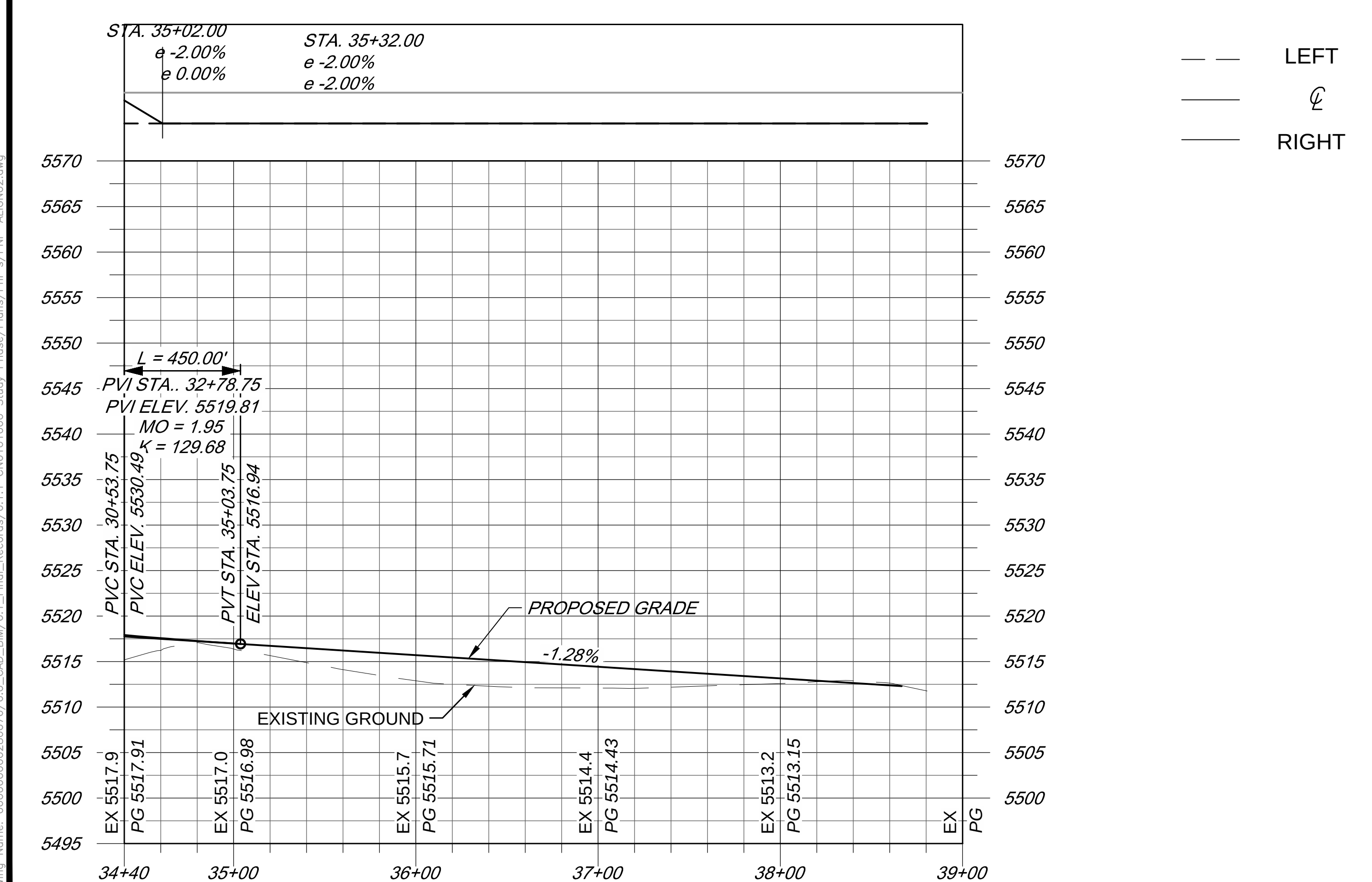
HDR
2155 LOUISIANA BLVD
NE, SUITE 9500
ALBUQUERQUE
NM, 87110
(505) 830-5400



PRELIMINARY
NOT FOR CONSTRUCTION
11/2016

ALTERNATIVE B

HORIZONTAL SCALE: 1"=100' VERTICAL SCALE: 1"=20'



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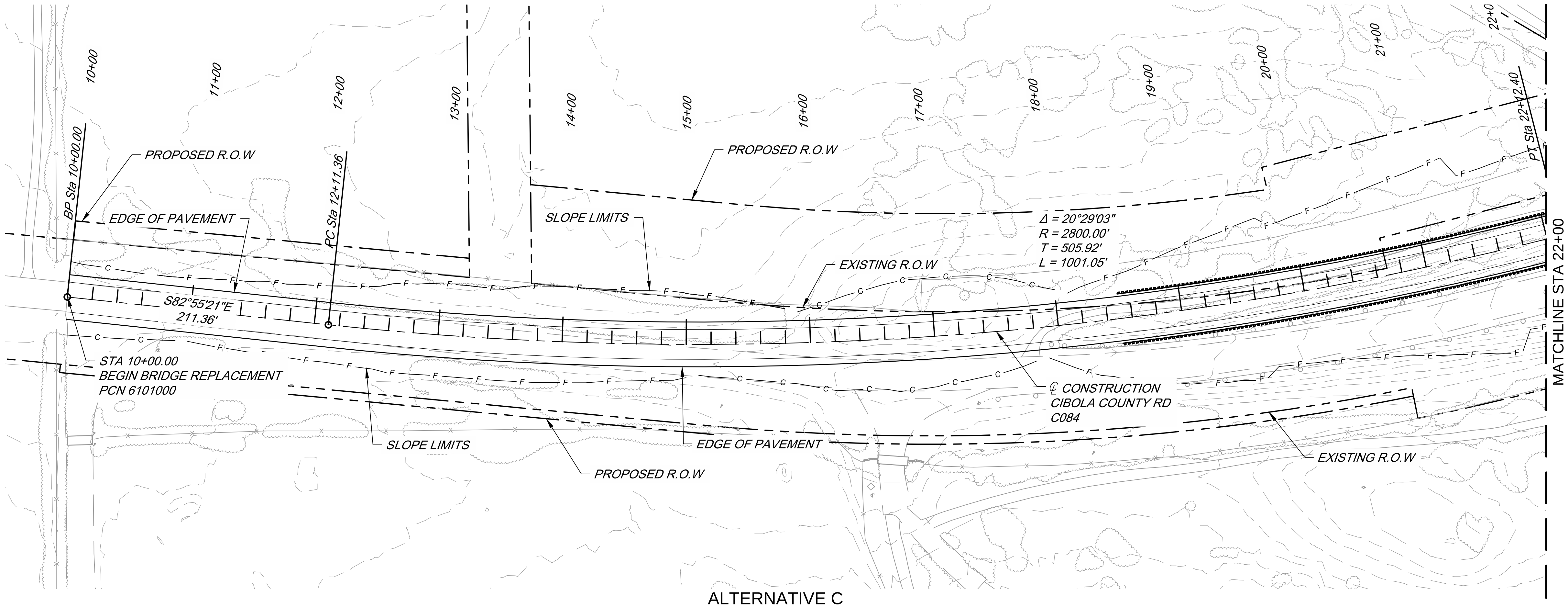
HDR
2155 LOUISIANA BLVD
NE, SUITE 9500
ALBUQUERQUE
NM, 87110
(505) 830-5400



PRELIMINARY
NOT FOR CONSTRUCTION
11/2016

ALTERNATIVE C

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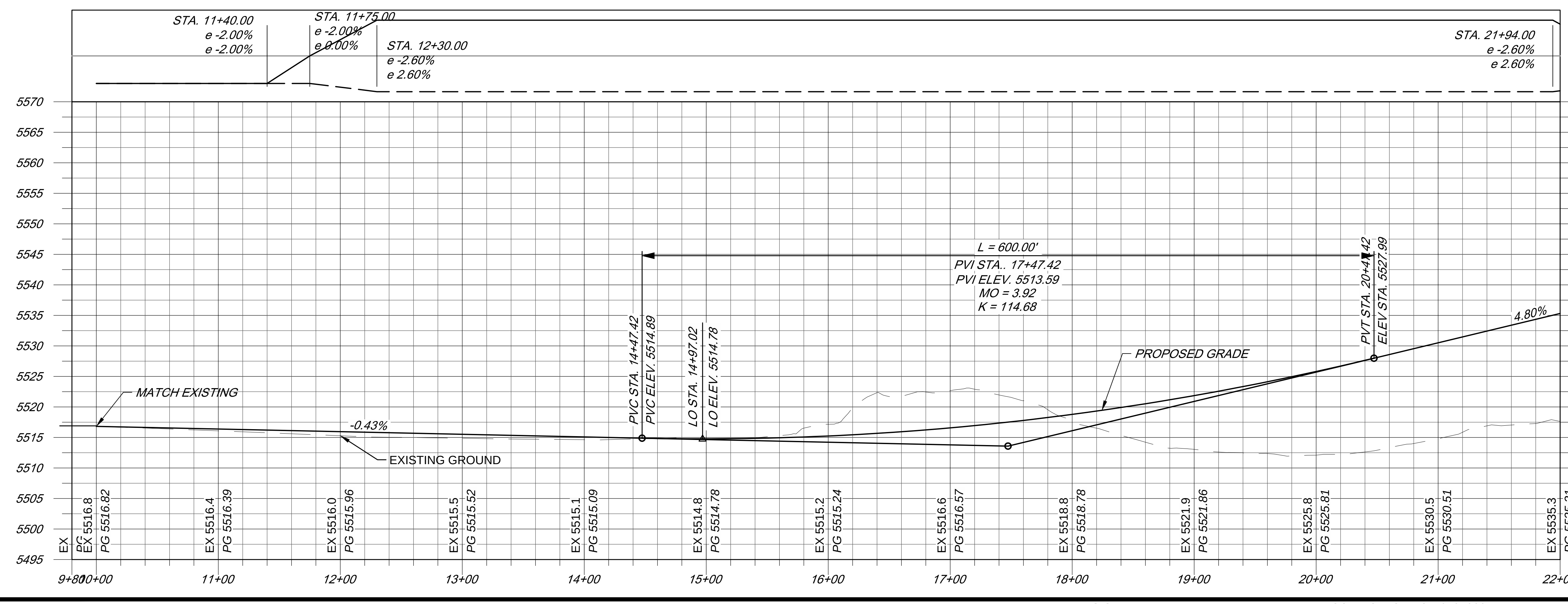

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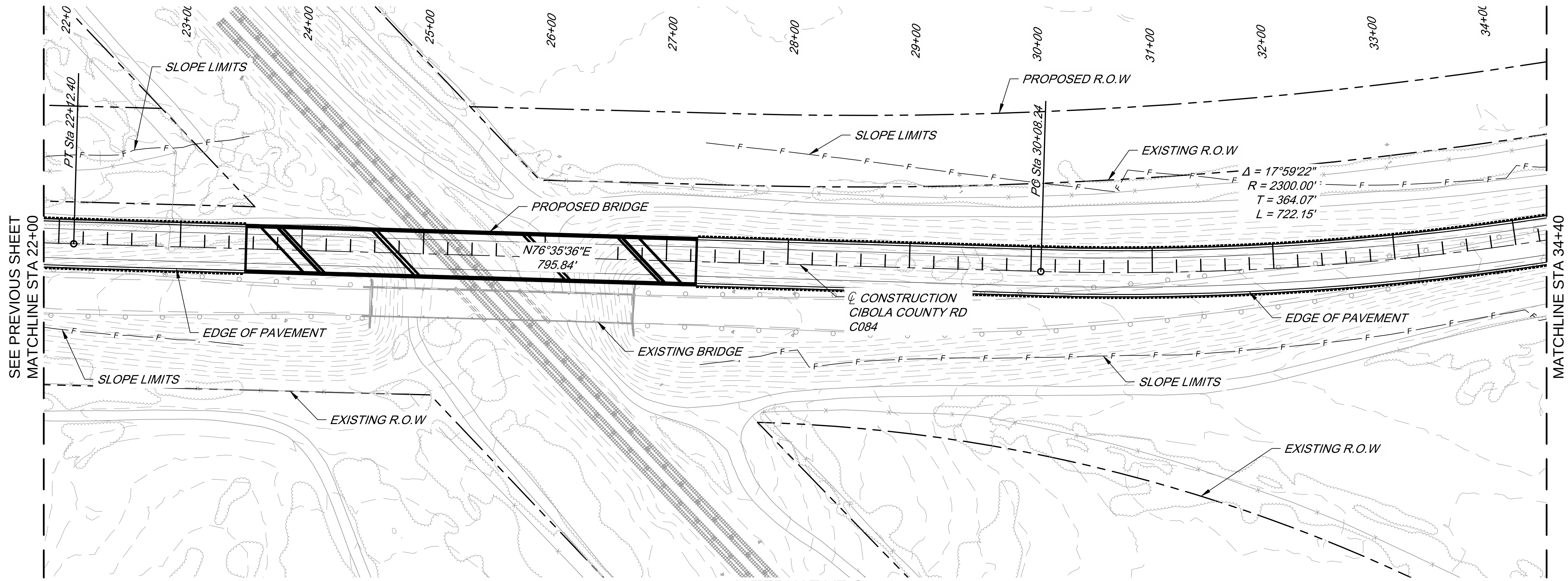
PROJECT CONTROL NUMBER: 6101000

HDR
2155 LOUISIANA BLVD
NE, SUITE 9500
ALBUQUERQUE
NM, 87110
(505) 830-5400



PRELIMINARY
NOT FOR CONSTRUCTION
11/2016

ALTERNATIVE C

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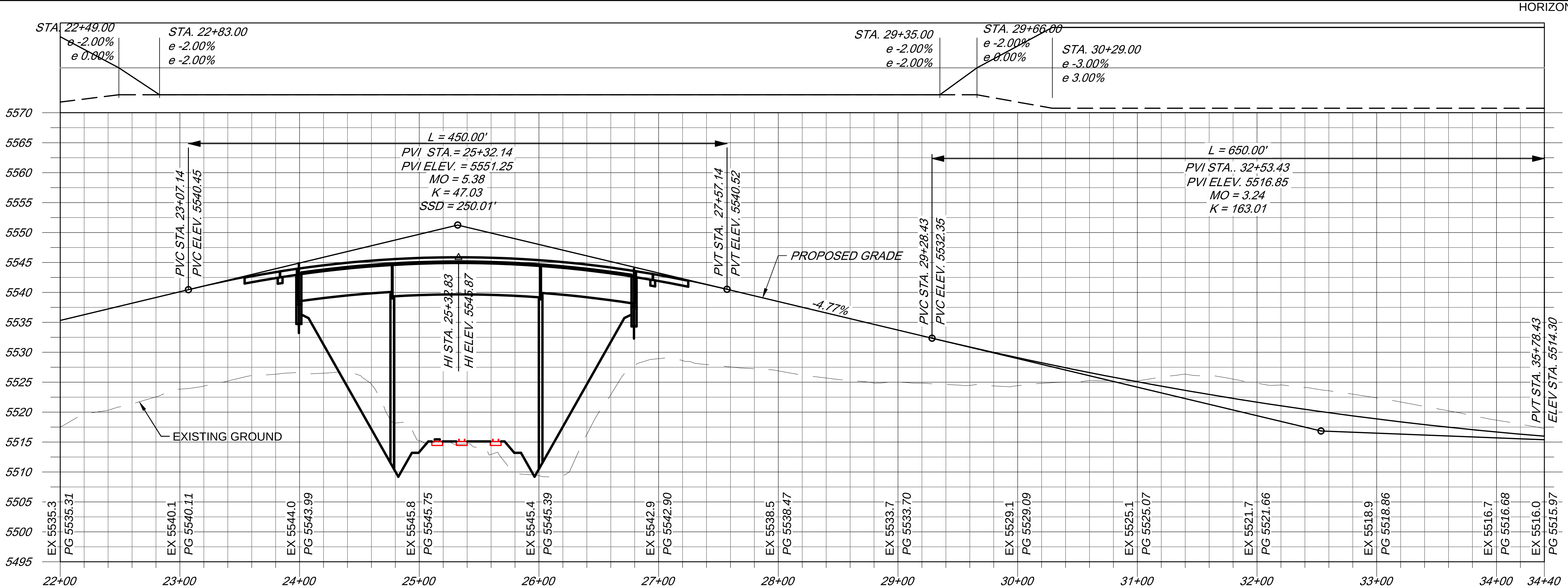


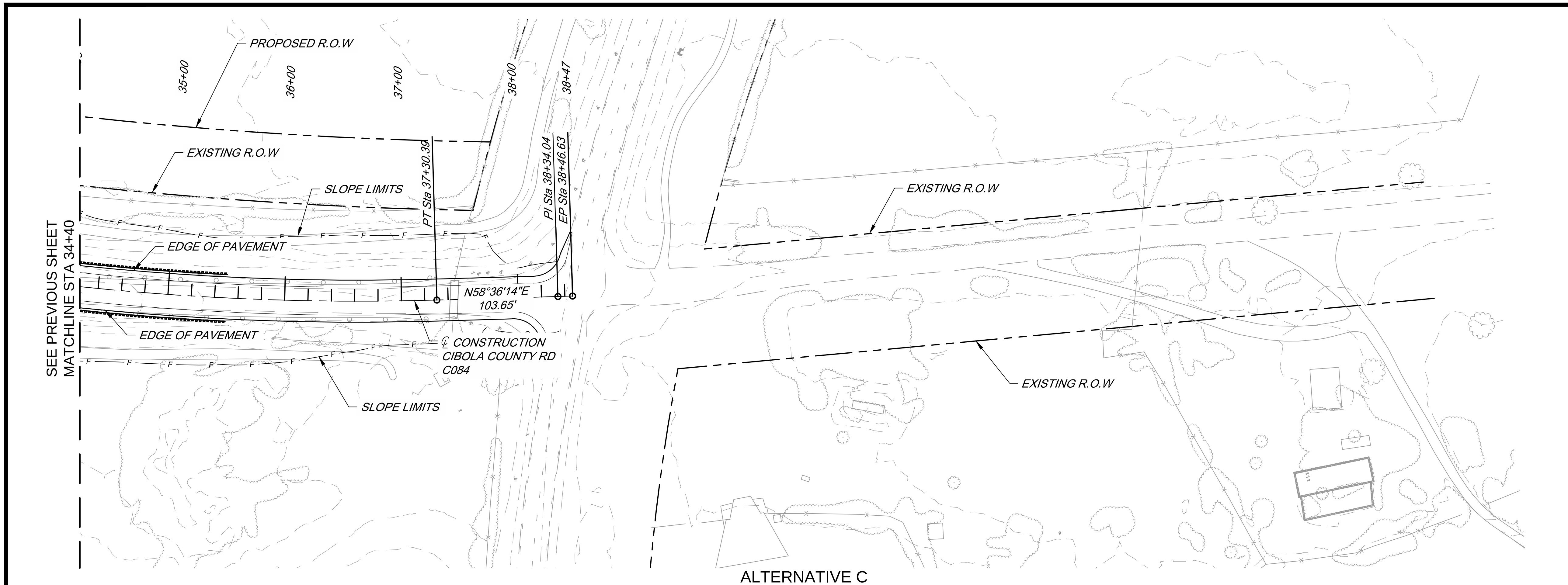
— — LEFT
——— ℄
——— RIGHT

ALTERNATIVE C

Date: 20 Oct 2016 – 3:44pm User: ANUNEZTO Layout: RD-PNP02

DESIGNED BY: ANT
NEW MEXICO PROJECT NO. 6101000
SHEET NO. 3 - 2

HDR
2155 LOUISIANA BLVD
NE, SUITE 9500
ALBUQUERQUE
NM, 87110
(505) 830-5400



PRELIMINARY
NOT FOR CONSTRUCTION
11/2016

ALTERNATIVE C

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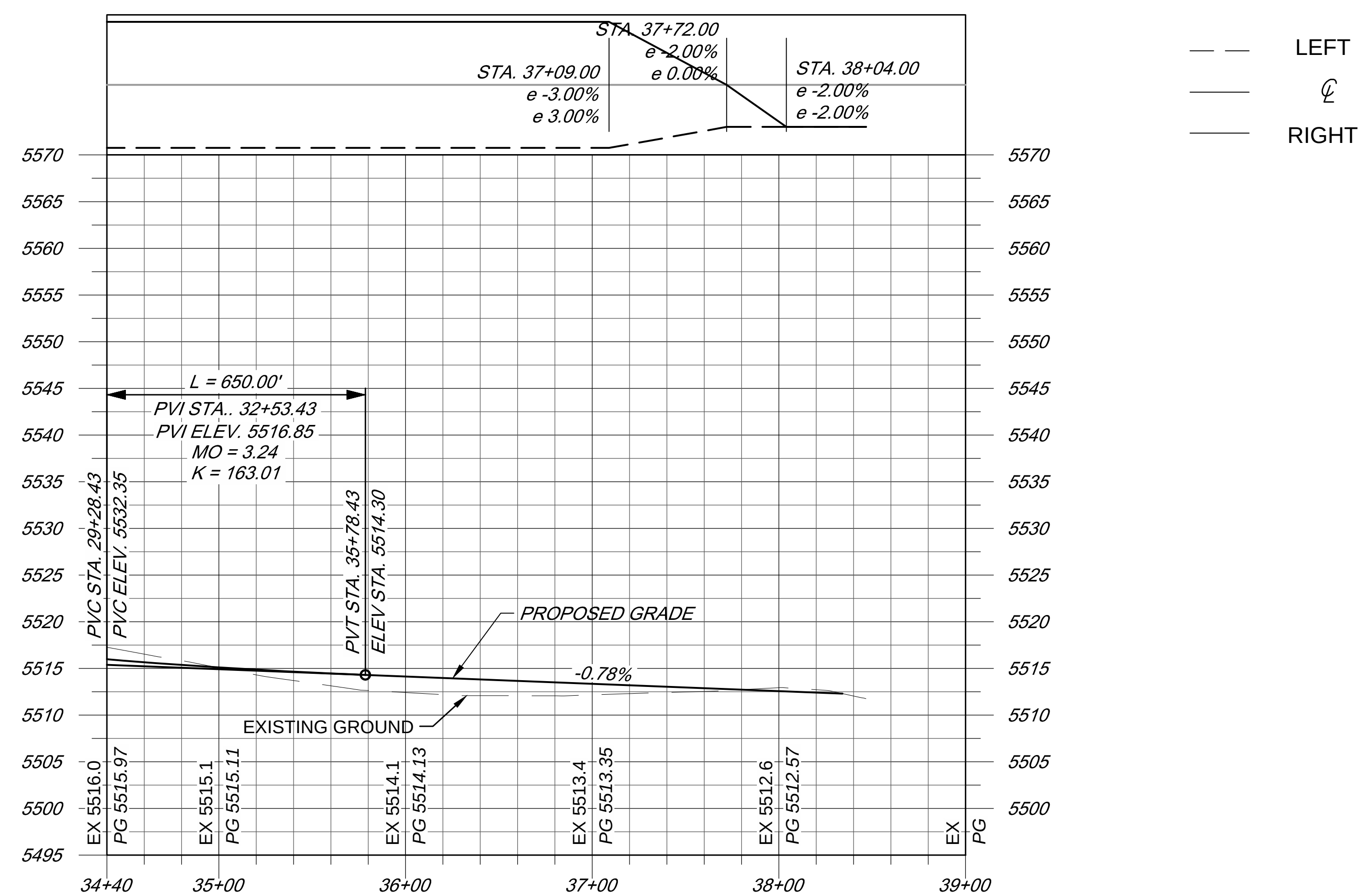
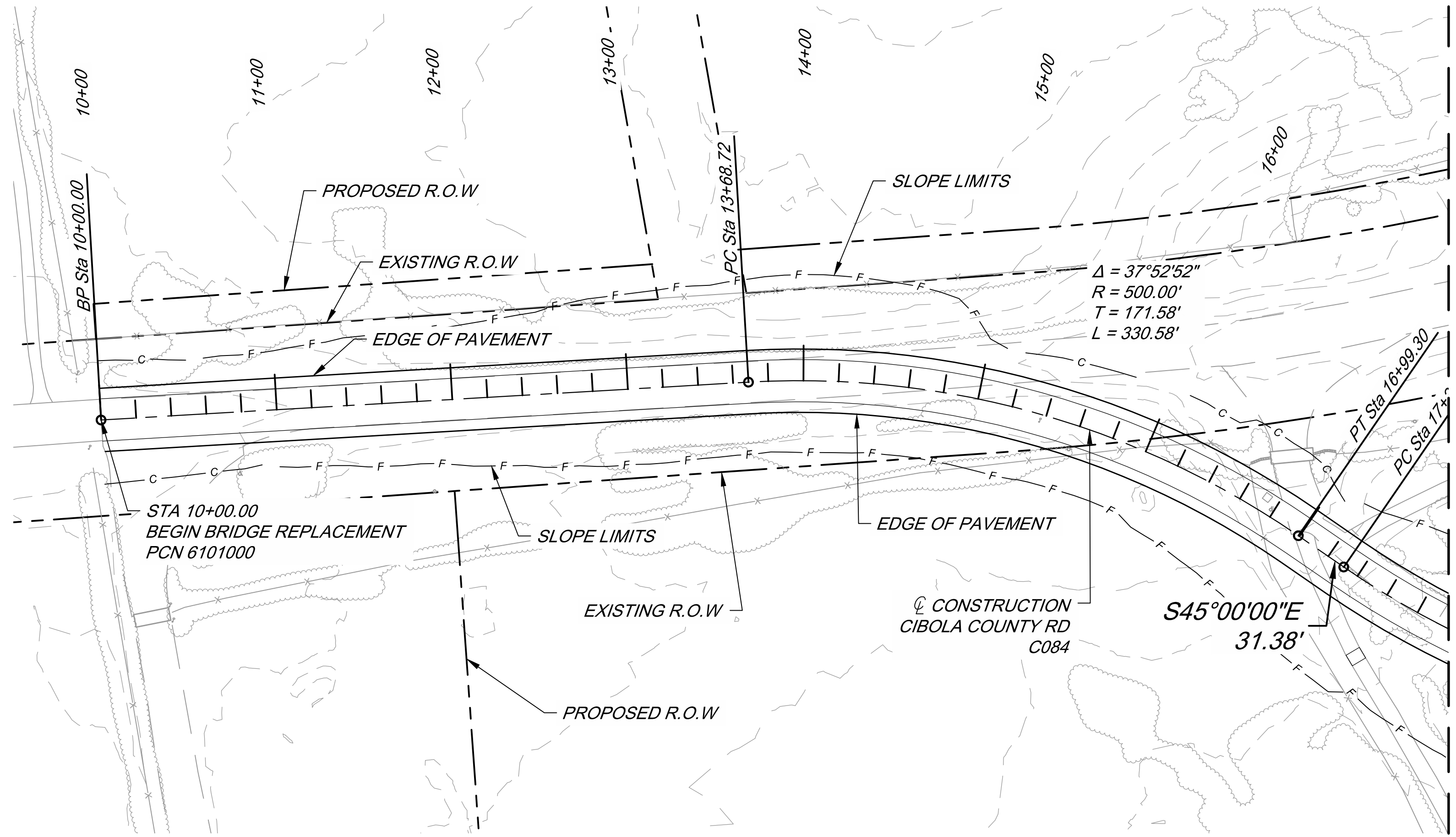


ALTERNATIVE C

HDR
2155 LOUISIANA BLVD
NE, SUITE 9500
ALBUQUERQUE
NM, 87110
(505) 830-5400



PRELIMINARY
NOT FOR CONSTRUCTION
11/2016

ALTERNATIVE D

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— — LEFT
—— ℄
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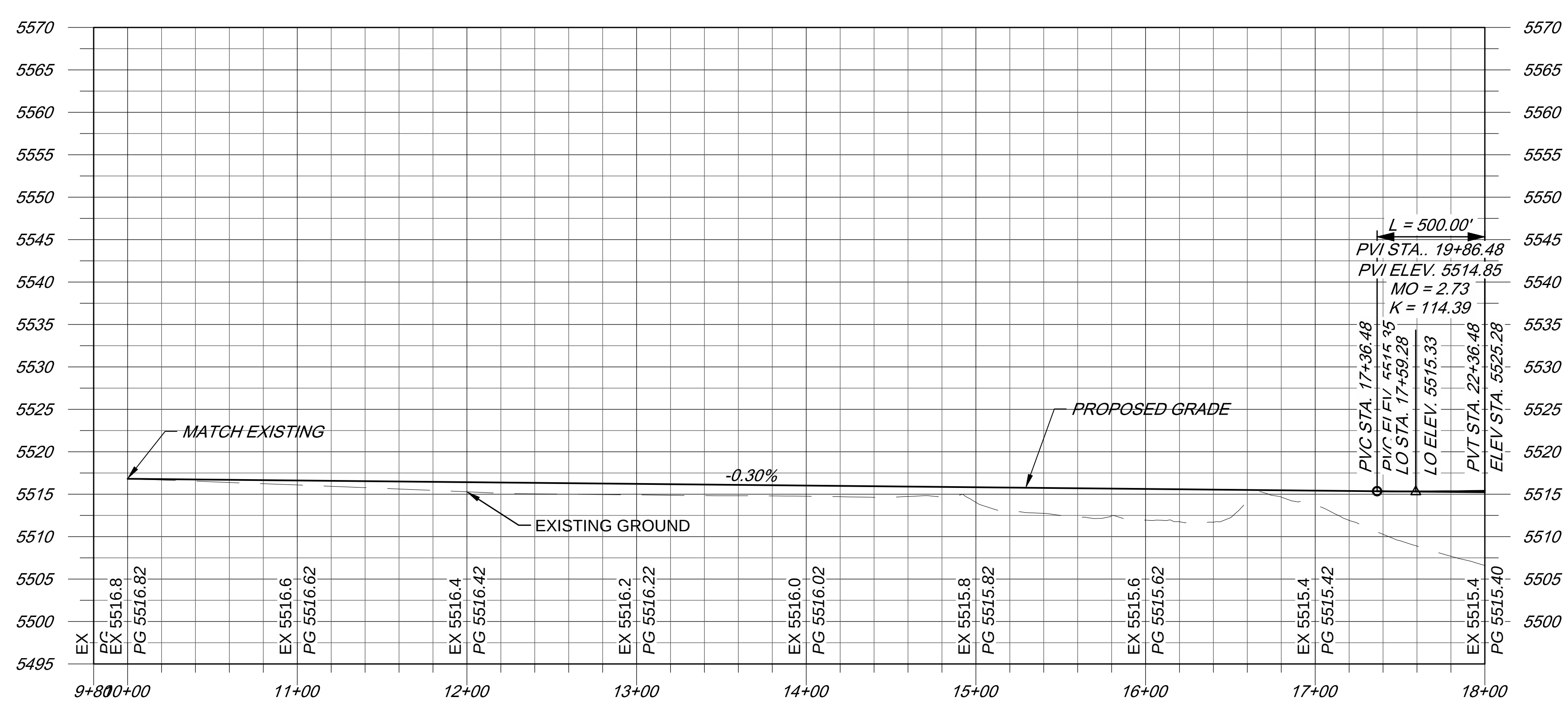

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HDR
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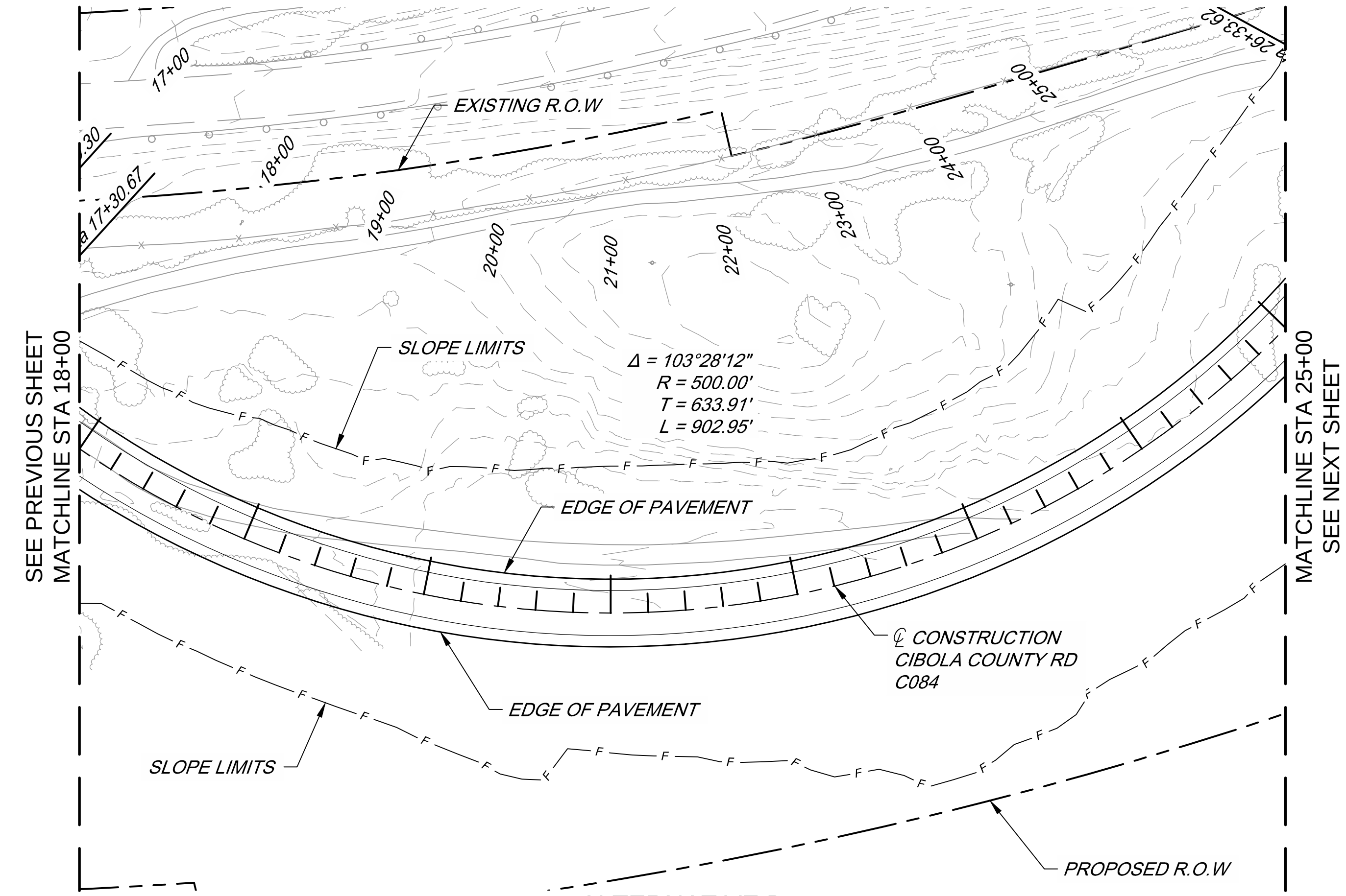
NE, SUITE 9500
ALBUQUERQUE
NM, 87110
(505) 830-5400

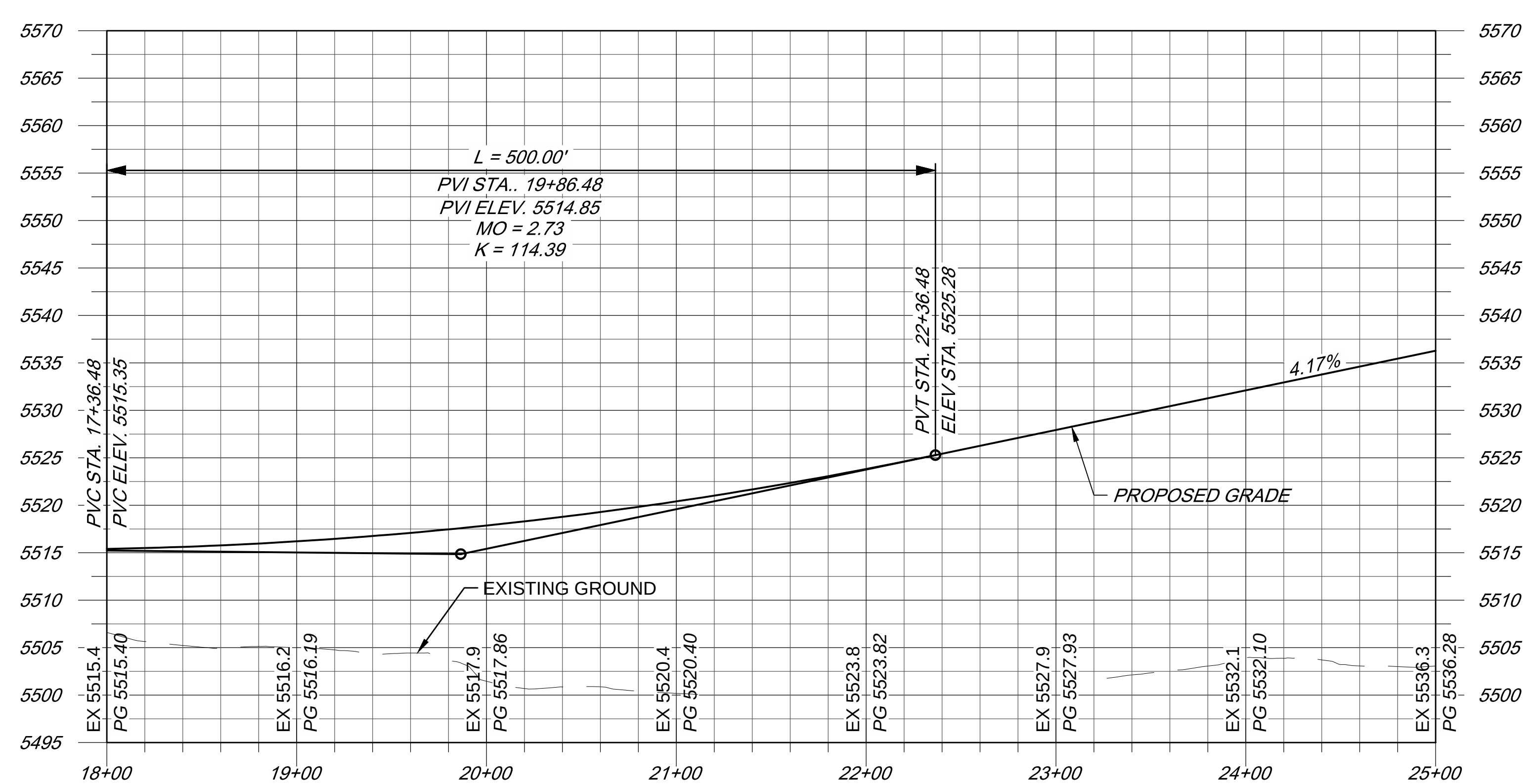


ALTERNATIVE D

PRELIMINARY
NOT FOR CONSTRUCTION
11/2016

HORIZONTAL SCALE: 1"=100' VERTICAL SCALE: 1"=20'

LEFT
℄
RIGHT



ALTERNATIVE D

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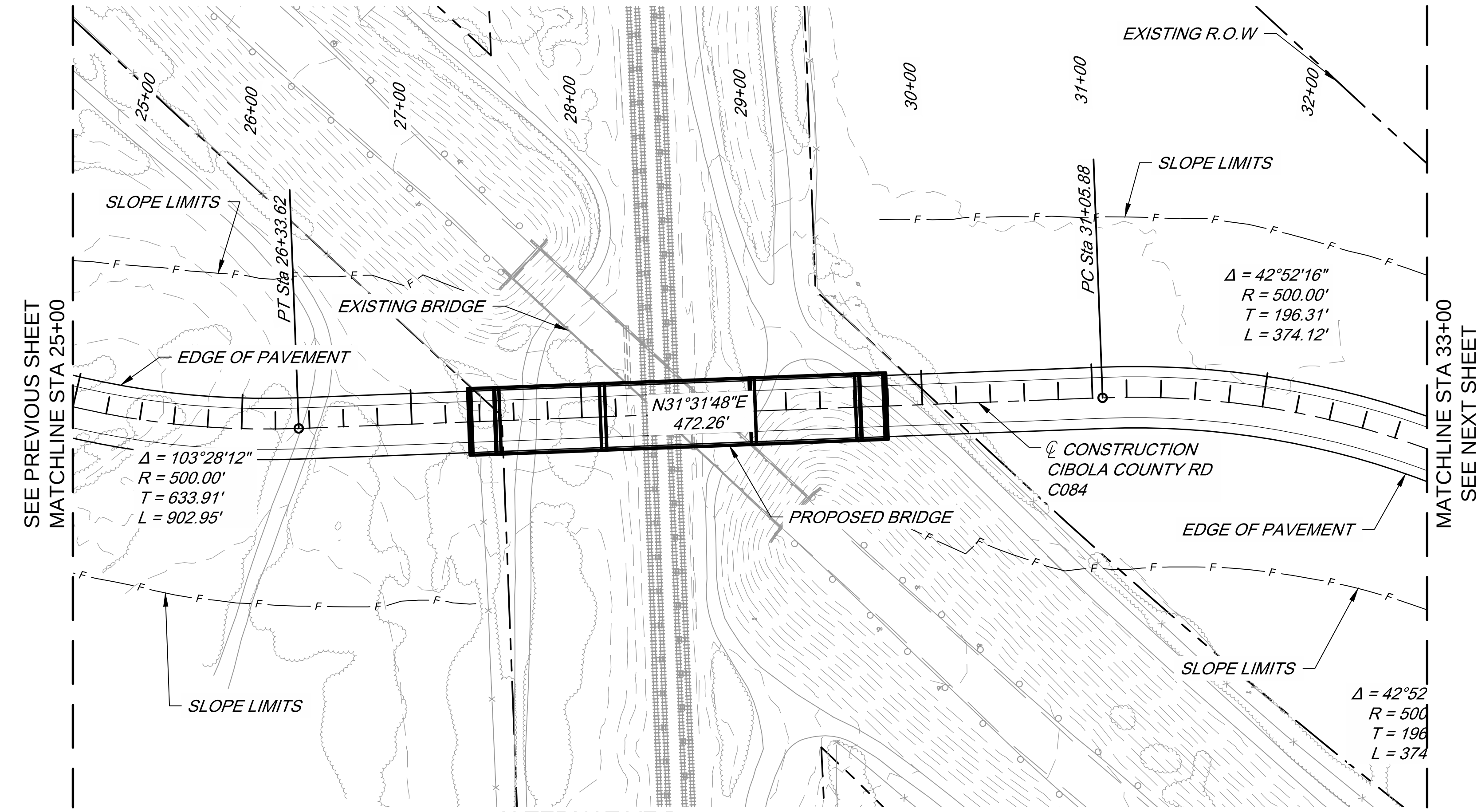
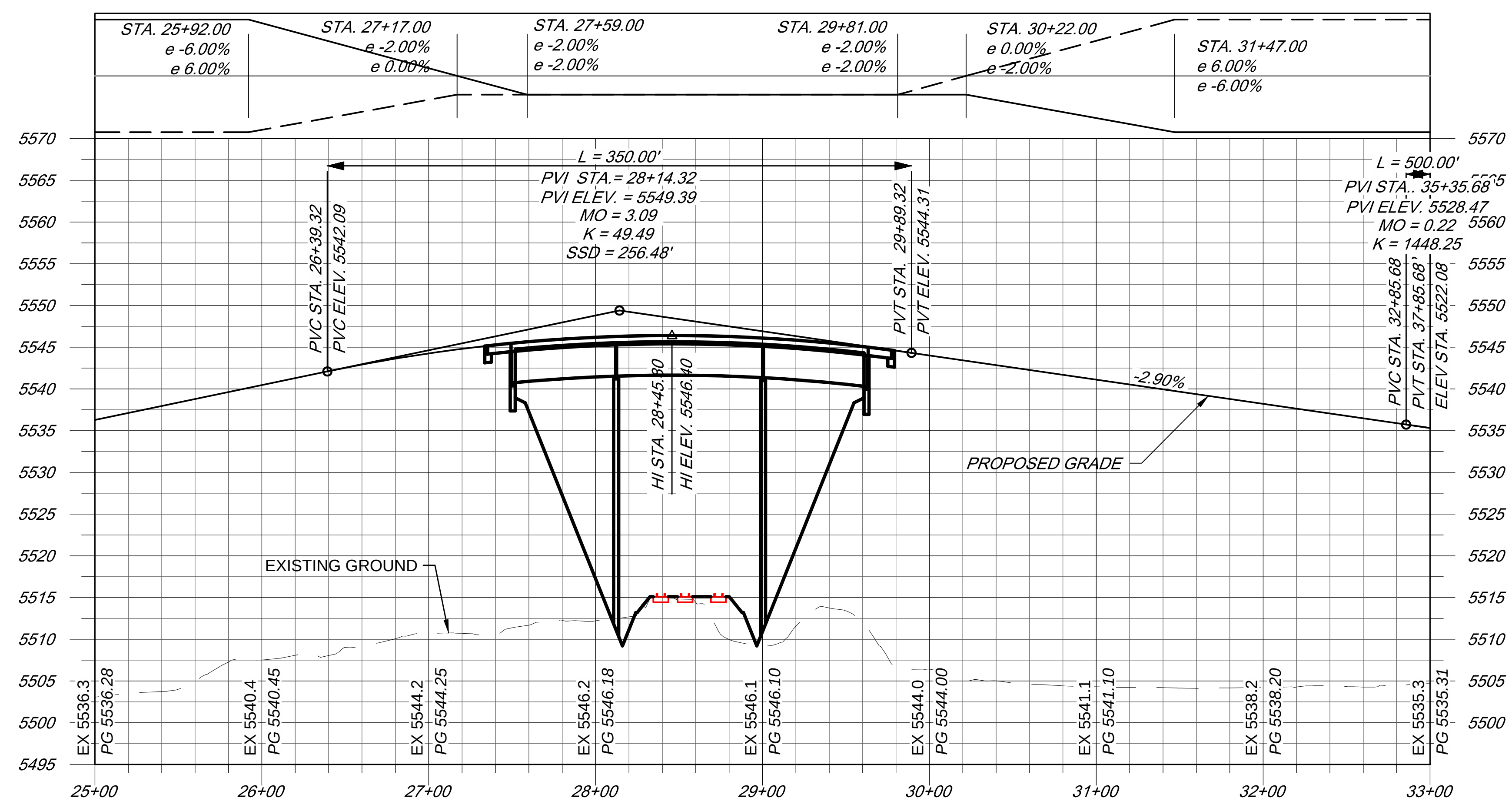
2155 LOUISIANA BLVD
NE, SUITE 9500
ALBUQUERQUE
NM, 87110
(505) 830-5400



ALTERNATIVE D

PRELIMINARY
NOT FOR CONSTRUCTION
11/2016

HORIZONTAL SCALE: 1"=100' VERTICAL SCALE: 1"=20'



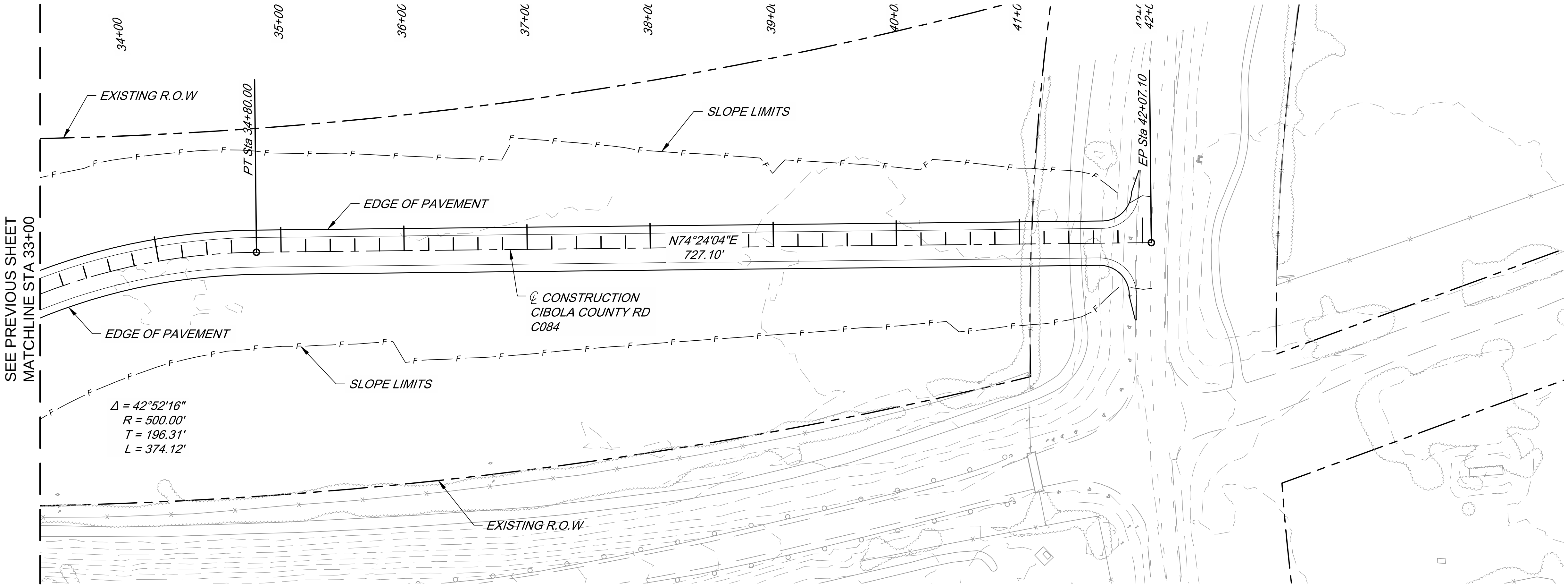
ALTERNATIVE D

DESIGNED BY: ANT

NEW MEXICO PROJECT NO. 6101000

PROJECT CONTROL NUMBER: 6101000

HDR
2155 LOUISIANA BLVD
NE, SUITE 9500
ALBUQUERQUE
NM, 87110
(505) 830-5400



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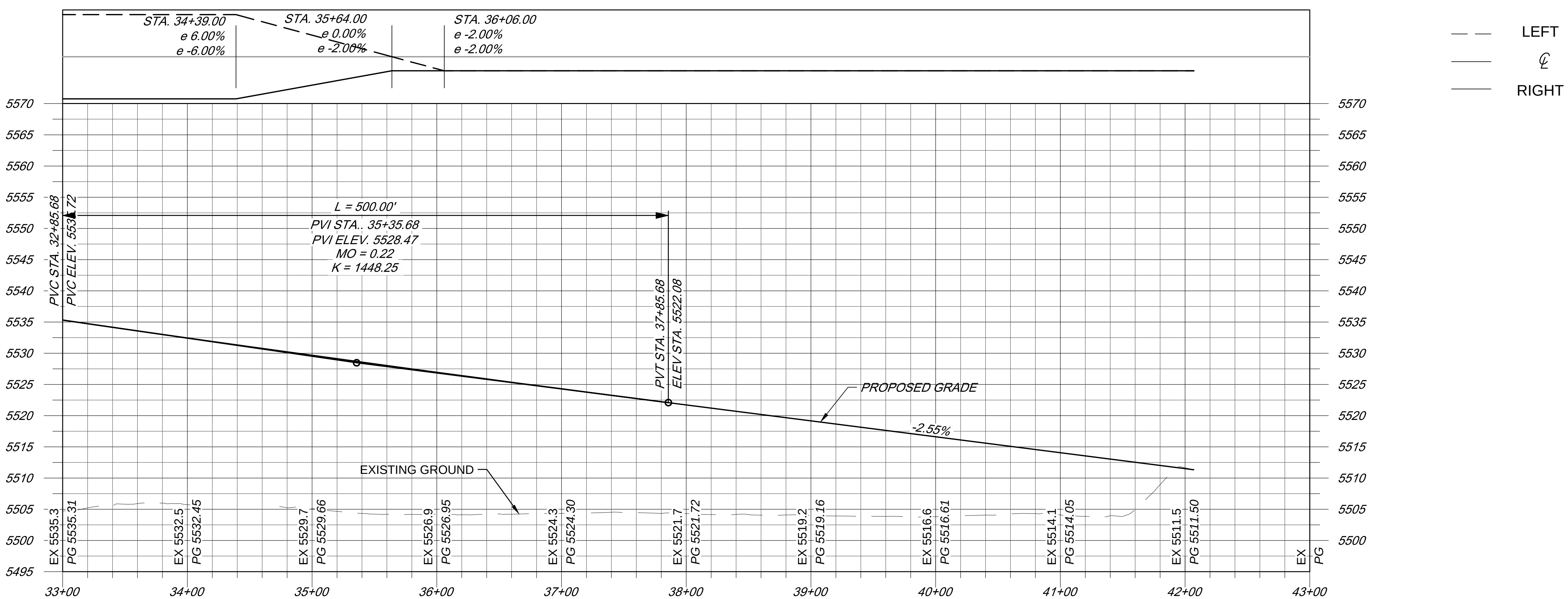

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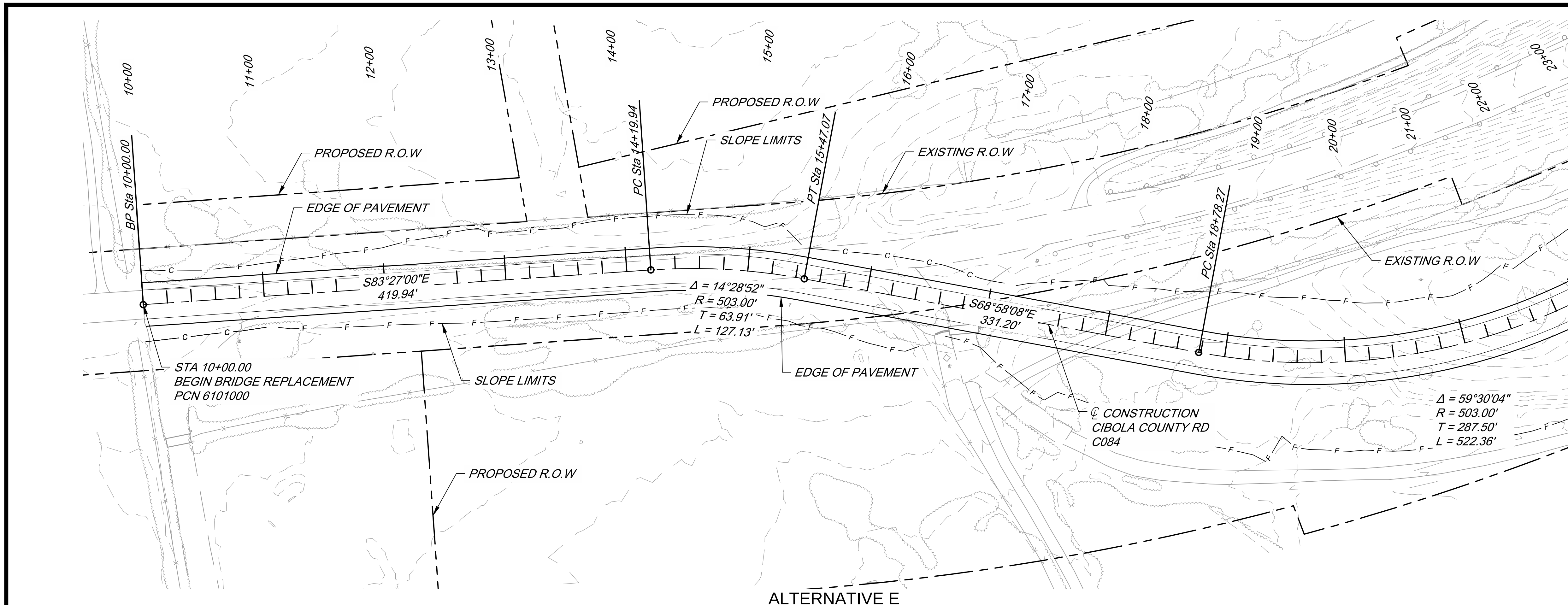

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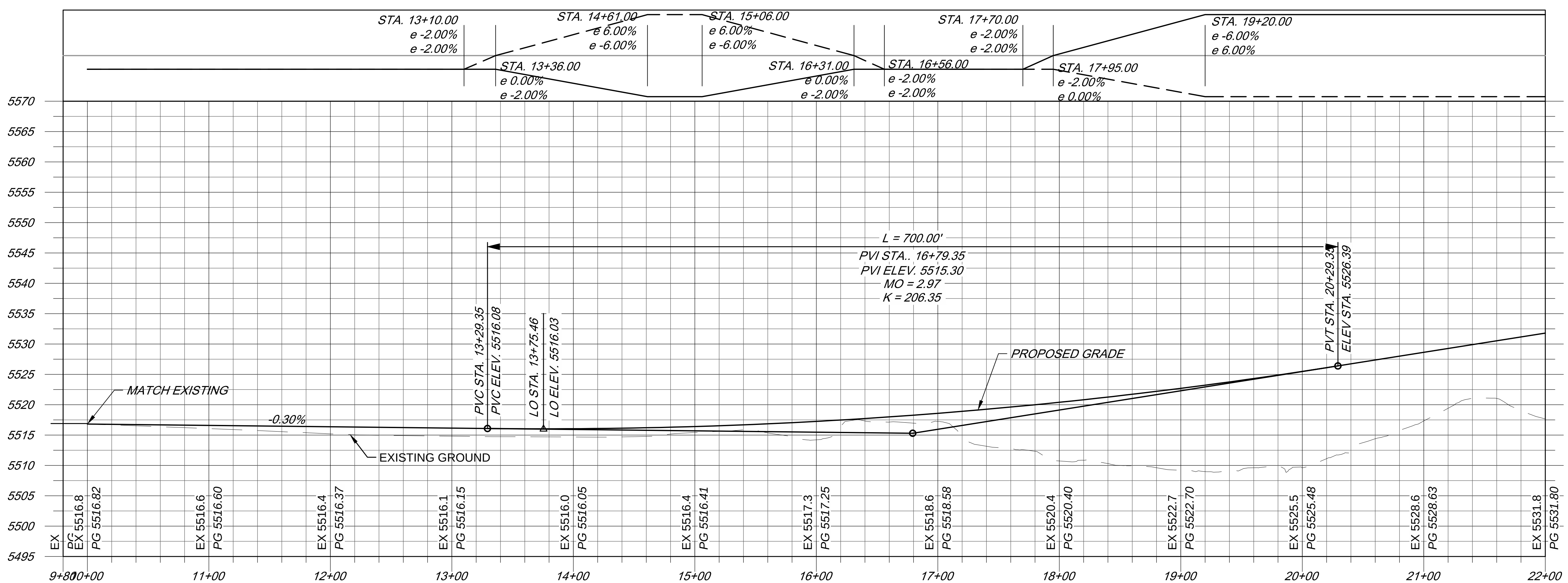

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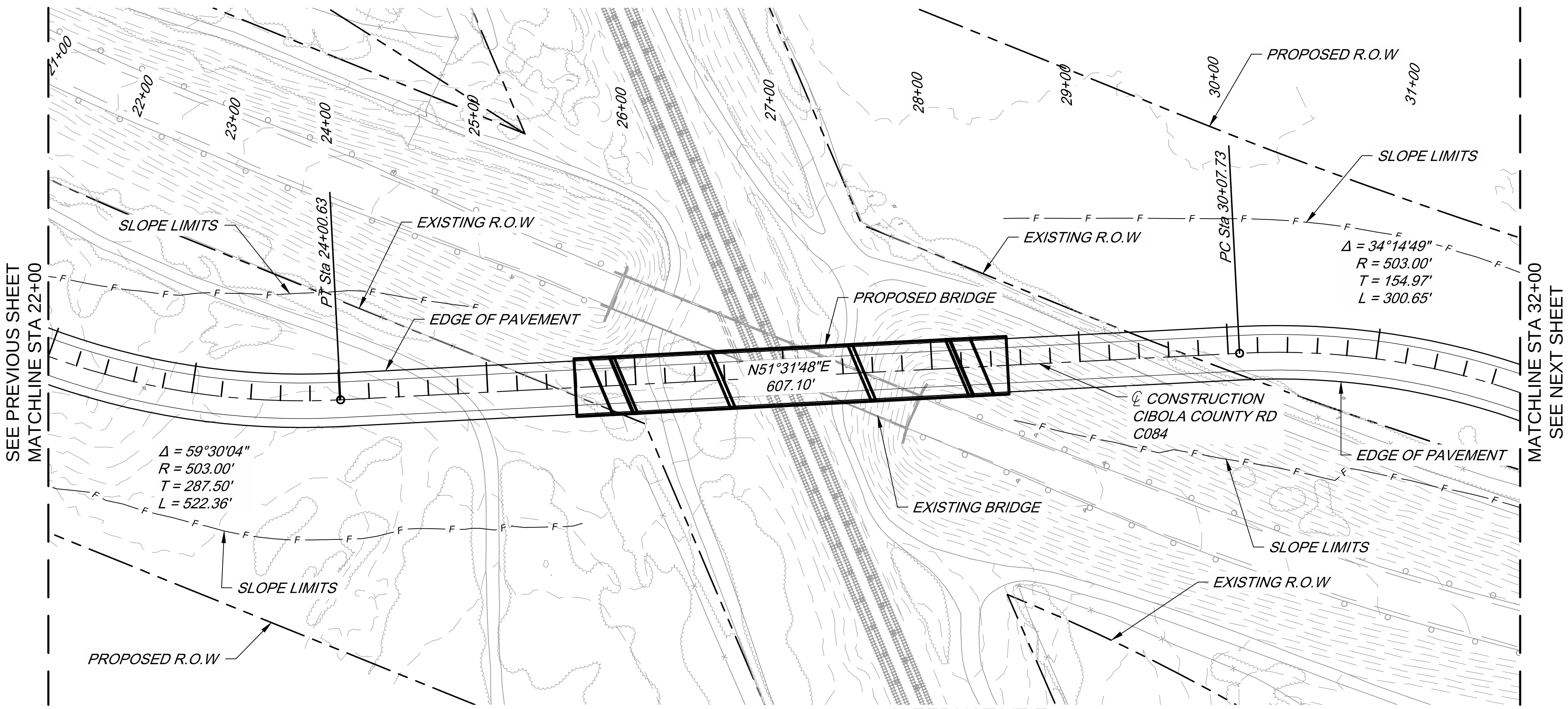

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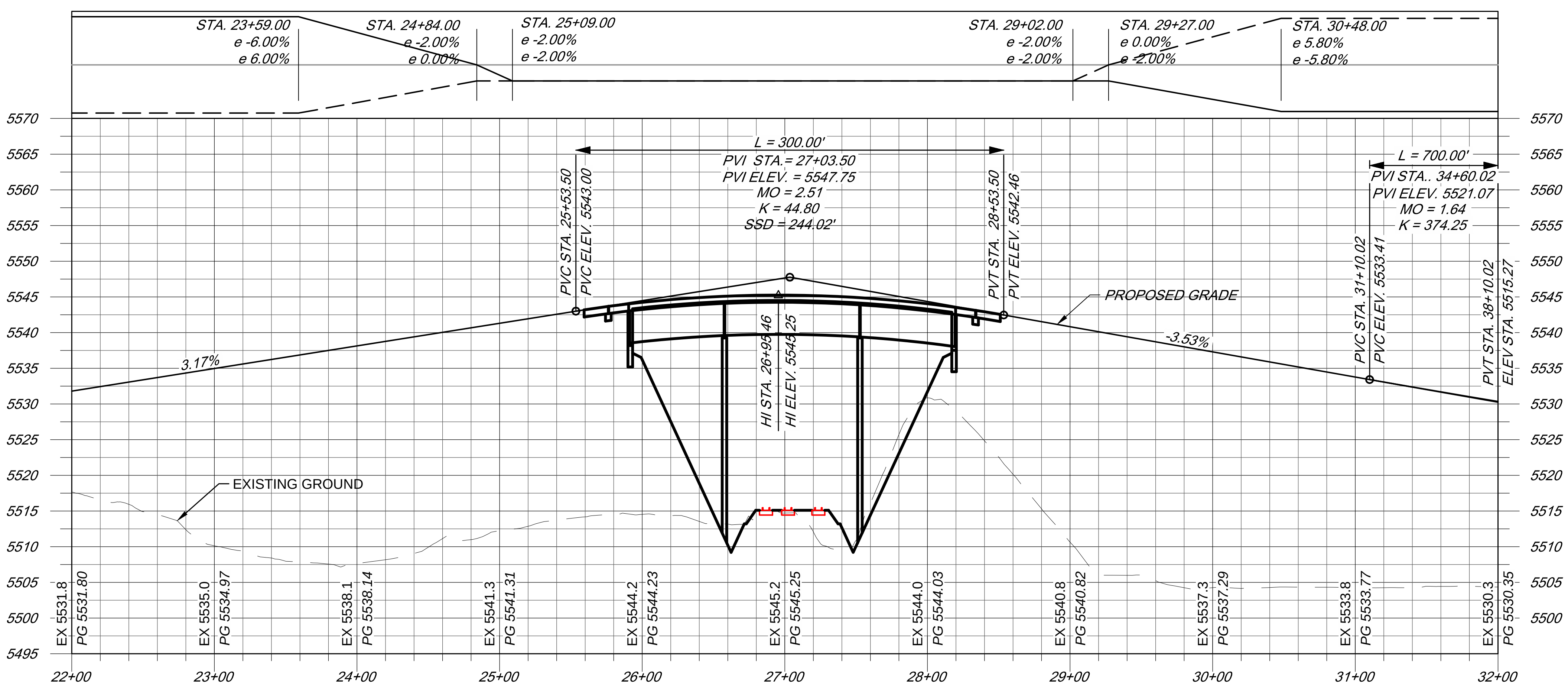

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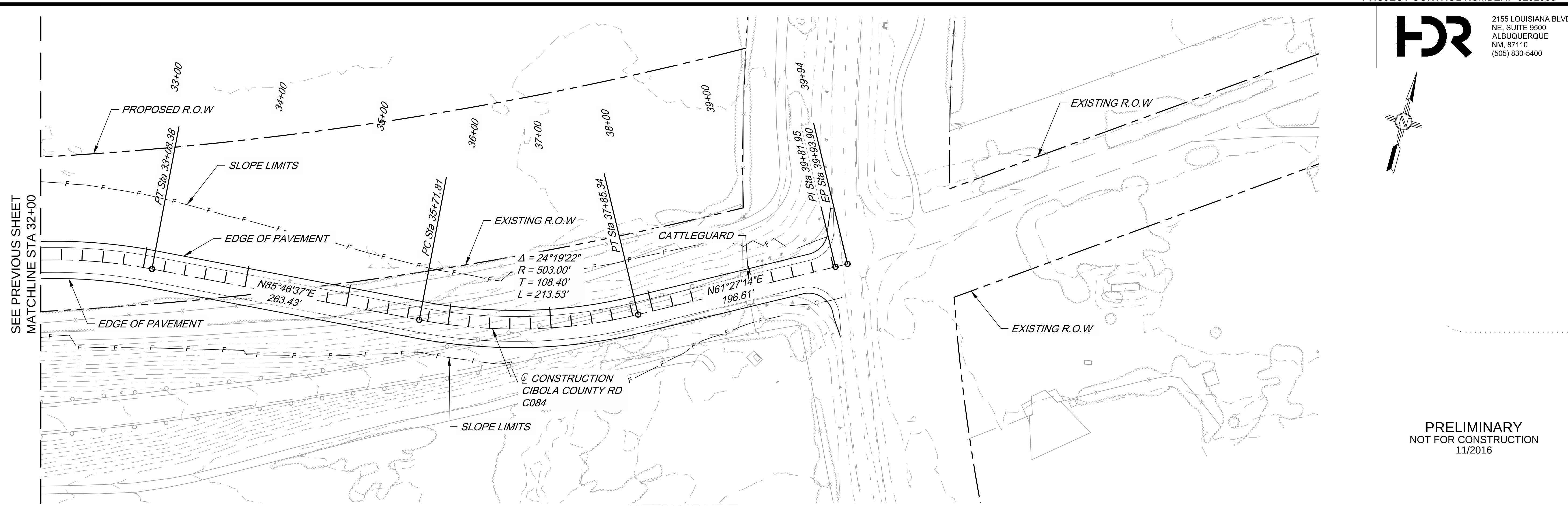

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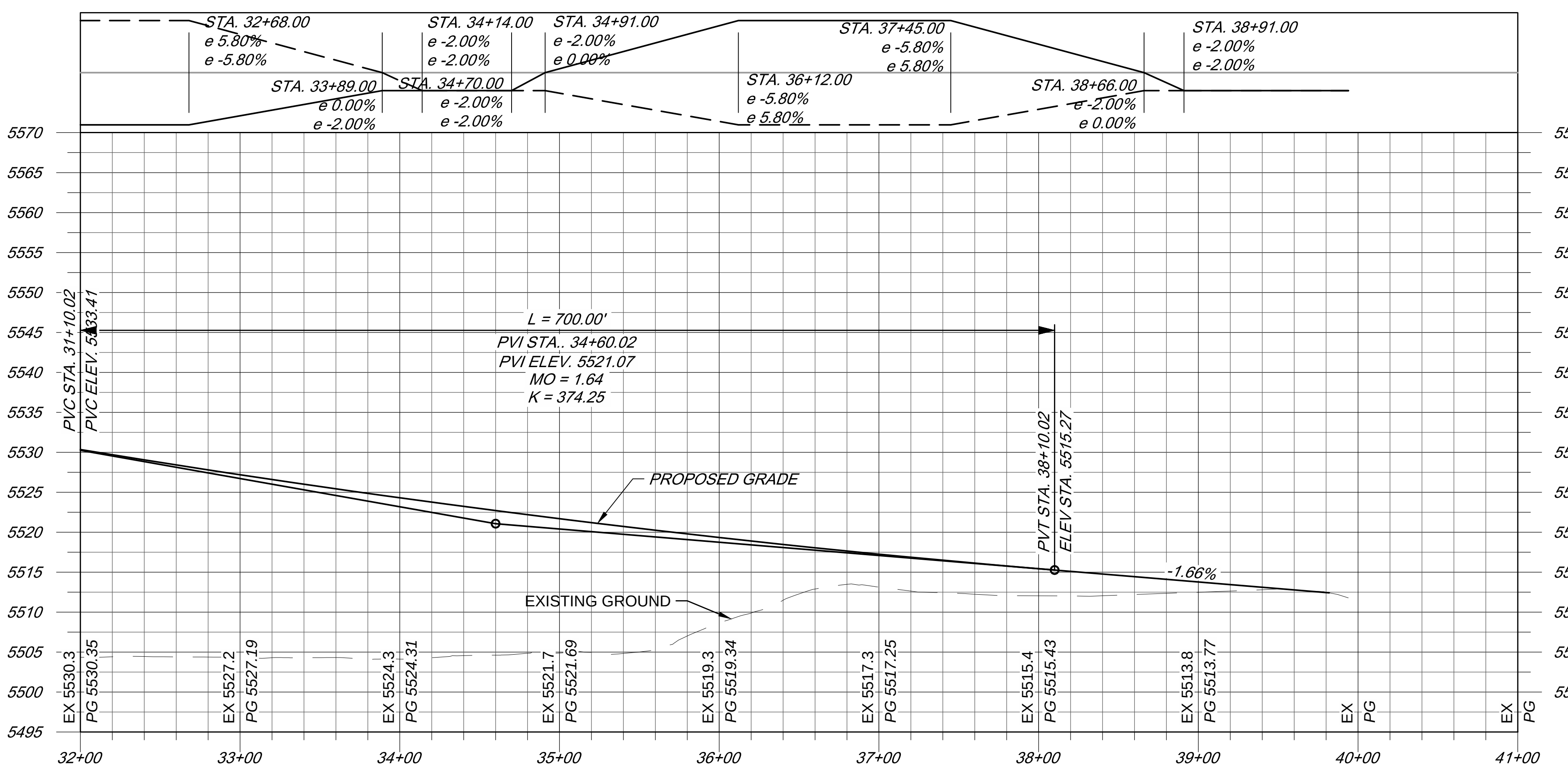

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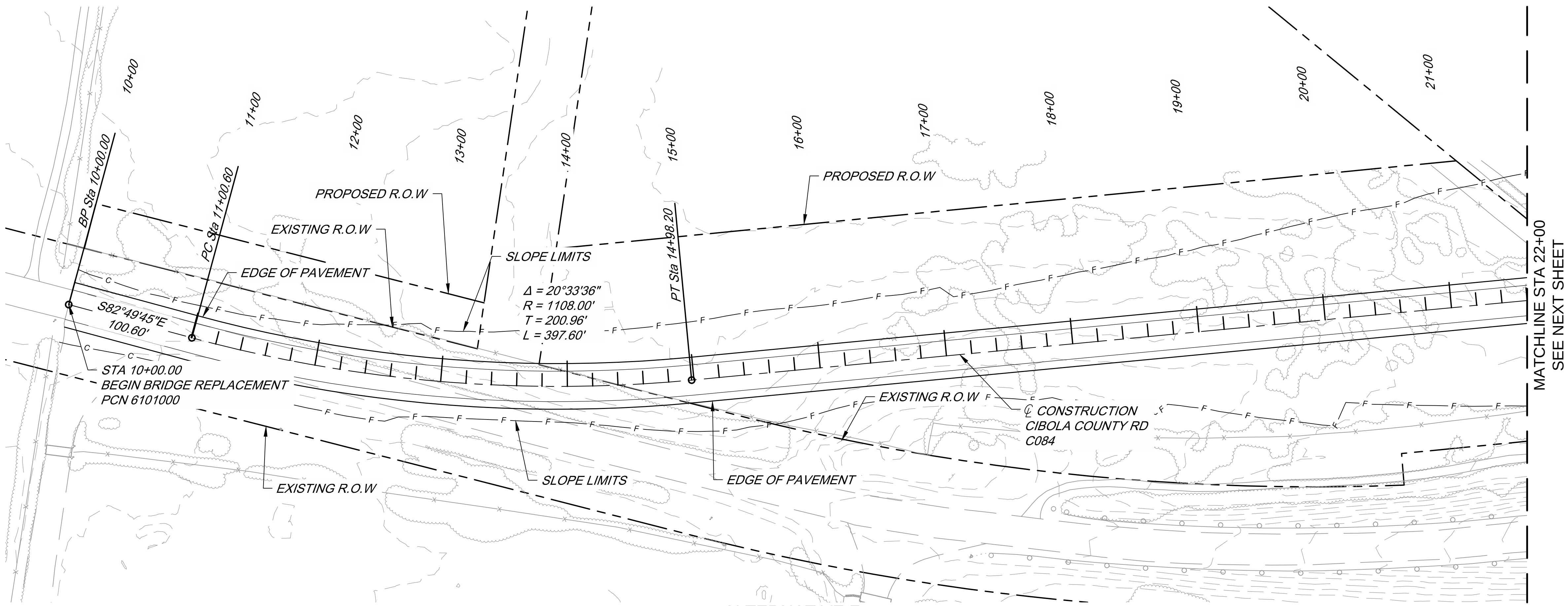

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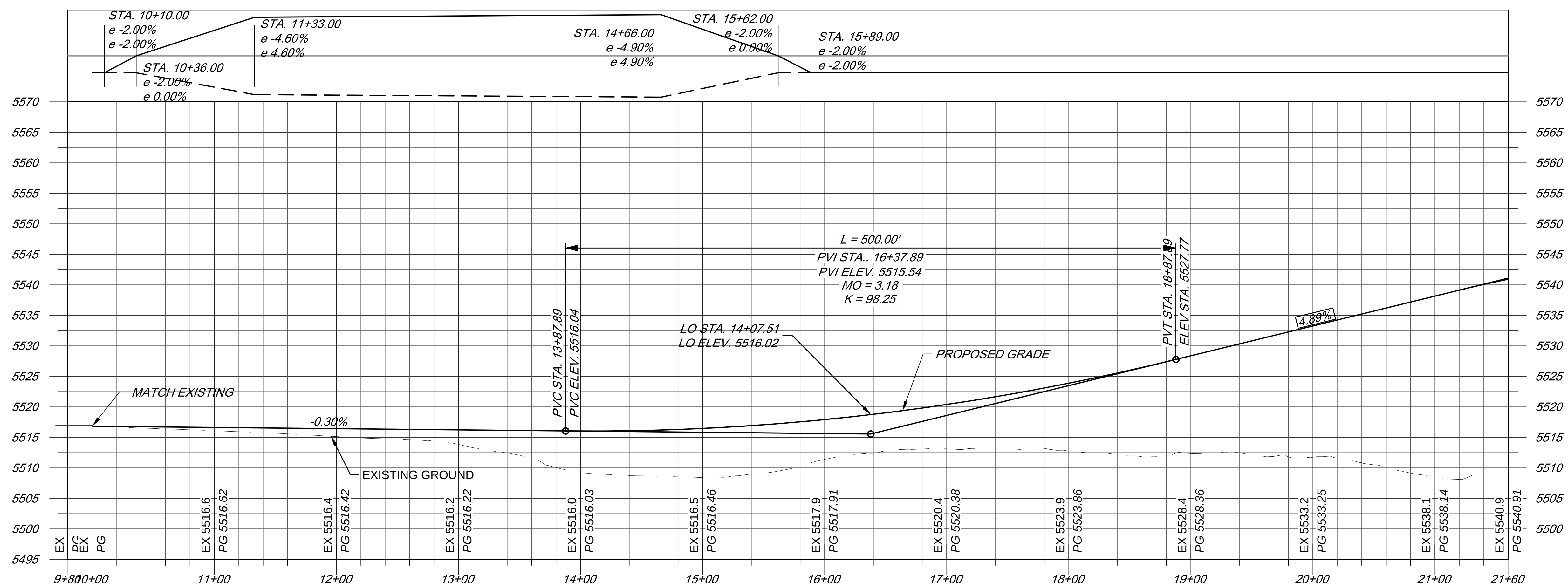

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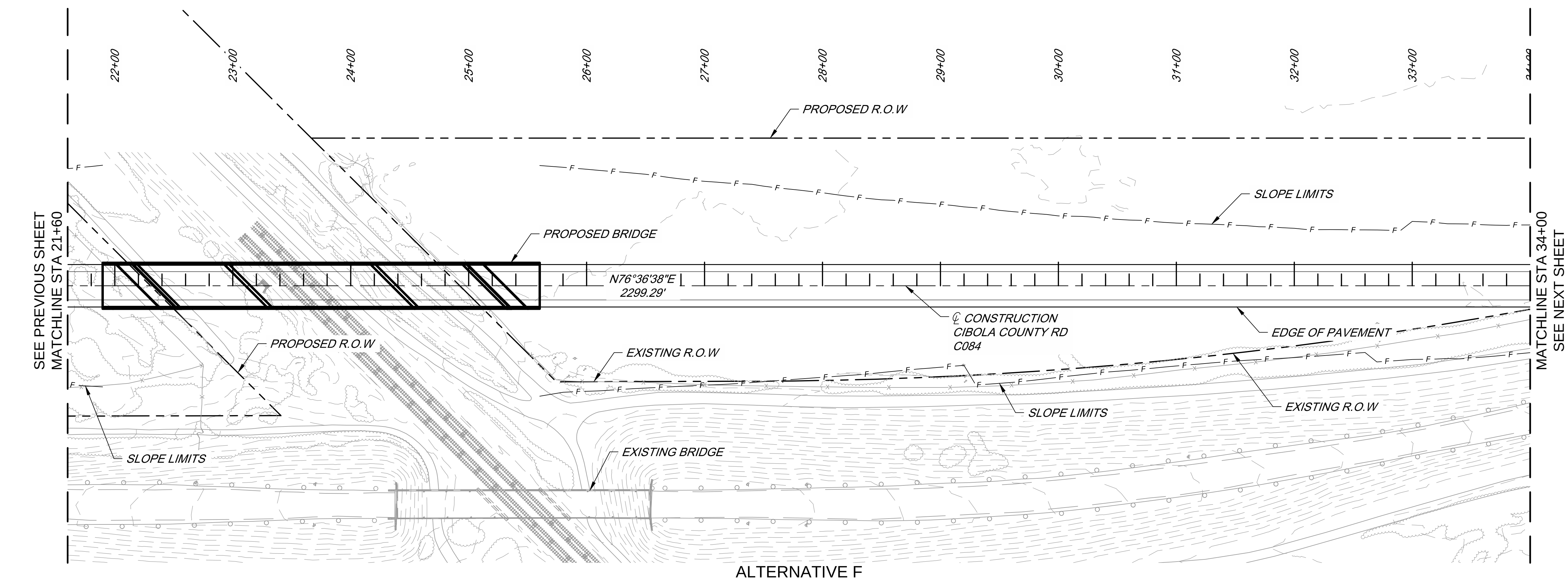

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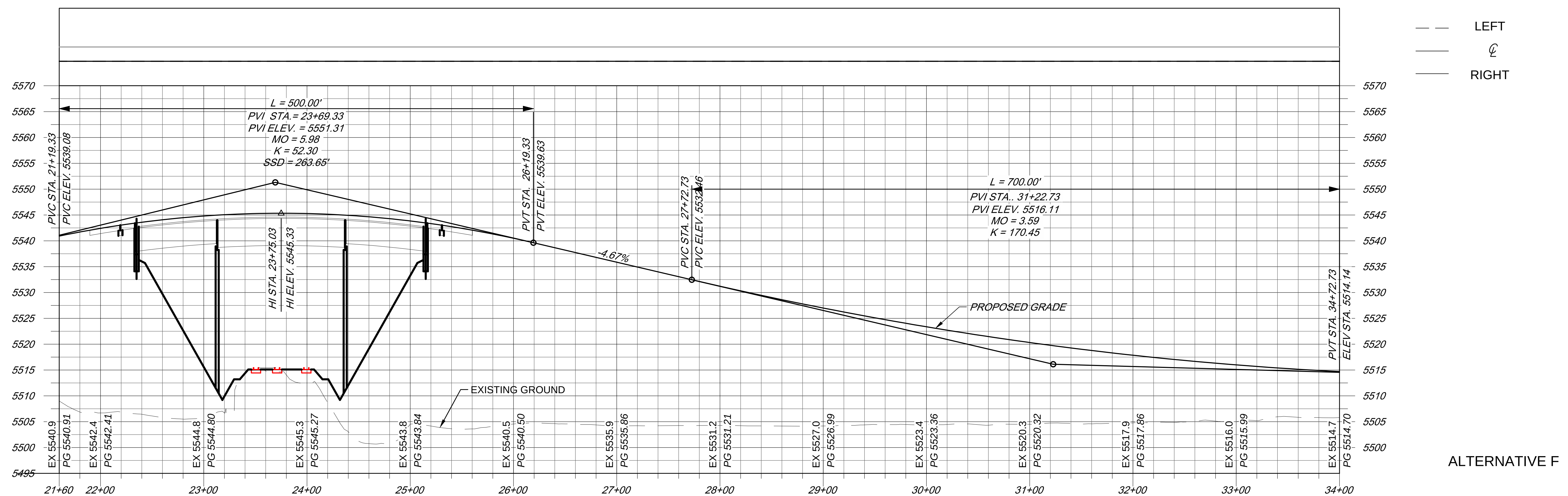

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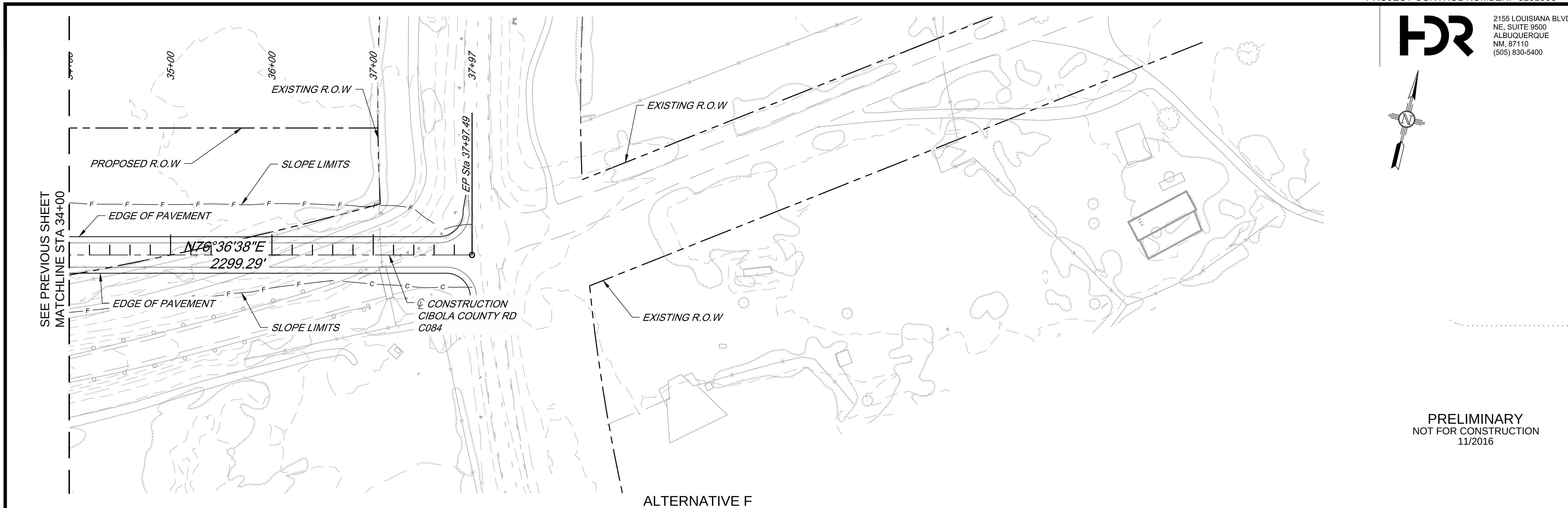

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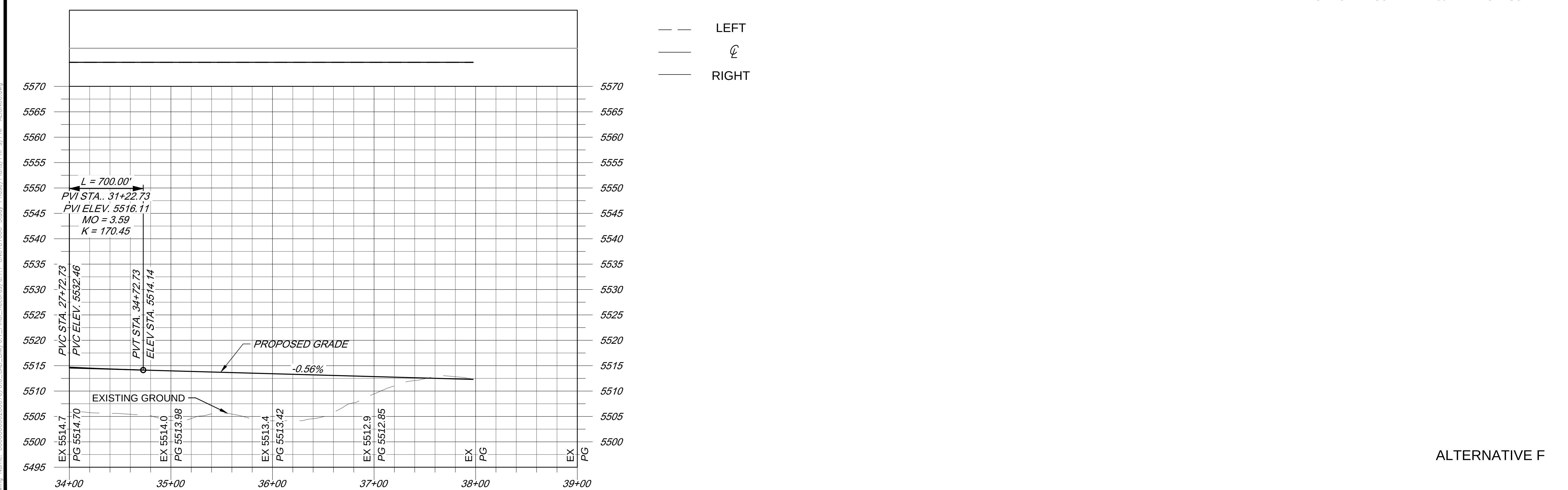

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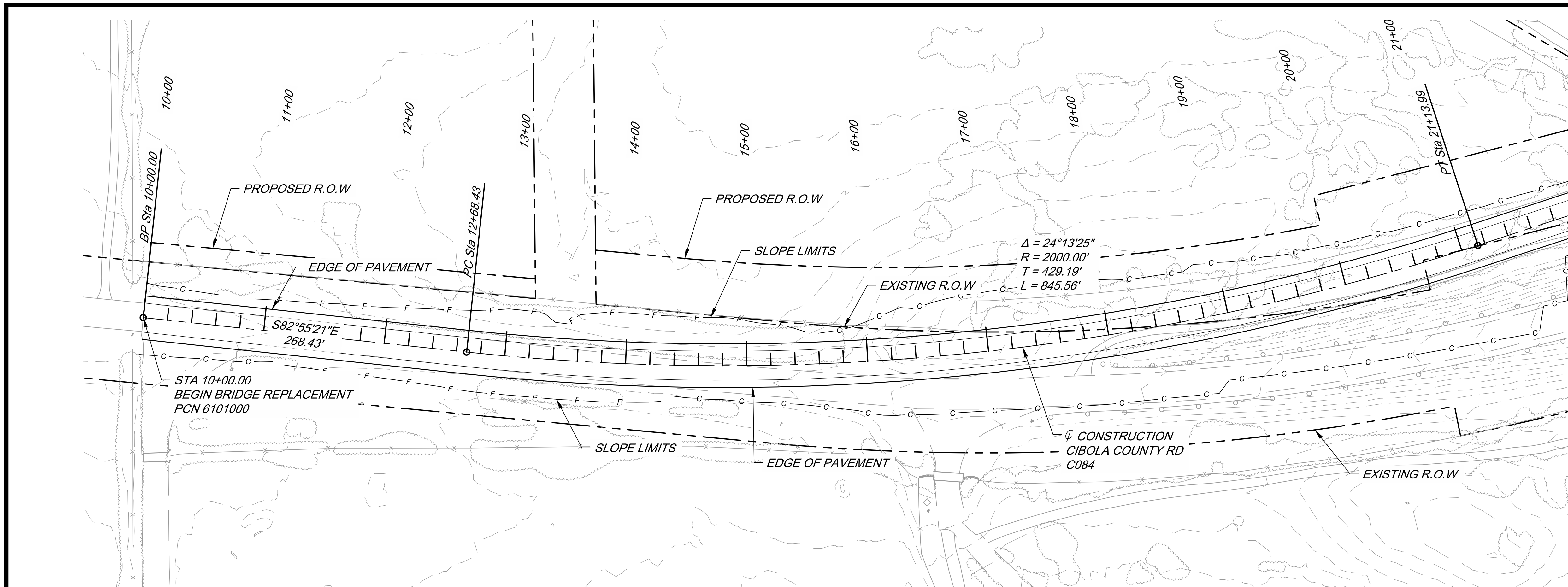

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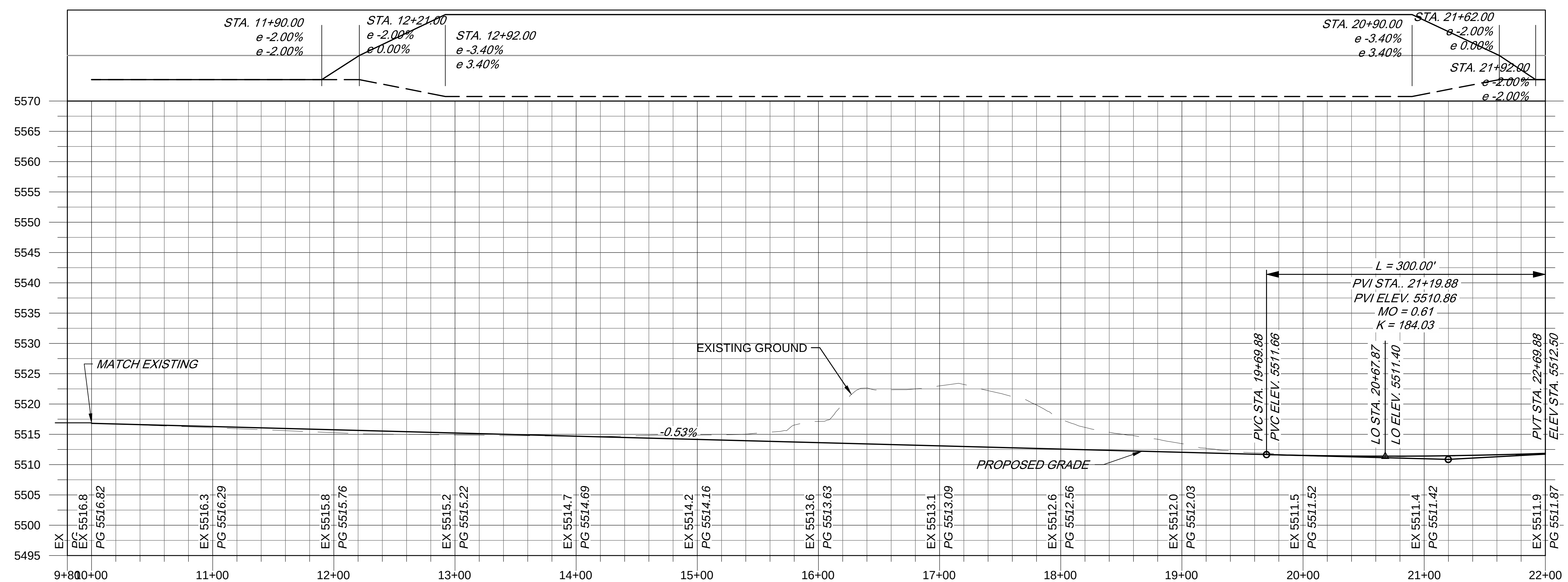

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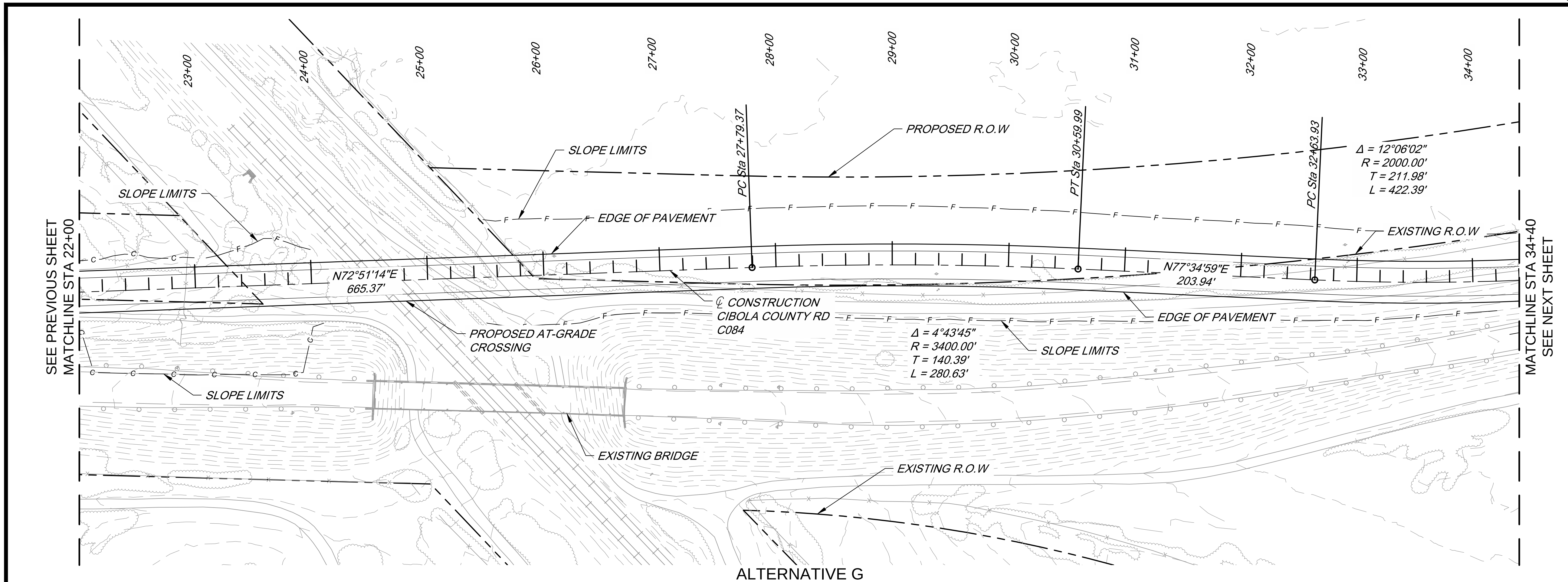

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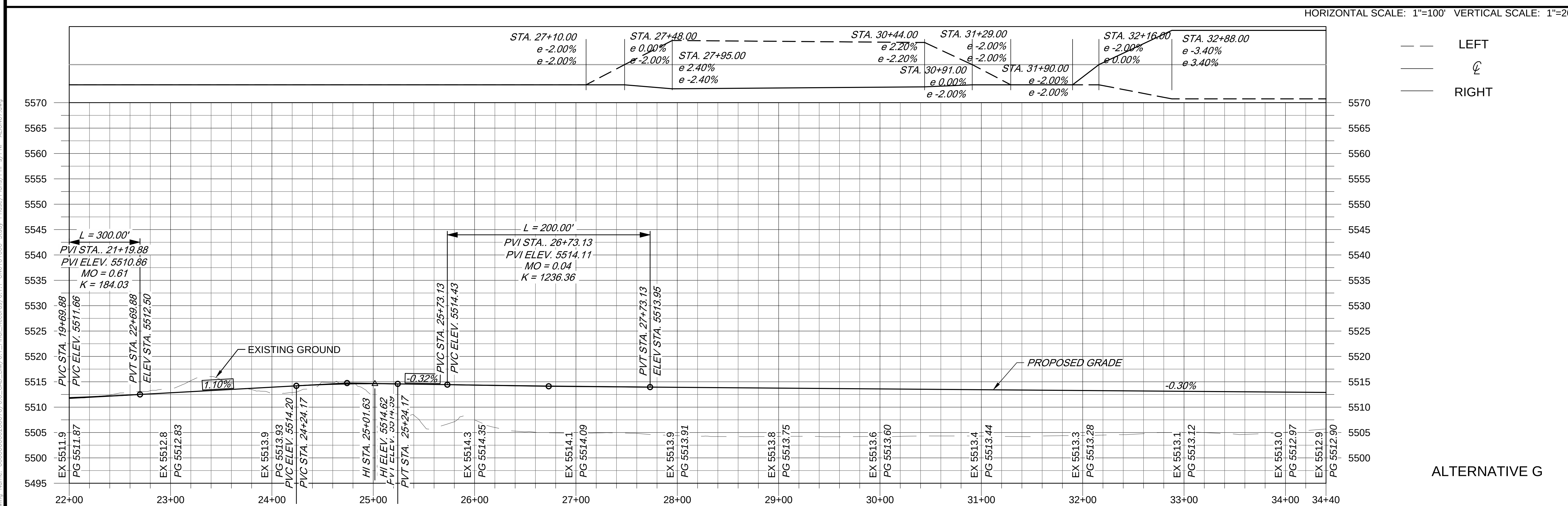

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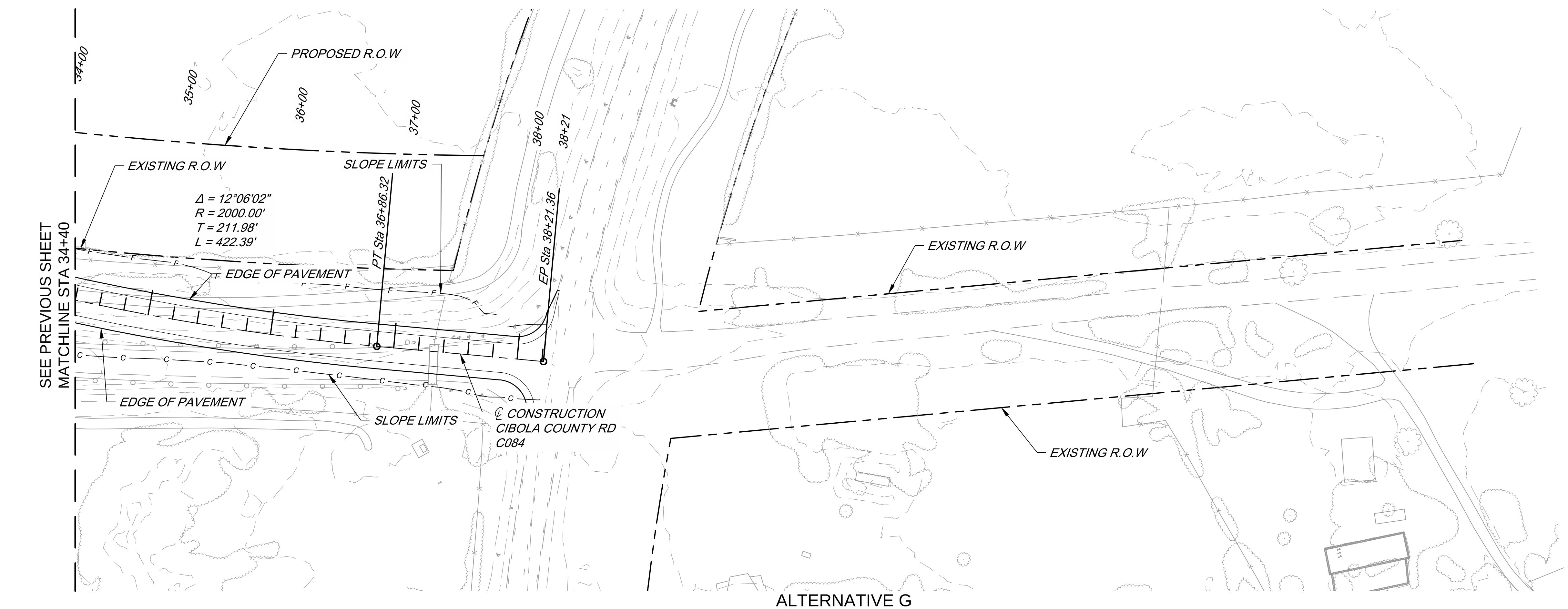

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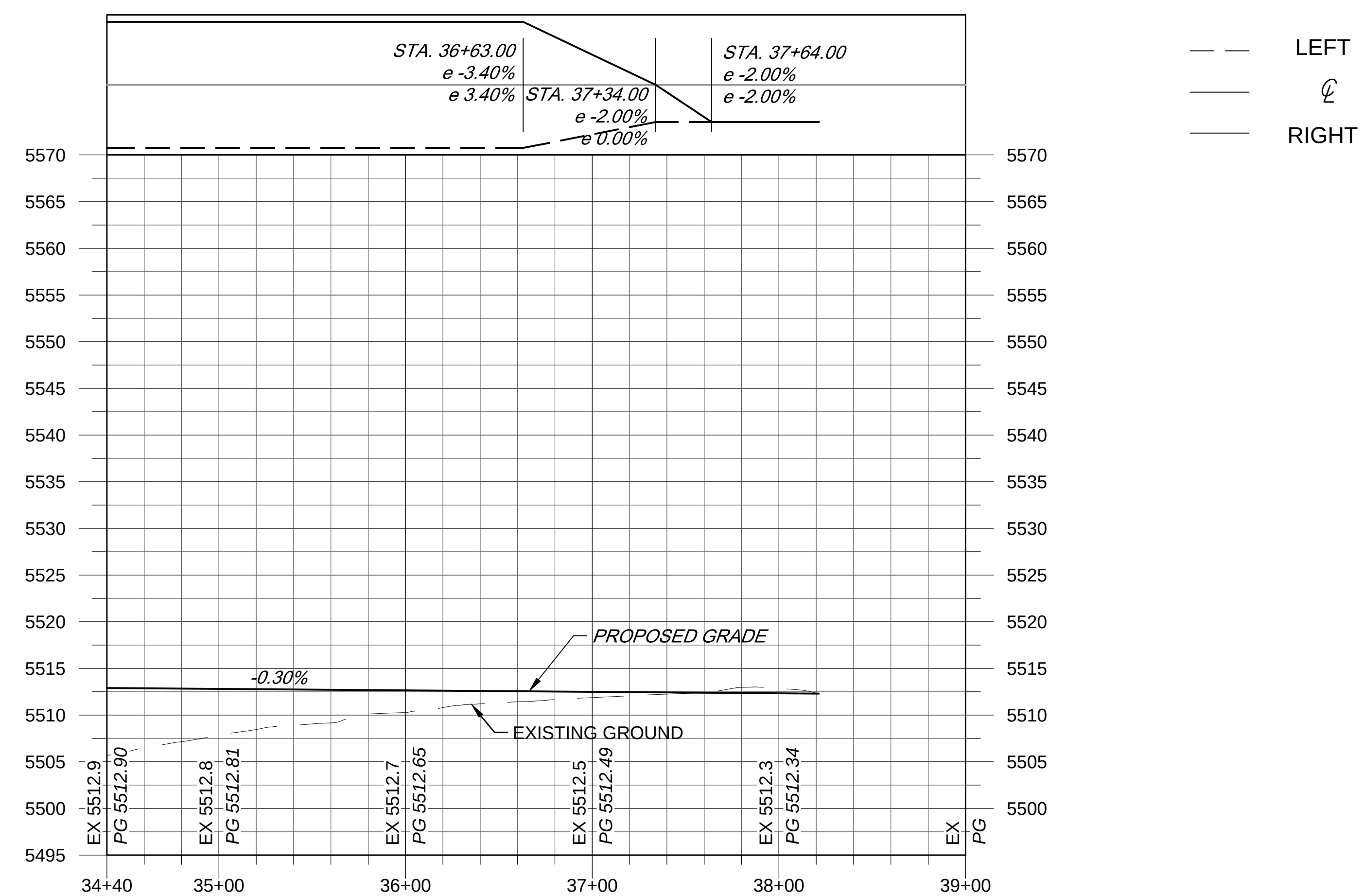

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Appendix D. Public Involvement and Context Sensitive Solutions Plan

Public Involvement and Context Sensitive Solutions Plan

CN 6101000

Cibola County Road C084
MP 0.0 to MP 1.0
Valencia County, New Mexico

Prepared by
HDR
Marron and Associates

Prepared for
New Mexico Department of Transportation
Federal Highway Administration

NMDOT

June 2016

Public Involvement and Context Sensitive Solutions Plan Cibola County Road C084 MP 0.0 to MP 1.0

CN 6101000

Valencia County, New Mexico

June 2016

Prepared for

New Mexico Department of Transportation
Federal Highway Administration

Prepared by

HDR
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Introduction

To provide a unified approach to public involvement and context sensitive solutions, this document combines the Public Involvement (PI) Plan and Context Sensitive Solutions (CSS) Plan for the proposed Cibola County Road C084 from NM 6 at milepost (MP) 0.0 to MP 1.0. The project location is shown on Figure 1.

This proposed project has been assigned New Mexico Department of Transportation (NMDOT) Control Number (CN) 6101000. The project is cooperatively sponsored by the Federal Highway Administration (FHWA) and NMDOT. The proposed project is funded by National Highway Performance Program, Surface Transportation Program (STP), and state match funds. FHWA is the lead agency for the National Environmental Policy Act (NEPA) and Section 106 of the National Historic Preservation Act process since the project will receive federal funding. The project development process will follow FHWA and NMDOT regulations and guidelines.

Public involvement and consideration of the project setting and context are fundamental components of the *Location Study Procedures* (NMDOT, 2015), which is the policy document followed by NMDOT to comply with federal transportation planning and environmental impact assessment rules and regulations. The PIP/CSS Plan is a dynamic document that will evolve as the proposed project progresses. It is expected that new issues will be identified as stakeholders become informed and involved in the process. Methods to involve stakeholders may also change to maximize outreach and to provide the best opportunities for input. In the end, CSS strives to incorporate public involvement and active stakeholder participation into the project development process to produce transportation projects that fit within the context of a community, provide visual enhancements where possible, and respond to the needs of the area residents, local businesses, and traveling public.

The major goals of the PI/CSS Plan for this project are as follows:

- To establish the project context and identify major issues
- To identify project stakeholders
- To facilitate efficient development of conceptual plans and implementation of viable infrastructure improvement projects
- To develop a decision-making process that is sensitive to the project context, involves stakeholders in a meaningful way, and leads to development of a proposed project with selected design criteria that is consistent with transportation, environmental, cultural, community, land use, and economic contexts in the project area

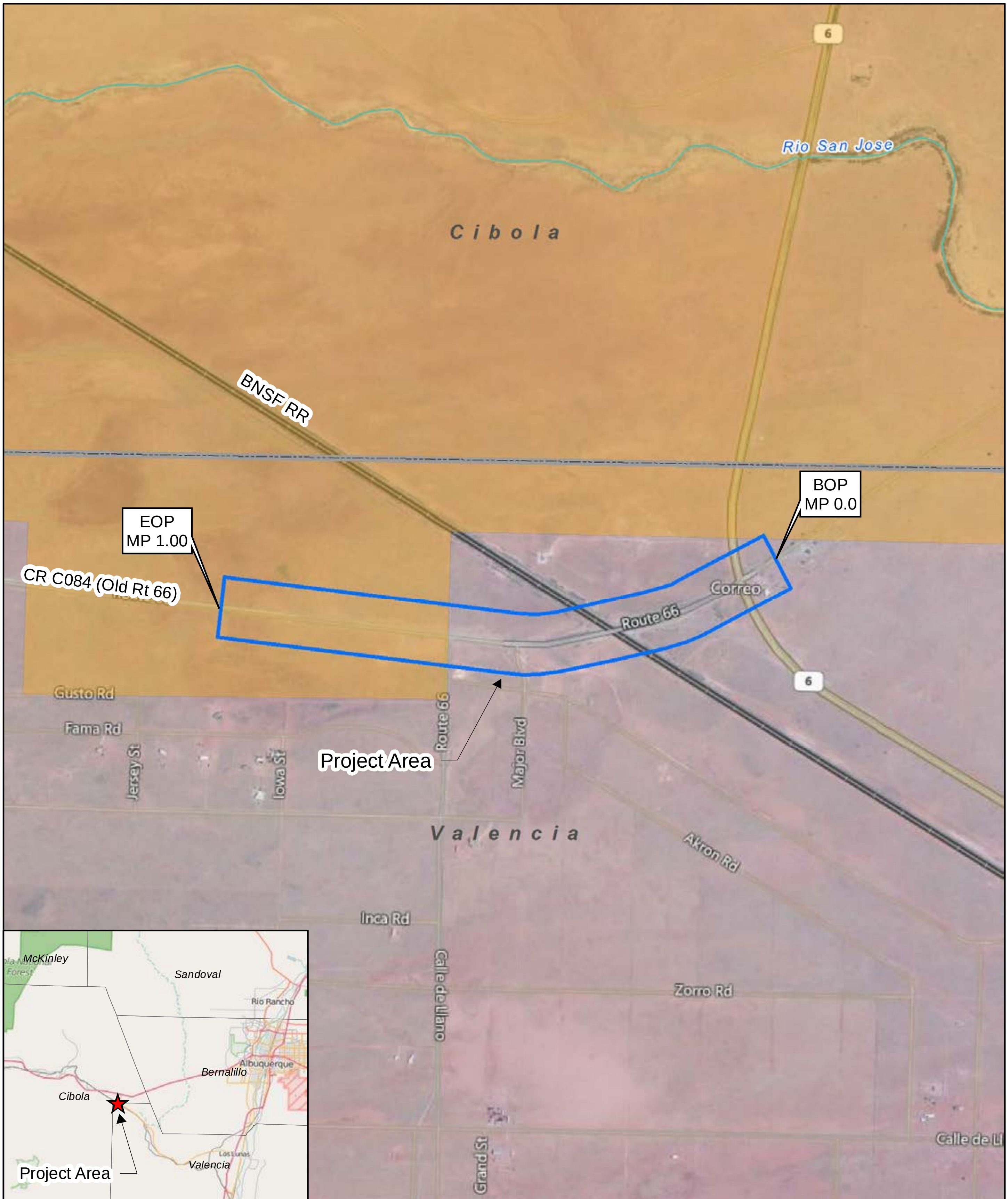

Figure 1
Project Location Map

Project Area

Land Ownership

Laguna Pueblo
Private

0 0.125 0.25 0.5 Kilometers

0 0.1 0.2 0.4 Miles

N

1:15,000

NMDOT Cibola CR C084 Old US 66, Valencia County, New Mexico

The last goal is directed at identifying when stakeholders will be involved in the project development process, specifying methods to inform and involve stakeholders, and describing approaches to resolve issues, concerns, and conflicts that may arise.

1.0 Goals of Collaboration with the Community

a. Provide Safety for Users and Community

Cibola County Road C084 begins at NM 6 and extends westward into Cibola County and Laguna Pueblo. C084 follows the original Route 66. The project area extends from MP 0.0 to MP 1.0 in Valencia County. The project ends near the Cibola/Valencia County line. C084 provides access to Highland Meadows Estates located south of the roadway. The Suwanee Bridge is located along C084 approximately 0.25 mile west of NM 6. C084 is paved from NM 6 to the Suwanee Bridge and unpaved west of the Suwanee Bridge section. Portions of the unpaved roadway have large depressions or washboarding. Paved and unpaved sections need subgrade and surfacing improvements.

The Suwanee Bridge is located within the project area and crosses over two Burlington Northern Santa Fe (BNSF) railroad tracks. This BNSF is a major east-west railroad route with frequent trains. The bridge was constructed in 1934 and partially reconstructed in 1995. It is a treated-timber structure with a center span over the BNSF railroad tracks. The timber deck, which is overlayed with a bituminous material is 23-feet wide. This provides just enough space for two vehicles to travel across the bridge. The existing bridge has two 11.5-foot lanes with no shoulders. The 1995 reconstruction reinforced the timber members with steel to bridge cracks and spread loads. The bridge is currently rated for 15 tons vehicular limit, which is below the current standard design load for a 36-ton truck. The bridge clearance over the railway is 21.25 feet, which should be 23.33 feet under current standards. The roadway surface of the bridge approaches exhibits signs of embankment and subgrade failures. For these reasons, extensive bridge rehabilitation or full bridge replacement will likely be recommended in the Phase1-A/B study.

b. Address Community and Social Issues

The design team and the public will identify community and social issues important to local communities and the region. Local communities include Correo and Suwanee. Highland Meadows Estates and eastern Laguna Pueblo residents use C084 regularly. Regular users of C084 are expected to have an interest in the project. Many residents commute to the Albuquerque area and Los Lunas for work and goods and services. A large materials pit is located southwest of the project area, and trucks travel on C084 to and from the materials pit. C084 also provides an alternate route to the village of Mesita in eastern Laguna Pueblo. In the event of an I-40 closure between NM 6 and Mesita, C084 could serve as a detour route. The bridge provides safe crossing over the BNSF railway. There are few crossing points across the railway in this area. The nearest railway crossings are 1.5 and 3.2 miles southeast of the project area. These crossing are at-grade and do not provide the safety of the C084 bridge crossing.

As part of the public involvement process, the public will have opportunities to comment on environmental issues and proposed project alternatives. There will be a public information meeting, a mailing to stakeholders, and opportunities for stakeholder comments. As part of the NEPA and public involvement processes, information on environmental characteristics and issues in the proposed project area will be gathered and presented to the public. This plan describes environmental characteristics of the proposed project area as well as means for addressing and incorporating community priorities into project development. As the NEPA process advances, additional environmental data will be gathered and used to evaluate proposed project alternatives. This will allow the design team to identify key issues and minimize or avoid adverse effects. The Phase A/B report will be a key document in this process since it will present and compare the proposed alternatives. To address local issues, public input will be integrated with design team recommendations.

c. **Maintain Environmental Harmony**The design team and the public will identify different ways to minimize or avoid adverse effects on the surrounding area. This may include managing traffic during construction, reducing drainage impacts, providing best management practices for stormwater runoff, minimizing right-of-way requirements and vegetation impacts, and developing an aesthetically and historically appropriate design. In locations where adverse effects cannot be avoided, the project team, public, and agencies will consider design options and mitigation measures.

d. **Promote Livability**

Improvement of the C084 roadway and bridge should promote the livability for communities and residents of nearby areas of Cibola and Valencia counties. This roadway provides a daily travel route for local residents. As part of the NEPA process, this plan provides guidance on integrating community concerns into alternative development and evaluation. Means to minimize or avoid adverse impacts will be identified. This information will be presented in the Phase A/B report. Consideration will be given to community priorities, other transportation modes, and the visual appearance of the C084 roadway and bridge. Alternatives that provide facilities for bicycles and pedestrians will promote livability. Improvements will seek to improve the livability for users, adjacent property owners, nearby residents, and businesses.

e. **Create Lasting Value for Community**

The underlying objective of the C084 Project is to develop a project that has lasting value for Cibola County, Valencia County, and Laguna Pueblo. This value will depend on the roadway's ability to serve local travelers and provide a safe railway crossing. The roadway will need to serve as a transportation facility for the long term.

Bridge rehabilitation versus constructing a new bridge will be considered. Extensive bridge rehabilitation would be required including replacement of bridge superstructure and substructure members. Posted weight limits would remain the same. Bridge rehabilitation would not substantially improve conditions for travelers to and from Highland Meadow Estates, Laguna Pueblo, eastern Cibola County, and the materials pit. Construction of a new bridge would better meet the purpose and need of the project. The new bridge would meet current bridge design and weight limit standards. The bridge would provide more vertical clearance over the BNSF railway. The bridge would be constructed with a wider typical section that would include shoulder space for bicyclists and pedestrians.

f. Use Agency and Community Resources Effectively

Agency resources will primarily come from FHWA and NMDOT. These resources will consist of funding and technical skills used to develop an improved roadway facility. FHWA will provide oversight and ensure that federal requirements are met. FHWA reviews project plans to ensure that they comply with federal design standards. NMDOT is actively involved in project alternative development and ensures that alternatives meet the transportation goals for the C084 facility as well as the requirements for roadway and bridge design, drainage, traffic, right-of-way, environment, and other project elements. NMDOT will ensure the integration of community preferences with transportation goals. During the alternative development and design process, costs and technical requirements will be reviewed and revised to ensure that planned improvements use funding and technical resources effectively. Officials from Cibola County, Valencia County, and Laguna Pueblo will be the primary sources of information on community preferences. Residents near the project area will also identify community preferences, and they will provide input on proposed improvements.

2.0 Analyses of the Project Background and Context

a. Environment

The C084 project area is located in west-central New Mexico on mostly flat terrain. Elevation is approximately 5,010 to 5,020 feet above mean sea level (AMSL). Hills and mesas are nearby. Geologic material consists of Quaternary alluvium and basaltic to andesitic rock. The project area is within the Rio San Jose watershed. The Rio San Jose empties into the Rio Puerco, which is a Rio Grande tributary. No waterbodies are located within the project area.

Natural vegetation consists of grasses, such as blue grama, and herbaceous plants, such as snakeweed. Most areas are grazed by cattle. Wildlife is limited by a lack of water sources. Grassland bird species, such as Swainson’s hawk, common raven, Say’s phoebe, western meadowlark and white-crowned sparrow, occur in the area. Based on experience with other bridges in central New Mexico, the bridge provides potential nest sites for cliff swallows and roost sites for bats, but train traffic may limit swallow nesting and bat roosting. A variety of small mammal and reptile species are present on surrounding lands.

Air quality is good near the proposed project area because surrounding lands have low-density development, and air emissions sources are dispersed. The open terrain allows for wind dispersal of pollutants. Both Cibola and Valencia counties are in attainment with the Clean Air Act. When the vegetation cover is removed, soils are vulnerable to wind erosion and can result in dust storms. Traffic volumes can vary with time of day and, along with trains, are the main noise source within the project area. Highest volumes occur during the daytime hours, including periods when residents are traveling to and from work and school. Trains travel under the bridge at regular intervals during the day and night.

b. Historic

Pueblo Indians who speak the Keresan language have lived in the region since the 13th Century. As with other pueblos, Laguna Pueblo residents lived in adobe structures and cultivated corn, beans, squash, and other crops. Laguna Pueblo was named by Spanish Governor Pedro Rodriguez Cubero in 1699. The pueblo includes communities such as Casa Blanca, Encinal, Paraje, Santa Ana, and Seama. Mesita, the nearest Laguna Pueblo community, is located approximately 7 miles west of the project area. Pueblo members traveled this route between the Rio Grande and pueblos to the west such as Hopi and Zuni. This area was also the route for the mid-1860s Navajo Long Walk when the Navajo were forced to relocate from their lands in western New Mexico and eastern Arizona to an encampment at Bosque Redonde near Fort Sumner.

Transportation routes played an important role in the region's history. San Jose was established along the railroad. In 1902, the town was renamed Suwanee because there was another town along the railroad named San Jose in Oklahoma. Correo refers to the post office. The US Geological Survey *Correo Quadrangle* map show Correo located near the NM 6/C084 intersection and Suwanee located approximately 2.5 miles south on the west side of the railroad and NM 6. The NM 6/C084 intersection was formerly the junction of US 66 from Albuquerque and US 66 from Los Lunas, known as the Laguna Cutoff. A general store, bar, and post office were once located next to the junction at Correo, but the construction of I-40 to the north, led to the eventual abandonment of the town. Most nearby residents currently live south of the project area in an unincorporated portion of Valencia County. Cibola County was created from western Valencia County in 1981 (Julyan, 1998; Pritzker, 2000).

Route 66 is listed on the State Register of Cultural Properties. This segment of C084 is the Correo to Old Laguna alignment before Route 66 was straightened in 1937. The bridge was originally constructed in 1934 and with a center span over the railway. Portions of the wooden bridge deck and trusses may be from the original bridge. The C084 bridge is a unique New Mexico highway bridge because of the extensive wood truss structures under the wood deck and beams. Reconstruction in 1995 reinforced the wood members with steel to bridge cracks and spread loads. The east and west slopes to access the bridge contain material from the original 1934 bridge, but the bridge span and supporting structure (such as the concrete piers) have been modified. Eligibility of the bridge to the National Register of Historic Places will be evaluated during the cultural resources investigation. The eligibility potential may have been affected by the bridge modifications, but the bridge contains original structural components, is located along the early Route 66 alignment, and has historical importance.

c. Land Use

Most lands near the project area are undeveloped. The Valencia County Comprehensive Land Use Plan shows a mixture of single family residential and rangeland in this part of the county. Most development in the county occurs in the Rio Grande valley near the cities of Los Lunas and Belen. Other parts of the county are experiencing little growth. The Valencia County Comprehensive Land Use Plan (Valencia County, 2005) contains the following land use goals:

A. Guide development in a manner that balances the patterns of urban development with the rural character and natural resources of the county
B. Protect and enhance the distinctive identities of the unincorporated communities and subregions within the county
C. Identify locations and siting criteria for "County Activity Centers" to accommodate intensive commercial and industrial activity clusters and other special use developments
D. Preserve and protect lands for agricultural purposes in the county
E. Establish a master plan for county parks, recreation, and open space
F. Encourage a range of housing opportunities for residents of the county

Lands near the C084/NM 6 intersection are suited for commercial development. Remaining lands along C084 will likely continue to be used as rangeland. Additional residential development may occur in lands south of C084.

d. Transportation

Highways and railroads have played an important role in the history of Correo and Suwanee. The railroad was constructed in the later part of the 19th Century followed by Route 66 in the 1930s. The BNSF railroad continues to run trains regularly along this railway. Route 66 no longer follows this route, but C084 continues to provide access to western Valencia County, eastern Cibola County, and Laguna Pueblo. Route 66 in general continues to play a key role in attracting tourists from around the world, and this segment embodies a rural "old west" character that attracts visitation.

The Valencia County Comprehensive Land Use Plan (Valencia County, 2005) contains the following transportation goals:

- Accommodate the efficient movement of people and goods through the county by maintaining a road network of sufficient capacity to meet local and regional circulation needs
- Preserve the integrity and quality of life in residential neighborhoods and county communities through proper transportation planning
- Establish a fully integrated, multimodal, and intermodal transportation system for the county

The plan also contained the following transportation objectives:

- Impose design criteria for transportation facilities that promote efficient traffic operations and address future expansions
- Link transportation and land use planning through development review procedures and policy directives
- Protect residential areas from heavy commercial vehicles and other negative traffic impacts by utilizing special design standards and vehicle restrictions
- Use innovative road design and traffic calming techniques to minimize neighborhood disruption caused by traffic flow

The C084 project will complement these goals and objectives by providing an improved roadway and bridge for travelers to residences and truck traffic to the materials pit. No houses are located within 0.2 mile of the project area, which will minimize impacts to residences.

e. Community

The project area is within northwestern Valencia County next to eastern Cibola County. Based on the 2010 Census, Valencia County's population was 76,569 and Cibola County's population was 27,213 (see Table 1). For the years 2015 to 2020, Valencia County has a strong growth rate of 1.34 percent, and Cibola County has a modest growth rate of 0.63 percent. The population's age is similar to the state average (36.7 years) with a median age of 37.7 years in Valencia County and 36.6 years in Cibola. The Hispanic/Latino population is a large minority group representing 58.3 percent of Valencia County's population, 36.5 percent of Cibola County's population, and 46.3 percent of New Mexico's population. Cibola County also has a large Native American population comprising 41.0 percent of the county's population.

Two Census Tracts provide local socioeconomic data for areas near the project area. Census Tract 9713 occupies western Valencia County, and Census Tract 9461 occupies eastern Cibola County, including Laguna Pueblo. Tract 9713 has a population with a median age of 39.4 years and a sizeable Hispanic/Latino population (46.9 percent). Tract 9461 has a median age of 33.8 years and a large Native American population (95.5 percent), which shows the tract's Laguna Pueblo population. Homeowner occupancy rates are higher than the state rate of 68.5 percent. The homeowner occupancy rates is 83.5 percent in Tract 9713 and 82.4 percent in Tract 9461.

Table 1 Demographic Characteristics of Areas Near C084 Project Area

Characteristics	New Mexico	Cibola County	Valencia County	Cibola County Census Tract 9461	Valencia County Census Tract 9713
Location Description	Statewide	West of Project Area	Project Area	West of Project Area	Project Area
2010 Population:					
- Total Population	2,059,179	27,213	76,569	4,093	2,077
- Median Age – years	36.7	36.6	37.7	33.8	39.4
- Percent Under 18	25.2%	25.1%	26.4%	28.2%	24.9%
- Percent Over 64	13.2%	12.8%	12.7%	12.7%	13.0%
- Percent Population Growth 2010-2015	1.34%	0.74	1.48	--	--
- Percent Population Growth 2015-2020	1.26%	0.63	1.34	--	--
2010 Race Status:					
- White	68.3%	41.8%	73.2%	1.7%	66.6%
- Black/African American	2.1%	1.0%	1.4%	0.1%	2.6%
- Native American	9.4%	41.0%	3.8%	95.5%	7.8%
- Asian	1.4%	0.5%	0.5%	0.5%	0.3%
- Hawaiian/Pacific Islander	0.1%	0.1%	0.1%	0.0%	0.0%
- Some other race	15.0%	12.4%	17.0%	0.7%	19.5%
- Two or more races	3.7%	3.1%	4.0%	1.5%	3.3%
2010 Hispanic/Latino	46.3%	36.5%	58.3%	4.9%	46.9%
2010 Housing Units:					
- Owner-occupied Units	68.5%	74.2%	80.0%	82.4%	83.5%
- Renter-occupied Units	31.5%	25.8%	20.0%	17.6%	16.5%
2010-2014 Income and Poverty:					
- Median Family Income	$54,801	$42,998	$50,263	$39,630	$46,944
- Family Poverty Rate	16.1%	26.2%	20.1%	29.4%	24.8%
- Per Capita Income	$23,948	$16,362	$19,646	$11,995	$17,970
- Per Capita Poverty Rate	20.9%	29.0%	24.8%	34.3%	30.41%

Sources: Bureau of Business and Economic Research (2012); U.S. Census Bureau (2016)

f. Visual

The views near the project area consist of a rural flat landscape with hills and mesas in the background. The bridge is the highest point in the immediate area (see Figure 2). From the top of the bridge, extensive views of the Rio San Jose valley and surrounding hills are visible (see Figure 3). West of the bridge, the road passes through a flat landscape, with hills and mesas in the background that has a Route 66 feeling of traveling across the American West (see Figure 4). At the NM 6 intersection, little remains of the town of Correo except for an abandoned building on the southeast corner (see Figure 5).

The bridge is visible from surround lands including from I-40 located 2 miles north of the bridge. The bridge appears as a noticeable rise in the surrounding flat landscape. The two-lane bridge is reminiscent of a typical Route 66 crossing and serves as a distinctive landmark. The bridge has a wood deck and numerous wood trusses that are not found in modern highway bridges.

Figure 2 View of C084 bridge from NM 6

Figure 3 Looking east from top of C084 bridge

Figure 4 Looking east along C084 from west end of project area

Figure 5 Abandoned building on southeast corner of C084/NM 6 intersection

g. Economic

Cibola and Valencia counties have mixed economic conditions. Cibola County was formerly dependent on the uranium mines west of Grants. When the mines closed, the county lacked an economic engine for growth. In contrast, Valencia County is part of the Albuquerque metropolitan area, and many county residents commute to work in Albuquerque. Much new home construction is occurring in Los Lunas, the Valencia county seat. Unemployment in Cibola and Valencia Counties are slightly above the state average. In March 2016, the unemployment rates were 6.7 percent in Cibola County and 6.5 percent in Valencia County compared with the state rate of 6.1 percent (New Mexico Department of WorkForce Solutions, 2016). The per capita poverty rate is 29.0 percent in Cibola County and 24.8 percent in Valencia County. The state per capita poverty rate is 20.9 percent.

The census tracts near the project area have incomes lower than the state median family income of $54,801 with corresponding family poverty rates (see Table 1). Median family incomes range from $39,630 in Cibola County Census Tract 9461 to $46,944 in Valencia County Census Tract 9731. Family poverty rates range from 29.4 percent in Tract 9461 to 24.8 percent in Tract 9713. Based on these statistics and their minority representation, the tracts may contain communities of concern for environmental justice evaluation.

Route 66 is one of the largest tourist attractions in New Mexico. Interested travelers along I-40 will often search for representative Route 66 segments, such as C084. Route 66 is a National Scenic Byway. Tourists benefit the local communities along Route 66 by spending money on food, lodging, souvenirs, and other items.

h. Public Health

Opportunities are available along C084 for improving public health. Wider shoulders may increase the number of bicyclists using the corridor although the unpaved and washboard character of C084 detract from its biking allure. The level terrain is well suited to bicycling. The shoulders would also be available for pedestrians to provide opportunities for walking, but there are few nearby destinations for pedestrians.

3.0 Modal Considerations and Connectivity

a. Motorized Vehicles

C084 is a key local traffic route. C084 provides access to Highland Meadows Estates, residences in Suwanee, eastern Laguna Pueblo, and a materials pit.

Motor vehicles will remain the principal traffic mode for the foreseeable future. Accommodating additional traffic is feasible with regular maintenance and improvements to the existing facility. The roadway currently has one eastbound lane and one westbound lane. Adjoining lands are undeveloped, and space is available to accommodate widening the roadway and shifting the bridge alignment.

b. Transit

No transit service is proposed along C084 nor does transit service currently exist. Demand is insufficient to support a transit system. In the long-term, C084 would be available for bus service.

c. Pedestrian

The existing bridge lacks space for pedestrians. If the bridge were widened, shoulder space is available for pedestrians. C084 is not expected to have much pedestrian traffic since there are no residences or destinations located along the roadway.

d. Bicycle

Opportunities for bicycle connectivity will be considered in the C084 Project. The existing bridge lacks space for bicycles. C084 occupies level terrain, which makes the route suited to bicycle travel. Destinations are limited, and the road is rough and unpaved, which would limit the number of bicyclists. C084 has potential for recreational bicyclists and for travel within the Correo-Suwanee communities.

4.0 Opportunities to Express Local Values

a. Functional Classification

The functional classification of C084 is a rural collector. This classification is not expected to change as a result of the proposed project. The new bridge may have a higher load rating, which may result in higher truck traffic volumes. This could result in the eventual re-classification of C084.

b. Design Speed

The design speed will be evaluated during the location study. At this time, the proposed design speed is 40 miles per hour (mph) with a posted speed limit of 35 mph.

c. Traffic Calming

Traffic calming measures are not needed. The unpaved condition along C084 along with the grade change at the bridge act as traffic calming measures.

d. Gateway and Place-Making Treatments

The intersection of C084 and NM 6 provides a potential location for a place-making treatments (see Figure 6). A sign could give information on Historic Route 66, the Los Lunas Cutoff, and the communities of Correo and Suwanee. The National Park Service and New Mexico State Historic Preservation Officer (SHPO) may require historic and aesthetic treatments, which would also add to a place-making effect. C084 would provide visitors with an idea of what traveling across New Mexico in the 1930s was like. C084 is close to I-40 and not difficult for travelers to access. Place-making treatments would also give a sense of community to this area, which currently lacks town limits or landmark signs.

Figure 6 C084 west of NM 6

e. Structural Aesthetics

The existing bridge has an historical appearance that is a reminder of its construction during the initial Route 66 era. The bridge creates its own hill that rises above the surrounding flat landscape. The bridge has a wood deck and numerous wood trusses, which is distinctive from modern highway bridges. It is expected that the National Park Service and New Mexico SHPO will have recommendations to develop a bridge design that retains historical design elements and fits with the bridge's role along Route 66.

5.0 Scale the Solution to the Problem

a. Affordability

Roadway improvements will be evaluated for cost and affordability. Design options will be developed and compared in terms of benefits and costs. A design will be developed that provides good value.

b. Supported by Community

Community support is essential for effective alternative development and for this proposed project to move forward. A public information meeting will be the main public involvement event to inform the community of proposed project alternatives and to receive comments on the alternatives. Representatives from local community associations will be included in public involvement. Individual property owners will be contacted to obtain their input on the project. There may be concerns with construction detours and delays, especially since the bridge is a key route across the railroad tracks. NMDOT will provide the community with information on proposed construction periods, traffic management during construction, and anticipated traffic delays.

c. Can Be Implemented in Reasonable Time Period

Approximately one to two years will be spent developing the proposed project alternatives and completing the environmental analysis. A project can typically be constructed within 9 to 18 months.

6.0 The Design Approach

a. Use Flexibility Found in Design Guidelines

Project development will use design guidelines from FHWA, NMDOT, and American Association of State Highway and Transportation Officials (AASHTO). As appropriate, federal and state guidance on context sensitive solutions will be implemented. The design will seek a balance between technical roadway/bridge standards, regulatory constraints associated with Route 66/historic preservation, and preferences of roadway users and area residents. The project design will seek flexible options to reduce project cost, improve roadway safety, and provide improved facilities for bicyclists and pedestrians.

b. Project-Specific Communication Strategy

The PI/CSS Plan serves to develop a decision-making process that is sensitive to the project context, involves the public in a meaningful way, and leads to development of a preferred alternative that is consistent with transportation, environmental, cultural, community, land use, and economic contexts in the proposed project area.

The PI/CSS Plan is directed at identifying when members of the public will be involved in the project development process, specifying methods to inform and involve the public, and describing approaches to resolve issues, concerns, and conflicts that may arise.

The Location Study Procedures, CSS, and public involvement will be fully integrated into the project with the intention of developing alternatives and designing a project that best responds to the needs of the local community and the traveling public. The CSS and public involvement approach are discussed in this document. Table 2 presents an overview of the communication strategy for public involvement. Additional details regarding public involvement are outlined in the sections that follow. The overall communication strategy framework will be established by NMDOT. HDR and Marron and Associates (Marron) will oversee the communication and will implement the communications strategy. Marron will be responsible for meeting FHWA and NMDOT public involvement requirements under NEPA and maintaining an administrative record of the public involvement process.

Table 2 Summary of Phases 1A/1B, 1C, and 1D Public Involvement Events

Activity	Study Development	Public Involvement Events
Phase 1A/1B – Identification and Evaluation of Alternatives	(1) Information gathering (2) Survey and Mapping (3) Detailed Inventory of Existing Conditions (4) Bridge Investigation (5) Purpose and Need Statement (6) Existing Environmental Conditions (7) Geotechnical Investigations (8) Preliminary Drainage Report (9) Right-of-way Requirements (10) Conceptual Design (11) Phase 1A/1B Report	• Design team meetings • Landowner coordination • Interviews with Cibola County, Valencia County, and Laguna Pueblo officials • Agency coordination meetings • Public Information meeting – end of Phase 1A/1B
Phase 1C – Environmental Documentation	(12) Biological and Cultural Resource Field Studies (13) Categorical Exclusion (14) FHWA and NMDOT Review and Decision	• Design team meetings • Agency coordination meetings

Primary responsibilities are as follows:

- NMDOT will approve the format and content of all public involvement events.
- HDR will give presentations on the design and engineering aspects of the proposed project at the public information meeting.
- HDR and Marron will prepare a slideshow presentation and handouts. HDR will prepare display boards. These materials will be used at the public information meeting.
- Marron will prepare public information meeting notices, comment forms, and summaries.
- Marron will arrange for newspaper publication of public information meeting notices (in the *Cibola County Beacon* and *Valencia County News-Bulletin*), regular mailing of notices, and emailing notices. The meeting will be mentioned on a local radio station public service announcement. Marron will maintain the administrative record for the proposed project, including public involvement documentation. Marron will help organize the public information meeting.

A decision matrix comparing different alternatives will be a fundamental part of the public information process. Documentation of public input, community preferences and concerns, newspaper clippings, and comments will be maintained throughout the project study process as part of the administrative record. Questions and comments received from the public will be addressed and responded to as appropriate and will be incorporated in the study documentation.

<u>Engagement of the Public</u>

The list of members of the public will be developed and updated. The public will include representatives from local and regional governments. Local residents will be invited to the public information meeting. Project information and plans will be posted on the NMDOT website.

Toolkit

A variety of media will be used to communicate with the public. Slideshow presentations and project display boards will be used at public information meeting. Project information will also be summarized in a handout. A comment form will be used to obtain comments for decision-making and the administrative record. Displays will show the proposed roadway and bridge improvements. Information on the proposed project alternatives will be made available at the public meeting.

Engaging the Public in Screening Criteria Development and Alternative Evaluation

Public input will be obtained through the public information meeting. The design team will consider public input during alternative development and evaluation.

Mailing List

There will be a single mailing effort prior to the public information meeting. Media releases will be coupled with the mailing as the primary means of outreach. US Postal Service (USPS) mail and email will be the primary means used to inform individuals and organizations of public information meeting.

Notices will be distributed in advance of the public information meeting and will have the following format and content:

- 8 ½" x 11" page, one-sided
- Identification of the sponsoring agencies
- Purpose of the meeting in relation to the overall project
- Meeting date, location, and time
- Map showing the proposed project area
- Note that comments will also be accepted on bicycle, pedestrian, and equestrian issues, as well as cultural resources
- Contact number for further information and Americans with Disabilities Act (ADA) accommodations

Prior to the public information meeting, notices will be mailed to key stakeholders including adjoining property owners, government officials, and business associations.

Publicity and Paid Advertisements

For the purposes of this proposed project, publicity is defined as the dissemination of information for public use by means that are typically free of charge. A public information meeting notice will be sent by USPS mail or email. Nevertheless, traditional forms of notification (published notices) will continue to be used to fulfill legal meeting notice requirements and to inform the public of project meetings and events. Paid display advertisements of public information meeting notices will be placed in the local newspaper(s) in advance of the public information meeting. The public information meeting notice will be published at least two weeks prior to the meeting. Public announcements will be provided on local radio stations. Marron will coordinate with the NMDOT

District 6 Public Information Officer to have notices displayed at the NMDOT District 6 office and posted on the NMDOT website.

Public Information Meeting

During Phase 1A/1B, a public information meeting will likely be conducted at Mesita in Laguna Pueblo or the Highland Meadows fire station, depending on where a meeting venue can be reserved. The proposed improvement alternatives and options will be a key discussion point for the public information meeting. The meeting will address specific issues of concern such as bridge condition, roadway condition, traffic volumes, property access, right-of-way/easement requirements, safety, visual impacts, and other identified issues. It is expected that the public will be interested in how improvements will improve safety and roadway conditions. The location, format, and presentation responsibilities for the meeting will be determined prior to the meeting and approved by the NMDOT Project Development Engineer, NMDOT Environmental Analyst, and NMDOT District 6 project representative. The meeting will include a presentation by project representatives and a question and comment session. Public involvement summaries will be prepared to document questions and comments made at the meeting.

Agency Coordination Meetings

As needed, agency coordination meetings will be held. These are expected to be agencies with a local presence such as Cibola County, Valencia County, and Laguna Pueblo. Meetings may also be held with representatives of the National Park Service and SHPO. These meetings will be held at the discretion of NMDOT.

Interviews

Interviews will be conducted with property owners. Information will be gathered on current property use and access needs.

Design Team Meetings

Design team meetings will occur throughout the project development process. Representatives from NMDOT, local government agencies, and HDR will participate in design team meetings. Marron will support these meetings as needed. The design team meetings will cover project management, project design, alternative/options evaluation and selection, schedule, study tasks, and public involvement.

Availability of Documents

The NMDOT website will be a central repository for most project information including alternatives information, proposed project plans, meeting handouts, and project documents.

c. Graphic of the Decision-Making Process

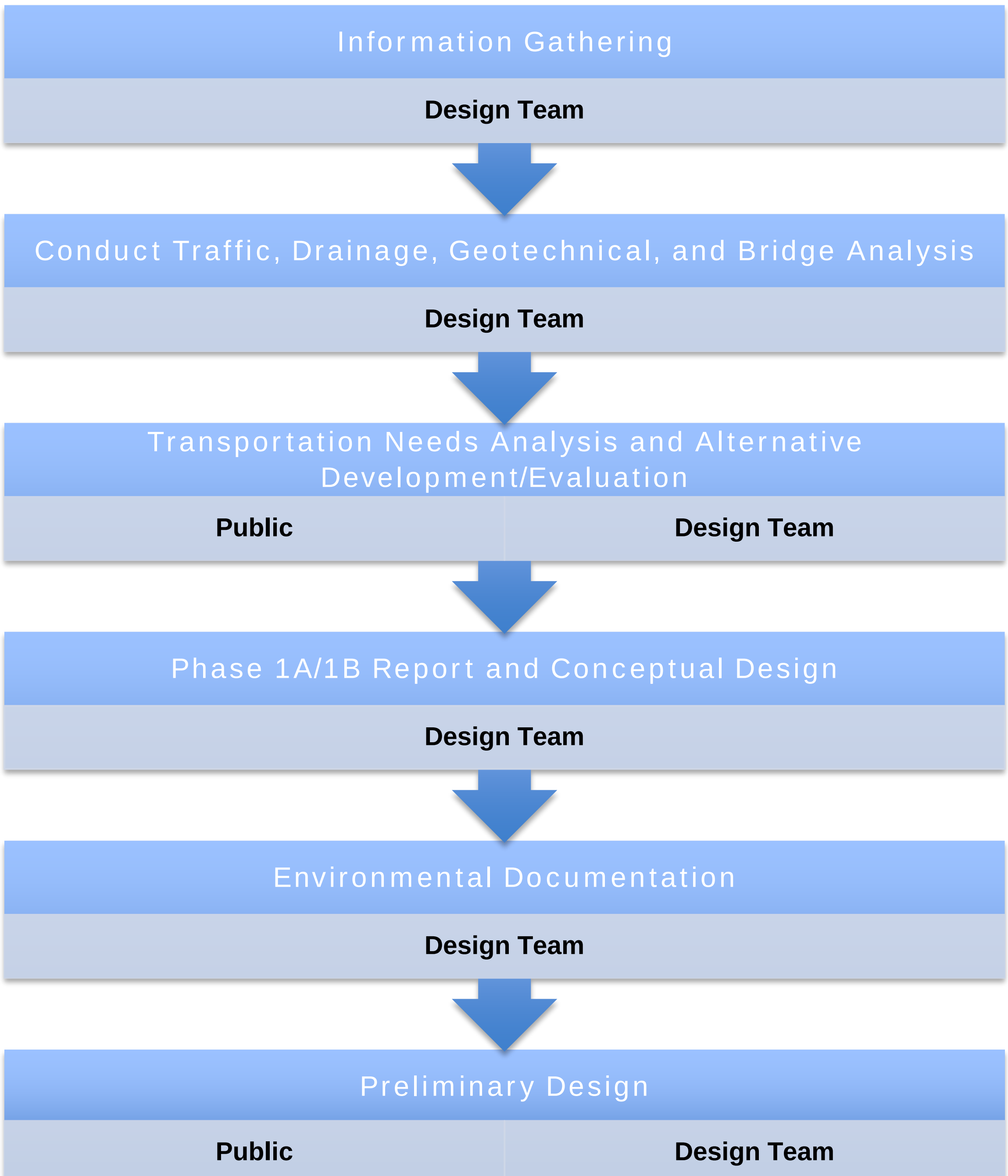

Figure 7 Decision-making process

d. Multi-Disciplinary Design Team

The design team will be responsible for developing and evaluating alternatives (see Figure 7). The design team includes individuals with engineering, technical, and environmental expertise. The team will incorporate input from specialists in the following disciplines: project development, roadway design, bridge design, right-of-way, traffic analysis, drainage analysis and design, pavement design, utilities, geotechnical investigations, biology, wetlands, hazardous materials, cultural resources, socioeconomics, and visual resources. Input from these different disciplines will be integrated throughout the issue identification, alternative development and screening, environmental analysis, and project design processes.

e. Identification of Interested Members of the Public

The public is divided into three categories: 1) members of the public directly impacted by the proposed project because they are located adjacent to C084, travel frequently through the project area, or have a vested interest in project decisions; 2) members of the public indirectly impacted by the study because they use C084 or NM 6 as part of their travel routes or because of their special interest in the project or project area; 3) agencies with jurisdictional authority over the lands or resources within the proposed project area.

The three categories of the public are identified below:

1. General Public: Directly Impacted
   - Those with properties located adjacent to the proposed project area
     - Property owners along C084
     - Ranchers near C084
     - BNSF
   - Those who frequently travel through the proposed project area
     - Residents in western Valencia County, eastern Cibola County, and eastern Laguna Pueblo
     - Commuters
   - Those who rely on C084 as part of their operations
     - Area ranchers
     - Materials pit owner and workers
     - Police, fire, and emergency services providers
   - Utilities

2. General Public: Indirectly Impacted
   - Business owners and managers
   - Residents from west-central New Mexico communities
   - General public
   - Elected officials

3. Government Agencies
    - FHWA
    - National Park Service
    - U.S. Fish and Wildlife Service
    - NMDOT
    - Mid Region Council of Governments
    - New Mexico Department of Game and Fish
    - New Mexico Office of Cultural Affairs, Historic Preservation Division
    - New Mexico Environment Department
    - New Mexico State Police
    - New Mexico Motor Transportation Police
    - Laguna Pueblo
    - Cibola County
    - Valencia County

f. Summary of Location Context

The landscape near C084 is flat and open. Lands adjacent to the C084 project are undeveloped. Most lands are used for cattle grazing. Dispersed residences are located south of C084 and west of NM 6. C084 provides a key access route across the BNSF railroad tracks for many residents in this area. The bridge is in need of repair or replacement. The project area is located in far western Valencia County next to Cibola County and Laguna Pueblo. C084 follows Historic Route 66. Few people live near the project area, but local residents have a strong interest in maintaining this essential route to their homes.

g. Identification of Issues

Based on similar projects in rural New Mexico, the following issues are anticipated during public involvement and project development:

- Safety issues
- Bridge condition
- Roadway condition
- Historic preservation/Route 66
- Access to area properties
- Construction impacts on travelers and local residents
- Railroad coordination
- Construction detours and delays
- Opportunities for economic development

h. Consensus on Purpose and Need Definition

NMDOT will seek to obtain a general consensus on the purpose and need definition. Components of the purpose and need statement are expected to include the following:

- Improve safety conditions

- Improve roadway conditions
- Improve bridge conditions
- Provide access to area residences and the materials pit
- Maintain environmental quality
- Maintain rural character

Consensus will be obtained through discussions with key stakeholders and agency coordination. Alternative design elements will address components of the purpose and need definition.

i. Consensus on Evaluation Criteria

NMDOT Location Study Procedures and NEPA

NMDOT carries out the preliminary project design according to the *Location Study Procedures Guidebook* (NMDOT, 2000). Public involvement occurs throughout the location study for a project. The study should result in compliance with NEPA. A Phase 1A/1B report will be prepared to describe and provide a detailed evaluation of alternatives. During Phase 1C, an environmental document will be prepared for the selected alternative.

j. Alternatives Development

Develop Initial Alternatives, Collect Data, and Develop Screening Criteria

Based on the purpose and need statement, initial alternatives will be developed. The alternatives are expected to focus on bridge and roadway issues as well as other issues identified by the public. Survey, geotechnical, bridge, drainage, environmental, traffic information, and public preferences will be gathered and presented to the design team. An evaluation matrix will be prepared and used for this exercise. The matrix will be present at the public information meeting.

Prepare Revised Alternatives

The alternatives will be further refined, and design team meetings will continue. Options for design, roadway alignment, bridges, curves, drainage, avoidance of environmentally sensitive areas, and consideration of historic preservation and Route 66 contextual factors will be developed. More detailed plans will be generated, allowing greater review of technical issues such as roadway design, slopes, cut and fill, drainage, traffic, access, right-of-way (including acquisitions, easements, and temporary work areas), pavement, constructability, socioeconomics, land use, and cost.

k. Investigation of Environmental and Cultural Impacts of the Alternatives

Existing data will be collected on the environmental and cultural settings. Information will be obtained on geology, soils, water, vegetation, wildlife, fish, protected species, cultural resources, air, noise, hazardous materials, Section 4(f) properties, socioeconomics, environmental justice, and visual resources. A preliminary evaluation of environmental impacts, including an evaluation matrix, of the initial alternatives will be conducted.

l. Alternatives Screening Against Evaluation Criteria

At this stage, efforts will be directed towards identifying and developing recommended alternatives for detailed evaluation. The alternatives being considered will be presented to the design team, and the design team will evaluate the alternatives using the screening criteria. An evaluation matrix will be used. Deficiencies and fatal flaws in the alternatives will be identified.

m. Preferred Alternative

Viable alternatives will be developed and refined. The alternatives will be evaluated and a recommended preferred alternative(s) selected. A Phase 1A/1B report will be prepared that describes existing conditions, alternatives, design options, and environment. The recommended preferred alternative will be analyzed for environmental impacts, which will be presented in the environmental documentation. Decisions will be reinforced by an evaluation matrix, which can demonstrate the alternative evaluation and selection process to the public.

n. Mitigation Measures for Impacts

Specific mitigation measures will be developed for project impacts. Wherever possible, options to avoid an impact will be considered first. Mitigation measures will be described in the environmental document and the project plan notes. All mitigation measures will be implemented throughout the design and construction process. Based on the project design and environmental investigations, mitigation measures may be developed for the following issues or resources:

- Cultural resource sites
- Historic Route 66
- Migratory birds
- Birds nesting and bats roosting under bridge
- Property access during construction
- Revegetation specifications
- Traffic management, noise control, and air quality management during construction
- Other applicable measures from the NMDOT Standard Specifications for Highway and Bridge Construction

o. Document Decisions

All decisions and recommendations will be documented as the project develops. The design team, stakeholder, and public information meeting will be documented. A meeting summary document will be prepared for the public information meeting. Formal comments received on comment forms as well as by letter, email, and fax will be maintained in the project records. The preferred recommended alternative, other alternatives, and design options will be documented with the Phase 1A/1B Report. An administrative record will be maintained with documents dated and referenced with control number 6101000.

p. Track and Meet All Commitments

All decisions and commitments made during the C084 Project will be documented so that they can be addressed during subsequent design and construction phases. All mitigation actions will also be included. It will be the responsibility of the Project Development Engineer to ensure that the decisions and commitments made are implemented.

Upon adoption of a preferred alternative during Phase 1C of the proposed project, the mitigation strategies to reduce adverse impacts may need to be revised. The environmental documentation will describe all commitments made for the final project. All mitigation strategies will be implemented in the construction documents.

The construction plans will guide the contractor in constructing the project with the agreed-upon design and commitments. All commitments for mitigation actions described in the environmental documentation will be monitored by NMDOT during the construction phases to ensure that these actions are implemented.

7.0 References

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Appendix E. Public Meeting Summary, October 13, 2016

Public Information Meeting Summary
County Road 84 Bridge Project
October 13, 2016
Highland Meadows Volunteer Fire Station

Meeting Announced in: Cibola Beacon, Valencia County News Bulletin, and with a banner
Dates announced: October 7 Cibola Beacon, October 6 Valencia County News Bulletin
Mail outs sent: 10/03/16 to 103 addresses, 10/06/16 to 77 addresses

Meeting Attendees

Sixty six people attended the meeting

	Name	Address
1	Rebecca Belding	HC 77 Box 60, Laguna, NM 87026 baby742010@gmail.com
2	Randy Belding	HC 77 Box 60, Laguna NM 87026
3	Harvey D. Alldredge Jr	69 Fruita Rd., Laguna, NM 87026 foreverfree1212@yahoo.com
4	Lance Hesselgram	HC 77 Box 358, Laguna, NM 87026
5	Lupita Duque	HC 77 Box 356, Laguna, NM 87026
6	Ray Lucero	PO Box 194, Laguna, NM 87026 rlucero@lagunapueblo-nsn.gov
7	Greg Toya	gtoya@lagunapueblo-nsn.gov
8	Dana Rhodes	94 Taos Rd. Laguna, NM 87026 dgrhodes66@hotmail.com
9	Jason Thomas	51 Mescalero Rd., Laguna, NM 87026 jaseak@gmail.com
10	Laura Griego	PO Box 832, Los Lunas, NM 87031
11	Lynn Applegate	HC 77 Box 75, Laguna, NM 87026 unschoolapple@aol.com
12	Harriett Marmon	10125 Central NW, Albuquerque, NM 87121
13	James M. Applegate	621 Fulkerson Dr., Roswell, NM 88203 japple@dfn.com
14	Jamie Nugent	HC 77 Box 231, Laguna, NM 87026
15	Kim Roberts	HC 77 Box 231, Laguna, NM 87026
16	James Bazar	95 Akron, Laguna, NM 87026
17	Sharon Thompson	Al Zorro, Laguna, NM 87026
18	Adam Ringia	PO Box 94, Laguna, NM 87026
19	James Applegate	HC 77 Box 75, Laguna, Nm 87026 jamesdapplegate@aol.com
20	George Taylor	HC 77 Box 308,, Laguna, NM 87026 110papito@gmail.com
21	Diana Hall	70 James Ave, Laguna, NM 87026
22	Kathi McCready	45 Fruta Rd., Laguna, NM 87106
23	Jennifer Belding	HC 77 Box 182, Laguna, NM 87026 jennifercburgess@hotmail.com
24	Elaine Neal	HC 77 Box 48, Laguna, NM 87026 anogess@gmail.com
25	Christopher Belding	
26	Rosslee Mackey	
27	Tara Frank	Tfrank20@gmail.com
28	Jason Frank	HC 77 Box 55, Laguna, NM 87026 jfrank20@juno.com
29	David Nielson	HC 77 Box 37, Laguna, NM 87026
30	Richard Stoltenberl	HC 77 Box 300, Laguna, NM 87026
31	Curtis E. Jones	29 Dan Domingo, Laguna, NM 87026 realionzy@yahoo.com
32	Shawn Ortega	04 Lakota, Laguna, NM 87026 notacostumeortega@yahoo.com
33	Keith Kofford	8113 Southern SE, Albuquerque, NM 87108
34	Andy House	2119 Glorieta NE, Albuquerque, NM 87112
35	Bob Hagarty	28 Amarillo, Laguna, NM 87026
36	Luci Hagarty	28 Amarillo, Laguna, NM 87026

	Name	Address
37	Brandon Herrera	PO Box 194, Laguna, NM 87026 bjherrera@lagunapueblo-nsn.gov
38	Stephen Hustava	PO Box 3156, Albuquerque, NM 87190 sjhustava@yahoo.com
39	Tony Nelson	5 Pardo, Laguna, NM 87026
40	Tasha Gorman	HC 77 Box 314, Laguna, NM 87026 tlchunn@msn.com
41	Ronny Trappman	HC 77 Box 69, Laguna, NM 87026 ronneytrappman@gmail.com
42	Name Illegible	Volcano West Enterprises Inc. 10125 Central NW, Albuquerque, NM 87121
43	Name Illegible	Volcano West Enterprises Inc. 10125 Central NW, Albuquerque, NM 87121
44	Joe J Crawford	5 San Sebash, Laguna, NM 87026
45	Catherine Bazar	95 Akron St., Laguna, NM 87026
46	Gail Major	PO Box 2211, Los Lunas, NM 87031
47	D. Guider	
48	David Fletcher	PO Box 40485, Albuquerque, NM 87196 fletcher.d@att.net
49	Jan Peterson	06 George Ave, Laguna, NM 87026 nelliejlp@gmail.com
50	Al Kaylor	PO Box 621, Los Lunas, NM 87031
51	Jennifer Hall	HC 77 Box 65, Laguna, NM 87026 iona6@aol.com
52	Rosalie Luke	HC 77 Box 250, Laguna, NM 87026
53	Moni Luis Valero	HC 77 Box 34, Laguna, NM 87026
54	George Neal	HC 77 Box 48, Laguna, NM 87026
55	Linda Foy	43 Amigo Ave, Laguna, NM 87026 alohabest-rentals@yahoo.com
56	Jim Russell	HC 77 Box 268, Laguna, NM 87026
57	Scott E. James	HC 77 Box 351, Laguna, NM 87026
58	Shala Norris	8 Inca Rd. Laguna, NM 87026
59	Chris Russell	HC 77 Box 268, Laguna, NM 87026
60	Manuela Gutierrez	HC 77 Box 268, Laguna, NM 87026 buildrust003@gmail.com
61	Jr. Wood	HC 77 Box 268, Laguna, NM 87026
62	Jim Luke	HC 77 Box 250, Laguna, NM 87026
63	M. Guider	
64	Myron Gorman	HC 77 Box 314, Laguna, NM 87026
65	Bettl Ann Applegate	621 Fulkerson Dr., Roswell, NM 88203
66	Cynthis Nelson	5 Pardo, Laguna, NM 87026 cynthis@theneals.biz

The following project team member were present:

- Rais Rizvi, NMDOT
- Steven Gisler, NMDOT
- Genevieve Head, NMDOT
- Danton Bean, HDR
- Paul Molina, HDR
- Antonio Nunez Tavor, HCR
- Carlos Aguilar, HDR
- Eric Johnson, Marron and Associates

Presentation

Danton Bean discussed the existing bridge conditions and bridge replacement alternatives. Eric Johnson discussed the environmental process and conditions.

Question and Answer Session
(Project team responses are in italics)

Female Speaker: It just baffles me, when you are talking about doing these changes, that you can build a new bridge, and leave this structure alone like they did by the casino. There's an old bridge there that is a historical bridge. They didn't bother taking it down. They just made bridges on the other side. Is that a possibility? Because we're mostly concerned about not having access across the bridge while the other one is being built.

Good, I will talk about that as we go through each one of these alternatives, and then, you know, in regards to keeping the old bridge, feel free to comment on the forms that you have. There's a page in there that's a comment form. We're looking for you to record your comments there. You can either hand them back to us as you leave tonight, or there's an address on that comment form that you can send them to.

Mr. Guider: Are you aware that the trains sometimes park there? For hours. So if that were at grade the crossing. We wouldn't be able to get across anywhere.

That's a great comment, and we appreciate that information. That's information that really helps us to know that that's a difficult alternative.

Female Speaker: And they do that all the way across. It's not just by that bridge. Its all the way down the lane.

Male Speaker: Yeah, and sometimes there's two trains that will park on two different tracks.

Female Speaker: To let the Amtrak through.

Male Speaker: They'll park bumper to bumper all the way to Los Lunas.

(Murmuring from the crowd multiple people) We need a railroad representative here. There's a lot of trains that go through here. Yeah.

We have started a discussion with the rail road, so once we get into…

(Murmuring from the crowd multiple people) If you are doing it for them, they should be here. Period. And they should pay for it for a lot of the work.

That has been worked in the past where when we added an extra track, they contributed to it.

Al Kaylor: You will get diagrams. You will get maps. You will get everything you need legally, and I want the railroad here. We will have cameras, and I will bring the senator. Thank you.

Jason Thomas: Has the possibility of using the existing grade if we have an offset crossing being continued to be used, because it's being used now? Until it has to be taken down? So that we limit the amount of time that there has to be an alternate route being taken?

Yes, you're getting into my next alternative.

James Bazar: Is that going to be a bridge? Or just a straight over crossing at that point?

Alternative F is a new bridge structure.

James Basak: It's pretty much got a straight run up to it and down. Keep the curves out. I mean once you put this bridge in, its going to be there a long time. And the straighter the road is, believe it or not, in the winter, it will actually help.

Male Speaker: As far as the cost of these things? Is the cost of this option greater than the other options?

Yes, Alternative F, is the most economical.

Female Speaker: Then it makes the most sense.

Louis Hesselgren: One of the issues that I deal with when I drive over that, you can't always see oncoming traffic, and that could potentially create an issue there. Would you have to go longer? Or how would that work?

Yeah, so that's another situation where the existing roadway doesn't meet current standards. So we would make that vertical crest curve to meet the current standards so that you would have the proper sight distance.

Jennifer Belding: What if you took F here, but brought it to where D comes out? Because honestly, when I have to go to Albuquerque, I can't see around that turn, off of 6. So if you brought us past the turn a little bit, it would give us enough time, and people that are flying down Highway 6 enough time to slow down, while we're coming out.

So you're saying bring this intersection further north?

Jennifer Belding: Yes, to where you have D at.

Female Speaker: Its really close to that curve.

Male Speaker: Where most of the traffic is going, to Albuquerque, it is a blind spot.

So I appreciate these comments. Its hard for maybe all of these comments to be recorded. So feel free to write these down on the forms that you have. That way we'll make sure that they get into the report, into the document.

Elaine Neal: When you build the bridge, is there going to be shoulders on the bridge? So the people that want to take photographs of the trains coming down the tracks. (Outpouring of agreement and comments from the crowd). Or just tourists in general. If that can be a consideration when you are building. We are always having people blocking the road.

You need to set up a booth there and sell some goodies. So this Alternative B is the, what I mentioned earlier, is an grade crossing, and I think we've already received a comment about the cars, the trains being parked there. And so we see the issue is connected to an at-grade crossing.

Female Speaker: The railroad used to have an access for us to get over there. And because the trailers that would go over it, they closed it off and ripped it out. They don't want an at-grade.

George Neal: We had an easement down there, by the ??? (southeast of the project area). There was an easement since 1908, and the railroad just come and closed it.

(Multiple people): If you go down there, and they find out, you will get fined. They don't want you there and you know, they put nails down too. Yeah, I've gotten tickets.

Tara Frank: Going back to the last one. Is it possible to go back to the last one? Did someone ask this? If so, I didn't hear it? But if you do this bridge, could you, I think somebody asked it, but I don't know if anybody answered. Could the bridge be left for the spectators so they could go take pictures?

Female Speaker: Off of the historical one?

Tara Frank: Yeah, so they would be able to. Right now it likes like there's some cement pillars that they put after the fact, so they could handle the load.

And that's the issue with leaving the structures. It doesn't provide the room for the railroads future track.

Female Speaker: But that's the rail road's problem, not ours.

Male Speaker: The railroad doesn't have a say in the historical part of the bridge. Its a historical landmark, nationally-known.

Male Speaker: I just want to cross, I don't care about a landmark.

Sorry about that, this slide is really hard to see. On this board is the same slide. Once we turn the lights on you'll be able to see it better. This is showing what the road way section would be. The 12-foot driving lanes and the shoulders. This is a proposed section at the pier of the bridge where we have the same road way configuration with the 12-foot driving lanes and 6-foot shoulders. We are proposing that the piers, the columns right adjacent to the rail road track be similar to what's there today. Be a concrete wall type of pile. We are also proposing that the railing be similar to what's there today. It's a steel railing, a three rail system. We are trying to maintain that to what we're proposing on the bridge to maintain the look of what's there today.

So with all of those bridge alternatives, we are considering a three-span bridge. Again, this would be a pier wall, adjacent to the tracks. The railing would be again, a metal railing similar to what's there today. The earth embankment, I think we want to maintain the look of that earth embankment, so we would have to rock laying over the top of that bank. Here is a little schematic of what the proposed railing would look like.

So that's the alternatives that we have developed to this point. And again, we are open to your comments. If you want to document those on the papers that you have, you could mail them back in. Your comments can also be emailed to Eric, at this email address. It's on the bottom of the paper there. We are looking for comments to be returned by October 27th. That way we can move and develop and move the project forward.

Jason Thomas: As far as funding goes, the proposed improvement from Alamo, how does that tie into this project? As far as funding goes? Because there's a lot of folks from Alamo that use the road, too.

Female Speaker: A lot of people. Alamo is doing construction on their road as well, and its still, going to be going on for quite some time as far as everything that I see. But there are so many people that are rely on that road.

Male Speaker: I'd say there are more people coming from Alamo than from here, almost.

Female Speaker: I mean, we have a lot from Alamo coming through there.

Are we talking about NM 6?

Multiple People: No (indecipherable speaking)

It's a BIA road right?

Male Speaker: Yeah, they come out that, and then they come up here. It's not far from the bridge.

Male Speaker: There's actually two reservations that deal with that road. There's Navajo reservation and the Laguna reservation. We have two different reservations. Right now the Navajo reservation is doing a lot to improve their road, including getting it paved. The Laguna side hasn't really done much.

Male Speaker: Eventually it will be paved. All 53 miles long, I think, will be paved all the way into Grants.

Male Speaker: Then there is Mesita, and other places can come here. It's actually quicker to come this way than through Grants to get to Albuquerque.

I guess that's not our, that's not DOT. It's not our funding source. They have their own funding sources.

Male Speaker: How many agencies does that entail? BIA? BLM?

Male Speaker: Like I said, I really like the current access that we currently have. You don't mess with it. You just do the bridge and then weather you turn it into national landmark or whatever you do it. We got a new bridge and that can be figured out.

David Nielson: Cost effectively, it makes more sense to just build something new. Rather than rebuild, or redo something, because cost of remodeling and something like that skyrockets the project.

Female Speaker: We tried to rebuild it once, and we're having to fix it again. So, why do it again?

Male Speaker: And it didn't last for a long time. It's been horrible shortly after.

Dana Rhodes: Unless you get the rail road to pay for these improvements, wouldn't it be more economical to leave the bridge, it would save you an awful lot of money, where you don't have to tear it down, haul it all off or something, and just have the new bridge. And then that one, the old bridge just stays the way it is. Unless the railroads going to pay for the difference and you're asking for a certain amount of money. If they don't want to belly up and pay the difference, then we should be able to do it another way. Because we need to go back and forth over the bridge.

Thank you. Definitely that's going to be a major deadlock in our traffic control. How do we get through without having you not cross the bridge?

Dana Rhodes: We haven't found the rail road to be very cooperative in our previous meetings. When I first moved here, we had two access roads. We had the bridge, and the road down here. And they've made it virtually impossible for us to use that other road. They don't cooperate.

Jason Frank: And also, they feel free to open up their road, any time they want, remove berms, come on and use our bridge. Soon as they're done with what they're doing, they put berms back. They put marshals, or whatever they call them, their security people over there, and if you try to go out that way and they're there, they harass you. So that's why we're not very friendly.

Male Speaker: They're Federal Police will harass you and will place federal charges on you when you go down there.

Jason Frank: But they bring large vehicles over that bridge all the time.

Multiple Speakers: They ignore the weight limit. They run full trucks with rocks over it.

Jason Frank: And if you try, I've tried to get rock for my driveway and stuff, and all the people that are private companies know that it's restricted and they won't do it. So you have to either, like I borrowed my friend, my neighbors trailer all the time and take, you know one load is like 7 tons.

Male Speaker: I think that is what a lot of our concern is about. The heavy equipment that goes over that bridge. The gravel that goes over that bridge. And it's the rail road people. If you want to keep the bridge up and running for us for another two years, you've got to stop these people from tearing this bridge up. I mean, if you want to see pictures? I have pictures on my phone of railroad people going across. I've come down and took pictures of them. I went and talked to them, and they told me to go… down stairs, let's put it that way. They just put a bag over the sign. And they just go over it. A couple weeks ago, they took a big earth mover over it. So somebody needs to stop it.

Jason Frank: The thing about it is, they could get it across their opening, but they go across the bridge instead.

You can call us.

Jason Frank: Trust me, I've called a million times, they don't call us back, the DOT.

Diana Hall: Yeah, the night he's talking about, I counted seven huge pieces of equipment going over that bridge, they have to pass my house going out, and I couldn't believe the size of the equipment, and we never saw it come in. So they are probably doing it at night, because it was when they were leaving.

Jason Thomas: I have a question, about the historic status of the bridge. Because I know the Park Service is in charge of that. How hard is it going to be to convince them to get a new bridge?

Jennifer Hall: Do we have any idea of when this might start? 18? 19? 2020?

2017 is when we want to get our design done. What our plans are is once we have the design, we have these documents out, we can convince the district and our upper management that this is something that we need funding for. Because the funding, the way the funding works, is prioritization. You know we've got things where there's accidents going on, there's fatalities going on, so the department looks at ratings as to what is important. So by doing this we can bring this project higher up.

Male Speaker: So if a fire starts on the back side that no one can get to.

Chris Russell: What about building a new bridge and changing the location of the bridge, to make it safer for the community that? Like you said, it isn't easy to access. Because it takes an extra 15-20 minutes to drive from the current location of the bridge is, all the way to the community of Highland Meadows. It's actually detrimental to ambulances, firetrucks. The gated communities into Los Lunas, it takes me an extra 25 minutes just to commute that extra, because I have to drive about 4-5 miles out and then make a U-turn and drive back 5 miles. So it's kind of chaotic to have to drive all the way around.

Female Speaker: It would also be safer for the kids. Crossing over the bridge, it's not safe. Bus drivers don't like going through there because of all the ruts. So what then? Because all our kids here go to Los Lunas or Grants. What then?

Christopher Belking: We've had train accidents out here before. If we have a train accident that has chemicals on it under the bridge, that's our only exit out. And general rule of thumb, when you have a chemical spill you can't get a vehicle within a mile of that accident. You know, are there alternates where you can put it so we have extra…

Currently there is no alternate.

Multiple Speakers: If something happens we're going be trapped in there. We need another exit. Technically there could be two in Mesita, but they may not allow us to go through it. When it flooded this whole area, they had to come in and bulldoze a higher road so that we can get in and out.

Diana Hall: So the people are talking about crazy days, when there is a national disaster, flooding, what not, to the east, stuff happening to the west. Or one of those weeks, where the trains pile up and just up and parks. Due to the guards, it would have to be the bridge overpass.

We appreciate that that is really helpful.

Male Speaker: When they have an official crossing, they generally don't park on the official crossing. The reason I think we had such an issue is it was a railroad crossing that the railroad used for a long time. And then we used it, and it was never, I guess they felt, an official crossing. Because there wasn't a lot of people out there at that time.

Jason Frank: I have another question. F seemed like, a lot of us liked F, but is there any provision in there to make a turn lane or something? Because the only accidents I've seen where we're stopping to turn to go down the bridge, someone doesn't realize that we're turning. I've seen a few accidents, and a few near misses there so.

Male Speaker: If we could move it down, because there's a huge straight away right here. So I mean, it's plenty open for everybody to see, you know both ways, coming and going, and it makes it easier for everybody driving.

Male Speaker: He's talking about anyone taking a left, really taking a left onto there.

Female Speaker: Because the bridge is hard. They do a lot of movies, and so they often have their catering trucks and it's very hard to make the left because of all the people standing around. And it's a blind spot with people coming the other way.

Good, thank you for that.

Elaine Neal: How about making it so that you can actually see where you're supposed to turn off to get on the bridge? I mean you can't tell, there's a little tiny reflective. Even in the day time it is hard to see.

Moni Luis Valero: If you guys decide you need to do an at-grade access for us while you build whatever you're doing, maybe you could do the at grade access somewhere where we could keep it. Instead of putting it up and ripping it out. So put it further down, so that then we'd have two accesses. If you have to put the money in to build it anyway, if you can talk the railroad into it. Make it something you could leave that gives us the double access.

Good idea.

Gail Major: They had an access, the road over by the hanger, this big building, this metal building, for years and years, and then they closed it off. It would be nice to do the bridge, but also have a second entry way, you know, to and fro.

Jamie Nugent: As this process moves on how do you keep in touch with us?

We will probably have to schedule another public information meeting to let you guys know.

Jamie Nugent: So you won't do anything without letting us know? You have our emails.

I expect it will be, as we get closer to construction. If there is another meeting, it will be as we get closer to construction.

Hagarty: The other advantage, as the gentleman said, of building it east of the bridge, all this open country near the fire station. The fire station would have more access. In case there was an emergency, they could just proceed right over the tracks this way at a nice location where it's close to the east end of Highland Meadows, and close to the west end. Kind of centrally located.

Gail Major: My question is, are you wanting everyone's input that's going to determine your outcome? Or are you just giving us information to what you're going to do? Without really taking into consideration?

Both of those things. We're getting you information, and we want your input to the alternatives. If there is one you like, we definitely want to know that. If there's something you don't like, and we've heard some of those comments already, we want to know.

Gail Major: And you'll let us know which one? Or you'll pretty much go with what the majority of everyone wants? Or are you going to make your own determination? That's my question. I know how these government places work.

We'll look at everything. We have to look at cost. We have to look at environment, historical. We have to look at all the factors before we decide. And that's part of this study that we're doing. Public input, environment, historical nature, cost, design, engineering, all that stuff comes into that report.

Male Speaker: Why don't we have another meeting? Can you have a railroad representative. (much agreement from the crowd)?

Male Speaker: Everyone here, if you really like one of those plans, put a comment in. Because this is our chance to actually say something and be heard about it. Just like saying it in here. You should write it in. Because otherwise, this is the process you have to go through and if we don't utilize it as best we can we're going to be out.

Thank you. Perfect comment.

I just want to say, this big turnout has made a big impression on us. We were expecting 15-20 people and to get a room full of 60 people so that goes into the record too. So you've made a big statement here that you really care about this bridge.

The study document that we're doing right now, will be wrapped up soon, and will be public information. And so it will be accessible to everybody as part of the process.

Let me ask folks if the internet, or social media would be an effective way, is that a possibility? Email?

Curtis Jones: I was wondering in regard to the height issue, could you lower the tracks right here?

Definitely that's an alternative to consider. That would be the railroad.

Luke: Seems to me like it would be a safety item if you built a bridge straight across from the fire station. It would give them quicker access to fires over there.

Post Meeting Comment

After the question and answer session, one stakeholder said "save the sunflowers!" and mentioned that bridge area was the only place where sunflowers bloom.

Written Comments

Comment 1: Jennifer Belding

We think the road would be best moved north out of the bend on Highway 6 to eliminate the blind spot from oncoming traffic around the bend. In addition, we prefer the current bridge remain open for access while the new bridge is being completed. We would also like to see in the plans or future plans, another bridge that either goes over the railroad tracks or an at grade exit. On the bridge, would like big enough shoulders so vehicles can pull over and take pictures of the trains. At the next meeting, we request a railroad representative to be there. We would like to stay updated on the progress. Please use my email jenniferburgess@hotmail.com for notifications.

Comment 2: Keith Kofford

I am totally against destruction of the bridge or any part of Route 66. It is that last, I believe, bridge of its kind in the state, certainly on Rt. 66. It's an historic treasure and should not be touched unless it's for repairs only. The Santa Fe Railroad and the other Rail works have complained for the past years that business is down, and they're suffering. It that's the case then they certainly don't need a new bridge. If one is to be made, do it alongside the present one. The same for the highway. Leave both alone for Route 66 fans to use and enjoy. There is too much "DEMOLITION-IT IS" to always tear things down. Look at the Alvarado Hotel. Bad feelings and feelings of remorse have been generated by its destruction. Now the Alvarado Transportation was built in its place, a poor copy of the original and the demolishers had to say "oops"! after it was gone. Build a bridge if you must (and I'm sure big money will force it to be done) but do it so the 66 Highway and old bridge are not disturbed.

Comment 3: Christopher Belding

We think the road would be best moved north out of the bend on Highway 6 to eliminate the blind spot from oncoming traffic around the bend. In addition, we prefer the current bridge remain open for access while the new bridge is being completed. We would also like to see in the plans or future plans another bridge that either goes over the railroad tracks or an at grade exit. On the bridge, would like big enough shoulders so vehicles can pull over and take pictures of the trains. At the next meeting we request a railroad representative to be there. We would like to stay updated on the progress. Please use my email iding45@gmail.com and cell phone number (505) 916-7684 for notifications.

Comment 4: James Bazar

I think #F is the best idea to keep life moving on. What happens to the old bridge doesn't matter to me.

Comment 5: Catherine Bazar

My concern is the women and children. I wake up at 4 am, get organized and leave at 5 am to get my son to work by 6 am. My concern is having to travel any more than needed.

Children must also be out on the corner to be picked up by A&S, bussed into Los Lunas. My husband works graveyard shift so if I break down, no help. The shortest route into Highway 6 and I-40 is greatly appreciated.

I favor #F route. Thank you for hearing us out.

Roads also get super muddy. Oftentimes stranded in winter and alone. The shortest route to I-40is best. Very tiring to travel every day. I already travel two hours daily: One hour to go and one hour to come.
Some sightseers, so it would be nice to plant a nice Route 66 sign. For the picture taking visitors.

Comment 6: Anonymous

Use Build Alternative F and leave old bridge open during most of construction. Thank you for hearing us.

Comment 7: Bob and Luci Hagarty

Thank you for the County Road Bridge 84 Project meeting of October 13 that you presented at our Fire Station in Highland Meadows.

Our comments for the bridge include:

1. We suggest moving the bridge to an area nearer the Fire Station so there is better access to the south side of Route 6 in the event of a fire in the Suwanee neighborhood. Also, a bridge in this area would be situated well away from Highway 6. I think that the current bridge is too close to highway 6. There should be some space between the bridge and the Highway 6.

2. Moving the bridge would also correct the danger associated with the curve in the road that now exists for cars traveling Highway 6 in a northerly direction but slowing or stopping to make a left turn onto the bridge. Cars speeding around the curve often have no time to stop because they may not see the car ahead due to the curve. There have been accidents here before. Also, as we can attest by firsthand experience, there have been many close calls. When I am making that same turn in my car, I make sure there is no one speeding behind my car or following too close. This is one of the most important reasons to move the bridge or somehow fix the dangerous curve problem.
3. Also, many times when we are traveling over the bridge, tourists are on the bridge. They park on the bridge itself and take photos, sometimes even setting up camera stands, etc. to take photos. It's very dangerous to do this. Not all drivers that come over the bridge drive slowly enough to be aware of people standing over the arc of the bridge. There should probably be no parking signs there. I am afraid that one day someone standing on the bridge is going to get hit. If you build a new bridge, maybe an overlook area or wide accommodating access for pedestrians would be called for.

These are comments. Thanks for listening.

Comment 8: George Taylor

I'm not into tearing down old landmarks that includes old buildings. The bridge should be saved. I believe Plan F should be the only alternative as a bridge replacement. But the only other Alternative I would like to see is the bridge be relocated down east to where the old Quanset Hut us. Once built there over the train tracks there is a dirt road that leads to the already paved road. I believe this area would be perfect. Where the bridge entrance is now is dangerous on that curve. People going west on Highway 6 turning left is in a bad spot. Many horrific rear end accidents have happened there. If anyone would like to discuss this they can call me at 505-363-4646.

Comment 9: Gail Major

I want to thank you all for your presentation on County Road 84 Bridge Project October 13, 2016.

I do not have any problems with the bridge project in Plan F, G.

I say no to your plan D, E, anything with the zig-zag I do not like. I am not sure but believe it would encroach onto our, (Major Land and Cattle, three Bar, Buddy Major) property which starts south of the original road and would mess with our rock entry way and the paved entry way. But I like the plans that the bridge be built north of the original bridge.

It is my understanding this bridge is for the railroad to bring the height, length and weight up to code and one of the biggest concerns and complaint in this community is not having a second exit over the railroad, as was spoken of at the meeting. Since the bridge is for the railroad, the railroad needs to allow a crossing by the big hanger area, down about 2 miles east from the bridge. A crossing was there for years and years. I believe the railroad wants to have it as a parking lot area.

The railroad seriously needs to put in a crossing like they have for the Waste Management Station which is east of the Highland Meadows by the Rio Puerco. You do this and the people will be happy. Right now people are upset with the railroad because they go over the bridge illegally and are tearing up our bridge and roads because of the heavy overweight trucks. Illegal weight limits and yet they do whatever they want. Illegal is still illegal and it doesn't matter who you are it is still illegal.

There are a lot of good and educated people out here despite the shabby looks of the area. And I think the people out here deserves a second crossing. One bridge plus one crossing.

Again, thank you for the great meeting and presentation.

Comment 10: Sherri Thompson

Thank you for the presentation to the community. I know those aren't always pleasant. A lot of good information was given.

Here are my comments.

1. I favor any alignment that would allow use of the existing bridge during construction. A detour through Mesita just would not be acceptable. Plus the dirt road through the Laguna Pueblo holdings would have to be greatly improved as it is impassible in wet weather. Also, the Pueblo really discourages any non-Pueblo residents from using that dirt road. They do not block access but they don't like it used.

2. The current bridge does not allow for a sight line for oncoming traffic from either direction on CR 84. I assume that cannot be changed due to current constraints. The BNSF tracks are just too close to SR 6 to allow a more gradual rise to pass over the tracks. I think the wider roadway will alleviate the unsafe condition we have now of people crossing over the bridge in the middle of the road.

3. Install signs stating NO STOPPING OR PARKING ON BRIDGE. We get a lot of people parking on the bridge to photograph the trains. The wider roadway with shoulders will help with this. If a vehicle is parked near either end of the bridge and you are coming from the opposite side in a passenger car you cannot see the parked car until you reach the crest of the roadway.

4. All signage needs to be tamper proof. Many signs have disappeared within days of being installed. (Weight limit signs)

5. Since the current bridge has had several modifications over the years, I see no reason to keep it. The possible historical significance just isn't there any longer.

6. We have a lot of burrowing owls in the area. The loss of a few nests in the area of construction will not endanger their population. However, as a retired Federal employee (USACE) I know the issue will have to be addressed.

Good luck!

Comment 11: George and Elane Neal

Bridge wide enough at top to easily pass pedestrian walk on one side for sightseers. No road from fire station to south side; enough wrong kind of people with sticky fingers.

Plan F – leave old bridge until new bridge is built – I believe this was Plan F.

Put turn lanes off Hwy 6 for everyone's safety. Both ways.

Mark Road – Put up street light so people can see where to turn.

To help our new paved roads, keep RR heavy equipment off all our roads – they have easy access to Hwy 6 on south side of tracks.

NMDOT

PUBLIC INFORMATION MEETING

U.S. Department of Transportation
Federal Highway Administration

CIBOLA COUNTY RD. C084 (OLD US66)

CN 6101000

Thursday, October 13, 2016

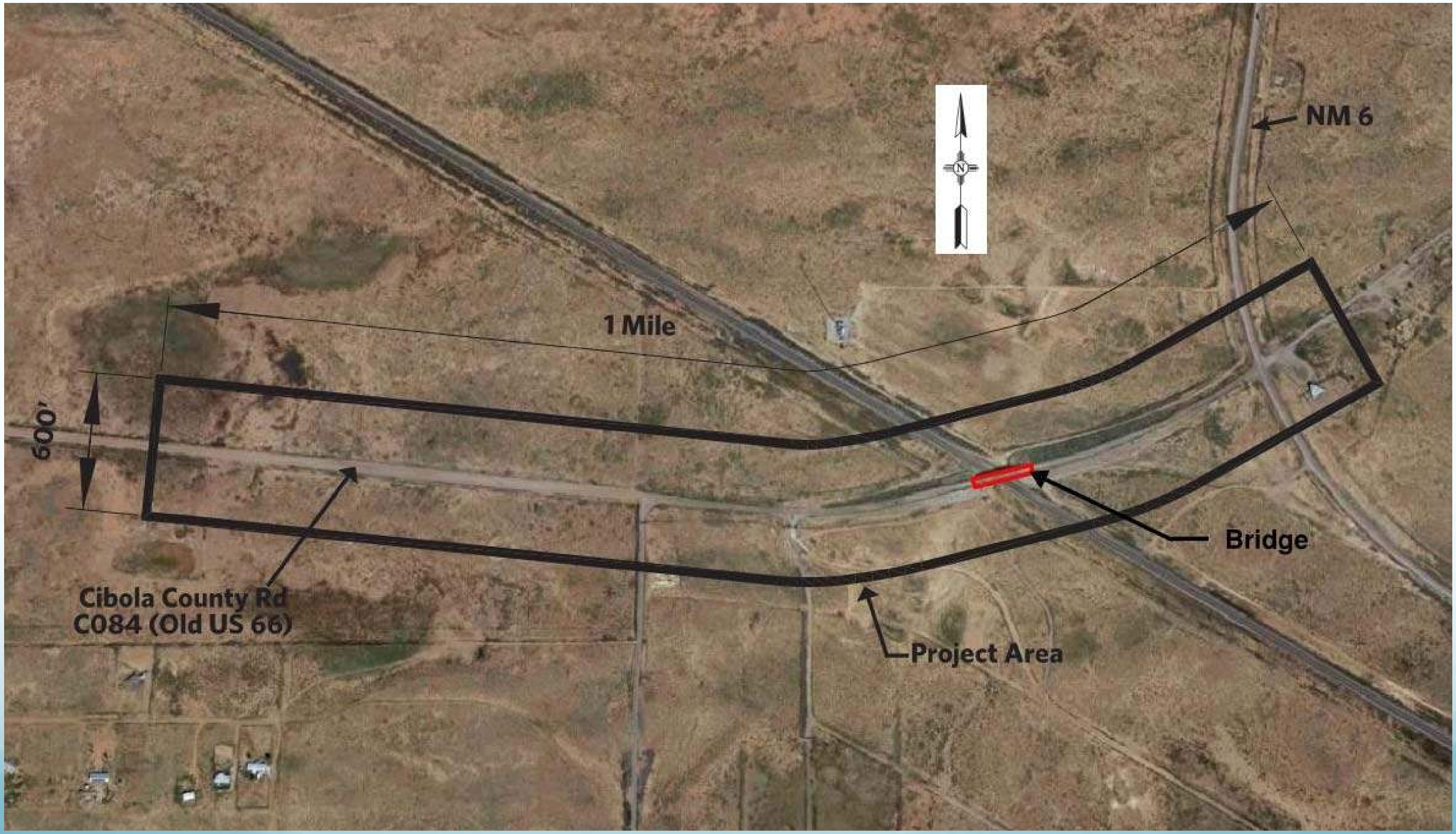
Team Members

- NMDOT
  - Rais Rizvi, Project Development Engineer
  - Lisa Boyd Vega, District 6
  - Bryan Peters, District 6
  - Steven Gisler, Environmental Bureau
  - Genevieve Head, Environmental Bureau
- HDR Team
  - Danton Bean, Project Manager
  - Paul Molina, Engineer
  - Antonio NunezTovar, Engineer
  - Eric Johnson, Marron Inc.

Meeting Purpose

- Present Project Study Area
- Present Project Purpose and Need
- Present Project Development Steps
- Present Alternatives
- Receive Input From Public
  - Project Needs
  - Project Solutions

Project Study Area



Project Purpose and Need

- Purpose: Provide Safe Crossing of the Railway (Current and Future Use)
- Need: Existing Structure does not meet current standards.

Project Development Steps

1. Development and Evaluation of Alternatives (Study)

   April 2016 – Nov. 2016

2. Environmental Documentation

   Dec. 2016 – June 2017

3. Design

   Dec. 2016 – Dec. 2017

4. Construction

   Funding Not Identified

1. Evaluation of Alternatives (Study)

1. Existing Conditions
   A. Bridge (No. 0002)
      1. Built in 1934 (Reconstructed in 1995)
      2. Timber and Steel Girders
         a. Timber girders reinforced with steel plates, straps and cradles
      3. Timber and Concrete Foundations
      4. Vertical clearance inadequate
         (Existing 21’-3”ft., Current Standard 23’-4”)
      5. Horizontal clearance inadequate for future BNSF track
         (Existing length 216’-9”, 284’-3” Future)
      6. Narrow bridge (Existing (2) 11’-6” Driving Lanes,
         Current Standard (2) 12’-0” & 6’-0” Shoulders)
      7. Weight restriction
         (Existing 15 ton, Current Standard 36 ton)

1. Evaluation of Alternatives (Study)

1. Existing Conditions

   B. Roadway

      1. Roadway/Railway Crossing at 45 degree skew
      2. 1200 ft. approach embankment with gravel armoring
      3. Embankment Failures
      4. Pavement Failures with cracking and undulations
      5. Traffic Counts are 400 vehicles per day
      6. Narrow Roadway (Existing (2) 11’-0” Driving Lanes & 2’-0” Shldrs, Current Standard (2) 12’-0” Driving Lanes & 6’-0” Shldrs)

1. Evaluation of Alternatives (Study)

1. Existing Conditions

1. Bridge Elevation

2. Weight Limit Sign


3. Narrow Bridge Deck


4. Inadequate height and width

1. Evaluation of Alternatives (Study)

1. Existing Conditions

1. Embankment Failure

2. Steel Plates and Straps

3. Timber Girders

4. Timber Piers

1. Evaluation of Alternatives (Study)

1. Need: Existing Structure does not meet current standards.
   - A. New Bridge Structure (Existing Bridge has Weight Limit)
   - B. Provide Horizontal Distance for Future Railway
   - C. Increase Vertical Clearance
   - D. Roadway and Bridge with Shoulders

2 .Environmental Process

- National Environmental Policy Act (NEPA)
- National Historic Preservation Act (NHPA)
- Section 4(f) of the Transportation Act
- NMDOT Location Study Procedures
- Evaluation of alternative impacts
- Public and stakeholder involvement
- Categorical Exclusion
- NMDOT and FHWA decision

Natural Environment

- Water – drainage impacts
- Geology and soils – erosion potential
- Vegetation – revegetation needs
- Wildlife – habitat and nesting areas
- Air quality – dust control

Historic/Cultural Environment

- Built in 1934 as part of the state/federal railroad grade separ
- A contributing element to this segment of historic US Route 66 [Correo to Laguna]
- One spot where the pre-1937 and 1937 alignments of Rt. 66 meet
- Railroad alignment was built in the 1880s
- Study area to be inventoried for additional cultural resources.

Human Environment

- Land Use – conformity with plans
- Socioeconomics – business viability and goods transportation
- Environmental Justice – neighborhood impacts and benefits
- Hazardous Materials – contaminated sites

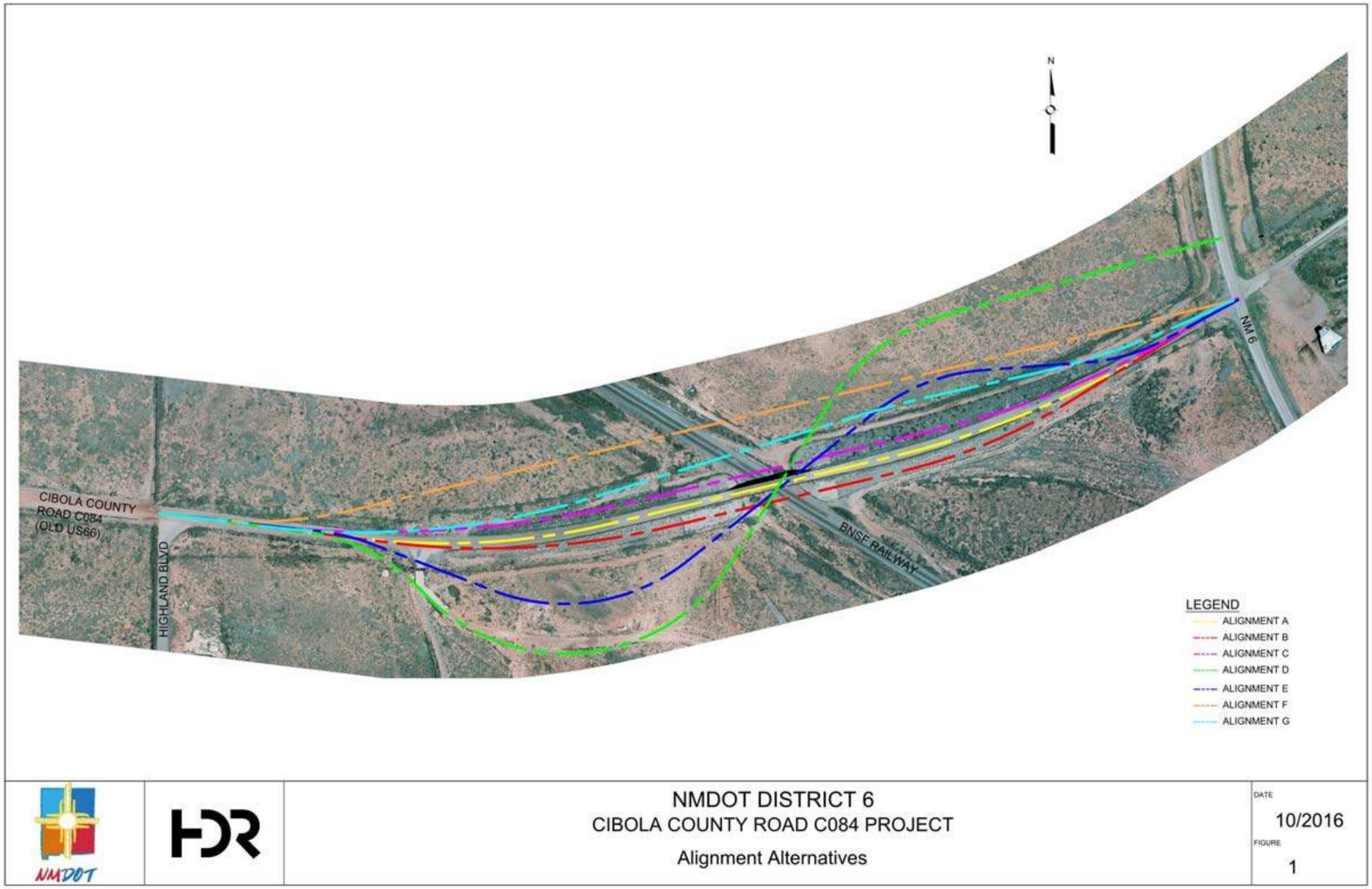
Context Sensitive Solutions

- Business viability
- Historic role
- Visual character
- Community preferences
- Transportation modes: pedestrians, bicycles, vans, and buses

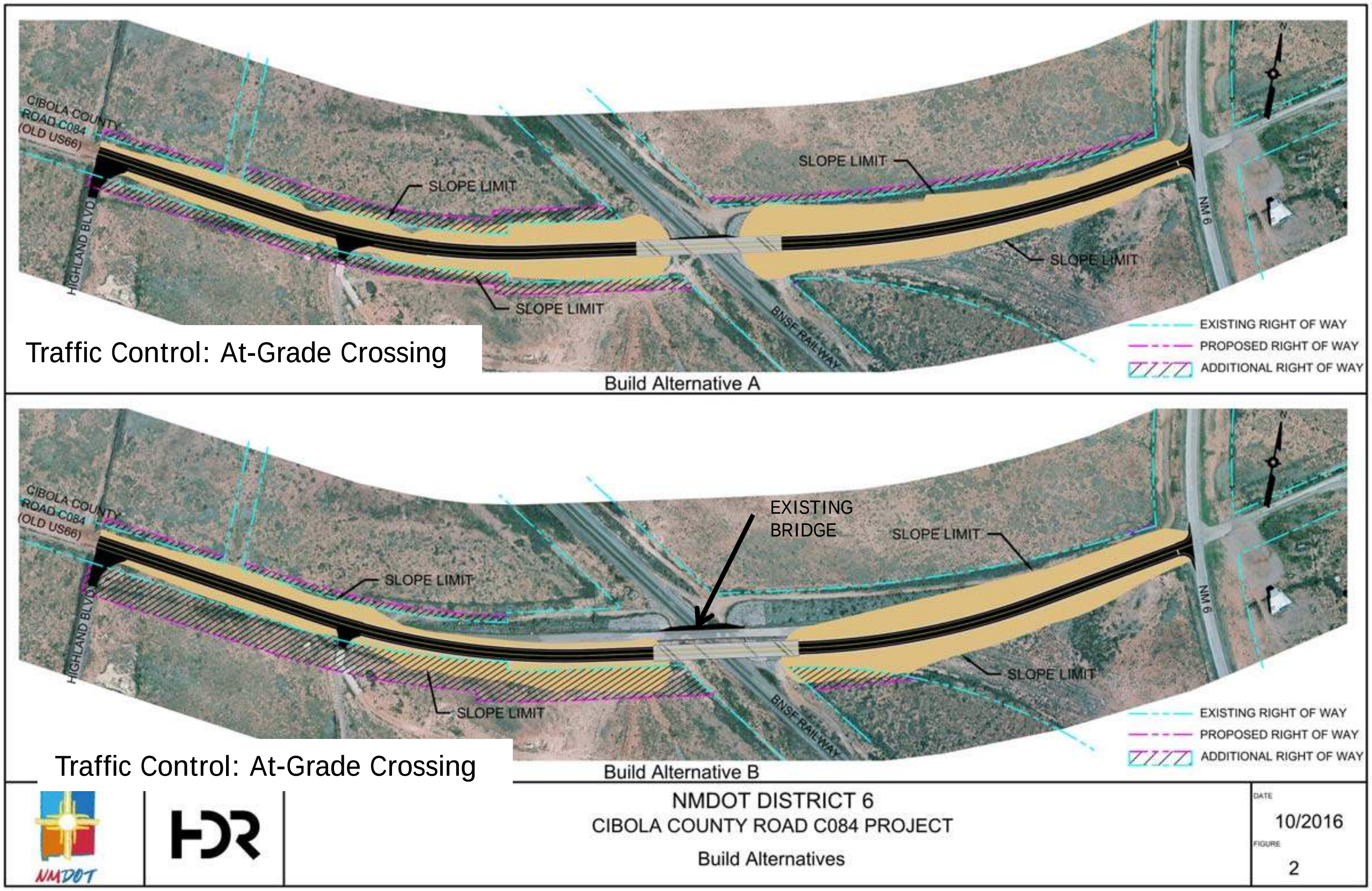
3. Alternatives

- No Build Alternative
- Rehabilitation Alternative
- Build Alternatives

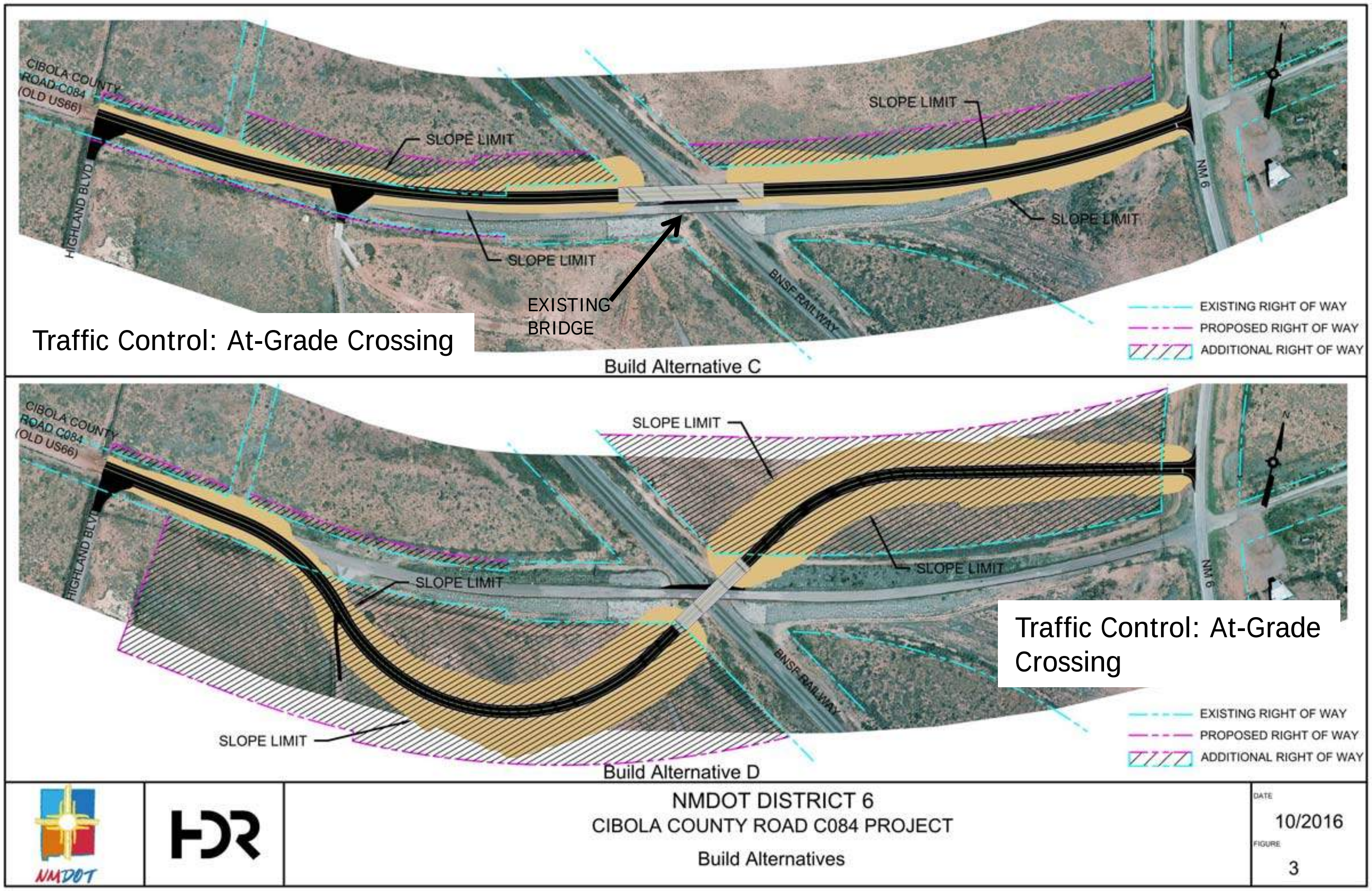
3. Alignment Alternatives



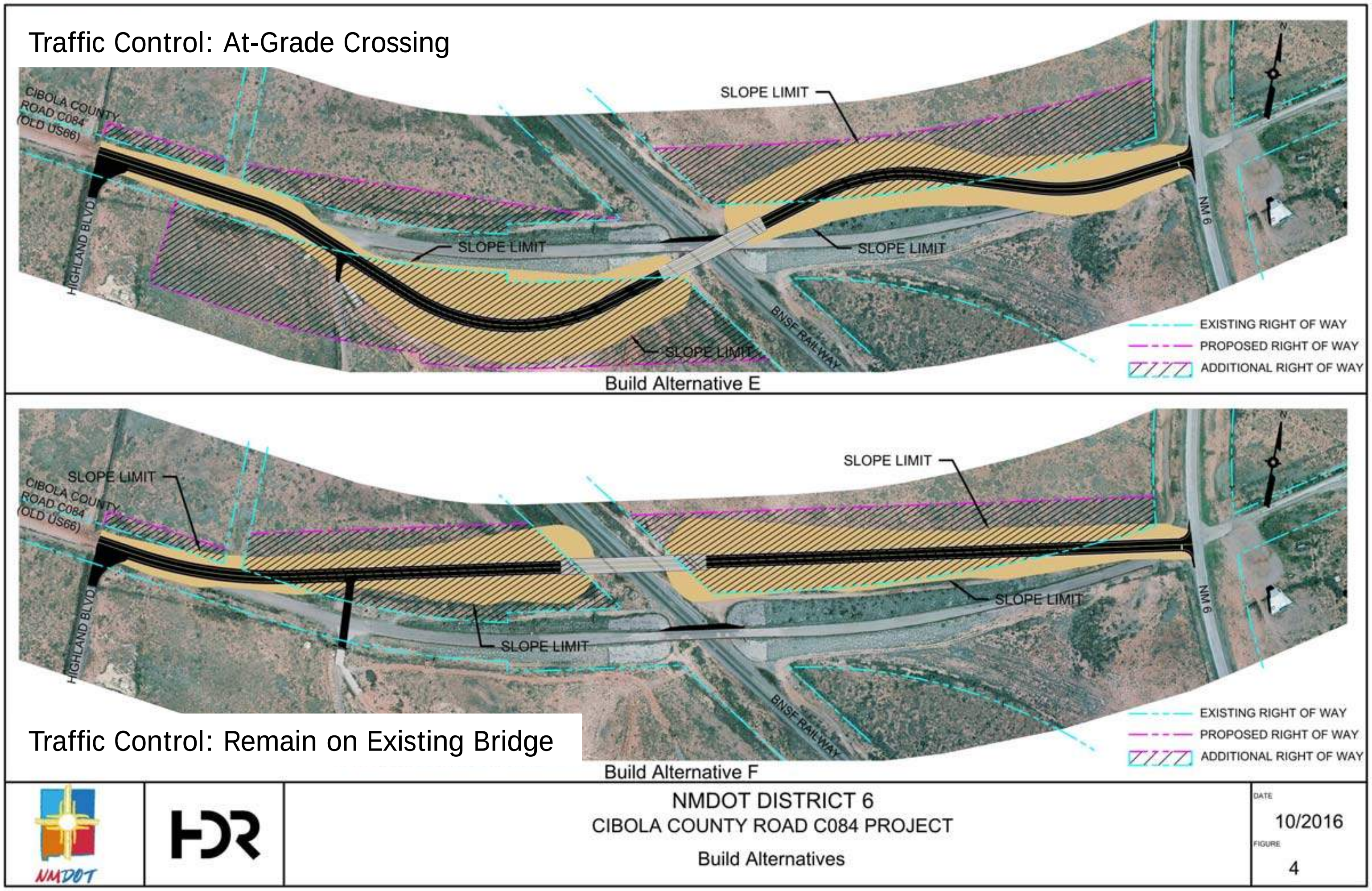
3. Alignment Alternatives



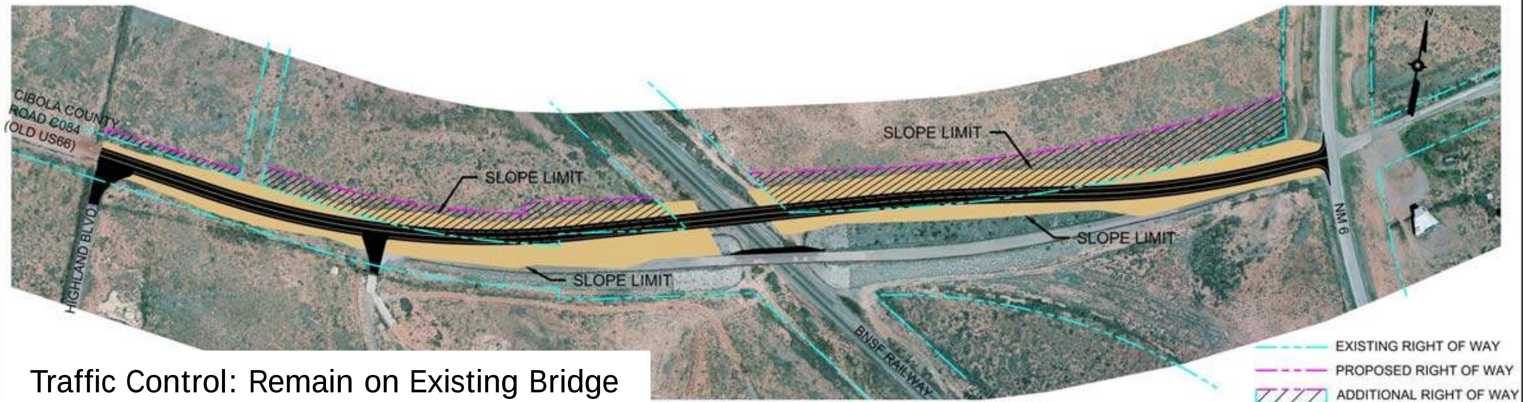
3. Alignment Alternatives



3. Alignment Alternatives



3. Alignment Alternatives



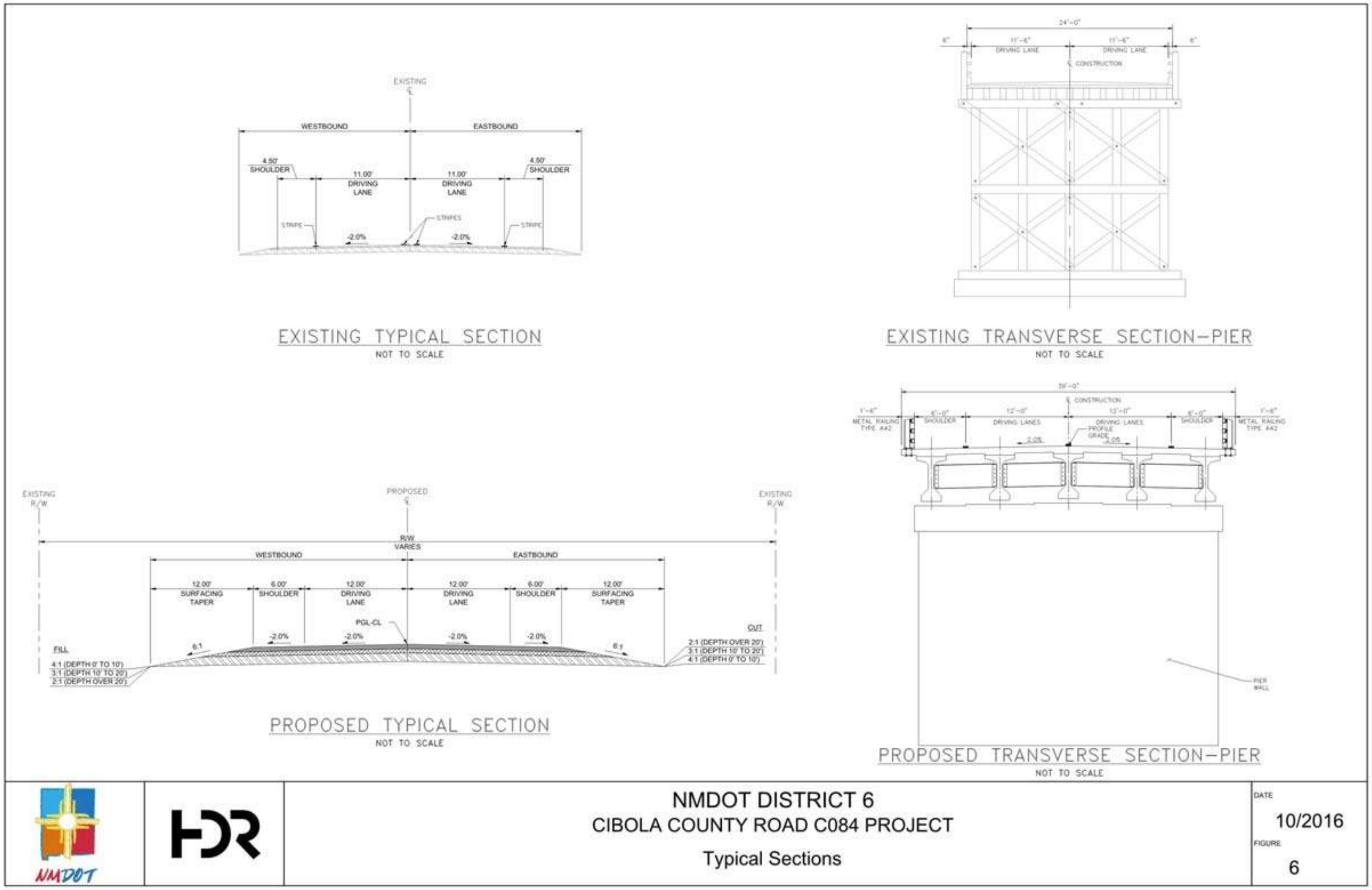
Build Alternative G

NMDOT DISTRICT 6
CIBOLA COUNTY ROAD C084 PROJECT
Build Alternatives

DATE 10/2016
FIGURE 5

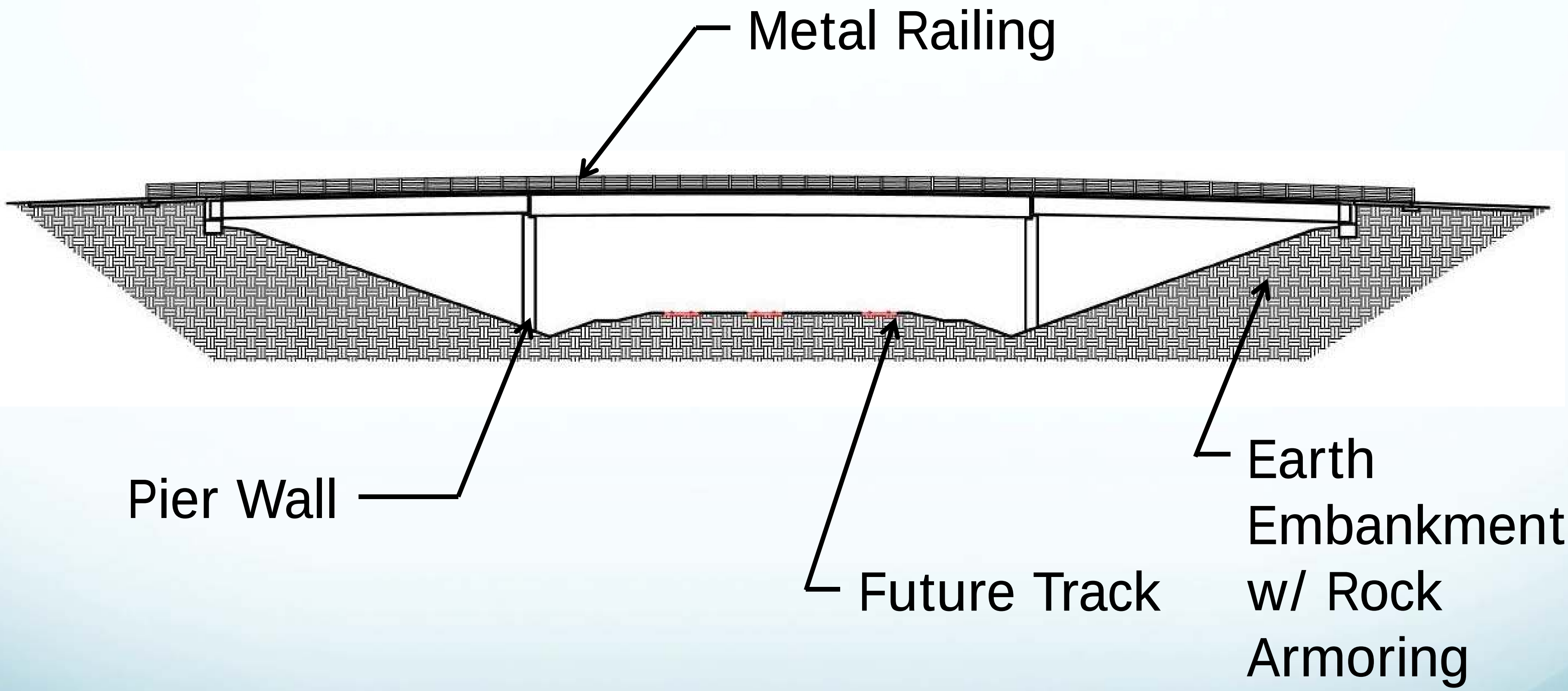
3. Alternatives

Existing& Proposed Typical Sections



3. Alternatives

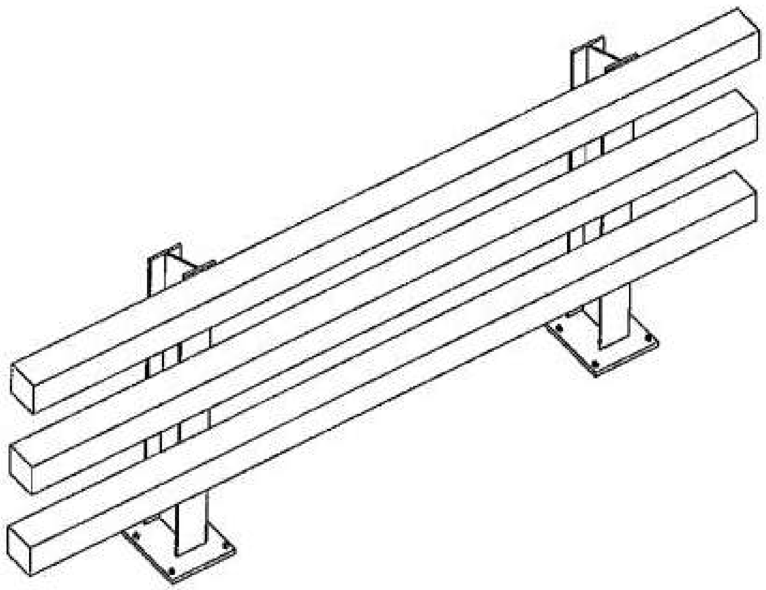
Proposed Bridge Elevation



Bridge Elevation

3. Alternatives

Proposed Bridge Elevation



1. Bridge Railing

Comments

- Provide spoken comment
- Complete comment form, leave in box or mail to:

  Eric Johnson,

  Marron and Associates

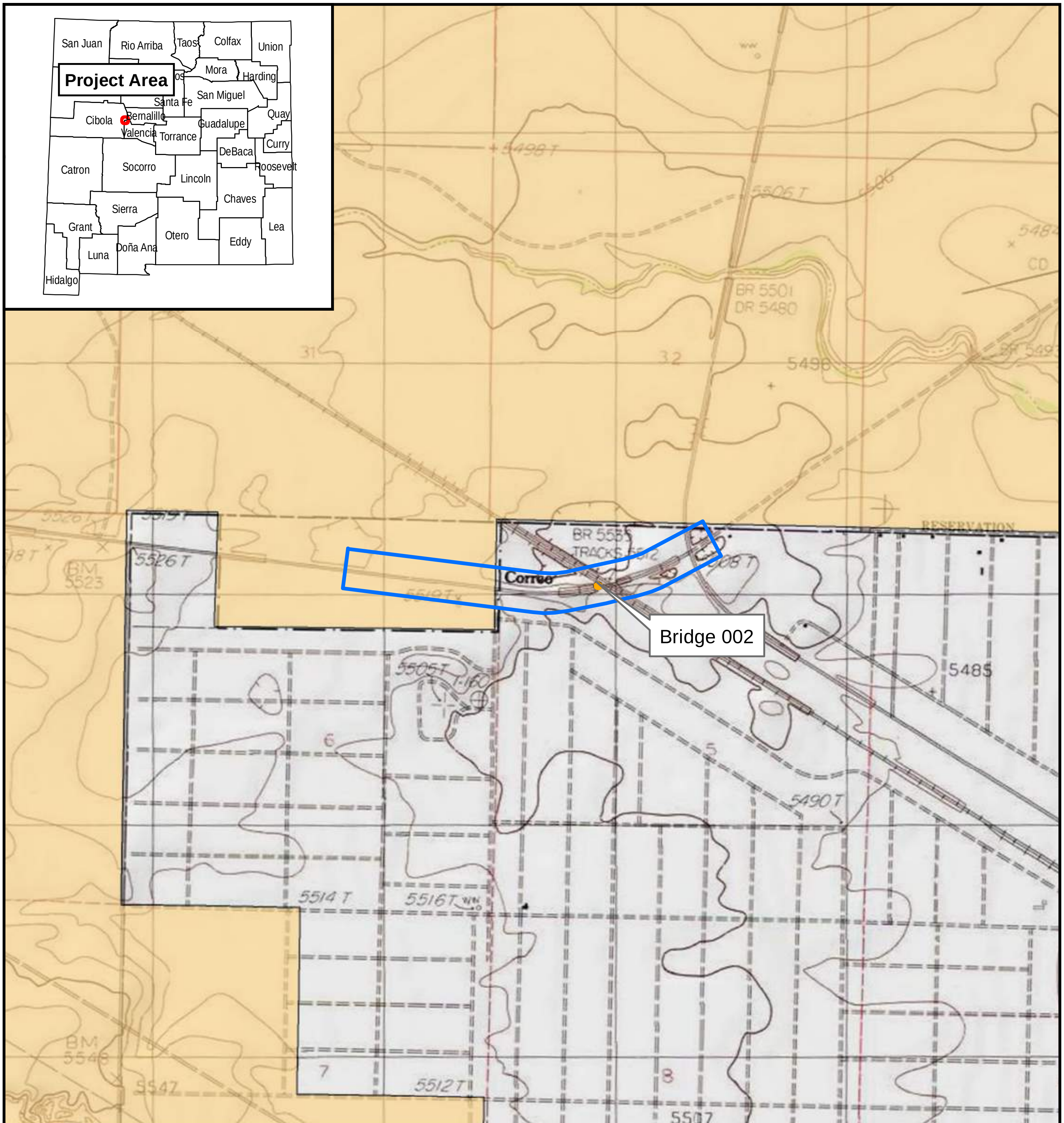
  7511 4th Street

  Albuquerque, NM 87107

- Letters
- Email comments to eric@marroninc.com
- Comments are due by Oct. 27, 2016

Appendix F. Cultural Resource Information

Confidential Information, not for Public Release



MARRON and ASSOCIATES

Figure 1
Project Location Map

(blue outline)	Project Area
(tan fill)	Laguna Pueblo
(white fill)	Private
(orange dot)	Bridge

Correo, NM
USGS 7.5' Quadrangles

T 08N, R 03E, Sec. 05 & 06
Cibola County, New Mexico

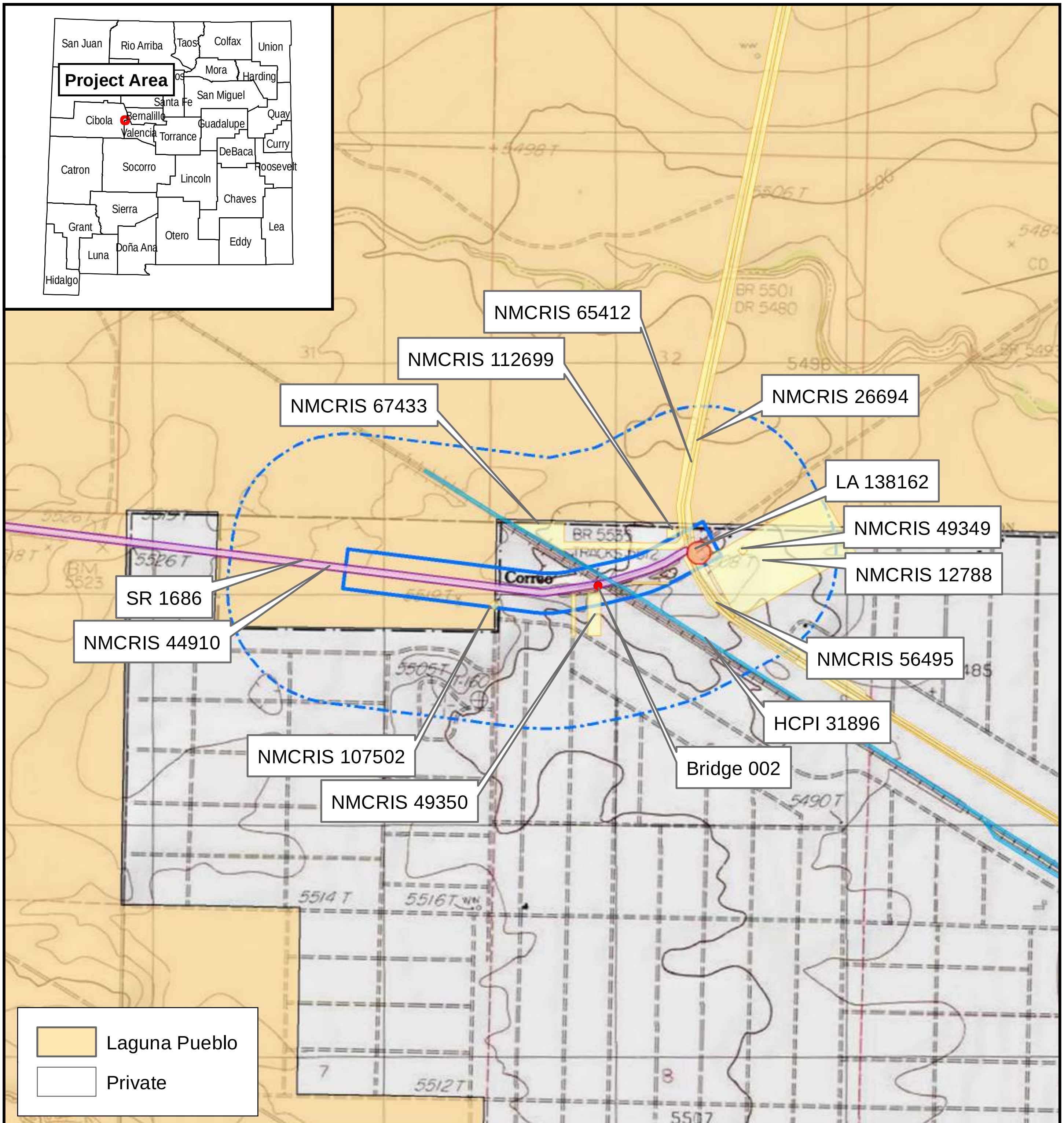
0 0.25 0.5 1 Miles

0 0.375 0.75 1.5 Kilometers

N

1:24,000

NMDOT Cibola CR C084, New Mexico



Project Area
ARMS Search (500m)
Previous Sites
HCPI
Registered Properties
Previous Surveys

Correo, NM
USGS 7.5' Quadrangles

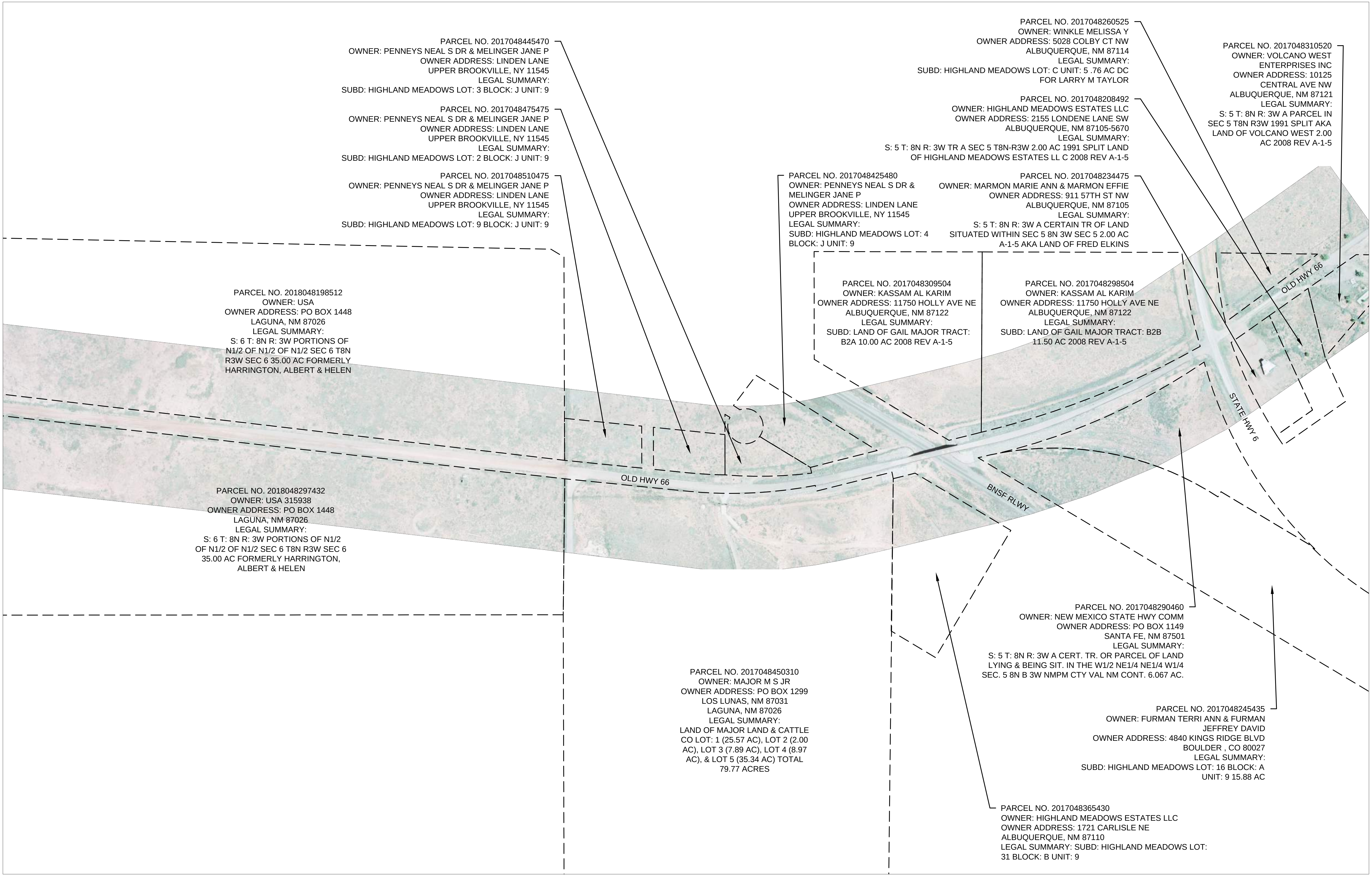
T 08N, R 03E, Sec. 05 & 06
Cibola County, New Mexico

0 0.25 0.5 1 Miles
0 0.375 0.75 1.5 Kilometers
N
1:24,000

Figure A1
File Search
Map

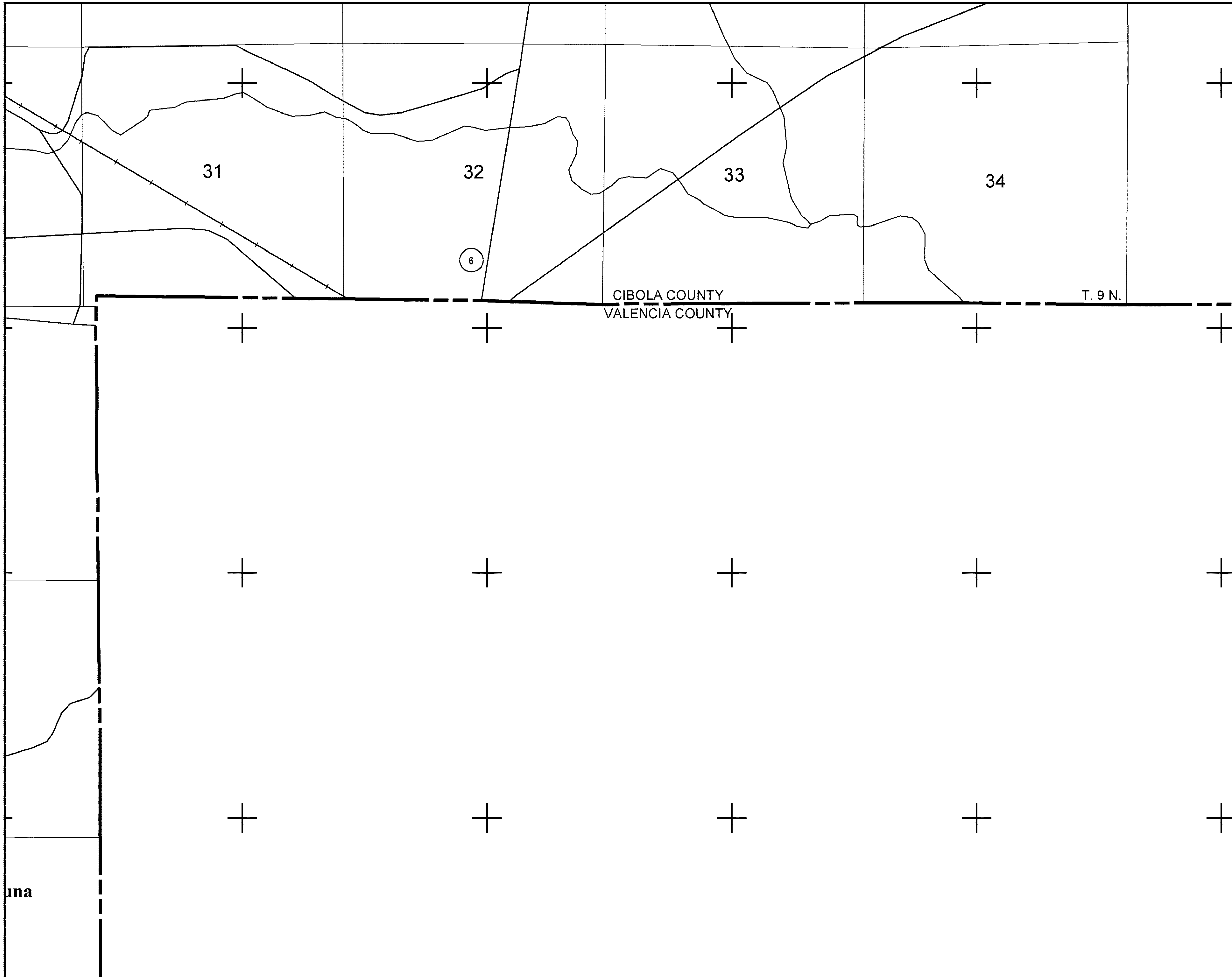
NMDOT Cibola CR C084 Old US 66 Valencia County, New Mexico

Appendix G. Property Ownership Maps



PARCEL NO. 2017048445470
OWNER: PENNEYS NEAL S DR & MELINGER JANE P
OWNER ADDRESS: LINDEN LANE
UPPER BROOKVILLE, NY 11545
LEGAL SUMMARY:
SUBD: HIGHLAND MEADOWS LOT: 3 BLOCK: J UNIT: 9
PARCEL NO. 2017048475475
OWNER: PENNEYS NEAL S DR & MELINGER JANE P
OWNER ADDRESS: LINDEN LANE
UPPER BROOKVILLE, NY 11545
LEGAL SUMMARY:
SUBD: HIGHLAND MEADOWS LOT: 2 BLOCK: J UNIT: 9
PARCEL NO. 2017048510475
OWNER: PENNEYS NEAL S DR & MELINGER JANE P
OWNER ADDRESS: LINDEN LANE
UPPER BROOKVILLE, NY 11545
LEGAL SUMMARY:
SUBD: HIGHLAND MEADOWS LOT: 9 BLOCK: J UNIT: 9
PARCEL NO. 2017048260525
OWNER: WINKLE MELISSA Y
OWNER ADDRESS: 5028 COLBY CT NW
ALBUQUERQUE, NM 87114
LEGAL SUMMARY:
SUBD: HIGHLAND MEADOWS LOT: C UNIT: 5 .76 AC DC
FOR LARRY M TAYLOR
PARCEL NO. 2017048310520
OWNER: VOLCANO WEST
ENTERPRISES INC
OWNER ADDRESS: 10125
CENTRAL AVE NW
ALBUQUERQUE, NM 87121
LEGAL SUMMARY:
S: 5 T: 8N R: 3W A PARCEL IN
SEC 5 T8N R3W 1991 SPLIT AKA
LAND OF VOLCANO WEST 2.00
AC 2008 REV A-1-5
PARCEL NO. 2017048208492
OWNER: HIGHLAND MEADOWS ESTATES LLC
OWNER ADDRESS: 2155 LONDENE LANE SW
ALBUQUERQUE, NM 87105-5670
LEGAL SUMMARY:
S: 5 T: 8N R: 3W TR A SEC 5 T8N-R3W 2.00 AC 1991 SPLIT LAND
OF HIGHLAND MEADOWS ESTATES LL C 2008 REV A-1-5
PARCEL NO. 2017048425480
OWNER: PENNEYS NEAL S DR &
MELINGER JANE P
OWNER ADDRESS: LINDEN LANE
UPPER BROOKVILLE, NY 11545
LEGAL SUMMARY:
SUBD: HIGHLAND MEADOWS LOT: 4
BLOCK: J UNIT: 9
PARCEL NO. 2017048234475
OWNER: MARMON MARIE ANN & MARMON EFFIE
OWNER ADDRESS: 911 57TH ST NW
ALBUQUERQUE, NM 87105
LEGAL SUMMARY:
S: 5 T: 8N R: 3W A CERTAIN TR OF LAND
SITUATED WITHIN SEC 5 8N 3W SEC 5 2.00 AC
A-1-5 AKA LAND OF FRED ELKINS
PARCEL NO. 2018048198512
OWNER: USA
OWNER ADDRESS: PO BOX 1448
LAGUNA, NM 87026
LEGAL SUMMARY:
S: 6 T: 8N R: 3W PORTIONS OF
N1/2 OF N1/2 OF N1/2 SEC 6 T8N
R3W SEC 6 35.00 AC FORMERLY
HARRINGTON, ALBERT & HELEN
PARCEL NO. 2017048309504
OWNER: KASSAM AL KARIM
OWNER ADDRESS: 11750 HOLLY AVE NE
ALBUQUERQUE, NM 87122
LEGAL SUMMARY:
SUBD: LAND OF GAIL MAJOR TRACT:
B2A 10.00 AC 2008 REV A-1-5
PARCEL NO. 2017048298504
OWNER: KASSAM AL KARIM
OWNER ADDRESS: 11750 HOLLY AVE NE
ALBUQUERQUE, NM 87122
LEGAL SUMMARY:
SUBD: LAND OF GAIL MAJOR TRACT: B2B
11.50 AC 2008 REV A-1-5
OLD HWY 66
OLD HWY 66
STATE HWY 6
BNSF RLWY
PARCEL NO. 2018048297432
OWNER: USA 315938
OWNER ADDRESS: PO BOX 1448
LAGUNA, NM 87026
LEGAL SUMMARY:
S: 6 T: 8N R: 3W PORTIONS OF N1/2
OF N1/2 OF N1/2 SEC 6 T8N R3W SEC 6
35.00 AC FORMERLY HARRINGTON,
ALBERT & HELEN
PARCEL NO. 2017048290460
OWNER: NEW MEXICO STATE HWY COMM
OWNER ADDRESS: PO BOX 1149
SANTA FE, NM 87501
LEGAL SUMMARY:
S: 5 T: 8N R: 3W A CERT. TR. OR PARCEL OF LAND
LYING & BEING SIT. IN THE W1/2 NE1/4 NE1/4 W1/4
SEC. 5 8N B 3W NMPM CTY VAL NM CONT. 6.067 AC.
PARCEL NO. 2017048450310
OWNER: MAJOR M S JR
OWNER ADDRESS: PO BOX 1299
LOS LUNAS, NM 87031
LAGUNA, NM 87026
LEGAL SUMMARY:
LAND OF MAJOR LAND & CATTLE
CO LOT: 1 (25.57 AC), LOT 2 (2.00
AC), LOT 3 (7.89 AC), LOT 4 (8.97
AC), & LOT 5 (35.34 AC) TOTAL
79.77 ACRES
PARCEL NO. 2017048245435
OWNER: FURMAN TERRI ANN & FURMAN
JEFFREY DAVID
OWNER ADDRESS: 4840 KINGS RIDGE BLVD
BOULDER , CO 80027
LEGAL SUMMARY:
SUBD: HIGHLAND MEADOWS LOT: 16 BLOCK: A
UNIT: 9 15.88 AC
PARCEL NO. 2017048365430
OWNER: HIGHLAND MEADOWS ESTATES LLC
OWNER ADDRESS: 1721 CARLISLE NE
ALBUQUERQUE, NM 87110
LEGAL SUMMARY: SUBD: HIGHLAND MEADOWS LOT:
31 BLOCK: B UNIT: 9

Appendix H. Drainage Maps



MAP SCALE 1" = 2000'

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 1250C

FIRM

FLOOD INSURANCE RATE MAP

CIBOLA COUNTY, NEW MEXICO

AND INCORPORATED AREAS

PANEL 1250 OF 2475

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
LAGUNA, PUEBLO OF	350003	1250	C

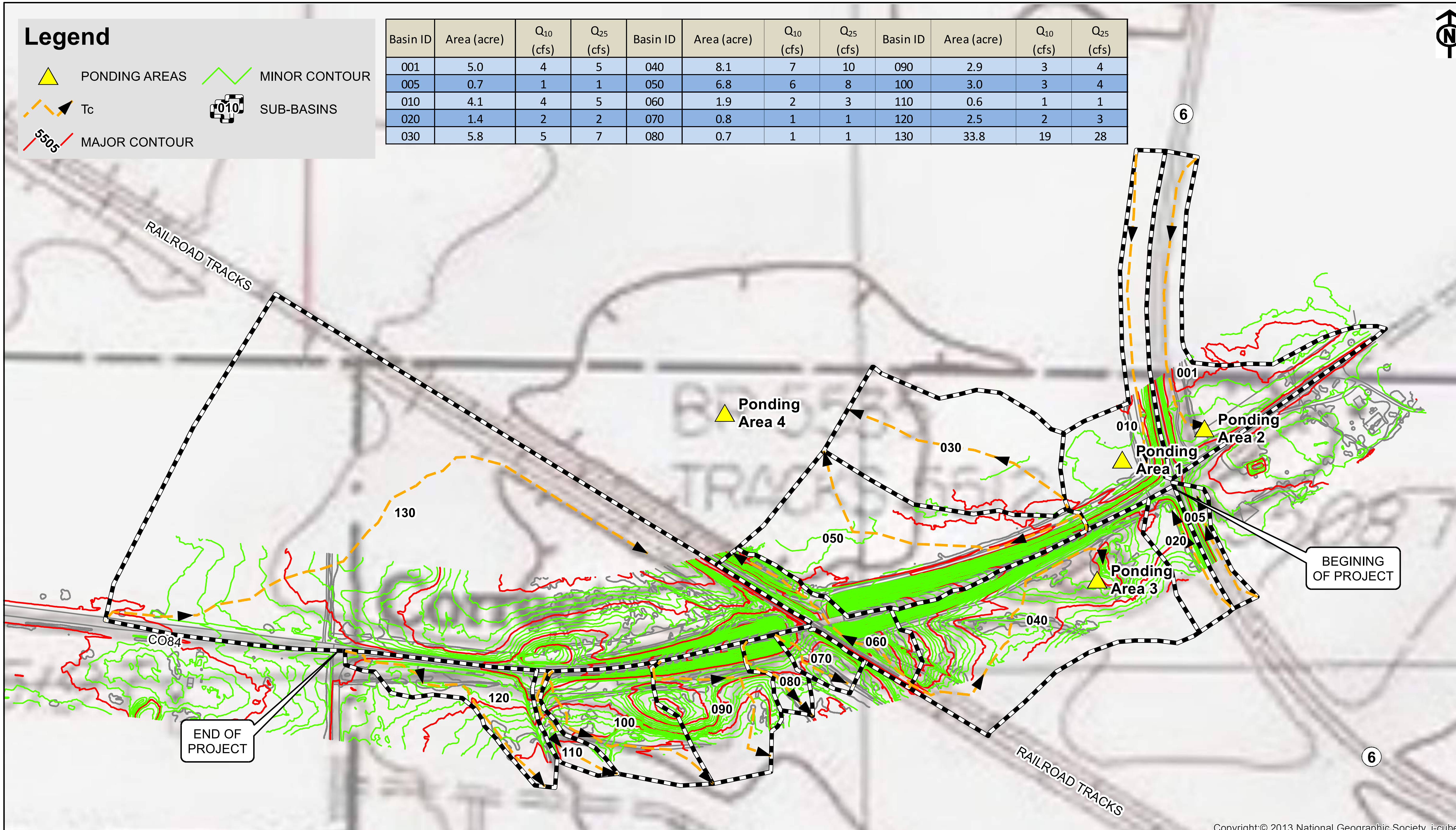
Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
35006C1250C

EFFECTIVE DATE
December 17, 2010

Federal Emergency Management Agency

Basin ID	Area (acre)	Q_{10} (cfs)	Q_{25} (cfs)	Basin ID	Area (acre)	Q_{10} (cfs)	Q_{25} (cfs)	Basin ID	Area (acre)	Q_{10} (cfs)	Q_{25} (cfs)
001	5.0	4	5	040	8.1	7	10	090	2.9	3	4
005	0.7	1	1	050	6.8	6	8	100	3.0	3	4
010	4.1	4	5	060	1.9	2	3	110	0.6	1	1
020	1.4	2	2	070	0.8	1	1	120	2.5	2	3
030	5.8	5	7	080	0.7	1	1	130	33.8	19	28



NMDOT

HDR

NMDOT DISTRICT 6
CIBOLA COUNTY ROAD CO84 PROJECT
EXISTING HYDROLOGIC CONDITIONS MAP

0 300 Feet

1 inch = 300 feet

DATE
10/2016

EXHIBIT
A

Project:	Cibola County Road	Computed: JDF	Date: 10/5/2016
Subject:	Existing Conditions Hydrology	Checked: EVS	Date: 10/12/2016
Task:	Rational Peak Discharge Calculation	Page: 1	of: 4
Job #:	280076	No:	

Cibola County Road Existing Conditions Estimated Runoff

Basin ID	Contributing Area (acre)	c_{10} Value	c_{10} Value	c_{10} Value	Tc (min)	i_{10} yr (in/hr)	i_{25}yr (in/hr)	i_{50} yr (in/hr)	Q_{10} (cfs)	Q_{25} (cfs)	Q_{50} (cfs)
001	5.0	0.20	0.25	0.30	14.1	3.2	3.9	4.5	4	5	7
005	0.7	0.20	0.25	0.30	10.0	3.7	4.5	5.1	1	1	2
010	4.1	0.20	0.25	0.30	10.0	3.7	4.5	5.1	4	5	7
020	1.4	0.20	0.25	0.30	10.0	3.7	4.5	5.1	2	2	3
030	5.8	0.20	0.25	0.30	10.6	3.6	4.4	5.0	5	7	9
040	8.1	0.20	0.25	0.30	10.0	3.7	4.5	5.1	7	10	13
050	6.8	0.20	0.25	0.30	10.1	3.7	4.5	5.1	6	8	11
060	1.9	0.20	0.25	0.30	10.0	3.7	4.5	5.1	2	3	3
070	0.8	0.20	0.25	0.30	10.0	3.7	4.5	5.1	1	1	2
080	0.7	0.20	0.25	0.30	10.0	3.7	4.5	5.1	1	1	2
090	2.9	0.20	0.25	0.30	10.0	3.7	4.5	5.1	3	4	5
100	3.0	0.20	0.25	0.30	10.0	3.7	4.5	5.1	3	4	5
110	0.6	0.20	0.25	0.30	10.0	3.7	4.5	5.1	1	1	1
120	2.5	0.20	0.25	0.30	10.0	3.7	4.5	5.1	2	3	4
130	33.8	0.20	0.25	0.30	20.6	2.7	3.3	3.7	19	28	38

Project:	Cibola County Road	Computed:	JDF	Date:	10/5/2016
Subject:	Existing Conditions Hydrolog	Checked:	EVS	Date:	10/12/2016
Task:	Composite C calculation	Page:	2	of:	4
Job #:	280076	No:			

C value for roadway not incorporated into c value estimation. Impervious roadway areas relatively small compared to the size of the basins.

"c" Coefficient Estimation

Basin ID	Basin Area (ac)	Land Use	Depth* P_{10} (in)	Depth* P_{25} (in)	Depth* P_{50} (in)	Percent Cover	HSG Soil	C_{10} (in)	C_{25} (in)	C_{50} (in)
001	4.96	Sage Grass	1.27	1.54	1.75	30%	B	0.20	0.25	0.30
005	0.70	Sage Grass	1.27	1.54	1.75	30%	B	0.20	0.25	0.30
010	4.07	Sage Grass	1.27	1.54	1.75	30%	B	0.20	0.25	0.30
020	1.35	Sage Grass	1.27	1.54	1.75	30%	B	0.20	0.25	0.30
030	5.83	Sage Grass	1.27	1.54	1.75	30%	B	0.20	0.25	0.30
040	8.14	Sage Grass	1.27	1.54	1.75	30%	B	0.20	0.25	0.30
050	6.77	Sage Grass	1.27	1.54	1.75	30%	B	0.20	0.25	0.30
060	1.91	Sage Grass	1.27	1.54	1.75	30%	B	0.20	0.25	0.30
070	0.77	Sage Grass	1.27	1.54	1.75	30%	B	0.20	0.25	0.30
080	0.71	Sage Grass	1.27	1.54	1.75	30%	B	0.20	0.25	0.30
090	2.90	Sage Grass	1.27	1.54	1.75	30%	B	0.20	0.25	0.30
100	2.98	Sage Grass	1.27	1.54	1.75	30%	B	0.20	0.25	0.30
110	0.57	Sage Grass	1.27	1.54	1.75	30%	B	0.20	0.25	0.30
120	2.45	Sage Grass	1.27	1.54	1.75	30%	B	0.20	0.25	0.30
130	33.82	Sage Grass	1.27	1.54	1.75	30%	B	0.20	0.25	0.30

*from figure 3-11 pg. 3-38 NMDOT hydrology Manual

Project:	Cibola County Road	Computed:	Date: 10/5/2016
Subject:	Existing Conditions Hydrology	Checked: EVS	Date: 10/12/2016
Task:	Time of Concentration Calculation	Page: 3	of: 4
Job #:	280076	No:	

Tc was estimated using the Upland Method, small ungullied watersheds
Data (length, slope, elevations, etc… extracted from GIS)

Sub-basin Tc estimation

Sub-Basin	Flow	Length	Start Elev	End Elev	Slope	Velocity	Tc	Design Tc*
	Type	(ft)	(ft)	(ft)	Percent	(ft/s)	(min)	(min)
001	Sheet Flow	299.9	5508.0	5506.0	0.667	0.8	14.1	14.1
001	Shallow Concentrated	681.3	5506.0	5502.5	0.514	1.4		
005	Sheet Flow	299.9	5520.0	5508.0	4.001	2.0	3.1	10.0
005	Shallow Concentrated	101.6	5508.0	5506.0	1.968	2.8		
010	Sheet Flow	299.9	5508.0	5506.0	0.667	0.8	7.7	10.0
010	Shallow Concentrated	726.2	5506.0	5403.5	14.114	7.6		
020	Sheet Flow	299.9	5520.0	5509.0	3.668	1.9	3.2	10.0
020	Shallow Concentrated	82.5	5509.0	5508.0	1.212	2.2		
030	Sheet Flow	299.9	5505.3	5503.5	0.583	0.8	10.6	10.6
030	Shallow Concentrated	503.3	5503.5	5498.0	1.093	2.1		
040	Sheet Flow	299.9	5515.5	5510.0	1.834	1.4	8.9	10.0
040	Shallow Concentrated	683.3	5510.0	5502.0	1.171	2.2		
050	Sheet Flow	299.9	5514.5	5504.8	3.234	1.8	10.1	10.1
050	Shallow Concentrated	808.9	5504.8	5498.0	0.841	1.8		
060	Sheet Flow	299.9	5515.5	5513.0	0.834	0.9	7.7	10.0
060	Shallow Concentrated	455.3	5513.0	5499.8	2.899	3.4		
070	Sheet Flow	299.9	5539.5	5507.5	10.670	3.3	1.6	10.0
070	Shallow Concentrated	22.8	5507.5	5506.5	4.386	4.2		
080	Sheet Flow	299.9	5537.5	5505.8	10.570	3.3	1.9	10.0
080	Shallow Concentrated	58.8	5505.8	5505.0	1.360	2.3		
090	Sheet Flow	299.9	5525.0	5511.7	4.435	2.1	4.2	10.0
090	Shallow Concentrated	370.6	5511.7	5501.0	2.887	3.4		
100	Sheet Flow	299.9	5518.5	5504.3	4.735	2.2	4.8	10.0
100	Shallow Concentrated	440.6	5504.3	5495.0	2.111	2.9		
110	Sheet Flow	299.9	5518.5	5504.8	4.568	2.2	3.5	10.0
110	Shallow Concentrated	203.5	5504.8	5501.0	1.867	2.7		
120	Sheet Flow	299.9	5516.5	5511.0	1.834	1.4	7.6	10.0
120	Shallow Concentrated	558.1	5511.0	5503.0	1.433	2.4		
130	Sheet Flow	299.9	5520.8	5518.3	0.834	0.9	20.6	20.6
130	Shallow Concentrated	1749.3	5518.3	5502.0	0.932	1.9		

*Minimum Tc = 10min

Project:	Cibola County Road	Computed:	JDF	Date:	10/5/2016
Subject:	Existing Conditions Hydrology	Checked:	EVS	Date:	10/12/2016
Task:	NOAA Atlas 14 Data	Page:	4	of:	4
Job #:	280076	No:			

Precipitaiton information obtained from NOAA Atlas 14 at the approximate center of project area:
NOAA Atlas 14 data downloaded 9/29/2016
Latitude: 34.9551 Longitude: -107.1801

PDS-based precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5	0.195	0.252	0.337	0.403	0.49	0.557	0.626	0.699	0.796	0.875
10	0.296	0.384	0.514	0.613	0.746	0.848	0.954	1.07	1.21	1.33
15	0.367	0.477	0.637	0.76	0.924	1.05	1.18	1.32	1.5	1.65
30	0.495	0.642	0.858	1.02	1.25	1.42	1.59	1.78	2.02	2.23
60	0.613	0.795	1.06	1.27	1.54	1.75	1.97	2.2	2.51	2.75
120	0.715	0.917	1.21	1.44	1.76	2.01	2.28	2.56	2.94	3.26
360	0.759	0.968	1.26	1.5	1.82	2.08	2.35	2.64	3.03	3.35
6-hr	0.868	1.1	1.4	1.64	1.97	2.23	2.5	2.78	3.16	3.47
12-hr	0.951	1.2	1.52	1.77	2.1	2.36	2.63	2.91	3.28	3.58
24-hr	1.03	1.3	1.63	1.89	2.24	2.52	2.8	3.09	3.47	3.78
2-day	1.12	1.4	1.76	2.04	2.42	2.72	3.03	3.34	3.77	4.1
3-day	1.27	1.58	1.97	2.27	2.69	3.01	3.34	3.68	4.13	4.48
4-day	1.41	1.76	2.18	2.51	2.96	3.3	3.66	4.01	4.49	4.86
7-day	1.64	2.05	2.52	2.89	3.38	3.76	4.14	4.51	5.01	5.39
10-day	1.84	2.3	2.84	3.27	3.84	4.27	4.72	5.16	5.75	6.19
20-day	2.36	2.93	3.58	4.08	4.71	5.18	5.64	6.09	6.66	7.07
30-day	2.84	3.53	4.28	4.84	5.55	6.06	6.56	7.04	7.63	8.06
45-day	3.44	4.27	5.13	5.74	6.5	7.04	7.56	8.03	8.62	9.02
60-day	3.99	4.96	5.96	6.67	7.54	8.15	8.73	9.27	9.92	10.4

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).
Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greate
at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.
Please refer to NOAA Atlas 14 document for more information.

PDS-based precipitation frequency estimates with 90% confidence intervals (in inches/hour)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5	2.34	3.02	4.04	4.84	5.88	6.68	7.51	8.39	9.55	10.5
10	1.78	2.3	3.08	3.68	4.48	5.09	5.72	6.39	7.27	8
15	1.47	1.91	2.55	3.04	3.7	4.2	4.73	5.28	6.01	6.61
30	0.99	1.28	1.72	2.05	2.49	2.83	3.18	3.55	4.05	4.45
60	0.613	0.795	1.06	1.27	1.54	1.75	1.97	2.2	2.51	2.75
120	0.358	0.458	0.605	0.72	0.879	1.01	1.14	1.28	1.47	1.63
360	0.253	0.322	0.42	0.498	0.606	0.692	0.783	0.878	1.01	1.12
6-hr	0.145	0.183	0.234	0.274	0.33	0.373	0.418	0.465	0.528	0.579
12-hr	0.079	0.099	0.126	0.147	0.174	0.196	0.219	0.242	0.272	0.297
24-hr	0.043	0.054	0.068	0.079	0.093	0.105	0.117	0.129	0.145	0.157
2-day	0.023	0.029	0.037	0.043	0.05	0.057	0.063	0.07	0.079	0.085
3-day	0.018	0.022	0.027	0.032	0.037	0.042	0.046	0.051	0.057	0.062
4-day	0.015	0.018	0.023	0.026	0.031	0.034	0.038	0.042	0.047	0.051
7-day	0.01	0.012	0.015	0.017	0.02	0.022	0.025	0.027	0.03	0.032
10-day	0.008	0.01	0.012	0.014	0.016	0.018	0.02	0.021	0.024	0.026
20-day	0.005	0.006	0.007	0.008	0.01	0.011	0.012	0.013	0.014	0.015
30-day	0.004	0.005	0.006	0.007	0.008	0.008	0.009	0.01	0.011	0.011
45-day	0.003	0.004	0.005	0.005	0.006	0.007	0.007	0.007	0.008	0.008
60-day	0.003	0.003	0.004	0.005	0.005	0.006	0.006	0.006	0.007	0.007

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).
Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a
given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not
Please refer to NOAA Atlas 14 document for more information.

Appendix I. Preliminary Drainage Report

PRELIMINARY DRAINAGE REPORT

CIBOLA COUNTY ROAD CO84 (Old US66)

NMDOT CN. # AC301181

HDR PRJ. # 280076

October 27, 2016

Table of Contents

Tables

Figures

Introduction

A. Location and Description:

The project area is located in the western portion of the state, in Valencia County and close to the Cibola County line (See Figure 1). The project is focused on the bridge structure carrying Cibola County Road C084 over the Burlington Northern and Santa Fe (BNSF) Railway. The bridge (Bridge No. 0002 and also referred to as Suwanee Bridge) is located in or near Correo, Valencia County, New Mexico (0.25 Miles West of MP 2.10 on NM 6). The project area includes the intersection of NM 6 and Cibola County Road C084 and extends west for 1 mile (See Figure 2). The improvements to be investigated for this project includes: roadway, bridge and drainage improvements.

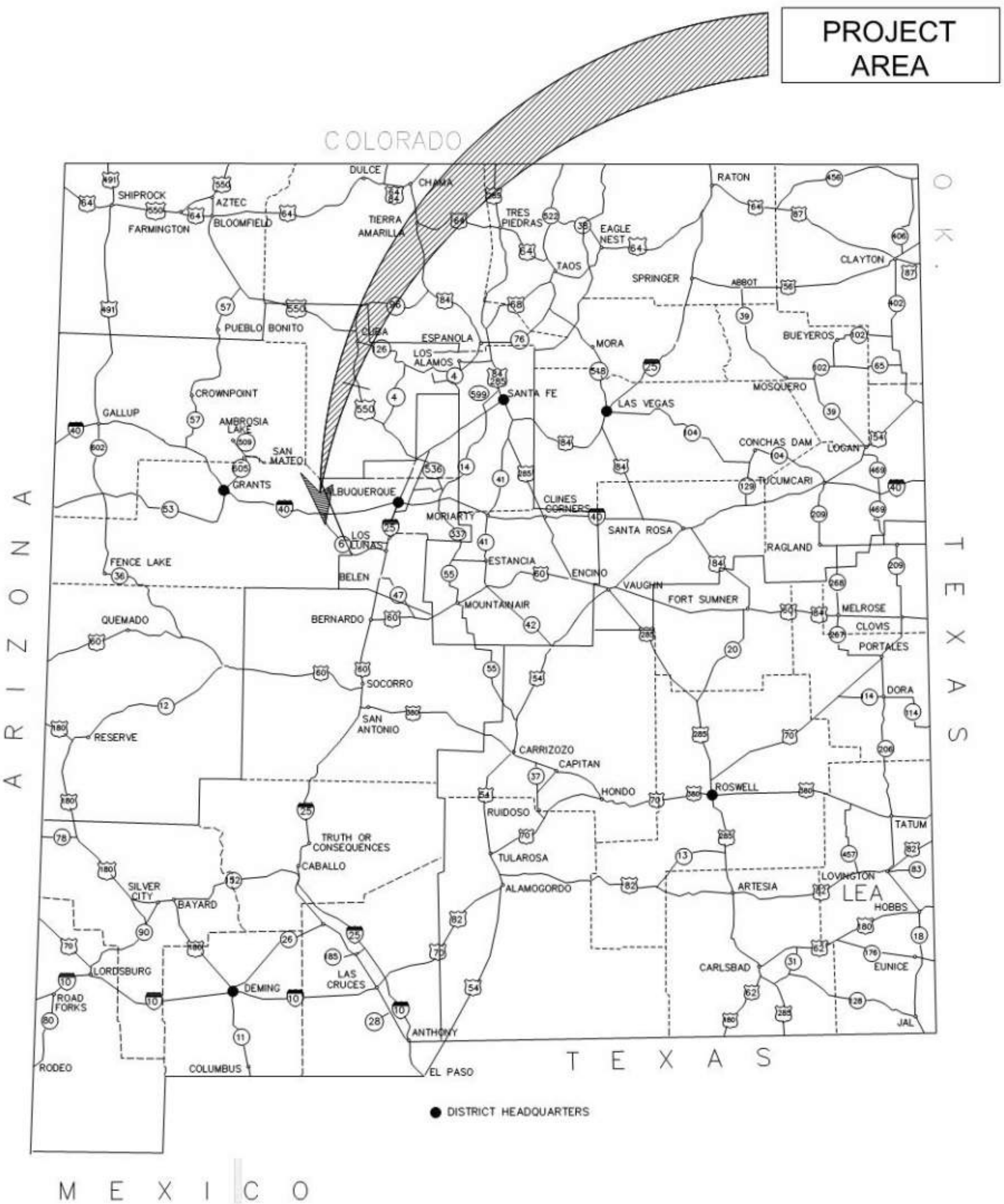


Figure 1: Project Location Map

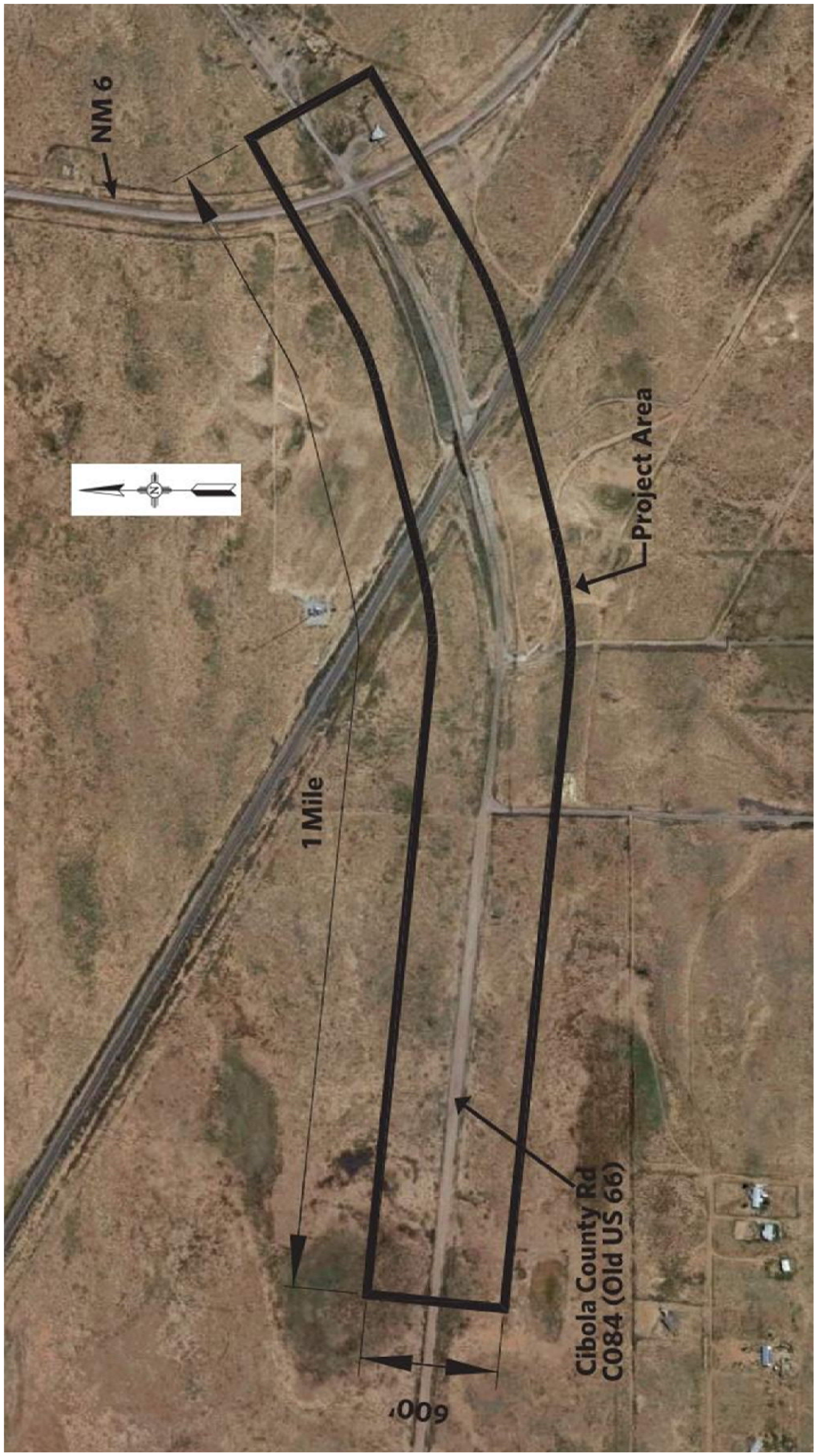


Figure 2: Vicinity Map

B. Purpose:

The purpose of the C084 Bridge Project is to improve C084 from MP 0.0 to MP 1.0 to current standards for a rural collector roadway including the rehabilitation or replacement of the Burlington Northern Santa Fe (BNSF) railroad bridge.

Bridge No. 0002 is located within the project area and crosses over two BNSF railroad tracks. This BNSF railway is a major east-west railroad route with frequent trains. The bridge was constructed in 1934 and partially reconstructed in 1995. It is a treated-timber structure with a rolled steel girder center span over the BNSF railroad tracks. The timber deck, which is overlayed with a bituminous material, is 23-feet wide. The existing bridge has two 11.5-foot lanes with no shoulders. The 1995 reconstruction reinforced the timber members with steel to bridge cracks and spread loads.

Cibola County Road C084 begins at NM 6 and extends westward into Cibola County and Laguna Pueblo. C084 follows the original Route 66. Local communities include Correo and Suwanee. Highland Meadows Estates, Alamo and eastern Laguna Pueblo residents use C084 regularly. Many of the local residents commute to the Albuquerque area and Los Lunas for work and goods and services. A large materials pit is located southwest of the project area, and trucks travel on C084 to and from the materials pit. C084 also provides an alternate route to the village of Mesita in eastern Laguna Pueblo. In the event of an I-40 closure between NM 6 and Mesita, C084 could serve as a detour route. The bridge provides safe crossing over the BNSF railway. There are few crossing points across the railway in this area. The crossing are at-grade and do not provide the safety of the C084 bridge crossing.

C. FEMA Floodplains:

Review of the effective FEMA Flood Insurance Study (FIS) maps published within the project area yielded no effective floodplain delineations within the region. As per the FEMA Flood Map Service the effective FEMA Flood Insurance Rate Maps (FIRM) map panel number 35061C0025E for Valencia County, New Mexico Valencia County is a non-printed flood map boundary with no special flood hazard areas identified.

D. Previous Studies:

There have been no previous drainage reports identified for the project area and surrounding features.

E. Existing Conditions:

Drainage patterns within the project area generally flow from west to east toward the Rio San Jose. The Rio San Jose is an ephemeral stream which drains into the Rio Puerco. The existing land use in the area is predominately unimproved open land with depressions within the terrain on either side of the existing CO84 alignment.

Within the project corridor there are two 24” corrugated metal pipes (CMP) along NM 6, near the intersection with CO84. One of the CMPs is located approximately 210’ north of the intersection of NM 6 and CO84. The other CMP is located approximately 42’ south of the same intersection. The pipes drain runoff eastward along Old Highway 66. Field reconnaissance photos indicate both pipes are in poor condition and partially filled with debris and sediment. It should be noted that the culvert north of the intersection does not appear to be very efficient at capture and conveyance of developing storm water runoff. Due to the natural gradient of the existing terrain a majority of the developing runoff will bypass the culvert and pond at the northwest corner of the intersection.

There is a cattle guard crossing approximately 100-ft west of the NM 6 and CO84 intersection as well. It appears that it may have been utilized as an overflow structure for discharge ponding at the associated intersection corners. However, field investigation indicates the pipe within the structure is clogged and inoperable at this time.

There is a 48” concrete pipe beneath the BNSF railroad approximately 275’ northwest of Suwanee Bridge (Bridge No. 0002). The pipe drains from south to north conveying discharge towards the NM 6 and CO84 intersection. It has a concrete headwall on the southern inlet side and a metal end section on the outfall. The pipe is free of debris and appears to be in relatively good condition.

In existing conditions the developing roadway drainage is allowed to sheet flow off of the roadway edge and down the roadway embankment slopes. At the toe of the slope runoff is conveyed east or west along naturally occurring swales and depressions in the existing terrain. Figure 3 and Figure 4 are photographic evidence of the conditions and size of the existing drainage features in the project corridor.

Figure 3 Existing 24-in Culvert Crossings at NM6

Figure 4: Existing BNSF Culvert

F. Alternatives:

Currently seven (7) alternatives are for consideration of the final design improvements within the project corridor. Table 2 is a listing of the identified alternatives and a brief description of their proposed features. Reference Appendix A Exhibit B for a plan view of each alternative along with a roadway typical section.

Table 1: Proposed Alternatives

Alternative	Description
A	• Existing roadway horizontal alignment maintained. • Intersections at Highland Boulevard/C084 and NM 6/C084 maintained.
B	• Roadway horizontal alignment shifted south. • Intersections at Highland Boulevard/C084 and NM 6/C084 maintained.
C	• Roadway horizontal alignment shifted north. • Intersections at Highland Boulevard/C084 and NM 6/C084 maintained.
D	• Roadway horizontal alignment reconfigured. • Bridge alignment reconfigured. • Intersection at Highland Boulevard/C084 maintained. • Intersection at NM 6/C084 reconfigured.
E	• Roadway horizontal alignment reconfigured. • Bridge alignment reconfigured. • Intersections at Highland Boulevard/C084 and NM 6/C084 maintained.
F	• Roadway horizontal alignment shifted north. • Intersections at Highland Boulevard/C084 and NM 6/C084 maintained.
G	• Roadway horizontal alignment shifted north. • Intersections at Highland Boulevard/C084 and NM 6/C084 maintained.

Methodology

A. Hydrologic Analysis

The NMDOT Drainage Manual Volume 1, Hydrology, NMDOT District 3 Storm Water Management Program, 2012, NMDOT Drainage Design Criteria, 2007, and Chapter 9 of the National Engineering Handbook (NEH 4) July 2004 were referenced to conduct the hydrologic analysis. The NMDOT Drainage Design Criteria, 2007 was referenced to determine the existing conditions peak storm event discharge utilized for assessing the alternatives design and hydraulic analysis of the existing and proposed drainage infrastructure.

The Modified Rational Method was utilized to assess peak discharge from contributing basins along the project area. The methodology requires several inputs for estimation of peak discharge including rainfall distribution, estimation of C-value, and times of concentration (Tc) for each sub-basin within the study area. Each input was estimated per criteria provided in the NMDOT Drainage Manual, Drainage Design Criteria and NEH 4. Excerpts from the manuals are provided in Appendix D for reference.

Estimation of storage capacity at identified depressions within the existing terrain was developed with the conic section formula.

1. Existing Conditions Basin Delineation

Existing sub-basins were delineated using a combination of field reconnaissance, LiDAR Survey and USGS Quad maps. The alternatives analysis was based upon the existing conditions delineation and the percentage of impact to the existing watershed based upon the current proposed alternative alignments.

2. Land Use Estimation

Land use within the project limits is defined as open range land with Sage grass as the existing ground cover.

Soils data for the project area was downloaded from the Natural Resource Conservation Service (NRCS) online web-service. The Grieta-Shiprock and Grieta-Kiki sandy loam are the only soil types in the project area. The NRCS soils report lists the hydrologic soil grouping as Class B. The full soils report downloaded from the NRCS website is in Appendix D. See Appendix B for the Existing Conditions Basin Exhibit Map.

3. Time of Concentration

The Upland Method, per the NMDOT Hydrology Manual, was used to estimate the time of concentration (Tc) for the sheet flow and shallow concentrated flows. Tc for channelized flow was estimated using Manning's equation. Flow regimes are identified in the Drainage Basin Maps. The NMDOT manual requires a minimum of 10-minutes for the time of concentration. Time of concentration estimations are provided in Appendix B. The NMDOT Drainage Design Criteria requires that the peak discharges for 10-year and 25-year event be used for analysis of the proposed storm drain inlets.

Routing between sub-basins along the roadway was not utilized due to the short travel times estimated between storm drain segments.

4. Existing Conditions Estimated Peak Discharge

In order to ascertain potential drainage impacts to proposed roadway alternative alignments offsite sub-basins were delineated using a combination of survey data, USGS maps, and aerial imagery. Based on the size of the sub-basins delineated the Rational Method was used to estimate peak discharges in the project area. The "c" coefficient for the Rational Method calculations was estimated using Figure 3-12 from the NMDOT hydrology drainage manual. The land use component was determined from a combination of aerial imagery and field photos. In order to develop site specific Intensity Depth Frequency (IDF) curves for the hydrologic calculations precipitation values for the project site were downloaded from the NOAA Atlas 14 website. See Appendix D for NMDOT reference material and Appendix B for the development of hydrologic calculations and results.

Table 1 provides a summary of the existing sub-basin peak discharges for the 10-year and 25-year design storm events.

Table 2: Existing Conditions Peak Discharges

Basin ID	Area (acre)	Q_{10} (cfs)	Q_{25} (cfs)
001	4.96	4	5
005	0.70	1	1
010	4.07	4	5
020	1.35	2	2
030	5.83	5	7
040	8.14	7	10
050	6.77	6	8
060	1.91	2	3
070	0.77	1	1
080	0.71	1	1
090	2.90	3	4
100	2.98	3	4
110	0.57	1	1
120	2.45	2	3
130	33.82	19	28

5. MS-4 Permitting & Ponds

The NMDOT has implemented a SWMP, 2012 to reduce storm water pollution to the maximum extent practicable (MEP). The SWMP gives guidance on controlling construction site runoff and post construction storm water management in new and re-developed areas. The projects post construction storm water management will include retention areas to offset the increase in flow resulting from widening of the project corridor. In order to meet MS-4 requirements and estimate the amount of retention required, the additional runoff volume generated by the project was multiplied by 0.48”.

Existing ponds as identified by the supplied LiDAR data indicated for distinct locations for additional storage of storm water runoff developing within the corridor. Based on initial estimates the ponding area just northwest of the alignment appears to be the largest in volume while the areas within the vicinity of the existing NM06/CR40 crossing appear to have minimal capacity to store developing runoff. Table 3 is the estimated volumes within the project area.

Table 3: Existing Conditions Peak Discharges

Pond ID	Volume AC-ft
01	0.22
02	0.30
03	5.32
04	20.13

See Appendix A Existing Basin Delineations for a depiction of the ponding locations. See Appendix B for volume calculations.

6. Proposed Conditions Estimated Peak Discharge

Each alternative alignment was reviewed against the existing conditions watershed delineation in order to estimate the percentage of existing watershed which would be impacted by the proposed features.

Based on those estimated discharge values recommendations and design considerations were developed for each alternative to assess feasibility, cost, and overall impact to the existing drainage and additional infrastructure that may be required to mitigate against further impact to drainage conditions within the corridor. See Appendix B for the preliminary analysis of hydrologic impacts associated with each alternative alignment.

B. Hydraulic Analysis

Preliminary hydraulic analysis was completed using the NMDOT's "Drainage Manual – Volume 1, Hydrology, 1995", "Drainage Manual – Volume 2, Hydraulics, Sedimentation and Erosion, 1998" and "Drainage Design Criteria for NMDOT Projects, 2007". The Federal Highway Administration' (FHWA) HY8 Version 8.7.30 was utilized to assess the hydraulic capacity and performance of existing features within the project limits. Bentley's Flowmaster V8i was utilized to assess proposed roadside conveyance features for normal depth capacity.

Additionally the NMDOT Drainage Design Criteria, 2007, for new storm drain systems and cross culverts require minimum pipe sizes of 24-inch diameter pipe with minimum slopes of 0.003 feet/foot and a minimum trunk line velocity of 2.5-fps. The preliminary assessment of alternatives was evaluated to safely convey runoff from the 25-year, 24-hour design event maintaining hydraulic grade lines in storm trunk lines below rim and grate elevations. It is anticipated that the proposed drainage infrastructure will outlet in the same manner as it does in existing conditions

As previously discussed the road is classified as a rural minor collector and according to NMDOT Drainage design criteria the design event for culverts and roadside ditches are the 25-year and 10-year storm events, respectively.

A. Existing Conditions Analysis

Based on the existing conditions assessment the culverts at NM06 can convey approximately 20- to 30-cfs before roadway overtopping will occur. Discharge values do not account for additional upstream storage which may increase capacity at the structures. The 48-in culvert at the existing BNSF alignment has the capacity to convey up to 150-cfs at outlet velocities which are manageable with energy dissipation. Overtopping of the rail would occurring at approximately 180-cfs.

See Appendix C for the existing features hydraulic assessment output tables.

B. Proposed Conditions Analysis

As previously discussed each alternative was assessed based on the percentage of existing watershed impacted by the proposed feature. Based on the prorated discharge values recommendations were made for additional features to convey discharge. Those features include roadside swales and ditches, cross culverts, and spillways to control on-site runoff should embankment curb be warranted. Cross culverts were sized at a minimum 24-in based upon NMDOT standards of design. Estimates of roadside ditches required for conveyance are based upon rating curves developed for a typical v-ditch along the roadside. As see in Figure 3 1- to 2-ft ditches within the project limits would provide capacity to convey upwards of 20cfs through the project corridor while still maintaining sufficient freeboard.

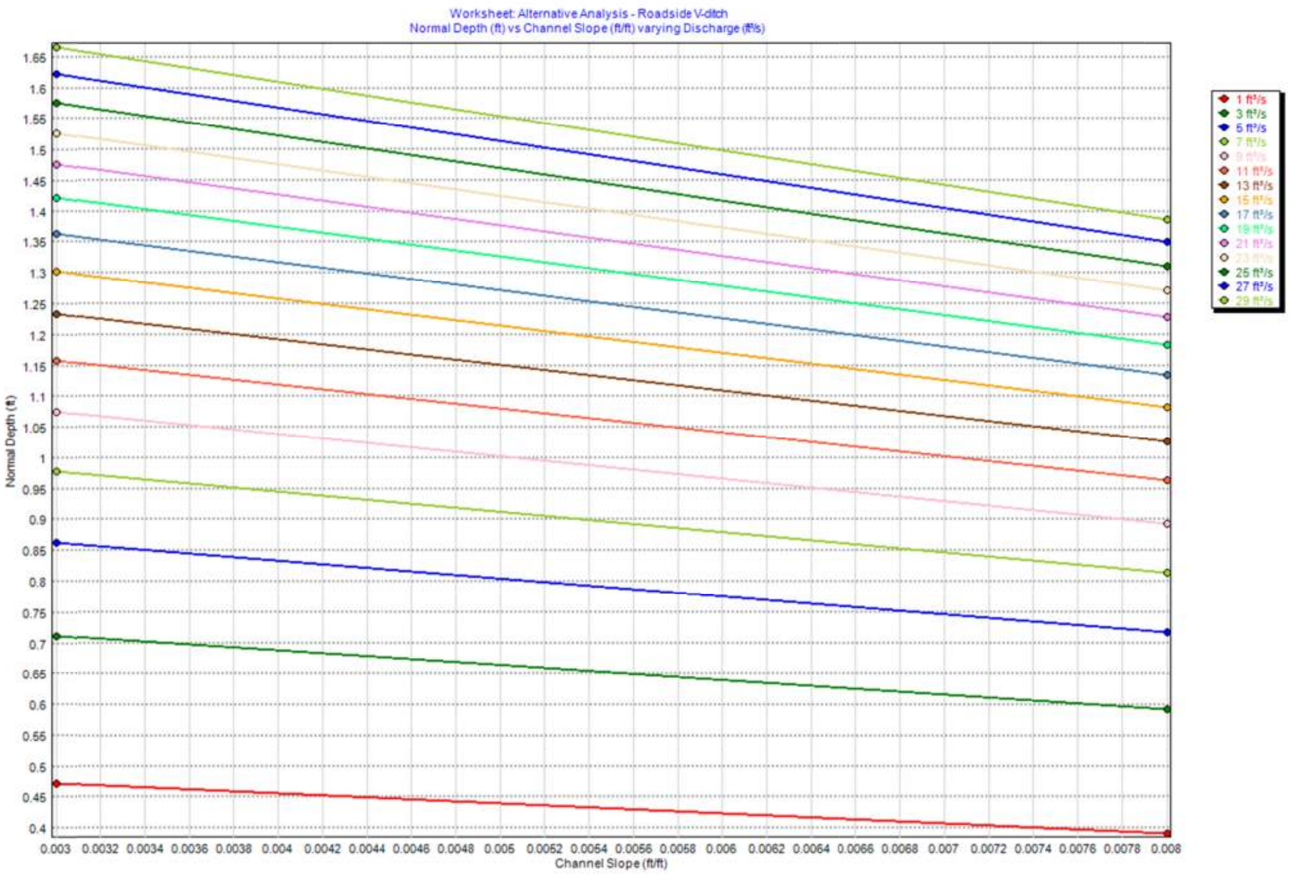


Figure 5: Roadside Ditch Rating Curves

A summary of proposed features for each alignment alternative is contained below.

Build Alternative A

Alternative A would be a similar alignment to the existing alignment however the bridge would be replaced and widened to meet current design criteria and allow for future BNSF railroad improvements. Offsite drainage patterns would remain the same as existing conditions. An incremental increase in on site discharge can be expected due to widening of the bridge and existing roadway in order to accommodate the new bridge approach sections. Newly developed rundowns at the end of the bridge deck can be expected. Due the increase in on site runoff MS4 ponds will be required for water quality treatment. Based on initial estimates the ponds can be accommodated within the available right-of-way limits.

Build Alternative B

The alternative B alignment is shifted slightly south compared to the existing alignment. The new bridge would be wider, meet current design criteria and allow for future BNSF railroad improvements. Offsite drainage patterns will be minimally impacted with additional discharge conveyed northward along existing contours patterns. The northeastern abutment will require a small conveyance ditch to maintain existing drainage patterns. In the event that the Alternate B fill slopes significantly reduce existing pond volumes, as identified within this study, additional grading may be required for compensatory volume. On site drainage will be incrementally increased due to bridge widening. Rundowns at the bridge approach sections will be required to control roadway runoff. Additional drainage elements in the form of ditches and swales may be required to control and convey roadway runoff.

Build Alternative C

The alternative C alignment is shifted slightly north compared to the existing alignment. The new bridge would be wider, meet current design criteria and allow for future BNSF railroad improvements. Offsite drainage patterns will be minimally impacted with additional discharge conveyed eastward along existing contours patterns. The northeastern abutment will require a small conveyance ditch to maintain existing drainage patterns. In the event that the Alternate C fill slopes significantly reduce existing pond volumes, as identified within this study, additional grading may be required for compensatory volume. On site drainage will be incrementally increased due to bridge widening. Rundowns at the bridge approach sections will be required to control roadway runoff. Additional drainage elements in the form of ditches and swales may be required to control and convey roadway runoff.

Build Alternative D

The proposed configuration will impede existing offsite flow patterns both east and west of the BNSF rail alignment. However, based on a preliminary assessment of the calculated peak discharges the impeded flows could be controlled and conveyed with relatively small (1- to 2-ft deep) roadside ditches at the edge of the proposed fill slopes. Collected discharge would be conveyed around the proposed abutments and discharged to their pre-existing outfall locations.

Additionally, the relocation of the intersection of CO84/NM 6 would require a cross culvert to be constructed along the northwestern corner of the intersection to allow concentrated storm water to maintain existing flow patterns. It should be noted that pre-existing ponding occurring at the existing intersection will remain. However, due the configuration of the proposed alignment the ponding at the existing northwest corner of the intersection will most likely be reduced due to a reduction in overall size of watershed contributing to the area.

Onsite discharge patterns will be altered due to the roadway section requiring super elevated typical sections in order to align the roadway perpendicular to the existing BNSF railroad track. However, the overall increase in discharge will be incremental due to the minimal change in overall width of the roadway section. MS-4 ponds for water quality treatment would be required. Based on preliminary estimates the ponds could be accommodated within the proposed right-of-way expansions.

Approach sections of the newly aligned bridge with require embankment spillways to control concentrated discharge. Additionally in the event that embankment fill material proves to be highly erodible then embankment curbs may be required along guardrail. The curbs would be drained by proposed spillways in order to control spread and depth of concentrated storm water along the roadway edge.

Build Alternative E

The proposed configuration will impede existing offsite flow patterns both east and west of the BNSF rail alignment. However, similarly to Alternative D developing peak discharges could be controlled and conveyed with relatively small (1- to 2-ft deep) roadside ditches at the edge of the proposed fill slopes. Collected discharge would be conveyed around the proposed abutments and discharged to their pre-existing outfall locations.

Alternative E utilizes the existing intersection of NM 6/CO84. However it should be noted fill slope may reduce a portion of the ponding capacity at the northwest corner of the intersection. Additional grading may be required to maintain existing capacities.

Onsite discharge patterns will be altered in a similar manner as Alternative D due to the proposed roadway geometry. However, the overall increase in discharge will be incremental due to the minimal change in overall width of the roadway section. MS-4 ponds for water quality treatment would be required. Based on preliminary estimates the ponds could be accommodated within the proposed right-of-way expansions.

Approach sections of the newly aligned bridge with require embankment spillways to control concentrated discharge. Additionally in the event that embankment fill material proves to be highly erodible then embankment curbs may be required along guardrail. The curbs would be drained by proposed spillways in order to control spread and depth of concentrated storm water along the roadway edge.

Build Alternative F

The proposed configuration will impede existing offsite flow patterns both east and west of the BNSF rail alignment. However, based on a preliminary assessment of the calculated peak discharges the impeded flows could be controlled and conveyed with relatively small (1- to 2-ft deep) roadside ditches at the edge of the proposed fill slopes. Collected discharge would be conveyed around the proposed abutments and discharged to their pre-existing outfall locations.

Due to the adjusted alignment of the CO84/ NM6 intersection additional capacity of the ponding area will be reduced. Additional grading may be required for compensatory volume.

An extension of the Archway Boulevard connection at CO84 will require a small (24-in) cross culvert to convey developing discharges related to both on- and off- site drainage.

There is an overall increase in onsite discharge due to a widening of the typical roadway section. MS-4 ponds for water quality treatment would be required. Based on preliminary estimates the ponds could be accommodated within the proposed right-of-way expansions.

Approach sections of the newly aligned bridge with require embankment spillways to control concentrated discharge. Additionally in the event that embankment fill material proves to be highly erodible then embankment curbs may be required along guardrail. The curbs would be drained by proposed spillways in order to control spread and depth of concentrated storm water along the roadway edge.

Build Alternative G

The proposed configuration will impede existing offsite flow patterns both east and west of the BNSF rail alignment. However, based on a preliminary assessment of the calculated peak discharges the impeded flows could be controlled and conveyed with relatively small (1- to 2-ft deep) roadside ditches at the edge of the proposed fill slopes. Collected discharge would be conveyed around the proposed abutments and discharged to their pre-existing outfall locations.

Due to the adjusted alignment of the CO84/ NM6 intersection additional capacity of the ponding area will be reduced. Additional grading may be required for compensatory volume.

An extension of the Archway Boulevard connection at CO84 will require a small (24-in) cross culvert to convey developing discharges related to both on- and off- site drainage.

There is an overall increase in onsite discharge due to a widening of the typical roadway section. MS-4 ponds for water quality treatment would be required. Based on preliminary estimates the ponds could be accommodated within the proposed right-of-way expansions.

Approach sections of the newly aligned bridge with require embankment spillways to control concentrated discharge. Additionally in the event that embankment fill material proves to be highly erodible then embankment curbs may be required along guardrail. The curbs would be drained by proposed spillways in order to control spread and depth of concentrated storm water along the roadway edge.

Summary

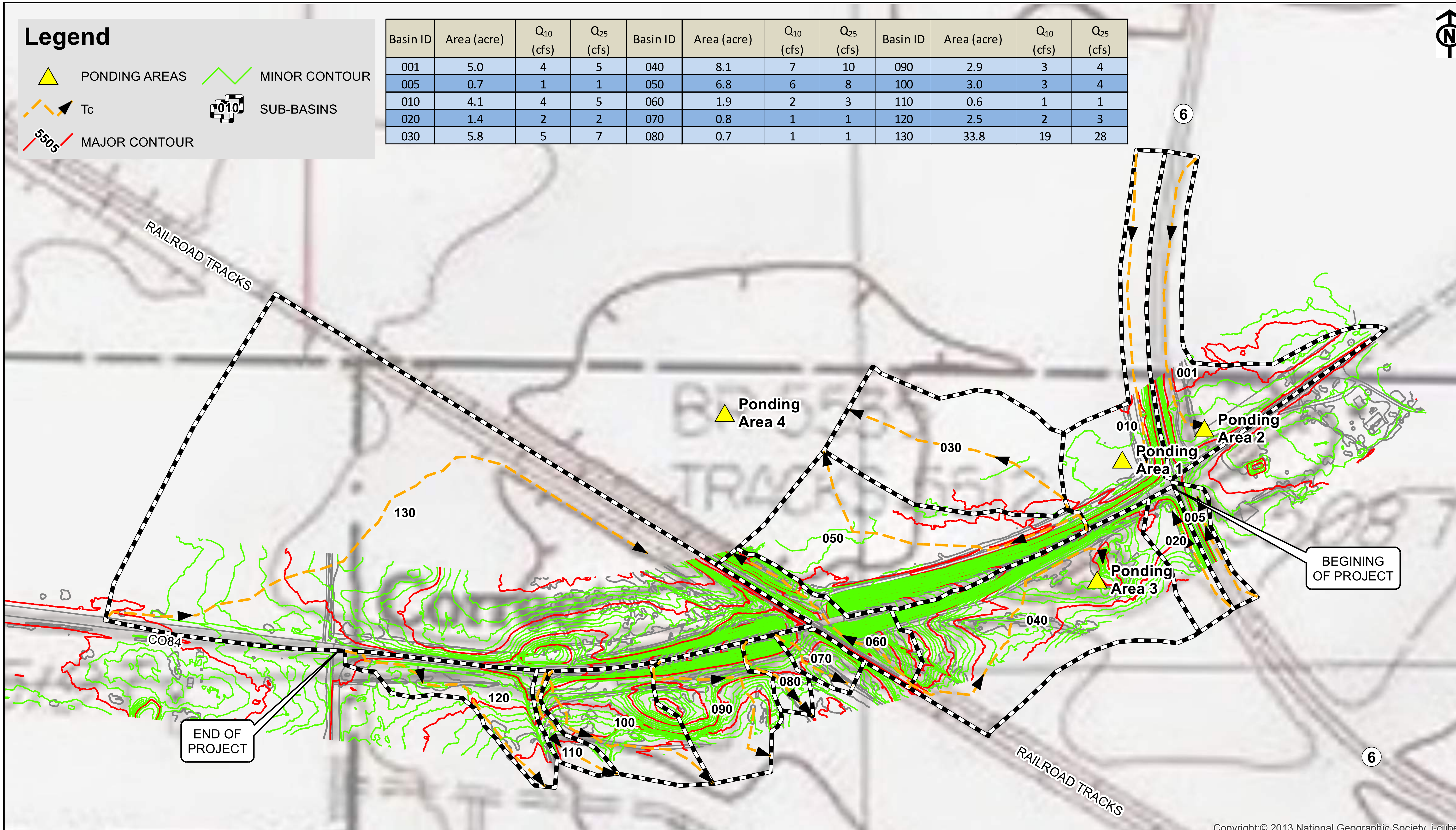
Analysis results discussed in this report indicate minimal impacts to the offsite flows or historic drainage patterns for alternatives A, B, C, and G. Alternatives D, E, and F will result in the most significant alterations of existing drainage patterns. As indicated in the proposed conditions assessment, all alternatives can be constructed without significant investment in drainage infrastructure. Swales, roadside ditches, and cross culverts can be utilized to safely and effectively control storm water runoff and maintain existing drainage patterns.

Roadway runoff will be maintained as primarily sheet flow runoff which is allowed to drain along the roadway embankment section. However, if erosion of the fill slopes becomes evident, embankment curb and spillways may be required to convey discharge forming within the roadway prism.

SWMP requires that the increased flow and volume be managed on-site to mimic historic flows. Additional grading may be required to accommodate the increase runoff and volume generated by the roadway widening.

Appendix A – Exhibits

Basin ID	Area (acre)	Q_{10} (cfs)	Q_{25} (cfs)	Basin ID	Area (acre)	Q_{10} (cfs)	Q_{25} (cfs)	Basin ID	Area (acre)	Q_{10} (cfs)	Q_{25} (cfs)
001	5.0	4	5	040	8.1	7	10	090	2.9	3	4
005	0.7	1	1	050	6.8	6	8	100	3.0	3	4
010	4.1	4	5	060	1.9	2	3	110	0.6	1	1
020	1.4	2	2	070	0.8	1	1	120	2.5	2	3
030	5.8	5	7	080	0.7	1	1	130	33.8	19	28



NMDOT

HDR

NMDOT DISTRICT 6
CIBOLA COUNTY ROAD CO84 PROJECT
EXISTING HYDROLOGIC CONDITIONS MAP

0 300 Feet

1 inch = 300 feet

DATE 10/2016

EXHIBIT A

NMDOT

HDR

NMDOT DISTRICT 6

CIBOLA COUNTY ROAD C084 PROJECT

Alignment Alternatives

DATE 10/2016

FIGURE 1

Build Alternative A

Build Alternative B

NMDOT

HDR

NMDOT DISTRICT 6

CIBOLA COUNTY ROAD C084 PROJECT

Build Alternatives

DATE 10/2016

FIGURE 2

Build Alternative C

Build Alternative D

NMDOT

HDR

NMDOT DISTRICT 6

CIBOLA COUNTY ROAD C084 PROJECT

Build Alternatives

DATE 10/2016

FIGURE 3

Build Alternative E

Build Alternative F

NMDOT

HDR

NMDOT DISTRICT 6

CIBOLA COUNTY ROAD C084 PROJECT

Build Alternatives

DATE 10/2016

FIGURE 4

Build Alternative G

NMDOT

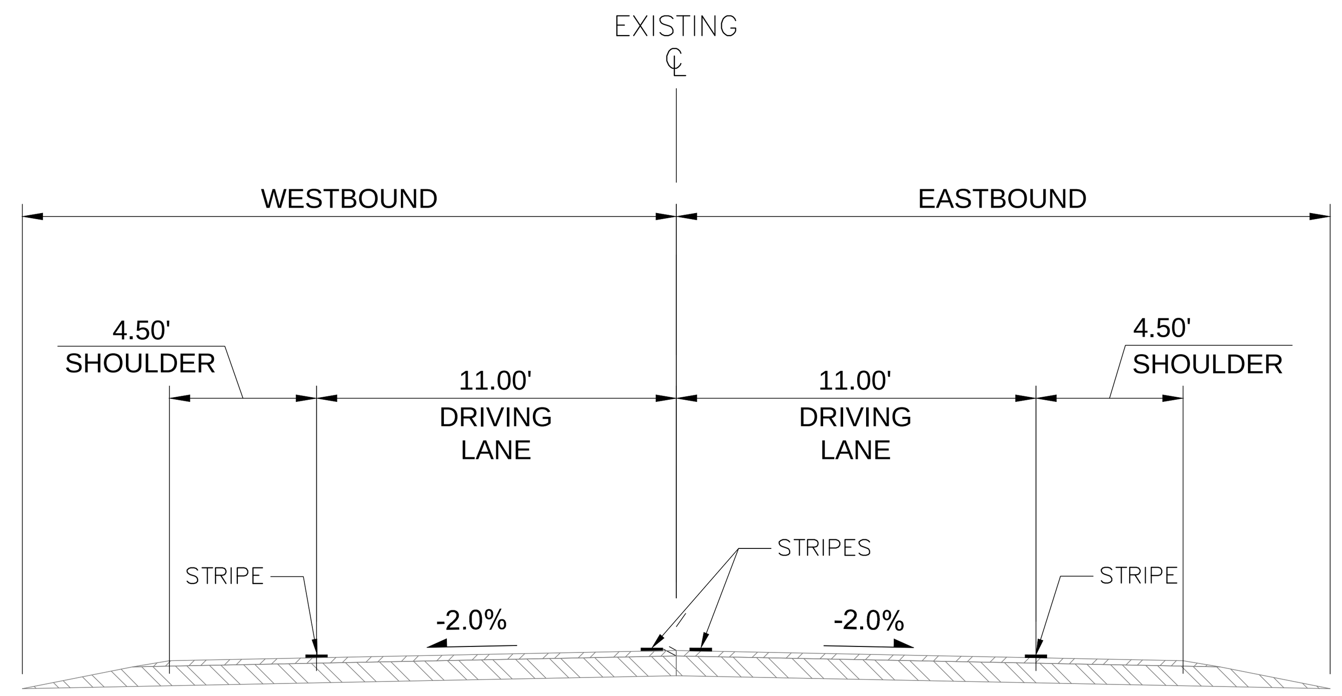
HDR

NMDOT DISTRICT 6
CIBOLA COUNTY ROAD C084 PROJECT

Build Alternatives

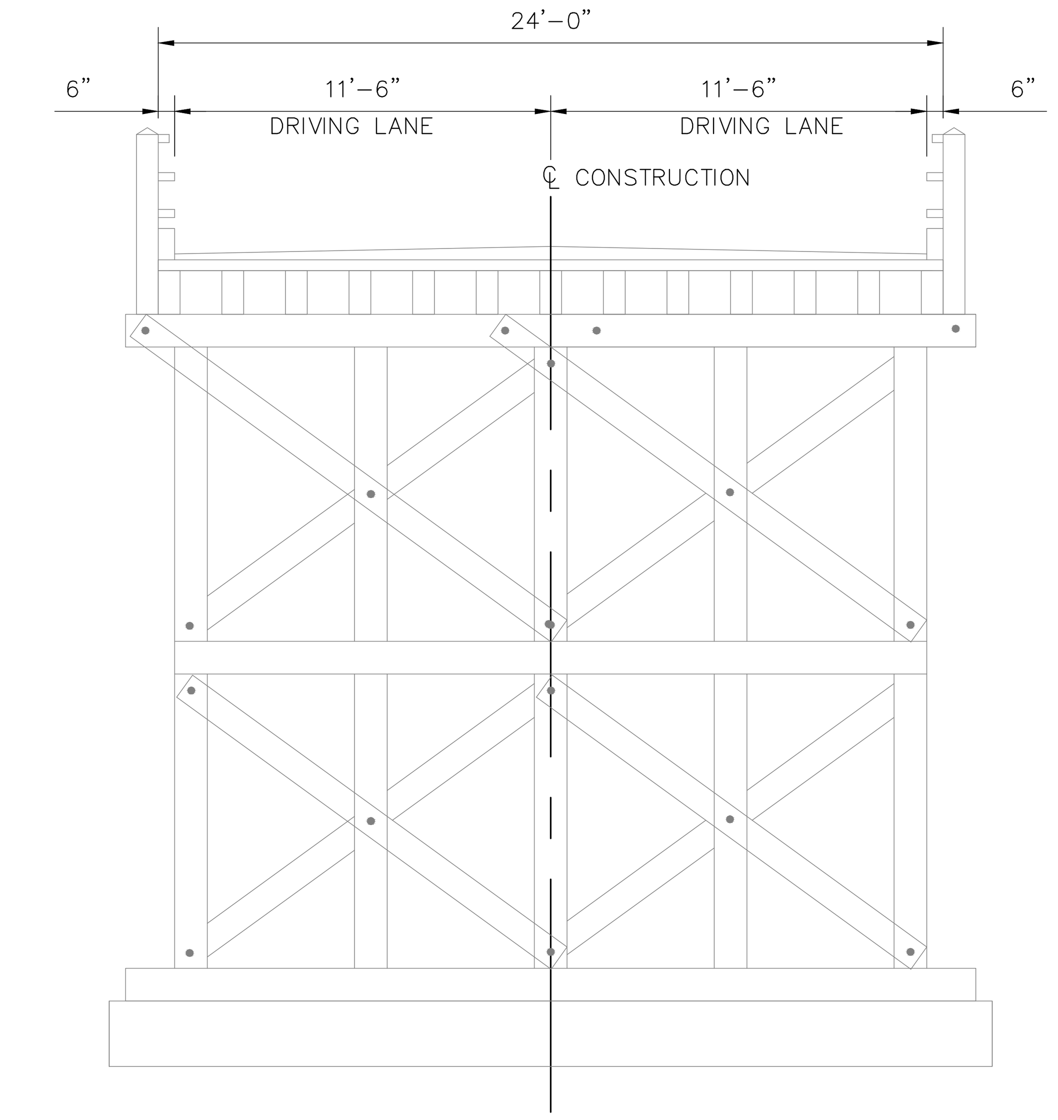
DATE 10/2016

FIGURE 5



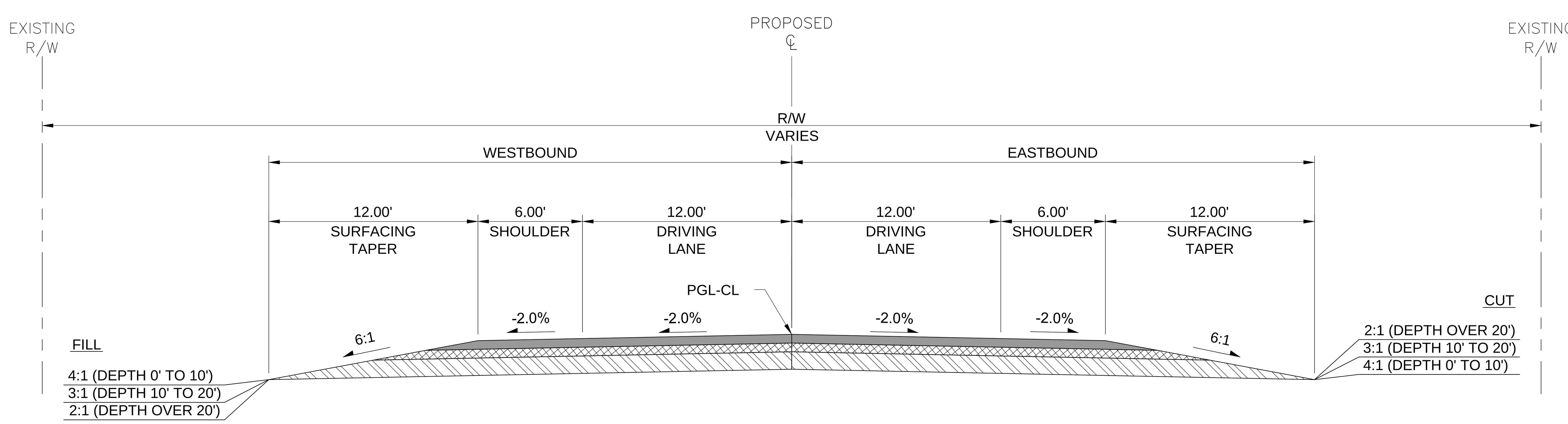
EXISTING TYPICAL SECTION

NOT TO SCALE



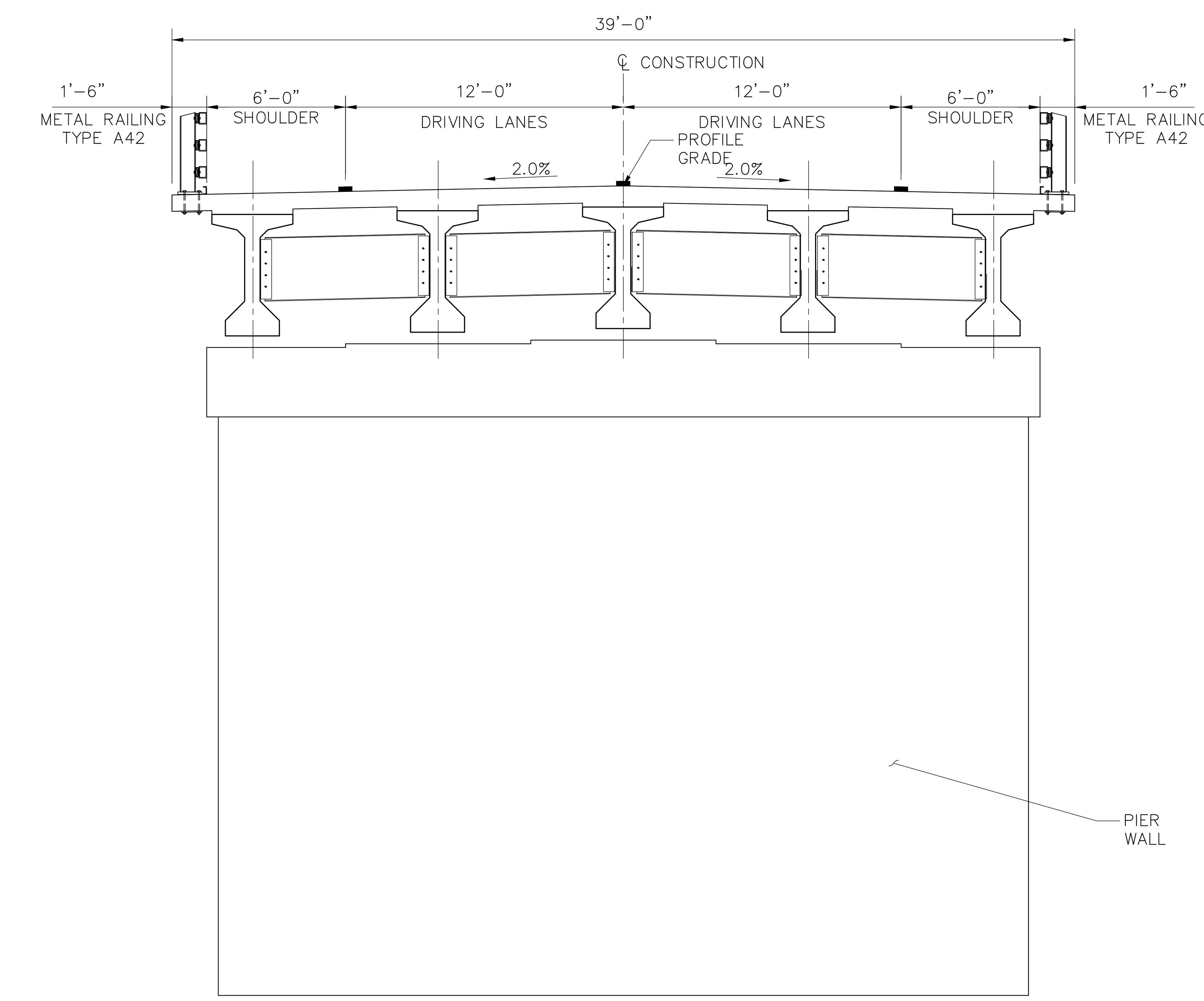
EXISTING TRANSVERSE SECTION–PIER

NOT TO SCALE



PROPOSED TYPICAL SECTION

NOT TO SCALE



PROPOSED TRANSVERSE SECTION–PIER

NOT TO SCALE

NMDOT

NMDOT DISTRICT 6
CIBOLA COUNTY ROAD C084 PROJECT
Typical Sections

DATE
10/2016

FIGURE
6

Appendix B – Hydrology

Computation

Project: Cibola County Road CO84	Computed: JDF	Date: 10-12-2016
Subject: Depression Storage Volume Estimation	Checked: MH	Date: 10-19-2016
Task: Preliminary hydrology	Sheet: 1 of 1	

ESTIMATED VOLUME

Conic Section Formula:

$$V_{1-2} = ((E_1 - E_2) / 3) * (A_1 + A_2 + (A_1 * A_2)^{1/2})$$

V_{1-2}	Storage Volume in cubic feet.
A_1	Top surface area in square feet.
A_2	Bottom surface area in square feet.
E_1	Top elevation in feet.
E_2	Bottom elevation in feet.

RETENTION BASIN	*ELEVATION*	*SURFACE AREA*	*VOLUME PROVIDED*	
	(ft)	*(ft^2)*	*(ft^3)*	*(Ac-ft)*
Ponding Area 1	5,504.0	37,825	9,437	0.22
	5,503.5	5,019		
		Subtotal:	9,437	0.22
Ponding Area 2	5,503.5	36,598	12,931	0.30
	5,503.0	16,451		
		Subtotal:	12,931	0.30
Ponding Area 3	5,509.0	85,082	73,223	1.68
	5,508.0	61,972	107,640	2.47
	5,506.0	46,061	35,904	0.82
	5,505.0	26,629	14,769	0.34
	5,504.0	5,537	5,520	0.13
	5,503.0	5,504	2,945	0.07
	5,502.0	993		
		Subtotal:	231,536	5.32
Ponding Area 4	5,500.0	964,016	876,987	20.13
	5,499.0	792,748		
		Subtotal:	876,987	20.13

Project:	Cibola County Road	Computed: JDF	Date: 10/5/2016
Subject:	Existing Conditions Hydrology	Checked: EVS	Date: 10/12/2016
Task:	Rational Peak Discharge Calculation	Page: 1	of: 4
Job #:	280076	No:	

Cibola County Road Existing Conditions Estimated Runoff

Basin ID	Contributing Area (acre)	c_{10} Value	c_{10} Value	c_{10} Value	Tc (min)	i_{10} yr (in/hr)	i_{25}yr (in/hr)	i_{50} yr (in/hr)	Q_{10} (cfs)	Q_{25} (cfs)	Q_{50} (cfs)
001	5.0	0.20	0.25	0.30	14.1	3.2	3.9	4.5	4	5	7
005	0.7	0.20	0.25	0.30	10.0	3.7	4.5	5.1	1	1	2
010	4.1	0.20	0.25	0.30	10.0	3.7	4.5	5.1	4	5	7
020	1.4	0.20	0.25	0.30	10.0	3.7	4.5	5.1	2	2	3
030	5.8	0.20	0.25	0.30	10.6	3.6	4.4	5.0	5	7	9
040	8.1	0.20	0.25	0.30	10.0	3.7	4.5	5.1	7	10	13
050	6.8	0.20	0.25	0.30	10.1	3.7	4.5	5.1	6	8	11
060	1.9	0.20	0.25	0.30	10.0	3.7	4.5	5.1	2	3	3
070	0.8	0.20	0.25	0.30	10.0	3.7	4.5	5.1	1	1	2
080	0.7	0.20	0.25	0.30	10.0	3.7	4.5	5.1	1	1	2
090	2.9	0.20	0.25	0.30	10.0	3.7	4.5	5.1	3	4	5
100	3.0	0.20	0.25	0.30	10.0	3.7	4.5	5.1	3	4	5
110	0.6	0.20	0.25	0.30	10.0	3.7	4.5	5.1	1	1	1
120	2.5	0.20	0.25	0.30	10.0	3.7	4.5	5.1	2	3	4
130	33.8	0.20	0.25	0.30	20.6	2.7	3.3	3.7	19	28	38

Project:	Cibola County Road	Computed: JDF	Date: 10/5/2016
Subject:	Existing Conditions Hydrolog	Checked: EVS	Date: 10/12/2016
Task:	Composite C calculation	Page: 2	of: 4
Job #:	280076	No:	

C value for roadway not incorporated into c value estimation. Impervious roadway areas relatively small compared to the size of the basins.

"c" Coefficient Estimation

Basin ID	Basin Area (ac)	Land Use	Depth* P_{10} (in)	Depth* P_{25} (in)	Depth* P_{50} (in)	Percent Cover	HSG Soil	C_{10} (in)	C_{25} (in)	C_{50} (in)
001	4.96	Sage Grass	1.27	1.54	1.75	30%	B	0.20	0.25	0.30
005	0.70	Sage Grass	1.27	1.54	1.75	30%	B	0.20	0.25	0.30
010	4.07	Sage Grass	1.27	1.54	1.75	30%	B	0.20	0.25	0.30
020	1.35	Sage Grass	1.27	1.54	1.75	30%	B	0.20	0.25	0.30
030	5.83	Sage Grass	1.27	1.54	1.75	30%	B	0.20	0.25	0.30
040	8.14	Sage Grass	1.27	1.54	1.75	30%	B	0.20	0.25	0.30
050	6.77	Sage Grass	1.27	1.54	1.75	30%	B	0.20	0.25	0.30
060	1.91	Sage Grass	1.27	1.54	1.75	30%	B	0.20	0.25	0.30
070	0.77	Sage Grass	1.27	1.54	1.75	30%	B	0.20	0.25	0.30
080	0.71	Sage Grass	1.27	1.54	1.75	30%	B	0.20	0.25	0.30
090	2.90	Sage Grass	1.27	1.54	1.75	30%	B	0.20	0.25	0.30
100	2.98	Sage Grass	1.27	1.54	1.75	30%	B	0.20	0.25	0.30
110	0.57	Sage Grass	1.27	1.54	1.75	30%	B	0.20	0.25	0.30
120	2.45	Sage Grass	1.27	1.54	1.75	30%	B	0.20	0.25	0.30
130	33.82	Sage Grass	1.27	1.54	1.75	30%	B	0.20	0.25	0.30

*from figure 3-11 pg. 3-38 NMDOT hydrology Manual

Project:	Cibola County Road	Computed:		Date: 10/5/2016
Subject:	Existing Conditions Hydrology	Checked:	EVS	Date: 10/12/2016
Task:	Time of Concentration Calculation	Page: 3		of: 4
Job #:	280076	No:		

Tc was estimated using the Upland Method, small ungullied watersheds
Data (length, slope, elevations, etc… extracted from GIS)

Sub-basin Tc estimation

Sub-Basin	Flow Type	Length (ft)	Start Elev (ft)	End Elev (ft)	Slope Percent	Velocity (ft/s)	Tc (min)	Design Tc* (min)
001	Sheet Flow	299.9	5508.0	5506.0	0.667	0.8	14.1	14.1
001	Shallow Concentrated	681.3	5506.0	5502.5	0.514	1.4		
005	Sheet Flow	299.9	5520.0	5508.0	4.001	2.0	3.1	10.0
005	Shallow Concentrated	101.6	5508.0	5506.0	1.968	2.8		
010	Sheet Flow	299.9	5508.0	5506.0	0.667	0.8	7.7	10.0
010	Shallow Concentrated	726.2	5506.0	5403.5	14.114	7.6		
020	Sheet Flow	299.9	5520.0	5509.0	3.668	1.9	3.2	10.0
020	Shallow Concentrated	82.5	5509.0	5508.0	1.212	2.2		
030	Sheet Flow	299.9	5505.3	5503.5	0.583	0.8	10.6	10.6
030	Shallow Concentrated	503.3	5503.5	5498.0	1.093	2.1		
040	Sheet Flow	299.9	5515.5	5510.0	1.834	1.4	8.9	10.0
040	Shallow Concentrated	683.3	5510.0	5502.0	1.171	2.2		
050	Sheet Flow	299.9	5514.5	5504.8	3.234	1.8	10.1	10.1
050	Shallow Concentrated	808.9	5504.8	5498.0	0.841	1.8		
060	Sheet Flow	299.9	5515.5	5513.0	0.834	0.9	7.7	10.0
060	Shallow Concentrated	455.3	5513.0	5499.8	2.899	3.4		
070	Sheet Flow	299.9	5539.5	5507.5	10.670	3.3	1.6	10.0
070	Shallow Concentrated	22.8	5507.5	5506.5	4.386	4.2		
080	Sheet Flow	299.9	5537.5	5505.8	10.570	3.3	1.9	10.0
080	Shallow Concentrated	58.8	5505.8	5505.0	1.360	2.3		
090	Sheet Flow	299.9	5525.0	5511.7	4.435	2.1	4.2	10.0
090	Shallow Concentrated	370.6	5511.7	5501.0	2.887	3.4		
100	Sheet Flow	299.9	5518.5	5504.3	4.735	2.2	4.8	10.0
100	Shallow Concentrated	440.6	5504.3	5495.0	2.111	2.9		
110	Sheet Flow	299.9	5518.5	5504.8	4.568	2.2	3.5	10.0
110	Shallow Concentrated	203.5	5504.8	5501.0	1.867	2.7		
120	Sheet Flow	299.9	5516.5	5511.0	1.834	1.4	7.6	10.0
120	Shallow Concentrated	558.1	5511.0	5503.0	1.433	2.4		
130	Sheet Flow	299.9	5520.8	5518.3	0.834	0.9	20.6	20.6
130	Shallow Concentrated	1749.3	5518.3	5502.0	0.932	1.9		

*Minimum Tc = 10min

Project:	Cibola County Road	Computed: JDF		Date:	10/5/2016
Subject:	Existing Conditions Hydrology	Checked: EVS		Date:	10/12/2016
Task:	NOAA Atlas 14 Data	Page: 4		of:	4
Job #:	280076	No:			

Precipitaiton information obtained from NOAA Atlas 14 at the approximate center of project area:
NOAA Atlas 14 data downloaded 9/29/2016
Latitude: 34.9551 Longitude: -107.1801

PDS-based precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5	0.195	0.252	0.337	0.403	0.49	0.557	0.626	0.699	0.796	0.875
10	0.296	0.384	0.514	0.613	0.746	0.848	0.954	1.07	1.21	1.33
15	0.367	0.477	0.637	0.76	0.924	1.05	1.18	1.32	1.5	1.65
30	0.495	0.642	0.858	1.02	1.25	1.42	1.59	1.78	2.02	2.23
60	0.613	0.795	1.06	1.27	1.54	1.75	1.97	2.2	2.51	2.75
120	0.715	0.917	1.21	1.44	1.76	2.01	2.28	2.56	2.94	3.26
360	0.759	0.968	1.26	1.5	1.82	2.08	2.35	2.64	3.03	3.35
6-hr	0.868	1.1	1.4	1.64	1.97	2.23	2.5	2.78	3.16	3.47
12-hr	0.951	1.2	1.52	1.77	2.1	2.36	2.63	2.91	3.28	3.58
24-hr	1.03	1.3	1.63	1.89	2.24	2.52	2.8	3.09	3.47	3.78
2-day	1.12	1.4	1.76	2.04	2.42	2.72	3.03	3.34	3.77	4.1
3-day	1.27	1.58	1.97	2.27	2.69	3.01	3.34	3.68	4.13	4.48
4-day	1.41	1.76	2.18	2.51	2.96	3.3	3.66	4.01	4.49	4.86
7-day	1.64	2.05	2.52	2.89	3.38	3.76	4.14	4.51	5.01	5.39
10-day	1.84	2.3	2.84	3.27	3.84	4.27	4.72	5.16	5.75	6.19
20-day	2.36	2.93	3.58	4.08	4.71	5.18	5.64	6.09	6.66	7.07
30-day	2.84	3.53	4.28	4.84	5.55	6.06	6.56	7.04	7.63	8.06
45-day	3.44	4.27	5.13	5.74	6.5	7.04	7.56	8.03	8.62	9.02
60-day	3.99	4.96	5.96	6.67	7.54	8.15	8.73	9.27	9.92	10.4

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).
Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greate
at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.
Please refer to NOAA Atlas 14 document for more information.

PDS-based precipitation frequency estimates with 90% confidence intervals (in inches/hour)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5	2.34	3.02	4.04	4.84	5.88	6.68	7.51	8.39	9.55	10.5
10	1.78	2.3	3.08	3.68	4.48	5.09	5.72	6.39	7.27	8
15	1.47	1.91	2.55	3.04	3.7	4.2	4.73	5.28	6.01	6.61
30	0.99	1.28	1.72	2.05	2.49	2.83	3.18	3.55	4.05	4.45
60	0.613	0.795	1.06	1.27	1.54	1.75	1.97	2.2	2.51	2.75
120	0.358	0.458	0.605	0.72	0.879	1.01	1.14	1.28	1.47	1.63
360	0.253	0.322	0.42	0.498	0.606	0.692	0.783	0.878	1.01	1.12
6-hr	0.145	0.183	0.234	0.274	0.33	0.373	0.418	0.465	0.528	0.579
12-hr	0.079	0.099	0.126	0.147	0.174	0.196	0.219	0.242	0.272	0.297
24-hr	0.043	0.054	0.068	0.079	0.093	0.105	0.117	0.129	0.145	0.157
2-day	0.023	0.029	0.037	0.043	0.05	0.057	0.063	0.07	0.079	0.085
3-day	0.018	0.022	0.027	0.032	0.037	0.042	0.046	0.051	0.057	0.062
4-day	0.015	0.018	0.023	0.026	0.031	0.034	0.038	0.042	0.047	0.051
7-day	0.01	0.012	0.015	0.017	0.02	0.022	0.025	0.027	0.03	0.032
10-day	0.008	0.01	0.012	0.014	0.016	0.018	0.02	0.021	0.024	0.026
20-day	0.005	0.006	0.007	0.008	0.01	0.011	0.012	0.013	0.014	0.015
30-day	0.004	0.005	0.006	0.007	0.008	0.008	0.009	0.01	0.011	0.011
45-day	0.003	0.004	0.005	0.005	0.006	0.007	0.007	0.007	0.008	0.008
60-day	0.003	0.003	0.004	0.005	0.005	0.006	0.006	0.006	0.007	0.007

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).
Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a
given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not
Please refer to NOAA Atlas 14 document for more information.

Project:	Cibola County Road	Computed:	JDF	Date:	10/5/2016
Subject:	Rational Peak Discharge Calculation	Checked:	EVS	Date:	10/12/2016
Task:	Estimated Impacts at Alternatives	Page:	1	of:	1
Job #:	280076	No:			

Estimated Peak Discharges 10-yr

Basin ID	Existing Total Basin Area (acre)	Existing Flow Rate (cfs)	Alternative A Impact Area (acre)	Alternative B Impact Area (acre)	Alternative C Impact Area (acre)	Alternative D Impact Area (acre)	Alternative E Impact Area (acre)	Alternative F Impact Area (acre)	Alternative G Impact Area (acre)	Estimated Flow Alternative A (cfs)	Estimated Flow Alternative B (cfs)	Estimated Flow Alternative C (cfs)	Estimated Flow Alternative D (cfs)	Estimated Flow Alternative E (cfs)	Estimated Flow Alternative F (cfs)	Estimated Flow Alternative G (cfs)
Sub-basin 001	4.96	4	4.96	4.96	4.96	4.96	4.96	4.96	4.96	4	4	4	4	4	4	4
Sub-basin 005	0.70	1	0.70	0.70	0.70	0.70	0.70	0.70	0.70	1	1	1	1	1	1	1
Sub-basin 010	4.07	4	4.07	4.07	4.07	2.04	4.07	0.41	0.41	4	4	4	2	4	0	0
Sub-basin 020	1.35	2	1.35	1.35	1.35	1.35	1.35	1.35	1.35	2	2	2	2	2	2	2
Sub-basin 030	5.83	5	5.83	5.83	5.83	1.93	5.83	5.83	5.83	5	5	5	2	5	5	5
Sub-basin 040	8.14	7	8.14	8.14	8.14	8.14	8.14	8.14	8.14	7	7	7	7	7	7	7
Sub-basin 050	6.77	6	6.77	6.77	6.77	3.38	2.23	3.38	6.77	6	6	6	3	2	3	6
Sub-basin 060	1.91	2	1.91	1.91	1.91	0.95	0.95	1.91	0.95	2	2	2	1	1	2	1
Sub-basin 070	0.77	1	0.77	0.77	0.77	0.25	0.77	0.77	0.77	1	1	1	0	1	1	1
Sub-basin 080	0.71	1	0.71	0.71	0.71	0.35	0.71	0.71	0.71	1	1	1	1	1	1	1
Sub-basin 090	2.90	3	2.90	2.90	2.90	2.90	1.45	2.90	2.90	3	3	3	3	2	3	3
Sub-basin 100	2.98	3	2.98	2.98	2.98	2.98	1.49	2.98	2.98	3	3	3	3	2	3	3
Sub-basin 110	0.57	1	0.57	0.57	0.57	0.57	0.57	0.57	0.57	1	1	1	1	1	1	1
Sub-basin 120	2.45	2	2.45	2.45	2.45	2.45	2.45	2.45	2.45	2	2	2	2	2	2	2
Sub-basin 130	33.82	19	33.82	33.82	33.82	33.82	33.82	8.46	5.07	19	19	19	19	19	5	3

Estimated Peak Discharges 25-yr

Basin ID	Existing Total Basin Area (acre)	Existing Flow Rate (cfs)	Alternative A Impact Area (acre)	Alternative B Impact Area (acre)	Alternative C Impact Area (acre)	Alternative D Impact Area (acre)	Alternative E Impact Area (acre)	Alternative F Impact Area (acre)	Alternative G Impact Area (acre)	Estimated Flow Alternative A (cfs)	Estimated Flow Alternative B (cfs)	Estimated Flow Alternative C (cfs)	Estimated Flow Alternative D (cfs)	Estimated Flow Alternative E (cfs)	Estimated Flow Alternative F (cfs)	Estimated Flow Alternative G (cfs)
Sub-basin 001	4.96	5	4.96	4.96	4.96	4.96	4.96	4.96	4.96	5	5	5	5	5	5	5
Sub-basin 005	0.70	1	0.70	0.70	0.70	0.70	0.70	0.70	0.70	1	1	1	1	1	1	1
Sub-basin 010	4.07	5	4.07	4.07	4.07	2.04	4.07	0.41	0.41	5	5	5	3	5	1	1
Sub-basin 020	1.35	2	1.35	1.35	1.35	1.35	1.35	1.35	1.35	2	2	2	2	2	2	2
Sub-basin 030	5.83	7	5.83	5.83	5.83	1.93	5.83	5.83	5.83	7	7	7	2	7	7	7
Sub-basin 040	8.14	10	8.14	8.14	8.14	8.14	8.14	8.14	8.14	10	10	10	10	10	10	10
Sub-basin 050	6.77	8	6.77	6.77	6.77	3.38	2.23	3.38	6.77	8	8	8	4	3	4	8
Sub-basin 060	1.91	3	1.91	1.91	1.91	0.95	0.95	1.91	0.95	3	3	3	2	2	3	2
Sub-basin 070	0.77	1	0.77	0.77	0.77	0.25	0.77	0.77	0.77	1	1	1	0	1	1	1
Sub-basin 080	0.71	1	0.71	0.71	0.71	0.35	0.71	0.71	0.71	1	1	1	1	1	1	1
Sub-basin 090	2.90	4	2.90	2.90	2.90	2.90	1.45	2.90	2.90	4	4	4	4	2	4	4
Sub-basin 100	2.98	4	2.98	2.98	2.98	2.98	1.49	2.98	2.98	4	4	4	4	2	4	4
Sub-basin 110	0.57	1	0.57	0.57	0.57	0.57	0.57	0.57	0.57	1	1	1	1	1	1	1
Sub-basin 120	2.45	3	2.45	2.45	2.45	2.45	2.45	2.45	2.45	3	3	3	3	3	3	3
Sub-basin 130	33.82	28	33.82	33.82	33.82	33.82	33.82	8.46	5.07	28	28	28	28	28	7	4

Estimated Peak Discharges 50-yr

Basin ID	Existing Total Basin Area (acre)	Existing Flow Rate (cfs)	Alternative A Impact Area (acre)	Alternative B Impact Area (acre)	Alternative C Impact Area (acre)	Alternative D Impact Area (acre)	Alternative E Impact Area (acre)	Alternative F Impact Area (acre)	Alternative G Impact Area (acre)	Estimated Flow Alternative A (cfs)	Estimated Flow Alternative B (cfs)	Estimated Flow Alternative C (cfs)	Estimated Flow Alternative D (cfs)	Estimated Flow Alternative E (cfs)	Estimated Flow Alternative F (cfs)	Estimated Flow Alternative G (cfs)
Sub-basin 001	4.96	7	4.96	4.96	4.96	4.96	4.96	4.96	4.96	7	7	7	7	7	7	7
Sub-basin 005	0.70	2	0.70	0.70	0.70	0.70	0.70	0.70	0.70	2	2	2	2	2	2	2
Sub-basin 010	4.07	7	4.07	4.07	4.07	2.04	4.07	0.41	0.41	7	7	7	4	7	1	1
Sub-basin 020	1.35	3	1.35	1.35	1.35	1.35	1.35	1.35	1.35	3	3	3	3	3	3	3
Sub-basin 030	5.83	9	5.83	5.83	5.83	1.93	5.83	5.83	5.83	9	9	9	3	9	9	9
Sub-basin 040	8.14	13	8.14	8.14	8.14	8.14	8.14	8.14	8.14	13	13	13	13	13	13	13
Sub-basin 050	6.77	11	6.77	6.77	6.77	3.38	2.23	3.38	6.77	11	11	11	6	4	6	11
Sub-basin 060	1.91	3	1.91	1.91	1.91	0.95	0.95	1.91	0.95	3	3	3	2	2	3	2
Sub-basin 070	0.77	2	0.77	0.77	0.77	0.25	0.77	0.77	0.77	2	2	2	1	2	2	2
Sub-basin 080	0.71	2	0.71	0.71	0.71	0.35	0.71	0.71	0.71	2	2	2	1	2	2	2
Sub-basin 090	2.90	5	2.90	2.90	2.90	2.90	1.45	2.90	2.90	5	5	5	5	3	5	5
Sub-basin 100	2.98	5	2.98	2.98	2.98	2.98	1.49	2.98	2.98	5	5	5	5	3	5	5
Sub-basin 110	0.57	1	0.57	0.57	0.57	0.57	0.57	0.57	0.57	1	1	1	1	1	1	1
Sub-basin 120	2.45	4	2.45	2.45	2.45	2.45	2.45	2.45	2.45	4	4	4	4	4	4	4
Sub-basin 130	33.82	38	33.82	33.82	33.82	33.82	33.82	8.46	5.07	38	38	38	38	38	10	6

Appendix C – Hydraulics

HY-8 Culvert Analysis Report

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 2 cfs

Design Flow: 30 cfs

Maximum Flow: 80 cfs

Table 1 - Summary of Culvert Flows at Crossing: Existing NM6 Northern Culvert

Headwater Elevation (ft)	Total Discharge (cfs)	Culvert 1 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
5504.73	2.00	2.00	0.00	1
5505.97	9.80	9.80	0.00	1
5508.68	17.60	17.60	0.00	1
5511.05	25.40	22.27	2.92	22
5511.09	30.00	22.35	7.46	5
5511.16	41.00	22.44	18.48	5
5511.20	48.80	22.33	26.39	4
5511.24	56.60	22.13	34.22	3
5511.27	64.40	21.94	42.30	3
5511.31	72.20	21.76	50.36	3
5511.34	80.00	21.59	58.37	3
5511.00	22.20	22.20	0.00	Overtopping

Rating Curve Plot for Crossing: Existing NM6 Northern Culvert

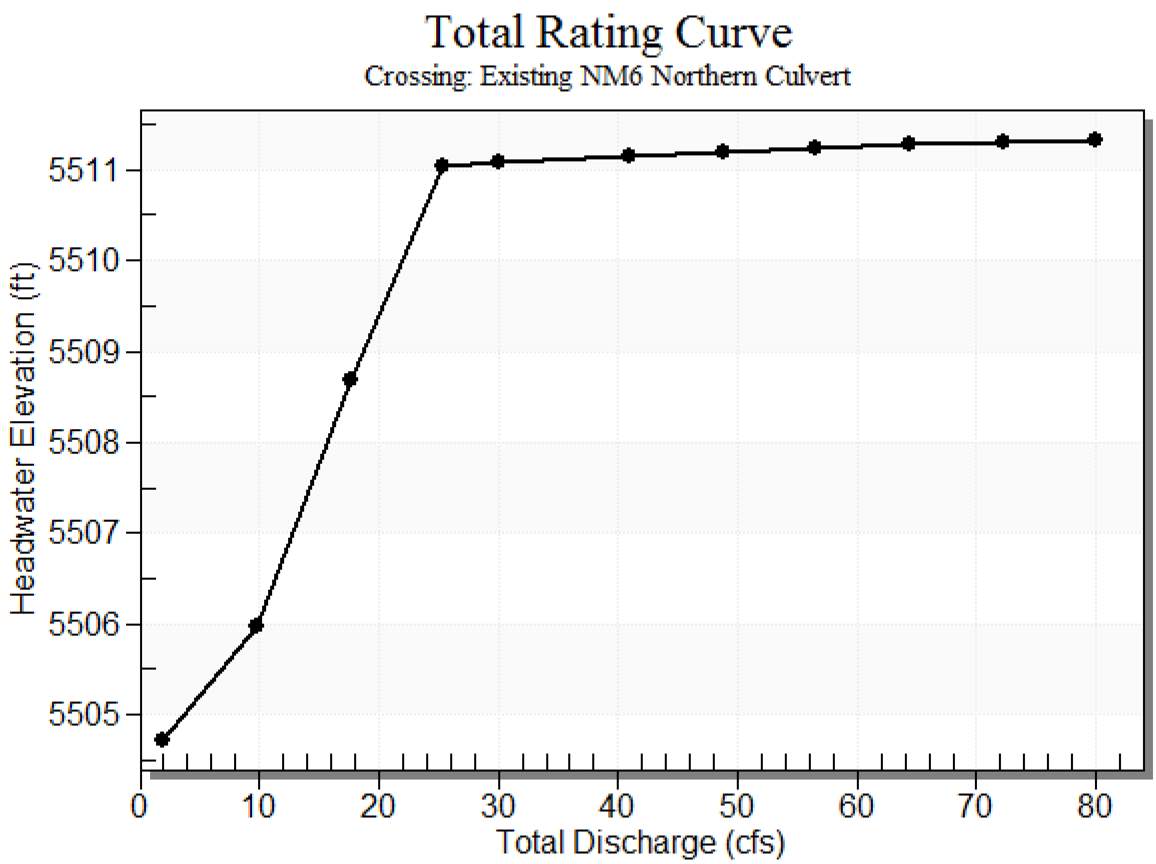


Table 2 - Culvert Summary Table: Culvert 1

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
2.00	2.00	5504.73	0.718	0.797	2-M2c	0.639	0.485	0.485	0.352	3.400	1.208
9.80	9.80	5505.97	1.799	2.040	7-M2c	2.000	1.115	1.115	0.861	5.443	1.989
17.60	17.60	5508.68	2.969	4.749	7-M2c	2.000	1.510	1.510	1.177	6.917	2.353
25.40	22.27	5511.05	3.958	7.116	7-M2c	2.000	1.683	1.683	1.424	7.895	2.605
30.00	22.35	5511.09	3.977	7.160	7-M2c	2.000	1.685	1.685	1.550	7.912	2.725
41.00	22.44	5511.16	4.000	7.227	7-M2t	2.000	1.688	1.813	1.813	7.496	2.964
48.80	22.33	5511.20	3.973	7.269	7-M2t	2.000	1.685	1.976	1.976	7.125	3.105
56.60	22.13	5511.24	3.924	7.307	4-FFf	2.000	1.678	2.000	2.125	7.045	3.229
64.40	21.94	5511.27	3.879	7.342	4-FFf	2.000	1.672	2.000	2.262	6.984	3.340
72.20	21.76	5511.31	3.836	7.375	4-FFf	2.000	1.666	2.000	2.390	6.926	3.441
80.00	21.59	5511.34	3.797	7.407	4-FFf	2.000	1.660	2.000	2.510	6.873	3.534

****

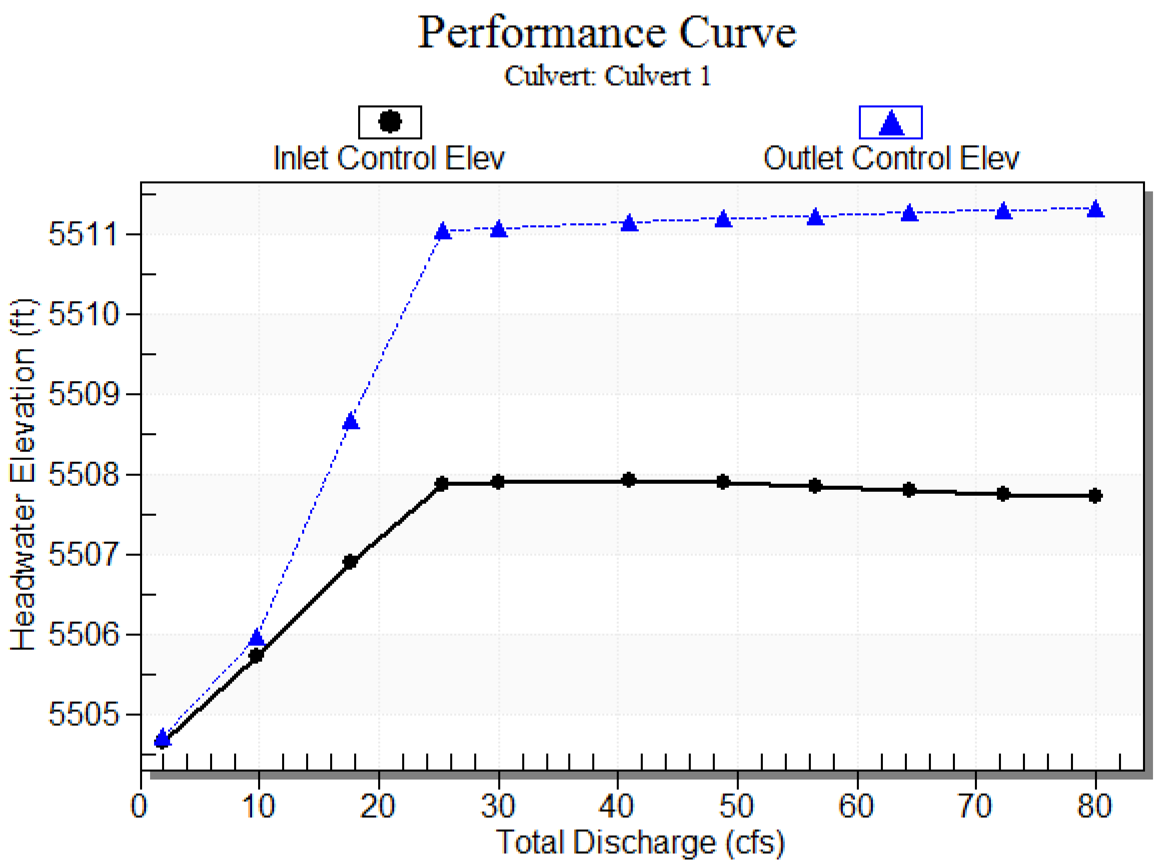
Straight Culvert

Inlet Elevation (invert): 5503.93 ft,   Outlet Elevation (invert): 5503.21 ft

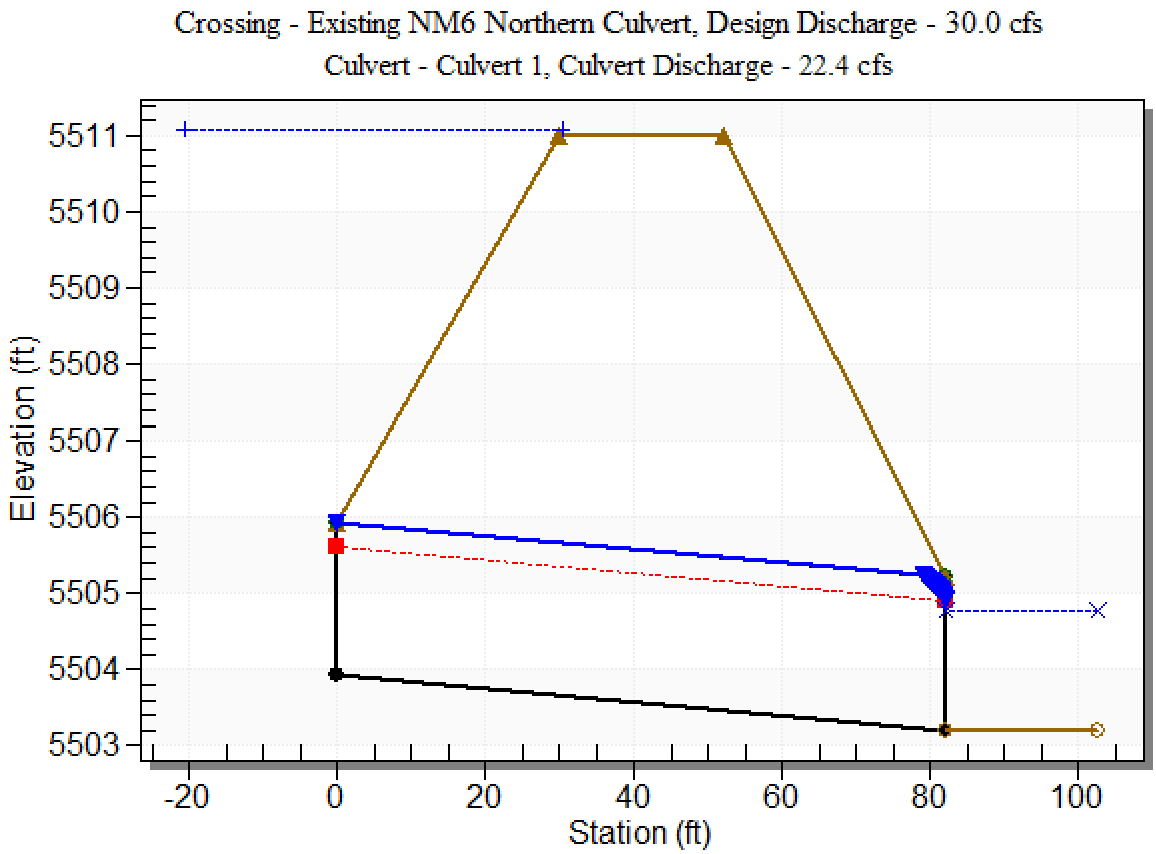
Culvert Length: 82.00 ft,   Culvert Slope: 0.0088

****

Culvert Performance Curve Plot: Culvert 1



Water Surface Profile Plot for Culvert: Culvert 1



Site Data - Culvert 1

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 5503.93 ft

Outlet Station: 82.00 ft

Outlet Elevation: 5503.21 ft

Number of Barrels: 1

Culvert Data Summary - Culvert 1

Barrel Shape: Circular

Barrel Diameter: 2.00 ft

Barrel Material: Corrugated Aluminum

Embedment: 0.00 in

Barrel Manning's n: 0.0310

Culvert Type: Straight

Inlet Configuration: Thin Edge Projecting

Inlet Depression: NONE

Table 3 - Downstream Channel Rating Curve (Crossing: Existing NM6 Northern

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
2.00	5503.56	0.35	1.21	0.07	0.38
9.80	5504.07	0.86	1.99	0.16	0.43
17.60	5504.39	1.18	2.35	0.22	0.45
25.40	5504.63	1.42	2.60	0.27	0.46
30.00	5504.76	1.55	2.73	0.29	0.46
41.00	5505.02	1.81	2.96	0.34	0.47
48.80	5505.19	1.98	3.10	0.37	0.48
56.60	5505.33	2.12	3.23	0.40	0.48
64.40	5505.47	2.26	3.34	0.42	0.48
72.20	5505.60	2.39	3.44	0.45	0.49
80.00	5505.72	2.51	3.53	0.47	0.49

Tailwater Channel Data - Existing NM6 Northern Culvert

Tailwater Channel Option: Trapezoidal Channel

Bottom Width: 4.00 ft

Side Slope (H:V): 2.00 (_:1)

Channel Slope: 0.0030

Channel Manning's n: 0.0300

Channel Invert Elevation: 5503.21 ft

Roadway Data for Crossing: Existing NM6 Northern Culvert

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 100.00 ft

Crest Elevation: 5511.00 ft

Roadway Surface: Paved

Roadway Top Width: 22.00 ft

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 2 cfs

Design Flow: 20 cfs

Maximum Flow: 80 cfs

Table 4 - Summary of Culvert Flows at Crossing: Existing NM6 Southern Culvert

Headwater Elevation (ft)	Total Discharge (cfs)	Culvert 1 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
5508.38	2.00	2.00	0.00	1
5509.73	9.80	9.80	0.00	1
5512.01	17.60	17.19	0.25	64
5512.04	20.00	17.29	2.58	7
5512.14	33.20	17.51	15.53	5
5512.18	41.00	17.39	23.50	4
5512.22	48.80	17.12	31.63	4
5512.26	56.60	16.79	39.62	3
5512.29	64.40	16.48	47.80	3
5512.33	72.20	16.19	55.95	3
5512.36	80.00	15.92	64.06	3
5512.00	17.16	17.16	0.00	Overtopping

Rating Curve Plot for Crossing: Existing NM6 Southern Culvert

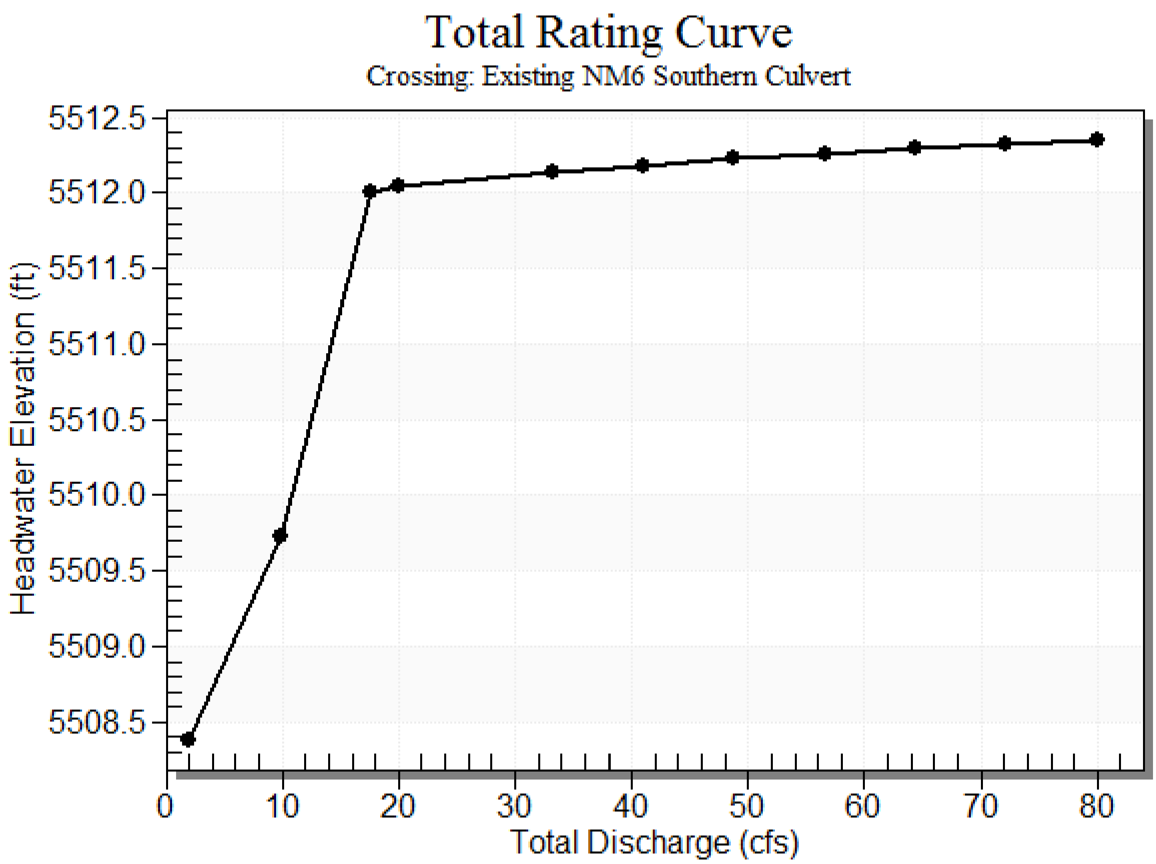


Table 5 - Culvert Summary Table: Culvert 1

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
2.00	2.00	5508.38	0.722	0.884	2-M2c	0.848	0.485	0.485	0.352	3.400	1.208
9.80	9.80	5509.73	1.805	2.233	7-M2c	2.000	1.115	1.115	0.861	5.443	1.989
17.60	17.19	5512.01	2.900	4.509	7-M2c	2.000	1.492	1.492	1.177	6.836	2.353
20.00	17.29	5512.04	2.918	4.543	7-M2c	2.000	1.497	1.497	1.259	6.856	2.438
33.20	17.51	5512.14	2.958	4.641	7-M2t	2.000	1.506	1.632	1.632	6.381	2.801
41.00	17.39	5512.18	2.936	4.685	7-M2t	2.000	1.501	1.813	1.813	5.809	2.964
48.80	17.12	5512.22	2.888	4.726	7-M2t	2.000	1.490	1.976	1.976	5.461	3.105
56.60	16.79	5512.26	2.829	4.761	4-FFf	2.000	1.475	2.000	2.125	5.345	3.229
64.40	16.48	5512.29	2.776	4.796	4-FFf	2.000	1.459	2.000	2.262	5.247	3.340
72.20	16.19	5512.33	2.726	4.828	4-FFf	2.000	1.446	2.000	2.390	5.154	3.441
80.00	15.92	5512.36	2.680	4.858	4-FFf	2.000	1.433	2.000	2.510	5.066	3.534

****

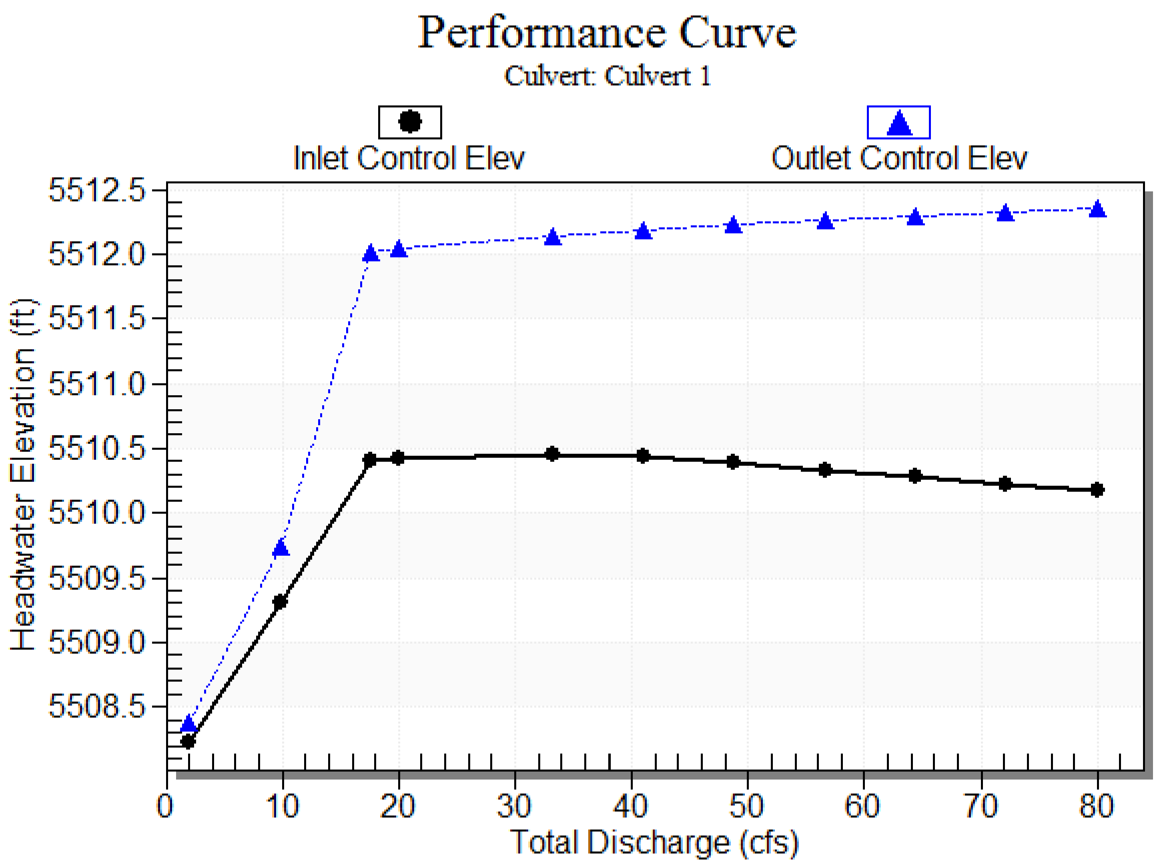
Straight Culvert

Inlet Elevation (invert): 5507.50 ft,   Outlet Elevation (invert): 5507.30 ft

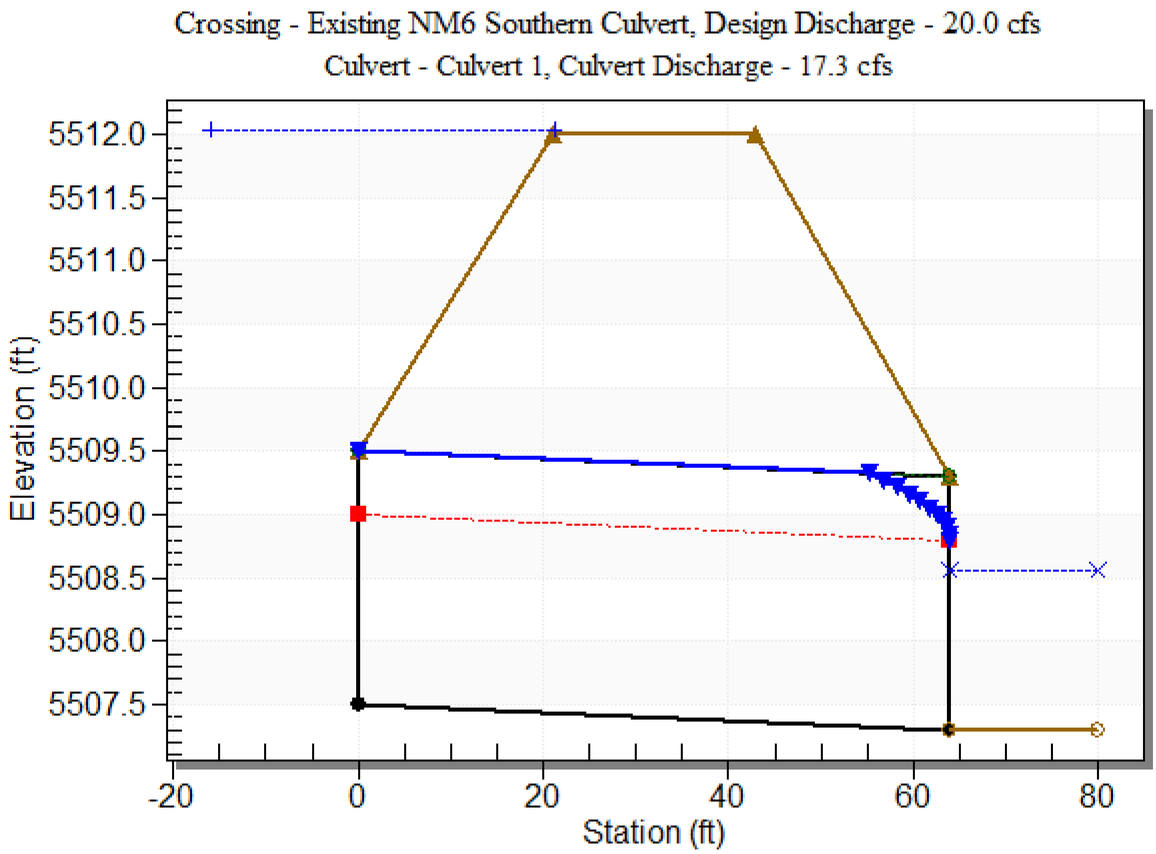
Culvert Length: 64.00 ft,   Culvert Slope: 0.0031

****

Culvert Performance Curve Plot: Culvert 1



Water Surface Profile Plot for Culvert: Culvert 1



Site Data - Culvert 1

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 5507.50 ft

Outlet Station: 64.00 ft

Outlet Elevation: 5507.30 ft

Number of Barrels: 1

Culvert Data Summary - Culvert 1

Barrel Shape: Circular

Barrel Diameter: 2.00 ft

Barrel Material: Corrugated Aluminum

Embedment: 0.00 in

Barrel Manning's n: 0.0310

Culvert Type: Straight

Inlet Configuration: Thin Edge Projecting

Inlet Depression: NONE

Table 6 - Downstream Channel Rating Curve (Crossing: Existing NM6 Southern

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
2.00	5507.65	0.35	1.21	0.07	0.38
9.80	5508.16	0.86	1.99	0.16	0.43
17.60	5508.48	1.18	2.35	0.22	0.45
20.00	5508.56	1.26	2.44	0.24	0.45
33.20	5508.93	1.63	2.80	0.31	0.47
41.00	5509.11	1.81	2.96	0.34	0.47
48.80	5509.28	1.98	3.10	0.37	0.48
56.60	5509.42	2.12	3.23	0.40	0.48
64.40	5509.56	2.26	3.34	0.42	0.48
72.20	5509.69	2.39	3.44	0.45	0.49
80.00	5509.81	2.51	3.53	0.47	0.49

Tailwater Channel Data - Existing NM6 Southern Culvert

Tailwater Channel Option: Trapezoidal Channel

Bottom Width: 4.00 ft

Side Slope (H:V): 2.00 (_:1)

Channel Slope: 0.0030

Channel Manning's n: 0.0300

Channel Invert Elevation: 5507.30 ft

Roadway Data for Crossing: Existing NM6 Southern Culvert

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 100.00 ft

Crest Elevation: 5512.00 ft

Roadway Surface: Paved

Roadway Top Width: 22.00 ft

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 2 cfs

Design Flow: 150 cfs

Maximum Flow: 400 cfs

Table 7 - Summary of Culvert Flows at Crossing: Existing BNSF Culvert

Headwater Elevation (ft)	Total Discharge (cfs)	Culvert 1 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
5507.03	2.00	2.00	0.00	1
5509.22	41.80	41.80	0.00	1
5510.77	81.60	81.60	0.00	1
5512.75	121.40	121.40	0.00	1
5514.69	150.00	150.00	0.00	1
5516.23	201.00	168.91	31.98	9
5516.38	240.80	170.66	69.77	5
5516.50	280.60	172.12	108.37	5
5516.62	320.40	173.40	146.80	4
5516.72	360.20	174.57	185.53	4
5516.82	400.00	175.65	223.94	3
5516.00	166.26	166.26	0.00	Overtopping

Rating Curve Plot for Crossing: Existing BNSF Culvert

Table 8 - Culvert Summary Table: Culvert 1

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
2.00	2.00	5507.03	0.593	0.0*	1-S2n	0.167	0.404	0.253	0.352	3.876	1.208
41.80	41.80	5509.22	2.781	0.496	1-S2n	1.095	1.932	1.246	1.831	12.473	2.980
81.60	81.60	5510.77	4.328	2.154	5-S2n	1.551	2.734	1.856	2.533	14.305	3.553
121.40	121.40	5512.75	6.310	4.483	5-S2n	1.941	3.312	2.365	3.052	15.709	3.936
150.00	150.00	5514.69	8.253	5.977	5-S2n	2.205	3.595	2.690	3.365	16.714	4.155
201.00	168.91	5516.23	9.786	7.073	5-S2n	2.378	3.722	2.887	3.843	17.398	4.477
240.80	170.66	5516.38	9.938	7.499	5-S2n	2.394	3.732	2.905	4.166	17.460	4.686
280.60	172.12	5516.50	10.065	7.879	5-S2n	2.408	3.736	2.919	4.459	17.513	4.871
320.40	173.40	5516.62	10.177	8.224	5-S2n	2.419	3.742	2.932	4.727	17.561	5.037
360.20	174.57	5516.72	10.281	8.544	5-JS1f	2.430	3.747	4.000	4.976	14.550	5.188
400.00	175.65	5516.82	10.377	8.842	5-JS1f	2.440	3.752	4.000	5.208	14.640	5.327

* Full Flow Headwater elevation is below inlet invert.

****

Straight Culvert

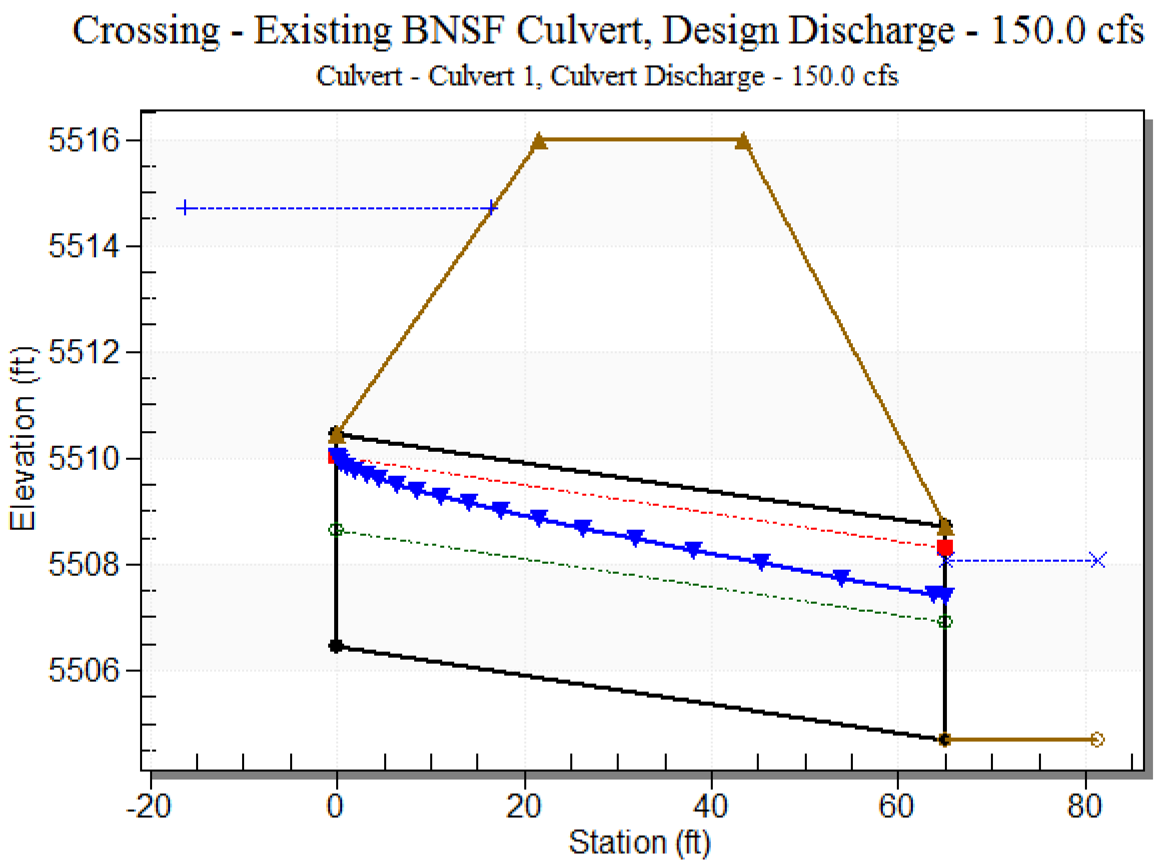
Inlet Elevation (invert): 5506.44 ft,   Outlet Elevation (invert): 5504.70 ft

Culvert Length: 65.02 ft,   Culvert Slope: 0.0268

****

Culvert Performance Curve Plot: Culvert 1

Water Surface Profile Plot for Culvert: Culvert 1



Site Data - Culvert 1

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 5506.44 ft

Outlet Station: 65.00 ft

Outlet Elevation: 5504.70 ft

Number of Barrels: 1

Culvert Data Summary - Culvert 1

Barrel Shape: Circular

Barrel Diameter: 4.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge with Headwall

Inlet Depression: NONE

Table 9 - Downstream Channel Rating Curve (Crossing: Existing BNSF Culvert)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
2.00	5505.05	0.35	1.21	0.07	0.38
41.80	5506.53	1.83	2.98	0.34	0.47
81.60	5507.23	2.53	3.55	0.47	0.49
121.40	5507.75	3.05	3.94	0.57	0.50
150.00	5508.06	3.36	4.15	0.63	0.51
201.00	5508.54	3.84	4.48	0.72	0.52
240.80	5508.87	4.17	4.69	0.78	0.52
280.60	5509.16	4.46	4.87	0.83	0.53
320.40	5509.43	4.73	5.04	0.88	0.53
360.20	5509.68	4.98	5.19	0.93	0.54
400.00	5509.91	5.21	5.33	0.98	0.54

Tailwater Channel Data - Existing BNSF Culvert

Tailwater Channel Option: Trapezoidal Channel

Bottom Width: 4.00 ft

Side Slope (H:V): 2.00 (_:1)

Channel Slope: 0.0030

Channel Manning's n: 0.0300

Channel Invert Elevation: 5504.70 ft

Roadway Data for Crossing: Existing BNSF Culvert

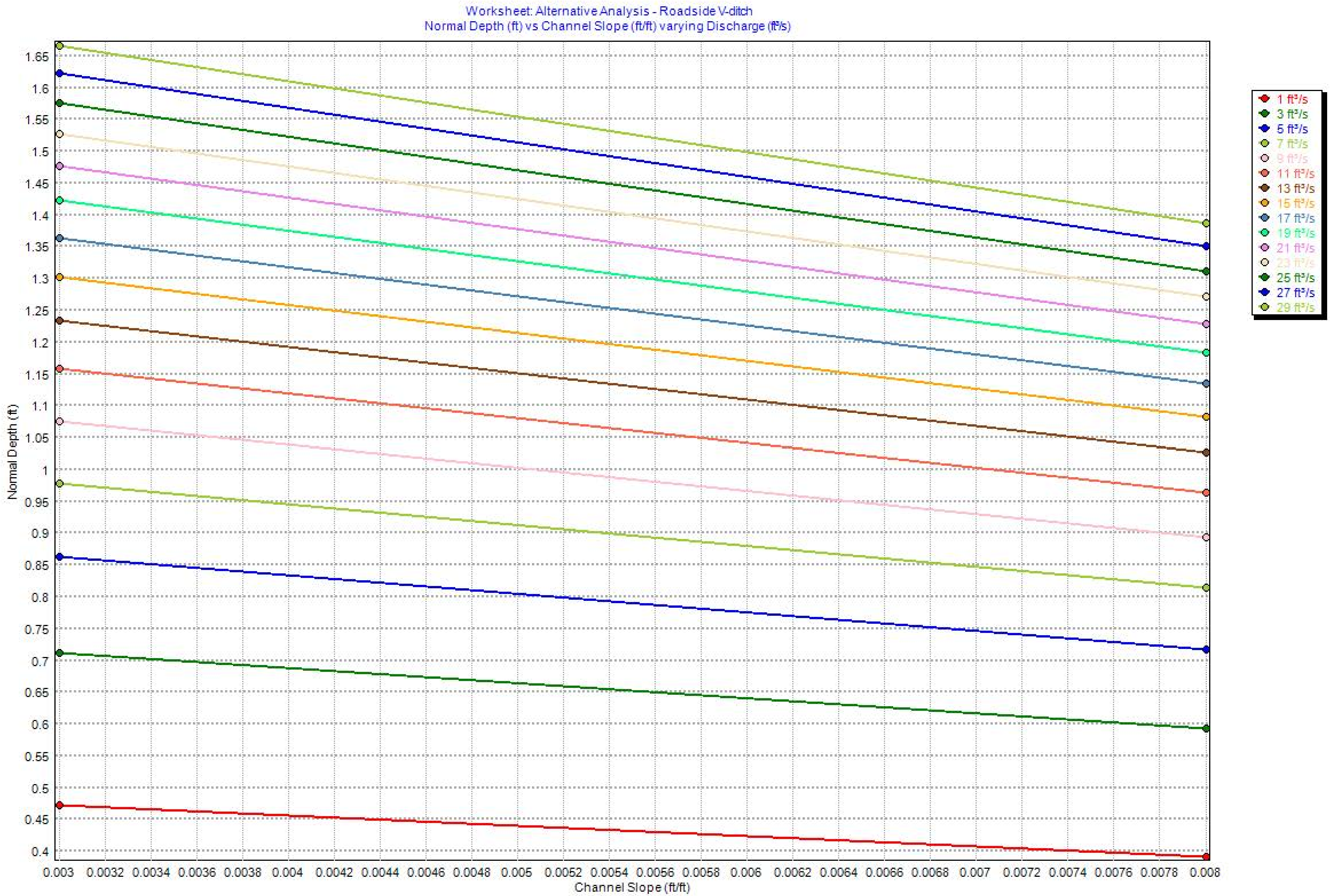
Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 100.00 ft

Crest Elevation: 5516.00 ft

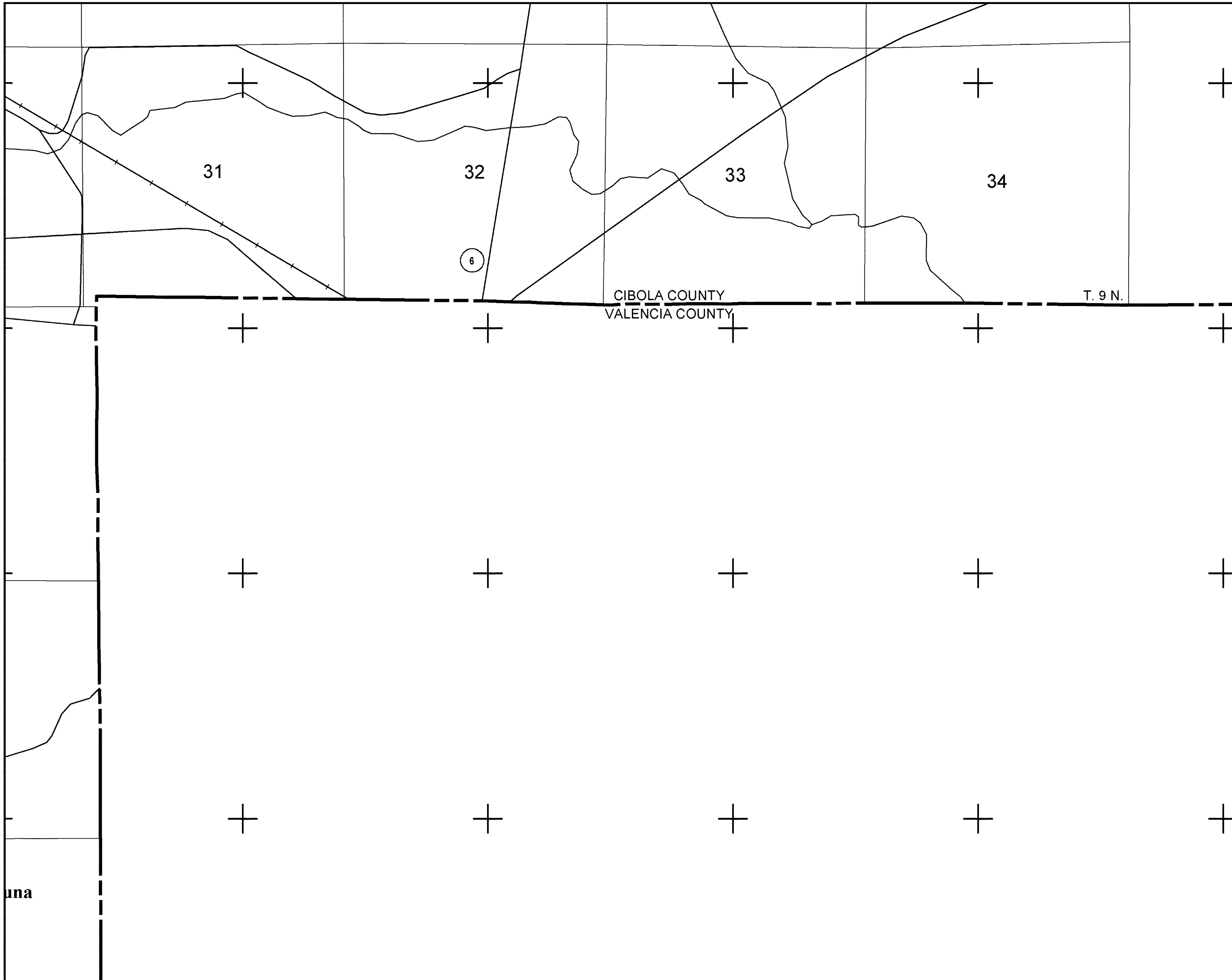
Roadway Surface: Paved

Roadway Top Width: 22.00 ft

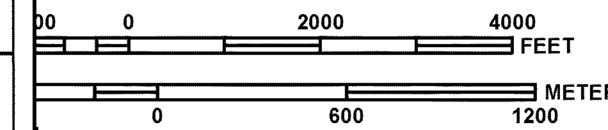


Worksheet: Alternative Analysis - Roadside V-ditch
Normal Depth (ft) vs Channel Slope (ft/ft) varying Discharge (ft³/s)
Normal Depth (ft)
Channel Slope (ft/ft)
1.65
1.6
1.55
1.5
1.45
1.4
1.35
1.3
1.25
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0.75
0.7
0.65
0.6
0.55
0.5
0.45
0.4
0.003 0.0032 0.0034 0.0036 0.0038 0.004 0.0042 0.0044 0.0046 0.0048 0.005 0.0052 0.0054 0.0056 0.0058 0.006 0.0062 0.0064 0.0066 0.0068 0.007 0.0072 0.0074 0.0076 0.0078 0.008
1 ft³/s
3 ft³/s
5 ft³/s
7 ft³/s
9 ft³/s
11 ft³/s
13 ft³/s
15 ft³/s
17 ft³/s
19 ft³/s
21 ft³/s
23 ft³/s
25 ft³/s
27 ft³/s
29 ft³/s

Appendix D – Reference Material



MAP SCALE 1" = 2000'



NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 1250C

FIRM

FLOOD INSURANCE RATE MAP

CIBOLA COUNTY,
NEW MEXICO
AND INCORPORATED AREAS

PANEL 1250 OF 2475

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
LAGUNA, PUEBLO OF	350003	1250	C

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
35006C1250C

EFFECTIVE DATE
December 17, 2010

Federal Emergency Management Agency

DRAINAGE DESIGN CRITERIA

FOR

New Mexico **DEPARTMENT OF**

TRANSPORTATION

MOBILITY FOR EVERYONE

PROJECTS

FOURTH REVISION

June 2007

Table 2A
Storm Frequencies for Interstate Highways and Primary Arterials

	Bridge Structure		Bridge Scour**		Existing, New, & sidewalk Culverts		Bridge Deck Drains		Roadside Ditches & Inlets		Median Ditches & Inlets		Trunk lines		Curb Drop Inlets	
ADT* RANGE	Design Flood	Check Flood	Design Flood	Check Flood	Design Flood	Check Flood	Design Flood	Check Flood	Design Flood	Check Flood	Design Flood	Check Flood	Design Flood	Check Flood	Design Flood	Check Flood
All ADT*	50 y	100 y	100 y	500 y	50 y	100 y	50 y	100 y	50 y	100 y	50 y	100 y	50 y	100 y	50 y	100 y

*ADT = projected average daily traffic measured in vehicles per day
** Use Overtopping flood if less than 100 years

Table 2B
Storm Frequencies for Minor Arterials, Collectors, and Local Roads

	Bridge Structure		Bridge Scour**		Existing, New, &sidewalk Culverts		Bridge Deck Drains		Roadside Ditches & Inlets		Median Ditches & Inlets		Trunk lines		Curb Drop Inlets	
ADT* RANGE	Design Flood	Check Flood	Design Flood	Check Flood	Design Flood	Check Flood	Design Flood	Check Flood	Design Flood	Check Flood	Design Flood	Check Flood	Design Flood	Check Flood	Design Flood	Check Flood
Rural >400 ADT and All Urban	50 y	100 y	100 y	500 y	50 y	100 y	50y	100y	10 y	50 y	10 y	50 y	10y	50y	10 y	50 y
Rural <400 ADT	25 y	50 y	100 y	500 y	25 y	50 y	25y	50y	10 y	25 y	10 y	25 y	10 y	25 y	10 y	25 y

*ADT = projected average daily traffic measured in vehicles per day
** Use Overtopping flood if less than 100 years

Table 4 - Additional Design Considerations for Bridges, Channels, and Culverts

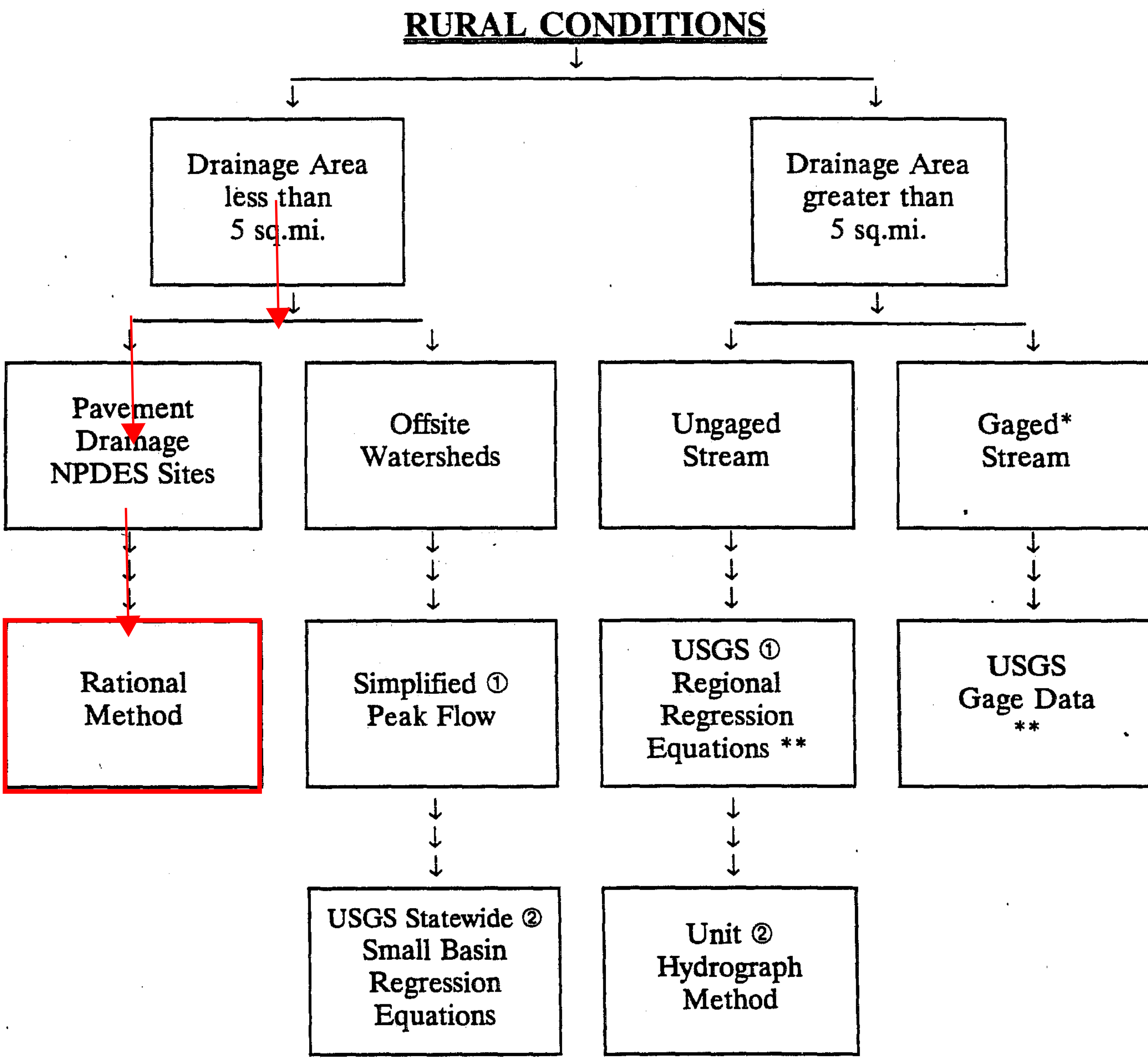
Adjacent Properties	There must be no detrimental effects - flooding, sedimentation, or erosion - on adjacent property.
Irrigation Ditches	Ensure that the proposed design does not adversely affect irrigation ditches.
Channel or Stream Deterioration and Modifications	Ensure the proposed structure does not cause significant changes to channel velocity, aggradation or degradation, scour, headcutting, and conveyance.
Debris and Sedimentation	Make allowance in the design for losses in channel conveyance due to debris and sedimentation.
Context Sensitive Issues	The design of the structure considers and respects local cultural customs and does not cause any negative effects on the local economy.
Regulatory Requirements	Ensure that the proposed structure and any channel or stream modifications meet the requirements of the US Army Corps of Engineers, the NM Environment Department, FEMA, and other agencies.

Table 5 - Other Design Considerations

Storm Drain / Inlet Item	Design Layout Criteria
Storm Drains	
Minimum Diameter Trunk line	24-inch
Minimum Diameter Connector pipes (inlets to trunk line)	24-inch
Maximum distance between manholes	
- 24-inch storm drain	300 feet
- 27-30 inch storm drain	375 feet
- 36-54 inch storm drain	450 feet
- 60 inch or greater storm drain	600 feet
Minimum cover on pipe	Based on manufacture's specifications
Minimum Storm Drain Slope	0.3 %
Minimum Velocity (trunk and connectors)	2.5 feet per second.
Manhole location	Not within an intersection
Inlets	
Minimum pipe diameter to connect inlets	24-inch

New Mexico
State Highway
and Transportation
Department

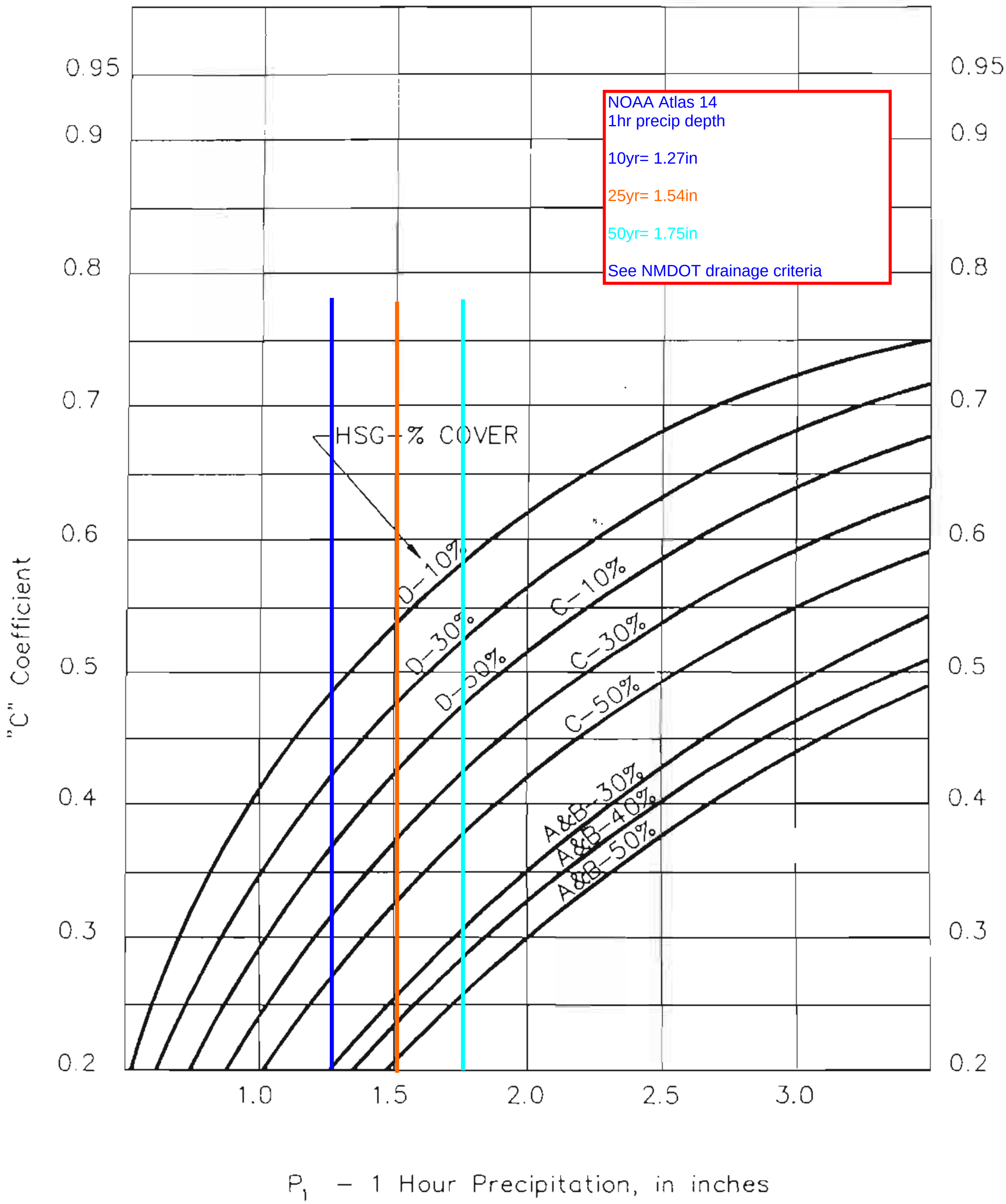
DRAINAGE MANUAL
Volume 1, Hydrology
1995



* Only gage data from USGS gages will be allowed for use on NMSHTD Projects.

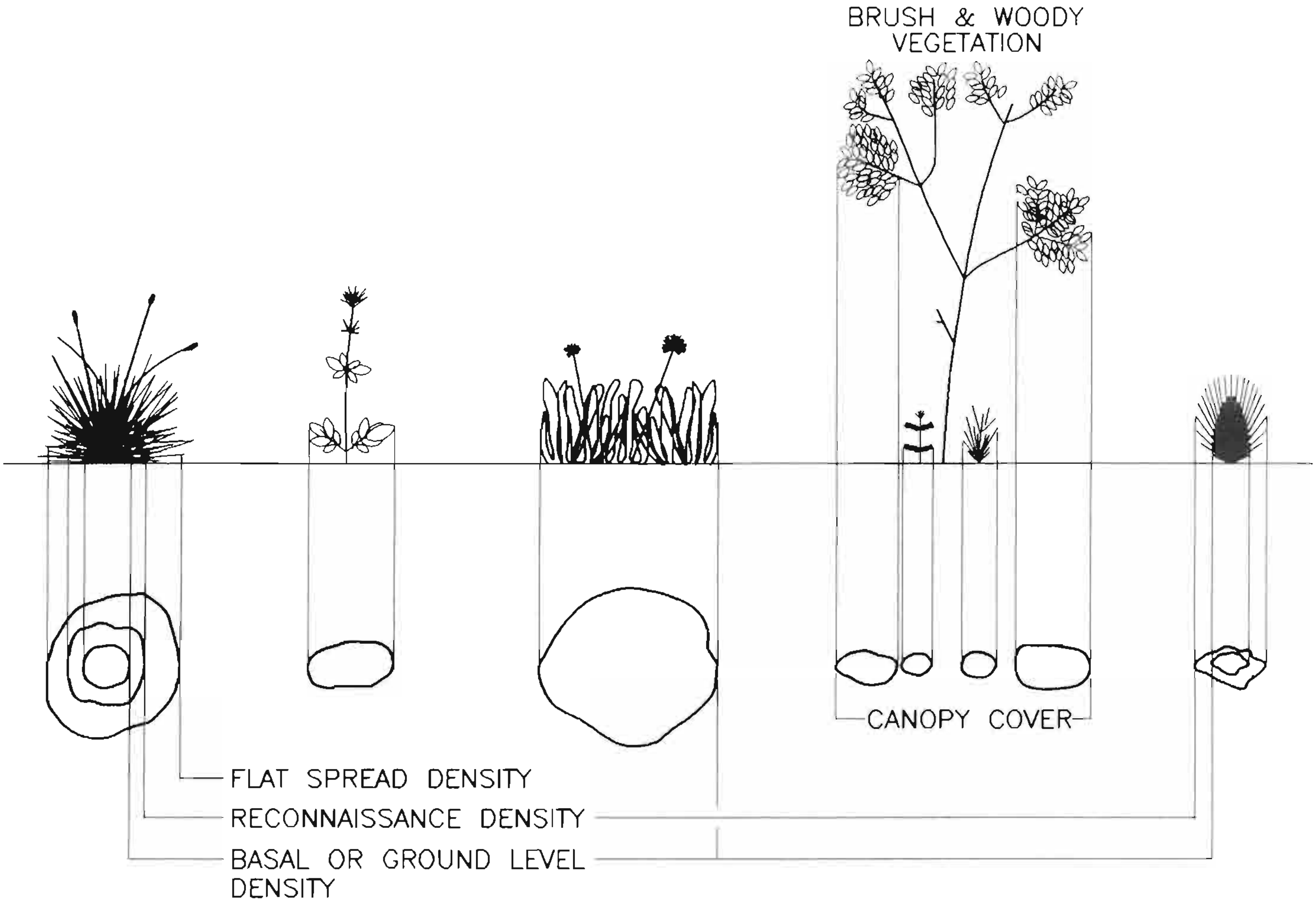
** The NMSHTD may require designers to provide a supplementary Unit Hydrograph calculation for comparison purposes.

Figure 3-1
Methodology Selection
Flow Chart
Rural Conditions

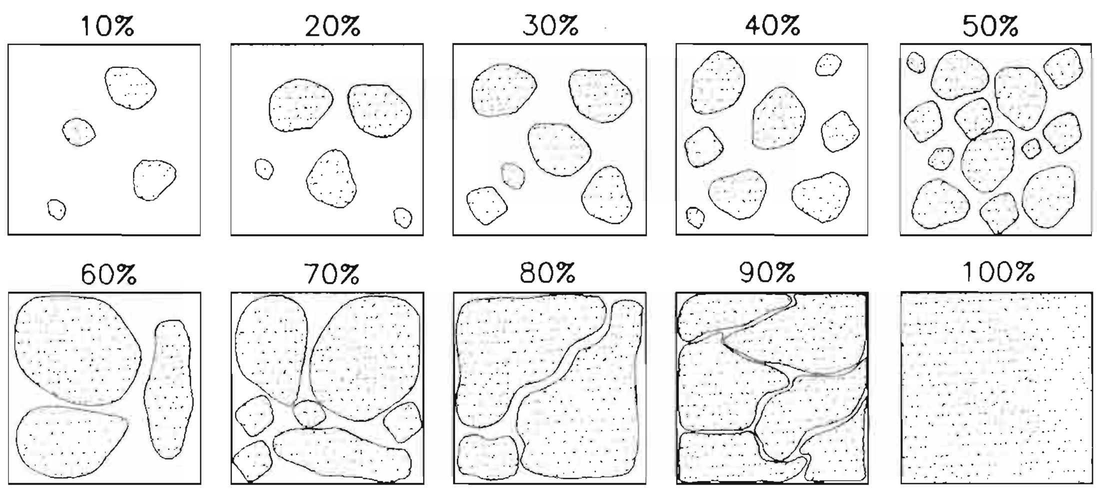


As a Function of Rainfall Depth, Hydrologic Soil Group (HSG), and % of Vegetation Cover
Adapted from Arizona DOT Highway Drainage Design Manual, 1993

Figure 3-12
Rational "C" Coefficient
Desert
(Cactus, Grass & Brush)



TYPES OF COVER DENSITIES FOR GRASSES, WEEDS, AND BRUSH.
USE BASAL DENSITIES FOR DESIGN



STANDARD METHOD OF MEASURING GROUND COVER DENSITY

Figure 3-7
Estimating Ground Cover Density

Table 3-6
Time of Concentration Method Selection Chart

Hydrologic Method	Watershed Condition	Time of Concentration Method
Rational Method	Un-gullied Watershed*	Upland Method
	Gullied Watershed*	Kirpich Formula
Simplified Peak Flow Method	Un-gullied Watershed*	Upland Method
	Gullied Watershed*	Kirpich Formula
	Watershed Partially Gullied	Upland Method for the Un-gullied Portion, then Kirpich Formula for the Gullied Portion**
USGS Regression Equations	———	NOT REQUIRED
Unit Hydrograph Method	No Defined Stream Channel	Upland Method
	Defined Stream Channel	Stream Hydraulic Method
Approved Urban Method	All Conditions	Use T_c Method Specified for the Approved Urban Method***

*A watershed is considered un-gullied if 10% or less of the primary watercourse exhibits gullying.

**Mixing T_c Methods in a watershed is only allowed with the Simplified Peak Flow Method.

When using AHYMO with the COMPUTE NM HYD routine, compute the time of concentration in accordance with the City of Albuquerque Design Process Manual. See ***SECTIONS 3.2 AND 3.3.5 of this manual for limitations on the use of AHYMO.

3.3.1.4.1 THE UPLAND METHOD

The Upland Method is used to estimate travel times for overland flow and shallow concentrated flow conditions. Originally developed by the SCS, the upland method is limited to use in watersheds less than 2000 acres in size, or to the upper reaches of larger watersheds. For NMSHTD projects the Upland Method may be used for computing the time of concentration when using the Rational Method or the Simplified Peak Flow method on an un–gullied watershed.

At the very top of the watershed, sheet flow is the predominant flow regime. The overland flow lines in **Figure 3.10** may be used to estimate the velocity of sheet flow. Overland flow continues until the volume of water creates a shallow concentrated flow regime. In erosive soil formations with limited ground cover, the length of overland flow may be so short as to be negligible. Given the slope of the land and some knowledge of the ground cover conditions, **Figure 3.10** may be used to estimate the velocity of shallow concentrated flow. For NMSHTD projects, shallow concentrated flow is assumed to occur from the end of overland flow to the bottom of a watershed where there is little or no gullying (10% or less). Where gullying is evident in the majority of the watercourse (by field inspection, or by a blue line on the USGS quadrangle topographic map), time of concentration should be computed by the Kirpich Method for the entire watershed. **When the Simplified Peak Flow method is being used for NMSHTD projects, the Upland Method may be used for the un–gullied portion of the watercourse, in combination with the Kirpich Formula for the gullied sections of the watercourse.**

$$Tc(Upland) = \Sigma(L_n/V_n)$$

Limitations for using the Rational Formula on NMSHTD projects include the following:

- Total drainage area no larger than about 150 acres
- Land use must be fairly consistent throughout the watershed
- No drainage channels or other structures in the watershed which would require flood routing
- Time of Concentration does not exceed one hour

3.3.2.1 APPLICATION OF THE RATIONAL FORMULA

Measure the watershed area in acres. Construct an Intensity–Duration Frequency (IDF) curve as described in ***SECTION 3.3.1.2*** of this manual. Compute the Time of Concentration (T_c) for the watershed as described in ***SECTION 3.3.1.4*** of this manual. Enter the appropriate IDF curve (or spreadsheet) with a value of T_c to obtain the design rainfall intensity. When T_c is computed as less than 10 minutes, a minimum rainfall duration of 10 minutes should be used. When T_c is computed as greater than 60 minutes, the Rational Method should not be used.

The runoff coefficient, C, is selected from **Figures 3–11 through 3–16**, depending on the ground cover, hydrologic soil group, type of development, and 1–hour rainfall depth for the design return period. Hydrologic soil groups are defined in ***SECTION 3.3.1.3*** and 1–hour rainfall depths are determined in ***SECTION 3.3.1.2*** of this manual. **Figures 3–11 through 3–16** show how C varies with 1–hour rainfall depth. This is because C is a function of infiltration and other hydrologic abstractions, relating the peak discharge to the theoretical peak discharge produced by 100% runoff.

When land use or other factors vary significantly throughout the watershed, an area weighted C value should be used. The weighted C value is computed by the equation:

$$Weighted\ C = \frac{\Sigma\ C_i \bullet A_i}{A} \quad \textbf{(3–21)}$$

where

C_i = C value for one part of the watershed
A_i = area, A, in acres for the corresponding part of the watershed

The designer should select the appropriate **Figure** (**3–11 through 3–16**) depending on the watershed location (desert, upland range, mountain or urban) and the predominant vegetation type (cactus, brush, grasses, juniper, pine). Enter each **Figure** with the design 1–hour rainfall depth. Move vertically up through the **Figure** until the appropriate curve is found, then move horizontally to find the design C value. The appropriate curve is selected based on the Hydrologic Soil Group (HSG) and the percent ground cover of the vegetation.

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Cibola Area, New Mexico, Parts of Cibola, McKinley, and Valencia Counties

September 28, 2016

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (http://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination, write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9410 or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.

Contents

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

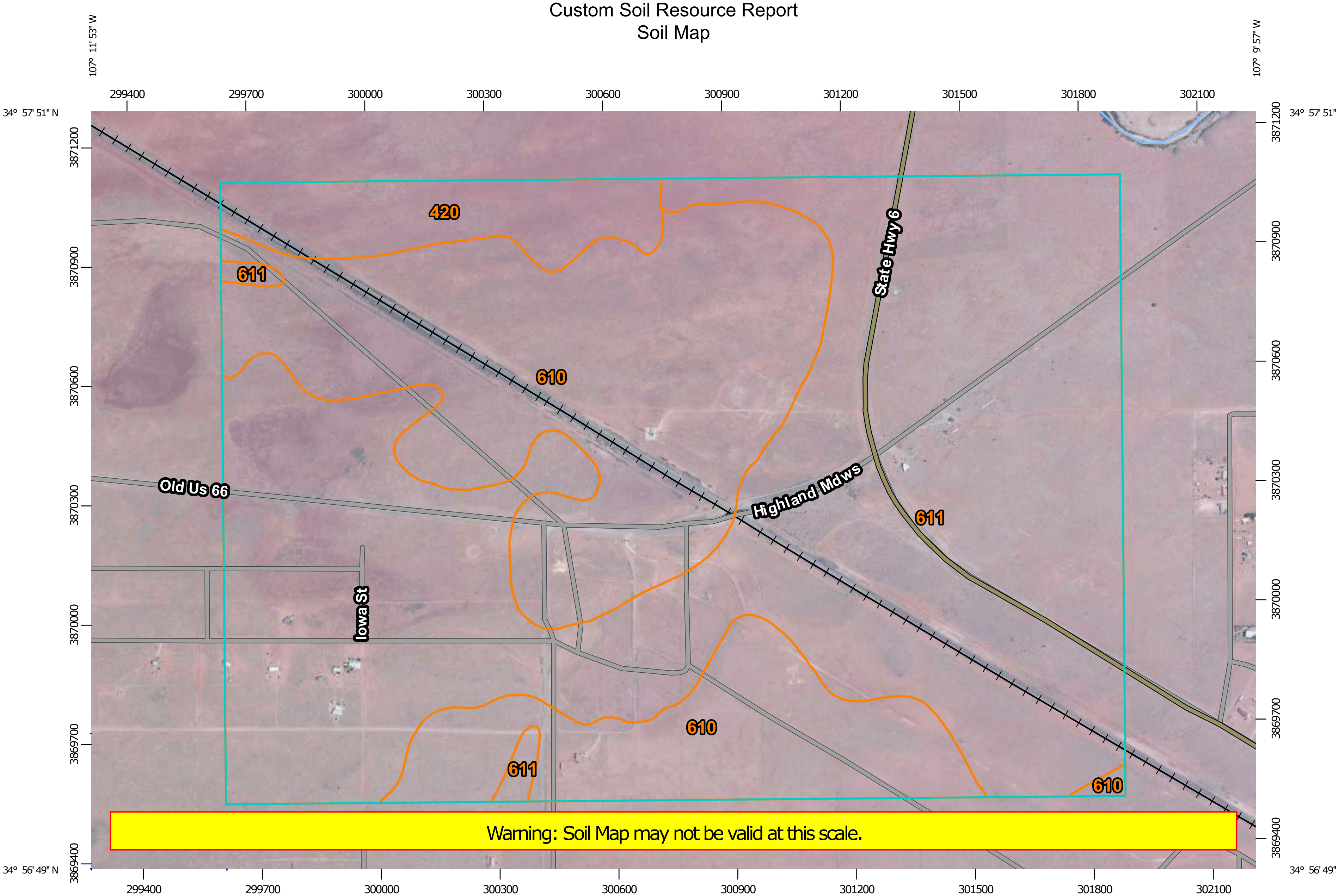
Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

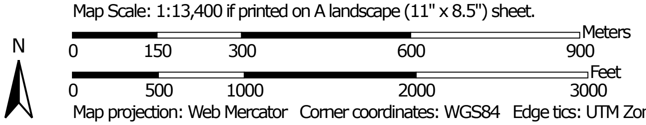
Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Soil Map



Map Scale: 1:13,400 if printed on A landscape (11" x 8.5") sheet.



Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 13N WGS84

MAP LEGEND

Area of Interest (AOI)
Area of Interest (AOI)

Soils
Soil Map Unit Polygons
Soil Map Unit Lines
Soil Map Unit Points

Special Point Features
Blowout
Borrow Pit
Clay Spot
Closed Depression
Gravel Pit
Gravelly Spot
Landfill
Lava Flow
Marsh or swamp
Mine or Quarry
Miscellaneous Water
Perennial Water
Rock Outcrop
Saline Spot
Sandy Spot
Severely Eroded Spot
Sinkhole
Slide or Slip
Sodic Spot
Spoil Area
Stony Spot
Very Stony Spot
Wet Spot
Other
Special Line Features

Water Features
Streams and Canals

Transportation
Rails
Interstate Highways
US Routes
Major Roads
Local Roads

Background
Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Cibola Area, New Mexico, Parts of Cibola, McKinley, and Valencia Counties
Survey Area Data: Version 11, Dec 27, 2013

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jun 11, 2011—Oct 11, 2011

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Cibola Area, New Mexico, Parts of Cibola, McKinley, and Valencia Counties (NM682)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
420	Navajo-Suwanee complex, 1 to 5 percent slopes	47.6	5.4%
610	Grieta-Shiprock association, 1 to 10 percent slopes	318.3	36.2%
611	Grieta-Kiki sandy loams, 3 to 15 percent slopes	514.3	58.4%
Totals for Area of Interest		**880.2**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Cibola Area, New Mexico, Parts of Cibola, McKinley, and Valencia Counties

420—Navajo-Suwanee complex, 1 to 5 percent slopes

Map Unit Setting

National map unit symbol: 1x69
Elevation: 5,400 to 6,100 feet
Mean annual precipitation: 7 to 10 inches
Mean annual air temperature: 51 to 55 degrees F
Frost-free period: 140 to 165 days
Farmland classification: Not prime farmland

Map Unit Composition

Navajo and similar soils: 45 percent
Suwanee and similar soils: 40 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Navajo

Setting

Landform: Alluvial fans, flood plains, drainageways
Landform position (three-dimensional): Rise, talf, dip
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Fan alluvium derived from shale

Typical profile

A - 0 to 4 inches: clay loam
Css - 4 to 60 inches: silty clay

Properties and qualities

Slope: 1 to 5 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Occasional
Frequency of ponding: None
Calcium carbonate, maximum in profile: 7 percent
Salinity, maximum in profile: Slightly saline to moderately saline (4.0 to 8.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 2.0
Available water storage in profile: Moderate (about 7.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: D
Ecological site: Bottomland (R042XA057NM)
Hydric soil rating: No

Description of Suwanee

Setting

Landform: Alluvial fans, flood plains, drainageways
Landform position (three-dimensional): Rise, talf, dip
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Fan alluvium derived from shale and siltstone

Typical profile

A - 0 to 3 inches: silty clay loam
C - 3 to 60 inches: stratified loamy fine sand to silty clay

Properties and qualities

Slope: 1 to 5 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Occasional
Frequency of ponding: None
Calcium carbonate, maximum in profile: 10 percent
Gypsum, maximum in profile: 5 percent
Salinity, maximum in profile: Very slightly saline to slightly saline (2.0 to 4.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 2.0
Available water storage in profile: Moderate (about 8.0 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 6c
Hydrologic Soil Group: B
Ecological site: Bottomland (R042XA057NM)
Hydric soil rating: No

610—Grieta-Shiprock association, 1 to 10 percent slopes

Map Unit Setting

National map unit symbol: 1x7t
Elevation: 5,400 to 6,100 feet
Mean annual precipitation: 7 to 10 inches
Mean annual air temperature: 51 to 55 degrees F
Frost-free period: 140 to 165 days
Farmland classification: Not prime farmland

Map Unit Composition

Grieta and similar soils: 65 percent
Shiprock and similar soils: 20 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Grieta

Setting

Landform: Dunes
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Slope alluvium derived from sandstone and shale

Typical profile

AB - 0 to 8 inches: sandy loam
Bt - 8 to 28 inches: sandy clay loam
Bk - 28 to 60 inches: sandy loam

Properties and qualities

Slope: 1 to 7 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 10 percent
Salinity, maximum in profile: Very slightly saline to slightly saline (2.0 to 4.0 mmhos/cm)
Available water storage in profile: Moderate (about 7.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: B
Ecological site: Loamy (R042XA052NM)
Hydric soil rating: No

Description of Shiprock

Setting

Landform: Dunes
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Slope alluvium derived from sandstone and shale

Typical profile

A - 0 to 3 inches: sandy loam
Btk - 3 to 60 inches: sandy loam

Properties and qualities

Slope: 3 to 10 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: More than 80 inches

Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 10 percent
Salinity, maximum in profile: Nonsaline to slightly saline (0.0 to 4.0 mmhos/cm)
Available water storage in profile: Moderate (about 6.6 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: B
Ecological site: Sandy (R042XA051NM)
Hydric soil rating: No

611—Grieta-Kiki sandy loams, 3 to 15 percent slopes

Map Unit Setting

National map unit symbol: 1x7v
Elevation: 5,400 to 6,100 feet
Mean annual precipitation: 7 to 10 inches
Mean annual air temperature: 51 to 55 degrees F
Frost-free period: 140 to 165 days
Farmland classification: Not prime farmland

Map Unit Composition

Grieta and similar soils: 50 percent
Kiki and similar soils: 35 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Grieta

Setting

Landform: Hills
Landform position (two-dimensional): Backslope, footslope, shoulder, toeslope
Landform position (three-dimensional): Crest, nose slope, side slope, head slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Slope alluvium derived from sandstone and shale

Typical profile

AB - 0 to 3 inches: sandy loam
Btk - 3 to 60 inches: sandy clay loam

Properties and qualities

Slope: 3 to 10 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None

Frequency of ponding: None
Calcium carbonate, maximum in profile: 10 percent
Salinity, maximum in profile: Very slightly saline to slightly saline (2.0 to 4.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 2.0
Available water storage in profile: High (about 9.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: B
Ecological site: Loamy (R042XA052NM)
Hydric soil rating: No

Description of Kiki

Setting

Landform: Ridges, hills
Landform position (two-dimensional): Backslope, footslope, shoulder, toeslope
Landform position (three-dimensional): Side slope, crest, nose slope, head slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Eolian deposits over slope alluvium derived from sandstone and shale

Typical profile

A - 0 to 6 inches: sandy loam
Bt - 6 to 14 inches: sandy clay loam
Bk - 14 to 24 inches: sandy clay loam
2R - 24 to 28 inches: bedrock

Properties and qualities

Slope: 3 to 15 percent
Depth to restrictive feature: 20 to 40 inches to lithic bedrock
Natural drainage class: Well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately high (0.00 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 5 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Low (about 3.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: C
Ecological site: Sandy (R042XA051NM)
Hydric soil rating: No

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Appendix J. Transportation Needs Analysis Report

HISTORIC
WEST
U.S.
66
ROUTE

NMDOT

Transportation Needs Analysis Report

Cibola County Road C084

(Old US 66), 0.25 Mi. West of MP 2.10 on NM 6

New Mexico Department of Transportation

Control/Project No: 6101000

October 2016

HDR

TRANSPORTATION NEEDS ANALYSIS REPORT

CIBOLA COUNTY ROAD C084 (OLD US 66), CN 6101000

PREPARED FOR:

NEW MEXICO DEPARTMENT OF TRANSPORTATION

The technical material and data contained in this document were prepared under the supervision and direction of the undersigned, whose seal as a Professional Engineer, licensed to practice in the State of New Mexico, is affixed below.

Matthew P. Grush
Engineer of Record
License No. 16906

MATTHEW P. GRUSH
NEW MEXICO
16906
LICENSED PROFESSIONAL ENGINEER

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I. INTRODUCTION

There are approximately 64,000 miles of public roads in the state of New Mexico. The New Mexico Department of Transportation (NMDOT) is responsible for approximately 12,000 miles or 19 percent of these roads. The state has invested significant resources to develop and maintain its extensive highway system. Since New Mexico is predominately a rural state, state roads are vital linkages between rural and urban areas. These state roads are relied upon by all types of highway users, from passenger cars and trucks to heavy freight vehicles. NM State Highway 6 (NM 6) and County Road 84 (C084) are examples of this type of road.

The NMDOT is proposing to replace the bridge along C084, Bridge No. 0002, over the railroad tracks. This report documents existing traffic conditions with regard to operations and provides recommendations for proposed improvements based on future traffic volumes, traffic operational analyses and safety issues.

I.A PROJECT PURPOSE

As defined in the detailed scope, this project involves a roadway alignment study in support of replacing Bridge No. 0002 along C084 over the BNSF railroad tracks. For the purposes of this document, the project area will be defined as an area extending approximately 5,280 feet to the west along C084 beginning at the intersection with NM 6. Additionally, a portion of NM 6,300 feet each side of C084, will be part of the study. The purpose of this Transportation Needs Analysis is to identify existing facility conditions, report the findings of traffic operational analyses for existing and future vehicle volumes, and perform a crash analysis to identify possible improvements. This study serves as an appendix to the Phase I-A/B study reports as required by the NMDOT *Location Study Procedures*. The *Location Study Procedures* outlines the project development process used by the NMDOT to comply with Federal Highway Administration (FHWA) requirements for federally funded projects.

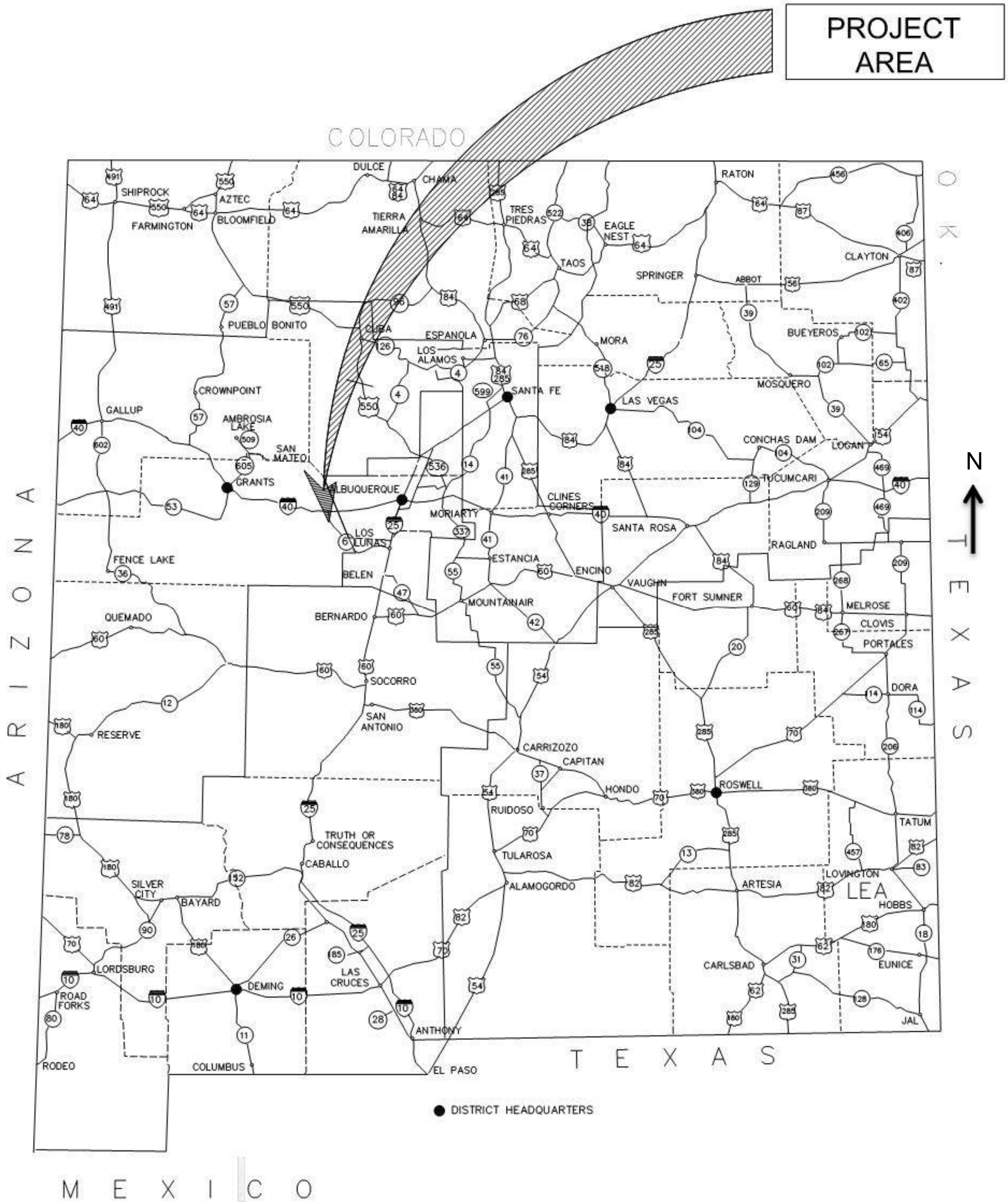


Figure I.A.1 Location Map

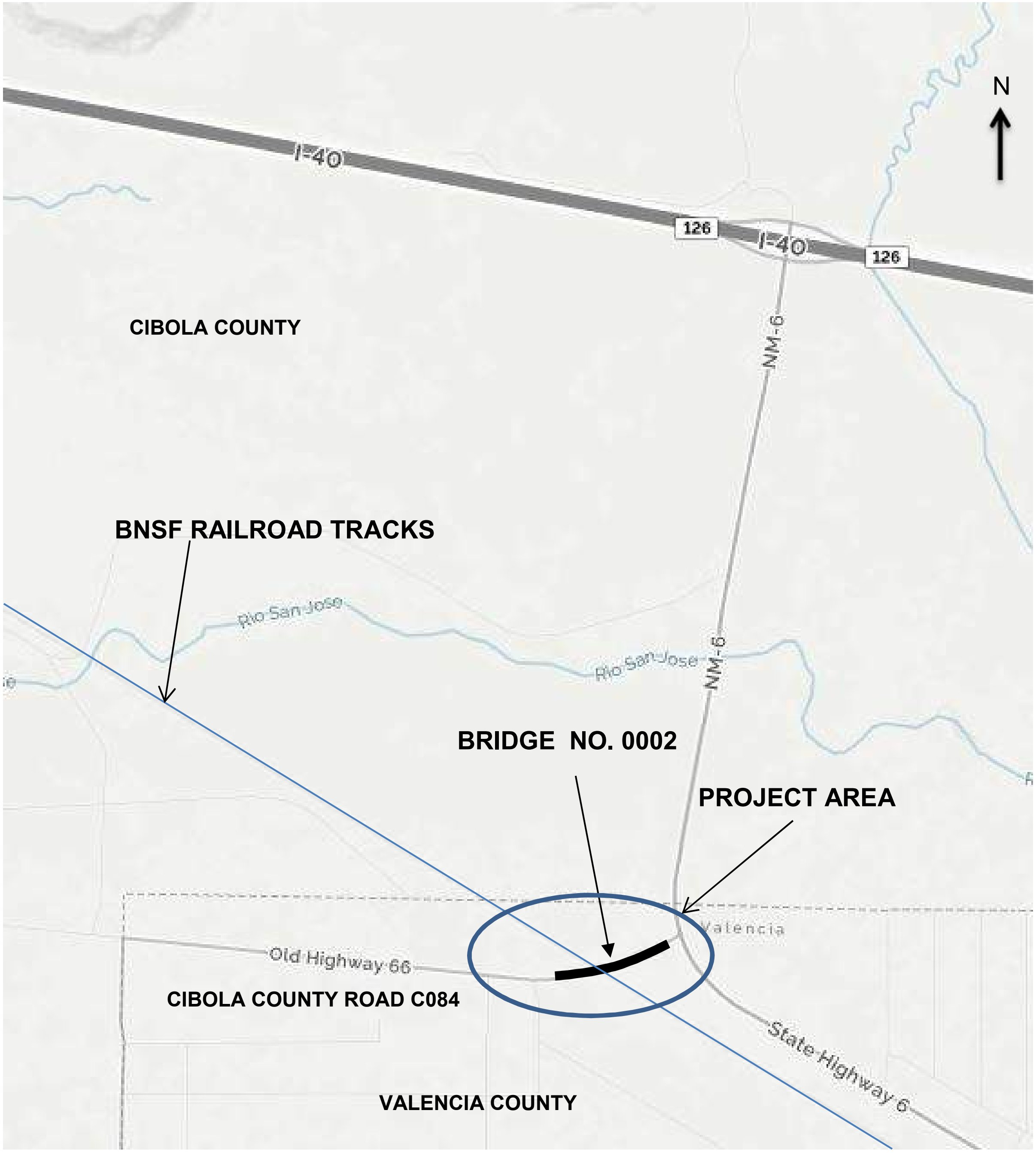


Figure I.A.2 Vicinity Map

II. PROJECT DESCRIPTION

The segment of concern for this study is in the far northwest portion of Valencia County bordered by Cibola County to the north and west. It is a 2-lane undivided highway that runs from NM 6 to the I-40 grade separated crossing near milepost 119.5 of I-40. Cibola County Road 084 is a 2-lane highway where Bridge No. 0002 crosses the BNSF railroad tracks and connects NM 6 to the residential development of Highland Meadows continuing west to the I-40 interchange at Mesita. NM 6 is a 2-lane state highway connecting I-40 and I-25 to the west of Albuquerque and is frequently used by heavy commercial vehicles to bypass Albuquerque. Refer to Figures I.A.1 and I.A.2 for Location and General Vicinity Maps of the project.

This transportation needs analysis study provides a detailed traffic analysis that includes a review of historic crash data, and addresses capacity improvements for existing, (2016) and horizon year (2037) conditions to improve capacity and promote safety.

II.A INVENTORY OF EXISTING CONDITIONS

The roadway on C084 cross-section has two 11-feet wide driving lanes with shoulders. The pavement on C084, approximately 1/2 mile west of NM 6, is asphalt. The pavement of remaining section on C084 has deteriorated to a partially unpaved gravel roadway due to age and lack of maintenance. There are no speed limits posted on CO84. There is a cattle guard near the intersection on NM 6. Approximately 1/4 mile west of NM 6 is Bridge #2 where C084 crosses over the BNSF railroad tracks. The functional classification using the criteria presented in the American Association of State Highway Transportation Officials (AASHTO) green book chapter 1 “Highway Functions” it was determined that C084 is a Rural Minor Collector.

NM 6 is a 2-lane state highway connecting I-40 and I-25 to the west of Albuquerque and is frequently used by heavy commercial vehicles to bypass Albuquerque. The cross-section of NM 6 is a 2-lane undivided highway having 11-foot driving lanes and one foot wide shoulders. Based on the NMDOT “Functional Classified System” map the functional classification for NM 6 is a Rural Major Collector. The posted speed limit on NM 6 is 55 MPH. The cross-section of NM 6 is in superelevation due to the horizontal curve at the intersection with C084.

NM 6 and C084 are Class I highway facilities. As stated in the 2010 Highway Capacity Manual (HCM) Class I highways are two-lane highways on which motorists expect to travel at relatively high speeds. Class I two-lane highways are major intercity routes, primary arterials connecting major traffic generators, daily commuter routes, or primary links in state or national highway networks.

II.A.1 TYPICAL SECTION

The existing typical section for C084 has two different crossections, one for the bridge and the other for the roadway. The roadway on either side of the bridge has a crossection of two (2) driving lanes, each 11 feet wide, and 4.5 feet wide shoulders along both side of the road. The roadway has a double solid centerline and shoulder edge lines. The existing roadway crossection meets the requirements for collector roads referring to AASHTO Table 6-5, “Minimum Width of Traveled Way and Shoulders” for Collector Roads. The roadway crossection is shown in Figure II.A.1.

The existing crossection of NM 6 is a 2-lane undivided highway having 11-foot driving lanes and one foot wide shoulders. This crossection does not meet the requirements for collector roads referring to AASHTO Table 7-3, “Minimum Width of Traveled Way and Usable Shoulders for Rural Arterial”.

The existing bridge No. 0002 crossection has two (2) 11’-6” driving lanes and a total deck width of 24’-0”. There are bridge railings type “D” on each side of the bridge that connect to metal W-beam guardrails. The guardrails extend to the bottom of the embankments on the bridge approaches. The existing bridge crossection is shown in 1.B.6.

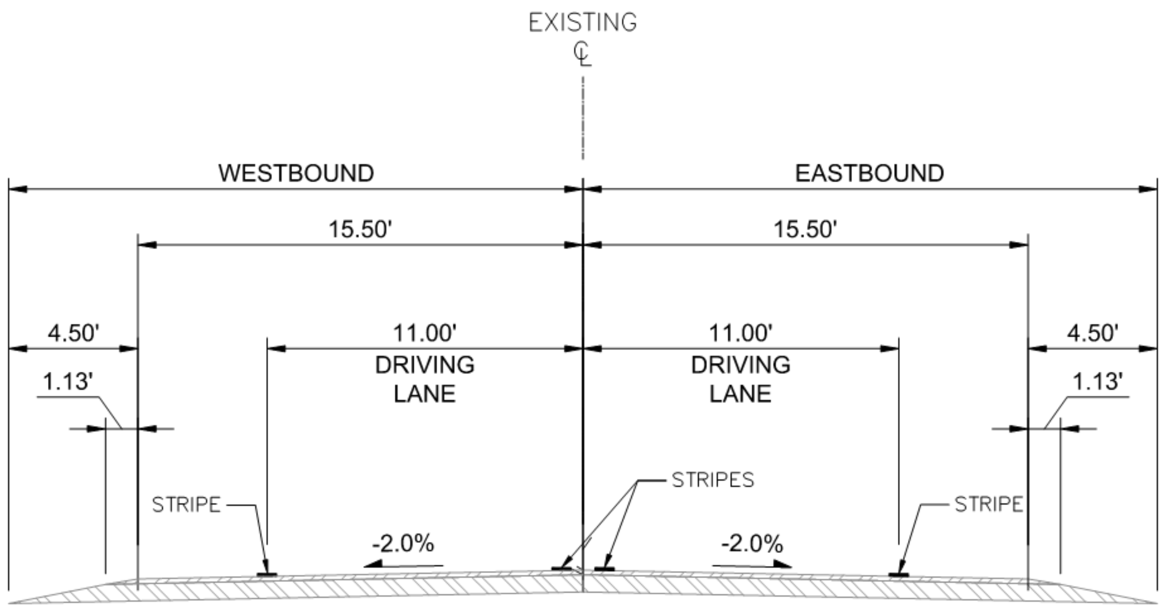


Figure II.A.1 Existing Cross Section of C084

II.A.2 HORIZONTAL ALIGNMENT

There are two horizontal curves on C084, one on each side of the bridge. The radius of the horizontal curve east of the bridge is 3,048 feet and the curve west of the bridge is 1,800 feet. There is no obstruction to the horizontal sight line outside of the roadway. A horizontal sightline obstruction is caused by grade separated crossing embankment and bridge. The vertical curve over the railroad track has more influence on stopping sight distance than the horizontal curves of these sizes and will be the limiting factor for Stopping Sight Distance (SSD).

II.A.3 VERTICAL ALIGNMENT

The vertical alignment has four vertical curves, three are sage vertical curves and one is a crest vertical curve. The "K" value for the sag vertical curves is between 46 and 100 and provides for a stopping sight distance speeds of 30 MPH to 50 MPH. The one crest vertical curve occurs where the embankment and bridge pass over the railroad tracks. The "K" value for this crest vertical is 98 allowing for a SSD speed of 50 MPH but is deficient for a the required passing sight distance. The sight distance for this crest vertical curve is 523 feet. From exhibit 3-73 in the AASHTO green book the minimum passing sight distance for a design speed of 20 MPH is 710 feet (K=180). The passing sight distance is inadequate. The roadway is striped with a double solid centerline prohibiting passing within this vertical curve.

II.A.4 DESIGN SPEED

The design speed for the existing condition is shown in the record drawings as 35 MPH. The geometry for existing conditions meets the criteria for this design speed when the section thorough the crest vertical curve is marked as a no-passing zone.

II.A.4 OTHER ELEMENTS

Towards the west end of the project limits on C084 there are two access points, Archway Blvd. and Highland Blvd. These two local streets provide access to the residents to the south of C084. Highland Blvd. is at the west termini of project and Archway Blvd. is approximately 660 feet east of Highland Blvd. The spacing of the two access points meets the SAMM requirements for Rural Collector Highways, Chapter 4 Section J.

The clear zone for the roadway is dependent on the ADT, design speed and foreslope/backslope condition. The existing foreslope of the bridge embankment is approximately 2:1 (H:V). Using the design speed of 35 MPH and the current ADT of 467 vehicles per day the recommended clear zone, AASHTO "Roadside Design Guide", Table 3.1 where the embankment exist is recommended to be shielded due to the steep (>3:1) foreslope. In areas beyond the embankment for the overpass the foreslopes is 6:1 or flatter the recommended clear zone width is 7 to 10 feet.

Figure II.A.2 Westbound C084 Approaching Bridge #2

Figure II.A.3 Eastbound C084 near Highland Boulevard, Bridge #2 in Background

Figure II.A.4 C084 Facing East Approximately 100 feet west of NM 6

Figure II.A.5 NM 6 Facing North, South of C084

Figure II.A.6 NM 6 Facing South at C084

II.A.5 BRIDGE STRUCTURE

Bridge No.0002 was originally constructed in 1934 and reconstructed in 1995. The structure has nine simple spans with a treated timber deck. Eight of the nine spans are treated timber girders (length = 21 ft. & 19 ft.) with the span over the railway being a rolled steel girder span (length = 52.74 ft.). The vertical clearance above the railway to the rolled steel girders is approximately 20'-10".

The bridge has two (2) 11'-6" driving lanes and a total deck width of 24'-0". The deck is overlaid with and asphalt pavement.

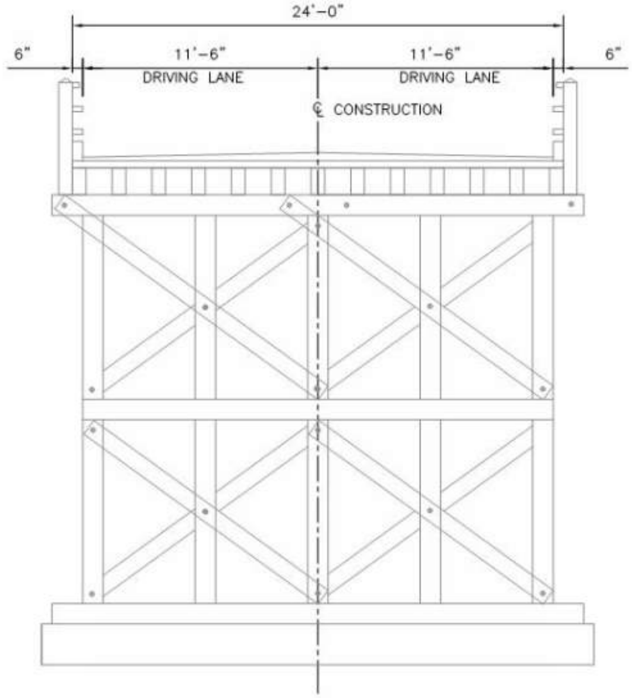


Figure II.A.7 Existing Bridge Typical Section

The steel girder span over the railway is supported with concrete pier walls and cap. The timber girders are supported with timber pier and abutments. The timber girders have been reinforced with steel plates, straps and cradles.

The concrete pier walls are supported on a shallow spread footing foundation. There is approximately 10'-2" horizontal clearance between the pier wall and the center of the adjacent track. The timber pier columns and abutments are also founded on shallow concrete footings. The abutment slopes spill-through and are covered with rock riprap.

Figure II.A.8 Bridge Elevation View

Figure II.A.9 Bridge Typical Section

The latest inspection reports evaluate the condition of the structures as satisfactory. The structure has been posted for heavy loads.

The top of the timber deck is covered and is unobservable due to the asphalt overlay. The concrete patches cover a steel plate which anchors straps and cradles used to repair the girders. The underside of the deck has some areas of decay and some minor weathering and water staining.

Figure II.A.10 Girders with Straps and Cradles

The steel girders over the railway are in good condition. The timber girders have been repaired. The girders have been reinforced with steel plates, straps and cradles. The timber girders do show signs of crushing, diagonal splitting, checks and weathering. The bridge is posted with a weight limit and the latest inspection report says the Inventory Rating is HS12.1 and the Operating Rating is HS 17.2.

The pier timber columns have heavy checks and splits with moderate weathering and water stains, areas of surface rot and discoloration. The capacity of the foundation members is unknown and an analysis has not been completed on the foundation elements as part of this report.

The bridge structure has several geometric deficiencies per today's standards. Those deficiencies are:

1. The deck width (24'-0") does not meet current standards as specified in the NMDOT Bridge Procedures and Design Guide, which calls for no bridge on a rural highway to be designed with a shoulder less than 4 feet wide.
2. The vertical clearance (20'-8") does not meet current standards as specified in the BNSF Guidelines for Railroad Grade Separation Projects, which calls for a minimum vertical clearance of 23'-4".
3. The horizontal clearance (10'-2") between the existing track and the pier walls, also does no meet the current standards as specified in the BNSF Guidelines for Railroad Grade Separation Projects, which calls for a minimum horizontal clearance of 25'-0".

III. TRAFFIC ANALYSIS

The primary purpose of performing a traffic analysis is to determine the operating characteristics of an identified transportation facility for existing and future conditions and to identify any deficient results. If any deficiencies are identified, recommendations to geometrics and/or traffic control devices of that facility are made to improve performance. The two primary elements of a transportation facility that are analyzed are highway segments and intersections.

III.A TRAFFIC DATA

Prior to analyzing any facility, traffic data in the form of traffic volume counts must be obtained. Typically there are two forms of data collected: Average Daily Traffic (ADT) in vehicles per day (VPD) and 9-hour or 12-hour volume counts in vehicles per hour (VPH). ADT counts are usually collected for a period of 48-hours during weekdays along roadway segments using tube counters or other approved electronic counting devices. The 48-hour counts are then averaged to obtain a 24-hour (ADT) count. The Annual Average Daily traffic (AADT) is the average daily traffic volume counted for the entire year divided by the number of day in the year.

For this project, historic AADT data for NM 6 was requested from NMDOT, and was provided for the segment of NM 6 between MP 1 to MP 3. As per the NMDOT records, the 2015 AADT for NM 6 is 1256 vehicles per day and the 2017 AADT is 1287, with horizon year 2037 projections expected to reach 1606 vehicles per day. The average percent of heavy commercial traffic through this section is 19.00% in the year of 2015. Refer to Appendix A – Traffic Data.

The volume of railroad traffic was reported by BNSF as being 50 to 80 trains per day passing under Bridge No. 0002.

The ADT traffic data for C084 was collected by Mike Henderson Consulting, LLC, on May 11th and 12th, 2016. The eastbound ADT is 214 vehicles per day and the westbound ADT is 253 vehicles per day resulting in an ADT of 467 vehicles per day for both directions. The traffic collection information has been reviewed, at HDR's request, by Mike Henderson to determine if a problem occurred while counting the vehicles and if a typical traffic was observed. He reported that the equipment was functioning correctly and no unexpected traffic was present. The average percent of heavy commercial traffic through this section was requested from NMDOT, which is 10.00% in the year of 2014, see Table III.A.1. Refer to Appendix A – Traffic Data.

		AADT	ADT	% Heavy Vehicle
NM 6		1273	-	19%
C084	Eastbound	-	214	10%
	Westbound	-	253	10%

Table III.A.1 Traffic Volume (Current Year 2016)

The turning movements at the intersection of C084 and NM 6 were collected by Mike Henderson Consulting, LLC, as well. The AM, Mid-day and PM peak hour traffic volumes are shown in Figure III.A.1.

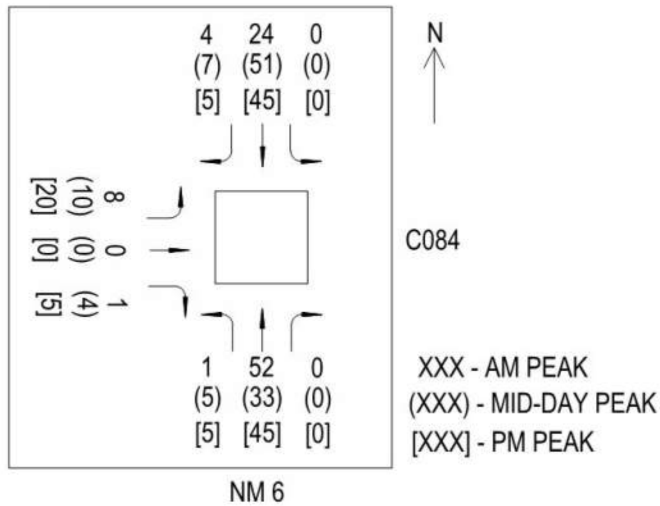


Figure III.A.1 Current Turning Movements at the Intersection of C084 and NM 6

III.B GROWTH PROJECTION

The existing traffic data and the growth factor calculation used are shown below and in Appendix A – Traffic Data. Current traffic volume AADT information was received from the NMDOT as well as future traffic volume estimates. This information was used to determine the traffic growth factors. The 2016 AADT was calculated using the growth factor 1.11%, which was calculated based on 2017 and 2037 AADTs obtained from NMDOT.

The traffic growth factor then was used to determine future traffic volumes based on the traffic volumes counted by Henderson in May of 2016. There is a discrepancy between the traffic volumes reported by the NMDOT and what was counted in May 2016. The NMDOT was asked when was the traffic on C084 last counted they reported it isn’t know when it was last counted. The 2016 volumes serve as the current, existing daily traffic volumes. Table III.A.2 shows the AADT Volumes for the year 2017 and 2037 for NM 6 and C084 requested from NMDOT. The annual growth factors were calculated based these two years traffic, which are 1.11% for NM 6 and 0.154% for C084.

	2017 AADT	2037 AADT	Growth Factor
NM 6	1287	1606	1.11%
C084	96	99	0.154%

Table III.B.1 Growth Factor Calculation

Table III.B.2 shows the existing 2016 and projected year 2037 AADT for NM 6 and the ADT for C084. The future ADT for C084 was calculated using the traffic growth factor and is based on the existing ADT's collected by Mike Henderson Consulting, LLC, on May 11th and 12th, 2016.

		Annual Growth Factor	2016 AADT	2016 ADT	2037 AADT	2037 ADT	% Heavy Vehicle
NM 6		1.11%	1273	-	1606	-	18.01%
C084	Eastbound	0.154%	-	214	-	221	12.87%
	Westbound	0.154%	-	253	-	261	12.87%

Table III.B.2 Projected Traffic Volume (Future Year 2037)

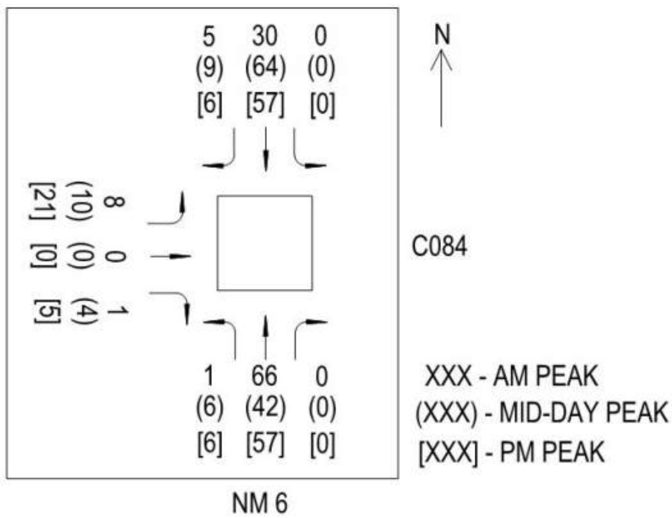


Figure III.B.1 Future Year 2037 Turning Movements at the Intersection of C084 and NM 6

III.C TRAFFIC OPERATIONAL ANALYSIS

As traffic volumes along roadway segments continue to increase over time, the average flow rate of the vehicles tends to also increase causing the mean speed of passenger cars to decrease. This ultimately causes delay and "congestion" along highways.

Class I, two-lane highways have one lane per each direction of travel. A motorist can only pass another vehicle by using the opposing lane. When there are sufficient gaps in the oncoming traffic and sight distance is appropriate, drivers can safely pass slower moving vehicles and achieve efficient mobility. When the sight distance is limited and the traffic in the opposing direction increases, the passing ability of the motorist becomes restricted. Vehicles then trail one another which tend to cause delay and results in poor operation of the roadway. Therefore, on these highways, Level of Service is defined in both average travel speed (ATS) and percent-time-spent-following (PTSF).

ATS reflects the mobility on a two-lane highway. ATS is defined as the highway segment length divided by the average travel time taken by vehicles to pass through it during a designated time.

PTSF is the average percentage of time that vehicles must travel in platoons behind slower vehicles due to the inability to pass on a two-lane highway. It represents the freedom to maneuver and the comfort and convenience of travel.

III.C.1 OPERATIONAL ANALYSIS DEFINITION

The operational performance of a two-lane highway is based on Level of Service (LOS) criteria. LOS is a term used to qualitatively describe roadway and intersection traffic operations. LOS is expressed in letter grade format from A to F, with LOS A representing the best operating conditions and LOS F representing the worst. Per the NMDOT *State Access Management Manual (SAMM)*, LOS B for rural collectors and LOS C for urban collectors are acceptable measures. In either case, a LOS F shall not be accepted for any individual movements. A general description of level of service is as follows:

LOS A: Motorists experience high operating speeds and little difficulty passing. Travel time is as efficient as the highway can provide. Individual users virtually travel unaffected by the presence of others in the traffic stream.

LOS B: Passing demand and passing capacity are balanced. Travel time remains efficient. Motorists have a high degree of freedom to select speed and operating conditions, but are slightly influenced by other road users.

LOS C: The efficiency of travel is reduced, but delays are well within reasonable limits. Traffic flow is becoming more restricted as individual users interact substantially with other road users. Most vehicles are traveling in platoons.

LOS D: Travel time continues to increase, and motorist delay approaches but still within reasonable limits. Platooning increases significantly, passing demand is high but passing capacity approaches zero. Percent Time Spent Following is noticeable.

LOS E: Travel time is substantially affected. Speeds are seriously reduced. Delays have reached and may exceed reasonable limits. The capacity of the facility is fully utilized. Passing is virtually impossible and Percent Time Spent Following is more than 80%.

LOS F: Travel along the highway is very inefficient. There is a forced breakdown in traffic flow. The amount of traffic approaching the highway segment exceeds the amount that can be served. Operating conditions are unstable and heavy congestion exists. The roadway facility fails.

LOS	Average Travel Speed (mi/hr)	Percent Time Spent Following (%)
A	>55	≤35
B	>50 - 55	>35 - 50
C	>45 - 50	>50 – 65
D	>40 - 45	>65 – 80
E	≤40	>80

Table III.C.1 LOS for Two-Lane Highway Class I

III.C.2 STUDY METHODOLOGY

In order to efficiently analyze the operational elements previously described, the use of various traffic analysis computer software packages is required. These software programs are all developed using the HCM accepted methodologies. Standard commercial software program such as the *Highway Capacity Software* (HCS) by *McTrans* is used for a variety of analyses.

The HCS is used to analyze freeway, multi-lane and two-lane segments, freeway ramp merge/diverge areas, lane weaving, and signalized and un-signalized intersections. For this study, HCS 2010 was used to provide the analysis.

III.D EXISTING CONDITION OPERATIONAL ANALYSIS

III.D.1 ROADWAY OPERATIONS

The 2016 current condition has been analyzed for this study. The results of the capacity analyses are summarized in Table III.D.2. All HCS two-lane segment capacity analysis runs have been provided in Appendix B – Existing Capacity Analysis. The minimum acceptable LOS for a two-lane rural collector highway, according to the NMDOT *State Access Management Manual* (SAMM), is LOS B as shown in 15.C-1 of the SAMM. Currently, NM 6 and C084 operate at a LOS B. Additionally, the Volume to Capacity Ratio (v/c) is being reported to provide an indication of the traffic density.

	Peak Hour Factor	Truck	RV	Posted Speed	Design Speed	Lane Segment	Number of lanes	Lane Width	Shoulder Width
	(PHF)	(%)	(%)	(mph)	(mph)	(mi)		(ft)	(ft)
NM 6	0.88	19	0	55	60	1	2	11	2
C084	0.88	10	0	-	35	1	2	10	1
	No Passing								
NM 6		NB: No Passing starts from 1700 feet south of the intersection and continues all way no passing SB: No passing starts from 550 north of intersection and continues 700 feet south of the intersection							
C084		No Passing							

Table III.D.1 Existing Roadway Characteristics (Year 2016)

	Level of Service	v/c	Average Travel Speed, MPH
NM 6	B	0.04	52.5
C084	B	0.02	51.6

Table III.D.2 Level of Service Summary (Year 2016)

III.D.2 UNSIGNALIZED INTERSECTION OPERATIONS

The intersection on NM 6 and C084 is stop controlled on the eastbound approach of C084. This unsignalized intersection has been analyzed using HCS 2010. The LOS for the eastbound approach is A, which is summarized in Table III.D.3.

	Eastbound	Northbound	Southbound
AM	A	A	A
MID-DAY	A	A	A
PM	A	A	A

Table III.D.3 Unsignalized Intersection Approach LOS (Year 2016)

III.E 2037 NO-BUILD CONDITION OPERATIONAL ANALYSIS

With every transportation analysis, comparisons between existing and projected volumes for the horizon year utilizing the existing geometric conditions need to be made. This evaluation is considered as the "No-Build" alternative. The No-Build scenario assumes no transportation improvements are made, but traffic volumes continue to increase (using an established annual growth factor) to the horizon year conditions. The resulting operational analyses may predict future deficiencies in lane capacity to roadway and ramp segments and operational capacity and delay to existing intersections. In some cases there may be no deficiencies observed with the No-Build alternative.

III.E.1 2037 NO-BUILD ROADWAY OPERATIONS

As with the existing conditions analysis, the Roadway Level of Service for the No-Build condition was determined using the methods and procedures presented in the *2010 Highway Capacity Manual* and modeled using 2010 Highway Capacity Software. The projected 2037 traffic volumes for the existing NM 6 segment and C084 segment were analyzed for the No-Build condition. The results of the highway segment analyses are summarized in Table III.E.1. All HCS two-lane segment capacity analyses output runs have been provided in Appendix C – No-Build Analysis.

	Level of Service (LOS)	v/c	Average Travel Speed, MPH
NM 6	B	0.05	52.1
C084	B	0.02	51.6

Table III.E.1 Level of Service Summary (Year 2037 No-Build)

III.E.2 2037 NO-BUILD UNSIGNALIZED INTERSECTION OPERATIONS

The eastbound approach on C084 is stop controlled. An unsignalized intersection analysis was done using the future year traffic volumes in the existing intersection configuration. The results of the operation analysis are shown in Table III.E.2, which LOS is A in the projected future year 2037. The year 2037 build condition will have the same LOS as the no build condition because there are no changes to the intersection configuration proposed.

	Eastbound	Northbound	Southbound
AM	A	A	A
MID-DAY	A	A	A
PM	A	A	A

Table III.E.2 Unsignalized Intersection Approach LOS (Year 2037 No-Build)

III.E.3 2037 NO-BUILD CONDITION TRAFFIC IMPACTS

The minimum acceptable LOS for a two-lane rural collector highway, according to the NMDOT *State Access Management Manual* (SAMM), is LOS B as shown in 15.C-1 of the SAMM. The roadway is anticipated to operate at below the acceptable LOS under 2037 horizon year conditions.

III.F 2037 HORIZON YEAR CONDITION OPERATIONAL ANALYSIS

The horizon or 2037 year analysis utilizes the projected 2037 peak hour volumes and proposed geometric improvements to determine the potential operational condition. The potential operational outcome for the horizon year should reflect improved conditions versus the existing and No-Build scenarios. The proposed geometric improvements are based on the recommendations shown in Table 7-3 “Minimum Width of Traveled Way and Usable Shoulder of Rural Arterials” in the AASHTO “Green Book”. The roadway cross-section of C084 should include usable shoulders that are 6 feet wide and a minimum traveled way width of and 22 feet.

III.F.1 ROADWAY OPERATIONS

As with the existing conditions analysis, the Roadway Level of Service for the 2037 horizon year was determined using the methods and procedures presented in the *2010 Highway Capacity Manual* and modeled using 2010 Highway Capacity Software. The results of the 2037 Build analyses are summarized for convenience in Table III.F.1. All HCS two-lane segment capacity analyses output runs have been provided in Appendix D – 2037 Build Analysis.

	Level of Service	v/c	Average Travel Speed, MPH
NM 6	*	*	*
C084	A	0.02	56.7

Table III.F.1 Level of Service Summary (Year 2037 Build),
* No roadway geometric changes proposed on NM 6

III.F.2 2037 BUILD CONDITION TRAFFIC IMPACTS

The minimum acceptable LOS for a two-lane rural collector highway, according to the NMDOT *State Access Management Manual* (SAMM), is LOS B as shown in 15.C-1 of the SAMM. The analysis results of the year 2037 No-Build and Build are very similar. The roadway is anticipated to operate at below the acceptable LOS under 2037 horizon year conditions.

The Highway LOS for NM 6 and C084 meets the minimum acceptable LOS for two-lane rural collector highways. The no-passing zone on NM 6 should not be changed due to the proximity of intersection of C084. A no-passing zone on C084 should be marked if the vertical curve of the overpass does not provide for the required 600 feet of sight distance need for safe passing as well as for the eastbound the approach to the NM 6 intersection.

IV. ACCESS MANAGEMENT ANALYSIS

IV.A ACCESS CATEGORY COMPLIANCE REQUIREMENTS

The NMDOT SAMM identifies the following: The level of access that is allowed along a state highway is dependent on the intended function of that highway. The function of a particular highway is defined in terms of service to through traffic movements (mobility) versus access to abutting properties (land accessibility). The NMDOT has developed a classification system that is based on the intended function of each state highway. Based on this functional classification system, eight access categories are defined for the purpose of managing access along New Mexico's highways.

There are four rural access categories. The access categories apply to highways functionally classified as collector roadways or above.

IV.B RURAL COLLECTOR HIGHWAYS ACCESS CATEGORY REQUIREMENTS

The following is the applicable access category requirements for rural collector highways (RCOL) from the NMDOT State *Access Management Manual:*

> ***(1) Functional Description****: Rural collector routes generally serve travel of primarily intra-county rather than statewide importance, and constitute those routes on which predominant travel distances are shorter than on arterial routes. More moderate travel speeds are typical of collector routes. The rural collector system fulfills intra-county travel needs that are not served by the arterial street system.*

> ***(2) General Access Characteristics:*** *Rural collector highways balance the need to provide traffic movement with the need to provide property access. A higher level of property access is allowed on the collector highway system than is allowed on the principal and minor arterial street systems.*

***(3) Performance**: The operational performance of RCOL highway segments should meet LOS B standards while LOS C standards are acceptable for signalized and unsignalized intersections on RCOL facilities, at a minimum. See Sub-Section 15.C, Table 15.C-1.*

***(4) Traffic Signal Spacing**: The minimum spacing of signalized intersection varies by posted speed limit and is 1/4 mile for 30 mph or less, 1/3 mile for 35 to 40 mph, and 1/2 mile for speeds of 45 mph or more. Progression bandwidths for through traffic movement are 30-45 percent for two-way travel depending on the posted speed. See Sub-Section 15.F, Table 15.F-1.*

***(5) Spacing of Unsignalized Access – Full Access**: The minimum spacing of full-access unsignalized intersections on RCOL highways varies by posted speed and is 330 feet at 30 mph or less, is 660 feet for 35 to 40 mph, and is 1320 feet on RCOL highways with posted speeds equal to or greater than 45 mph. On highways with non-traversable medians, this represents the allowable spacing between median openings. See Sub-Section 18.C, Table 18.C-1, and Sub-Section 18.D.*

***(6) Spacing of Unsignalized Access – Partial Access**: The minimum spacing of unsignalized access points and driveways where some turn movements may be restricted, depending on the type of median control, varies by posted speed limit as follows (see Sub-Section 18.C, Table 18.C-1):*

- ≤ 30 mph: 200 feet
- 35 to 40 mph: 300 feet
- 45 to 55 mph: 425 feet
- 55 mph: 550 feet

***(7) Corner Clearance**: When property is adjacent to an intersection, proposed access points on the approach or departure sides of the intersection should be controlled. Corner clearances should be consistent with the access spacing standards defined in Table 18.C-1.*

***(8) Left-turn and Right-turn Acceleration Lanes**: The need for left-turn and right-turn acceleration lanes is based on safety conditions associated with site specific conditions. The Department may require acceleration lanes wherever safety concerns occur at a proposed access.*

***(9) Left-turn Deceleration Lanes:** Left-turn deceleration lane requirements vary by posted speed and are based on the traffic volume on the highway and the number of left-turns expected at an access (see Sub-Section 17.B, Table 17.B-3 and Table 17.B-4). Left-turn deceleration lanes are required, regardless of the traffic volume on the highway, when the following left-turning volumes are expected:*

Posted Speed	*Two-lane Highway*	*Multi-lane Highway*
≤ 30 mph	26 left-turns per hour	36 left-turns per hour
35 to 40 mph	21 left-turns per hour	26 left-turns per hour
45 to 55 mph	16 left-turns per hour	21 left-turns per hour
> 55 mph	11 left-turns per hour	16 left-turns per hour

(10) Right-turn Deceleration Lanes: *Right-turn deceleration lane requirements vary by posted speed and are based on the traffic volume on the highway and the number of right-turns expected at an access (see Sub-Section 17.B, Table 17.B-5 and Table 17.B-6). Right-turn deceleration lanes are required, regardless of the traffic volume on the highway, when the following right-turning volumes are expected:*

Posted Speed	***Two-lane Highway***	***Multi-lane Highway***
≤ 30 mph	31 right-turns per hour	36 right-turns per hour
35 to 40 mph	31 right-turns per hour	36 right-turns per hour
45 to 55 mph	26 right-turns per hour	31 right-turns per hour
> 55 mph	21 right-turns per hour	21 right-turns per hour

(11) Other References to Sections of the Manual

- Definitions of Terms: Section 7
- Access Categories: Section 10
- Permitting Process: Section 14
- Traffic Study Requirements: Section 16
- Design Specifications: Section 18

Table 18.C-1

Access Spacing Standards for Intersections and Driveways (centerline to centerline spacing in feet)

Access Category	Posted Speed (mph)	Intersection Spacing (feet)		Driveway Spacing (feet)		
				Non-Traversable Median		Traversable Median
		Signalized	Unsignalized	Full Access	Partial Access	
RAM	≤ 30 mph	1,760	660	660	200	200
	35 to 40 mph	2,640	660	660	325	325
	45 to 50 mph	2,640	1320	1320	450	450
	≥55 mph	5,280	2640	2640	725	725

Table IV.B.1 Access Spacing Standards for Intersections and Driveways

Notes: 1. Intersection - Public street or other access serving a large area or a major traffic generator(s) where full access is typically provided.
2. Driveway - Public or private access serving a limited area where traffic signal control is not required.
3. In urban areas, spacing should be consistent with the established street spacing along the state highway facility.
4. Includes highways with no median or a painted median. The type of access, full or partial, is determined at the discretion of the Department. See Sub-Sections 7.AO and 7.BP.

IV.C ACCESS CONTROL ANALYSIS

The need for deceleration lanes for left turning and right turning vehicles was analyzed using the requirement in the SAMM criteria. Based on the current and future turning vehicle peak hour traffic volumes, deceleration lanes are not warranted for left and right turning vehicles.

Towards the west end of the project limits on C084 there are two access points, Archway Blvd. and Highland Blvd. These two local streets provide access to the residents to the south of C084. Highland Blvd. is at the west termini of project and Archway Blvd. is approximately 660 feet east of Highland Blvd. The spacing of the two access points meets the SAMM requirements for Rural Collector Highways, Chapter 4 Section J.

As part of this project, it is not anticipated that new intersections or other access points will be provided within the project limits.

V. CRASH ANALYSIS

V.A CRASH ANALYSIS REQUIREMENTS AND DESCRIPTION

The purpose of collecting and analyzing historic traffic crash data for a specific location is to identify possible crash patterns and to determine the probable causes of those crashes. Typically, when available, crash data is requested for a three year period. This allows for a comprehensive review of crash data for the facility. The crash analysis includes patterns related to roadway conditions; time of day; weather conditions; type of crash; locations, i.e., roadway, intersection, etc.; crash severity; and driver characteristics.

Utilizing crash data also assists with determining expected values of a specific type of crash and ultimately identifying benefit costs and estimated Rate of Return (ROR) for improving roadway segments or intersection locations within the study boundary. These "estimated" ROR values should not be construed as "True" values, but more as approximated for planning purposes.

V.B CRASH DATA

Crash data for 2012, 2013 and 2014 was obtained from the NMDOT Traffic Safety Bureau. There have only been two crashes reported on NM 6 within the project study area since 2012. The crash reports can be found in Appendix E – Crash Analysis.

Crash	Date	Time	Location	Crash Severity	Highest Contributing Factor in Crash	Lighting	Visible Injury	Crash Analysis
No.1	6/22/2012	8:39 PM	600 feet north of the NM6/C084 intersection, on NM 6	Property Damage Only Crash	Driver Inattention	Dark-Not Lighted	0	Non-Collision - All Other/Not Stated
No.2	4/21/2012	7:30 PM	At the intersection of NM 6/C084	Injury Crash	Alcohol/Drug Involved	Dusk	2	Overturn/Rollover - On The Road

Table V.C.1 Crash Reported from Year 2012 to 2014

The first crash was a property damage only crash and the most possible reason to cause the crash was driver inattention. According to the record, it was dark and not lighted when the crash happened. The second crash was an injury crash, which had two visible injuries. Alcohol was a contributing factor for one of the crashes.

V.C CRASH ANALYSIS AND RATE OF RETURN (ROR)

In order to create a comparison between crashes from one location to the other, crash rates are used. These rates are based on data such as traffic volume, length of road sections considered, and period of time in years. Typical crash rate equations for intersections are rates per million of entering vehicles (RMEV) and for roadway segments are rates per 100 million vehicle miles (RMVM).

$$RMEV = \frac{C \times 1,000,000}{n \times 365 \times v}$$

where:

- R = Roadway Crash Rate per million entering vehicles (mev)
- C = Total Crashes in an n-year period
- n = year period of study (minimum 3 years)
- v = total entering volume in vehicles per day

$$RMVM = \frac{C \times 100,000,000}{n \times 365 \times l \times v}$$

where:

- R = Roadway Crash Rate per 100,000,000 veh-mi traveled
- C = Total Crashes in an n-year period
- n = year period of study (minimum 3 years)
- l = length of roadway in miles
- v = Average Daily Traffic (ADT) in vehicles per day

The crash rate for the three year period per million miles traveled is as follows:

$$RMVM = \frac{C \times 100,000,000}{n \times 365 \times l \times v} = 71.7$$

where:

R = Roadway Crash Rate per 100,000,000 veh-mi
C = 2
n = 3 years
l = 2 miles
v = 1273 vehicles per day

RMVM = 71.7 per million miles traveled

The crash rate of 71.7 crashes per million miles traveled is substantially less than the 2012 state-wide average of 159 crashes per million miles traveled for roadway segments.

VI. PROPOSED FACILITY IMPROVEMENTS

According to the results of the HCS analysis, there are no traffic operational deficiencies for existing 2016, and 2037 horizon year conditions. The current and projected 2037 LOS are within acceptable parameters set by the NMDOT SAMM. The no-passing zone on NM 6 should be maintained due to the proximity of intersection of C084. The no-passing zone on C084 between the NM 6 intersection and the western termini is recommended if adequate passing sight distance due to the vertical curve is not possible for the new facility.

In order to maximize traffic safety, the following improvements are recommended to C084 and NM 6 within the project area:

1) Increase the driving lanes to 12 feet on C084.
2) Provide 6-foot wide shoulders on C084.
3) Use largest corner radii feasible at the NM 6/C084 intersection to accommodate turning heavy vehicle.
4) Install cattle guard on C084 at NM 6 intersection.

VII. REFERENCES

A Policy of Geometric Design of Highways and Streets, 4th Edition. Washington D.C.: American Associations of State Highway and Transportation Officials, 2011.

Highway Capacity Manual, HCM2010. Washington D.C.: Transportation Research Board, National Research Council, 2010 and *Highway Capacity Software 2010, Version 6.2*, McTrans, University of Florida, Federal Highway Administration, 2010.

State Access Management Manual, Santa Fe, NM: New Mexico Department of Transportation, 2002.

New Mexico Traffic Crash Annual Report, 2012, New Mexico Department of Transportation, Transportation Planning and Safety Division Data Management Bureau

Traffic Access and Impact Studies For Site Development, 1991, Institute of Transportation Engineers (ITE)

Traffic Engineering Handbook, 5th Edition. ISBN: 0-935403-32-9, Prentice Hall Inc., Washington D.C., 1999. Institute of Transportation Engineers (ITE).

Roadside Design Guide, 4th Edition 2011, Washington D.C.: American Associations of State Highway and Transportation Officials, 2011

VIII. APPENDICES

APPENDIX A – TRAFFIC DATA

APPENDIX B – EXISTING OPERATIONAL ANALYSIS

APPENDIX C – NO-BUILD HORIZON YEAR 2037 OPERATIONAL ANALYSIS

APPENDIX D – HORIZON YEAR 2037 OPERATIONAL ANALYSIS

APPENDIX E – CRASH DATA CALCULATIONS

APPENDIX A – TRAFFIC DATA

Basic Volume Report: C084 (Old Rt 66)

Station ID : C084 (Old Rt 66)
Info Line 1 : West of RR Tracks
Info Line 2 : East of Archway Blvd
GPS Lat/Lon :
DB File : C084 WO BR 1WB.DB

Last Connected Device Type : Apollo
Version Number : 1.62
Serial Number :
Number of Lanes : 2
Posted Speed Limit :

Lane #1 Configuration

#	Dir.	Information	Volume Mode	Volume Sensors	Divide By 2	Comment
1.		Westbound				

Lane #1 Basic Volume Data From: 00:00 - 05/11/2016 To: 23:59 - 05/12/2016

Date	Time	:00	:15	:30	:45	Total
05/11/16	00:00	0	0	1	0	1
Wed	01:00	0	1	0	0	1
	02:00	0	0	0	0	0
	03:00	0	0	0	0	0
	04:00	0	1	0	0	1
	05:00	1	1	3	4	9
	06:00	6	8	7	3	24
	07:00	3	4	3	3	13
	08:00	2	1	2	0	5
	09:00	3	2	1	5	11
	10:00	3	2	8	1	14
	11:00	1	0	1	0	2
	12:00	0	4	9	4	17
	13:00	2	5	1	7	15
	14:00	2	3	3	4	12
	15:00	6	3	8	9	26
	16:00	4	3	2	4	13
	17:00	6	2	3	4	15
	18:00	8	7	3	3	21
	19:00	4	5	0	1	10
	20:00	4	4	5	0	13
	21:00	3	5	2	1	11
	22:00	2	2	2	1	7
	23:00	0	2	0	1	3
Day Total :						244

AM Total :	81 (33.2%)	Peak AM Hour : 05:45 =	25 (10.2%)	Peak AM Factor :	0.781	Average Period :	2.5
PM Total :	163 (66.8%)	Peak PM Hour : 15:00 =	26 (10.7%)	Peak PM Factor :	0.722	Average Hour :	10.2

Date	*Time*	*:00*	*:15*	*:30*	*:45*	*Total*
05/12/16	00:00	1	0	1	0	2
Thu	01:00	0	0	2	0	2
	02:00	0	0	0	0	0
	03:00	0	0	0	0	0
	04:00	1	0	0	0	1
	05:00	1	0	2	5	8
	06:00	6	8	7	6	27
	07:00	0	1	3	2	6
	08:00	4	5	2	3	14
	09:00	1	3	3	4	11
	10:00	6	3	3	2	14
	11:00	3	0	1	6	10
	12:00	2	0	1	6	9
	13:00	1	4	5	4	14
	14:00	2	1	3	1	7
	15:00	1	9	4	6	20
	16:00	4	5	5	2	16
	17:00	3	5	6	5	19
	18:00	7	8	6	5	26
	19:00	5	4	5	1	15
	20:00	1	5	6	2	14
	21:00	5	1	0	2	8
	22:00	1	2	1	3	7
	23:00	2	4	4	1	11
Day Total :						261

AM Total :	95 (36.4%)	Peak AM Hour :	06:00 =	27 (10.3%)	Peak AM Factor : 0.844	Average Period :	2.7
PM Total :	166 (63.6%)	Peak PM Hour :	17:30 =	26 (10.0%)	Peak PM Factor : 0.722	Average Hour :	10.9

Lane #2 Configuration

#	Dir.	Information	Volume Mode	Volume Sensors	Divide By 2	Comment
2.		Eastbound				

Lane #2 Basic Volume Data From: 00:00 - 05/11/2016 To: 23:59 - 05/12/2016

Date	Time	:00	:15	:30	:45	Total
05/11/16	00:00	0	0	0	0	0
Wed	01:00	0	0	0	0	0
	02:00	0	0	0	0	0
	03:00	0	0	0	1	1
	04:00	0	0	0	0	0
	05:00	1	1	1	4	7
	06:00	6	3	4	5	18
	07:00	2	5	6	4	17
	08:00	1	3	2	1	7
	09:00	4	2	2	7	15
	10:00	2	2	4	4	12
	11:00	3	0	1	6	10
	12:00	2	3	3	5	13
	13:00	1	6	1	6	14
	14:00	7	2	0	4	13
	15:00	5	4	12	3	24
	16:00	6	3	1	6	16
	17:00	3	2	1	6	12
	18:00	6	0	3	0	9
	19:00	2	0	2	1	5
	20:00	3	1	2	2	8
	21:00	0	0	0	0	0
	22:00	0	3	0	0	3
	23:00	1	1	0	0	2
Day Total :						206

AM Total :	87 (42.2%)	Peak AM Hour : 06:00 =	18 (8.7%)	Peak AM Factor : 0.643	Average Period : 2.1
PM Total :	119 (57.8%)	Peak PM Hour : 14:45 =	25 (12.1%)	Peak PM Factor : 0.521	Average Hour : 8.6

Date	Time	:00	:15	:30	:45	Total
05/12/16	00:00	0	0	0	0	0
Thu	01:00	0	0	1	0	1
	02:00	0	0	0	0	0
	03:00	0	0	0	0	0
	04:00	1	0	0	0	1
	05:00	1	1	2	3	7
	06:00	5	4	4	4	17
	07:00	1	3	6	5	15
	08:00	2	2	4	2	10
	09:00	1	0	4	6	11
	10:00	6	2	2	4	14
	11:00	4	3	2	3	12
	12:00	2	4	2	2	10
	13:00	3	2	3	2	10
	14:00	1	2	6	7	16
	15:00	1	5	7	10	23
	16:00	4	10	3	1	18
	17:00	6	7	3	6	22
	18:00	4	3	1	3	11
	19:00	0	2	1	2	5
	20:00	0	2	2	2	6
	21:00	1	0	0	2	3
	22:00	1	1	0	1	3
	23:00	2	2	1	1	6
Day Total :						221

AM Total :	88 (39.8%)	Peak AM Hour : 09:30 =	18 (8.1%)	Peak AM Factor : 0.750		Average Period :	2.3
PM Total :	133 (60.2%)	Peak PM Hour : 15:30 =	31 (14.0%)	Peak PM Factor : 0.775		Average Hour :	9.2

Basic Volume Summary: C084 (Old Rt 66)

Grand Total For Data From: 00:00 - 05/11/2016 To: 23:59 - 05/12/2016

Lane	Total Count		# Of Days	ADT	Avg. Period	Avg. Hour	AM Total & Percent	PM Total & Percent
#1.	505	(54.2%)	2.00	253	2.6	10.5	176 (34.9%)	329 (65.1%)
#2.	427	(45.8%)	2.00	214	2.2	8.9	175 (41.0%)	252 (59.0%)
ALL	932		2.00	467	4.8	19.4	351 (37.7%)	581 (62.3%)

Lane	Peak AM Hour		Date	Peak AM Factor	Peak PM Hour		Date	Peak PM Factor
#1.	06:00 =	27	05/12/2016	0.844	15:00 =	26	05/11/2016	0.722
#2.	06:00 =	18	05/11/2016	0.643	15:30 =	31	05/12/2016	0.775

Basic Axle Classification Report: C084 (Old Rt 66)

Station ID : C084 (Old Rt 66)
Info Line 1 : West of RR Tracks
Info Line 2 : East of Archway Blvd
GPS Lat/Lon :
DB File : C084 WO BR 1WB.DB

Last Connected Device Type : Apollo
Version Number : 1.62
Serial Number :
Number of Lanes : 2
Posted Speed Limit :

Lane #1 Configuration

#	Dir.	Information	Vehicle Sensors	Sensor Spacing	Loop Length	Comment
1.		Westbound	Ax-Ax	4.0 ft	6.0 ft	

Lane #1 Basic Axle Classification Data From: 00:00 - 05/11/2016 To: 23:59 - 05/12/2016

Date	Time (DEFAULTC)	#1 Cycle	#2 Cars	#3 2A-4T	#4 Buses	#5 2A-SU	#6 3A-SU	#7 4A-SU	#8 4A-ST	#9 5A-ST	#10 6A-ST	#11 5A-MT	#12 6A-MT	#13 Other	Total
05/11/16	00:00	0	0	1	0	0	0	0	0	0	0	0	0	0	1
Wed	01:00	0	0	1	0	0	0	0	0	0	0	0	0	0	1
	02:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	03:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	04:00	0	1	0	0	0	0	0	0	0	0	0	0	0	1
	05:00	1	2	3	0	1	0	0	0	0	0	0	0	0	7
	06:00	0	3	19	0	0	0	0	0	0	0	0	0	0	22
	07:00	0	2	3	0	1	0	0	0	0	0	0	0	0	6
	08:00	0	0	2	0	0	0	0	0	0	0	0	0	0	2
	09:00	0	5	3	0	0	0	0	0	0	0	0	0	0	8
	10:00	0	5	8	0	1	0	0	0	0	0	0	0	0	14
	11:00	0	1	1	0	0	0	0	0	0	0	0	0	0	2
	12:00	0	8	1	0	0	0	0	0	0	0	0	0	0	9
	13:00	0	10	2	0	0	0	0	0	0	0	0	0	0	12
	14:00	0	4	5	0	0	0	0	0	0	0	0	0	0	9
	15:00	0	11	7	0	1	0	0	0	0	0	0	0	0	19
	16:00	0	5	4	0	1	0	0	0	0	0	0	0	0	10
	17:00	0	10	3	0	0	0	0	0	0	0	0	0	0	13
	18:00	0	14	5	0	0	0	0	0	0	0	0	0	0	19
	19:00	0	5	4	0	0	0	0	0	0	0	0	0	0	9
	20:00	0	6	2	0	0	0	0	0	0	0	0	0	0	8
	21:00	0	8	3	0	0	0	0	0	0	0	0	0	0	11
	22:00	0	4	2	0	0	0	0	0	0	0	0	0	0	6
	23:00	0	3	0	0	0	0	0	0	0	0	0	0	0	3
Daily Total :		1	107	79	0	5	0	0	0	0	0	0	0	0	192
Percent :		1%	56%	41%	0%	3%	0%	0%	0%	0%	0%	0%	0%	0%	
Average :		0	4	3	0	0	0	0	0	0	0	0	0	0	7

(DEFAULTC) Date	Time	#1 Cycle	#2 Cars	#3 2A-4T	#4 Buses	#5 2A-SU	#6 3A-SU	#7 4A-SU	#8 4A-ST	#9 5A-ST	#10 6A-ST	#11 5A-MT	#12 6A-MT	#13 Other	Total
05/12/16	00:00	0	2	0	0	0	0	0	0	0	0	0	0	0	2
Thu	01:00	0	1	0	0	0	0	0	0	0	0	0	0	0	1
	02:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	03:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	04:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	05:00	0	0	4	0	1	0	0	0	0	0	0	0	0	5
	06:00	0	4	17	0	0	0	0	0	0	0	0	0	0	21
	07:00	0	2	0	0	1	0	0	0	0	0	0	0	0	3
	08:00	0	6	4	0	1	0	0	0	0	0	0	0	0	11
	09:00	1	3	7	0	0	0	0	0	0	0	0	0	0	11
	10:00	0	5	7	0	0	0	0	0	0	0	0	0	0	12
	11:00	0	1	5	0	0	2	0	0	0	0	0	0	0	8
	12:00	0	3	3	0	1	1	0	0	0	0	0	0	0	8
	13:00	0	8	4	0	0	1	0	0	0	0	0	0	0	13
	14:00	0	3	1	0	0	0	0	0	0	0	0	0	0	4
	15:00	0	10	5	0	1	0	0	0	0	0	0	0	0	16
	16:00	0	9	3	0	1	0	0	0	0	0	0	0	0	13
	17:00	0	8	7	0	0	0	0	0	0	0	0	0	0	15
	18:00	0	13	8	0	0	0	0	0	0	0	0	0	0	21
	19:00	1	6	6	0	0	0	0	0	0	0	0	0	0	13
	20:00	0	6	6	0	0	1	0	0	0	0	0	0	0	13
	21:00	1	4	0	0	0	0	1	1	0	0	0	0	0	7
	22:00	0	4	2	0	0	0	0	0	0	0	0	0	0	6
	23:00	0	7	1	0	0	0	0	0	0	0	0	0	0	8
Daily Total :		3	105	90	0	6	5	1	1	0	0	0	0	0	211
Percent :		1%	50%	43%	0%	3%	2%	0%	0%	0%	0%	0%	0%	0%	
Average :		0	4	4	0	0	0	0	0	0	0	0	0	0	8

Lane #2 Configuration

#	Dir.	Information	Vehicle Sensors	Sensor Spacing	Loop Length	Comment
2.		Eastbound	Ax-Ax	4.0 ft	6.0 ft	

Lane #2 Basic Axle Classification Data From: 00:00 - 05/11/2016 To: 23:59 - 05/12/2016

Date	(DEFAULTC) Time	#1 Cycle	#2 Cars	#3 2A-4T	#4 Buses	#5 2A-SU	#6 3A-SU	#7 4A-SU	#8 4A-ST	#9 5A-ST	#10 6A-ST	#11 5A-MT	#12 6A-MT	#13 Other	Total
05/11/16	00:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Wed	01:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	02:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	03:00	0	1	0	0	0	0	0	0	0	0	0	0	0	1
	04:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	05:00	0	5	1	0	1	0	0	0	0	0	0	0	0	7
	06:00	0	13	5	0	0	0	0	0	0	0	0	0	0	18
	07:00	0	11	5	0	1	0	0	0	0	0	0	0	0	17
	08:00	0	3	4	0	0	0	0	0	0	0	0	0	0	7
	09:00	0	5	9	0	0	0	0	0	1	0	0	0	0	15
	10:00	0	5	7	0	0	0	0	0	0	0	0	0	0	12
	11:00	0	8	2	0	0	0	0	0	0	0	0	0	0	10
	12:00	1	5	5	0	0	0	0	0	0	0	0	0	0	11
	13:00	0	10	4	0	0	0	0	0	0	0	0	0	0	14
	14:00	0	5	8	0	0	0	0	0	0	0	0	0	0	13
	15:00	0	7	15	0	2	0	0	0	0	0	0	0	0	24
	16:00	0	4	11	0	1	0	0	0	0	0	0	0	0	16
	17:00	0	2	10	0	0	0	0	0	0	0	0	0	0	12
	18:00	0	6	3	0	0	0	0	0	0	0	0	0	0	9
	19:00	0	4	1	0	0	0	0	0	0	0	0	0	0	5
	20:00	0	3	5	0	0	0	0	0	0	0	0	0	0	8
	21:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	22:00	0	2	1	0	0	0	0	0	0	0	0	0	0	3
	23:00	0	2	0	0	0	0	0	0	0	0	0	0	0	2
Daily Total :		1	101	96	0	5	0	0	0	1	0	0	0	0	204
Percent :		0%	50%	47%	0%	2%	0%	0%	0%	0%	0%	0%	0%	0%	
Average :		0	4	4	0	0	0	0	0	0	0	0	0	0	8

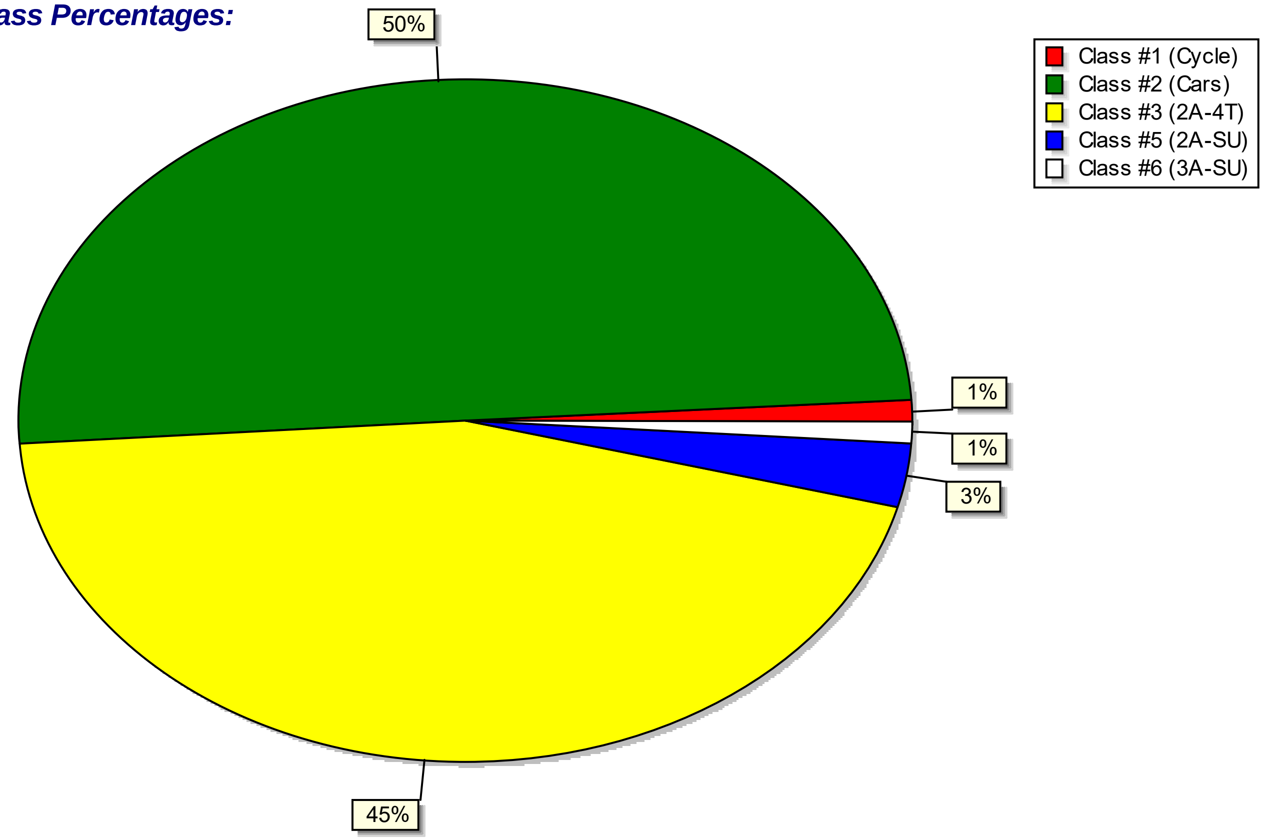
(DEFAULTC)		#1	#2	#3	#4	#5	#6	#7	#8	#9	#10	#11	#12	#13	
Date	Time	Cycle	Cars	2A-4T	Buses	2A-SU	3A-SU	4A-SU	4A-ST	5A-ST	6A-ST	5A-MT	6A-MT	Other	Total
05/12/16	00:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Thu	01:00	0	0	1	0	0	0	0	0	0	0	0	0	0	1
	02:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	03:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	04:00	0	1	0	0	0	0	0	0	0	0	0	0	0	1
	05:00	0	5	1	0	1	0	0	0	0	0	0	0	0	7
	06:00	0	13	4	0	0	0	0	0	0	0	0	0	0	17
	07:00	0	8	6	0	1	0	0	0	0	0	0	0	0	15
	08:00	0	7	3	0	0	0	0	0	0	0	0	0	0	10
	09:00	1	5	5	0	0	0	0	0	0	0	0	0	0	11
	10:00	0	8	6	0	0	0	0	0	0	0	0	0	0	14
	11:00	0	4	5	0	0	0	0	0	0	1	0	0	0	10
	12:00	0	5	5	0	0	0	0	0	0	0	0	0	0	10
	13:00	0	4	6	0	0	0	0	0	0	0	0	0	0	10
	14:00	0	7	5	0	2	2	0	0	0	0	0	0	0	16
	15:00	0	5	16	0	1	1	0	0	0	0	0	0	0	23
	16:00	0	5	11	0	1	1	0	0	0	0	0	0	0	18
	17:00	0	4	18	0	0	0	0	0	0	0	0	0	0	22
	18:00	0	6	5	0	0	0	0	0	0	0	0	0	0	11
	19:00	1	0	3	0	0	0	0	0	0	0	0	0	0	4
	20:00	0	2	3	0	0	0	0	0	0	0	0	0	0	5
	21:00	0	0	1	0	0	0	0	0	0	0	0	0	0	1
	22:00	0	2	0	0	0	0	0	0	0	0	0	0	0	2
	23:00	0	2	1	0	0	0	0	0	0	0	0	0	0	3
Daily Total :		2	93	105	0	6	4	0	0	0	1	0	0	0	211
Percent :		1%	44%	50%	0%	3%	2%	0%	0%	0%	0%	0%	0%	0%	
Average :		0	4	4	0	0	0	0	0	0	0	0	0	0	8

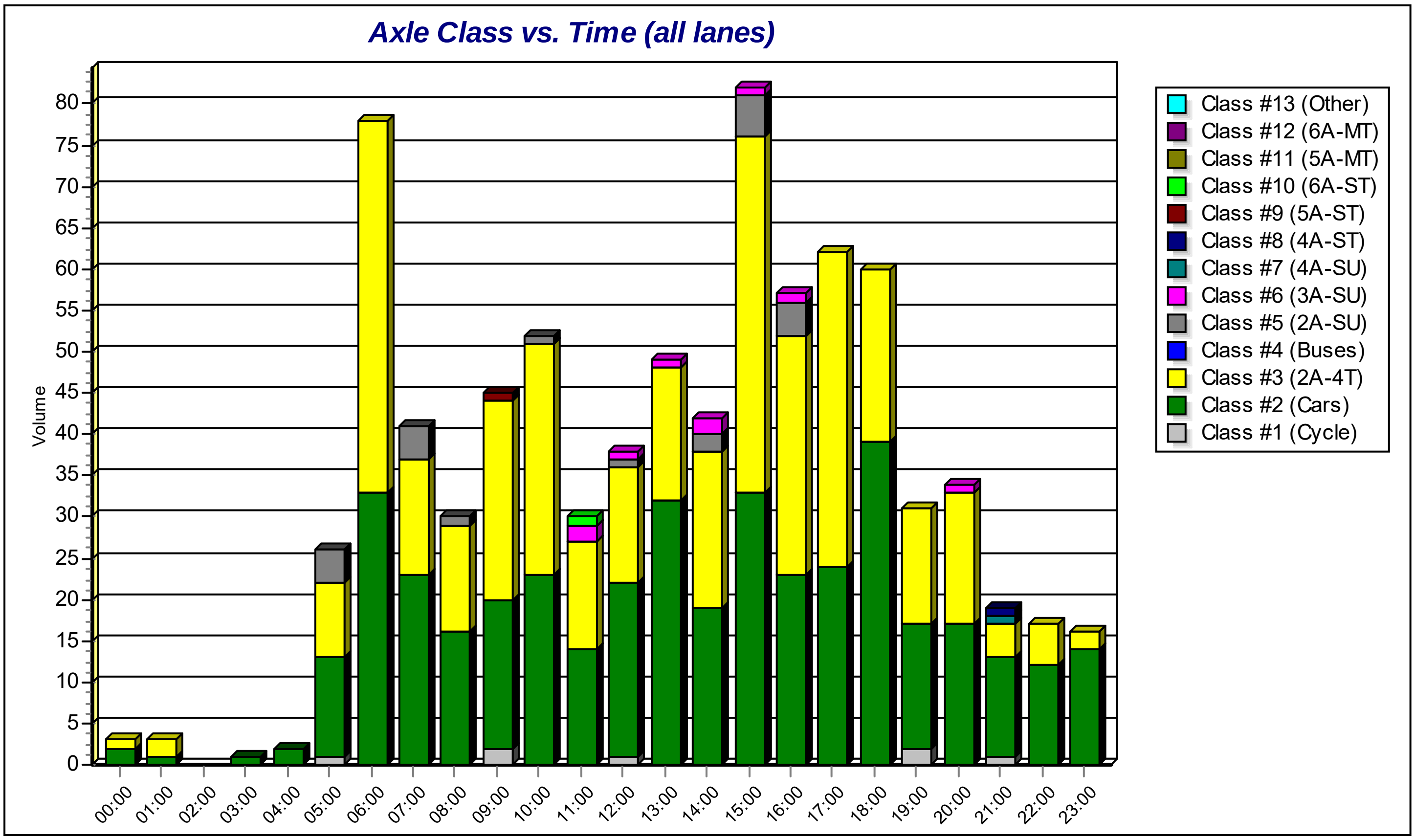
Basic Axle Class Summary: C084 (Old Rt 66)

(DEFAULTC) Description	Lane	#1 Cycle	#2 Cars	#3 2A-4T	#4 Buses	#5 2A-SU	#6 3A-SU	#7 4A-SU	#8 4A-ST	#9 5A-ST	#10 6A-ST	#11 5A-MT	#12 6A-MT	#13 Other	Total
TOTAL COUNT :	#1.	4	212	169	0	11	5	1	1	0	0	0	0	0	403
	#2.	3	194	201	0	11	4	0	0	1	1	0	0	0	415
		7	406	370	0	22	9	1	1	1	1	0	0	0	818
Percents :	#1.	1%	53%	42%	0%	3%	1%	0%	0%	0%	0%	0%	0%	0%	49%
	#2.	1%	47%	48%	0%	3%	1%	0%	0%	0%	0%	0%	0%	0%	51%
		1%	50%	45%	0%	3%	1%	0%	0%	0%	0%	0%	0%	0%	
Average :	#1.	0	4	4	0	0	0	0	0	0	0	0	0	0	8
	#2.	0	4	4	0	0	0	0	0	0	0	0	0	0	8
		0	8	8	0	0	0	0	0	0	0	0	0	0	16
Days & ADT :	#1.	2.0	201												
	#2.	2.0	207												
		2.0	409												

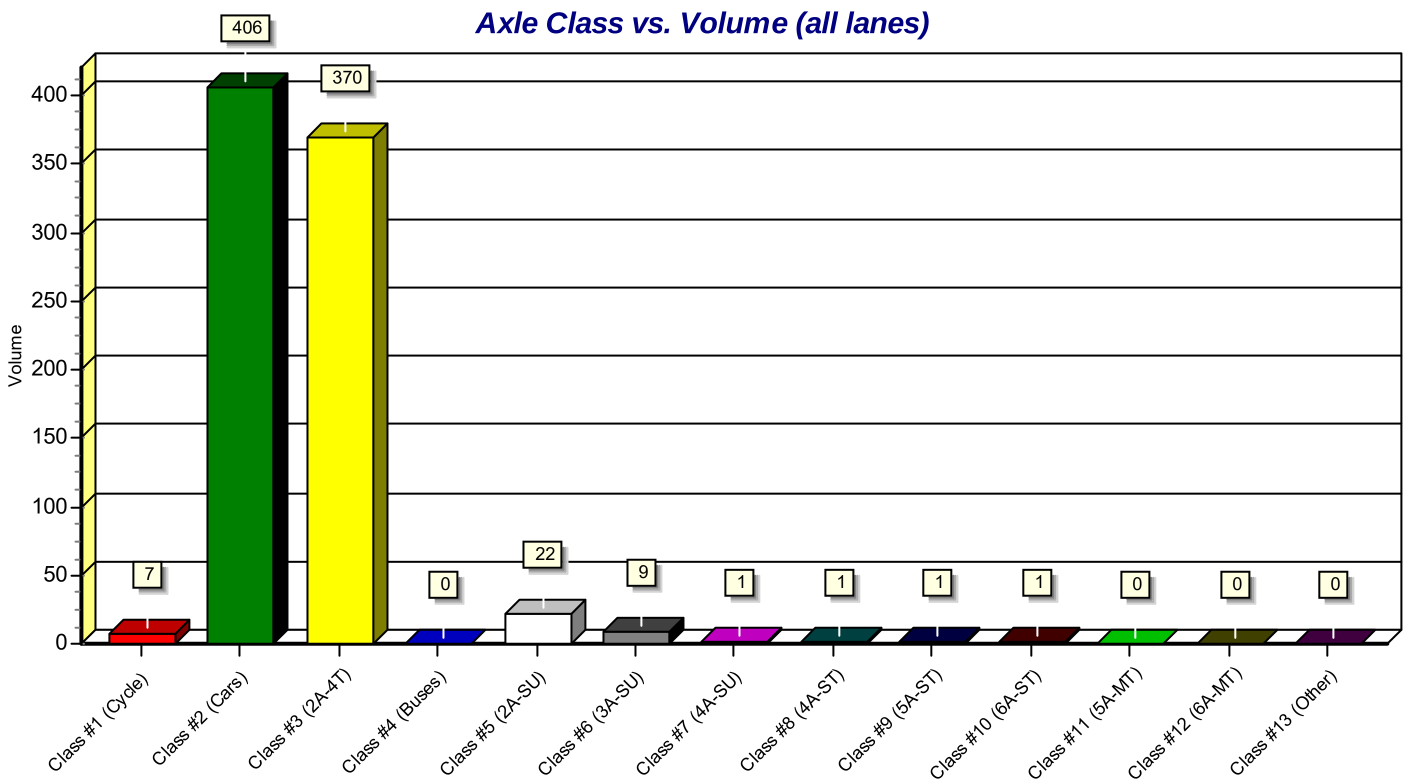
C084 (Old Rt 66) Axle Class Charts For Data From: 00:00 - 05/11/2016 To: 23:59 - 05/12/2016

Axle Class Percentages:





C084 (Old Rt 66) Axle Class Charts For Data From: 00:00 - 05/11/2016 To: 23:59 - 05/12/2016



Special Speed Study Report: C084 (Old Rt 66)

Station ID : C084 (Old Rt 66)
Info Line 1 : West of RR Tracks
Info Line 2 : East of Archway Blvd
GPS Lat/Lon :
DB File : C084 WO BR 1WB.DB

Last Connected Device Type : Apollo
Version Number : 1.62
Serial Number :
Number of Lanes : 2
Posted Speed Limit :

Lane #1 Configuration

#	Dir.	Information	Vehicle Sensors	Sensor Spacing	Loop Length	Comment
1.		Westbound	Ax-Ax	4.0 ft	6.0 ft	

Lane #1 Special Speed Study Data From: 00:00 - 05/11/2016 To: 23:59 - 05/12/2016

Date	Time	#1 0 - 19.9	#2 20 - 24.9	#3 25 - 29.9	#4 30 - 34.9	#5 35 - 39.9	#6 40 - 44.9	#7 45 - 49.9	#8 50 - 54.9	#9 55 - 59.9	#10 60 - 64.9	#11 65 - 69.9	#12 70 - 74.9	#13 75 - 79.9	#14 80 - 84.9	#15 85 - 89.9	#16 Other	Total
05/11/16	00:00	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1
Wed	01:00	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1
	02:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	03:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	04:00	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	05:00	1	0	0	0	3	3	0	0	0	0	0	0	0	0	0	0	7
	06:00	0	0	1	0	2	7	10	2	0	0	0	0	0	0	0	0	22
	07:00	0	0	1	1	2	0	2	0	0	0	0	0	0	0	0	0	6
	08:00	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	2
	09:00	0	0	0	1	3	3	1	0	0	0	0	0	0	0	0	0	8
	10:00	1	0	0	4	5	0	3	1	0	0	0	0	0	0	0	0	14
	11:00	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	2
	12:00	1	0	0	2	3	1	2	0	0	0	0	0	0	0	0	0	9
	13:00	0	1	1	4	4	2	0	0	0	0	0	0	0	0	0	0	12
	14:00	1	0	0	2	4	1	1	0	0	0	0	0	0	0	0	0	9
	15:00	1	5	1	2	3	4	3	0	0	0	0	0	0	0	0	0	19
	16:00	0	0	1	6	1	2	0	0	0	0	0	0	0	0	0	0	10
	17:00	0	1	0	4	3	2	3	0	0	0	0	0	0	0	0	0	13
	18:00	0	1	0	7	6	2	2	1	0	0	0	0	0	0	0	0	19
	19:00	0	0	0	2	5	2	0	0	0	0	0	0	0	0	0	0	9
	20:00	0	2	0	0	4	1	1	0	0	0	0	0	0	0	0	0	8
	21:00	0	0	1	4	2	1	2	0	1	0	0	0	0	0	0	0	11
	22:00	0	0	1	3	2	0	0	0	0	0	0	0	0	0	0	0	6
	23:00	0	0	0	0	1	2	0	0	0	0	0	0	0	0	0	0	3
Daily Total :		5	11	8	42	55	36	30	4	1	0	0	0	0	0	0	0	192
Percent :		3%	6%	4%	22%	29%	19%	16%	2%	1%	0%	0%	0%	0%	0%	0%	0%	
Cum. Percent :		3%	8%	13%	34%	63%	82%	97%	99%	100%	100%	100%	100%	100%	100%	100%	100%	
Average :		0	0	0	2	2	2	1	0	0	0	0	0	0	0	0	0	7

Average Speed 37.3 mph   50% Speed : 37.7 mph   67% Speed : 41.8 mph   85% Speed : 47.0 mph
10mph Pace: 31.2 - 41.1 (50.5%)

Date	Time	#1 0 - 19.9	#2 20 - 24.9	#3 25 - 29.9	#4 30 - 34.9	#5 35 - 39.9	#6 40 - 44.9	#7 45 - 49.9	#8 50 - 54.9	#9 55 - 59.9	#10 60 - 64.9	#11 65 - 69.9	#12 70 - 74.9	#13 75 - 79.9	#14 80 - 84.9	#15 85 - 89.9	#16 Other	Total
05/12/16	00:00	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	2
Thu	01:00	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1
	02:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	03:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	04:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	05:00	0	0	0	0	3	2	0	0	0	0	0	0	0	0	0	0	5
	06:00	1	1	0	0	2	8	6	3	0	0	0	0	0	0	0	0	21
	07:00	0	0	0	2	0	0	0	0	1	0	0	0	0	0	0	0	3
	08:00	0	1	1	1	4	1	0	2	0	1	0	0	0	0	0	0	11
	09:00	0	2	0	2	1	4	2	0	0	0	0	0	0	0	0	0	11
	10:00	0	0	0	5	4	1	2	0	0	0	0	0	0	0	0	0	12
	11:00	1	0	2	2	1	2	0	0	0	0	0	0	0	0	0	0	8
	12:00	0	0	3	1	3	1	0	0	0	0	0	0	0	0	0	0	8
	13:00	0	0	4	1	4	2	1	1	0	0	0	0	0	0	0	0	13
	14:00	0	0	0	3	0	1	0	0	0	0	0	0	0	0	0	0	4
	15:00	0	3	2	5	3	2	1	0	0	0	0	0	0	0	0	0	16
	16:00	1	0	6	1	3	2	0	0	0	0	0	0	0	0	0	0	13
	17:00	0	0	0	6	6	2	1	0	0	0	0	0	0	0	0	0	15
	18:00	0	0	2	4	7	4	2	2	0	0	0	0	0	0	0	0	21
	19:00	1	0	4	2	3	2	1	0	0	0	0	0	0	0	0	0	13
	20:00	0	1	2	6	2	2	0	0	0	0	0	0	0	0	0	0	13
	21:00	0	1	1	3	2	0	0	0	0	0	0	0	0	0	0	0	7
	22:00	1	0	2	2	1	0	0	0	0	0	0	0	0	0	0	0	6
	23:00	0	0	3	2	1	2	0	0	0	0	0	0	0	0	0	0	8
Daily Total :		5	9	32	48	51	40	16	8	1	1	0	0	0	0	0	0	211
Percent :		2%	4%	15%	23%	24%	19%	8%	4%	0%	0%	0%	0%	0%	0%	0%	0%	
Cum. Percent :		2%	7%	22%	45%	69%	88%	95%	99%	100%	100%	100%	100%	100%	100%	100%	100%	
Average :		0	0	1	2	2	2	1	0	0	0	0	0	0	0	0	0	8

Average Speed 36.0 mph 50% Speed : 36.6 mph 67% Speed : 38.8 mph 85% Speed : 43.4 mph
10mph Pace: 31.0 - 40.9 (46.9%)

Lane #2 Configuration

#	Dir.	Information	Vehicle Sensors	Sensor Spacing	Loop Length	Comment
2.		Eastbound	Ax-Ax	4.0 ft	6.0 ft	

Lane #2 Special Speed Study Data From: 00:00 - 05/11/2016 To: 23:59 - 05/12/2016

Date	Time	#1 0 - 19.9	#2 20 - 24.9	#3 25 - 29.9	#4 30 - 34.9	#5 35 - 39.9	#6 40 - 44.9	#7 45 - 49.9	#8 50 - 54.9	#9 55 - 59.9	#10 60 - 64.9	#11 65 - 69.9	#12 70 - 74.9	#13 75 - 79.9	#14 80 - 84.9	#15 85 - 89.9	#16 Other	Total
05/11/16	00:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Wed	01:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	02:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	03:00	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1
	04:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	05:00	0	0	0	2	2	2	0	1	0	0	0	0	0	0	0	0	7
	06:00	0	0	0	1	5	4	6	2	0	0	0	0	0	0	0	0	18
	07:00	0	0	0	2	3	4	7	0	1	0	0	0	0	0	0	0	17
	08:00	0	0	0	2	0	3	2	0	0	0	0	0	0	0	0	0	7
	09:00	1	1	0	1	3	6	3	0	0	0	0	0	0	0	0	0	15
	10:00	0	0	1	0	5	4	2	0	0	0	0	0	0	0	0	0	12
	11:00	0	0	0	3	0	5	2	0	0	0	0	0	0	0	0	0	10
	12:00	1	0	0	1	2	3	3	1	0	0	0	0	0	0	0	0	11
	13:00	1	1	0	1	4	3	3	0	1	0	0	0	0	0	0	0	14
	14:00	0	0	1	1	3	1	4	2	1	0	0	0	0	0	0	0	13
	15:00	1	1	0	1	3	5	8	2	2	1	0	0	0	0	0	0	24
	16:00	0	1	1	3	4	3	2	2	0	0	0	0	0	0	0	0	16
	17:00	0	0	0	1	3	5	2	1	0	0	0	0	0	0	0	0	12
	18:00	0	0	0	0	3	5	1	0	0	0	0	0	0	0	0	0	9
	19:00	0	0	1	1	3	0	0	0	0	0	0	0	0	0	0	0	5
	20:00	0	0	0	1	2	3	1	1	0	0	0	0	0	0	0	0	8
	21:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	22:00	0	0	0	0	1	1	0	0	1	0	0	0	0	0	0	0	3
	23:00	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	2
Daily Total :		4	4	4	21	47	58	46	13	6	1	0	0	0	0	0	0	204
Percent :		2%	2%	2%	10%	23%	28%	23%	6%	3%	0%	0%	0%	0%	0%	0%	0%	
Cum. Percent :		2%	4%	6%	16%	39%	68%	90%	97%	100%	100%	100%	100%	100%	100%	100%	100%	
Average :		0	0	0	1	2	2	2	1	0	0	0	0	0	0	0	0	8

Average Speed 41.3 mph 50% Speed : 42.1 mph 67% Speed : 44.2 mph 85% Speed : 48.3 mph
10mph Pace: 36.0 - 45.9 (51.5%)

Date	Time	#1 0 - 19.9	#2 20 - 24.9	#3 25 - 29.9	#4 30 - 34.9	#5 35 - 39.9	#6 40 - 44.9	#7 45 - 49.9	#8 50 - 54.9	#9 55 - 59.9	#10 60 - 64.9	#11 65 - 69.9	#12 70 - 74.9	#13 75 - 79.9	#14 80 - 84.9	#15 85 - 89.9	#16 Other	Total
05/12/16	00:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Thu	01:00	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1
	02:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	03:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	04:00	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1
	05:00	0	0	0	0	3	4	0	0	0	0	0	0	0	0	0	0	7
	06:00	2	1	0	0	3	4	7	0	0	0	0	0	0	0	0	0	17
	07:00	0	0	0	2	4	3	5	0	1	0	0	0	0	0	0	0	15
	08:00	0	0	0	2	1	4	3	0	0	0	0	0	0	0	0	0	10
	09:00	1	1	0	3	0	5	0	1	0	0	0	0	0	0	0	0	11
	10:00	0	1	2	0	3	6	2	0	0	0	0	0	0	0	0	0	14
	11:00	1	0	0	2	2	4	1	0	0	0	0	0	0	0	0	0	10
	12:00	0	0	0	1	7	1	1	0	0	0	0	0	0	0	0	0	10
	13:00	0	0	2	1	1	3	3	0	0	0	0	0	0	0	0	0	10
	14:00	0	0	0	1	7	3	4	1	0	0	0	0	0	0	0	0	16
	15:00	0	2	2	0	3	6	6	3	1	0	0	0	0	0	0	0	23
	16:00	0	0	0	1	5	2	5	5	0	0	0	0	0	0	0	0	18
	17:00	0	1	0	1	7	7	3	2	1	0	0	0	0	0	0	0	22
	18:00	0	0	1	1	1	6	2	0	0	0	0	0	0	0	0	0	11
	19:00	0	0	1	0	2	0	1	0	0	0	0	0	0	0	0	0	4
	20:00	0	0	1	2	1	1	0	0	0	0	0	0	0	0	0	0	5
	21:00	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1
	22:00	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	2
	23:00	0	0	0	1	2	0	0	0	0	0	0	0	0	0	0	0	3
Daily Total :		4	6	9	19	52	61	44	13	3	0	0	0	0	0	0	0	211
Percent :		2%	3%	4%	9%	25%	29%	21%	6%	1%	0%	0%	0%	0%	0%	0%	0%	
Cum. Percent :		2%	5%	9%	18%	43%	72%	92%	99%	100%	100%	100%	100%	100%	100%	100%	100%	
Average :		0	0	0	1	2	3	2	1	0	0	0	0	0	0	0	0	9

Average Speed 40.3 mph 50% Speed : 41.5 mph 67% Speed : 43.7 mph 85% Speed : 47.9 mph
10mph Pace: 35.9 - 45.8 (53.6%)

Date	Time	#1 0 - 19.9	#2 20 - 24.9	#3 25 - 29.9	#4 30 - 34.9	#5 35 - 39.9	#6 40 - 44.9	#7 45 - 49.9	#8 50 - 54.9	#9 55 - 59.9	#10 60 - 64.9	#11 65 - 69.9	#12 70 - 74.9	#13 75 - 79.9	#14 80 - 84.9	#15 85 - 89.9	#16 Other	Total

Special Speed Study Summary: C084 (Old Rt 66)

Description	#1 0 - 19.9	#2 20 - 24.9	#3 25 - 29.9	#4 30 - 34.9	#5 35 - 39.9	#6 40 - 44.9	#7 45 - 49.9	#8 50 - 54.9	#9 55 - 59.9	#10 60 - 64.9	#11 65 - 69.9	#12 70 - 74.9	#13 75 - 79.9	#14 80 - 84.9	#15 85 - 89.9	#16 Other	Total
Grand Total #1:	10	20	40	90	106	76	46	12	2	1	0	0	0	0	0	0	403
Percent :	2%	5%	10%	22%	26%	19%	11%	3%	0%	0%	0%	0%	0%	0%	0%	0%	
Cum. Percent :	2%	7%	17%	40%	66%	85%	96%	99%	100%	100%	100%	100%	100%	100%	100%	100%	
Average :	0	0	1	2	2	2	1	0	0	0	0	0	0	0	0	0	8

ADT = 201

Average Speed 36.6 mph | 50% Speed : 37.2 mph | 67% Speed : 40.4 mph | 85% Speed : 44.9 mph
10mph Pace: 30.0 - 39.9 (48.6%)

Description	#1 0 - 19.9	#2 20 - 24.9	#3 25 - 29.9	#4 30 - 34.9	#5 35 - 39.9	#6 40 - 44.9	#7 45 - 49.9	#8 50 - 54.9	#9 55 - 59.9	#10 60 - 64.9	#11 65 - 69.9	#12 70 - 74.9	#13 75 - 79.9	#14 80 - 84.9	#15 85 - 89.9	#16 Other	Total
Grand Total #2:	8	10	13	40	99	119	90	26	9	1	0	0	0	0	0	0	415
Percent :	2%	2%	3%	10%	24%	29%	22%	6%	2%	0%	0%	0%	0%	0%	0%	0%	
Cum. Percent :	2%	4%	7%	17%	41%	70%	91%	98%	100%	100%	100%	100%	100%	100%	100%	100%	
Average :	0	0	0	1	2	2	2	1	0	0	0	0	0	0	0	0	8

ADT = 207

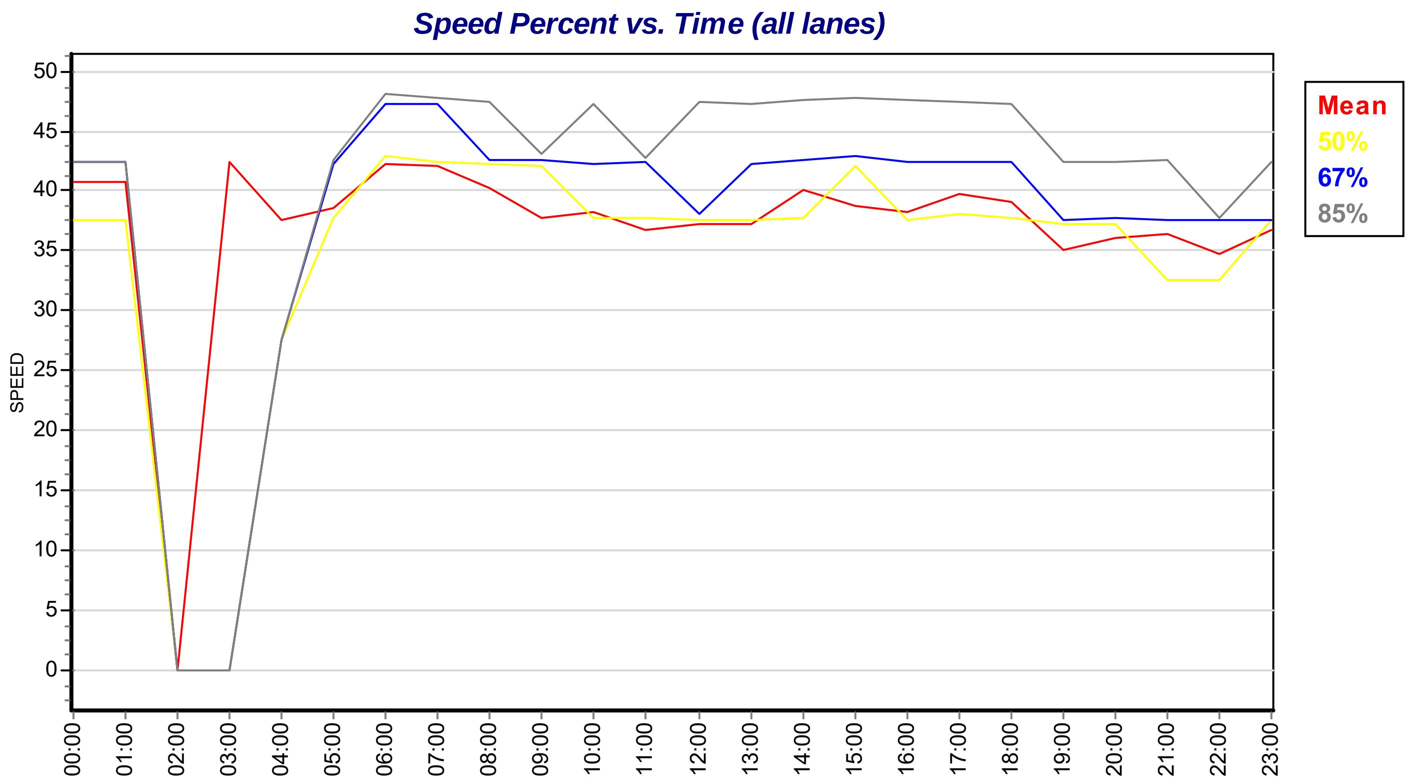
Average Speed 40.8 mph | 50% Speed : 41.8 mph | 67% Speed : 44.3 mph | 85% Speed : 48.3 mph
10mph Pace: 36.9 - 46.8 (52.5%)

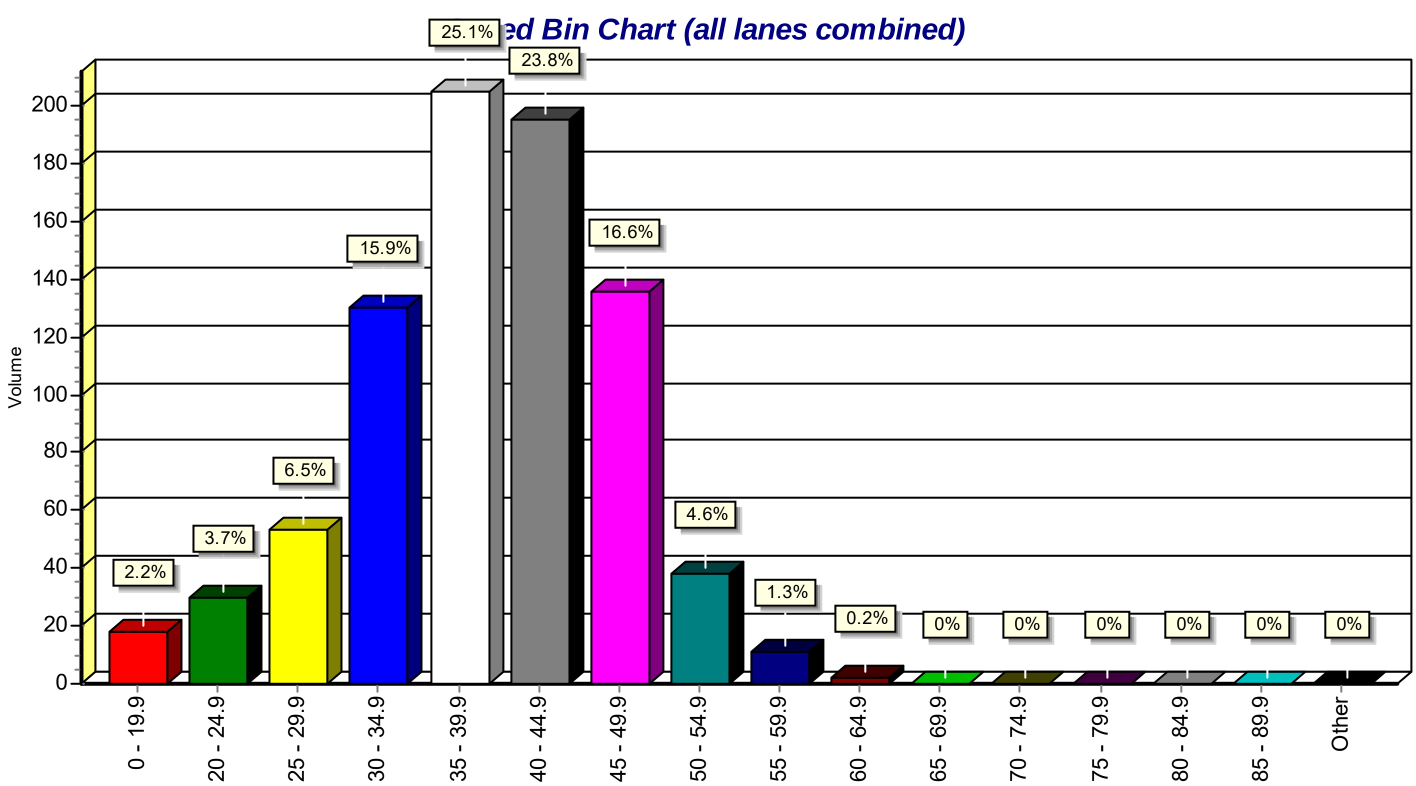
Description	#1 0 - 19.9	#2 20 - 24.9	#3 25 - 29.9	#4 30 - 34.9	#5 35 - 39.9	#6 40 - 44.9	#7 45 - 49.9	#8 50 - 54.9	#9 55 - 59.9	#10 60 - 64.9	#11 65 - 69.9	#12 70 - 74.9	#13 75 - 79.9	#14 80 - 84.9	#15 85 - 89.9	#16 Other	Total
Comb. Total :	18	30	53	130	205	195	136	38	11	2	0	0	0	0	0	0	818
Percent :	2%	4%	6%	16%	25%	24%	17%	5%	1%	0%	0%	0%	0%	0%	0%	0%	
Cum. Percent :	2%	6%	12%	28%	53%	77%	94%	98%	100%	100%	100%	100%	100%	100%	100%	100%	
Average :	0	1	1	3	4	4	3	1	0	0	0	0	0	0	0	0	17

ADT = 409

Average Speed 38.7 mph | 50% Speed : 39.1 mph | 67% Speed : 42.8 mph | 85% Speed : 47.4 mph
10mph Pace: 35.0 - 44.9 (48.9%)

C084 (Old Rt 66) Charts For Data From: 00:00 - 05/11/2016 To: 23:59 - 05/12/2016





Mike Henderson Consulting, LLC

5301 Camino Sandia NE
Albuquerque, NM 87111
(505) 275-5706

Collected by: MH13

File Name : NM 6 & C084
Site Code :
Start Date : 5/11/2016
Page No : 1

Groups Printed- Car - Med Truck - Heavy Truck

	C084 (Old Rt 66) Eastbound				Westbound				NM 6 Northbound				NM 6 Southbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
00:00	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	1
*** BREAK ***																	
00:30	0	0	0	0	0	0	0	0	0	2	0	2	0	2	1	3	5
*** BREAK ***																	
Total	0	0	0	0	0	0	0	0	0	3	0	3	0	2	1	3	6
*** BREAK ***																	
01:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1
*** BREAK ***																	
01:45	0	0	0	0	0	0	0	0	0	2	0	2	0	0	0	0	2
Total	0	0	0	0	0	0	0	0	0	2	0	2	0	0	1	1	3
02:00	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	4	4
02:15	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	3	3
02:30	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1
02:45	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	2	2
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	10	0	10	10
*** BREAK ***																	
03:45	1	0	0	1	0	0	0	0	0	1	0	1	0	0	0	0	2
Total	1	0	0	1	0	0	0	0	0	1	0	1	0	0	0	0	2
04:00	0	0	1	1	0	0	0	0	0	1	0	1	0	1	0	1	3
04:15	0	0	0	0	0	0	0	0	0	1	0	1	0	1	1	2	3
04:30	0	0	0	0	0	0	0	0	0	3	0	3	0	0	0	0	3
04:45	0	0	0	0	0	0	0	0	0	4	0	4	0	1	0	1	5
Total	0	0	1	1	0	0	0	0	0	9	0	9	0	3	1	4	14
05:00	1	0	0	1	0	0	0	0	1	7	0	8	0	0	0	0	9
05:15	1	0	0	1	0	0	0	0	0	4	0	4	0	0	1	1	6
05:30	1	0	0	1	0	0	0	0	0	8	0	8	0	2	2	4	13
05:45	2	0	2	4	0	0	0	0	1	6	0	7	0	3	2	5	16
Total	5	0	2	7	0	0	0	0	2	25	0	27	0	5	5	10	44
06:00	4	0	2	6	0	0	0	0	2	11	0	13	0	1	4	5	24
06:15	3	0	0	3	0	0	0	0	1	6	0	7	0	2	6	8	18
06:30	4	0	0	4	0	0	0	0	0	7	0	7	0	5	7	12	23
06:45	5	0	0	5	0	0	0	0	0	14	0	14	0	3	1	4	23
Total	16	0	2	18	0	0	0	0	3	38	0	41	0	11	18	29	88
07:00	2	0	0	2	0	0	0	0	0	14	0	14	0	1	2	3	19
07:15	5	0	0	5	0	0	0	0	1	13	0	14	0	4	0	4	23
07:30	4	0	0	4	0	0	0	0	0	11	0	11	0	5	2	7	22
07:45	3	0	3	6	0	0	0	0	0	6	0	6	0	5	1	6	18
Total	14	0	3	17	0	0	0	0	1	44	0	45	0	15	5	20	82
08:00	1	0	0	1	0	0	0	0	0	12	0	12	0	2	1	3	16
08:15	3	0	0	3	0	0	0	0	0	12	0	12	0	2	0	2	17
08:30	2	0	0	2	0	0	0	0	0	11	0	11	0	6	1	7	20
08:45	1	0	0	1	0	0	0	0	0	20	0	20	0	5	0	5	26
Total	7	0	0	7	0	0	0	0	0	55	0	55	0	15	2	17	79
09:00	3	0	1	4	0	0	0	0	0	13	0	13	0	7	2	9	26
09:15	2	0	0	2	0	0	0	0	1	8	0	9	0	6	1	7	18
09:30	2	0	0	2	0	0	0	0	0	8	0	8	0	7	1	8	18
09:45	5	0	1	6	0	0	0	0	1	4	0	5	0	3	2	5	16
Total	12	0	2	14	0	0	0	0	2	33	0	35	0	23	6	29	78
10:00	0	0	1	1	0	0	0	0	2	19	0	21	0	6	1	7	29
10:15	2	0	1	3	0	0	0	0	0	8	0	8	0	7	2	9	20
10:30	3	0	1	4	0	0	0	0	2	7	0	9	0	5	6	11	24
10:45	1	0	3	4	0	0	0	0	1	12	0	13	0	6	0	6	23
Total	6	0	6	12	0	0	0	0	5	46	0	51	0	24	9	33	96

Mike Henderson Consulting, LLC

5301 Camino Sandia NE
Albuquerque, NM 87111
(505) 275-5706

Collected by: MH13

File Name : NM 6 & C084
Site Code :
Start Date : 5/11/2016
Page No : 2

Groups Printed- Car - Med Truck - Heavy Truck

	C084 (Old Rt 66) Eastbound				Westbound				NM 6 Northbound				NM 6 Southbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
11:00	2	0	1	3	0	0	0	0	0	6	0	6	0	5	1	6	15
11:15	0	0	0	0	0	0	0	0	0	9	0	9	0	9	0	9	18
11:30	1	0	0	1	0	0	0	0	0	13	0	13	0	5	1	6	20
11:45	6	0	0	6	0	0	0	0	0	5	0	5	0	2	0	2	13
Total	9	0	1	10	0	0	0	0	0	33	0	33	0	21	2	23	66
12:00	2	0	0	2	0	0	0	0	0	8	0	8	0	9	0	9	19
12:15	3	0	0	3	0	0	0	0	1	7	0	8	0	13	3	16	27
12:30	0	0	1	1	0	0	0	0	3	5	0	8	0	12	0	12	21
12:45	5	0	0	5	0	0	0	0	0	8	0	8	0	5	3	8	21
Total	10	0	1	11	0	0	0	0	4	28	0	32	0	39	6	45	88
13:00	1	0	0	1	0	0	0	0	1	9	0	10	0	9	1	10	21
13:15	3	0	3	6	0	0	0	0	1	8	0	9	0	9	3	12	27
13:30	0	0	1	1	0	0	0	0	1	6	0	7	0	16	0	16	24
13:45	6	0	0	6	0	0	0	0	2	10	0	12	0	17	3	20	38
Total	10	0	4	14	0	0	0	0	5	33	0	38	0	51	7	58	110
14:00	3	0	3	6	0	0	0	0	0	3	0	3	0	6	1	7	16
14:15	3	0	0	3	0	0	0	0	2	8	0	10	0	13	0	13	26
14:30	0	0	0	0	0	0	0	0	3	8	0	11	0	10	0	10	21
14:45	3	0	1	4	0	0	0	0	2	8	0	10	0	17	2	19	33
Total	9	0	4	13	0	0	0	0	7	27	0	34	0	46	3	49	96
15:00	4	0	1	5	0	0	0	0	2	7	0	9	0	10	3	13	27
15:15	2	0	2	4	0	0	0	0	3	14	0	17	0	16	0	16	37
15:30	8	0	3	11	0	0	0	0	1	13	0	14	0	14	2	16	41
15:45	4	0	0	4	0	0	0	0	0	9	0	9	0	15	7	22	35
Total	18	0	6	24	0	0	0	0	6	43	0	49	0	55	12	67	140
16:00	6	0	0	6	0	0	0	0	1	9	0	10	0	10	2	12	28
16:15	1	0	1	2	0	0	0	0	2	7	0	9	0	11	1	12	23
16:30	0	0	2	2	0	0	0	0	0	17	0	17	0	14	2	16	35
16:45	5	0	0	5	0	0	0	0	1	11	0	12	0	12	1	13	30
Total	12	0	3	15	0	0	0	0	4	44	0	48	0	47	6	53	116
17:00	1	0	3	4	0	0	0	0	0	9	0	9	0	13	6	19	32
17:15	1	0	1	2	0	0	0	0	1	6	0	7	0	14	2	16	25
17:30	1	0	0	1	0	0	0	0	0	15	0	15	0	9	3	12	28
17:45	5	0	1	6	0	0	0	0	0	13	0	13	0	15	1	16	35
Total	8	0	5	13	0	0	0	0	1	43	0	44	0	51	12	63	120
18:00	3	0	3	6	0	0	0	0	4	10	0	14	0	13	4	17	37
18:15	0	0	0	0	0	0	0	0	3	11	0	14	0	15	4	19	33
18:30	1	0	1	2	0	0	0	0	0	1	0	1	0	8	1	9	12
18:45	1	0	0	1	0	0	0	0	0	4	0	4	0	11	3	14	19
Total	5	0	4	9	0	0	0	0	7	26	0	33	0	47	12	59	101
19:00	1	0	1	2	0	0	0	0	0	5	0	5	0	13	3	16	23
19:15	0	0	0	0	0	0	0	0	3	6	0	9	0	4	2	6	15
19:30	1	0	1	2	0	0	0	0	0	3	0	3	0	8	0	8	13
19:45	1	0	0	1	0	0	0	0	0	3	0	3	0	6	1	7	11
Total	3	0	2	5	0	0	0	0	3	17	0	20	0	31	6	37	62
20:00	2	0	1	3	0	0	0	0	2	7	0	9	0	8	1	9	21
20:15	0	0	1	1	0	0	0	0	1	1	0	2	0	5	2	7	10
20:30	1	0	1	2	0	0	0	0	1	8	0	9	0	3	2	5	16
20:45	1	0	1	2	0	0	0	0	0	3	0	3	0	4	0	4	9
Total	4	0	4	8	0	0	0	0	4	19	0	23	0	20	5	25	56
21:00	0	0	0	0	0	0	0	0	1	4	0	5	0	6	2	8	13
21:15	0	0	0	0	0	0	0	0	2	5	0	7	0	7	3	10	17
21:30	0	0	0	0	0	0	0	0	0	1	0	1	0	4	2	6	7
21:45	0	0	0	0	0	0	0	0	1	2	0	3	0	4	0	4	7
Total	0	0	0	0	0	0	0	0	4	12	0	16	0	21	7	28	44

Mike Henderson Consulting, LLC
5301 Camino Sandia NE
Albuquerque, NM 87111
(505) 275-5706

Collected by: MH13

File Name : NM 6 & C084
Site Code :
Start Date : 5/11/2016

Groups Printed- Car - Med Truck - Heavy Truck

	C084 (Old Rt 66) Eastbound				Westbound				NM 6 Northbound				NM 6 Southbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
22:00	0	0	0	0	0	0	0	0	1	2	0	3	0	9	1	10	13
22:15	3	0	0	3	0	0	0	0	0	1	0	1	0	2	1	3	7
22:30	0	0	0	0	0	0	0	0	1	5	0	6	0	5	2	7	13
22:45	0	0	0	0	0	0	0	0	0	2	0	2	0	4	0	4	6
Total	3	0	0	3	0	0	0	0	2	10	0	12	0	20	4	24	39
23:00	1	0	0	1	0	0	0	0	0	1	0	1	0	3	0	3	5
23:15	1	0	0	1	0	0	0	0	2	3	0	5	0	2	0	2	8
23:30	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1
23:45	0	0	0	0	0	0	0	0	0	4	0	4	0	4	1	5	9
Total	2	0	0	2	0	0	0	0	2	8	0	10	0	10	1	11	23
Grand Total	154	0	50	204	0	0	0	0	62	599	0	661	0	567	131	698	1563
Apprch %	75.5	0	24.5		0	0	0		9.4	90.6	0		0	81.2	18.8		
Total %	9.9	0	3.2	13.1	0	0	0	0	4	38.3	0	42.3	0	36.3	8.4	44.7	
Car	150	0	46	196	0	0	0	0	57	487	0	544	0	454	129	583	1323
% Car	97.4	0	92	96.1	0	0	0	0	91.9	81.3	0	82.3	0	80.1	98.5	83.5	84.6
Med Truck	3	0	4	7	0	0	0	0	4	28	0	32	0	23	2	25	64
% Med Truck	1.9	0	8	3.4	0	0	0	0	6.5	4.7	0	4.8	0	4.1	1.5	3.6	4.1
Heavy Truck	1	0	0	1	0	0	0	0	1	84	0	85	0	90	0	90	176
% Heavy Truck	0.6	0	0	0.5	0	0	0	0	1.6	14	0	12.9	0	15.9	0	12.9	11.3

Mike Henderson Consulting, LLC

5301 Camino Sandia NE
Albuquerque, NM 87111
(505) 275-5706

Collected by: MH13

File Name : NM 6 & C084
Site Code :
Start Date : 5/11/2016
Page No : 4

	C084 (Old Rt 66) Eastbound				Westbound				NM 6 Northbound				NM 6 Southbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 00:00 to 10:00 - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 08:30																	
08:30	2	0	0	2	0	0	0	0	0	11	0	11	0	6	1	7	20
08:45	1	0	0	1	0	0	0	0	0	20	0	20	0	5	0	5	26
09:00	3	0	1	4	0	0	0	0	0	13	0	13	0	7	2	9	26
09:15	2	0	0	2	0	0	0	0	1	8	0	9	0	6	1	7	18
Total Volume	8	0	1	9	0	0	0	0	1	52	0	53	0	24	4	28	90
% App. Total	88.9	0	11.1		0	0	0		1.9	98.1	0		0	85.7	14.3		
PHF	.667	.000	.250	.563	.000	.000	.000	.000	.250	.650	.000	.663	.000	.857	.500	.778	.865
Car	7	0	1	8	0	0	0	0	1	43	0	44	0	17	4	21	73
% Car	87.5	0	100	88.9	0	0	0	0	100	82.7	0	83.0	0	70.8	100	75.0	81.1
Med Truck	0	0	0	0	0	0	0	0	0	3	0	3	0	1	0	1	4
% Med Truck	0	0	0	0	0	0	0	0	0	5.8	0	5.7	0	4.2	0	3.6	4.4
Heavy Truck	1	0	0	1	0	0	0	0	0	6	0	6	0	6	0	6	13
% Heavy Truck	12.5	0	0	11.1	0	0	0	0	0	11.5	0	11.3	0	25.0	0	21.4	14.4
Peak Hour Analysis From 10:00 to 14:30 - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 13:00																	
13:00	1	0	0	1	0	0	0	0	1	9	0	10	0	9	1	10	21
13:15	3	0	3	6	0	0	0	0	1	8	0	9	0	9	3	12	27
13:30	0	0	1	1	0	0	0	0	1	6	0	7	0	16	0	16	24
13:45	6	0	0	6	0	0	0	0	2	10	0	12	0	17	3	20	38
Total Volume	10	0	4	14	0	0	0	0	5	33	0	38	0	51	7	58	110
% App. Total	71.4	0	28.6		0	0	0		13.2	86.8	0		0	87.9	12.1		
PHF	.417	.000	.333	.583	.000	.000	.000	.000	.625	.825	.000	.792	.000	.750	.583	.725	.724
Car	10	0	4	14	0	0	0	0	4	23	0	27	0	38	7	45	86
% Car	100	0	100	100	0	0	0	0	80.0	69.7	0	71.1	0	74.5	100	77.6	78.2
Med Truck	0	0	0	0	0	0	0	0	1	4	0	5	0	4	0	4	9
% Med Truck	0	0	0	0	0	0	0	0	20.0	12.1	0	13.2	0	7.8	0	6.9	8.2
Heavy Truck	0	0	0	0	0	0	0	0	0	6	0	6	0	9	0	9	15
% Heavy Truck	0	0	0	0	0	0	0	0	0	18.2	0	15.8	0	17.6	0	15.5	13.6
Peak Hour Analysis From 14:45 to 23:45 - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 15:15																	
15:15	2	0	2	4	0	0	0	0	3	14	0	17	0	16	0	16	37
15:30	8	0	3	11	0	0	0	0	1	13	0	14	0	14	2	16	41
15:45	4	0	0	4	0	0	0	0	0	9	0	9	0	15	7	22	35
16:00	6	0	0	6	0	0	0	0	1	9	0	10	0	10	2	12	28
Total Volume	20	0	5	25	0	0	0	0	5	45	0	50	0	55	11	66	141
% App. Total	80	0	20		0	0	0		10	90	0		0	83.3	16.7		
PHF	.625	.000	.417	.568	.000	.000	.000	.000	.417	.804	.000	.735	.000	.859	.393	.750	.860
Car	20	0	4	24	0	0	0	0	3	39	0	42	0	37	11	48	114
% Car	100	0	80.0	96.0	0	0	0	0	60.0	86.7	0	84.0	0	67.3	100	72.7	80.9
Med Truck	0	0	1	1	0	0	0	0	2	1	0	3	0	3	0	3	7
% Med Truck	0	0	20.0	4.0	0	0	0	0	40.0	2.2	0	6.0	0	5.5	0	4.5	5.0
Heavy Truck	0	0	0	0	0	0	0	0	0	5	0	5	0	15	0	15	20
% Heavy Truck	0	0	0	0	0	0	0	0	0	11.1	0	10.0	0	27.3	0	22.7	14.2

NEW MEXICO DEPARTMENT OF TRANSPORTATION
TRAFFIC VOLUME ESTIMATES

PROJECT 6101000 ROAD NO. NM 6 CN 6101000

TERMINI 1 to 3

BMP 1.000 LENGTH (MILES) 2

AADT (2015) ACTUAL 1,256

AADT (2017) 1,287 DHV (2017) 12

AADT ( ) DHV ( )

AADT (2027) 1,446 DHV (2027) 145

AADT (2037) 1,606 DHV (2037) 161

AADT (2047) DESIGN 1,765 DHV (2047) 177

% HEAVY COMMERCIAL (2015) ACTUAL 19.00% %

% HEAVY COMMERCIAL (2047) DESIGN 18.01% %

% HEAVY COMMERCIAL DURING DHV 16.01% %

NOISE MODEL DATA (% MEDIUM TRUCKS DURING DHV)

(% HEAVY TRUCKS DURING DHV)

SUBMITTED TO Lisa Zhong

DATE 9-Jun-2016

NEW MEXICO DEPARTMENT OF TRANSPORTATION
TRAFFIC VOLUME ESTIMATES

PROJECT 6101000 ROAD NO. C-084 CN 6101000

TERMINI 0 to 1

BMP 0.000 LENGTH (MILES) 1

AADT (2014) ACTUAL 96

AADT (2017) 96 DHV (2017) 12

AADT ( ) DHV ( )

AADT (2027) 98 DHV (2027) 13

AADT (2037) 99 DHV (2037) 13

AADT (2047) DESIGN 101 DHV (2047) 13

% HEAVY COMMERCIAL (2014) ACTUAL 10.00% %

% HEAVY COMMERCIAL (2047) DESIGN 12.87% %

% HEAVY COMMERCIAL DURING DHV 10.87% %

NOISE MODEL DATA (% MEDIUM TRUCKS DURING DHV)

(% HEAVY TRUCKS DURING DHV)

SUBMITTED TO Robert Young

DATE 20-Apr-2015

APPENDIX B – EXISTING OPERATIONAL ANALYSIS

Phone: Fax:
E-Mail:

Directional Two-Lane Highway Segment Analysis

Analyst	Lisa Zhong
Agency/Co.	HDR
Date Performed	8/30/2016
Analysis Time Period	
Highway	NM 6
From/To	MP1.5-MP2.5
Jurisdiction	
Analysis Year	Year 2016
Description	Cibola County Bridge

Input Data

Highway class	Class 1		Peak hour factor, PHF	0.88	
Shoulder width	2.0	ft	% Trucks and buses	19	%
Lane width	11.0	ft	% Trucks crawling	0.0	%
Segment length	1.0	mi	Truck crawl speed	0.0	mi/hr
Terrain type	Level		% Recreational vehicles	0	%
Grade: Length	-	mi	% No-passing zones	100	%
Up/down	-	%	Access point density	2	/mi

Analysis direction volume, Vd	50	veh/h
Opposing direction volume, Vo	67	veh/h

Average Travel Speed

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.9		1.9	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adj. factor,(note-5) fHV	0.854		0.854	
Grade adj. factor,(note-1) fg	1.00		1.00	
Directional flow rate,(note-2) vi	67	pc/h	89	pc/h

Free-Flow Speed from Field Measurement:		
Field measured speed,(note-3) S FM	-	mi/h
Observed total demand,(note-3) V	-	veh/h
Estimated Free-Flow Speed:		
Base free-flow speed,(note-3) BFFS	60.0	mi/h
Adj. for lane and shoulder width,(note-3) fLS	3.0	mi/h
Adj. for access point density,(note-3) fA	0.5	mi/h
Free-flow speed, FFSd	56.5	mi/h
Adjustment for no-passing zones, fnp	2.8	mi/h
Average travel speed, ATSd	52.5	mi/h
Percent Free Flow Speed, PFFS	93.0	%

Percent Time-Spent-Following

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.1		1.1	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adjustment factor, fHV	0.981		0.981	
Grade adjustment factor,(note-1) fg	1.00		1.00	
Directional flow rate,(note-2) vi	58	pc/h	78	pc/h
Base percent time-spent-following,(note-4) BPTSFd	7.0	%		
Adjustment for no-passing zones, fnp	53.3			
Percent time-spent-following, PTSFd	29.7	%		

Level of Service and Other Performance Measures

Level of service, LOS	B	
Volume to capacity ratio, v/c	0.04	
Peak 15-min vehicle-miles of travel, VMT15	14	veh-mi
Peak-hour vehicle-miles of travel, VMT60	50	veh-mi
Peak 15-min total travel time, TT15	0.3	veh-h
Capacity from ATS, CdATS	1452	veh/h
Capacity from PTSF, CdPTSF	1668	veh/h
Directional Capacity	1452	veh/h

Passing Lane Analysis

Total length of analysis segment, Lt	1.0	mi
Length of two-lane highway upstream of the passing lane, Lu	-	mi
Length of passing lane including tapers, Lpl	-	mi
Average travel speed, ATSd (from above)	52.5	mi/h
Percent time-spent-following, PTSFd (from above)	29.7	
Level of service, LOSd (from above)	B	

Average Travel Speed with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for average travel speed, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for average travel speed, Ld	-	mi
Adj. factor for the effect of passing lane on average speed, fpl	-	
Average travel speed including passing lane, ATSpl	-	
Percent free flow speed including passing lane, PFFSpl	0.0	%

Percent Time-Spent-Following with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for percent time-spent-following, Ld	-	mi
Adj. factor for the effect of passing lane on percent time-spent-following, fpl	-	
Percent time-spent-following including passing lane, PTSFpl	-	%

Level of Service and Other Performance Measures with Passing Lane

Level of service including passing lane, LOSpl	E	
Peak 15-min total travel time, TT15	-	veh-h

Bicycle Level of Service

Posted speed limit, Sp	55
Percent of segment with occupied on-highway parking	0
Pavement rating, P	3
Flow rate in outside lane, vOL	56.8
Effective width of outside lane, We	22.75
Effective speed factor, St	4.79
Bicycle LOS Score, BLOS	8.77
Bicycle LOS	F

Notes:

1. Note that the adjustment factor for level terrain is 1.00, as level terrain is one of the base conditions. For the purpose of grade adjustment, specific dewngrade segments are treated as level terrain.
2. If vi (vd or vo) >= 1,700 pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

Phone: Fax:
E-Mail:

Directional Two-Lane Highway Segment Analysis

Analyst	Lisa Zhong
Agency/Co.	HDR
Date Performed	8/30/2016
Analysis Time Period	
Highway	C084
From/To	
Jurisdiction	
Analysis Year	Year 2016
Description	Cibola County Bridge

Input Data

Highway class	Class 1		Peak hour factor, PHF	0.88	
Shoulder width	1.0	ft	% Trucks and buses	10	%
Lane width	10.0	ft	% Trucks crawling	0.0	%
Segment length	1.0	mi	Truck crawl speed	0.0	mi/hr
Terrain type	Level		% Recreational vehicles	0	%
Grade: Length	-	mi	% No-passing zones	100	%
Up/down	-	%	Access point density	0	/mi

Analysis direction volume, Vd 24 veh/h
Opposing direction volume, Vo 18 veh/h

Average Travel Speed

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.9		1.9	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adj. factor,(note-5) fHV	0.917		0.917	
Grade adj. factor,(note-1) fg	1.00		1.00	
Directional flow rate,(note-2) vi	30	pc/h	22	pc/h

Free-Flow Speed from Field Measurement:		
Field measured speed,(note-3) S FM	-	mi/h
Observed total demand,(note-3) V	-	veh/h
Estimated Free-Flow Speed:		
Base free-flow speed,(note-3) BFFS	60.0	mi/h
Adj. for lane and shoulder width,(note-3) fLS	5.3	mi/h
Adj. for access point density,(note-3) fA	0.0	mi/h
Free-flow speed, FFSd	54.7	mi/h
Adjustment for no-passing zones, fnp	2.7	mi/h
Average travel speed, ATSd	51.6	mi/h
Percent Free Flow Speed, PFFS	94.3	%

Percent Time-Spent-Following

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.1		1.1	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adjustment factor, fHV	0.990		0.990	
Grade adjustment factor,(note-1) fg	1.00		1.00	
Directional flow rate,(note-2) vi	28	pc/h	21	pc/h

Base percent time-spent-following,(note-4) BPTSFd	3.5	%
Adjustment for no-passing zones, fnp	53.2	
Percent time-spent-following, PTSFd	33.9	%

Level of Service and Other Performance Measures

Level of service, LOS	B	
Volume to capacity ratio, v/c	0.02	
Peak 15-min vehicle-miles of travel, VMT15	7	veh-mi
Peak-hour vehicle-miles of travel, VMT60	24	veh-mi
Peak 15-min total travel time, TT15	0.1	veh-h
Capacity from ATS, CdATS	1559	veh/h
Capacity from PTSF, CdPTSF	1683	veh/h
Directional Capacity	1559	veh/h

Passing Lane Analysis

Total length of analysis segment, Lt	1.0	mi
Length of two-lane highway upstream of the passing lane, Lu	-	mi
Length of passing lane including tapers, Lpl	-	mi
Average travel speed, ATSd (from above)	51.6	mi/h
Percent time-spent-following, PTSFd (from above)	33.9	
Level of service, LOSd (from above)	B	

Average Travel Speed with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for average travel speed, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for average travel speed, Ld	-	mi
Adj. factor for the effect of passing lane on average speed, fpl	-	
Average travel speed including passing lane, ATSpl	-	
Percent free flow speed including passing lane, PFFSpl	0.0	%

Percent Time-Spent-Following with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for percent time-spent-following, Ld	-	mi
Adj. factor for the effect of passing lane on percent time-spent-following, fpl	-	
Percent time-spent-following including passing lane, PTSFpl	-	%

Level of Service and Other Performance Measures with Passing Lane

Level of service including passing lane, LOSpl	E	
Peak 15-min total travel time, TT15	-	veh-h

Bicycle Level of Service

Posted speed limit, Sp	55
Percent of segment with occupied on-highway parking	0
Pavement rating, P	3
Flow rate in outside lane, vOL	27.3
Effective width of outside lane, We	20.68
Effective speed factor, St	4.79
Bicycle LOS Score, BLOS	4.35
Bicycle LOS	D

Notes:

1. Note that the adjustment factor for level terrain is 1.00, as level terrain is one of the base conditions. For the purpose of grade adjustment, specific dewngrade segments are treated as level terrain.
2. If vi (vd or vo) >= 1,700 pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: Lisa Zhong
Agency/Co.: HDR
Date Performed: 7/12/2016
Analysis Time Period: AM Peak
Intersection: C084&NM 6
Jurisdiction:
Units: U. S. Customary
Analysis Year: 2016
Project ID:
East/West Street: C084
North/South Street: NM 6
Intersection Orientation: NS   Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	1	52	0	0	24	4
Peak-Hour Factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Hourly Flow Rate, HFR	1	52	0	0	24	4
Percent Heavy Vehicles	0	--	--	0	--	--
Median Type/Storage	TWLTL			/ 1		
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				8	0	1
Peak Hour Factor, PHF				1.00	1.00	1.00
Hourly Flow Rate, HFR				8	0	1
Percent Heavy Vehicles				0	0	0
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			/			No /
Lanes				0	1	0
Configuration					LTR	

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LTR	LTR					LTR	
v (vph)	1	0					9	
C(m) (vph)	1599	1567					889	
v/c	0.00	0.00					0.01	
95% queue length	0.00	0.00					0.03	
Control Delay	7.3	7.3					9.1	
LOS	A	A					A	
Approach Delay							9.1	
Approach LOS							A	

HCS+: Unsignalized Intersections Release 5.6

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: Lisa Zhong
Agency/Co.: HDR
Date Performed: 7/12/2016
Analysis Time Period: AM Peak
Intersection: C084&NM 6
Jurisdiction:
Units: U. S. Customary
Analysis Year: 2016
Project ID:
East/West Street: C084
North/South Street: NM 6
Intersection Orientation: NS Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street Movements	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	1	52	0	0	24	4
Peak-Hour Factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Peak-15 Minute Volume	0	13	0	0	6	1
Hourly Flow Rate, HFR	1	52	0	0	24	4
Percent Heavy Vehicles	0	--	--	0	--	--
Median Type/Storage	TWLTL			/ 1		
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	
Upstream Signal?		No			No	

Minor Street Movements	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				8	0	1
Peak Hour Factor, PHF				1.00	1.00	1.00
Peak-15 Minute Volume				2	0	0
Hourly Flow Rate, HFR				8	0	1
Percent Heavy Vehicles				0	0	0
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			/			No /
RT Channelized?						
Lanes				0	1	0
Configuration					LTR	

Pedestrian Volumes and Adjustments

Movements	13	14	15	16
Flow (ped/hr)	0	0	0	0

Lane Width (ft)	12.0	12.0	12.0	12.0
Walking Speed (ft/sec)	4.0	4.0	4.0	4.0
Percent Blockage	0	0	0	0

Upstream Signal Data

	Prog. Flow vph	Sat Flow vph	Arrival Type	Green Time sec	Cycle Length sec	Prog. Speed mph	Distance to Signal feet
S2 Left-Turn							
Through							
S5 Left-Turn							
Through							

Worksheet 3-Data for Computing Effect of Delay to Major Street Vehicles

	Movement 2	Movement 5
Shared ln volume, major th vehicles:	52	24
Shared ln volume, major rt vehicles:	0	4
Sat flow rate, major th vehicles:	1700	1700
Sat flow rate, major rt vehicles:	1700	1700
Number of major street through lanes:	1	1

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation

Movement		1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(c,base)		4.1	4.1				7.1	6.5	6.2
t(c,hv)		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)		0	0				0	0	0
t(c,g)				0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade				0.00	0.00	0.00	0.00	0.00	0.00
t(3,lt)		0.00	0.00				0.70	0.00	0.00
t(c,T):	1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c)	1-stage	4.1	4.1				6.4	6.5	6.2
	2-stage	4.1	4.1				5.4	5.5	6.2

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)	2.20	2.20				3.50	4.00	3.30
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)	0	0				0	0	0
t(f)	2.2	2.2				3.5	4.0	3.3

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

	Movement 2 V(t)	Movement 2 V(l,prot)	Movement 5 V(t)	Movement 5 V(l,prot)
V prog				

Total Saturation Flow Rate, s (vph)		
Arrival Type		
Effective Green, g (sec)		
Cycle Length, C (sec)		
Rp (from Exhibit 16-11)		
Proportion vehicles arriving on green P		
g(q1)		
g(q2)		
g(q)		

Computation 2-Proportion of TWSC Intersection Time blocked

	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
alpha				
beta				
Travel time, t(a) (sec)				
Smoothing Factor, F				
Proportion of conflicting flow, f				
Max platooned flow, V(c,max)				
Min platooned flow, V(c,min)				
Duration of blocked period, t(p)				
Proportion time blocked, p		0.000		0.000

Computation 3-Platoon Event Periods	Result
p(2)	0.000
p(5)	0.000
p(dom)	
p(subo)	
Constrained or unconstrained?	

Proportion unblocked for minor movements, p(x)	(1) Single-stage Process	(2) Two-Stage Process Stage I	(3) Two-Stage Process Stage II
p(1)			
p(4)			
p(7)			
p(8)			
p(9)			
p(10)			
p(11)			
p(12)			

Computation 4 and 5
Single-Stage Process

Movement	1	4	7	8	9	10	11	12
	L	L	L	T	R	L	T	R
V c,x	28	52				80	80	26
s								
Px								
V c,u,x								
C r,x								
C plat,x								

Two-Stage Process

	7	8	10	11

	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2
V(c,x)					26	54	26	54
s						1500		1500
P(x)								
V(c,u,x)								
C(r,x)								
C(plat,x)								

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.	9	12
Conflicting Flows		26
Potential Capacity		1056
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity		1056
Probability of Queue free St.	1.00	1.00

Step 2: LT from Major St.	4	1
Conflicting Flows	52	28
Potential Capacity	1567	1599
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	1567	1599
Probability of Queue free St.	1.00	1.00
Maj L-Shared Prob Q free St.	1.00	1.00

Step 3: TH from Minor St.	8	11
Conflicting Flows		80
Potential Capacity		814
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	1.00	1.00
Movement Capacity		813
Probability of Queue free St.	1.00	1.00

Step 4: LT from Minor St.	7	10
Conflicting Flows		80
Potential Capacity		927
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	1.00	
Maj. L, Min T Adj. Imp Factor.	1.00	
Cap. Adj. factor due to Impeding mvmnt	1.00	1.00
Movement Capacity		926

Worksheet 7-Computation of the Effect of Two-stage Gap Acceptance

Step 3: TH from Minor St.	8	11
Part 1 - First Stage		
Conflicting Flows		26
Potential Capacity	854	878
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	1.00	1.00
Movement Capacity	853	878
Probability of Queue free St.	1.00	1.00

Part 2 - Second Stage		
Conflicting Flows		54
Potential Capacity	876	854
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	1.00	1.00
Movement Capacity	876	853

Part 3 - Single Stage		
Conflicting Flows		80
Potential Capacity		814
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	1.00	1.00
Movement Capacity		813

Result for 2 stage process:		
a	0.91	0.91
y		
C t		813
Probability of Queue free St.	1.00	1.00

Step 4: LT from Minor St.	7	10

Part 1 - First Stage		
Conflicting Flows		26
Potential Capacity	974	1002
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	1.00	1.00
Movement Capacity	973	1002

Part 2 - Second Stage		
Conflicting Flows		54
Potential Capacity	1002	974
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	1.00	1.00
Movement Capacity	1001	973

Part 3 - Single Stage		
Conflicting Flows		80
Potential Capacity		927
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	1.00	
Maj. L, Min T Adj. Imp Factor.	1.00	
Cap. Adj. factor due to Impeding mvmnt	1.00	1.00
Movement Capacity		926

Results for Two-stage process:		
a	0.91	0.91
y		1.62
C t		872

Worksheet 8-Shared Lane Calculations

Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume (vph)				8	0	1
Movement Capacity (vph)				872	813	1056
Shared Lane Capacity (vph)					889	

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

Movement	7 L	8 T	9 R	10 L	11 T	12 R
C sep				872	813	1056
Volume				8	0	1
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh					889	
SUM C sep						
n						
C act						

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config	LTR	LTR					LTR	
v (vph)	1	0					9	
C(m) (vph)	1599	1567					889	
v/c	0.00	0.00					0.01	
95% queue length	0.00	0.00					0.03	
Control Delay	7.3	7.3					9.1	
LOS	A	A					A	
Approach Delay							9.1	
Approach LOS							A	

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	1.00	1.00
v(il), Volume for stream 2 or 5	52	24
v(i2), Volume for stream 3 or 6	0	4
s(il), Saturation flow rate for stream 2 or 5	1700	1700
s(i2), Saturation flow rate for stream 3 or 6	1700	1700
P*(oj)	1.00	1.00
d(M,LT), Delay for stream 1 or 4	7.3	7.3
N, Number of major street through lanes	1	1
d(rank,1) Delay for stream 2 or 5	0.0	0.0

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: Lisa Zhong
Agency/Co.: HDR
Date Performed: 7/12/2016
Analysis Time Period: Mid-Day Peak
Intersection: C084&NM 6
Jurisdiction:
Units: U. S. Customary
Analysis Year: 2016
Project ID:
East/West Street: C084
North/South Street: NM 6
Intersection Orientation: NS Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	5	33	0	0	51	7
Peak-Hour Factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Hourly Flow Rate, HFR	5	33	0	0	51	7
Percent Heavy Vehicles	0	--	--	0	--	--
Median Type/Storage	TWLTL			/ 1		
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				10	0	
Peak Hour Factor, PHF				1.00	1.00	1.00
Hourly Flow Rate, HFR				10	0	0
Percent Heavy Vehicles				0	0	0
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			/			No /
Lanes				0	1	0
Configuration					LTR	

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LTR	LTR					LTR	
v (vph)	5	0					10	
C(m) (vph)	1559	1592					859	
v/c	0.00	0.00					0.01	
95% queue length	0.01	0.00					0.04	
Control Delay	7.3	7.3					9.2	
LOS	A	A					A	
Approach Delay							9.2	
Approach LOS							A	

HCS+: Unsignalized Intersections Release 5.6

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: Lisa Zhong
Agency/Co.: HDR
Date Performed: 7/12/2016
Analysis Time Period: Mid-Day Peak
Intersection: C084&NM 6
Jurisdiction:
Units: U. S. Customary
Analysis Year: 2016
Project ID:
East/West Street: C084
North/South Street: NM 6
Intersection Orientation: NS Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street Movements	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	5	33	0	0	51	7
Peak-Hour Factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Peak-15 Minute Volume	1	8	0	0	13	2
Hourly Flow Rate, HFR	5	33	0	0	51	7
Percent Heavy Vehicles	0	--	--	0	--	--
Median Type/Storage	TWLTL			/ 1		
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	
Upstream Signal?		No			No	

Minor Street Movements	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				10	0	
Peak Hour Factor, PHF				1.00	1.00	1.00
Peak-15 Minute Volume				2	0	0
Hourly Flow Rate, HFR				10	0	0
Percent Heavy Vehicles				0	0	0
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			/			No /
RT Channelized?						
Lanes				0	1	0
Configuration					LTR	

Pedestrian Volumes and Adjustments

Movements	13	14	15	16
Flow (ped/hr)	0	0	0	0

Lane Width (ft)	12.0	12.0	12.0	12.0
Walking Speed (ft/sec)	4.0	4.0	4.0	4.0
Percent Blockage	0	0	0	0

Upstream Signal Data

	Prog. Flow vph	Sat Flow vph	Arrival Type	Green Time sec	Cycle Length sec	Prog. Speed mph	Distance to Signal feet
S2 Left-Turn							
Through							
S5 Left-Turn							
Through							

Worksheet 3-Data for Computing Effect of Delay to Major Street Vehicles

	Movement 2	Movement 5
Shared ln volume, major th vehicles:	33	51
Shared ln volume, major rt vehicles:	0	7
Sat flow rate, major th vehicles:	1700	1700
Sat flow rate, major rt vehicles:	1700	1700
Number of major street through lanes:	1	1

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation

Movement		1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(c,base)		4.1	4.1				7.1	6.5	6.2
t(c,hv)		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)		0	0				0	0	0
t(c,g)				0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade				0.00	0.00	0.00	0.00	0.00	0.00
t(3,lt)		0.00	0.00				0.70	0.00	0.00
t(c,T):	1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c)	1-stage	4.1	4.1				6.4	6.5	6.2
	2-stage	4.1	4.1				5.4	5.5	6.2

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)	2.20	2.20				3.50	4.00	3.30
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)	0	0				0	0	0
t(f)	2.2	2.2				3.5	4.0	3.3

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

	Movement 2 V(t)	Movement 2 V(l,prot)	Movement 5 V(t)	Movement 5 V(l,prot)
V prog				

Total Saturation Flow Rate, s (vph)
Arrival Type
Effective Green, g (sec)
Cycle Length, C (sec)
Rp (from Exhibit 16-11)
Proportion vehicles arriving on green P
g(q1)
g(q2)
g(q)

Computation 2-Proportion of TWSC Intersection Time blocked

	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
alpha				
beta				
Travel time, t(a) (sec)				
Smoothing Factor, F				
Proportion of conflicting flow, f				
Max platooned flow, V(c,max)				
Min platooned flow, V(c,min)				
Duration of blocked period, t(p)				
Proportion time blocked, p	0.000		0.000	

Computation 3-Platoon Event Periods	Result
p(2)	0.000
p(5)	0.000
p(dom)	
p(subo)	
Constrained or unconstrained?	

Proportion unblocked for minor movements, p(x)	(1) Single-stage Process	(2) Two-Stage Process Stage I	(3) Two-Stage Process Stage II
p(1)			
p(4)			
p(7)			
p(8)			
p(9)			
p(10)			
p(11)			
p(12)			

Computation 4 and 5
Single-Stage Process

Movement	1	4	7	8	9	10	11	12
	L	L	L	T	R	L	T	R
V c,x	58	33				97	97	54
s								
Px								
V c,u,x								
C r,x								
C plat,x								

Two-Stage Process

	7	8	10	11

	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2
V(c,x)					54	43	54	43
s						1500		1500
P(x)								
V(c,u,x)								
C(r,x)								
C(plat,x)								

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.	9	12
Conflicting Flows		54
Potential Capacity		1019
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity		1019
Probability of Queue free St.	1.00	1.00

Step 2: LT from Major St.	4	1
Conflicting Flows	33	58
Potential Capacity	1592	1559
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	1592	1559
Probability of Queue free St.	1.00	1.00
Maj L-Shared Prob Q free St.	1.00	1.00

Step 3: TH from Minor St.	8	11
Conflicting Flows		97
Potential Capacity		797
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	1.00	1.00
Movement Capacity		794
Probability of Queue free St.	1.00	1.00

Step 4: LT from Minor St.	7	10
Conflicting Flows		97
Potential Capacity		907
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	1.00	
Maj. L, Min T Adj. Imp Factor.	1.00	
Cap. Adj. factor due to Impeding mvmnt	1.00	1.00
Movement Capacity		904

Worksheet 7-Computation of the Effect of Two-stage Gap Acceptance

Step 3: TH from Minor St.	8	11
Part 1 - First Stage		
Conflicting Flows		54
Potential Capacity	863	854
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	1.00	1.00
Movement Capacity	860	854
Probability of Queue free St.	1.00	1.00

Part 2 - Second Stage		
Conflicting Flows		43
Potential Capacity	851	863
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	1.00	1.00
Movement Capacity	851	860

Part 3 - Single Stage		
Conflicting Flows		97
Potential Capacity		797
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	1.00	1.00
Movement Capacity		794

Result for 2 stage process:		
a	0.91	0.91
y		
C t		794
Probability of Queue free St.	1.00	1.00

Step 4: LT from Minor St.	7	10

Part 1 - First Stage		
Conflicting Flows		54
Potential Capacity	985	974
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	1.00	1.00
Movement Capacity	982	974

Part 2 - Second Stage		
Conflicting Flows		43
Potential Capacity	974	985
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	1.00	1.00
Movement Capacity	974	982

Part 3 - Single Stage		
Conflicting Flows		97
Potential Capacity		907
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	1.00	
Maj. L, Min T Adj. Imp Factor.	1.00	
Cap. Adj. factor due to Impeding mvmnt	1.00	1.00
Movement Capacity		904

Results for Two-stage process:		
a	0.91	0.91
y		0.90
C t		859

Worksheet 8-Shared Lane Calculations

Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume (vph)				10	0	0
Movement Capacity (vph)				859	794	1019
Shared Lane Capacity (vph)					859	

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

Movement	7 L	8 T	9 R	10 L	11 T	12 R
C sep				859	794	1019
Volume				10	0	0
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh					859	
SUM C sep						
n						
C act						

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config	LTR	LTR					LTR	
v (vph)	5	0					10	
C(m) (vph)	1559	1592					859	
v/c	0.00	0.00					0.01	
95% queue length	0.01	0.00					0.04	
Control Delay	7.3	7.3					9.2	
LOS	A	A					A	
Approach Delay							9.2	
Approach LOS							A	

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	1.00	1.00
v(il), Volume for stream 2 or 5	33	51
v(i2), Volume for stream 3 or 6	0	7
s(il), Saturation flow rate for stream 2 or 5	1700	1700
s(i2), Saturation flow rate for stream 3 or 6	1700	1700
P*(oj)	1.00	1.00
d(M,LT), Delay for stream 1 or 4	7.3	7.3
N, Number of major street through lanes	1	1
d(rank,1) Delay for stream 2 or 5	0.0	0.0

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: Lisa Zhong
Agency/Co.: HDR
Date Performed: 7/12/2016
Analysis Time Period: PM Peak
Intersection: C084&NM 6
Jurisdiction:
Units: U. S. Customary
Analysis Year: 2016
Project ID:
East/West Street: C084
North/South Street: NM 6
Intersection Orientation: NS Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	5	45	0	0	45	0
Peak-Hour Factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Hourly Flow Rate, HFR	5	45	0	0	45	0
Percent Heavy Vehicles	0	--	--	0	--	--
Median Type/Storage	TWLTL			/ 1		
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				20	0	5
Peak Hour Factor, PHF				1.00	1.00	1.00
Hourly Flow Rate, HFR				20	0	5
Percent Heavy Vehicles				0	0	0
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			/			No /
Lanes				0	1	0
Configuration					LTR	

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LTR	LTR					LTR	
v (vph)	5	0					25	
C(m) (vph)	1576	1576					887	
v/c	0.00	0.00					0.03	
95% queue length	0.01	0.00					0.09	
Control Delay	7.3	7.3					9.2	
LOS	A	A					A	
Approach Delay							9.2	
Approach LOS							A	

HCS+: Unsignalized Intersections Release 5.6

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: Lisa Zhong
Agency/Co.: HDR
Date Performed: 7/12/2016
Analysis Time Period: PM Peak
Intersection: C084&NM 6
Jurisdiction:
Units: U. S. Customary
Analysis Year: 2016
Project ID:
East/West Street: C084
North/South Street: NM 6
Intersection Orientation: NS Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street Movements	1 L	2 T	3 R	4 L	5 T	6 R
Volume	5	45	0	0	45	0
Peak-Hour Factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Peak-15 Minute Volume	1	11	0	0	11	0
Hourly Flow Rate, HFR	5	45	0	0	45	0
Percent Heavy Vehicles	0	--	--	0	--	--
Median Type/Storage	TWLTL			/ 1		
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration	LTR			LTR		
Upstream Signal?		No			No	

Minor Street Movements	7 L	8 T	9 R	10 L	11 T	12 R
Volume				20	0	5
Peak Hour Factor, PHF				1.00	1.00	1.00
Peak-15 Minute Volume				5	0	1
Hourly Flow Rate, HFR				20	0	5
Percent Heavy Vehicles				0	0	0
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			/			No /
RT Channelized?						
Lanes				0	1	0
Configuration					LTR	

Pedestrian Volumes and Adjustments

Movements	13	14	15	16
Flow (ped/hr)	0	0	0	0

Lane Width (ft)	12.0	12.0	12.0	12.0
Walking Speed (ft/sec)	4.0	4.0	4.0	4.0
Percent Blockage	0	0	0	0

Upstream Signal Data

	Prog. Flow vph	Sat Flow vph	Arrival Type	Green Time sec	Cycle Length sec	Prog. Speed mph	Distance to Signal feet
S2 Left-Turn							
Through							
S5 Left-Turn							
Through							

Worksheet 3-Data for Computing Effect of Delay to Major Street Vehicles

	Movement 2	Movement 5
Shared ln volume, major th vehicles:	45	45
Shared ln volume, major rt vehicles:	0	0
Sat flow rate, major th vehicles:	1700	1700
Sat flow rate, major rt vehicles:	1700	1700
Number of major street through lanes:	1	1

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(c,base)	4.1	4.1				7.1	6.5	6.2
t(c,hv)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)	0	0				0	0	0
t(c,g)			0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade			0.00	0.00	0.00	0.00	0.00	0.00
t(3,lt)	0.00	0.00				0.70	0.00	0.00
t(c,T): 1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c) 1-stage	4.1	4.1				6.4	6.5	6.2
2-stage	4.1	4.1				5.4	5.5	6.2

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)	2.20	2.20				3.50	4.00	3.30
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)	0	0				0	0	0
t(f)	2.2	2.2				3.5	4.0	3.3

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

	Movement 2 V(t)	Movement 2 V(l,prot)	Movement 5 V(t)	Movement 5 V(l,prot)
V prog				

Total Saturation Flow Rate, s (vph)	
Arrival Type	
Effective Green, g (sec)	
Cycle Length, C (sec)	
Rp (from Exhibit 16-11)	
Proportion vehicles arriving on green P	
g(q1)	
g(q2)	
g(q)	

Computation 2-Proportion of TWSC Intersection Time blocked

	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
alpha				
beta				
Travel time, t(a) (sec)				
Smoothing Factor, F				
Proportion of conflicting flow, f				
Max platooned flow, V(c,max)				
Min platooned flow, V(c,min)				
Duration of blocked period, t(p)				
Proportion time blocked, p	0.000		0.000	

Computation 3-Platoon Event Periods	Result
p(2)	0.000
p(5)	0.000
p(dom)	
p(subo)	
Constrained or unconstrained?	

Proportion unblocked for minor movements, p(x)	(1) Single-stage Process	(2) Two-Stage Process Stage I	(3) Two-Stage Process Stage II
p(1)			
p(4)			
p(7)			
p(8)			
p(9)			
p(10)			
p(11)			
p(12)			

Computation 4 and 5
Single-Stage Process

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
V c,x	45	45				100	100	45
s								
Px								
V c,u,x								
C r,x								
C plat,x								

Two-Stage Process

	7	8	10	11

	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2
V(c,x)					45	55	45	55
s						1500		1500
P(x)								
V(c,u,x)								
C(r,x)								
C(plat,x)								

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.	9	12
Conflicting Flows		45
Potential Capacity		1031
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity		1031
Probability of Queue free St.	1.00	1.00

Step 2: LT from Major St.	4	1
Conflicting Flows	45	45
Potential Capacity	1576	1576
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	1576	1576
Probability of Queue free St.	1.00	1.00
Maj L-Shared Prob Q free St.	1.00	1.00

Step 3: TH from Minor St.	8	11
Conflicting Flows		100
Potential Capacity		794
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	1.00	1.00
Movement Capacity		791
Probability of Queue free St.	1.00	1.00

Step 4: LT from Minor St.	7	10
Conflicting Flows		100
Potential Capacity		904
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	1.00	
Maj. L, Min T Adj. Imp Factor.	1.00	
Cap. Adj. factor due to Impeding mvmnt	0.99	1.00
Movement Capacity		901

Worksheet 7-Computation of the Effect of Two-stage Gap Acceptance

Step 3: TH from Minor St.	8	11
Part 1 - First Stage		
Conflicting Flows		45
Potential Capacity	853	861
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	1.00	1.00
Movement Capacity	850	861
Probability of Queue free St.	1.00	1.00

Part 2 - Second Stage		
Conflicting Flows		55
Potential Capacity	861	853
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	1.00	1.00
Movement Capacity	861	850
Part 3 - Single Stage		
Conflicting Flows		100
Potential Capacity		794
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	1.00	1.00
Movement Capacity		791
Result for 2 stage process:		
a	0.91	0.91
y		
C t		791
Probability of Queue free St.	1.00	1.00

Step 4: LT from Minor St.	7	10
Part 1 - First Stage		
Conflicting Flows		45
Potential Capacity	973	983
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	1.00	1.00
Movement Capacity	970	983
Part 2 - Second Stage		
Conflicting Flows		55
Potential Capacity	980	973
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	1.00	1.00
Movement Capacity	975	970
Part 3 - Single Stage		
Conflicting Flows		100
Potential Capacity		904
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	1.00	
Maj. L, Min T Adj. Imp Factor.	1.00	
Cap. Adj. factor due to Impeding mvmnt	0.99	1.00
Movement Capacity		901
Results for Two-stage process:		
a	0.91	0.91
y		1.19
C t		857

Worksheet 8-Shared Lane Calculations

Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume (vph)				20	0	5
Movement Capacity (vph)				857	791	1031
Shared Lane Capacity (vph)					887	

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

Movement	7 L	8 T	9 R	10 L	11 T	12 R
C sep				857	791	1031
Volume				20	0	5
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh					887	
SUM C sep						
n						
C act						

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config	LTR	LTR					LTR	
v (vph)	5	0					25	
C(m) (vph)	1576	1576					887	
v/c	0.00	0.00					0.03	
95% queue length	0.01	0.00					0.09	
Control Delay	7.3	7.3					9.2	
LOS	A	A					A	
Approach Delay							9.2	
Approach LOS							A	

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	1.00	1.00
v(il), Volume for stream 2 or 5	45	45
v(i2), Volume for stream 3 or 6	0	0
s(il), Saturation flow rate for stream 2 or 5	1700	1700
s(i2), Saturation flow rate for stream 3 or 6	1700	1700
P*(oj)	1.00	1.00
d(M,LT), Delay for stream 1 or 4	7.3	7.3
N, Number of major street through lanes	1	1
d(rank,1) Delay for stream 2 or 5	0.0	0.0

APPENDIX C – NO-BUILD HORIZON YEAR 2037 OPERATIONAL ANALYSIS

Phone: Fax:
E-Mail:

Directional Two-Lane Highway Segment Analysis

Analyst	Lisa Zhong
Agency/Co.	HDR
Date Performed	8/30/2016
Analysis Time Period	
Highway	NM 6
From/To	MP1.5-2.5
Jurisdiction	
Analysis Year	Year 2037_No Build
Description	Cibola County Bridge

Input Data

Highway class	Class 1		Peak hour factor, PHF	0.88	
Shoulder width	2.0	ft	% Trucks and buses	18	%
Lane width	11.0	ft	% Trucks crawling	0.0	%
Segment length	1.0	mi	Truck crawl speed	0.0	mi/hr
Terrain type	Level		% Recreational vehicles	0	%
Grade: Length	-	mi	% No-passing zones	100	%
Up/down	-	%	Access point density	2	/mi

Analysis direction volume, Vd	63	veh/h
Opposing direction volume, Vo	85	veh/h

Average Travel Speed

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.9		1.9	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adj. factor,(note-5) fHV	0.861		0.861	
Grade adj. factor,(note-1) fg	1.00		1.00	
Directional flow rate,(note-2) vi	83	pc/h	112	pc/h

Free-Flow Speed from Field Measurement:		
Field measured speed,(note-3) S FM	-	mi/h
Observed total demand,(note-3) V	-	veh/h
Estimated Free-Flow Speed:		
Base free-flow speed,(note-3) BFFS	60.0	mi/h
Adj. for lane and shoulder width,(note-3) fLS	3.0	mi/h
Adj. for access point density,(note-3) fA	0.5	mi/h
Free-flow speed, FFSd	56.5	mi/h
Adjustment for no-passing zones, fnp	2.9	mi/h
Average travel speed, ATSd	52.1	mi/h
Percent Free Flow Speed, PFFS	92.1	%

Percent Time-Spent-Following

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.1		1.1	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adjustment factor, fHV	0.982		0.982	
Grade adjustment factor,(note-1) fg	1.00		1.00	
Directional flow rate,(note-2) vi	73	pc/h	98	pc/h
Base percent time-spent-following,(note-4) BPTSFd	8.7	%		
Adjustment for no-passing zones, fnp	53.3			
Percent time-spent-following, PTSFd	31.5	%		

Level of Service and Other Performance Measures

Level of service, LOS	B	
Volume to capacity ratio, v/c	0.05	
Peak 15-min vehicle-miles of travel, VMT15	18	veh-mi
Peak-hour vehicle-miles of travel, VMT60	63	veh-mi
Peak 15-min total travel time, TT15	0.3	veh-h
Capacity from ATS, CdATS	1464	veh/h
Capacity from PTSF, CdPTSF	1670	veh/h
Directional Capacity	1464	veh/h

Passing Lane Analysis

Total length of analysis segment, Lt	1.0	mi
Length of two-lane highway upstream of the passing lane, Lu	-	mi
Length of passing lane including tapers, Lpl	-	mi
Average travel speed, ATSd (from above)	52.1	mi/h
Percent time-spent-following, PTSFd (from above)	31.5	
Level of service, LOSd (from above)	B	

Average Travel Speed with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for average travel speed, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for average travel speed, Ld	-	mi
Adj. factor for the effect of passing lane on average speed, fpl	-	
Average travel speed including passing lane, ATSpl	-	
Percent free flow speed including passing lane, PFFSpl	0.0	%

Percent Time-Spent-Following with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for percent time-spent-following, Ld	-	mi
Adj. factor for the effect of passing lane on percent time-spent-following, fpl	-	
Percent time-spent-following including passing lane, PTSFpl	-	%

Level of Service and Other Performance Measures with Passing Lane

Level of service including passing lane, LOSpl	E	
Peak 15-min total travel time, TT15	-	veh-h

Bicycle Level of Service

Posted speed limit, Sp	55
Percent of segment with occupied on-highway parking	0
Pavement rating, P	3
Flow rate in outside lane, vOL	71.6
Effective width of outside lane, We	21.91
Effective speed factor, St	4.79
Bicycle LOS Score, BLOS	8.49
Bicycle LOS	F

Notes:

1. Note that the adjustment factor for level terrain is 1.00, as level terrain is one of the base conditions. For the purpose of grade adjustment, specific dewngrade segments are treated as level terrain.
2. If vi (vd or vo) >= 1,700 pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

Phone: Fax:
E-Mail:

Directional Two-Lane Highway Segment Analysis

Analyst	Lisa Zhong
Agency/Co.	HDR
Date Performed	8/30/2016
Analysis Time Period	
Highway	C084
From/To	
Jurisdiction	
Analysis Year	Year 2037_No Build
Description	Cibola County Bridge

Input Data

Highway class	Class 1		Peak hour factor, PHF	0.88	
Shoulder width	1.0	ft	% Trucks and buses	13	%
Lane width	10.0	ft	% Trucks crawling	0.0	%
Segment length	1.0	mi	Truck crawl speed	0.0	mi/hr
Terrain type	Level		% Recreational vehicles	0	%
Grade: Length	-	mi	% No-passing zones	100	%
Up/down	-	%	Access point density	0	/mi

Analysis direction volume, Vd	25	veh/h
Opposing direction volume, Vo	19	veh/h

Average Travel Speed

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.9		1.9	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adj. factor,(note-5) fHV	0.895		0.895	
Grade adj. factor,(note-1) fg	1.00		1.00	
Directional flow rate,(note-2) vi	32	pc/h	24	pc/h

Free-Flow Speed from Field Measurement:		
Field measured speed,(note-3) S FM	-	mi/h
Observed total demand,(note-3) V	-	veh/h
Estimated Free-Flow Speed:		
Base free-flow speed,(note-3) BFFS	60.0	mi/h
Adj. for lane and shoulder width,(note-3) fLS	5.3	mi/h
Adj. for access point density,(note-3) fA	0.0	mi/h
Free-flow speed, FFSd	54.7	mi/h
Adjustment for no-passing zones, fnp	2.7	mi/h
Average travel speed, ATSd	51.6	mi/h
Percent Free Flow Speed, PFFS	94.3	%

Percent Time-Spent-Following

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.1		1.1	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adjustment factor, fHV	0.987		0.987	
Grade adjustment factor,(note-1) fg	1.00		1.00	
Directional flow rate,(note-2) vi	29	pc/h	22	pc/h

Base percent time-spent-following,(note-4) BPTSFd	3.6	%
Adjustment for no-passing zones, fnp	53.2	
Percent time-spent-following, PTSFd	33.9	%

Level of Service and Other Performance Measures

Level of service, LOS	B	
Volume to capacity ratio, v/c	0.02	
Peak 15-min vehicle-miles of travel, VMT15	7	veh-mi
Peak-hour vehicle-miles of travel, VMT60	25	veh-mi
Peak 15-min total travel time, TT15	0.1	veh-h
Capacity from ATS, CdATS	1522	veh/h
Capacity from PTSF, CdPTSF	1678	veh/h
Directional Capacity	1522	veh/h

Passing Lane Analysis

Total length of analysis segment, Lt	1.0	mi
Length of two-lane highway upstream of the passing lane, Lu	-	mi
Length of passing lane including tapers, Lpl	-	mi
Average travel speed, ATSd (from above)	51.6	mi/h
Percent time-spent-following, PTSFd (from above)	33.9	
Level of service, LOSd (from above)	B	

Average Travel Speed with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for average travel speed, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for average travel speed, Ld	-	mi
Adj. factor for the effect of passing lane on average speed, fpl	-	
Average travel speed including passing lane, ATSpl	-	
Percent free flow speed including passing lane, PFFSpl	0.0	%

Percent Time-Spent-Following with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for percent time-spent-following, Ld	-	mi
Adj. factor for the effect of passing lane on percent time-spent-following, fpl	-	
Percent time-spent-following including passing lane, PTSFpl	-	%

Level of Service and Other Performance Measures with Passing Lane

Level of service including passing lane, LOSpl	E	
Peak 15-min total travel time, TT15	-	veh-h

Bicycle Level of Service

Posted speed limit, Sp	55
Percent of segment with occupied on-highway parking	0
Pavement rating, P	3
Flow rate in outside lane, vOL	28.4
Effective width of outside lane, We	20.63
Effective speed factor, St	4.79
Bicycle LOS Score, BLOS	5.69
Bicycle LOS	F

Notes:

1. Note that the adjustment factor for level terrain is 1.00, as level terrain is one of the base conditions. For the purpose of grade adjustment, specific dewngrade segments are treated as level terrain.
2. If vi (vd or vo) >= 1,700 pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: Lisa Zhong
Agency/Co.: HDR
Date Performed: 7/12/2016
Analysis Time Period: AM Peak
Intersection: C084&NM 6
Jurisdiction:
Units: U. S. Customary
Analysis Year: 2037
Project ID:
East/West Street: C084
North/South Street: NM 6
Intersection Orientation: NS   Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	1	66	0	0	30	
Peak-Hour Factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Hourly Flow Rate, HFR	1	66	0	0	30	4
Percent Heavy Vehicles	0	--	--	0	--	--
Median Type/Storage	TWLTL			/ 1		
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				8	0	1
Peak Hour Factor, PHF				1.00	1.00	1.00
Hourly Flow Rate, HFR				8	0	1
Percent Heavy Vehicles				0	0	0
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			/		No	/
Lanes				0	1	0
Configuration					LTR	

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LTR	LTR					LTR	
v (vph)	1	0					9	
C(m) (vph)	1591	1549					874	
v/c	0.00	0.00					0.01	
95% queue length	0.00	0.00					0.03	
Control Delay	7.3	7.3					9.2	
LOS	A	A					A	
Approach Delay							9.2	
Approach LOS							A	

HCS+: Unsignalized Intersections Release 5.6

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: Lisa Zhong
Agency/Co.: HDR
Date Performed: 7/12/2016
Analysis Time Period: AM Peak
Intersection: C084&NM 6
Jurisdiction:
Units: U. S. Customary
Analysis Year: 2037
Project ID:
East/West Street: C084
North/South Street: NM 6
Intersection Orientation: NS Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street Movements	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	1	66	0	0	30	
Peak-Hour Factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Peak-15 Minute Volume	0	16	0	0	8	1
Hourly Flow Rate, HFR	1	66	0	0	30	4
Percent Heavy Vehicles	0	--	--	0	--	--
Median Type/Storage	TWLTL			/ 1		
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	
Upstream Signal?		No			No	

Minor Street Movements	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				8	0	1
Peak Hour Factor, PHF				1.00	1.00	1.00
Peak-15 Minute Volume				2	0	0
Hourly Flow Rate, HFR				8	0	1
Percent Heavy Vehicles				0	0	0
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			/			No /
RT Channelized?						
Lanes				0	1	0
Configuration					LTR	

Pedestrian Volumes and Adjustments

Movements	13	14	15	16
Flow (ped/hr)	0	0	0	0

Lane Width (ft)	12.0	12.0	12.0	12.0
Walking Speed (ft/sec)	4.0	4.0	4.0	4.0
Percent Blockage	0	0	0	0

Upstream Signal Data

		Prog. Flow vph	Sat Flow vph	Arrival Type	Green Time sec	Cycle Length sec	Prog. Speed mph	Distance to Signal feet
S2	Left-Turn							
	Through							
S5	Left-Turn							
	Through							

Worksheet 3-Data for Computing Effect of Delay to Major Street Vehicles

	Movement 2	Movement 5
Shared ln volume, major th vehicles:	66	30
Shared ln volume, major rt vehicles:	0	4
Sat flow rate, major th vehicles:	1700	1700
Sat flow rate, major rt vehicles:	1700	1700
Number of major street through lanes:	1	1

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation

Movement		1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(c,base)		4.1	4.1				7.1	6.5	6.2
t(c,hv)		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)		0	0				0	0	0
t(c,g)				0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade				0.00	0.00	0.00	0.00	0.00	0.00
t(3,lt)		0.00	0.00				0.70	0.00	0.00
t(c,T):	1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c)	1-stage	4.1	4.1				6.4	6.5	6.2
	2-stage	4.1	4.1				5.4	5.5	6.2

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)	2.20	2.20				3.50	4.00	3.30
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)	0	0				0	0	0
t(f)	2.2	2.2				3.5	4.0	3.3

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

	Movement 2 V(t)	Movement 2 V(l,prot)	Movement 5 V(t)	Movement 5 V(l,prot)
V prog				

Total Saturation Flow Rate, s (vph)
Arrival Type
Effective Green, g (sec)
Cycle Length, C (sec)
Rp (from Exhibit 16-11)
Proportion vehicles arriving on green P
g(q1)
g(q2)
g(q)

Computation 2-Proportion of TWSC Intersection Time blocked	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
alpha				
beta				
Travel time, t(a) (sec)				
Smoothing Factor, F				
Proportion of conflicting flow, f				
Max platooned flow, V(c,max)				
Min platooned flow, V(c,min)				
Duration of blocked period, t(p)				
Proportion time blocked, p		0.000		0.000

Computation 3-Platoon Event Periods	Result
p(2)	0.000
p(5)	0.000
p(dom)	
p(subo)	
Constrained or unconstrained?	

Proportion unblocked for minor movements, p(x)	(1) Single-stage Process	(2) Two-Stage Process Stage I	(3) Stage II
p(1)			
p(4)			
p(7)			
p(8)			
p(9)			
p(10)			
p(11)			
p(12)			

Computation 4 and 5
Single-Stage Process

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
V c,x	34	66				100	100	32
s								
Px								
V c,u,x								
C r,x								
C plat,x								

Two-Stage Process

	7	8	10	11

	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2
V(c,x)					32	68	32	68
s						1500		1500
P(x)								
V(c,u,x)								
C(r,x)								
C(plat,x)								

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.	9	12
Conflicting Flows		32
Potential Capacity		1048
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity		1048
Probability of Queue free St.	1.00	1.00

Step 2: LT from Major St.	4	1
Conflicting Flows	66	34
Potential Capacity	1549	1591
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	1549	1591
Probability of Queue free St.	1.00	1.00
Maj L-Shared Prob Q free St.	1.00	1.00

Step 3: TH from Minor St.	8	11
Conflicting Flows		100
Potential Capacity		794
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	1.00	1.00
Movement Capacity		793
Probability of Queue free St.	1.00	1.00

Step 4: LT from Minor St.	7	10
Conflicting Flows		100
Potential Capacity		904
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	1.00	
Maj. L, Min T Adj. Imp Factor.	1.00	
Cap. Adj. factor due to Impeding mvmnt	1.00	1.00
Movement Capacity		903

Worksheet 7-Computation of the Effect of Two-stage Gap Acceptance

Step 3: TH from Minor St.	8	11
Part 1 - First Stage		
Conflicting Flows		32
Potential Capacity	842	872
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	1.00	1.00
Movement Capacity	841	872
Probability of Queue free St.	1.00	1.00

Part 2 - Second Stage		
Conflicting Flows		68
Potential Capacity	871	842
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	1.00	1.00
Movement Capacity	871	841

Part 3 - Single Stage		
Conflicting Flows		100
Potential Capacity		794
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	1.00	1.00
Movement Capacity		793

Result for 2 stage process:		
a	0.91	0.91
y		
C t		793
Probability of Queue free St.	1.00	1.00

Step 4: LT from Minor St.	7	10

Part 1 - First Stage		
Conflicting Flows		32
Potential Capacity	960	996
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	1.00	1.00
Movement Capacity	959	996

Part 2 - Second Stage		
Conflicting Flows		68
Potential Capacity	996	960
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	1.00	1.00
Movement Capacity	995	959

Part 3 - Single Stage		
Conflicting Flows		100
Potential Capacity		904
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	1.00	
Maj. L, Min T Adj. Imp Factor.	1.00	
Cap. Adj. factor due to Impeding mvmnt	1.00	1.00
Movement Capacity		903

Results for Two-stage process:		
a	0.91	0.91
y		1.66
C t		856

Worksheet 8-Shared Lane Calculations

Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume (vph)				8	0	1
Movement Capacity (vph)				856	793	1048
Shared Lane Capacity (vph)					874	

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

Movement	7 L	8 T	9 R	10 L	11 T	12 R
C sep				856	793	1048
Volume				8	0	1
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh					874	
SUM C sep						
n						
C act						

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config	LTR	LTR					LTR	
v (vph)	1	0					9	
C(m) (vph)	1591	1549					874	
v/c	0.00	0.00					0.01	
95% queue length	0.00	0.00					0.03	
Control Delay	7.3	7.3					9.2	
LOS	A	A					A	
Approach Delay							9.2	
Approach LOS							A	

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	1.00	1.00
v(il), Volume for stream 2 or 5	66	30
v(i2), Volume for stream 3 or 6	0	4
s(il), Saturation flow rate for stream 2 or 5	1700	1700
s(i2), Saturation flow rate for stream 3 or 6	1700	1700
P*(oj)	1.00	1.00
d(M,LT), Delay for stream 1 or 4	7.3	7.3
N, Number of major street through lanes	1	1
d(rank,1) Delay for stream 2 or 5	0.0	0.0

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: Lisa Zhong
Agency/Co.: HDR
Date Performed: 7/12/2016
Analysis Time Period: Mid-Day Peak
Intersection: C084&NM 6
Jurisdiction:
Units: U. S. Customary
Analysis Year: 2037
Project ID:
East/West Street: C084
North/South Street: NM 6
Intersection Orientation: NS   Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	6	42	0	0	64	9
Peak-Hour Factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Hourly Flow Rate, HFR	6	42	0	0	64	9
Percent Heavy Vehicles	0	--	--	0	--	--
Median Type/Storage	TWLTL			/ 1		
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				10	0	4
Peak Hour Factor, PHF				1.00	1.00	1.00
Hourly Flow Rate, HFR				10	0	4
Percent Heavy Vehicles				0	0	0
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			/			No /
Lanes				0	1	0
Configuration					LTR	

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LTR	LTR					LTR	
v (vph)	6	0					14	
C(m) (vph)	1540	1580					880	
v/c	0.00	0.00					0.02	
95% queue length	0.01	0.00					0.05	
Control Delay	7.3	7.3					9.2	
LOS	A	A					A	
Approach Delay							9.2	
Approach LOS							A	

HCS+: Unsignalized Intersections Release 5.6

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: Lisa Zhong
Agency/Co.: HDR
Date Performed: 7/12/2016
Analysis Time Period: Mid-Day Peak
Intersection: C084&NM 6
Jurisdiction:
Units: U. S. Customary
Analysis Year: 2037
Project ID:
East/West Street: C084
North/South Street: NM 6
Intersection Orientation: NS Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street Movements	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	6	42	0	0	64	9
Peak-Hour Factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Peak-15 Minute Volume	2	10	0	0	16	2
Hourly Flow Rate, HFR	6	42	0	0	64	9
Percent Heavy Vehicles	0	--	--	0	--	--
Median Type/Storage	TWLTL			/ 1		
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	
Upstream Signal?		No			No	

Minor Street Movements	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				10	0	4
Peak Hour Factor, PHF				1.00	1.00	1.00
Peak-15 Minute Volume				2	0	1
Hourly Flow Rate, HFR				10	0	4
Percent Heavy Vehicles				0	0	0
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			/			No /
RT Channelized?						
Lanes				0	1	0
Configuration					LTR	

Pedestrian Volumes and Adjustments

Movements	13	14	15	16
Flow (ped/hr)	0	0	0	0

Lane Width (ft)	12.0	12.0	12.0	12.0
Walking Speed (ft/sec)	4.0	4.0	4.0	4.0
Percent Blockage	0	0	0	0

Upstream Signal Data

	Prog. Flow vph	Sat Flow vph	Arrival Type	Green Time sec	Cycle Length sec	Prog. Speed mph	Distance to Signal feet
S2 Left-Turn							
Through							
S5 Left-Turn							
Through							

Worksheet 3-Data for Computing Effect of Delay to Major Street Vehicles

	Movement 2	Movement 5
Shared ln volume, major th vehicles:	42	64
Shared ln volume, major rt vehicles:	0	9
Sat flow rate, major th vehicles:	1700	1700
Sat flow rate, major rt vehicles:	1700	1700
Number of major street through lanes:	1	1

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation

Movement		1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(c,base)		4.1	4.1				7.1	6.5	6.2
t(c,hv)		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)		0	0				0	0	0
t(c,g)				0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade				0.00	0.00	0.00	0.00	0.00	0.00
t(3,lt)		0.00	0.00				0.70	0.00	0.00
t(c,T):	1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c)	1-stage	4.1	4.1				6.4	6.5	6.2
	2-stage	4.1	4.1				5.4	5.5	6.2

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)	2.20	2.20				3.50	4.00	3.30
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)	0	0				0	0	0
t(f)	2.2	2.2				3.5	4.0	3.3

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

	Movement 2 V(t)	Movement 2 V(l,prot)	Movement 5 V(t)	Movement 5 V(l,prot)
V prog				

Total Saturation Flow Rate, s (vph)
Arrival Type
Effective Green, g (sec)
Cycle Length, C (sec)
Rp (from Exhibit 16-11)
Proportion vehicles arriving on green P
g(q1)
g(q2)
g(q)

Computation 2-Proportion of TWSC Intersection Time blocked	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
alpha				
beta				
Travel time, t(a) (sec)				
Smoothing Factor, F				
Proportion of conflicting flow, f				
Max platooned flow, V(c,max)				
Min platooned flow, V(c,min)				
Duration of blocked period, t(p)				
Proportion time blocked, p	0.000		0.000	

Computation 3-Platoon Event Periods	Result
p(2)	0.000
p(5)	0.000
p(dom)	
p(subo)	
Constrained or unconstrained?	

Proportion unblocked for minor movements, p(x)	(1) Single-stage Process	(2) Two-Stage Process Stage I	(3) Two-Stage Process Stage II
p(1)			
p(4)			
p(7)			
p(8)			
p(9)			
p(10)			
p(11)			
p(12)			

Computation 4 and 5
Single-Stage Process

Movement	1	4	7	8	9	10	11	12
	L	L	L	T	R	L	T	R
V c,x	73	42				122	122	68
s								
Px								
V c,u,x								
C r,x								
C plat,x								

Two-Stage Process

	7	8	10	11

	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2
V(c,x)					68	54	68	54
s						1500		1500
P(x)								
V(c,u,x)								
C(r,x)								
C(plat,x)								

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.	9	12
Conflicting Flows		68
Potential Capacity		1001
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity		1001
Probability of Queue free St.	1.00	1.00

Step 2: LT from Major St.	4	1
Conflicting Flows	42	73
Potential Capacity	1580	1540
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	1580	1540
Probability of Queue free St.	1.00	1.00
Maj L-Shared Prob Q free St.	1.00	1.00

Step 3: TH from Minor St.	8	11
Conflicting Flows		122
Potential Capacity		772
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	1.00	1.00
Movement Capacity		769
Probability of Queue free St.	1.00	1.00

Step 4: LT from Minor St.	7	10
Conflicting Flows		122
Potential Capacity		878
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	1.00	
Maj. L, Min T Adj. Imp Factor.	1.00	
Cap. Adj. factor due to Impeding mvmnt	0.99	1.00
Movement Capacity		875

Worksheet 7-Computation of the Effect of Two-stage Gap Acceptance

Step 3: TH from Minor St.	8	11
Part 1 - First Stage		
Conflicting Flows		68
Potential Capacity	854	842
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	1.00	1.00
Movement Capacity	851	842
Probability of Queue free St.	1.00	1.00

Part 2 - Second Stage		
Conflicting Flows		54
Potential Capacity	838	854
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	1.00	1.00
Movement Capacity	838	851

Part 3 - Single Stage		
Conflicting Flows		122
Potential Capacity		772
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	1.00	1.00
Movement Capacity		769

Result for 2 stage process:		
a	0.91	0.91
y		
C t		769
Probability of Queue free St.	1.00	1.00

Step 4: LT from Minor St.	7	10

Part 1 - First Stage		
Conflicting Flows		68
Potential Capacity	974	960
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	1.00	1.00
Movement Capacity	970	960

Part 2 - Second Stage		
Conflicting Flows		54
Potential Capacity	958	974
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	1.00	1.00
Movement Capacity	954	970

Part 3 - Single Stage		
Conflicting Flows		122
Potential Capacity		878
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	1.00	
Maj. L, Min T Adj. Imp Factor.	1.00	
Cap. Adj. factor due to Impeding mvmnt	0.99	1.00
Movement Capacity		875

Results for Two-stage process:		
a	0.91	0.91
y		0.89
C t		840

Worksheet 8-Shared Lane Calculations

Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume (vph)				10	0	4
Movement Capacity (vph)				840	769	1001
Shared Lane Capacity (vph)					880	

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

Movement	7 L	8 T	9 R	10 L	11 T	12 R
C sep				840	769	1001
Volume				10	0	4
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh					880	
SUM C sep						
n						
C act						

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config	LTR	LTR					LTR	
v (vph)	6	0					14	
C(m) (vph)	1540	1580					880	
v/c	0.00	0.00					0.02	
95% queue length	0.01	0.00					0.05	
Control Delay	7.3	7.3					9.2	
LOS	A	A					A	
Approach Delay							9.2	
Approach LOS							A	

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	1.00	1.00
v(il), Volume for stream 2 or 5	42	64
v(i2), Volume for stream 3 or 6	0	9
s(il), Saturation flow rate for stream 2 or 5	1700	1700
s(i2), Saturation flow rate for stream 3 or 6	1700	1700
P*(oj)	1.00	1.00
d(M,LT), Delay for stream 1 or 4	7.3	7.3
N, Number of major street through lanes	1	1
d(rank,1) Delay for stream 2 or 5	0.0	0.0

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: Lisa Zhong
Agency/Co.: HDR
Date Performed: 7/12/2016
Analysis Time Period: PM Peak
Intersection: C084&NM 6
Jurisdiction:
Units: U. S. Customary
Analysis Year: 2037
Project ID:
East/West Street: C084
North/South Street: NM 6
Intersection Orientation: NS   Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1 L	2 T	3 R	4 L	5 T	6 R
Volume	6	57	0	0	57	6
Peak-Hour Factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Hourly Flow Rate, HFR	6	57	0	0	57	6
Percent Heavy Vehicles	0	--	--	0	--	--
Median Type/Storage	TWLTL			/ 1		
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume				21	0	5
Peak Hour Factor, PHF				1.00	1.00	1.00
Hourly Flow Rate, HFR				21	0	5
Percent Heavy Vehicles				0	0	0
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			/			No /
Lanes				0	1	0
Configuration					LTR	

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LTR	LTR					LTR	
v (vph)	6	0					26	
C(m) (vph)	1553	1560					863	
v/c	0.00	0.00					0.03	
95% queue length	0.01	0.00					0.09	
Control Delay	7.3	7.3					9.3	
LOS	A	A					A	
Approach Delay							9.3	
Approach LOS							A	

HCS+: Unsignalized Intersections Release 5.6

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: Lisa Zhong
Agency/Co.: HDR
Date Performed: 7/12/2016
Analysis Time Period: PM Peak
Intersection: C084&NM 6
Jurisdiction:
Units: U. S. Customary
Analysis Year: 2037
Project ID:
East/West Street: C084
North/South Street: NM 6
Intersection Orientation: NS Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street Movements	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	6	57	0	0	57	6
Peak-Hour Factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Peak-15 Minute Volume	2	14	0	0	14	2
Hourly Flow Rate, HFR	6	57	0	0	57	6
Percent Heavy Vehicles	0	--	--	0	--	--
Median Type/Storage	TWLTL			/ 1		
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	
Upstream Signal?		No			No	

Minor Street Movements	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				21	0	5
Peak Hour Factor, PHF				1.00	1.00	1.00
Peak-15 Minute Volume				5	0	1
Hourly Flow Rate, HFR				21	0	5
Percent Heavy Vehicles				0	0	0
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			/			No /
RT Channelized?						
Lanes				0	1	0
Configuration					LTR	

Pedestrian Volumes and Adjustments

Movements	13	14	15	16
Flow (ped/hr)	0	0	0	0

Lane Width (ft)	12.0	12.0	12.0	12.0
Walking Speed (ft/sec)	4.0	4.0	4.0	4.0
Percent Blockage	0	0	0	0

Upstream Signal Data

	Prog. Flow vph	Sat Flow vph	Arrival Type	Green Time sec	Cycle Length sec	Prog. Speed mph	Distance to Signal feet
S2 Left-Turn							
Through							
S5 Left-Turn							
Through							

Worksheet 3-Data for Computing Effect of Delay to Major Street Vehicles

	Movement 2	Movement 5
Shared ln volume, major th vehicles:	57	57
Shared ln volume, major rt vehicles:	0	6
Sat flow rate, major th vehicles:	1700	1700
Sat flow rate, major rt vehicles:	1700	1700
Number of major street through lanes:	1	1

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation

Movement		1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(c,base)		4.1	4.1				7.1	6.5	6.2
t(c,hv)		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)		0	0				0	0	0
t(c,g)				0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade				0.00	0.00	0.00	0.00	0.00	0.00
t(3,lt)		0.00	0.00				0.70	0.00	0.00
t(c,T):	1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c)	1-stage	4.1	4.1				6.4	6.5	6.2
	2-stage	4.1	4.1				5.4	5.5	6.2

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)	2.20	2.20				3.50	4.00	3.30
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)	0	0				0	0	0
t(f)	2.2	2.2				3.5	4.0	3.3

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

	Movement 2 V(t)	Movement 2 V(l,prot)	Movement 5 V(t)	Movement 5 V(l,prot)
V prog				

Total Saturation Flow Rate, s (vph)	
Arrival Type	
Effective Green, g (sec)	
Cycle Length, C (sec)	
Rp (from Exhibit 16-11)	
Proportion vehicles arriving on green P	
g(q1)	
g(q2)	
g(q)	

Computation 2-Proportion of TWSC Intersection Time blocked

	Movement 2 V(t)	Movement 2 V(l,prot)	Movement 5 V(t)	Movement 5 V(l,prot)
alpha				
beta				
Travel time, t(a) (sec)				
Smoothing Factor, F				
Proportion of conflicting flow, f				
Max platooned flow, V(c,max)				
Min platooned flow, V(c,min)				
Duration of blocked period, t(p)				
Proportion time blocked, p		0.000		0.000

Computation 3-Platoon Event Periods	Result
p(2)	0.000
p(5)	0.000
p(dom)	
p(subo)	
Constrained or unconstrained?	

Proportion unblocked for minor movements, p(x)	(1) Single-stage Process	(2) Two-Stage Process Stage I	(3) Two-Stage Process Stage II
p(1)			
p(4)			
p(7)			
p(8)			
p(9)			
p(10)			
p(11)			
p(12)			

Computation 4 and 5
Single-Stage Process

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
V c,x	63	57				129	129	60
s								
Px								
V c,u,x								
C r,x								
C plat,x								

Two-Stage Process

	7	8	10	11

	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2
V(c,x)					60	69	60	69
s						1500		1500
P(x)								
V(c,u,x)								
C(r,x)								
C(plat,x)								

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.	9	12
Conflicting Flows		60
Potential Capacity		1011
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity		1011
Probability of Queue free St.	1.00	1.00

Step 2: LT from Major St.	4	1
Conflicting Flows	57	63
Potential Capacity	1560	1553
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	1560	1553
Probability of Queue free St.	1.00	1.00
Maj L-Shared Prob Q free St.	1.00	1.00

Step 3: TH from Minor St.	8	11
Conflicting Flows		129
Potential Capacity		765
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	1.00	1.00
Movement Capacity		762
Probability of Queue free St.	1.00	1.00

Step 4: LT from Minor St.	7	10
Conflicting Flows		129
Potential Capacity		870
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	1.00	
Maj. L, Min T Adj. Imp Factor.	1.00	
Cap. Adj. factor due to Impeding mvmnt	0.99	1.00
Movement Capacity		867

Worksheet 7-Computation of the Effect of Two-stage Gap Acceptance

Step 3: TH from Minor St.	8	11
Part 1 - First Stage		
Conflicting Flows		60
Potential Capacity	841	849
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	1.00	1.00
Movement Capacity	838	849
Probability of Queue free St.	1.00	1.00

Part 2 - Second Stage		
Conflicting Flows		69
Potential Capacity	846	841
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	1.00	1.00
Movement Capacity	846	838

Part 3 - Single Stage		
Conflicting Flows		129
Potential Capacity		765
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	1.00	1.00
Movement Capacity		762

Result for 2 stage process:		
a	0.91	0.91
y		
C t		762
Probability of Queue free St.	1.00	1.00

Step 4: LT from Minor St.	7	10

Part 1 - First Stage		
Conflicting Flows		60
Potential Capacity	959	968
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	1.00	1.00
Movement Capacity	955	968

Part 2 - Second Stage		
Conflicting Flows		69
Potential Capacity	966	959
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	1.00	1.00
Movement Capacity	961	955

Part 3 - Single Stage		
Conflicting Flows		129
Potential Capacity		870
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	1.00	
Maj. L, Min T Adj. Imp Factor.	1.00	
Cap. Adj. factor due to Impeding mvmnt	0.99	1.00
Movement Capacity		867

Results for Two-stage process:		
a	0.91	0.91
y		1.15
C t		834

Worksheet 8-Shared Lane Calculations

Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume (vph)				21	0	5
Movement Capacity (vph)				834	762	1011
Shared Lane Capacity (vph)					863	

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

Movement	7	8	9	10	11	12
	L	T	R	L	T	R
C sep				834	762	1011
Volume				21	0	5
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh					863	
SUM C sep						
n						
C act						

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config	LTR	LTR					LTR	
v (vph)	6	0					26	
C(m) (vph)	1553	1560					863	
v/c	0.00	0.00					0.03	
95% queue length	0.01	0.00					0.09	
Control Delay	7.3	7.3					9.3	
LOS	A	A					A	
Approach Delay							9.3	
Approach LOS							A	

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	1.00	1.00
v(il), Volume for stream 2 or 5	57	57
v(i2), Volume for stream 3 or 6	0	6
s(il), Saturation flow rate for stream 2 or 5	1700	1700
s(i2), Saturation flow rate for stream 3 or 6	1700	1700
P*(oj)	1.00	1.00
d(M,LT), Delay for stream 1 or 4	7.3	7.3
N, Number of major street through lanes	1	1
d(rank,1) Delay for stream 2 or 5	0.0	0.0

APPENDIX D – HORIZON YEAR 2037 OPERATIONAL ANALYSIS

Phone: Fax:
E-Mail:

Directional Two-Lane Highway Segment Analysis

Analyst	Lisa Zhong
Agency/Co.	HDR
Date Performed	8/30/2016
Analysis Time Period	
Highway	C084
From/To	
Jurisdiction	
Analysis Year	Year 2037_Build
Description	Cibola County Bridge

Input Data

Highway class	Class 1		Peak hour factor, PHF	0.88	
Shoulder width	6.0	ft	% Trucks and buses	13	%
Lane width	12.0	ft	% Trucks crawling	0.0	%
Segment length	1.0	mi	Truck crawl speed	0.0	mi/hr
Terrain type	Level		% Recreational vehicles	0	%
Grade: Length	-	mi	% No-passing zones	100	%
Up/down	-	%	Access point density	0	/mi

Analysis direction volume, Vd	25	veh/h
Opposing direction volume, Vo	19	veh/h

Average Travel Speed

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.9		1.9	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adj. factor,(note-5) fHV	0.895		0.895	
Grade adj. factor,(note-1) fg	1.00		1.00	
Directional flow rate,(note-2) vi	32	pc/h	24	pc/h

Free-Flow Speed from Field Measurement:		
Field measured speed,(note-3) S FM	-	mi/h
Observed total demand,(note-3) V	-	veh/h
Estimated Free-Flow Speed:		
Base free-flow speed,(note-3) BFFS	60.0	mi/h
Adj. for lane and shoulder width,(note-3) fLS	0.0	mi/h
Adj. for access point density,(note-3) fA	0.0	mi/h
Free-flow speed, FFSd	60.0	mi/h
Adjustment for no-passing zones, fnp	2.9	mi/h
Average travel speed, ATSd	56.7	mi/h
Percent Free Flow Speed, PFFS	94.4	%

Percent Time-Spent-Following

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.1		1.1	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adjustment factor, fHV	0.987		0.987	
Grade adjustment factor,(note-1) fg	1.00		1.00	
Directional flow rate,(note-2) vi	29	pc/h	22	pc/h
Base percent time-spent-following,(note-4) BPTSFd	3.6	%		
Adjustment for no-passing zones, fnp	53.2			
Percent time-spent-following, PTSFd	33.9	%		

Level of Service and Other Performance Measures

Level of service, LOS	A	
Volume to capacity ratio, v/c	0.02	
Peak 15-min vehicle-miles of travel, VMT15	7	veh-mi
Peak-hour vehicle-miles of travel, VMT60	25	veh-mi
Peak 15-min total travel time, TT15	0.1	veh-h
Capacity from ATS, CdATS	1522	veh/h
Capacity from PTSF, CdPTSF	1678	veh/h
Directional Capacity	1522	veh/h

Passing Lane Analysis

Total length of analysis segment, Lt	1.0	mi
Length of two-lane highway upstream of the passing lane, Lu	-	mi
Length of passing lane including tapers, Lpl	-	mi
Average travel speed, ATSd (from above)	56.7	mi/h
Percent time-spent-following, PTSFd (from above)	33.9	
Level of service, LOSd (from above)	A	

Average Travel Speed with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for average travel speed, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for average travel speed, Ld	-	mi
Adj. factor for the effect of passing lane on average speed, fpl	-	
Average travel speed including passing lane, ATSpl	-	
Percent free flow speed including passing lane, PFFSpl	0.0	%

Percent Time-Spent-Following with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for percent time-spent-following, Ld	-	mi
Adj. factor for the effect of passing lane on percent time-spent-following, fpl	-	
Percent time-spent-following including passing lane, PTSFpl	-	%

Level of Service and Other Performance Measures with Passing Lane

Level of service including passing lane, LOSpl	E	
Peak 15-min total travel time, TT15	-	veh-h

Bicycle Level of Service

Posted speed limit, Sp	55
Percent of segment with occupied on-highway parking	0
Pavement rating, P	3
Flow rate in outside lane, vOL	28.4
Effective width of outside lane, We	39.75
Effective speed factor, St	4.79
Bicycle LOS Score, BLOS	-0.08
Bicycle LOS	A

Notes:

1. Note that the adjustment factor for level terrain is 1.00, as level terrain is one of the base conditions. For the purpose of grade adjustment, specific dewngrade segments are treated as level terrain.
2. If vi (vd or vo) >= 1,700 pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

APPENDIX E – CRASH DATA CALCULATIONS

CRASH REPORT NUMBER	CRASH DATE	YEAR OF CRASH	MONTH OF CRASH	TIME OF CRASH	HOUR OF CRASH	LAW ENFORCEMENT AGENCY	COUNTY	CRASH LOCATION (CITY OR RURAL)	MAJOR STREET	SECONDARY STREET	LANDMARK/LOCATION	ROUTE NAME	GIS-DERIVED MILEPOST	KILLED
30078772	6/22/2012	2012	June	20:39	8 p.m.	LAGUNA PUEBLO POLICE DEPARTMENT	VALENCIA	NONE	NM 6		MM 2	NM 6	2	0
30052696	4/21/2012	2012	April	19:30	7 p.m.	NEW MEXICO STATE POLICE (NMSP)	CIBOLA	NONE	US HWY 66	NM ROAD 6	NM 6			0

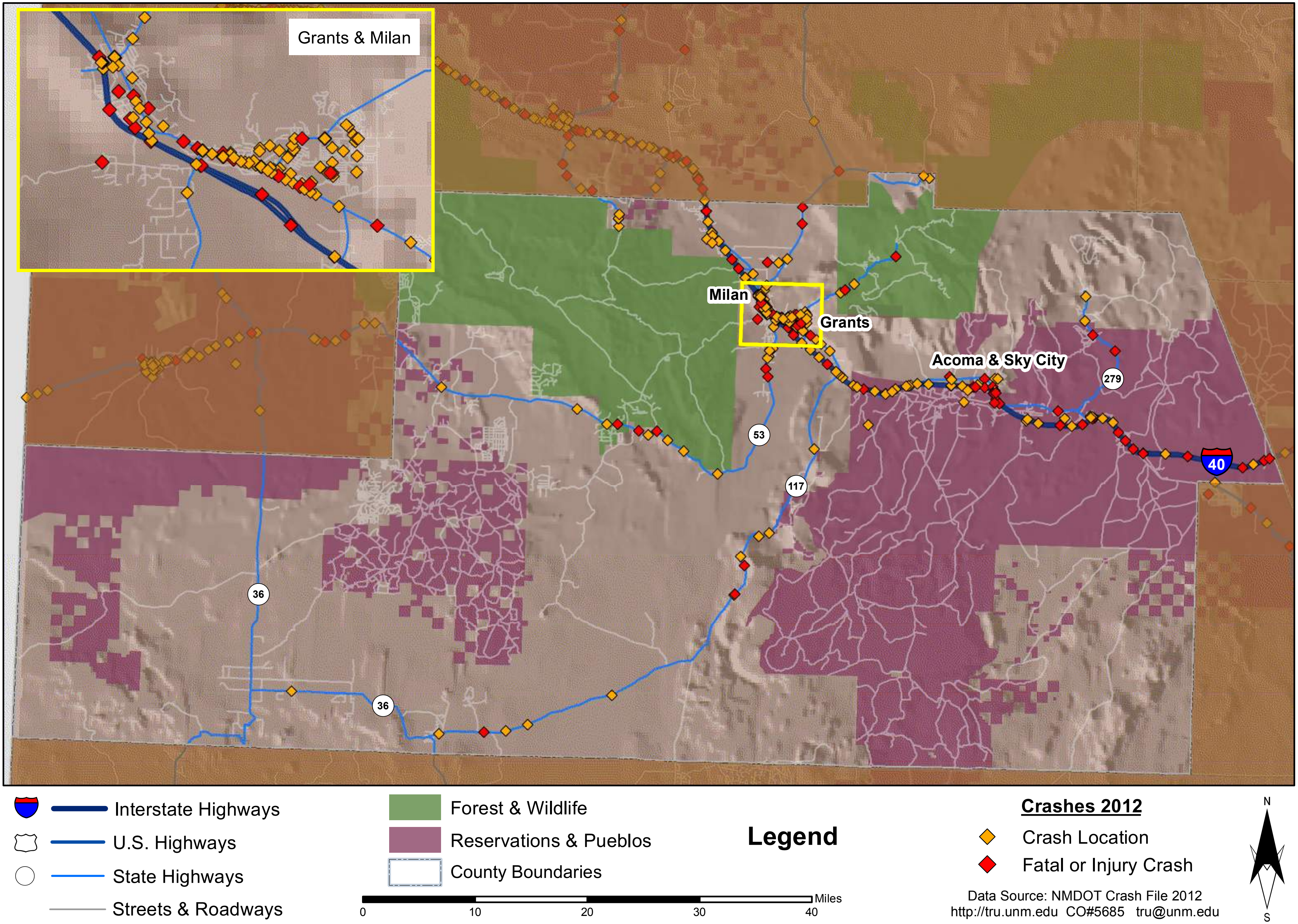
CRASH REPORT NUMBER	INCAPACITATING INJURY	VISIBLE INJURY	COMPLAINT OF INJURY	NUMBER OF PEOPLE INJURED (CLASS A+B+C)	NO APPARENT INJURY	NUMBER OF OCCUPANTS IN CRASH	NUMBER OF VEHICLES, ETC. INVOLVED	WEATHER	LIGHTING	CRASH SEVERITY	CRASH CLASSIFICATION	CRASH ANALYSIS	HIGHEST CONTRIBUTING FACTOR IN CRASH	HIT AND RUN CRASH
30078772	0	0	0	0	1	1	1	Clear	Dark-Not Lighted	ımage Only Crash	Other (Non-Collision)	Non-Collision - All Other/Not Stated	Inattention	No
30052696	0	2	0	2	0	2	1	Clear	Dusk	Injury Crash	Overturn/Rollover	Overturn/Rollover - On The Road	ug Involved	No

CRASH REPORT NUMBER	ALCOHOL INVOLVEMENT	DRIVER DRUG INVOLVEMENT	PEDESTRIAN INVOLVEMENT	MOTORCYCLE INVOLVEMENT	PEDALCYCLE INVOLVEMENT	HEAVY TRUCK INVOLVEMENT	HAZARDOUS MATERIAL INVOLVEMENT	DOT PROPERTY	ROAD SYSTEM	MAXIMUM VEHICLE DAMAGE	FIRST HARMFUL EVENT OCCURRED	ROAD CHARACTER	ROAD GRADE	INVOLVEMENT OF NON-LOCAL DRIVER
30078772	Not Involved	Not Involved	Not Involved	Not Involved	Not Involved	Not Involved	ot Involved		Rural Non-Interstate	Functional	Off Roadway	Straight	Level	Local Drivers
30052696	Involved	Not Involved	Not Involved	Not Involved	Not Involved	Not Involved	ot Involved		Rural Non-Interstate	Disabling	On Roadway	Straight	Level	Local Drivers

CRASH REPORT NUMBER	DIRECTION FROM INTERSECTION	DISTANCE FROM LANDMARK	DISTANCE FROM LANDMARK MEASUREMENT UNIT	GIS-DERIVED URBAN OR RURAL	GIS-DERIVED RESERVATION	GIS-DERIVED STATE HIGHWAY TRANSPORTATION DISTRICT	STATE POLICE DISTRICT	GIS-DERIVED STATE HIGHWAY MAINTENANCE DISTRICT	GIS-DERIVED UTM X COORDINATE	GIS-DERIVED UTM Y COORDINATE	GIS-DERIVED LATITUDE COORDINATE	GIS-DERIVED LONGITUDE COORDINATE
30078772	Left Blank		99	URBAN	LAGUNA	6	5	6	301242.64590	3870581.54500	34.9582894	-107.1768378
30052696	W	4	MI	URBAN	LAGUNA	3	5	6				

Crashes in Cibola County, New Mexico, 2012

Map created by the Traffic Research Unit, Geospatial & Population Studies at UNM

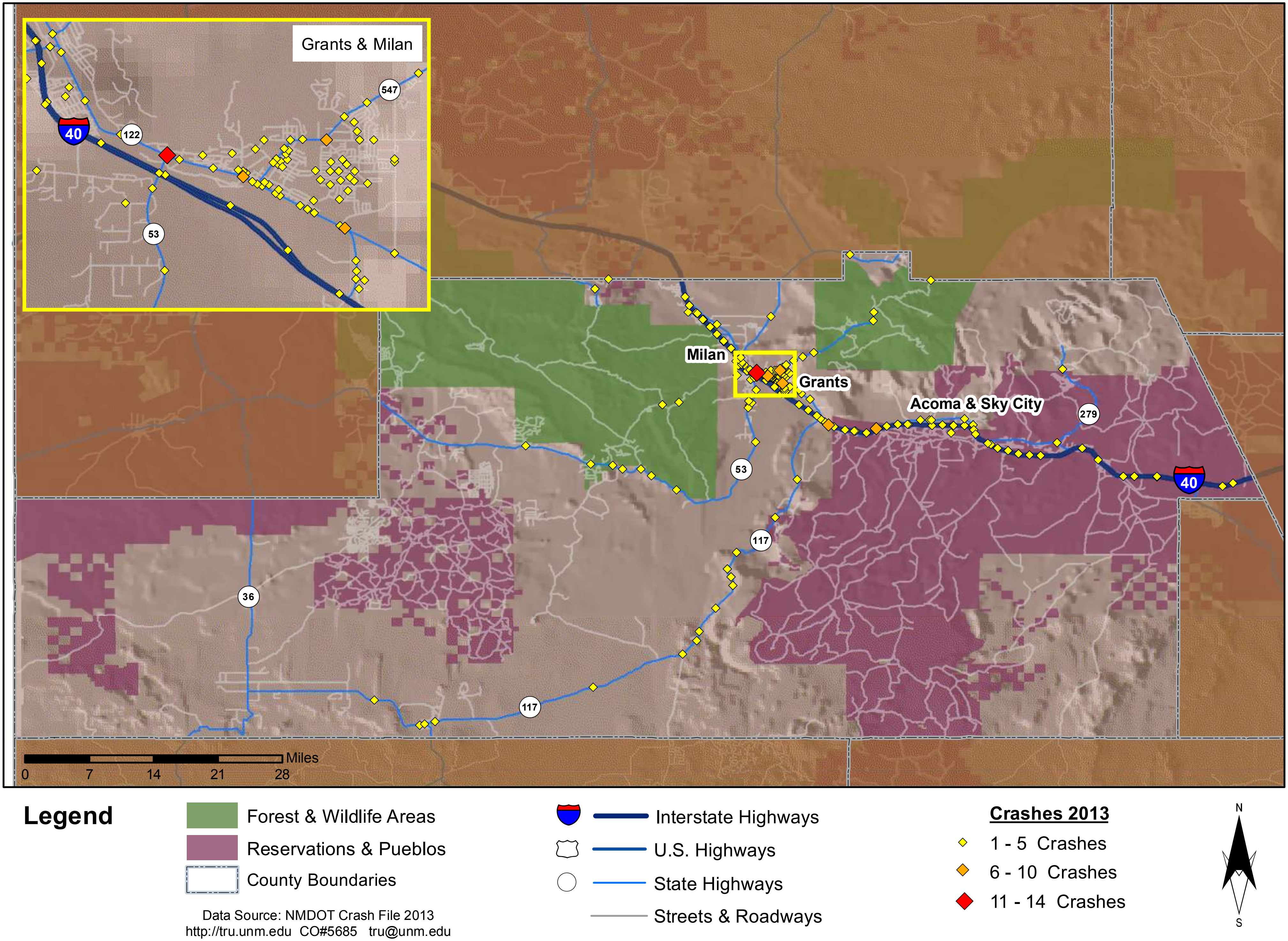


Data Source: NMDOT Crash File 2012

http://tru.unm.edu CO#5685 tru@unm.edu

Crashes in Cibola County, New Mexico, 2013

Map created by the Traffic Research Unit, Geospatial & Population Studies at UNM



Data Source: NMDOT Crash File 2013
http://tru.unm.edu CO#5685 tru@unm.edu

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Appendix K. Cost Estimate Sheets

COMPUTATION SHEET

Subject NMDOT
Cibola County Rd. C084
Quantities & Estimate - Build Alternative A

BASE ITEMS

Item No.	Item Description	Unit	Quantity	Unit Cost	Extension
201000	CLEARING AND GRUBBING	L.S.	L.S.	$10,000.00	$10,000.00
203000	UNCLASSIFIED EXCAVATION	CU.YD.	92000	$6.10	$561,200.00
203100	BORROW	CU.YD.	138300	$8.50	$1,175,550.00
207000	SUBGRADE PREPARATION	SQ.YD.	13250	$1.40	$18,550.00
213000	OBLITERATING OLD ROAD	MILE	1	$38,100.00	$38,100.00
303000	BASE COURSE	TON	3950	$17.10	$67,545.00
407000	ASPHALT MATERIAL FOR TACK COAT	TON	4	$512.00	$2,048.00
408100	PRIME COAT MATERIAL	TON	19	$513.00	$9,747.00
423282	HMA SP III COMPLETE	TON	2870	$71.00	$203,770.00
601000	REMOVAL OF STRUCTURES AND OBSTRUCTIONS	L.S.	L.S.	$45,000.00	$45,000.00
601110	REMOVAL OF SURFACING	S.Y.	9100	$4.30	$39,130.00
606001	SINGLE FACE W-BEAM GUARDRAIL	LIN.FT.	2640	$23.30	$61,512.00
606011	SINGLE FACE THRIE-BEAM GUARDRAIL	LIN.FT.	100	$52.10	$5,210.00
606051	END TREATMENT TL-3 END TERMINAL	EACH	4	$2,395.70	$9,582.80
618000	TRAFFIC CONTROL MANAGEMENT	L.S.	L.S.	$21,000.00	$21,000.00
621000	MOBILIZATION	L.S.	L.S.	$407,000.00	$407,000.00
702810	TRAFFIC CONTROL DEVICES FOR CONSTRUCTION	L.S.	L.S.	$33,000.00	$33,000.00
801000	CONSTRUCTION STAKING BY THE CONTRACTOR	L.S.	L.S.	$41,000.00	$41,000.00
	BRIDGE (CONCRETE BRIDGE @ $150/SQ.FT.)	L.S.	L.S.	$1,663,000.00	$1,663,000.00
	DRAINAGE	L.S.	L.S.	$100,000.00	$100,000.00
	TESCP & SWPPP	L.S.	L.S.	$30,000.00	$30,000.00
	PERMANENT SIGNING AND STRIPING	L.S.	L.S.	$25,000.00	$25,000.00
	DETOUR	L.S.	L.S.	$827,000.00	$827,000.00
				SUB-TOTAL =	$5,393,944.80
				30% Contingency =	$1,618,183.44
				NMDGRT (6.875) =	$482,083.82
				Project Total =	**$7,494,212.06**

COMPUTATION SHEET

Subject NMDOT
Cibola County Rd. C084
Quantities & Estimate - Build Alternative B

BASE ITEMS

Item No.	Item Description	Unit	Quantity	Unit Cost	Extension
201000	CLEARING AND GRUBBING	L.S.	L.S.	$10,000.00	$10,000.00
203000	UNCLASSIFIED EXCAVATION	CU.YD.	92000	$6.10	$561,200.00
203100	BORROW	CU.YD.	155500	$8.50	$1,321,750.00
207000	SUBGRADE PREPARATION	SQ.YD.	13450	$1.40	$18,830.00
213000	OBLITERATING OLD ROAD	MILE	1	$38,100.00	$38,100.00
303000	BASE COURSE	TON	3960	$17.10	$67,716.00
407000	ASPHALT MATERIAL FOR TACK COAT	TON	4	$512.00	$2,048.00
408100	PRIME COAT MATERIAL	TON	19	$513.00	$9,747.00
423282	HMA SP III COMPLETE	TON	2890	$71.00	$205,190.00
601000	REMOVAL OF STRUCTURES AND OBSTRUCTIONS	L.S.	L.S.	$45,000.00	$45,000.00
601110	REMOVAL OF SURFACING	S.Y.	9100	$4.30	$39,130.00
606001	SINGLE FACE W-BEAM GUARDRAIL	LIN.FT.	3220	$23.30	$75,026.00
606011	SINGLE FACE THRIE-BEAM GUARDRAIL	LIN.FT.	100	$52.10	$5,210.00
606051	END TREATMENT TL-3 END TERMINAL	EACH	4	$2,395.70	$9,582.80
618000	TRAFFIC CONTROL MANAGEMENT	L.S.	L.S.	$22,000.00	$22,000.00
621000	MOBILIZATION	L.S.	L.S.	$423,000.00	$423,000.00
702810	TRAFFIC CONTROL DEVICES FOR CONSTRUCTION	L.S.	L.S.	$34,000.00	$34,000.00
801000	CONSTRUCTION STAKING BY THE CONTRACTOR	L.S.	L.S.	$43,000.00	$43,000.00
	BRIDGE (CONCRETE BRIDGE @ $150/SQ.FT.)	L.S.	L.S.	$1,663,000.00	$1,663,000.00
	DRAINAGE	L.S.	L.S.	$100,000.00	$100,000.00
	TESCP & SWPPP	L.S.	L.S.	$30,000.00	$30,000.00
	PERMANENT SIGNING AND STRIPING	L.S.	L.S.	$25,000.00	$25,000.00
	DETOUR	L.S.	L.S.	$827,000.00	$827,000.00
				SUB-TOTAL =	$5,575,529.80
				30% Contingency =	$1,672,658.94
				NMDGRT (6.875) =	$498,312.98
				Project Total =	**$7,746,501.72**

COMPUTATION SHEET

Subject NMDOT
Cibola County Rd. C084
Quantities & Estimate - Build Alternative C

BASE ITEMS

Item No.	Item Description	Unit	Quantity	Unit Cost	Extension
201000	CLEARING AND GRUBBING	L.S.	L.S.	$10,000.00	$10,000.00
203000	UNCLASSIFIED EXCAVATION	CU.YD.	92500	$6.10	$564,250.00
203100	BORROW	CU.YD.	162900	$8.50	$1,384,650.00
207000	SUBGRADE PREPARATION	SQ.YD.	13300	$1.40	$18,620.00
213000	OBLITERATING OLD ROAD	MILE	1	$38,100.00	$38,100.00
303000	BASE COURSE	TON	3910	$17.10	$66,861.00
407000	ASPHALT MATERIAL FOR TACK COAT	TON	4	$512.00	$2,048.00
408100	PRIME COAT MATERIAL	TON	19	$513.00	$9,747.00
423282	HMA SP III COMPLETE	TON	2850	$71.00	$202,350.00
601000	REMOVAL OF STRUCTURES AND OBSTRUCTIONS	L.S.	L.S.	$45,000.00	$45,000.00
601110	REMOVAL OF SURFACING	S.Y.	9100	$4.30	$39,130.00
606001	SINGLE FACE W-BEAM GUARDRAIL	LIN.FT.	2670	$23.30	$62,211.00
606011	SINGLE FACE THRIE-BEAM GUARDRAIL	LIN.FT.	100	$52.10	$5,210.00
606051	END TREATMENT TL-3 END TERMINAL	EACH	4	$2,395.70	$9,582.80
618000	TRAFFIC CONTROL MANAGEMENT	L.S.	L.S.	$22,000.00	$22,000.00
621000	MOBILIZATION	L.S.	L.S.	$428,000.00	$428,000.00
702810	TRAFFIC CONTROL DEVICES FOR CONSTRUCTION	L.S.	L.S.	$35,000.00	$35,000.00
801000	CONSTRUCTION STAKING BY THE CONTRACTOR	L.S.	L.S.	$43,000.00	$43,000.00
	BRIDGE (CONCRETE BRIDGE @ $150/SQ.FT.)	L.S.	L.S.	$1,663,000.00	$1,663,000.00
	DRAINAGE	L.S.	L.S.	$100,000.00	$100,000.00
	TESCP & SWPPP	L.S.	L.S.	$30,000.00	$30,000.00
	PERMANENT SIGNING AND STRIPING	L.S.	L.S.	$25,000.00	$25,000.00
	DETOUR	L.S.	L.S.	$827,000.00	$827,000.00
				SUB-TOTAL =	$5,630,759.80
				30% Contingency =	$1,689,227.94
				NMDGRT (6.875) =	$503,249.16
				Project Total =	**$7,823,236.90**

COMPUTATION SHEET

Subject NMDOT
Cibola County Rd. C084
Quantities & Estimate - Build Alternative D

BASE ITEMS

Item No.	Item Description	Unit	Quantity	Unit Cost	Extension
201000	CLEARING AND GRUBBING	L.S.	L.S.	$10,000.00	$10,000.00
203000	UNCLASSIFIED EXCAVATION	CU.YD.	200	$6.10	$1,220.00
203100	BORROW	CU.YD.	269500	$8.50	$2,290,750.00
207000	SUBGRADE PREPARATION	SQ.YD.	15950	$1.40	$22,330.00
213000	OBLITERATING OLD ROAD	MILE	1	$38,100.00	$38,100.00
303000	BASE COURSE	TON	4700	$17.10	$80,370.00
407000	ASPHALT MATERIAL FOR TACK COAT	TON	5	$512.00	$2,560.00
408100	PRIME COAT MATERIAL	TON	23	$513.00	$11,799.00
423282	HMA SP III COMPLETE	TON	3420	$71.00	$242,820.00
601000	REMOVAL OF STRUCTURES AND OBSTRUCTIONS	L.S.	L.S.	$45,000.00	$45,000.00
601110	REMOVAL OF SURFACING	S.Y.	9100	$4.30	$39,130.00
606001	SINGLE FACE W-BEAM GUARDRAIL	LIN.FT.	4780	$23.30	$111,374.00
606011	SINGLE FACE THRIE-BEAM GUARDRAIL	LIN.FT.	100	$52.10	$5,210.00
606051	END TREATMENT TL-3 END TERMINAL	EACH	4	$2,395.70	$9,582.80
618000	TRAFFIC CONTROL MANAGEMENT	L.S.	L.S.	$22,000.00	$22,000.00
621000	MOBILIZATION	L.S.	L.S.	$433,000.00	$433,000.00
702810	TRAFFIC CONTROL DEVICES FOR CONSTRUCTION	L.S.	L.S.	$35,000.00	$35,000.00
801000	CONSTRUCTION STAKING BY THE CONTRACTOR	L.S.	L.S.	$44,000.00	$44,000.00
	BRIDGE (CONCRETE BRIDGE @ $150/SQ.FT.)	L.S.	L.S.	$1,258,000.00	$1,258,000.00
	DRAINAGE	L.S.	L.S.	$100,000.00	$100,000.00
	TESCP & SWPPP	L.S.	L.S.	$30,000.00	$30,000.00
	PERMANENT SIGNING AND STRIPING	L.S.	L.S.	$25,000.00	$25,000.00
	DETOUR	L.S.	L.S.	$827,000.00	$827,000.00
				SUB-TOTAL =	$5,684,245.80
				30% Contingency =	$1,705,273.74
				NMDGRT (6.875) =	$508,029.47
				Project Total =	**$7,897,549.01**

COMPUTATION SHEET

Subject NMDOT
Cibola County Rd. C084
Quantities & Estimate - Build Alternative E

BASE ITEMS

Item No.	Item Description	Unit	Quantity	Unit Cost	Extension
201000	CLEARING AND GRUBBING	L.S.	L.S.	$10,000.00	$10,000.00
203000	UNCLASSIFIED EXCAVATION	CU.YD.	13100	$6.10	$79,910.00
203100	BORROW	CU.YD.	185800	$8.50	$1,579,300.00
207000	SUBGRADE PREPARATION	SQ.YD.	14550	$1.40	$20,370.00
213000	OBLITERATING OLD ROAD	MILE	1	$38,100.00	$38,100.00
303000	BASE COURSE	TON	4290	$17.10	$73,359.00
407000	ASPHALT MATERIAL FOR TACK COAT	TON	4	$512.00	$2,048.00
408100	PRIME COAT MATERIAL	TON	21	$513.00	$10,773.00
423282	HMA SP III COMPLETE	TON	3120	$71.00	$221,520.00
601000	REMOVAL OF STRUCTURES AND OBSTRUCTIONS	L.S.	L.S.	$45,000.00	$45,000.00
601110	REMOVAL OF SURFACING	S.Y.	9100	$4.30	$39,130.00
606001	SINGLE FACE W-BEAM GUARDRAIL	LIN.FT.	4950	$23.30	$115,335.00
606011	SINGLE FACE THRIE-BEAM GUARDRAIL	LIN.FT.	100	$52.10	$5,210.00
606051	END TREATMENT TL-3 END TERMINAL	EACH	4	$2,395.70	$9,582.80
618000	TRAFFIC CONTROL MANAGEMENT	L.S.	L.S.	$19,000.00	$19,000.00
621000	MOBILIZATION	L.S.	L.S.	$376,000.00	$376,000.00
702810	TRAFFIC CONTROL DEVICES FOR CONSTRUCTION	L.S.	L.S.	$31,000.00	$31,000.00
801000	CONSTRUCTION STAKING BY THE CONTRACTOR	L.S.	L.S.	$38,000.00	$38,000.00
	BRIDGE (CONCRETE BRIDGE @ $150/SQ.FT.)	L.S.	L.S.	$1,347,000.00	$1,347,000.00
	DRAINAGE	L.S.	L.S.	$100,000.00	$100,000.00
	TESCP & SWPPP	L.S.	L.S.	$30,000.00	$30,000.00
	PERMANENT SIGNING AND STRIPING	L.S.	L.S.	$25,000.00	$25,000.00
	DETOUR	L.S.	L.S.	$827,000.00	$827,000.00
				SUB-TOTAL =	$5,042,637.80
				30% Contingency =	$1,512,791.34
				NMDGRT (6.875) =	$450,685.75
				Project Total =	**$7,006,114.89**

COMPUTATION SHEET

Subject NMDOT
Cibola County Rd. C084
Quantities & Estimate - Build Alternative E

BASE ITEMS

Item No.	Item Description	Unit	Quantity	Unit Cost	Extension
201000	CLEARING AND GRUBBING	L.S.	L.S.	$10,000.00	$10,000.00
203000	UNCLASSIFIED EXCAVATION	CU.YD.	100	$6.10	$610.00
203100	BORROW	CU.YD.	202500	$8.50	$1,721,250.00
207000	SUBGRADE PREPARATION	SQ.YD.	13100	$1.40	$18,340.00
213000	OBLITERATING OLD ROAD	MILE	1	$38,100.00	$38,100.00
303000	BASE COURSE	TON	3850	$17.10	$65,835.00
407000	ASPHALT MATERIAL FOR TACK COAT	TON	4	$512.00	$2,048.00
408100	PRIME COAT MATERIAL	TON	19	$513.00	$9,747.00
423282	HMA SP III COMPLETE	TON	2810	$71.00	$199,510.00
601000	REMOVAL OF STRUCTURES AND OBSTRUCTIONS	L.S.	L.S.	$45,000.00	$45,000.00
601110	REMOVAL OF SURFACING	S.Y.	9100	$4.30	$39,130.00
606001	SINGLE FACE W-BEAM GUARDRAIL	LIN.FT.	4470	$23.30	$104,151.00
606011	SINGLE FACE THRIE-BEAM GUARDRAIL	LIN.FT.	100	$52.10	$5,210.00
606051	END TREATMENT TL-3 END TERMINAL	EACH	4	$2,395.70	$9,582.80
618000	TRAFFIC CONTROL MANAGEMENT	L.S.	L.S.	$21,000.00	$21,000.00
621000	MOBILIZATION	L.S.	L.S.	$409,000.00	$409,000.00
702810	TRAFFIC CONTROL DEVICES FOR CONSTRUCTION	L.S.	L.S.	$33,000.00	$33,000.00
801000	CONSTRUCTION STAKING BY THE CONTRACTOR	L.S.	L.S.	$41,000.00	$41,000.00
	BRIDGE (CONCRETE BRIDGE @ $150/SQ.FT.)	L.S.	L.S.	$1,663,000.00	$1,663,000.00
	DRAINAGE	L.S.	L.S.	$100,000.00	$100,000.00
	TESCP & SWPPP	L.S.	L.S.	$30,000.00	$30,000.00
	PERMANENT SIGNING AND STRIPING	L.S.	L.S.	$25,000.00	$25,000.00
	DETOUR	L.S.	L.S.	$0.00	$0.00
				SUB-TOTAL =	$4,590,513.80
				30% Contingency =	$1,377,154.14
				NMDGRT (6.875) =	$410,277.17
				Project Total =	**$6,377,945.11**

COMPUTATION SHEET

Subject NMDOT
Cibola County Rd. C084
Quantities & Estimate - Build Alternative G

BASE ITEMS

Item No.	Item Description	Unit	Quantity	Unit Cost	Extension
201000	CLEARING AND GRUBBING	L.S.	L.S.	$10,000.00	$10,000.00
203000	UNCLASSIFIED EXCAVATION	CU.YD.	9600	$6.10	$58,560.00
203100	BORROW	CU.YD.	27200	$8.50	$231,200.00
207000	SUBGRADE PREPARATION	SQ.YD.	14500	$1.40	$20,300.00
213000	OBLITERATING OLD ROAD	MILE	1	$38,100.00	$38,100.00
303000	BASE COURSE	TON	4250	$17.10	$72,675.00
407000	ASPHALT MATERIAL FOR TACK COAT	TON	4	$512.00	$2,048.00
408100	PRIME COAT MATERIAL	TON	21	$513.00	$10,773.00
423282	HMA SP III COMPLETE	TON	3100	$71.00	$220,100.00
601000	REMOVAL OF STRUCTURES AND OBSTRUCTIONS	L.S.	L.S.	$45,000.00	$45,000.00
601110	REMOVAL OF SURFACING	S.Y.	9100	$4.30	$39,130.00
606001	SINGLE FACE W-BEAM GUARDRAIL	LIN.FT.	0	$23.30	$0.00
606011	SINGLE FACE THRIE-BEAM GUARDRAIL	LIN.FT.	0	$52.10	$0.00
606051	END TREATMENT TL-3 END TERMINAL	EACH	0	$2,395.70	$0.00
618000	TRAFFIC CONTROL MANAGEMENT	L.S.	L.S.	$5,000.00	$5,000.00
621000	MOBILIZATION	L.S.	L.S.	$92,000.00	$92,000.00
702810	TRAFFIC CONTROL DEVICES FOR CONSTRUCTION	L.S.	L.S.	$8,000.00	$8,000.00
801000	CONSTRUCTION STAKING BY THE CONTRACTOR	L.S.	L.S.	$33,000.00	$33,000.00
	BRIDGE (CONCRETE BRIDGE @ $150/SQ.FT.)	L.S.	L.S.	$41,000.00	$41,000.00
	DRAINAGE	L.S.	L.S.	$75,000.00	$75,000.00
	TESCP & SWPPP	L.S.	L.S.	$30,000.00	$30,000.00
	PERMANENT SIGNING AND STRIPING	L.S.	L.S.	$25,000.00	$25,000.00
	RR CROSSING ARMS, FLASSERS, SIGNAL	L.S.	L.S.	$550,000.00	$550,000.00
	DETOUR	L.S.	L.S.	$0.00	$0.00
				SUB-TOTAL =	$1,606,886.00
				30% Contingency =	$482,065.80
				NMDGRT (6.875) =	$143,615.44
				Project Total =	**$2,232,567.24**

Appendix L. Bridge Type Selection Report

HISTORIC
WEST
U.S.
66
ROUTE

NMDOT

Bridge Type Selection Report

Cibola County Road C084

(Old US 66), 0.25 Mi. West of MP 2.10 on NM 6

New Mexico Department of Transportation

Control/Project No: 6101000

January 26, 2017

HDR

BRIDGE TYPE SELECTION REPORT

Cibola County Road C084 (Old US 66) over BNSF Railway (Bridge No. 0002)

prepared for:

NMDOT

NMDOT PROJECT/CONTROL NO.: 6101000

prepared by:

HDR

January, 26 2017

DANTON B. BEAN
NEW MEXICO
15551
LICENSED PROFESSIONAL ENGINEER

1/26/17

Table of Contents

1. Introduction

HDR Inc. has been retained by the NMDOT to investigate alternatives to upgrade the condition of Bridge No. 0002. The bridge is located in or near Correo, Valencia County, New Mexico (0.25 Miles West of MP 2.10 on NM 6). The bridge carries County Road C084 (Old US 66) over the Burlington Northern and Santa Fe (BNSF) Railway.

The Phase I-A/B document for this project has analyzed and evaluated a number of roadway alternatives, including No-Build, Rehabilitation and Build. The recommended alternative from the study document is a “Build” alternative. The alternative will construct a new bridge parallel and directly adjacent to the existing bridge and will remove the existing structure. The new structure will provide BNSF with vertical clearance that meets current standards and horizontal space for future railway track.

Bridge No. 0002 is an element of Historic Route 66 with characteristics that are valuable to preserve. The following characteristics of the bridge structure have been discussed as features to preserve:

1. Overpass: the up and over and then down profile of the roadway and bridge will preserve the historic feel for Route 66 users. It will also preserve the view from the bridge and toward the bridge.
2. Earth embankment approaches,
3. Bridge railing: Three rail system with vertical posts and fence mesh.
4. Concrete Pier Wall adjacent to Railway Tracks

There are many different types of bridges that could be considered at a specific crossing including Beam Bridge, Girder Bridge, Cable-Stayed Bridge, Covered Bridge, Rigid-Frame Bridge, Segmental Bridge, Suspension Bridge, Trestle Bridge, Truss Bridge and others. There are also different materials that could be incorporated into each one of these bridge structure types including concrete, steel, timber, etc. This report will not discuss all the different bridge types and materials, but will focus the discussion toward the bridge types that are expected to be reasonable solutions for the specific situation.

This report will primarily focus bridge types typical to short and medium span bridges, including slab and girder bridges. It will also focus on the materials of concrete and steel.

The material for the existing bridge structure is primarily treated timber. The exception are the pier walls adjacent to the tracks that are constructed of concrete. Timber material is not being considered in this report as a feasible material type due to the desired changes in geometric layout of the bridge. The span lengths are proposed to be increased for the construction of a third rail track and the vertical clearance will be increased to meet the current standard for a railway overpass. These geometric changes and todays’ standard loadings lead the type selection toward material types with the appropriate strength properties like with reinforced concrete and steel bridges.

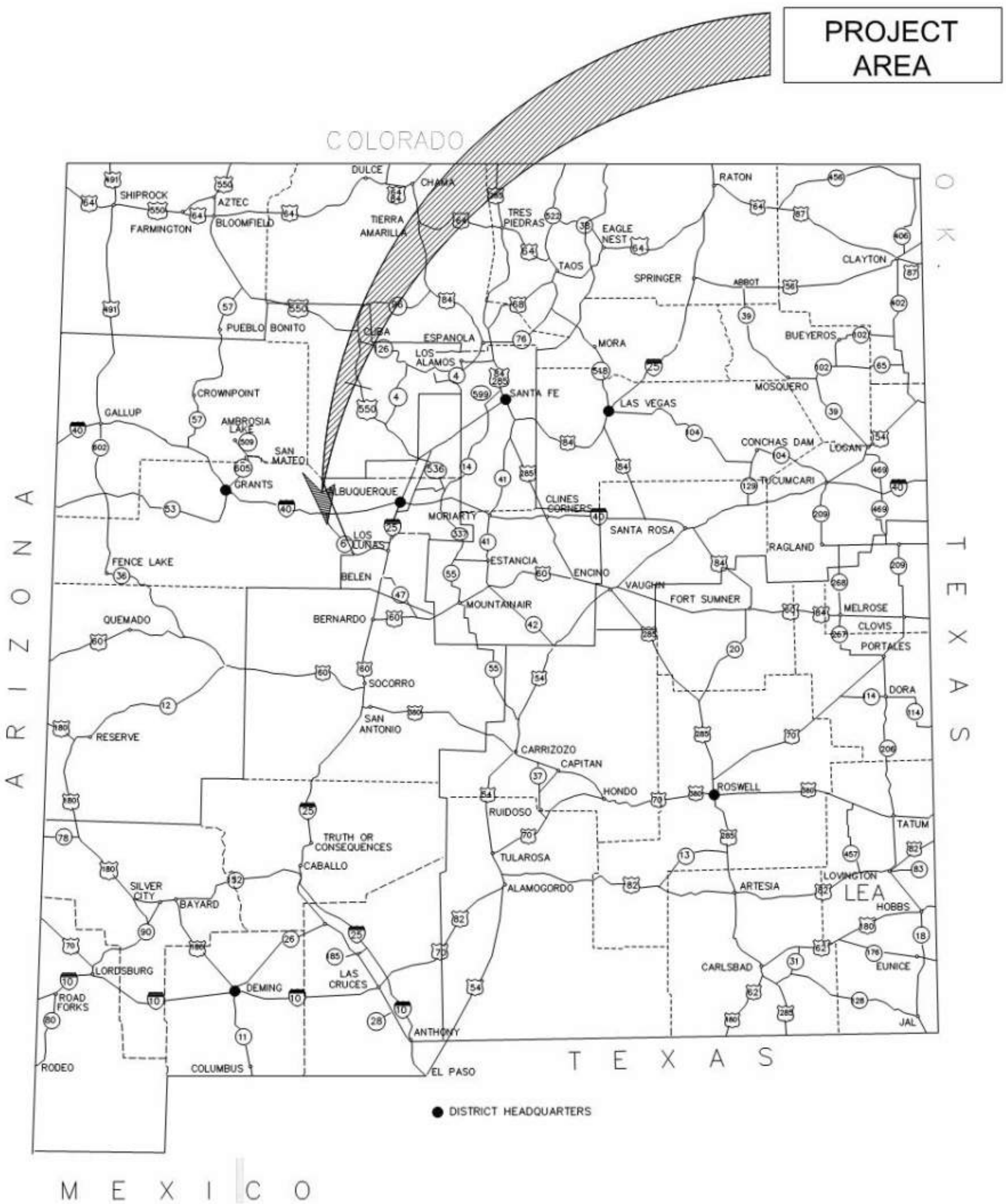


Figure 1 - Location Map

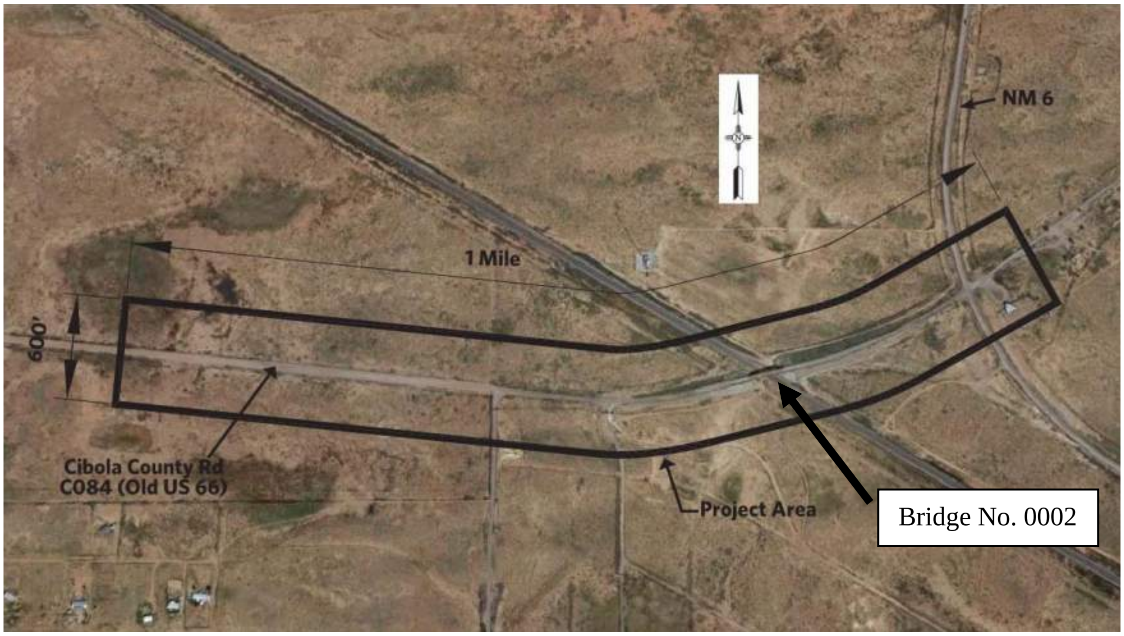


Figure 2 - Vicinity Map

2. Work Tasks Completed

Under the project the following tasks were completed.

1. As-built drawings for the bridge were obtained from the NMDOT. Copies of the record drawings are included in Appendix D.
2. The latest inspection report was obtained from the NMDOT. Copies of the inspection report are included in Appendix E.
3. Cursory visual field inspections were completed during the fall of 2015 and the summer of 2016, specifically, October 7, 2015 and June 22, 2016. The structures were inspected visually. Deficiencies were documented by taking digital images. The photo log is included in Appendix C.
4. Possible alignments for Build Alternatives were considered in the Phase I-A/B Study Document. See Appendix B for alignment layouts. Alignment F was the selected alignment.
5. Possible bridge layouts were considered for the selected Alignment. See Appendix A for layouts.
6. Evaluation of alternatives.
7. A preliminary construction cost was estimated.

3. Existing Bridge Description

Bridge No.0002 was originally constructed in 1934 and reconstructed in 1995 using original 1934 materials. The structure has nine simple spans with a treated timber deck. Eight of the nine spans are treated timber girders (length = 21 ft. & 19 ft.) with the span over the railway being a rolled steel girder span (length = 52.74 ft.). According to the as-built plans, the minimum vertical clearance above the railway to the rolled steel girders is approximately 20'-10".

The bridge has two (2) 11'-6" driving lanes and a total deck width of 24'-0". The deck currently has an asphalt pavement overlay.

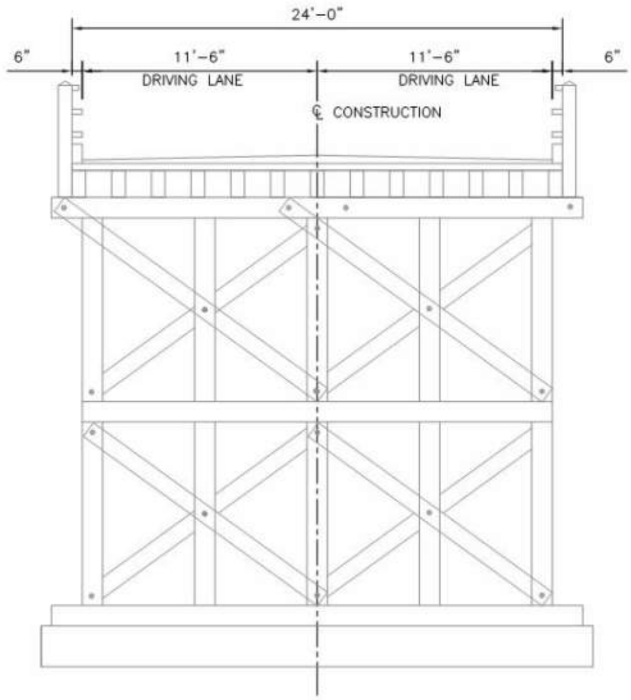


Figure 3 – Existing Typical Section

The steel girder span over the railway is supported with concrete pier walls and cap. The timber girders are supported by a timber pier and timber abutments. The timber girders have been reinforced with steel plates, straps and cradles.

The concrete pier walls are supported on a shallow spread footing foundation. There is approximately 10'-2" horizontal clearance between the pier wall and the center of the adjacent track. The timber pier columns and abutments are also founded on shallow concrete footings. The abutment slopes spill-through and are covered with rock riprap.

The bridge has a steel railing with a timber curb and a chain link fence mesh stretched between the posts. The railing has three (3) horizontal rail members.

Bridge Elevation View

Bridge Typical Section

4. Existing Condition

The latest inspection reports evaluate the condition of the structure as satisfactory. The structure has been posted for heavy loads.

The top of the timber deck is unobservable due to the asphalt overlay. In various areas of the deck, the asphalt was removed to access the timber deck members to rehabilitate the structure and then the overlay was patched with concrete. The underside of the deck has some areas of decay and some minor weathering and water staining.

Girders with Straps and Cradles

According to the current bridge inspection report, the steel girders over the railway are in good condition. The timber girders have been reinforced with steel plates, straps and cradles. The timber girders do show signs of crushing, diagonal splitting, checks and weathering. The bridge is posted with a weight limit and the latest inspection report says the Inventory Rating is HS12.1 and the Operating Rating is HS 17.2.

Weight Limit Sign

According to the current bridge inspection report, the pier timber columns have heavy checks and splits with moderate weathering and water stains, areas of surface rot and discoloration.

Pier Timber Columns

According to the current bridge inspection report, the pier walls have isolated horizontal, vertical and map cracks and spalls.

Pier Concrete Walls

According to the current bridge inspection report, the abutment timbers have moderate checks and splits and heavy weathering and minor water stains.

Abutments with Slope faced with Riprap

The capacity of the foundation members is unknown and an analysis has not been completed on the foundation elements as part of this report.

The bridge structure has several geometric deficiencies relative to today's standards. Those deficiencies are:

1. The deck width (24'-0") does not meet current standards as specified in the NMDOT Bridge Procedures and Design Guide, which calls for all bridges on rural highways to be designed with a shoulder equal or greater than 4 feet wide.

2. The vertical clearance (20'-8") does not meet current standards as specified in the BNSF Guidelines for Railroad Grade Separation Projects, which calls for a minimum vertical clearance of 23'-6".

3. The horizontal clearance (10'-2") between the existing track and the pier walls, also does no meet the current standards as specified in the BNSF Guidelines for Railroad Grade Separation Projects, which requires a minimum horizontal clearance of 25'-0". The current span length does not provide a sufficient horizontal offset for the requested third lane by BNSF.

5. Design Criteria

The proposed bridge structure will be designed in accordance with current engineering criteria from the following sources:

- AASHTO LRFD Bridge Design Specifications
- New Mexico Department of Transportation Bridge Procedures and Design Guide
- New Mexico Department of Transportation Standard Specification for Highway and Bridge

6. Evaluation Criteria

The criteria that will be used to evaluate the structures for this project are existing conditions/geometric constraints, structural requirements, economics, constructability, and aesthetics.

The evaluation process will be to assign a numerical value to the different criteria for each bridge. The numerical values will be assigned relative to how well they satisfy the evaluation criteria. The scale is as follows:

Favorable:……………………………………………….4
Adequate:……………………………………………….3
Insufficient:…………………………………………….2
Intolerable:……………………………………………..1

Each evaluated criteria will also have a weighted value that will be applied to the numerical value above and is a function of their perceived degree of importance. The weighted value for the criteria is:

Existing Conditions/Geometric Constraints:……………. 4
Structural Requirements:………………………………. 4
Economics: ……………………………………………. 6
Constructability:………………………………………. 5
Accelerated Bridge Construction (ABC): ……………….. 2
Aesthetics:……………………………………………….. 2

The numerical values will be multiplied together and combined within the evaluation matrix. The structure with the highest calculated value will be the preferred option.

Descriptions of the evaluation criteria used to determine the recommended structure type are as follows:

6.1. Existing Site Conditions/Geometric Constraints:

The proposed structures will be evaluated on how well they fit into the existing conditions and proposed geometry. The existing conditions may include the topography, hydrology, and geology. The geometric constraints may include span lengths, number of spans, structure width, vertical clearances, horizontal clearances, etc. For this particular application, the recommendations provided in the Phase I-A/B document will be considered as part of the Existing Site Conditions/Geometric Constraints

6.2. Structural Requirements:

The proposed structure will be evaluated on how well it performs structurally under the constraints and loads that are produced from the existing conditions and proposed geometry. Non-appropriate structure types relative to the required span length will be assigned an insufficient or intolerable score. The concrete option is the typical bridge type in this area due to accessibility of the building material and the historically lower costs for construction compared to steel. Steel superstructures offer advantages in a long span or shallow superstructure environment. Use of a steel superstructure will not provide any appreciable advantage given the existing span lengths and corresponding superstructure depths. Standard NMDOT details such as abutment expansion joint elimination will be applied during final design. All build options have the same opportunities relative to long-term serviceability and maintenance requirements.

6.3. Economics:

The initial construction cost and long term maintenance must be carefully considered to determine the most economic structure from a life cycle perspective. Historic data will be used to evaluate the relative costs of superstructure types in an effort to determine the most efficient. Estimated costs will be based on quantities of major bridge items and the average NMDOT unit bid prices.

6.4. Constructability:

The proposed structures will be evaluated on their level of difficulty to be constructed, length of time for construction, and availability of the construction material.

6.5. Accelerated Bridge Construction

Accelerated Bridge Construction (ABC) is bridge construction that uses innovative planning, design, materials, and construction methods in a safe and cost-effective manner to reduce the onsite construction time when building new bridges or replacing and rehabilitating existing bridges. ABC improves site constructability, total project delivery time and work-zone safety for the traveling public. ABC reduces traffic impacts, onsite construction time and weather-related time delays. A common reason to use ABC is to reduce traffic impacts because the safety of the traveling public and the flow of the transportation network are directly impacted by onsite construction related activities. Other common and equally viable reasons to use ABC deal with site constructability issues. Oftentimes long detours, costly use of temporary structure, remote site locations, and limited construction periods present opportunities where the use of ABC methods can provide more practical and economical solutions to those offered if conventional construction methods were used.

ABC methods may include approaches like Geosynthetic Reinforced Soil (GRS), Rapid Embankment Construction, Prefabricated Elements and Systems (PBES) and Structural Placement Methods. PBES are structural components of a bridge that are built offsite, or near-site of a bridge, and include features that reduce the onsite construction time and mobility impact time that occur from conventional construction methods. The Structural Placement Methods may incorporate Self-Propelled Modular Transporters, slide-in bridge construction, longitudinal launching, and horizontal sliding or skidding.

6.6. Aesthetics:

With any project, aesthetics are a concern. Clean lines and a slender structure that blends into the environment are generally considered to be favorable aesthetic features. Subtle enhancements such as form liners may be used to increase aesthetic appeal.

This bridge is an element of Historic Route 66 and the appearance of the bridge and views associated with and around the structure are a resource worth preserving.

7. Structure Types

The majority of all the bridge structures in New Mexico require short to medium span lengths. The most practical bridge for a short to medium span is a girder type structure, therefore a large percentage of all bridges are girder structures. The structure crossing requirements considered for this project fall into the short to medium span length group and will most likely follow the trend of being girder structures.

Girder Bridge types can be divided into two main groups with several subgroups. The main groups are steel girder structures and concrete girder structures. Concrete structures, prevalent in New Mexico, are commonly used for spans less than 130’. Due to steel’s high strength to weight ratio, steel structures are generally selected for spans greater than 130’.

7.1. Steel Structure:

Steel girder types considered in this report include a plate girder and a box girder. There are two options for the steel "I" plate girder option, "Continuous" and the "Simple for Dead Load and Continuous for Live Load". For the evaluation section of this report, both steel "I" girder sections will be evaluated together. Should a steel girder superstructure alternative prove preferable, a more detailed analysis will be performed to recommend either the continuous or simple plate girder options.

7.1.1. Continuous steel "I" plate girders

Continuous steel "I" plate girders combine efficiency of design with relative ease of construction. These girders can be designed to span within the range required by this project. Steel girders can provide a slender superstructure; however, optimization of depth must be carefully balanced against fabrication cost.

Raw material cost and availability will be a consideration in the current economic climate. Additional economies can be gained by the consideration of high performance steel.

This type of structure lends itself to mirroring the profile grade with minimal effort. It is likely that a continuous steel plate girder will yield the shallowest superstructure depth of the identified alternatives. Steel girders have a significantly smaller inertia when compared to a concrete girder.

Steel plate girders are a fairly common bridge superstructure type and are regionally available. American Institute of Steel Construction (AISC) certified steel plate girder fabricators are located in adjacent states, and therefore, girder transportation is not typically an obstacle.

Steel plate girder structures provide an aesthetically pleasing appearance. This material type provides a thin superstructure. However, the bolted connections and bracing tend to break the clean lines of the girder.

7.1.2. Simple for Dead Load and Continuous for Live Load Steel Plate Girder

The steel "I" plate girders could also be designed as a Simple for Dead Load and Continuous for Live Load. This design concept gains its economy from simplification of fabrication and construction details. It sacrifices some efficiency in material use for less expensive labor costs. By eliminating field splices and simplifying and reducing connection details the labor effort required to produce the finished structure is reduced. The associated costs of construction drawing detail development, shop drawing development, fabrication, and construction are reduced as well.

The girder lengths required by the project site are well within the capabilities of this design concept and material properties.

In an effort to reduce fabrication costs, flange and web transitions are typically eliminated. This results in a slightly deeper, slightly more "bulky" structure when compared to a continuous plate girder.

This superstructure type results in a slightly cleaner design when compared with a continuous steel plate girder as field splices are not present to break the lines of the girder.

7.1.3. Steel Box Girder

The advantages of using a welded steel box girder are similar to those of a continuous steel plate girder. However, fabrication, transportation, and erection are typically more complicated. This increased complication generally translates into an increased cost.

Traditionally this type of structure provides advantages when placed in an environment where high lateral load resistance is desired.

7.2. Concrete Structure:

With the concrete girder structure being the most common structure used in New Mexico there are many different options to consider when selecting a concrete structure. The pre-cast, pre-stressed sections include "I" shapes, "U" shapes, box shapes and slab shapes. Cast-in-place concrete construction should also be considered for the shorter spans and cast-in-place post-tensioned section should be considered for longer spans. The cast-in-place sections include a slab or a box.

7.2.1. Pre-Cast Pre-Stressed I Girder:

Pre-cast pre-stressed "I" girders are a common superstructure type in New Mexico due in part to their economy and relative ease of construction. The historical performance of standard AASHTO girder superstructures has generally been good. Pre-cast, pre-stressed concrete girders are typically produced in incremental depths with typical spans ranging from 30 feet to 140 feet.

This type of superstructure does tend to be deeper than steel girder structures. A deeper superstructure has the potential to adversely affect the profile.

These types of girders are readily available in the area.

Pre-cast girder bridges are a good aesthetic choice for bridges on horizontal tangents. The superstructure consists of horizontal lines, which create a continuous look.

7.2.2. Pre-Cast Pre-Stressed Box/Tub/Slab girder

Not only are the pre-cast pre-stressed concrete box, tub and slab girders similar in nature to each other, they have a lot in common with the pre-cast pre-stressed I girder. All are economical, readily constructible, and locally available.

The beam depth between the box girder and the tub girder vary for the available standard sections. The deepest available standard box girder section is 42" deep, while the deepest available standard tub girder section is 54" deep. Shallower girder depth is more advantageous from a geometric, economic and aesthetic perspective.

7.2.3. Cast-in-Place Post-Tensioned Box Girder

The advantage the cast in place post-tensioned box structure offers is its shallow superstructure. This type would be accommodating to the profile constraints of this project. Span ranges from 100 feet to over 250 feet are typical for this type of construction.

A cast in place, post-tensioned concrete box makes use of an eccentric, compressive force in much the same way as pre-cast, pre-stressed concrete. The major difference is the construction technique. This alternative requires the use of false work to support the entire superstructure during the majority of the construction process. The false work would have to be placed at railroad bed elevation. The allowable temporary clearance at this location is 21 feet. All falsework would have to be above this elevation.

Experienced contractors and construction crews are not locally available for this type of construction. Due to the lack of experienced contractors for this bridge type and the obstructions the false work would create in the railway, this superstructure type is not feasible for this project and will be eliminated from further consideration.

7.2.4. Cast-in-Place Slab

A cast-in-place slab bridge is the simplest type of reinforced concrete bridge type. The slab acts as the superstructure unit carrying loads to the substructure units. Conventionally reinforced slab bridges have a span range up to 30 feet. The railroad requires a 50 foot minimum opening per tangent track. Casting of the slab bridge would require false work to support the entire superstructure during construction. The false work would have to be placed outside of the temporary clearance envelope. Due to the span length limitations, this superstructure type is not feasible for this project and will be eliminated from further consideration.

7.3. Abutment:

The bridge type selection will also need to consider the abutment type. There are two basic, geometrical types under consideration for this project: Spill Through Abutments and Full Height Abutments.

7.3.1. Spill Through Abutments

Spill through abutments place the abutment at the top of the approaching roadway embankment. This abutment style allows for the approaching roadway embankment to spill through the abutment and slope down to the surface below. The overall bridge length will be longer for this abutment type relative to the full height abutments. This abutment type will match the existing structure and is preferred.

7.3.2. Full Height Abutments

Full height abutments retain the soil so that an embankment does not exist under the bridge. The vertical retaining wall could be either a foundation member for the bridge or constructed in front of the bridge foundation.

Mechanically Stabilized Earth (MSE) walls supporting roadways above track level are not acceptable within the Railroad right-of-way or within 50 feet of the centerline of the existing or future tracks. Since the MSE wall is not acceptable in the Railroad right-of-way and due to the heights of the abutment walls for a rail crossing, the full height abutment walls are expected to be precast double tee walls.

The main criteria for evaluating the abutment type will be the existing conditions, and economical balance of the cost for additional bridge length versus costs associated with full height abutment walls.

7.4. Pier:

The bridge type selection will also consider the pier type. Due to the historic connection that this bridge has to Route 66, it is desired that the pier substructure maintain the appearance of the existing bridge with concrete pier wall adjacent to the rail tracks.

8. Type Selection Evaluation

The evaluation criteria discussion above has focused the type selection to a girder bridge type. The significant characteristic of this bridge that narrowed the possibilities to this type is the span length over the railway. The center span length falls into the medium range and eliminates the types typical for short or long spans. Therefore, the alternatives that will be evaluated as part of this report are:

- Three Span with Spill Through Abutments (Concrete and Steel Girders)
- Single Span with Full Height Abutment Walls (Concrete and Steel Girders)

See Appendix A for layouts.

8.1. Existing Site Conditions/Geometric Contraints

The existing conditions to consider in the selection of the bridge type for this crossing are the topography of the area and the BNSF railway. The surrounding area is relatively flat. The approaching roadway will require embankment construction for all alternatives.

The preferred alignment alternative is Build Alternative F as defined in the Phase I-A/B document. The roadway alignment crosses the railway at a 45 degree skew. It is desirable to span the entire railway, including the desired future track. The length of the span required to bridge the railway is approximately 124'-0".

All of the proposed alternatives are *Favorable* for these conditions.

8.2. Structural Requirements

The structural requirements to consider in the selection of a structure type are typically set by the geometric constraints of the roadway. The geometric constraint that is most influential to the structural requirements of a bridge and its type selection is the span length configuration. As previously mentioned, the center span length is approximately 124'-0".

This bridge length requirement can be satisfied with a steel or concrete girder structure. The "I" girder shapes are the preferred girder type for this structure. The box or tub shapes are not needed due to the lack of high lateral loads or vertical depth constraints. The box or tub shapes will be eliminated from future consideration.

All of the proposed alternatives are *Favorable* for these conditions.

8.3. Economics

Concrete girders are economically efficient in the 30 foot to 130 foot span range. For span lengths less then 30' a slab bridge structure has traditionally proven economical. For span lengths greater than about 130' the steel girder structures are economically competitive. The superstructure depth for a concrete girder bridge is typically greater than a steel girder structure. The minimal increase in earthwork volumes associated with a deeper superstructure depth at this location is considered negligible.

The concrete girder alternatives are *Favorable* and the steel girder alternatives are *Insufficient*.

8.4. Constructability

Construction of a bridge at this location is feasible, but with significant constraints from BNSF. BNSF will require all activities within 25 ft. of the railway centerline to stop as a train approaches and all construction workers to find a location that is at a safe distance away from the tracks. Large equipment, like a crane, that has the possibility of falling on the tracks is a concern and will have to be removed from the area of the tracks. Precast or prefabricated bridge elements are advantageous to the project to minimize construction activities around the tracks, but also unsatisfactory because they require a crane to be placed. Close coordination with BNSF will result in allowable windows for all construction activities. All of the alternatives will be subject to the same constructability constraints from BNSF. Alternatives requiring lighter loads where the crane can be located further from the track or alternatives reducing the need for a crane will be preferred.

As previously discussed, the vertical abutment walls will be precast double tee elements. The precast elements are post tensioned and anchored to a seat that is founded on deep foundation members. The precast members are placed over the post tension rod that is anchored into the foundation and the height of the walls require that the precast members be post tensioned in stages to resist the earth pressure of the retained embankment. The crane requirement for these precast members is not Favorable.

Three span steel girders on spill through abutments will be rated as *Favorable* for construction. Three span concrete girders on spill through abutments will be rated as *Adequate*. Single span steel and concrete girder alternatives supported on precast abutment wall will be rated as *Insufficient*.

8.5. Accelerated Bridge Construction

The very low vehicular traffic volume that is present on the project doesn’t support a primary reason for ABC, which is to reduce impacts to traffic. The expected costs due to the impacts resulting from typical construction methods will not be high due to the low volume of traffic. The high volume of train traffic does support the reason for ABC. Minimizing the construction time adjacent to the railway will be preferable to the project, but not at the cost of additional crane time necessary to lift the precast elements.

The alternatives with full height abutment walls will be valued as *Insufficient* because they rely on additional crane usage. The other alternatives will be valued as *Adequate*, because they only incorporate prefabricated girder elements.

8.6. Aesthetics

The bridge structure is minimally visible for all bridge types. Aesthetic features in this rural location are not essential and its value is diminished. Therefore, the aesthetics of all the considered bridge types will be *Favorable* at this location.

8.7. Summary of Alternatives

The evaluations discussed above are included in the following table with the weighting factors applied to the ranking scores. The highest overall score represents the structure that evaluated the best.

	Evaluation Criteria:	Existing Conditions/ Geometric Constraints		Structural Requirements		Economics		Constructability		ABC		Aesthetics		Total
	Weighting Factor:	4		4		6		5		2		2		
		Score	Total	Score	Total	Score	Total	Score	Total	Score	Total	Score	Total	
Alternative	Three Span with Spill Through Abutments (Steel "I" Girders)	4	16	4	16	2	12	4	20	3	6	4	8	78
	Three Span with Spill Through Abutments (Concrete "I" Girders)	4	16	4	16	4	24	3	15	3	6	4	8	**85**
	Single Span with Full Height Abutment Walls (Steel "I" Girders)	4	16	4	16	2	12	2	10	2	4	4	8	66
	Single Span with Full Height Abutment Walls (Concrete "I" Girders)	4	16	4	16	4	24	2	10	2	4	4	8	78

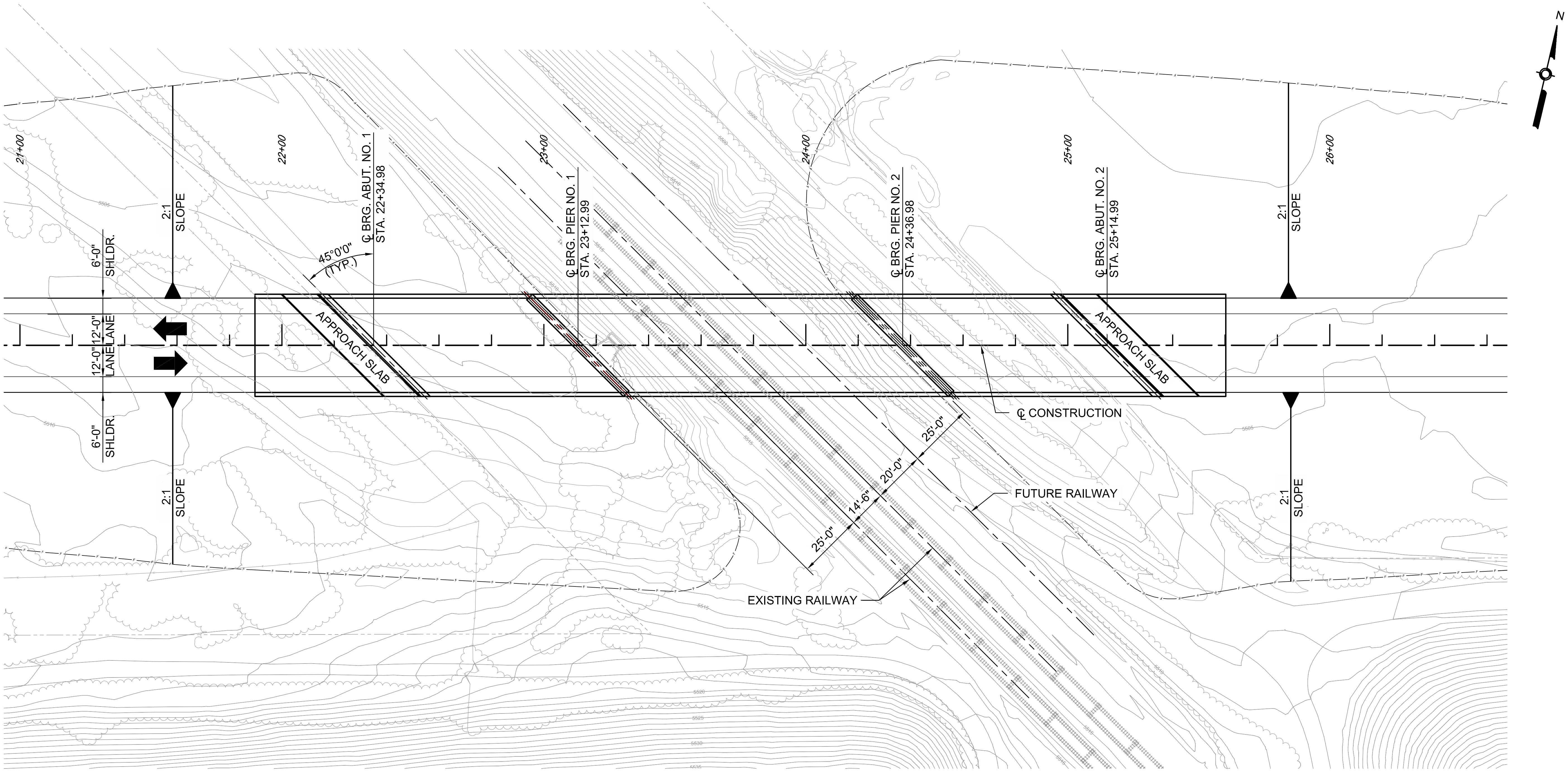
9. Recommendations

The purpose of this report was to evaluate the appropriate bridge structure type for the Cibola County Road C084 structure over the BNSF Railway. The recommended structure type based on the criteria and methodology outlined in this report is a prestressed concrete girder on spill through abutments.

The proposed structure layout sheets are included in Appendix A. The proposed layout is a 3 span prestressed concrete bridge member type BT-54 (span 1 and 3) and type 63 (span 2). The span lengths would be 78'-0" (span 1 and 3) and 124'-0" (span 2). The bridge width is 39'-0" with two (2) 12' driving lanes, two (2) 6' shoulders and two (2) 1.5' bridge metal railings. An estimated construction cost for the structure is $1,663, 000. This estimate is for the bridge only and does not include any other components (i.e. roadway, traffic control, BNSF flagging, etc.). Currently, the recommended foundation system is unknown. Should adverse foundation conditions exist, the bridge cost should be increased.

10. Appendix A – Bridge Location Layouts

HDR
2155 LOUISIANA BLVD NE,
SUITE 9500
ALBUQUERQUE, NM 87110
MAIN: (505) 830-5400
FAX: (505) 830-5454



STRUCTURE LOCATION - PLAN

NO.	DESCRIPTION	DATE	BY
4			
3			
2			
1			

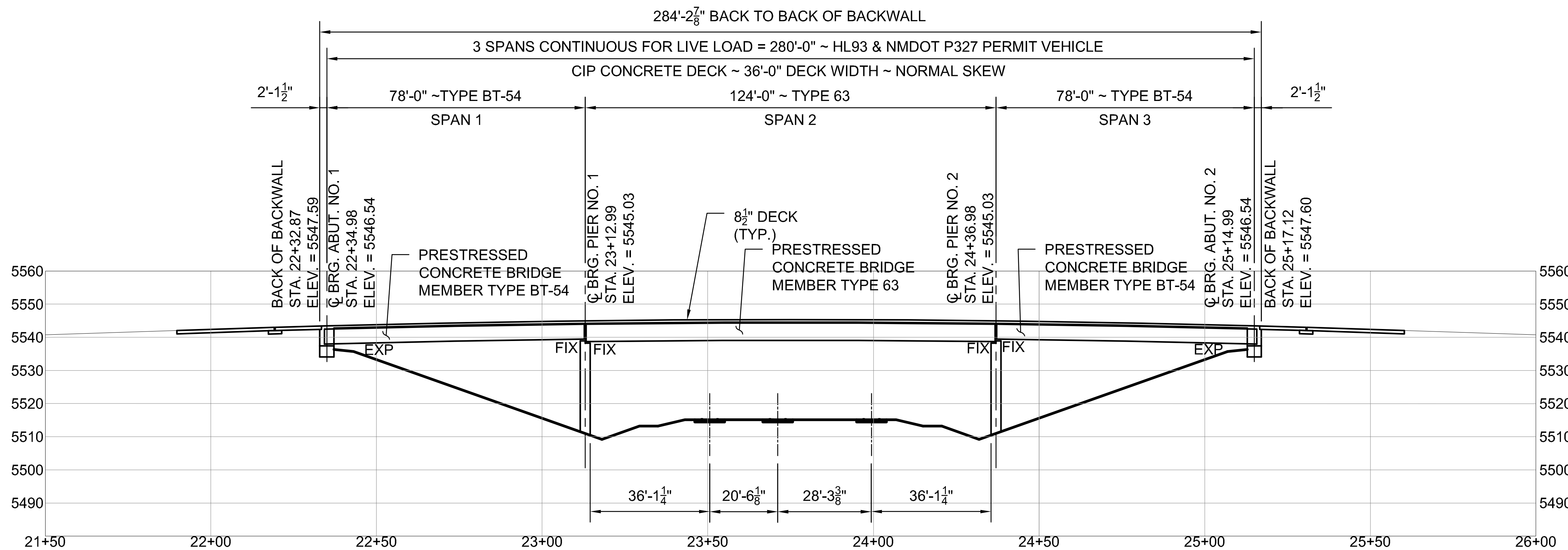
REVISIONS (OR CHANGE NOTICES)

NEW MEXICO DEPARTMENT
OF TRANSPORTATION
CIBOLA COUNTY ROAD
3 SPAN OPTION
STRUCTURE LOCATION - PLAN

BRIDGE NO. XXX
STA. XXX

APPROVED FOR CONSTRUCTION:________________ DATE: ________

HDR
2155 LOUISIANA BLVD NE,
SUITE 9500
ALBUQUERQUE, NM 87110
MAIN: (505) 830-5400
FAX: (505) 830-5454



STRUCTURE LOCATION - ELEVATION

NO.	DESCRIPTION	DATE	BY
4			
3			
2			
1			

REVISIONS (OR CHANGE NOTICES)

NEW MEXICO DEPARTMENT OF TRANSPORTATION
CIBOLA COUNTY ROAD
3 SPAN OPTION
STRUCTURE LOCATION - ELEVATION

BRIDGE NO. XXX
STA. XXX

APPROVED FOR CONSTRUCTION:______________ DATE: ______________

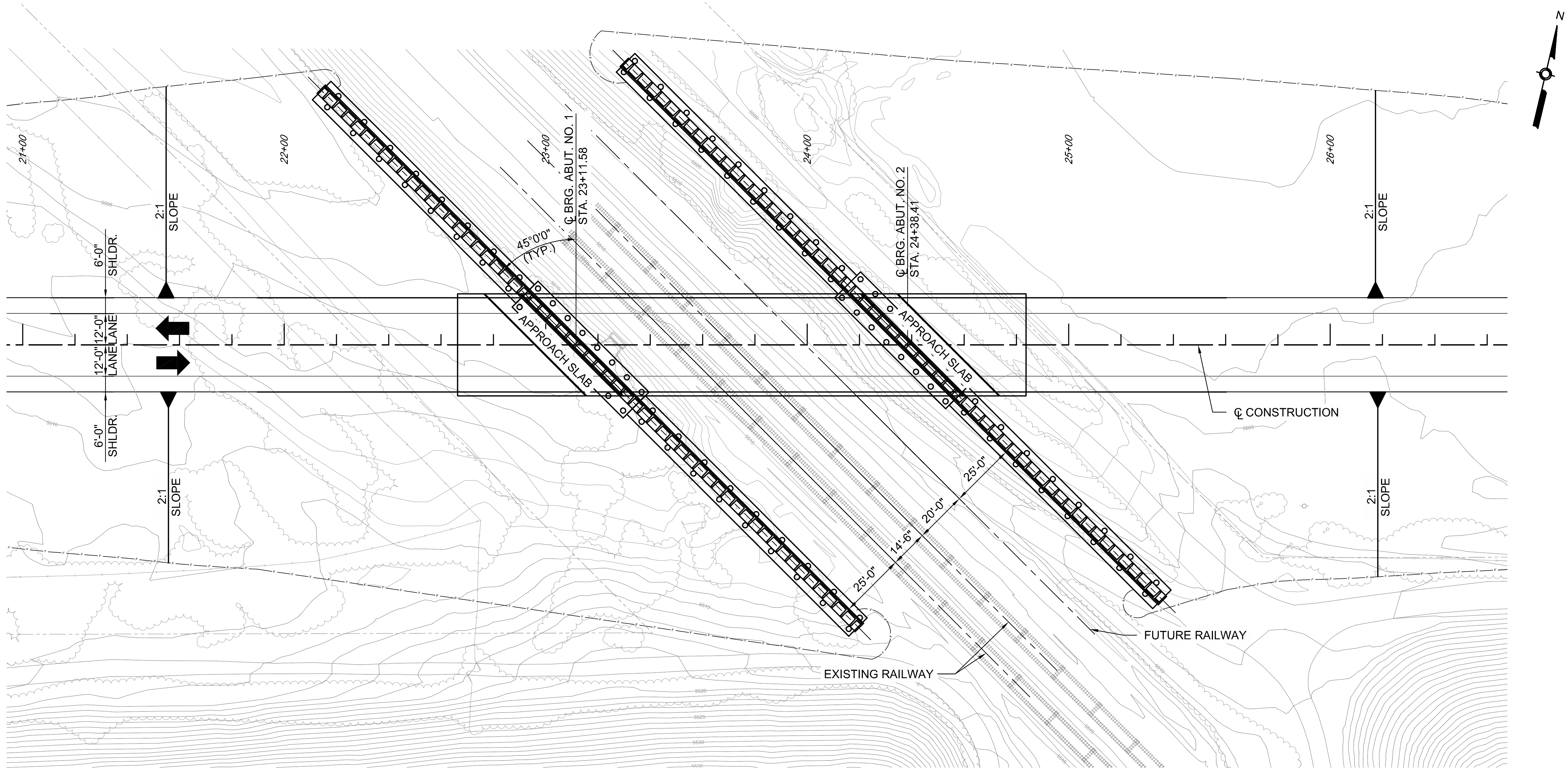
Drawing File:

DESIGNED BY: D. BEAN

NEW MEXICO PROJECT NO. XXX

MAESE, KEVIN C:\PWWORKING\PHX\D0509966\S100350 5BR05.DWG

HDR
2155 LOUISIANA BLVD NE,
SUITE 9500
ALBUQUERQUE, NM 87110
MAIN: (505) 830-5400
FAX: (505) 830-5454



STRUCTURE LOCATION - PLAN

NO.	DESCRIPTION	DATE	BY
4			
3			
2			
1			

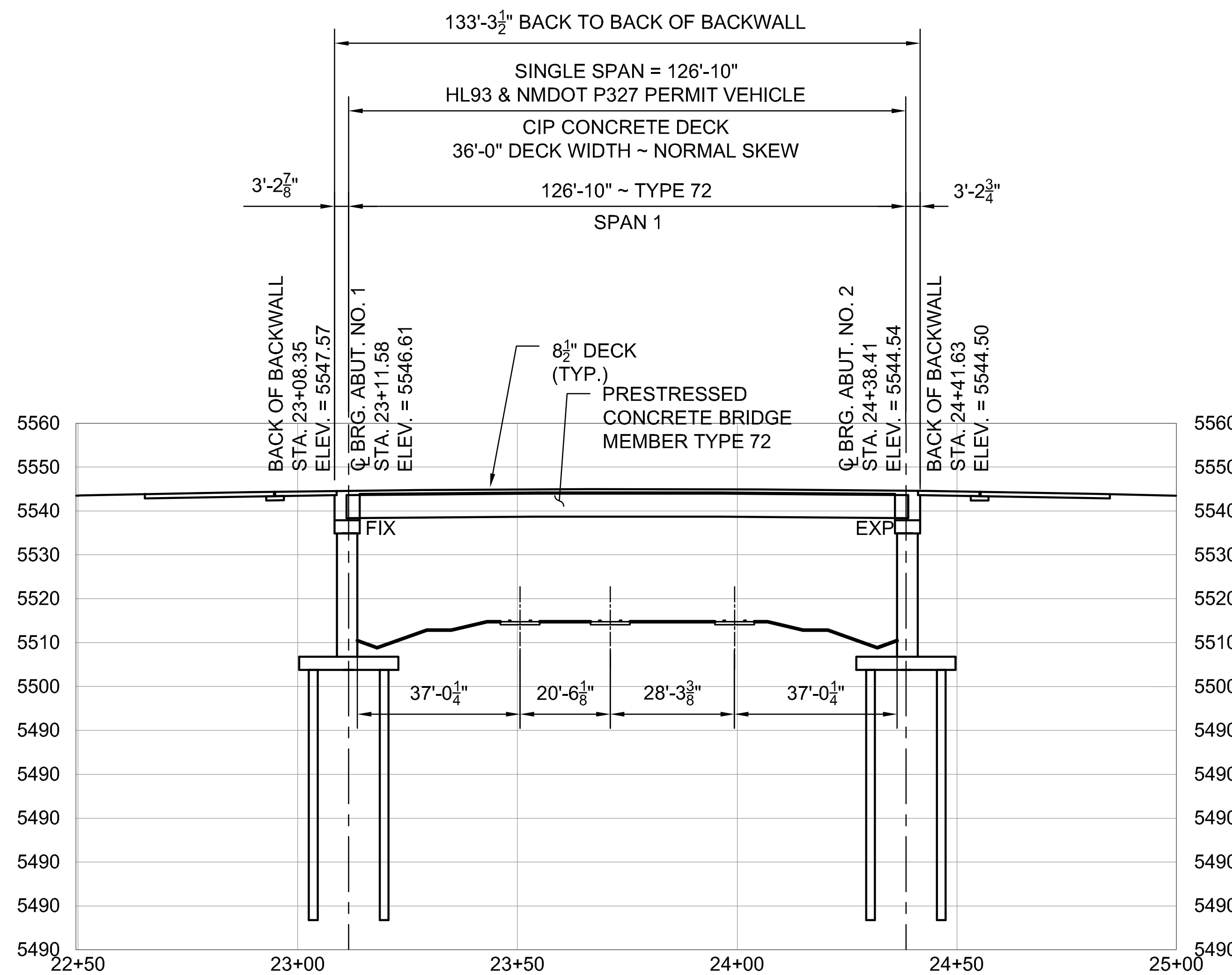
REVISIONS (OR CHANGE NOTICES)

NEW MEXICO DEPARTMENT
OF TRANSPORTATION
CIBOLA COUNTY ROAD
SINGLE SPAN OPTION
STRUCTURE LOCATION - PLAN

BRIDGE NO. XXX
STA. XXX

APPROVED FOR CONSTRUCTION:____________________ DATE: __________

HDR
2155 LOUISIANA BLVD NE,
SUITE 9500
ALBUQUERQUE, NM 87110
MAIN: (505) 830-5400
FAX: (505) 830-5454



STRUCTURE LOCATION - ELEVATION

NO.	DESCRIPTION	DATE	BY
4			
3			
2			
1			

REVISIONS (OR CHANGE NOTICES)

NEW MEXICO DEPARTMENT
OF TRANSPORTATION
CIBOLA COUNTY ROAD

SINGLE SPAN OPTION
STRUCTURE LOCATION -
ELEVATION

BRIDGE NO. XXX
STA. XXX

APPROVED FOR CONSTRUCTION:____________________ DATE: ____________

Drawing File:

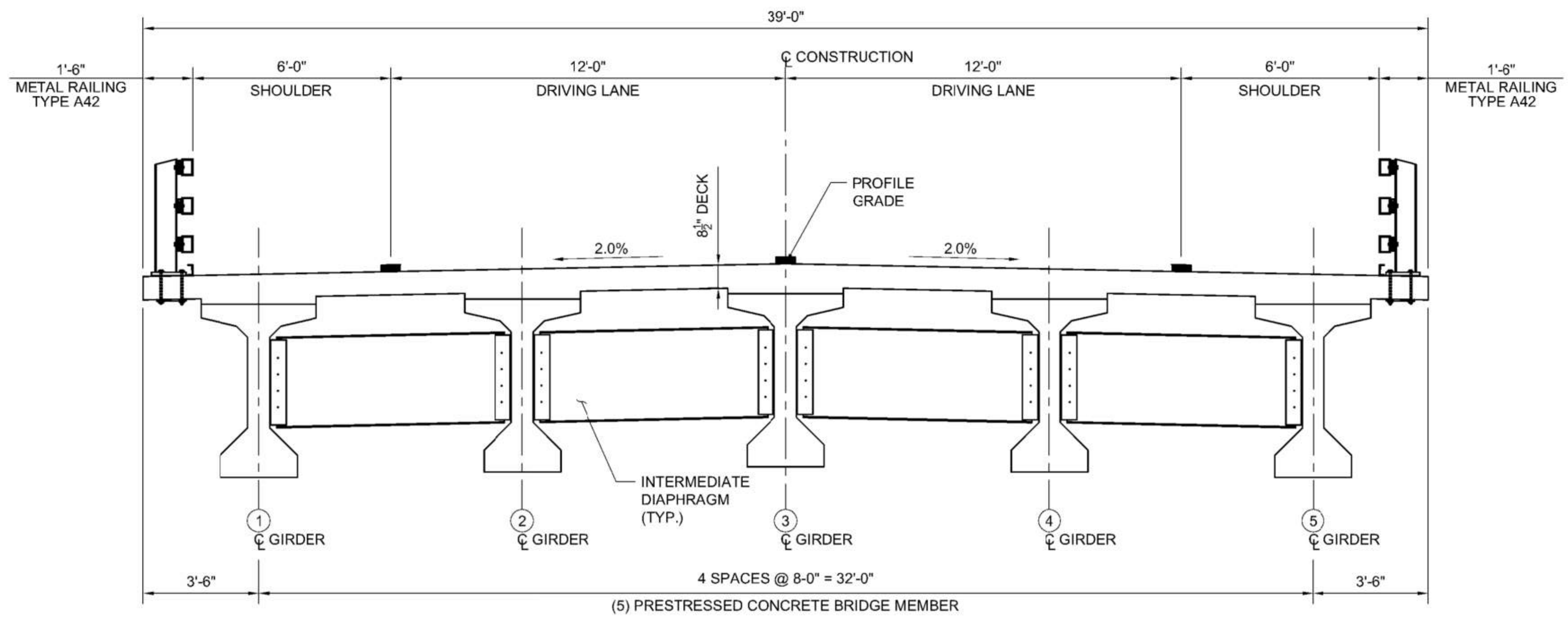
DESIGNED BY: D. BEAN

NEW MEXICO PROJECT NO. XXX

SHEET NO. 24

MAESE, KEVIN C:\PWWORKING\PHX\D0509966\S100350 5BR05A.DWG

2155 LOUISIANA BLVD NE,
SUITE 9500
ALBUQUERQUE, NM 87110
MAIN: (505) 830-5400
FAX: (505) 830-5454



TRANSVERSE SECTION

NO.	DESCRIPTION	DATE	BY
4			
3			
2			
1			

REVISIONS (OR CHANGE NOTICES)

NEW MEXICO DEPARTMENT OF TRANSPORTATION
CIBOLA COUNTY ROAD
3 SPAN OPTION
TYPICAL SECTION

BRIDGE NO. XXX
STA. XXX

APPROVED FOR CONSTRUCTION:________________ DATE: ________

Drawing File:

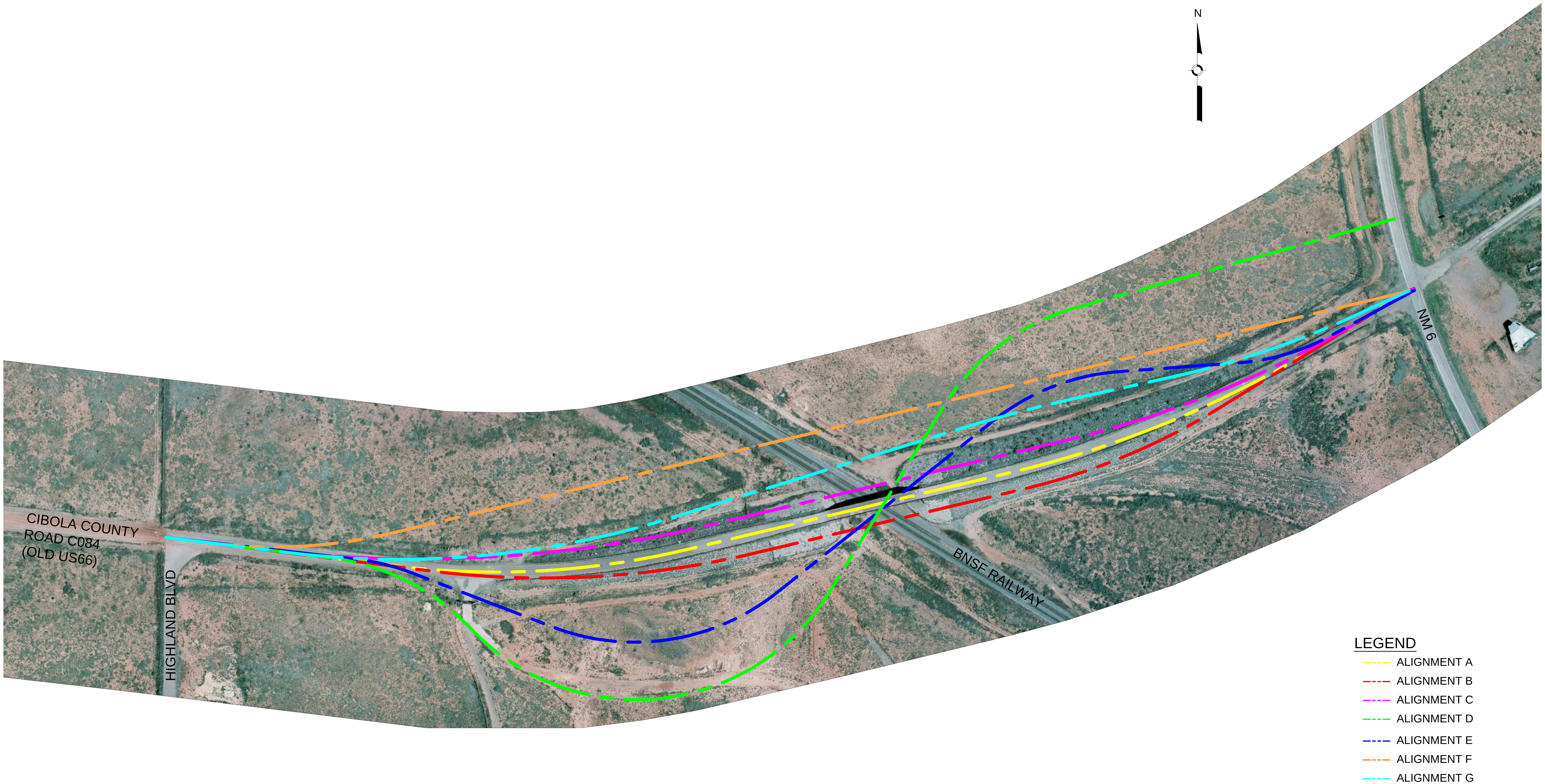
DESIGNED BY: D. BEAN

NEW MEXICO PROJECT NO. XXX

SHEET NO.

MAESE, KEVIN C:\PWWORKING\PHX\D0509966\S100350 5BR06.DWG

11. Appendix B – Alignment Alternatives



NMDOT

HDR

NMDOT DISTRICT 6

CIBOLA COUNTY ROAD C084 PROJECT

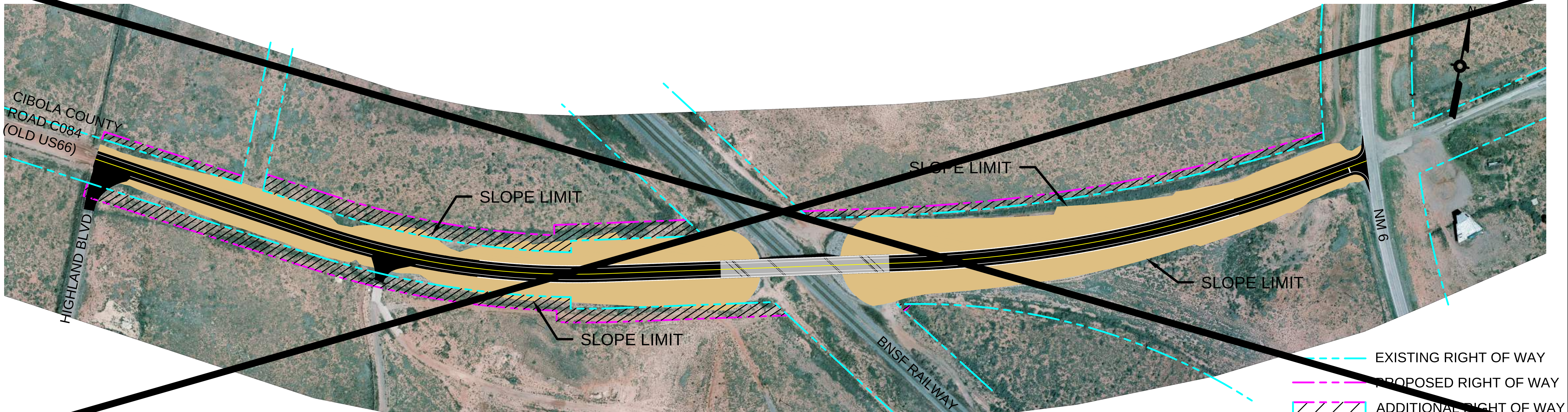
Alignment Alternatives

DATE

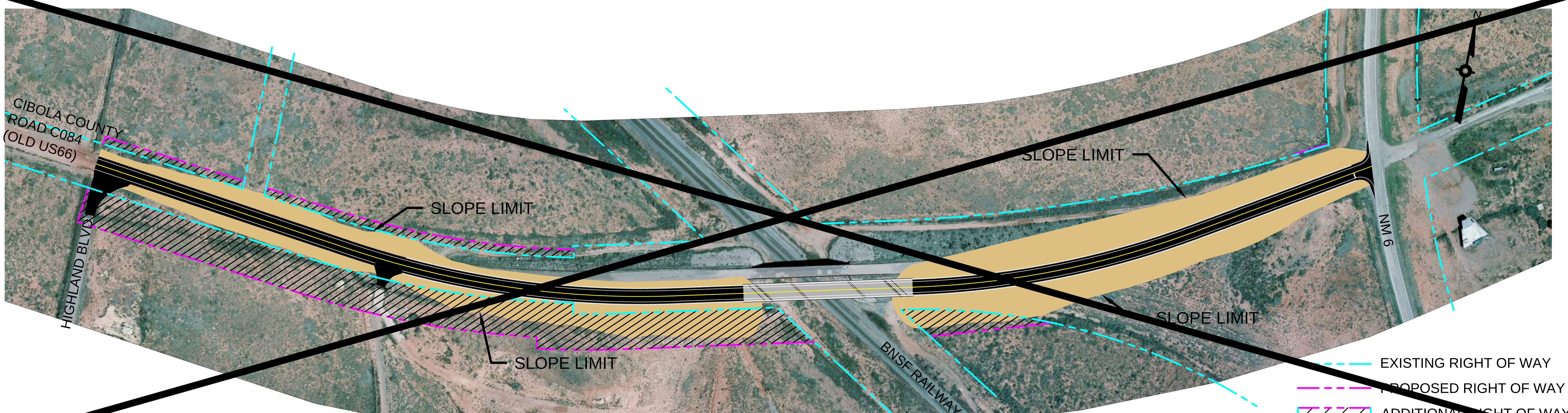
10/2016

FIGURE

1 27



Build Alternative A



Build Alternative B

NMDOT

HDR

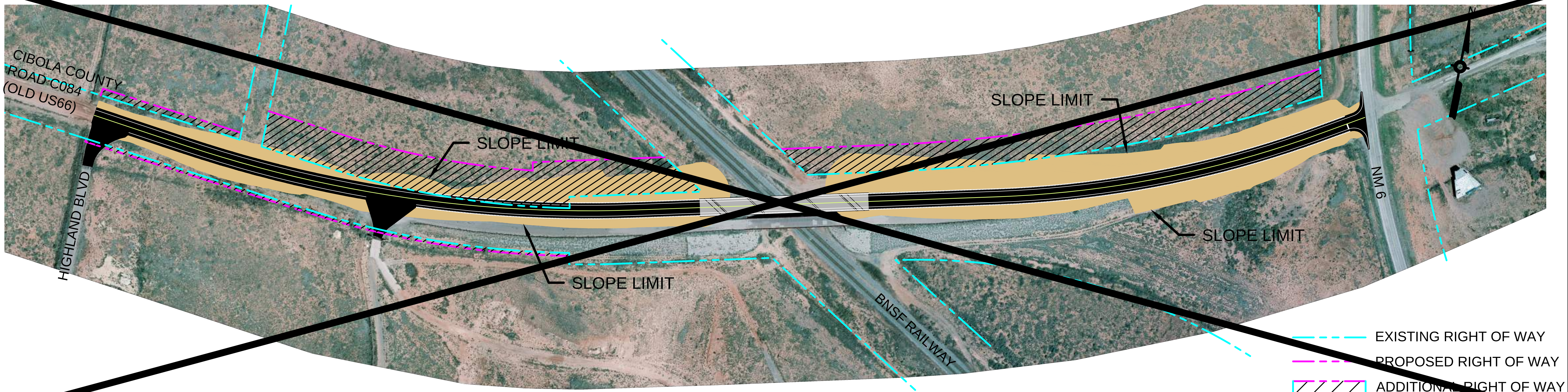
NMDOT DISTRICT 6

CIBOLA COUNTY ROAD C084 PROJECT

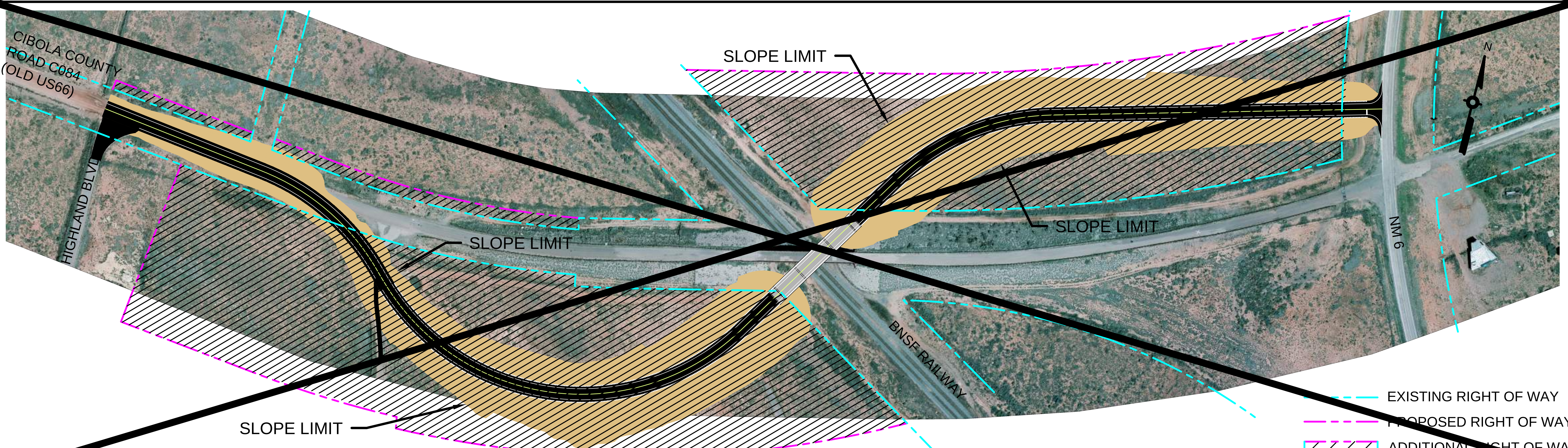
Build Alternatives

DATE 10/2016

FIGURE 2



Build Alternative C



Build Alternative D

NMDOT

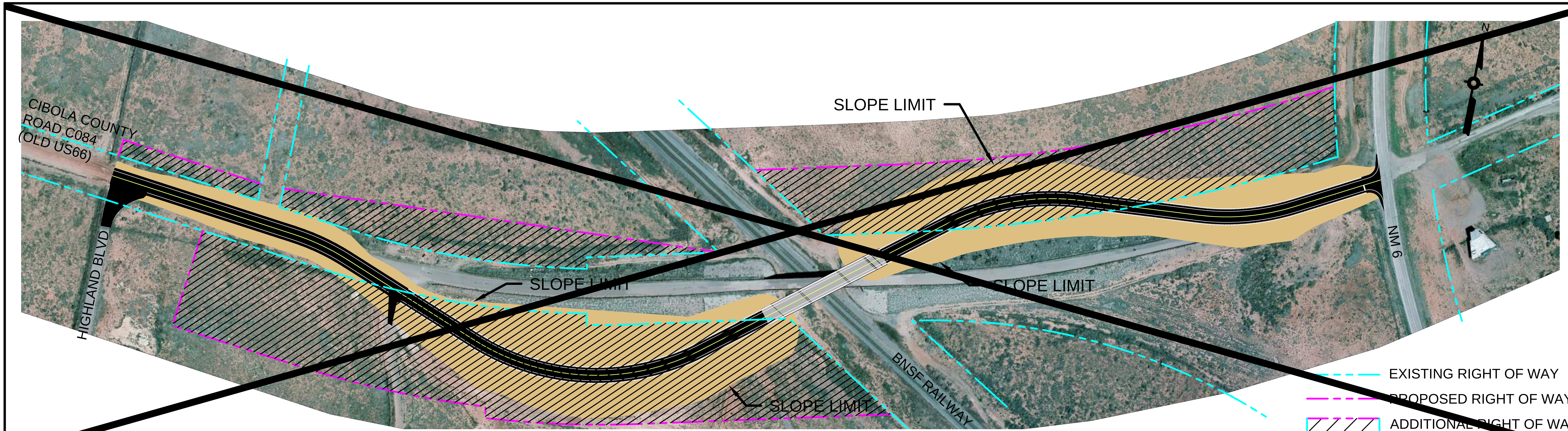
NMDOT DISTRICT 6

CIBOLA COUNTY ROAD C084 PROJECT

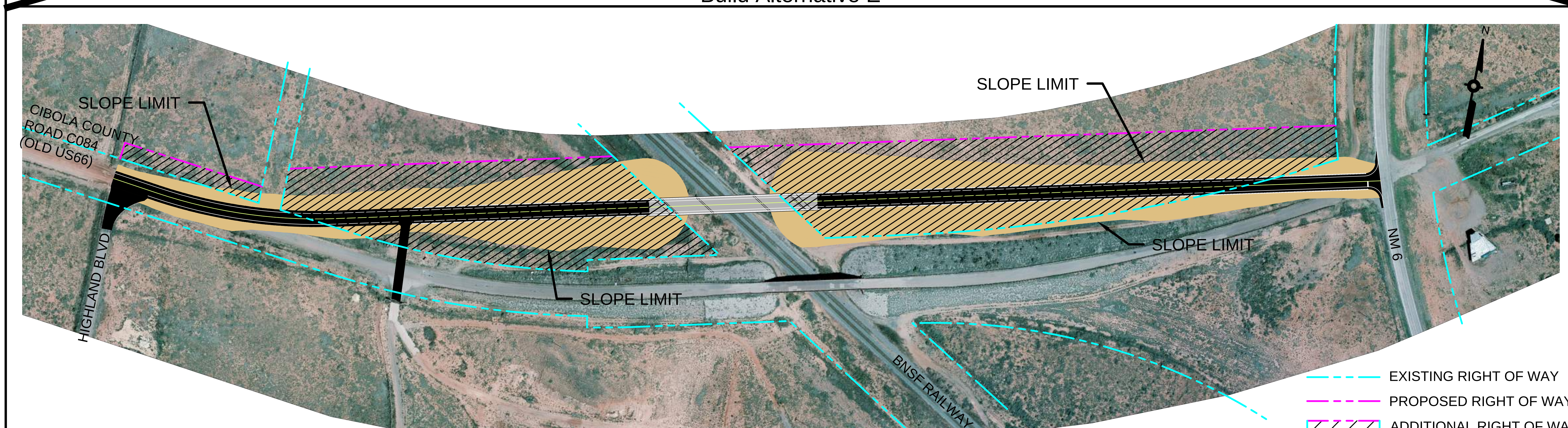
Build Alternatives

DATE
10/2016

FIGURE
3



Build Alternative E



Build Alternative F

NMDOT

HDR

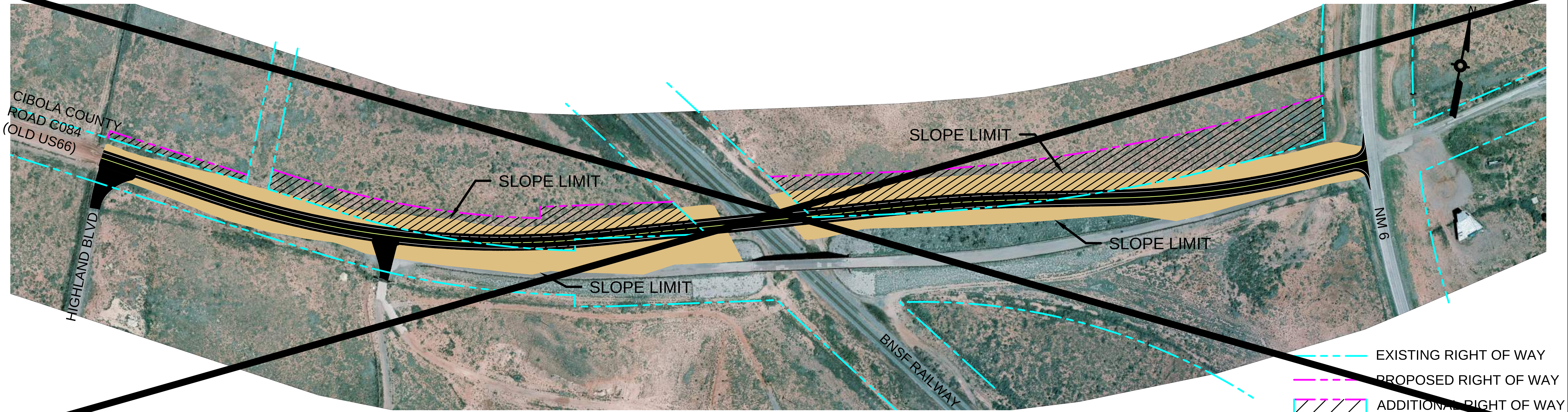
NMDOT DISTRICT 6

CIBOLA COUNTY ROAD C084 PROJECT

Build Alternatives

DATE 10/2016

FIGURE 4



Build Alternative G

NMDOT

HDR

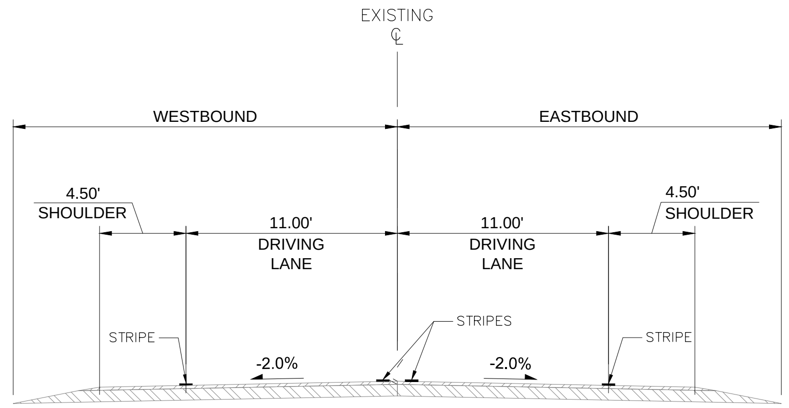
NMDOT DISTRICT 6

CIBOLA COUNTY ROAD C084 PROJECT

Build Alternatives

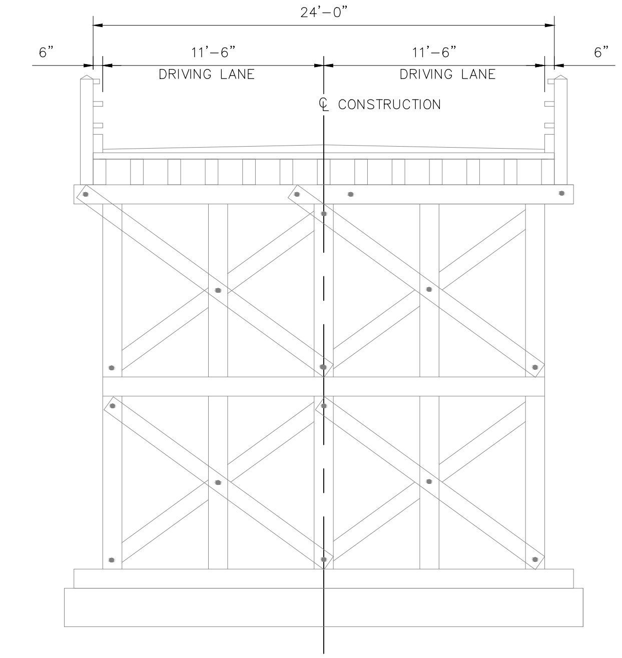
DATE 10/2016

FIGURE 5



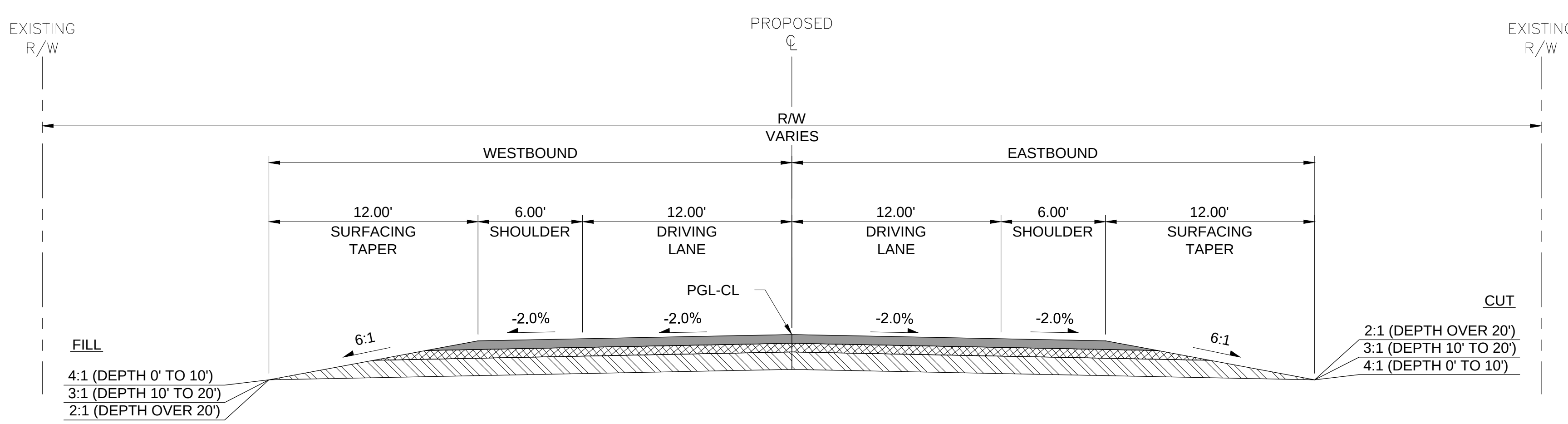
EXISTING TYPICAL SECTION

NOT TO SCALE



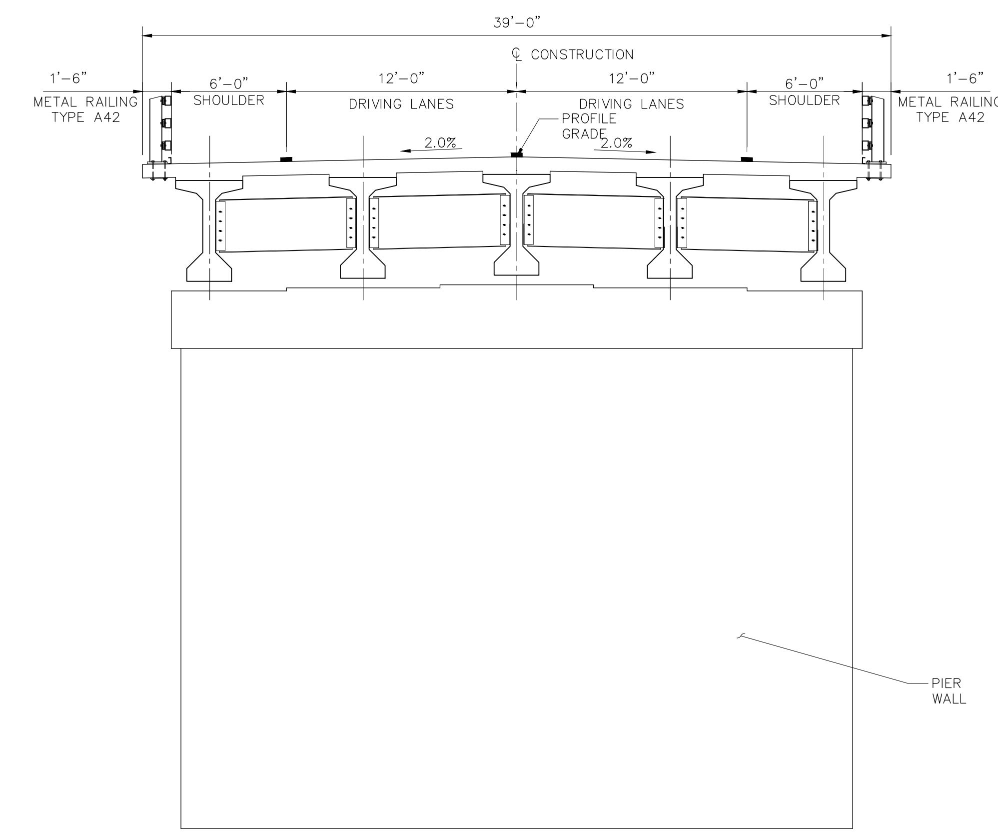
EXISTING TRANSVERSE SECTION–PIER

NOT TO SCALE



PROPOSED TYPICAL SECTION

NOT TO SCALE



PROPOSED TRANSVERSE SECTION–PIER

NOT TO SCALE

NMDOT

HDR

NMDOT DISTRICT 6

CIBOLA COUNTY ROAD C084 PROJECT

Typical Sections

DATE

10/2016

FIGURE

6 32

12. Appendix C – Inspection Photo Log

NMDOT
BRIDGE INSPECTION REPORT PHOTOS
BRIDGE NO. 0002

STRUCTURE NUMBER:	0002	**FACILITY CARRIED:**	Cibola County Road C084
INSPECTION DATE:	October 2015	**FEATURE INTERSECTED:**	BNSF Railway

Photo No:	**1**
Filename	P1030025.JPG
Location	West Side of Bridge – Looking East
Description	Roadway

Photo No:	**2**
Filename	P1030028.JPG
Location	West Side of Bridge – Looking East
Description	Roadway and Bridge Deck

NMDOT
BRIDGE INSPECTION REPORT PHOTOS
BRIDGE NO. 0002

STRUCTURE NUMBER:	0002	**FACILITY CARRIED:**	Cibola County Road C084
INSPECTION DATE:	October 2015	**FEATURE INTERSECTED:**	BNSF Railway

Photo No:	**3**
Filename	P1030029.JPG
Location	West Side of Bridge – Looking East
Description	Bridge Deck

Photo No:	**4**
Filename	P1030030.JPG
Location	Bridge Deck
Description	Bridge Number Plate

STRUCTURE NUMBER:	0002	**FACILITY CARRIED:**	Cibola County Road C084
INSPECTION DATE:	October 2015	**FEATURE INTERSECTED:**	BNSF Railway

Photo No:	**5**	
Filename	P1030031.JPG	
Location	Bridge Deck	
Description	Bridge Deck	

Photo No:	**6**	
Filename	P1030032.JPG	
Location	Bridge Deck	
Description	Deck Patches	

STRUCTURE NUMBER:	0002	**FACILITY CARRIED:**	Cibola County Road C084
INSPECTION DATE:	October 2015	**FEATURE INTERSECTED:**	BNSF Railway

Photo No:	**7**
Filename	P1030033.JPG
Location	Bridge Deck
Description	Looking West along Railway

Photo No:	**8**
Filename	P1030034.JPG
Location	Bridge Deck
Description	Looking East along Railway

STRUCTURE NUMBER:	0002	**FACILITY CARRIED:**	Cibola County Road C084
INSPECTION DATE:	October 2015	**FEATURE INTERSECTED:**	BNSF Railway

Photo No:	**9**
Filename	P1030035.JPG
Location	Under Bridge
Description	Bridge Elevation View

Photo No:	**10**
Filename	P1030036.JPG
Location	Under Bridge
Description	Timber Piers and Timber Beams

NMDOT
BRIDGE INSPECTION REPORT PHOTOS
BRIDGE NO. 0002

STRUCTURE NUMBER:	0002	**FACILITY CARRIED:**	Cibola County Road C084
INSPECTION DATE:	October 2015	**FEATURE INTERSECTED:**	BNSF Railway

Photo No:	**11**
Filename	P1030037.JPG
Location	Under Bridge
Description	Steel Cradles and Straps

Photo No:	**12**
Filename	P1030038.JPG
Location	South Side of Bridge and Railway
Description	Bridge Elevation

NMDOT
BRIDGE INSPECTION REPORT PHOTOS
BRIDGE NO. 0002

STRUCTURE NUMBER:	0002	**FACILITY CARRIED:**	Cibola County Road C084
INSPECTION DATE:	October 2015	**FEATURE INTERSECTED:**	BNSF Railway

Photo No:	**13**
Filename	P1030039.JPG
Location	South Side of Bridge and Railway
Description	Concrete Pier Walls and East Abutment

Photo No:	**14**
Filename	P1030043.JPG
Location	East Abutment
Description	Abutment Slope

STRUCTURE NUMBER:	0002	**FACILITY CARRIED:**	Cibola County Road C084
INSPECTION DATE:	October 2015	**FEATURE INTERSECTED:**	BNSF Railway

Photo No:	**15**
Filename	P1030046.JPG
Location	East Abutment
Description	Bridge Elevation

Photo No:	**16**
Filename	P1030048.JPG
Location	East Abutment
Description	West Abutment

STRUCTURE NUMBER:	0002	**FACILITY CARRIED:**	Cibola County Road C084
INSPECTION DATE:	October 2015	**FEATURE INTERSECTED:**	BNSF Railway

Photo No:	**17**
Filename	P1030050.JPG
Location	Under Bridge
Description	West Abutment Slope

Photo No:	**18**
Filename	P1030055.JPG
Location	Under Bridge
Description	Timber Piers

STRUCTURE NUMBER:	0002	**FACILITY CARRIED:**	Cibola County Road C084
INSPECTION DATE:	October 2015	**FEATURE INTERSECTED:**	BNSF Railway

Photo No:	**19**
Filename	P1030059.JPG
Location	Approach Embankment
Description	Weight Limit Sign

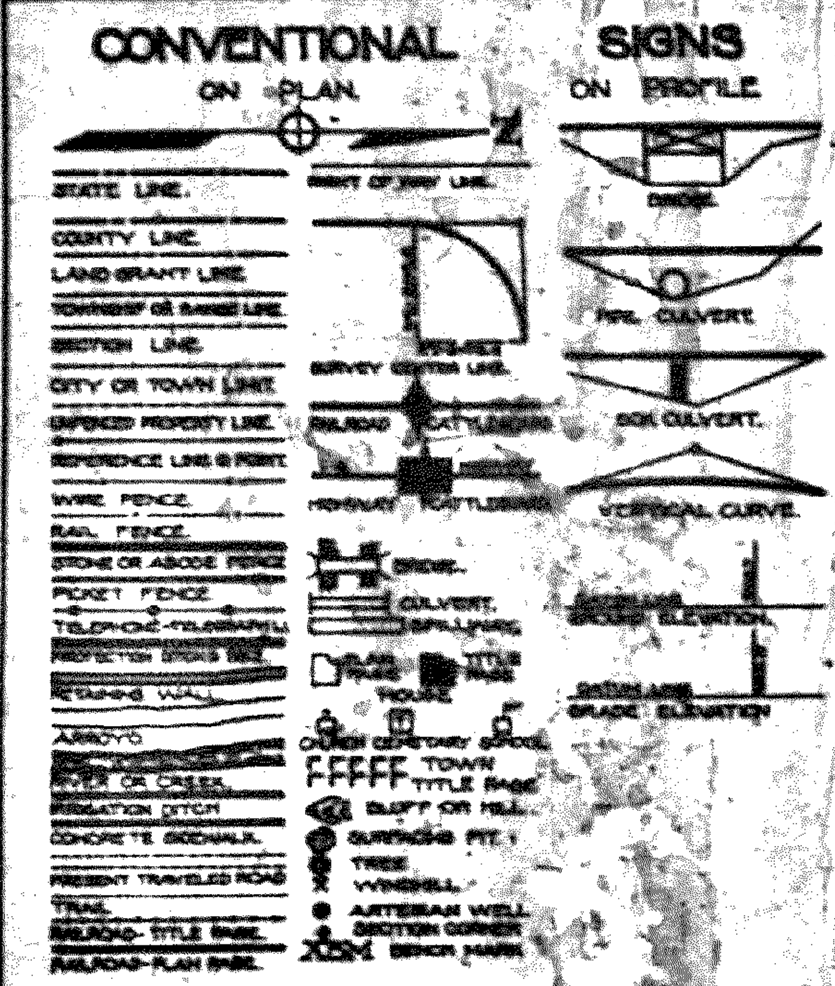
Photo No:	**20**
Filename	P1030061.JPG
Location	South of Bridge
Description	Bridge Elevation

NMDOT
BRIDGE INSPECTION REPORT PHOTOS
BRIDGE NO. 0002

STRUCTURE NUMBER:	0002	**FACILITY CARRIED:**	Cibola County Road C084
INSPECTION DATE:	October 2015	**FEATURE INTERSECTED:**	BNSF Railway

Photo No:	**20**
Filename	P1030062.JPG
Location	South of Bridge
Description	Bridge Elevation

13. Appendix D – Record Drawings



NEW MEXICO STATE HIGHWAY COMMISSION

PLAN & PROFILE OF PROPOSED STATE HIGHWAY

N.R.H. FEDERAL AID PROJECT Nº 4

ROAD ______ SECTION ______

VALENCIA COUNTY

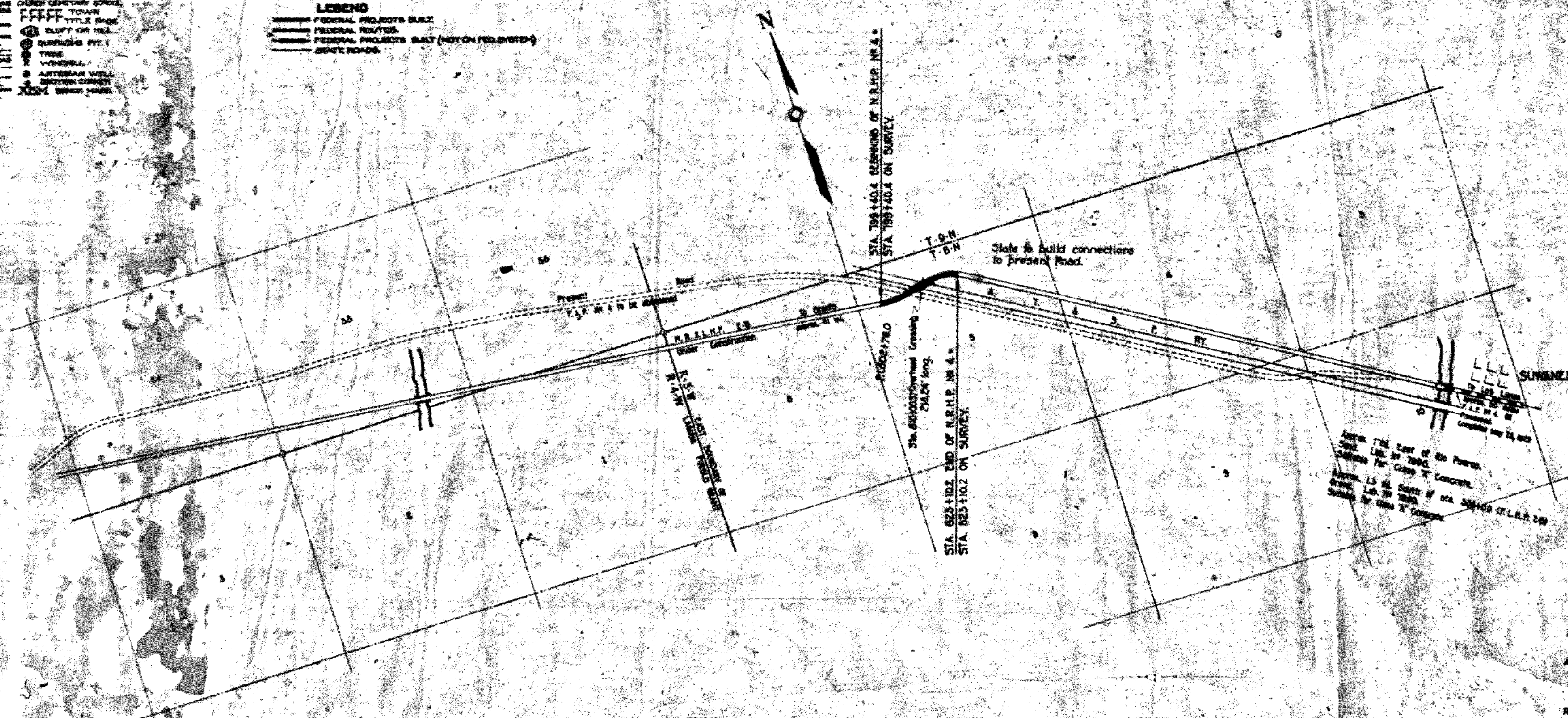
SCALES { PLAN 1"=100; PROFILE: HOR. 1"=100', VERT 1"=10

SCALE OF LAYOUT 1"=1500'

LENGTH OF PROJECT IN MILES 0.448

INDEX OF SHEETS

NUMBER	DESCRIPTION.	SERIAL
1	TITLE SHEET	
2	TYPICAL SECTION SHEET	
2a	TABULATION SHEET	
3	PLAN & PROFILE	
4	STRUCTURE LOCATION SHEET	
5	N.R.H. MARKER	FM-1
6	RIGHT OF WAY & STATION MARKER	FM-3
7	WIRE CABLE GUARD RAIL	[illegible]
8	SUPERELEVATION & WIDENING	[illegible]
9-11	TREATED BRIDGE TIMBER SPANS 2 & 3	[illegible]
12	MISC. TREATED BRIDGE TIMBER	BTM-1
13	SUPERSTRUCTURE DETAILS	SPEC.
14	CONCRETE PIERS	"
15	TIMBER LISTS & FRAMING DIAG.	"
16-22	CROSS-SECTIONS	



SHIPPING POINTS.

SUWANEE

New Mexico Standards and Specifications on file in Office of Bureau of Public Roads.

APPROVED Oct 24 193

STATE HIGHWAY ENGINEER

RECOMMENDED FOR APPROVAL:

[redacted]

DIST. ENGINEER, U.S. BUREAU OF PUBLIC ROADS.

RECOMMENDED FOR APPROVAL:

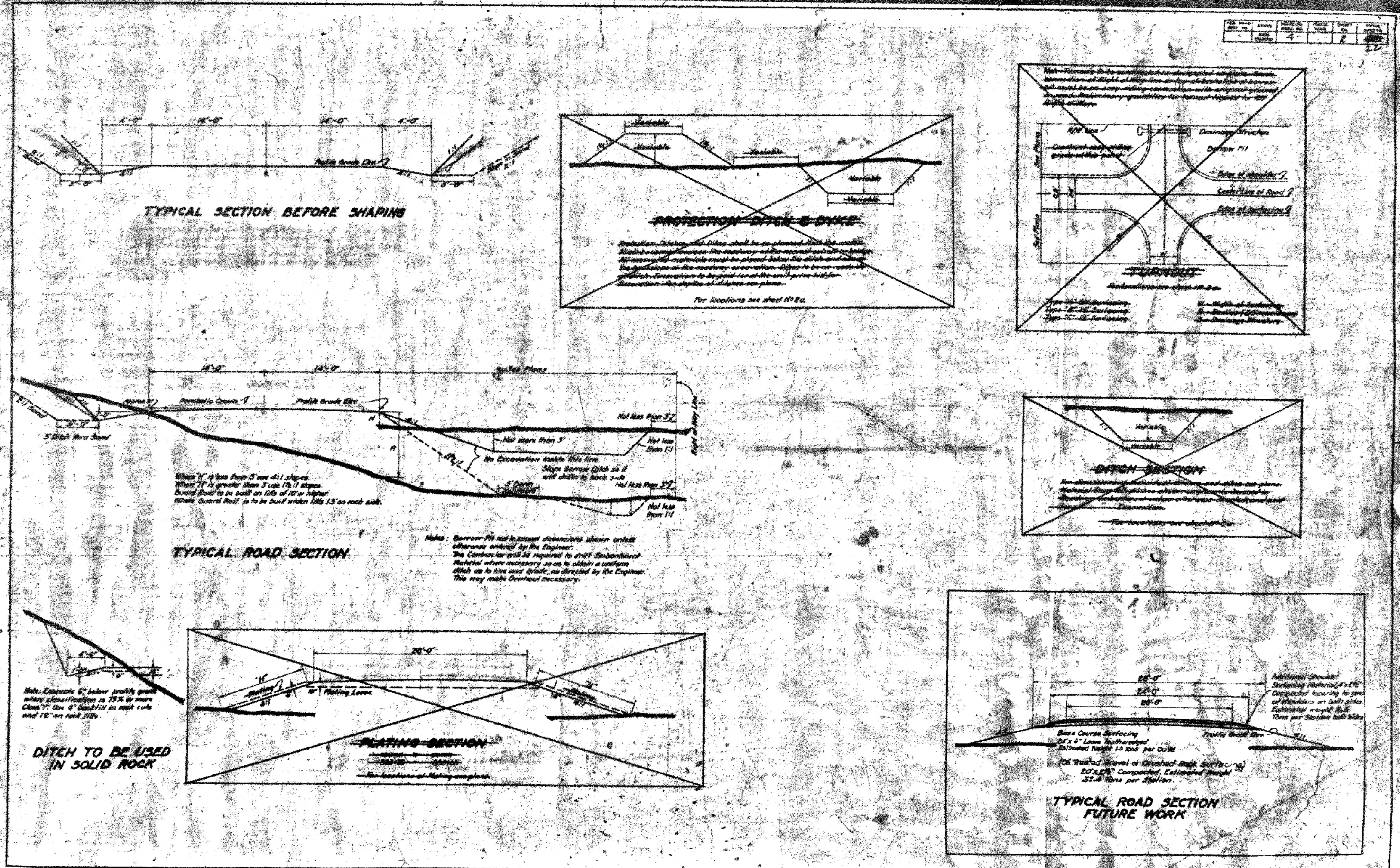
[redacted]

CHIEF ENGINEER, U.S. BUREAU OF PUBLIC ROADS.

APPROVED:

[redacted]

DIRECTOR, U.S. BUREAU OF PUBLIC ROADS.



TYPICAL SECTION BEFORE SHAPING
Profile Grade Elev.
PROTECTION DITCH & DIKE
For locations see sheet Nº 2a.
TURNOUT
Drainage Structure
Borrow Pit
Edge of shoulder
Center Line of Road
Edge of surfacing
Profile Grade Elev.
Parabolic Crown
Not less than 3'
Not more than 3'
Not less than 1:1
No Excavation inside this line
Slope Borrow Ditch so it will drain to back side
Right of Way Line
5' Ditch thru Sand
Where "H" is less than 3' use 4:1 slopes.
Where "H" is greater than 3' use 1½:1 slopes.
Guard Rail to be built on fills of 10' or higher.
Where Guard Rail is to be built widen fills 1.5' on each side.
TYPICAL ROAD SECTION
Notes: Borrow Pit not to exceed dimensions shown unless otherwise ordered by the Engineer.
The Contractor will be required to drift Embankment Material where necessary so as to obtain a uniform ditch as to line and grade, as directed by the Engineer. This may make Overhaul necessary.
DITCH SECTION
Note: Excavate 6" below profile grade where classification is 75% or more Class "I". Use 6" backfill in rock cuts and 12" on rock fills.
DITCH TO BE USED IN SOLID ROCK
PLATING SECTION
Plating Loose
Base Course Surfacing
(Oil Treated Gravel or Crushed Rock Surfacing)
20'x2½" Compacted. Estimated Weight 32.4 Tons per Station.
TYPICAL ROAD SECTION FUTURE WORK

MATERIAL SURVEY

MATERIAL	STATION	ACCESS RIGHT	ACCESS LEFT	LAB. NO.	APPROX. QUANTITY	REMARKS
Sand	Approx. 1 Mi. E. of Sta. Puerco			7306	2000 C.Y.	Suitable for Class "A" Concrete
* Gravel	" 1.5 Mi. S. Sta. 308			7300	Unlimited	" " " " "
* On F.L.H.P. 159						

Concrete Aggregate may be obtained from Commercial Pit at Albuquerque, but must be tested and accepted before using.

The Concrete Aggregate Data shown in Material Survey is for information only. The State does not guarantee quantity, quality of material or distance of haul for Concrete Aggregate. The Contractor must furnish this material unless otherwise stated in the specifications.

PROTECTION DITCH AND DYKE

STATION	TO	STATION	LOCATION	LIN. FT.

DITCH SECTION

STATION	TO	STATION	LOCATION	TYPE	LIN. FEET

STRUCTURE LIST

STATION	DESCRIPTION	SIZE	LENGTH	SERIAL	DESIGN	REVISED
733+40.6	N.R.H.P. Marker					
810+98.57	R.R. Overpass		736.14	FWH 5726, 5727 & Spec. Plans		
813+10.1	N.R.H.P. Marker					

NOTES

1. Reconstruction of new fences are not Right of Way considerations.
2. For estimating purposes only Borrow Quantities computed on basis of 10% shrinkage in Embankment and 40% swell in Rock where Rock is 75% or more of Excavation.
3. The contractor will be required to drift Embankment Material from sumps within the Right of Way so as to obtain a uniform Borrow Ditch as to line & grade as directed by the Engineer. This may make overhaul necessary.
4. New Mexico Standards and Tentative Standard Specifications shall govern the construction of of this project otherwise noted.
5. The contractors shall make arrangements for and be responsible for all haul road between material pits and job.
6. Connections between the work of this contract and the present road to be built by State.

SPECIAL SPECIFICATIONS

Special Provisions for use on National Recovery Highway Projects.

" " Supplementing FP, 112 & 114

" " Wire Cable Guard Rail.

FUTURE WORK

Special Provisions for Oil Treated Gravel or Crushed Rock Surfacing.

TURNOUTS

STATION	TYPE	LOCATION

REMOVAL OF OLD DRAINAGE STRUCTURES

STATION	STRUCTURE	LOCATION

NOTICE TO CONTRACTOR

Cement, Reinforcing Steel and Corrugated Metal Culverts must be tested and accepted before they can be used. For further details communicate with the District Engineer. Lengths of structures as shown are approximate only, approved lengths may be obtained from the District Engineer upon request.

SUMMARY OF QUANTITIES

CONSTRUCTION QUANTITIES	ESTIMATED QUANTITIES	UNIT	ITEM
			Roadway
	3761	Cu. Yd.	Excavation - Unclassified
	66836	" "	Common - Borrow
	259422	Sta. Yd.	Overhaul
	68605	½ Mi. Yd.	Haul
	2	Each	Reinforced Concrete Monument & Marker
	2640	Lin. Ft.	Wire Cable Guard Rail
	8	Each	"Dead Men" for Wire Cable Guard Rail
	12	"	Right of Way & Station Markers
			Bridges
	670	Cu. Yd.	Excavation for Structures
	329	" "	Class "A" Concrete Substructure
	69.358	M.B.M.	Treated Bridge Timber - Superstructure
	26.473	" "	" " " - Substructure
	13704	Pound	Reinforcing Steel
	38069	"	Structural Steel
	457	Lin. Ft.	Woven Wire Bridge Rail (With Steel Angles)
	93	Cu. Yd.	Screened Gravel Wearing Top
			Future Work
	777	Ton	Top Course Surfacing
	288	Bbl.	Asphaltic Road Oil Type (SC-3 or SC-4)
	0.446	Mile	Mixing Oil & Aggregate
	61	Bbl.	Seal Coat Material (Type RC-1)
	0.446	Mile	Seal Coating
	1569	Ton	Base Course Surfacing

Roadway & Bridge Quantities Included in Future Work.

FOR INFORMATION OF CONTRACTOR ONLY

LENGTH OF PROJECT

STATION	TO	STATION	LIN. FEET
733+40.4	"	813+10.1	2369.60
		Total	2369.60

$\frac{2369.60}{5280}$ = 0.446 Miles

FUTURE WORK

LENGTH OF SURFACING

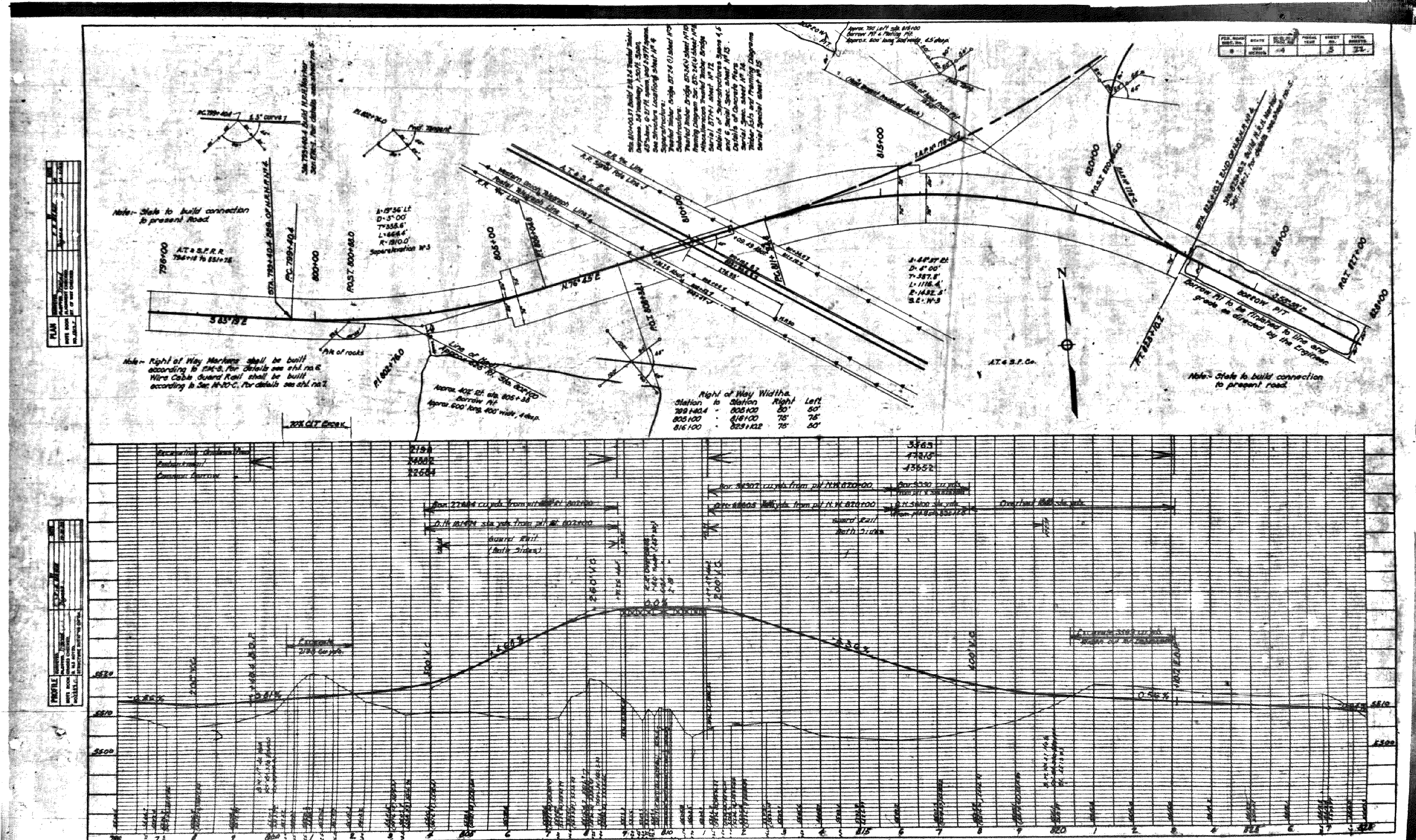
STATION	TO	STATION	LIN. FEET
733+40.4	"	813+10.1	2369.60
		Total	2369.60

REMOVAL OF OBSTRUCTIONS

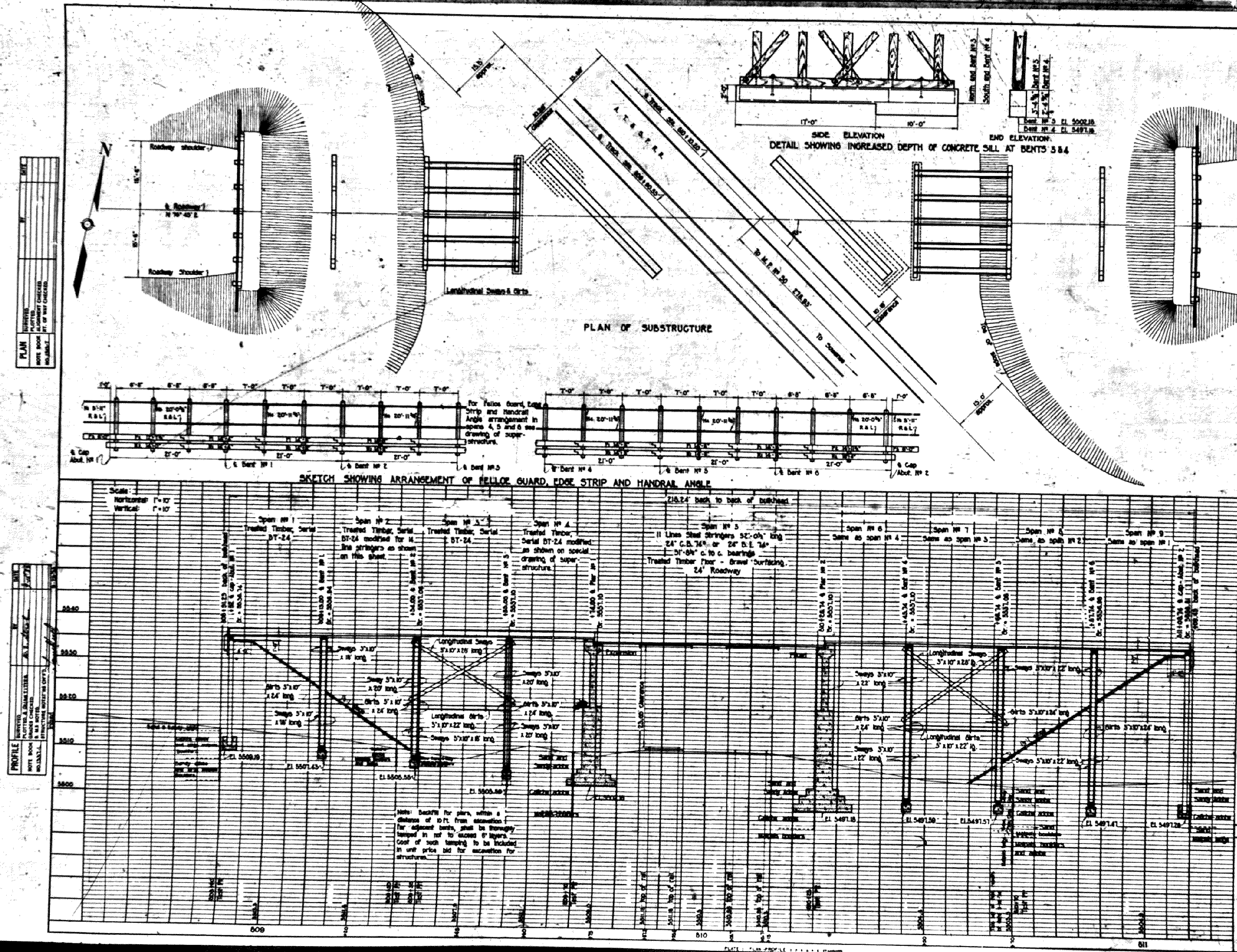
STATION	STRUCTURE	LOCATION

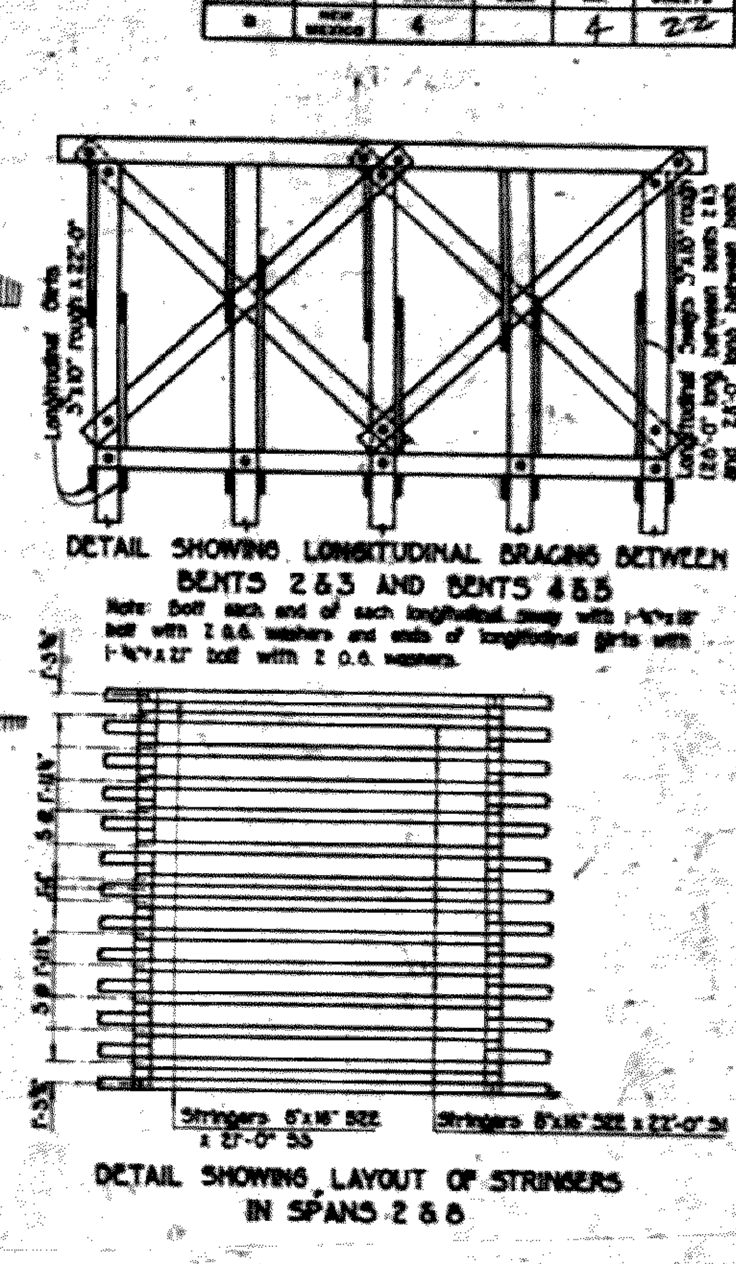
FED. ROAD DIST. NO.	STATE	PROJECT	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
6	NEW MEXICO	4		1-4	22

PLAN	
SURVEYED	
DRAWN	
CHECKED	



PLAN
PROFILE
Note:- State to build connection to present Road.
Note:- Right of Way Markers shall be built according to EM-6. For details see sht. no. 6. Wire Cable Guard Rail shall be built according to Sec. H-20-C. For details see sht. no. 7.
Pile of rocks
A.T. & S.F. R.R.
A.T. & S.F. Co.
N
Borrow Pit to be finished to line and grade as directed by the Engineer.
BORROW PIT
Note:- State to build connection to present road.
Right of Way Widths
Station to Station Right Left
799+40.4 - 805+00 50' 50'
805+00 - 816+00 75' 75'
816+00 - 829+10.2 75' 50'
Guard Rail (Both Sides)
Guard Rail Both Sides





STRUCTURE LOCATION SHEET

N.R.H.P. Nº 4 STA. 810+00.37

OVERHEAD CROSSING A. T. & S. F. R. R.

278.95 FT. WEST MILE POST Nº 80

GENERAL NOTES

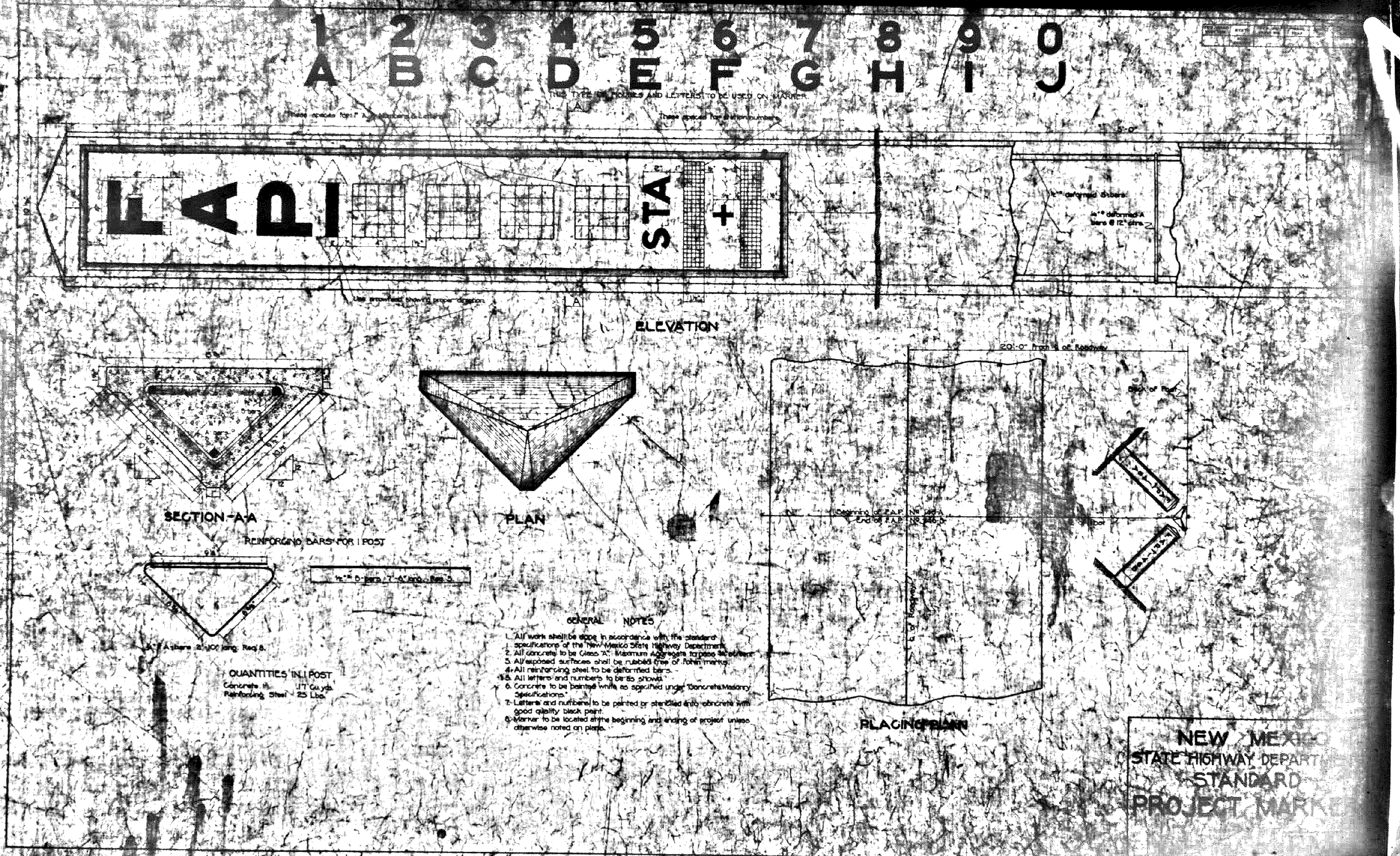
1. Grade elevations shown are 3" above profile grades shown on plan and profile sheet. This places top of wood floor on same gradient as top of crowned sub-grade of approach roadways at center line.
2. Abutments - Type B - section B-C. Order posts 24 ft. long for Abutment Nº 1 and 36 ft. long for Abutment Nº 2. Use 6"x12" brace blocks. Brace outside abutment posts with alternate strut as shown on serial BTM-E.
3. Bents - Case II, with two sets of sway bracing. Order sways and girts as shown. Order posts 24 ft. long for Bent Nº 1, 28 ft. long for Bent Nº 2, 32 ft. long for Bent Nº 3 and 34 ft. long for Bents Nºs 4, 5 and 6.
4. Piers Nº 1 and Nº 2 - Class "A" Concrete. See special drawing.
5. Brace 10"x10" approach posts as shown on sheet 1 of serial BT-24.
6. Cost of handrail angles and bolts for fastening handrail angles to posts shall be included in the unit price bid per lin. ft. for Woven Wire Bridge Railing.
7. Place approach fills simultaneously at each end of structure and simultaneously on each side of each bulkhead. Before placing approach fills at ends of structure, flooring shall be placed entirely across the structure to within 6 ft. of each end, opening at each end being left to facilitate placing of fill material.
8. Paint for structural steel members in span 5, except blast protection units, shall be as follows: One shop coat of red lead and linseed oil, and two field coats of aluminum paint as prescribed in the N.M.S.H.D. specifications. Paint for blast protection shall be as noted on special drawing of superstructure for spans 4, 5 & 6. Paint for handrail angles shall be as noted on sheet 1 of serial BT-24.

DRAWINGS REQUIRED

Serial BT-24, Sheets 1, 2 and 3. Serial BTM-E. Special drawing of superstructure showing spans 4, 5 and 6. Special drawing of piers. Special drawing for timber list and framing diagrams.

QUANTITIES FOR STRUCTURE

DESCRIPTION	QUANTITY	
Excavation for Structures	670	Cu. Yds.
Class "A" Concrete Substructure	329	Cu. Yds.
Treated Bridge Timber Substructure	28.475	M.B.M.
Treated Bridge Timber Superstructure	58.356	M.B.M.
Reinforcing Steel	13704	Lbs.
Structural Steel	56069	Lbs.
Woven Wire Bridge Railing (including steel angles)	457	Lin. Ft.
Screened Gravel Flooring Top	85	Cu. Yds.

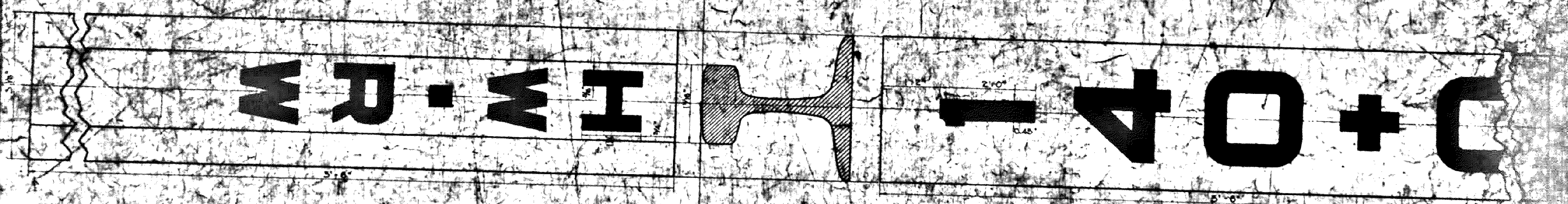

1 2 3 4 5 6 7 8 9 0
A B C D E F G H I J
THIS TYPE OF FIGURES AND LETTERS TO BE USED ON MARKER
F A P I
STA +
ELEVATION
SECTION - A-A
PLAN
REINFORCING BARS FOR 1 POST
QUANTITIES IN 1 POST
Reinforcing Steel 25 Lbs.
GENERAL NOTES
1. All work shall be done in accordance with the standard specifications of the New Mexico State Highway Department.
2. All concrete to be Class "A".
3. All exposed surfaces shall be rubbed free of form marks.
4. All reinforcing steel to be deformed bars.
5. All letters and numbers to be as shown.
6. Concrete to be painted white as specified under "Concrete Masonry Specifications."
7. Letters and numbers to be painted or stenciled onto concrete with good quality black paint.
8. Marker to be located at the beginning and ending of project unless otherwise noted on plans.
PLACING PLAN
NEW MEXICO
STATE HIGHWAY DEPART
STANDARD
PROJECT MARKE

Revised 9-1-51

Note: Set Right of Way Markers on Right of Way Lines and at P.C. and P.T. of curves and at jogs in Right of Way Lines and preferably a sufficient number of intermediate markers so as to be visible from one to the next.

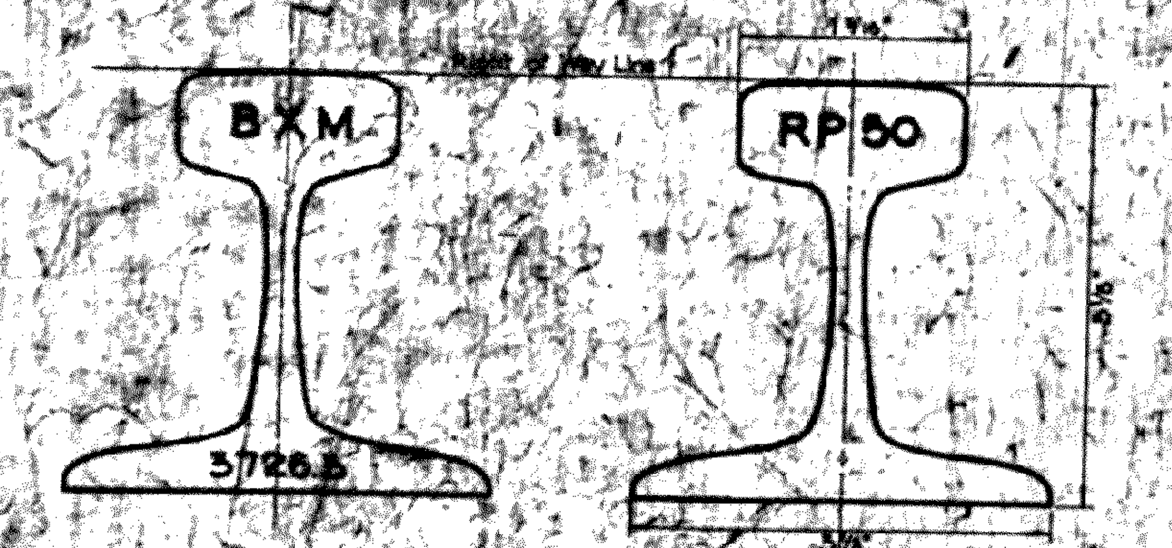
⌛ = Right of Way and Station Marker.

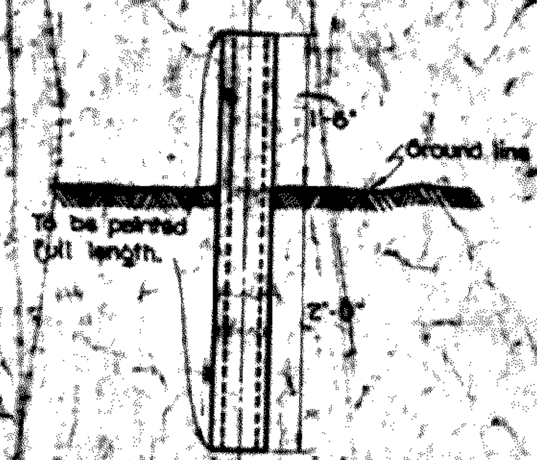
LAYOUT SHOWING LOCATIONS OF RIGHT OF WAY MARKERS



NOTES

1 - 30 pound rails saw cut to 3'-6" lengths.
2 - Markers to be set where shown on the plans or as directed by the Engineer.
3 - The back side of the marker to face the ℄ of the highway.
4 - Set the back or head of the marker on the right of way line.
5 - Each marker to be given two coats of "Federal Yellow" paint to conform to New Mexico Standard Specifications.
6 - One station marker shall be placed every tenth station beginning at the first even tenth station on the right side of the road in the direction of stationing.



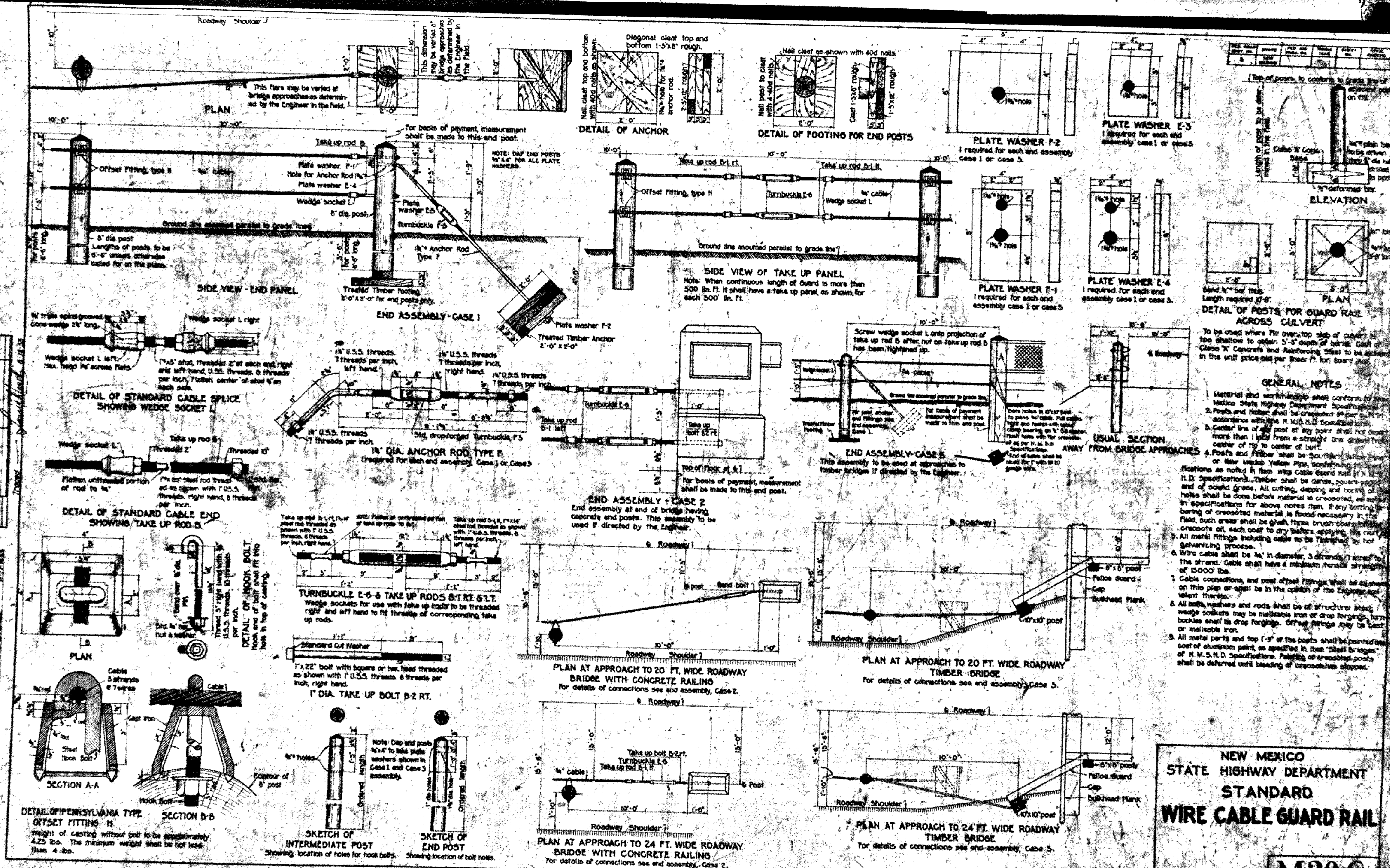


MARKER IN PLACE

Note: B. M.s to be placed at the direction of the Engineer. Suggest that right of way or station markers be used as B.M.s adjacent to all permanent structures.

Note: The figure 50 as shown above is the distance from the face of the head of the rail to the center line of the road. If the right of way is other than 50 feet show the correct distance from the head of the rail to the center line of the road in place of the 50.

NEW MEXICO
STATE HIGHWAY DEPARTMENT
STANDARD
RIGHT-OF-WAY MARKER


PLAN
DETAIL OF ANCHOR
DETAIL OF FOOTING FOR END POSTS
PLATE WASHER F-2
1 required for each end assembly case 1 or case 3.
PLATE WASHER E-3
1 required for each end assembly case 1 or case 3.
ELEVATION
SIDE VIEW - END PANEL
END ASSEMBLY - CASE 1
SIDE VIEW OF TAKE UP PANEL
Note: When continuous length of Guard is more than 500 lin. ft. it shall have a take up panel, as shown, for each 500' lin. ft.
PLATE WASHER F-1
1 required for each end assembly case 1 or case 3
PLATE WASHER E-4
1 required for each end assembly case 1 or case 3.
PLAN
DETAIL OF POSTS FOR GUARD RAIL ACROSS CULVERT
To be used where fill over top slab of culvert is too shallow to obtain 3'-6" depth of burial. Cost of Class "A" Concrete and Reinforcing Steel to be included in the unit price bid per linear ft. for Guard Rail.
DETAIL OF STANDARD CABLE SPLICE SHOWING WEDGE SOCKET L
1¼" DIA. ANCHOR ROD, TYPE F
1 required for each end assembly Case 1 or Case 3
END ASSEMBLY - CASE 3
This assembly to be used at approaches to timber bridges if directed by the Engineer.
USUAL SECTION AWAY FROM BRIDGE APPROACHES
GENERAL NOTES
1. Material and workmanship shall conform to New Mexico State Highway Department Specifications.
2. Posts and timber shall be creosoted 8# per cu. ft. in accordance with the N. M. S. H. D. Specifications.
3. Center line of any post at any point shall not depart more than 1 inch from a straight line drawn from center of tip to center of butt.
4. Posts and timber shall be Southern Yellow Pine or New Mexico Yellow Pine, conforming to specifications as noted in item Wire Cable Guard Rail in N. M. S. H. D. Specifications. Timber shall be dense, square-edged and of sound grade. All cutting, dapping and boring of holes shall be done before material is creosoted, as noted in specifications for above noted item. If any cutting or boring of creosoted material is found necessary in the field, such areas shall be given three brush coats of hot creosote oil, each coat to dry before applying the next.
5. All metal fittings including cable to be finished by hot galvanizing process.
6. Wire cable shall be ¾" in diameter, 3 strands, 7 wires to the strand. Cable shall have a minimum tensile strength of 13000 lbs.
7. Cable connections, and post offset fittings shall be as shown on this plan or shall be in the opinion of the Engineer equivalent thereto.
8. All bolts, washers and rods shall be of structural steel, wedge sockets may be malleable iron or drop forgings, turnbuckles shall be drop forgings. Offset fittings may be cast or malleable iron.
9. All metal parts and top 1'-9" of the posts shall be painted one coat of aluminum paint, as specified in item "Steel Bridges" of N. M. S. H. D. Specifications. Painting of creosoted posts shall be deferred until bleeding of creosote has stopped.
DETAIL OF STANDARD CABLE END SHOWING TAKE UP ROD B
END ASSEMBLY - CASE 2
End assembly at end of bridge having concrete end posts. This assembly to be used if directed by the Engineer.
TURNBUCKLE E-6 & TAKE UP RODS B-1 RT. & LT.
Wedge sockets for use with take up rods to be threaded right and left hand to fit threads of corresponding take up rods.
DETAIL OF HOOK BOLT
1" DIA. TAKE UP BOLT B-2 RT.
PLAN AT APPROACH TO 20 FT. WIDE ROADWAY BRIDGE WITH CONCRETE RAILING
For details of connections see end assembly, Case 2.
PLAN AT APPROACH TO 20 FT. WIDE ROADWAY TIMBER BRIDGE
For details of connections see end assembly, Case 3.
SECTION A-A
SECTION B-B
DETAIL OF PENNSYLVANIA TYPE OFFSET FITTING H
Weight of casting without bolt to be approximately 4.25 lbs. The minimum weight shall be not less than 4 lbs.
SKETCH OF INTERMEDIATE POST
Showing location of holes for hook bolts.
SKETCH OF END POST
Showing location of bolt holes.
PLAN AT APPROACH TO 24 FT. WIDE ROADWAY BRIDGE WITH CONCRETE RAILING
For details of connections see end assembly, Case 2.
PLAN AT APPROACH TO 24 FT. WIDE ROADWAY TIMBER BRIDGE
For details of connections see end-assembly, Case 3.
NEW MEXICO
STATE HIGHWAY DEPARTMENT
STANDARD
WIRE CABLE GUARD RAIL
M-20-C

SPECIAL CASES

WHEN LENGTH OF CURVE IS LESS THAN 50 FEET

1. WIDENING

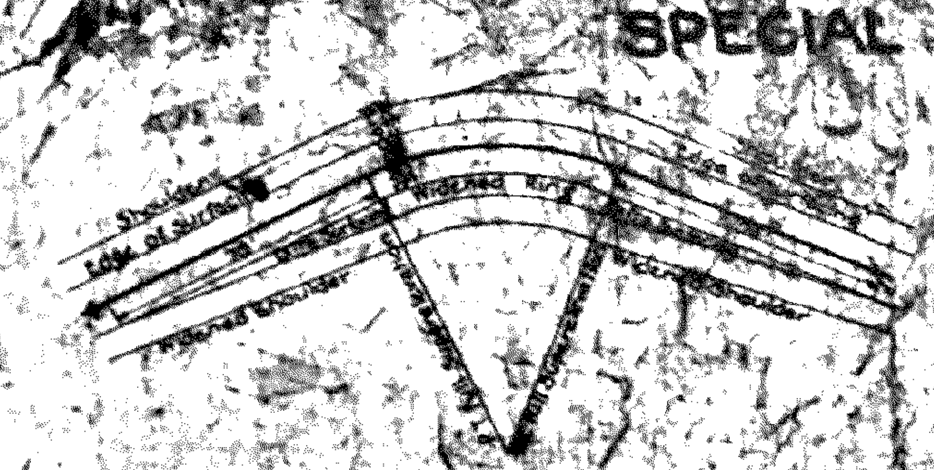
Use standard widening for curves sharper than 40° on any degree of curve.

2. AREAS

For "W"=5' extra areas "D" are taken from table. For curves sharper than 40° if "W" is less than 5' they must be scaled. Area of widening is taken from Table as usual except that no correction for Transition Area is subtracted.

3. SUPERELEVATION

Attain full superelevation at P.C. and P.T. Use standard 100 ft transition. Inside shoulder and ditch grades remain constant.



REVERSED CURVES WITH CONNECTING TANGENTS LESS THAN 150 FEET LONG

1. WIDENING

Standard transition on either end of reverse. Reverse should be laid out to scale and shoulder lines and edges of surfacing located as per sketch. Distances X-O and OL-ON should be scaled and noted for use in the field.

2. AREAS

a. Extra areas "D" must be scaled.
b. Determine length of widened ring and multiply by constant taken from table.
Subtract one-half transition area correction.

3. SUPERELEVATION

Revolve full superelevated section from X about ℄ until horizontal at O and to full superelevation again at Y. Inside shoulder and ditch grades remain constant. X-O = OT = 100'. If length of curve should not permit of 200' for reversal of superelevation use a lesser distance.

COMPOUND CURVES

1. WIDENING

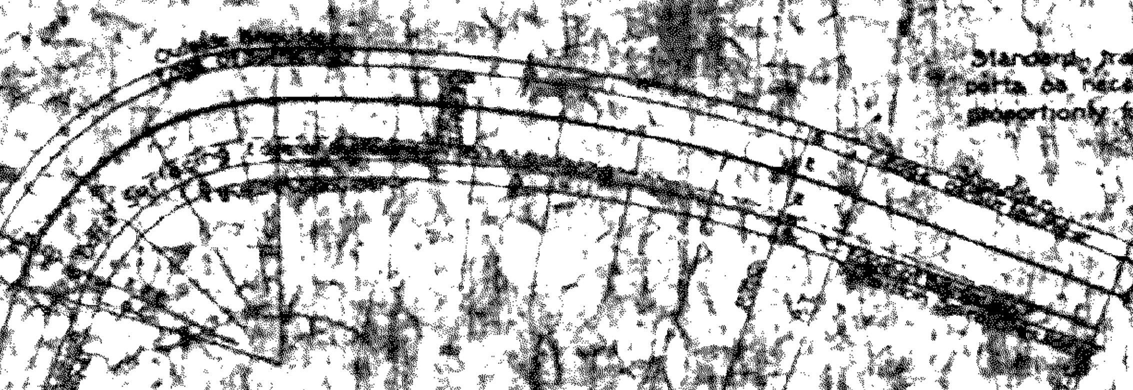
Standard transition on either end. Divide distance NN' into as many equal parts as necessary. Take difference between N and N' distribute this difference proportionally for each radial offset between N and N'.

2. AREAS

a. Extra areas "D" taken from table.
b. Extra area between N and N' must be scaled.

3. SUPERELEVATION

Standard transition on either end. Take difference in superelevation at N and N' distribute this proportionally between N and N'.



CURVES IN SAME DIRECTION WITH CONNECTING TANGENTS TOO SHORT FOR STANDARD TRANSITION

1. WIDENING

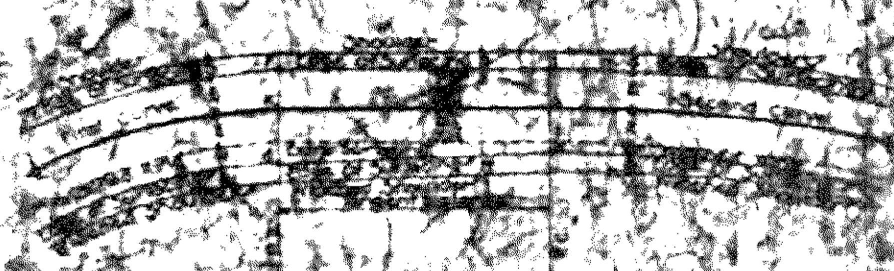
Standard transition on either end. Method of widening between curves as per sketch.

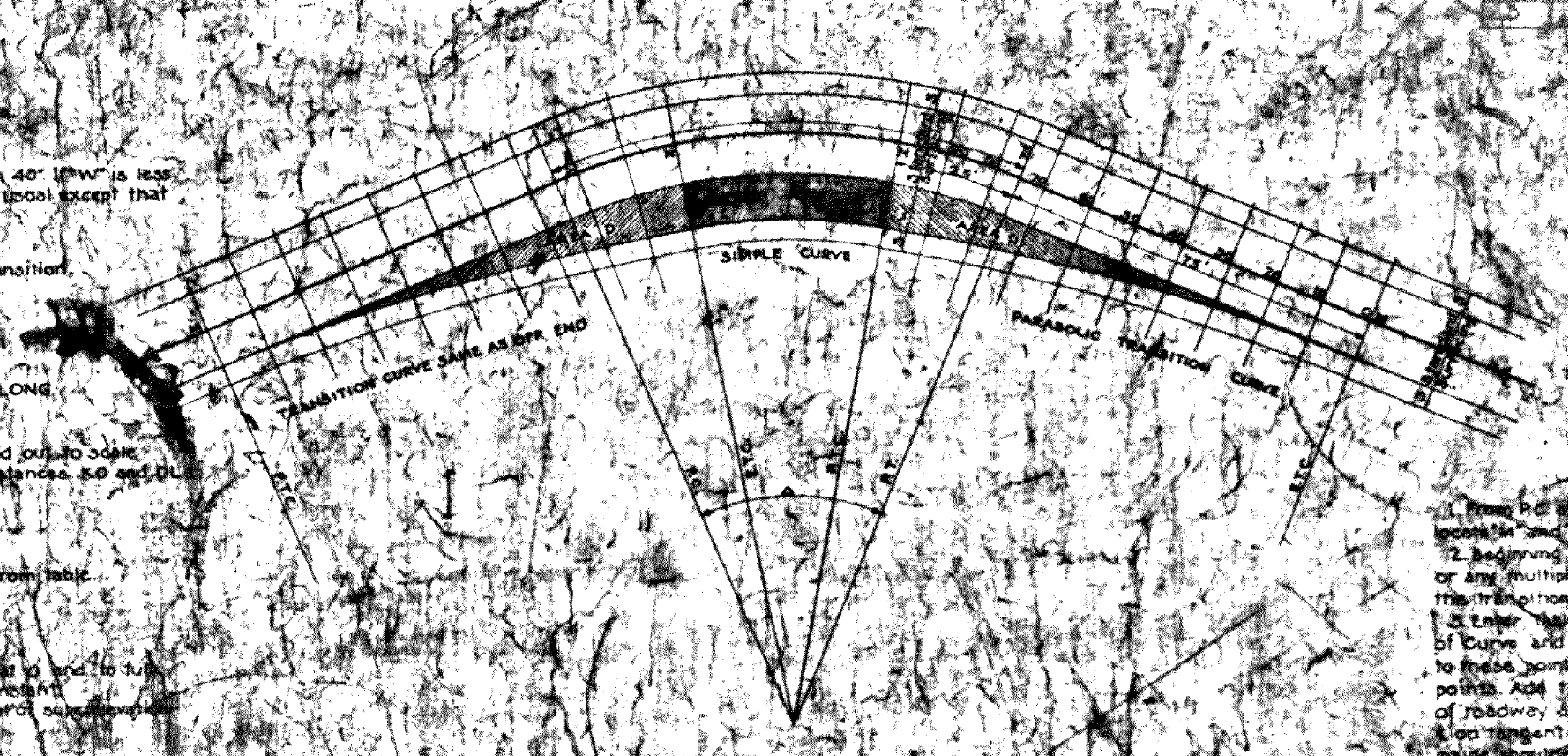
2. AREAS

a. Ring areas taken from table. Subtract one-half transition area correction.
b. Extra areas [illegible]

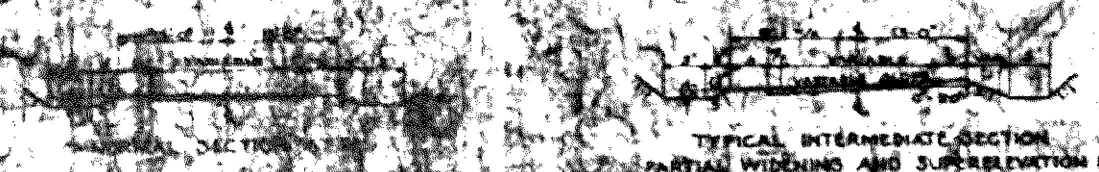
3. SUPERELEVATION

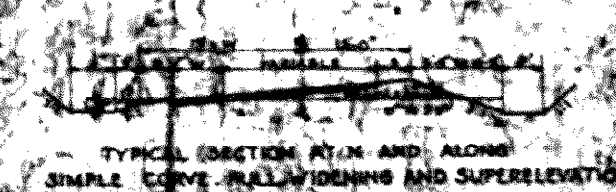
Proportion superelevation between Y and Z.





PLAN OF TYPICAL WIDENED CURVE





TYPICAL SECTIONS

TABLE 2 GRADE CORRECTIONS FOR 24' OR 26' ROADWAY

Max. Super.	.021					.042					.063					.084					.105					.126				
Degree	0°–3°					3°–5°					5°–7°					7°–9°					9°–12°					12° and above				
W	0					0					0					0					See Table 1					See Table 1				
Points	I.E.	℄ Pave.	℄ L.S.	O.E.	O.S.	I.E.	℄ Pave.	℄ L.S.	O.E.	O.S.	I.E.	℄ Pave.	℄ L.S.	O.E.	O.S.	I.E.	℄ Pave.	℄ L.S.	O.E.	O.S.	I.E.	℄ Pave.	℄ L.S.	O.E.	O.S.	I.E.	℄ Pave.	℄ L.S.	O.E.	O.S.
0	.17	.25	0	.17	0	.17	.25	0	.17	0	.17	.25	0	.17	0	.17	.25	0	.17	0	.17	.25	0	.17	0	.17	.25	0	.17	0
10	.17	.25	.02	.17	.05	.17	.25	.05	.17	.07	.17	.25	.05	.17	.10	.17	.25	.07	.17	.14	.17	.25	.09	.17	.17	.17	.25	.10	.15	.21
20	.17	.25	.04	[illegible]	.08	.17	.25	.08	.17	.16	.17	.25	.12	.22	.25	.17	.25	.16	.25	.33	.17	.25	.21	.36	.41	.17	.25	.25	.44	.49
30	.17	.25	.07	[illegible]	.14	.17	.25	.14	.24	.27	.17	.25	.21	.38	.41	.17	.27	.27	.48	.55	.17	.34	.34	.60	.68	.17	.41	.41	.75	.82
40	.17	.25	.10	.18	.21	.17	.25	.21	.34	.41	.17	.31	.31	.54	.61	.17	.41	.41	.72	.82	.17	.51	.51	.90	1.02	.17	.62	.62	1.09	1.23
50	.17	.25	.14	.24	.27	.17	.27	.27	.48	.55	.17	.41	.41	.72	.82	.17	.55	.55	.97	1.09	.19	.68	.68	1.21	1.37	.19	.82	.82	1.45	1.64
60	.17	.25	.17	.30	.34	.17	.34	.34	.60	.68	.17	.51	.51	.90	1.02	.17	.68	.68	1.21	1.37	.20	.85	.85	1.51	1.71	.20	1.02	1.02	1.81	2.05
70	.17	.25	.21	.36	.41	[illegible]	.41	.41	.72	.82	.17	.62	.62	1.09	1.23	.19	.82	.82	1.45	1.64	.24	1.02	1.02	1.81	2.05	.28	1.23	1.23	2.17	2.46
80	.17	.25	.23	.41	.46	[illegible]	.46	.46	[illegible]	[illegible]	.19	.70	.70	1.23	1.39	.21	.93	.93	1.64	1.86	.27	1.16	1.16	[illegible]	2.32	.32	1.39	1.39	2.46	2.78
90	.17	.26	.26	.45	.51	[illegible]	.51	.51	.90	1.02	.18	.77	.77	1.36	1.54	[illegible]	1.02	1.02	1.81	2.05	.30	1.28	1.28	[illegible]	[illegible]	[illegible]	1.54	1.54	[illegible]	3.07
100	.17	.27	.27	.48	.55	.17	.55	.55	.97	1.09	.19	.82	.82	1.45	1.64	.25	1.09	1.09	[illegible]	[illegible]	.32	1.37	1.37	2.41	2.73	[illegible]	1.64	1.64	2.90	3.28

All corrections to be added to the grade elevation of inside shoulder. Inside shoulder and ditch grades not affected by superelevation.

I.E. - Inside edge of 20' concrete pavement
℄ Pave. - Finished ℄ grade of concrete pavement
℄ L.S. - ℄ grade for a section normally level
O.E. - Outside edge of 20' concrete pavement
O.S. - Outer shoulder offset of 26' roadway

Take O.S. corrections from Graph.
To find corrections for other points multiply O.S. correction by the following constants:
O.E. = 0.883 Minimum = 0.17
℄ L.S. = 0.500 Minimum = 0.0
℄ Pave. = 0.500 Minimum = 0.25
I.E. = 0.118 Minimum = 0.17

GRAPH OF TABLE 2

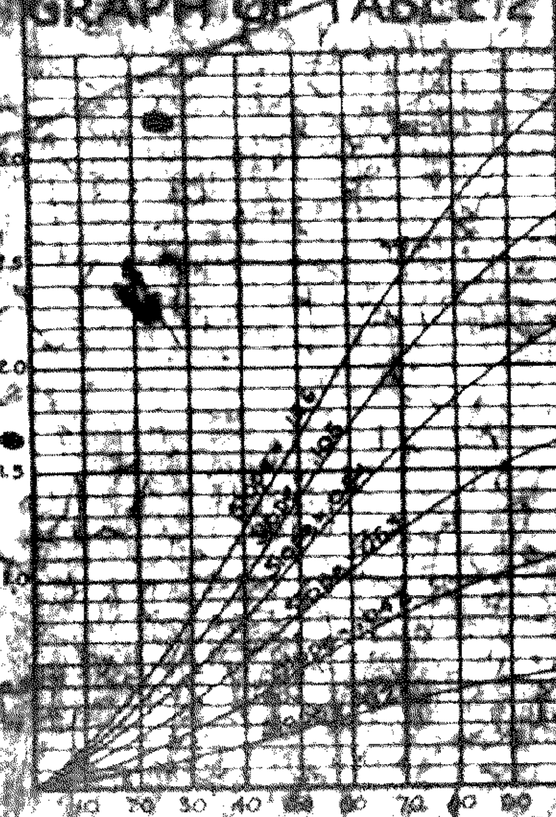


TABLE 1 PROPERTIES OF TRANSITION

Degree of Curve	Radius R	W	10	20	30	40	50	60	70	80	90	100	L	Widening Ring Areas C 16' Surfacing	18' Surfacing	20' Surfacing	Degree of Curve
10°00'	573.0'	3.0	.08	.23	.45	.70	1.00	1.41	1.85	2.34	2.72	3.0	27.0	3281-16.40	3271-16.35	3271-16.35	10°00'
10°30'	545.7'		.09	.23	.44	.71	1.04	1.43	1.87	2.36	2.74	3.0	27.3	3281-16.40	3271-16.35	3261-16.30	10°30'
11°00'	520.9		.09	.24	.45	.72	1.05	1.44	1.89	2.38	2.76	3.0	27.6	3271-16.35	3271-16.35	3261-16.30	11°00'
11°30'	498.5		.09	.25	.46	.73	1.06	1.46	1.91	2.40	2.78	3.0	27.7	3271-16.35	3261-16.30	3261-16.30	11°30'
12°00'	477.5'		.10	.25	.47	.74	1.08	1.47	1.93	2.41	2.78	3.0	28.0	3271-16.35	3261-16.30	3251-16.25	12°00'
12°00'	[illegible]	3.5	.11	.27	.52	.82	1.21	1.65	2.16	2.73	3.19	3.5	31.7	3811-19.05	3801-19.00	3791-18.95	12°00'
12°30'	458.4		.11	.27	.53	.83	1.22	1.67	2.20	2.76	3.21	3.5	31.9	3811-19.05	3801-19.00	3791-18.95	12°30'
13°00'	440.7		.11	.28	.53	.84	1.23	1.68	2.21	2.78	3.23	3.5	32.1	3801-19.00	3801-19.00	3791-18.95	13°00'
13°30'	424.41		.11	.29	.54	.86	1.25	1.70	2.23	2.80	3.24	3.5	32.4	3801-19.00	3791-18.95	3781-18.90	13°30'
13°30'	424.4	4.0	.11	.31	.58	.93	1.37	1.88	2.47	[illegible]	3.64	4.0	36.0	4341-21.70	4331-21.65	4321-21.60	13°30'
14°00'	409.3		[illegible]	.31	.59	.94	1.38	1.90	2.49	3.14	3.66	4.0	36.2	4341-21.70	4321-21.60	4321-21.60	14°00'
14°30'	395.2		.12	.32	.60	.96	1.39	1.91	2.51	3.16	3.67	4.0	36.4	4331-21.65	4321-21.60	4311-21.55	14°30'
15°00'	382.0'		.12	.32	.60	.97	1.41	1.93	2.55	3.18	3.68	4.0	36.6	4331-21.65	4321-21.60	4311-21.55	15°00'
15°30'	369.6		.12	.33	.61	.98	1.42	1.95	2.56	3.20	3.70	4.0	36.8	4321-21.60	4311-21.55	4301-21.50	15°30'
16°00'	358.1		.12	.33	.62	.99	1.44	1.96	2.58	3.23	3.71	4.0	37.0	4321-21.60	4311-21.55	4291-21.45	16°00'
16°30'	347.3		.13	.33	.63	1.00	1.45	1.98	2.60	3.24	3.73	4.0	37.2	4301-21.50	4301-21.50	4291-21.45	16°30'
16°30'	347.3	4.5	.14	.36	.68	1.08	1.58	2.16	2.84	3.56	4.14	4.5	41.1	4851-24.25	4841-24.20	4831-24.15	16°30'
17°00'	337.0		.14	.36	.69	1.09	1.59	2.17	2.80	3.58	4.15	4.5	41.2	4851-24.25	4841-24.20	4821-24.10	17°00'
17°30'	327.4'		.14	.37	.70	1.10	1.61	2.19	2.86	3.61	4.17	4.5	41.5	4851-24.25	4851-24.25	4821-24.10	17°30'
18°00'	318.3		.15	.38	.70	1.11	1.62	2.21	2.88	3.62	4.18	4.5	41.7	4841-24.20	4831-24.15	4811-24.05	18°00'
18°30'	309.7		.15	.38	.71	1.12	1.63	2.22	2.91	3.64	4.19	4.5	42.0	4841-24.20	4821-24.10	4801-24.00	18°30'
19°00'	301.6		.15	.39	.72	1.13	1.65	2.24	2.93	3.67	4.21	4.5	42.1	4831-24.15	4821-24.10	4801-24.00	19°00'
19°30'	293.8		.16	.39	.73	1.14	1.66	2.25	2.95	3.69	4.22	4.5	42.4	4831-24.15	4811-24.05	4791-23.95	19°30'
19°30'	293.8	5.0	.16	.41	.77	1.22	1.78	2.43	[illegible]	4.01	4.62	5.0	45.9	5361-26.80	5341-26.70	5321-26.60	19°30'
20°00'	286.5		.16	.42	.78	1.24	1.80	2.45	3.21	4.03	4.64	5.0	[illegible]	5361-26.75	5331-26.65	5311-26.55	20°00'
21°	272.9		.16	.43	.79	1.26	1.82	2.49	3.25	4.07	4.67	5.0	[illegible]	5341-26.70	5321-26.60	5301-26.50	21°
22°	260.5		.17	.44	.81	1.28	1.86	2.52	3.29	4.11	4.70	5.0	47.1	5331-26.65	5311-26.55	5291-26.45	22°
23°	249.1		.18	.45	.83	1.30	1.88	2.55	[illegible]	[illegible]	4.73	5.0	[illegible]	[illegible]	5301-26.50	5281-26.40	23°
24°	238.8		.18	[illegible]	.84	1.32	1.90	2.58	3.37	4.20	4.76	5.0	[illegible]	[illegible]	5291-26.45	5271-26.35	24°
25°	229.2		.19	.47	.86	1.35	1.93	2.62	3.40	4.25	4.79	5.0	48.4	5301-26.50	5281-26.40	5251-26.25	25°
26°	220.4		.19	.48	.88	1.37	1.96	2.65	3.44	4.27	4.82	5.0	48.8	5291-26.45	5271-26.35	5241-26.20	26°
27°	212.2		.20	.50	.89	1.39	1.99	2.68	3.48	4.32	4.86	5.0	49.3	5281-26.40	5261-26.30	5231-26.15	27°
28°	204.6		.20	.51	.91	1.41	2.01	2.72	3.52	4.36	4.87	5.0	49.7	5271-26.35	5241-26.20	5221-26.10	28°
29°	197.6		.21	.52	.92	1.43	2.04	2.76	3.56	4.41	4.90	5.0	50.2	5261-26.30	[illegible]	5211-26.05	29°
30°	191.0		.21	.53	.94	1.45	2.08	2.79	3.59	4.45	4.93	[illegible]	50.5	[illegible]	[illegible]	5191-25.95	[illegible]
32°	179.1		.22	.56	.97	1.50	2.12	2.85	3.67	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
34°	168.5		.24	.57	1.01	1.54	2.18	2.91	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
36°	159.2		[illegible]	.59	1.04	1.59	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
38°	150.8		.26	.61	1.07	1.62	2.29	3.04	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
40°	143.2		.28	.64	1.10	1.67	2.34	3.11	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
40°	143.2	5.5	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

NOTE: Where two values are given for the same degree of curve the lesser is for interpolation.

NOTES

1. From P.C. ... locate "M" and "N" respectively ...
2. Beginning at ... or any multiple of ... the transition should ...
3. Enter Table 1 with ... of curve and take out ... to these points. Interpolate ... points. Add these offsets ... of roadway and measure ... on tangent and radial ... inside shoulder. The ... constant.
4. From Table 2 take ... added to grade of inside shoulder ... the grade elevations ... lines of graph for intermediate ... for 26' is true for the ... widths other than ... will be proportional ...
5. The three ... in Table 1 are to be ... of the surfacing ... Solved with a ... for transition ... are in ...
6. For curves sharper ... is reached at P.C. and ... 125' long. Standard ...
7. All curves to be superelevated ... curves sharper than ...
8. Superelevation ... 30 miles per hour ... elevation for ...

APPROVED:

STATE HIGHWAY ENGINEER

RECOMMENDED FOR APPROVAL:

[illegible]

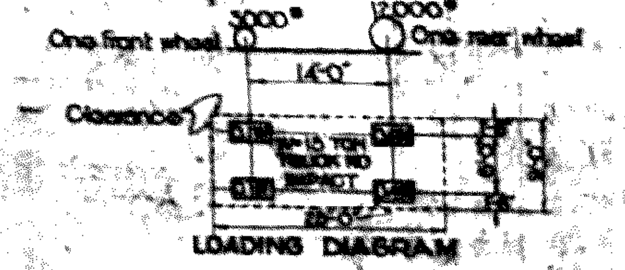
CHIEF ENGINEER U.S. BUREAU OF PUBLIC ROADS

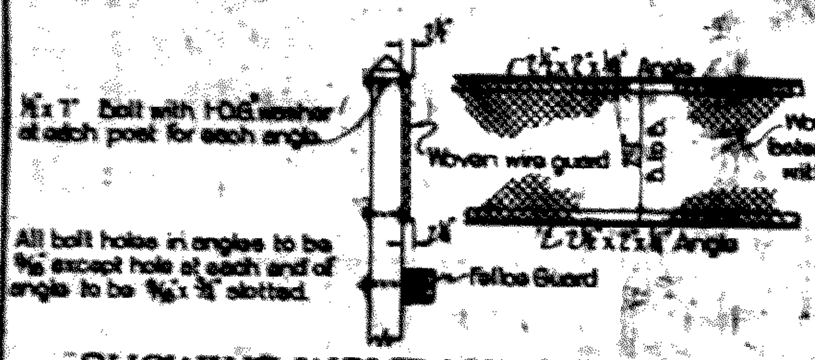
APPROVED:

DIRECTOR U.S. BUREAU OF PUBLIC ROADS

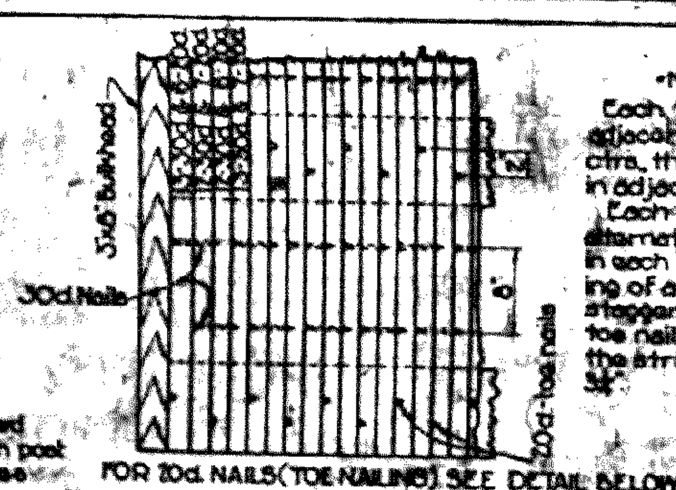
NEW MEXICO STATE HIGHWAY COMMISSION

STANDARD METHOD OF CURVE SUPERELEVATION AND WIDENING





SHOWING WOVEN WIRE GUARD WITH 2-2½"x2½"x¼" RAILS

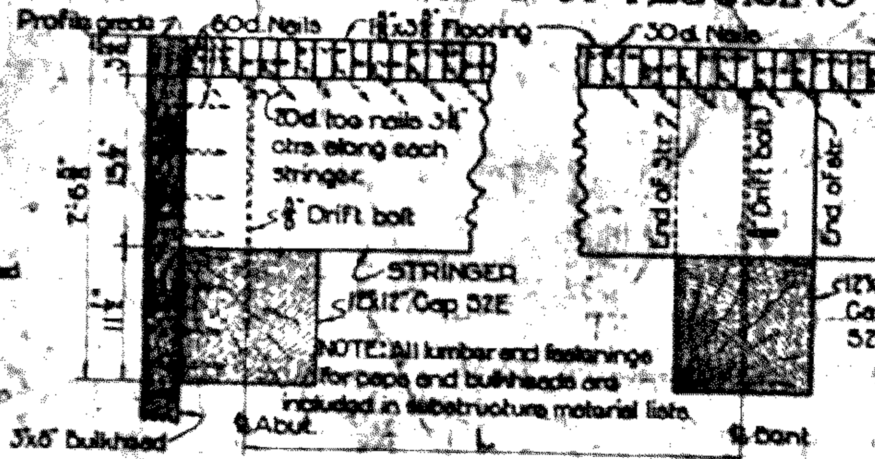


PLAN SHOWING NAILING OF FLOORING

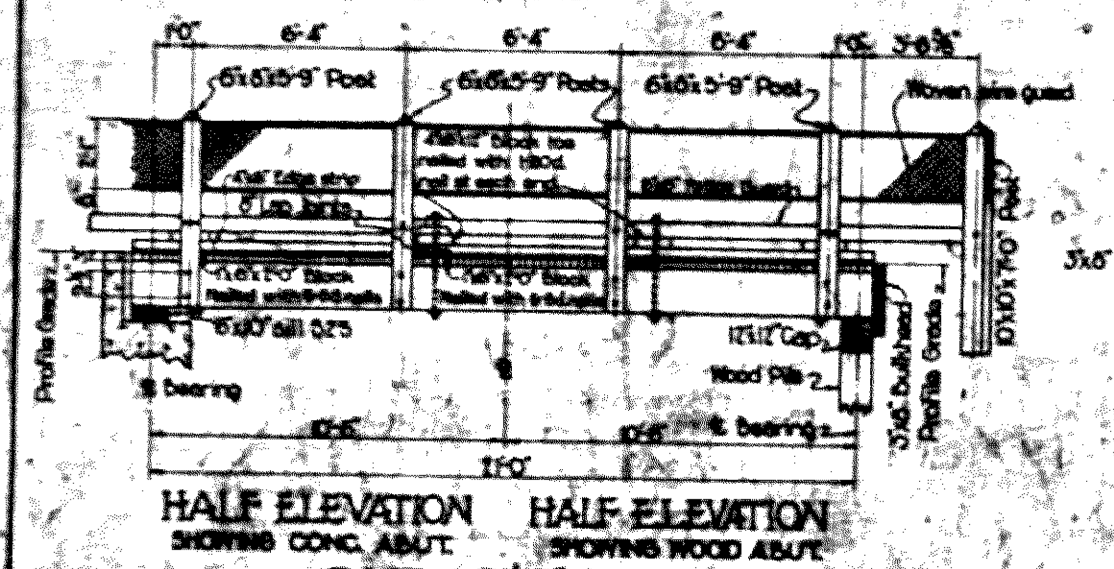
·NAILING NOTE·

Each 2"x4" shall be nailed to the adjacent 2"x4" with 30d. nails at 2'0" ctrs., the nails being staggered 6" in adjacent 2"x4"s.

Each 2"x4" shall be toe nailed to alternate stringers. The toe nails in each stringer from the toe nailing of alternate 2"x4"s shall be staggered 2" so that the spacing of toe nails along a longitudinal fiber of the stringer shall be not less than 4".

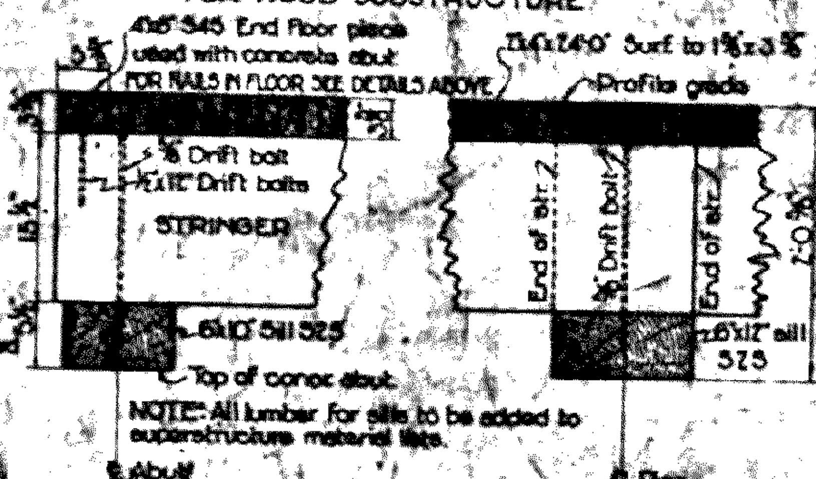


SHOWING CONNECTIONS OF FLOORING & STRINGERS FOR WOOD SUBSTRUCTURE

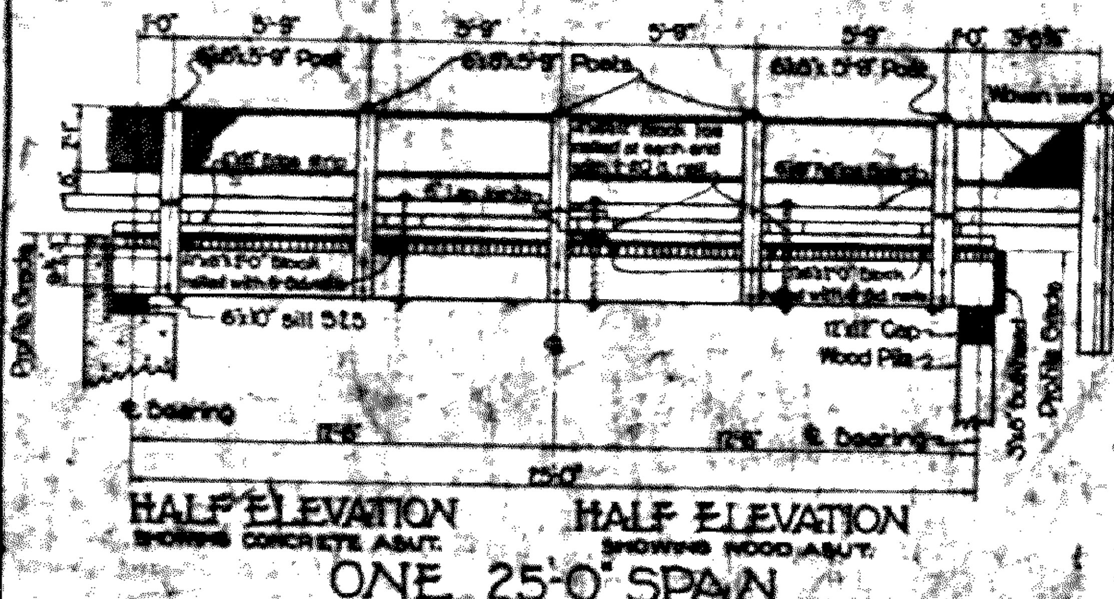


HALF ELEVATION SHOWING CONC. ABUT. HALF ELEVATION SHOWING WOOD ABUT.

ONE 21'0" SPAN

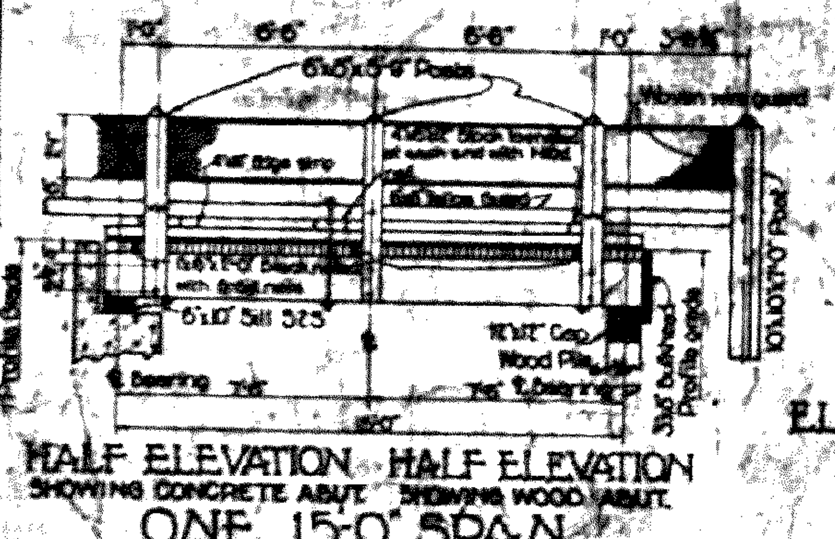


SHOWING CONNECTIONS OF FLOORING & STRINGERS FOR CONCRETE SUBSTRUCTURE



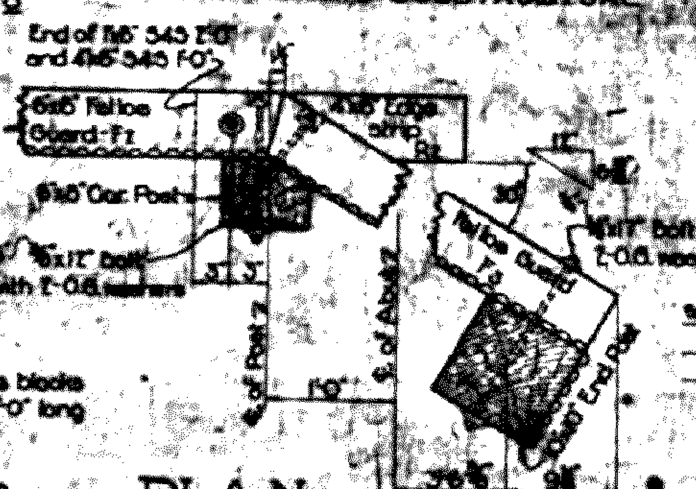
HALF ELEVATION SHOWING CONCRETE ABUT. HALF ELEVATION SHOWING WOOD ABUT.

ONE 25'0" SPAN

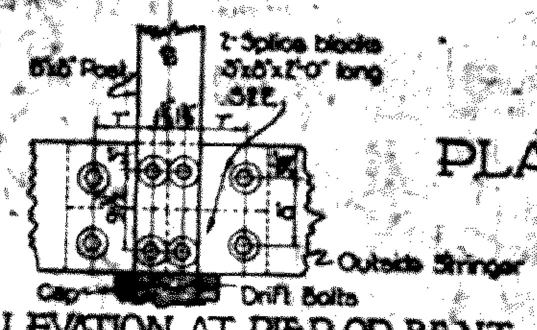


HALF ELEVATION SHOWING CONCRETE ABUT. HALF ELEVATION SHOWING WOOD ABUT.

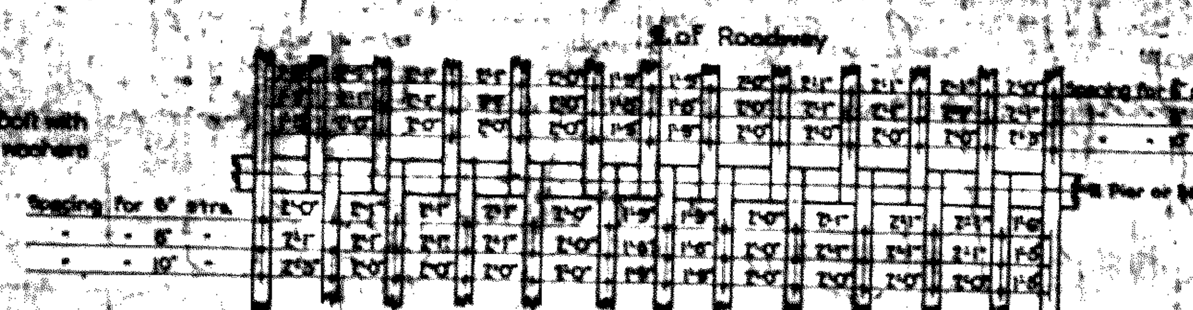
ONE 15'0" SPAN



PLAN

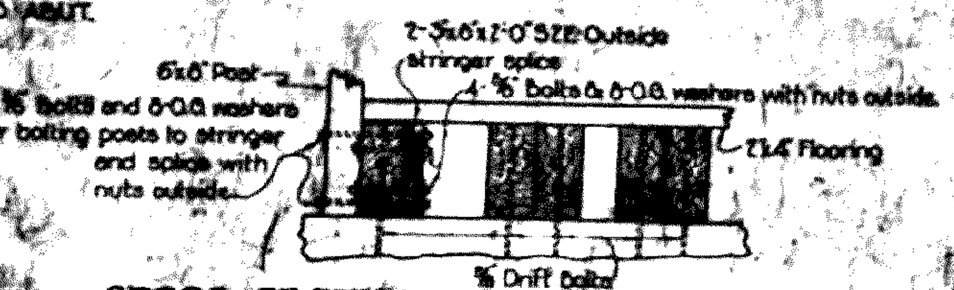


ELEVATION AT PIER OR BENT

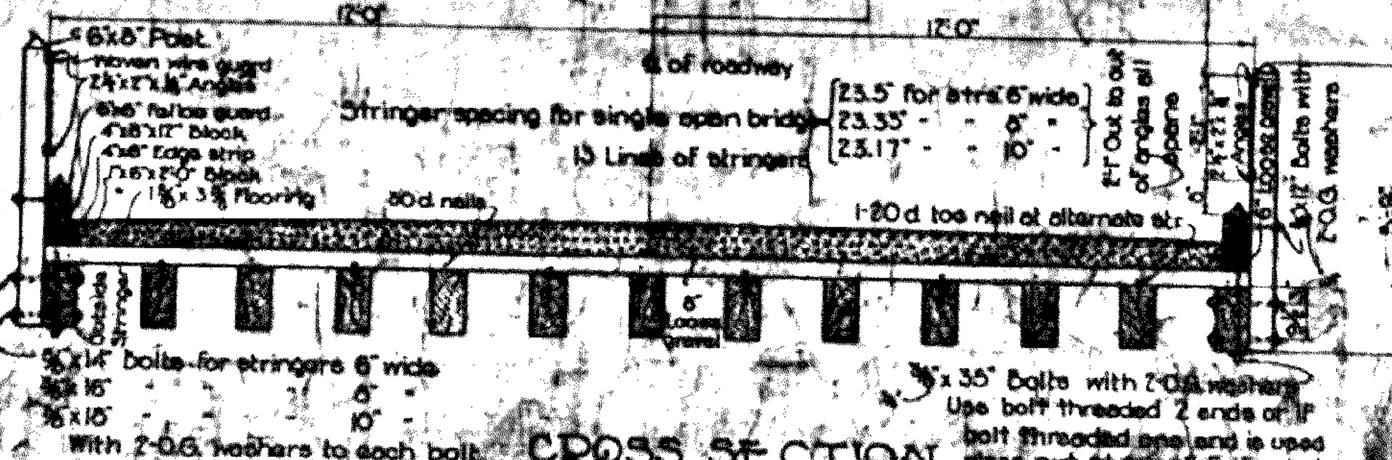


SKETCH SHOWING SPACING OF STRINGERS FOR MULTIPLE SPANS

At abutment ends of end spans, space centers of stringers as shown for single span bridge by slanting inside stringers in plan.



CROSS SECTION AT PIER OR BENT SHOWING FASTENINGS FOR STRINGERS & POST



CROSS SECTION

QUANTITIES IN SUPERSTRUCTURE (USING WOVEN WIRE GUARD)

DESCRIPTION	L = 15'0" Single Span PCS.	Single Span FT. B.M.	Double Span PCS.	Double Span FT. B.M.	Triple Span PCS.	Triple Span FT. B.M.	L = 21'0" Single Span PCS.	Single Span FT. B.M.	Double Span PCS.	Double Span FT. B.M.	Triple Span PCS.	Triple Span FT. B.M.	L = 25'0" Single Span PCS.	Single Span FT. B.M.	Double Span PCS.	Double Span FT. B.M.	Triple Span PCS.	Triple Span FT. B.M.
Ballast Edge strip 4"x6"x14'0" S4S							2	56	4	112	2	56	2	56	7	196	11	308
" 4"x6"x16'0" "	2	84	2	64	4	128					5	160	2	64				
" 4"x6"x18'0" "			2	72	2	72			2	72	2	72						
" 4"x6"x20'0" "							1	40							1	38	1	38
Edge strip block 1"x6"x2'0" S4S	6	6	10	10	14	14	6	6	14	14	20	20	10	10	18	18	26	26
Felloe Guard 6"x6"x12'0" S4S	2	72	2	72	2	72	4	144	2	72	2	72	4	144	3	108	2	72
" 6"x6"x14'0" "	2	84							4	168	2	84	2	84	6	252	12	504
" 6"x6"x16'0" "			4	192	6	288	1	48	2	96	7	336			1	48		
Felloe Guard blocks 4"x6"x1'0" S4S	6	12	10	20	14	28	8	16	14	28	20	40	10	20	18	36	26	52
Posts 6"x8"x6'0" S4S	6	144	10	240	14	336	8	192	14	336	20	480	10	240	18	432	26	624
" 10"x10"x7'0" "	4	233	4	233	4	233	4	233	4	233	4	233	4	233	4	233	4	233
Flooring 2"x4"x24'0" Surf. to 1⅝"x3⅝"	119	1904	229	3664	340	5440	163	2608	318	5088	473	7568	193	3088	377	6032	562	8992
Stringers 6"x16"x16'0" S2E	13	1664	26	3328	39	4992												
" 8"x16"x22'0" "							13	3051	26	6101	39	9152						
" 10"x16"x26'0" "													13	4507	26	9013	39	13520
Outside stringer splice 3"x8"x2'0" S2E			4	16	8	32			4	16	8	32			4	16	8	32
* TOTAL FEET BOARD MEASURE		4163		7911		11633		6396		12338		18305		6448		16420		24398
Nº 0 Woven wire guard including angles	53	Lin. Ft.	83	Lin. Ft.	113	Lin. Ft.	65	Lin. Ft.	107	Lin. Ft.	149	Lin. Ft.	73	Lin. Ft.	123	Lin. Ft.	173	Lin. Ft.
HARDWARE	PCS.	WEIGHT	PCS.	WEIGHT	PCS.	WEIGHT	PCS.	WEIGHT	PCS.	WEIGHT	PCS.	WEIGHT	PCS.	WEIGHT	PCS.	WEIGHT	PCS.	WEIGHT
Drift Bolts Stringers to caps 5/8"x21"	26	47.5	52	95.0	78	142.5	26	47.5	52	95.0	78	142.5	26	47.5	52	95.0	78	142.5
Bolts (Felloe Guard-10"x10" Post) 3/4"x17"	4	6.6	4	6.6	4	6.6	4	6.6	4	6.6	4	6.6	4	6.6	4	6.6	4	6.6
" (Posts to Felloe Guard) 3/4"x12"	10	12.7	14	17.8	18	22.9	12	15.2	18	22.9	24	30.4	14	17.8	22	27.9	30	38.1
" (Posts to Stringer) 3/4"x14"	12	17.3	16	23.0	20	28.8												
" (") 3/4"x16"							16	23.0	24	34.6	32	51.5						
" (") 3/4"x18"																		
" (Posts to Stringer & Splice) 3/4"x16"			8	13.2	16	26.4							20	35.4	32	56.6	44	77.9
" (") 3/4"x18"									8	14.6	16	29.3						
" (") 3/4"x20"																		
" (Stringer to Splice) 5/8"x11"			8	9.4	16	18.9									8	16.1	16	32.2
" (") 5/8"x13"									8	10.8	16	21.6						
" (") 5/8"x15"															8	12.2	18	24.5
" (Felloe Guard to Stringers) 3/4"x35"	6	19.6	10	32.6	14	45.6	8	26.1	14	45.6	20	65.2	10	32.6	18	58.7	26	84.8
" (Hand Rail to Posts) 3/8"x7"	20	10.4	32	16.6	44	22.9	24	12.5	40	20.8	56	29.1	32	16.6	56	29.1	80	41.6
" (Hand Rail to 10"x10" Posts) ½"x10½"	8	5.7	8	5.7	8	5.7	8	5.7	8	5.7	8	5.7	8	5.7	8	5.7	8	5.7
Staples Wire Guard to posts 1"	60	1.1	84	1.4	108	1.9	72	1.2	108	1.9	144	2.5	84	1.4	132	2.3	180	3.1
O.G. Washers 3/4"	64	48.0	120	90.0	176	132.0	80	60.0	152	114.0	224	168.0	96	72.0	184	138.0	272	204.0
" 5/8"	28	14.0	40	20.0	52	26.0	32	16.0	48	24.0	64	32.0	40	20.0	64	32.0	88	44.0
30d. (Com.) Nails in Floor	1488	62.0	2863	119.3	4250	177.1	2036	84.9	3975	165.6	5913	246.4	2413	100.5	4713	196.4	7025	292.7
20d. (Com.) " "	774	25.0	1469	46.0	2210	71.3	1060	34.2	2067	66.7	3078	99.2	1255	40.5	2451	79.1	3653	117.9
20d. (Com.) Nails for Felloe Grd. Blocks	12	0.4	20	0.6	28	0.9	16	0.5	28	0.9	40	1.3	20	0.6	36	1.2	52	1.7
8d. (Com.) Nails for Edge Strip Blocks	36	0.3	60	.06	84	0.8	48	0.5	84	0.8	120	1.1	60	0.6	108	1.0	156	1.5
† TOTAL WT. OF HARDWARE		270.8		500.0		730.5		336.9		634.7		932.6		396.0		758.1		1118.6

(a) * For concrete substructure deduct (6-Pcs. 2"x4"x24'0") From and add 2-Pcs. 4"x6"x24'0" S4S to above table.

(b) † For concrete substructure add 26 drift bolts 3/4"x12" (This makes additional hardware 17.3 Lbs. For each bridge)

(c) All timber shown above including flooring to be cut to length except that edge strip blocks may be random lengths & cut to 2 ft. lengths in Field.

(d) Framing diagrams are shown on sheet 3 of BT-24.

(e) For fill approaches use approach planks and braces to 10"x10" posts as shown on sketch.

·GENERAL NOTES·

① All timber shall be pressure creosoted 12 pounds per cubic foot in accordance with the New Mexico State Highway Specifications.

② All dapping, cutting, framing of lumber and timbers and boring of drift bolt holes in stringers shall be done before timber is pressure creosoted. Holes bored in field shall have dia. ⅛ less than diameter of bolt and shall be flushed with hot creosote oil before bolts are placed.

③ Timber shall meet the requirements of the 1927 Standard Specifications for grades of dense long leaf and short leaf Southern Yellow Pine of the Southern Pine Association. Grades shall be as follows with no heartwood requirement and the amount of sap wood shall not be limited.
Stringers, caps, sills, substructure posts and brace blocks shall be dense structural square edge and sound timbers.
Bulkhead plank shall be dense structural square edge and sound plank.
Flooring shall be dense structural square edge and sound plank.
All other timbers and lumber shall be dense square edge and sound.
Loblolly, bull and old field pine or other species with porous, corky or spongy structure, will not be accepted.

④ After floor is laid the top surface shall be thoroughly flushed with a coat of hot asphalt which shall be brushed in with a stiff brush or broom.

⑤ At inside of felloe guard the washer and head of bolt connecting post to felloe guard shall be countersunk.

⑥ Cost of all hardware in place in finished bridge shall be included in price bid per M of timber.

⑦ The top and [illegible] of [illegible] shall be given two field coats of white lead paint. [illegible] woven wire fence shall be given one field coat of white lead paint.

⑧ Rail posts are included in and paid for as superstructure timber. Bid price for woven wire bridge railing shall include cost of steel angle rails.

⑨ For substructure see sheet Nº 2. When special substructure is used special drawings will be furnished.

⑩ All bolts shall be standard machine bolts with cut threads and hexagon nuts.

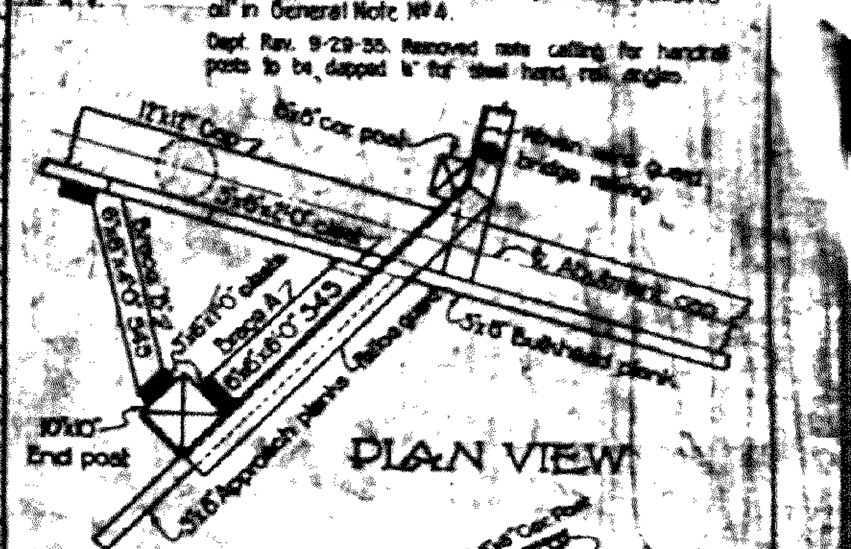
⑪ All washers to be standard O.G. cast iron washers with dimensions not less than the following:

Dia. Bolt	Dia. Bottom	Dia. Top	Dia. Hole	Thickness
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

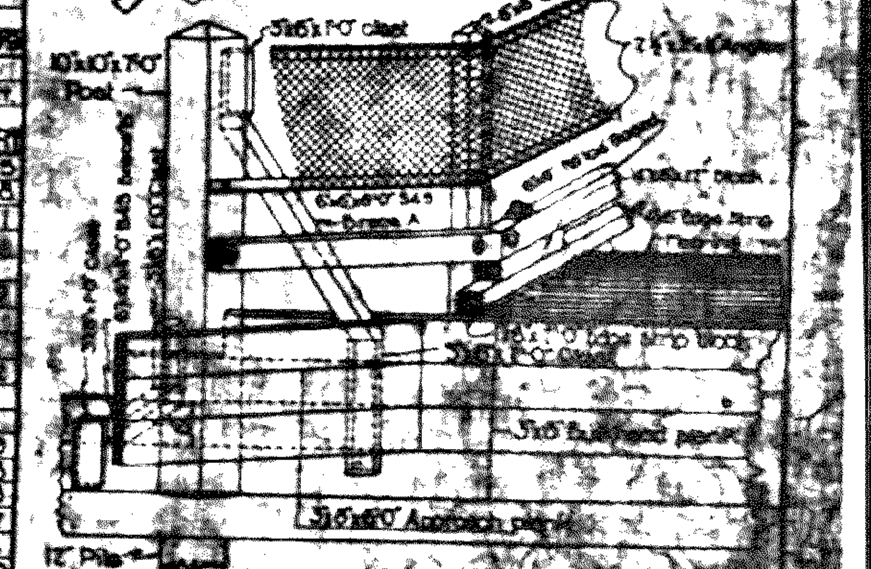
* Dept. Revision [illegible] Changed vertical [illegible]

Dept. Rev. 7-18-33. Substituted "asphalt" for "creosote" in General Note Nº 4.

Dept. Rev. 9-29-33. Removed [illegible] for handrail posts to be dapped ½" for steel hand rail angles.



PLAN VIEW



ISOMETRIC VIEW SHOWING BRACE TO 10"x10" POST

Braces to be used on fill approaches.

NOTE: Nail each cleat with 4-50d nails. Nail ends of each approach plank with 5-50d nails and ends of each brace with 2-50d nails.

LUMBER REQUIRED FOR TWO APPROACHES

12-Pcs. 3"x6"x8'0" Rough 144 Ft. B.M.
1-Pc. 6"x8"x16'0" S4S [illegible]
2-Pcs. 6"x6"x10'0" S4S [illegible]
2-Pcs. 3"x6"x10'0" S4S [illegible]
TOTAL [illegible]

HARDWARE REQUIRED FOR TWO APPROACHES

96-50d. nails 6.8 Lbs.
48-30d. nails 4 [illegible]
TOTAL 10.8 Lbs.

⑫ Where cleats are used drill holes for the nails. The use of spikes or crooked planks for cleats will not be permitted.

NEW MEXICO STATE HIGHWAY DEPARTMENT

STANDARD TREATED TIMBER BRIDGES SUPERSTRUCTURE

SHEET Nº 1

BT-2

Designed: [illegible]
Traced: [illegible]
Checked: [illegible]

FED. ROAD DIST. NO.	STATE	FED. AID PROJECT NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
3	NEW MEXICO				

Revision- Dec. 27, 1932- Changed length of 1¼" buck brace bolts to 27".
Revision- Jan. 27, 1933- Added Note 7.

QUANTITIES FOR TWO ABUTMENTS TYPE-C — WINGS AT 15°

PCS	DESCRIPTION	LENGTH	STOCK LENGTH TAKEN FROM	FT. B.M.
4	12x12" S2E Caps Nº A-1	16'0"	4 pcs. 16'0"	664
4	12x12" S2E Blocks	3'6"	1 pc. 14'0"	168
4	12x12" S2E Blocks	5'0"	2 pcs. 10'0"	240
4	3x6" Bulkhead Plank	15'6"	4 pcs. 16'0"	128
4	3x6" " "	16'0"	4 pcs. 16'0"	128
4	3x6" " "	17'0"	4 pcs. 18'0"	144
4	3x6" " "	18'0"	4 pcs. 18'0"	144
4	3x6" " "	19'0"	4 pcs. 20'0"	160
16	3x6" " "	20'0"	16 pcs. 20'0"	640
4	3x6" Wing Plank	1'6"	1 pc. 6'0"	12
4	3x6" " "	2'6"	1 pc. 10'0"	18
4	3x6" " "	3'6"	1 pc. 14'0"	28
4	3x6" " "	5'0"	2 pcs. 10'0"	40
4	3x6" Wing Braces	4'0"	2 pcs. 8'0"	32
18	Piles	Variable	Variable	Variable
	TOTAL FT. B.M. (NOT INCLUDING PILES)			2748
	HARDWARE			
PCS	DESCRIPTION	LENGTH		POUNDS
30	¾" Drift Bolts	22"		67.4
	60d Nails			40.0
	50d Nails			5.0
	30d Nails			7.0
	TOTAL WEIGHT			129.4
	IF BULKHEAD PLANK IS CARRIED DOWN TO 7'4" SUBTRACT FROM ABOVE			
4	3x6" Wing Braces	4'0"	2 Pcs. 8'0"	32
	ADD TO ABOVE			
4	3x6" Wing Braces	7'0"	2 Pcs. 14'0"	56
6	3x6" Bulkhead Plank	20'0"	6 Pcs. 20'0"	370
6	3x6" Wing Plank	6'0"	6 Pcs. 6'0"	56
	TOTAL FT. B.M. (NOT INCLUDING PILES)			3186

QUANTITIES FOR TWO ABUTMENTS TYPE-C — WINGS AT 30°

PCS	DESCRIPTION	LENGTH	STOCK LENGTH TAKEN FROM	FT. B.M.
4	3x6" Cleats	2'6"	1 Pc. 12'0"	16
	TOTAL SAME AS TABLE OF WINGS AT 15°			2748
	TOTAL FT. B.M. (NOT INCLUDING PILES)			2766
	HARDWARE			
PCS	DESCRIPTION	LENGTH		POUNDS
30	¾" Drift Bolts	22"		67.4
	60d Nails			40.0
	50d Nails			9.0
	TOTAL WEIGHT			131.4
	IF BULKHEAD PLANK IS CARRIED DOWN TO 7'4" SUBTRACT FROM ABOVE			
4	3x6" Wing Braces	4'0"	2 Pcs. 8'0"	32
4	3x6" Cleats	2'6"	1 Pc. 12'0"	16
	ADD TO ABOVE			
4	3x6" Wing Braces	7'0"	2 Pcs. 14'0"	56
6	3x6" Bulkhead Plank	20'0"	6 Pcs. 20'0"	370
6	3x6" Wing Plank	6'0"	6 Pcs. 6'0"	56
4	3x6" Cleats	4'0"	2 Pcs. 8'0"	24
	TOTAL FT. B.M. (NOT INCLUDING PILES)			3212

QUANTITIES FOR TWO ABUTMENTS TYPE-C — WINGS AT 45°

PCS	DESCRIPTION	LENGTH	STOCK LENGTH TAKEN FROM	FT. B.M.
4	12x12" S2E Cap Nº A-1	16'0"	4 Pcs. 16'0"	664
4	12x12" S2E Blocks	5'0"	2 Pcs. 10'0"	240
4	12x12" S2E Blocks	3'6"	1 Pc. 14'0"	168
4	3x6" Bulkhead Plank	15'6"	4 Pcs. 16'0"	128
4	3x6" " "	16'0"	4 Pcs. 16'0"	128
4	3x6" " "	17'0"	4 Pcs. 18'0"	144
4	3x6" " "	18'0"	4 Pcs. 18'0"	144
4	3x6" " "	19'0"	4 Pcs. 20'0"	160
16	3x6" " "	20'0"	16 Pcs. 20'0"	640
4	3x6" Wing Plank	1'6"	1 Pc. 6'0"	12
4	3x6" " "	3'0"	2 Pcs. 6'0"	24
4	3x6" " "	4'0"	2 Pcs. 8'0"	32
4	3x6" " "	6'0"	4 Pcs. 6'0"	48
4	3x6" Wing Braces	5'0"	2 Pcs. 10'0"	40
4	3x6" Cleats	2'6"	1 Pc. 12'0"	16
16	Piles	Variable	Variable	Variable
	TOTAL FT. B.M. (NOT INCLUDING PILES)			2790
	HARDWARE			
PCS	DESCRIPTION	LENGTH		POUNDS
30	¾" Drift Bolts	22"		67.4
	60d Nails			40.0
	50d Nails			7.0
	TOTAL WEIGHT			129.4
	IF BULKHEAD PLANK IS CARRIED DOWN TO 7'4" SUBTRACT FROM ABOVE			
4	3x6" Wing Braces	5'0"	2 Pcs. 10'0"	40
4	3x6" Cleats	2'6"	1 Pc. 12'0"	16
	ADD TO ABOVE			
4	3x6" Wing Braces	8'0"	4 Pcs. 8'0"	64
6	3x6" Bulkhead Plank	20'0"	6 Pcs. 20'0"	370
6	3x6" Wing Plank	7'6"	4 Pcs. 14'0"	112
4	3x6" Cleats	4'0"	2 Pcs. 8'0"	24
	TOTAL FT. B.M. (NOT INCLUDING PILES)			3252

QUANTITIES FOR TWO ABUTMENTS TYPE-A

PCS	DESCRIPTION	LENGTH	STOCK LENGTH TAKEN FROM	FT. B.M.
	TIMBER			
4	12x12" S2E Caps Nº A-1	16'0"	4 Pcs. 16'0"	664
4	12x12" S2E Blocks	5'0"	2 Pcs. 10'0"	240
4	12x12" S2E Blocks	3'6"	1 Pc. 14'0"	168
Bundles	3x6" Bulkhead Plank	666 Lin. Ft.	See Table on Abutments	1408
4	3x6" Wing Braces	5'0"	2 Pcs. 10'0"	40
14	Piles	Variable	Variable	Variable
	TOTAL FT. B.M. (NOT INCLUDING PILES)			2720
	HARDWARE			
PCS	DESCRIPTION	LENGTH		POUNDS
30	¾" Drift Bolts	22"		67.4
	60d Nails			38.0
	50d Nails			5.0
	TOTAL WEIGHT			125.4

QUANTITIES FOR TWO ABUTMENTS TYPE-B

PCS	DESCRIPTION	LENGTH	STOCK LENGTH TAKEN FROM	FT. B.M.
	TIMBER			
4	12x12" S2E Caps Nº A-1	16'0"	4 Pcs. 16'0"	664
4	12x12" S2E Blocks	5'0"	2 Pcs. 10'0"	240
4	12x12" S2E Blocks	3'6"	1 Pc. 14'0"	168
14	6x12" S2S Blocks BP-1	4'0"	7 Pcs. 8'0"	446
Bundles	3x6" Bulkhead Plank	666 Lin. Ft.	See Table on Abutments	1408
4	3x6" Wing Braces	5'0"	2 Pcs. 10'0"	40
14	12x12" Rough Posts	Variable	Variable	Variable
	TOTAL FT. B.M. (NOT INCLUDING PILES)			3168
	HARDWARE			
PCS	DESCRIPTION	LENGTH		POUNDS
30	¾" Drift Bolts	22"		67.4
28	¾" Bolts	27"		302.8
56	6x6x⅜" Steel Washers			499.8
	60d Nails			38.0
	50d Nails			5.0
	TOTAL WEIGHT			928.0

NOTE: 1-Cu. Yd. Class "A" concrete under each post where needed.

CASE II — QUANTITIES FOR ONE BENT WITH ONE TIER OF BRACING

PCS	DESCRIPTION	LENGTH	AMOUNT	TOTAL
1	12x12" S2E Cap	26'0"	312 Ft. B.M.	Variable
4	3x10" Diagonals	Variable	Variable	
2	3x10" Girts	24'0"	120 Ft. B.M.	
*1	1"x10" Shim Material	4'0"	3 Ft. B.M.	
5	Piles	Variable	Variable	
	HARDWARE			
5	¾" Drift Bolts	22"	13.6*	105.3*
8	¾" Bolts	16"	21.9	
24	¾" O.G. Washers		42.8	
8	¾" Bolts	21"	27.0	

CASE II — QUANTITIES FOR ONE BENT WITH TWO TIERS OF BRACING

PCS	DESCRIPTION	LENGTH	AMOUNT	TOTAL
1	12x12" S2E Cap	26'0"	312 Ft. B.M.	Variable
6	3x10" Diagonals	Variable	Variable	
4	3x10" Girts	24'0"	240 Ft. B.M.	
5	Piles	Variable	Variable	
*1	1"x10" Shim Material	4'0"	3 Ft. B.M.	
	HARDWARE			
5	¾" Drift Bolts	22"	13.6*	134.2*
12	¾" Bolts	16"	31.4	
16	¾" Bolts	21"	[illegible]	
60	¾" O.G. Washers		[illegible]	

SHIM NOTE FOR BENTS CASE II

* 1"x10" To be used in short lengths of about 12 inches where needed for shims to take care of gap between sways and piles or between sways and cap due to difference between diameter of pile and width of cap. Fasten shims with 8d. nails to prevent rotation.

NAILING NOTE FOR ABUTS. TYPE A-B&C.

Use 2-60d. nails in each plank at each pile. For planks above pile tops nail each plank with 2-60d. nails at about 2'0" centers. Nail wing brace with 50d. nails as shown.

CASE III — QUANTITIES FOR ONE BENT WITH ONE TIER OF BRACING

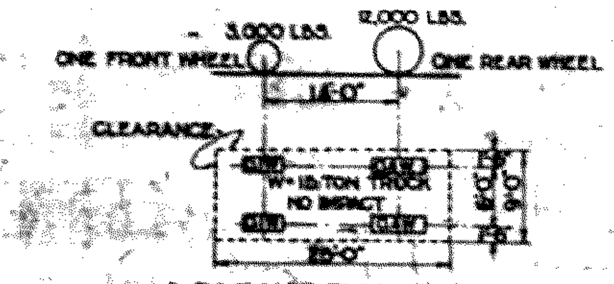
PCS	DESCRIPTION	LENGTH	AMOUNT	TOTAL
1	12x12" S2E Cap	26'0"	312 Ft. B.M.	Variable
4	3x10" Diagonals	Variable	Variable	
1	12x12" S2E Sill	26'0"	312 Ft. B.M.	
5	12x12" Rough Posts	Variable	Variable	
	HARDWARE			
2	1¼" Anchor Bolts	24"	6.7*	120.1*
10	¾" Drift Bolts	22"	27.5	
12	¾" Bolts	16"	31.4	
24	¾" O.G. Washers		42.8	
4	¾" Bolts	21"	12.0	
	REINFORCING BARS			
4	1" Deformed A-bars	26'6"	360.4*	390.2*
4	½" Deformed B-bars	6'9"	29.8	
	CONCRETE			
1	2'0"x2'0" Sill	27'0"	4 Cu. Yds.	4 Cu. Yds.

CASE III — QUANTITIES FOR ONE BENT WITH TWO TIERS OF BRACING

PCS	DESCRIPTION	LENGTH	AMOUNT	TOTAL
1	12x12" S2E Cap	26'0"	312 Ft. B.M.	Variable
6	3x10" Diagonals	Variable	Variable	
2	3x10" Girts	24'0"	120 Ft. B.M.	
1	12x12" S2E Sill	26'0"	312 Ft. B.M.	
5	12x12" Rough Posts	Variable	Variable	
	HARDWARE			
2	1¼" Anchor Bolts	24"	6.7*	190.1*
10	¾" Drift Bolts	22"	27.5	
16	¾" Bolts	16"	41.9	
60	¾" O.G. Washers		74.0	
12	¾" Bolts	21"	38.0	
	REINFORCING BARS			
4	1" Deformed A-bars	26'6"	360.4*	390.2*
4	½" Deformed B-bars	6'9"	29.8	
	CONCRETE			
1	2'0"x2'0" Sill	27'0"	4 Cu. Yds.	4 Cu. Yds.

·GENERAL NOTES·

1. All piling shall be dense Southern Yellow Pine and shall be pressure creosoted 12 pounds per cubic foot in accordance with New Mexico State Highway Specifications.
2. For specifications regarding timber see sheet Nº1 of BT-24.
3. For superstructure see sheet Nº1 of BT-24.
4. For framing diagrams see sheet Nº 3 of BT-24.
5. The following substructure timber shall be cut to length before being creosoted: All timber and plank except where lengths required are 4 feet and up in multiples of 2 feet.
6. See notes 10 & 11 on sheet 1 of BT-24 regarding bolts & washers.
7. Bottom & top ends of timber posts in bents and top end of timber posts in abutments shall be given treatment of hot creosote and hot tar pitch and covered with galvanized sheet iron as specified for Treated Timber Piling.



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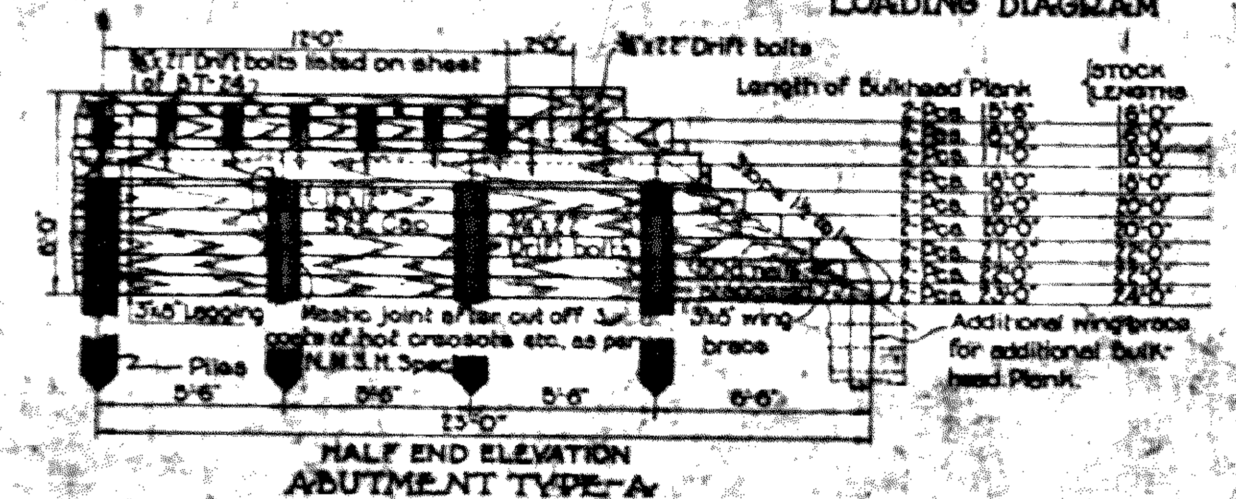
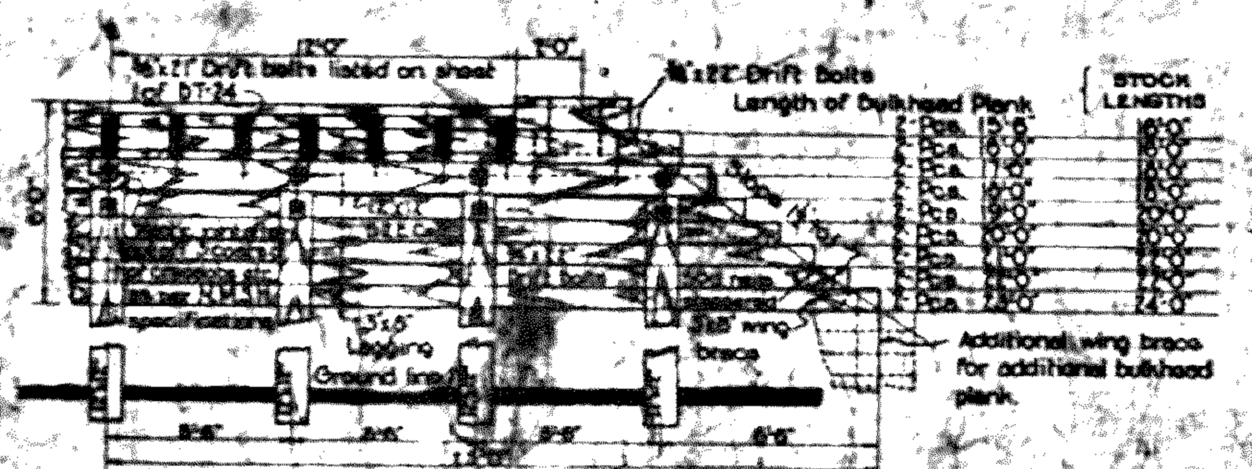
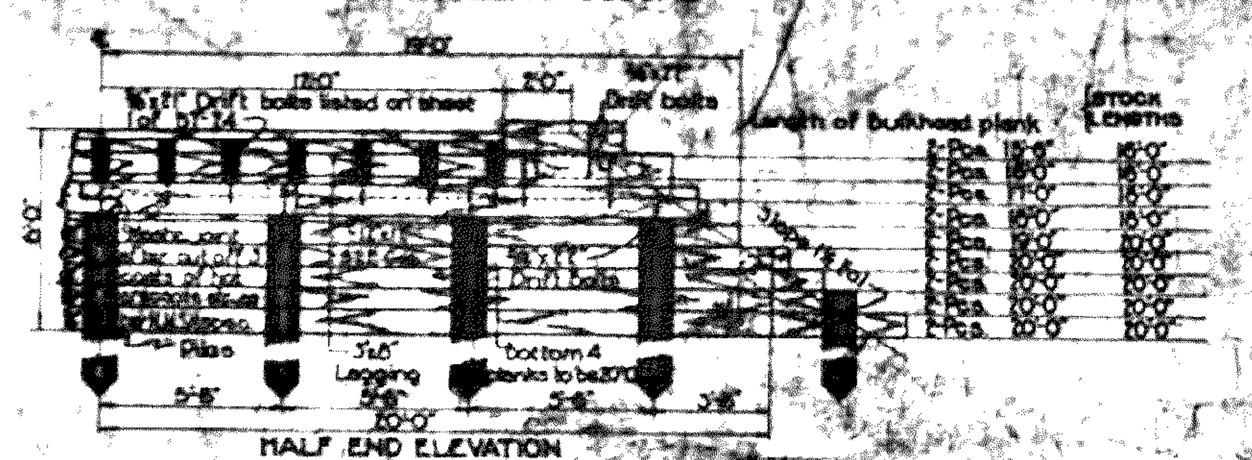


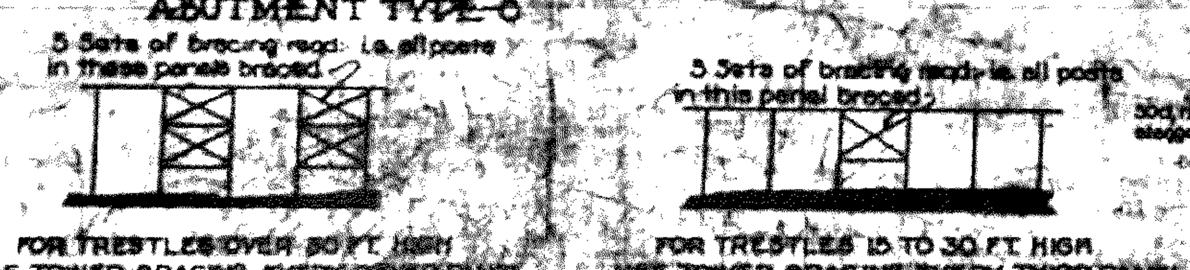
HALF END ELEVATION
ABUTMENT TYPE-A



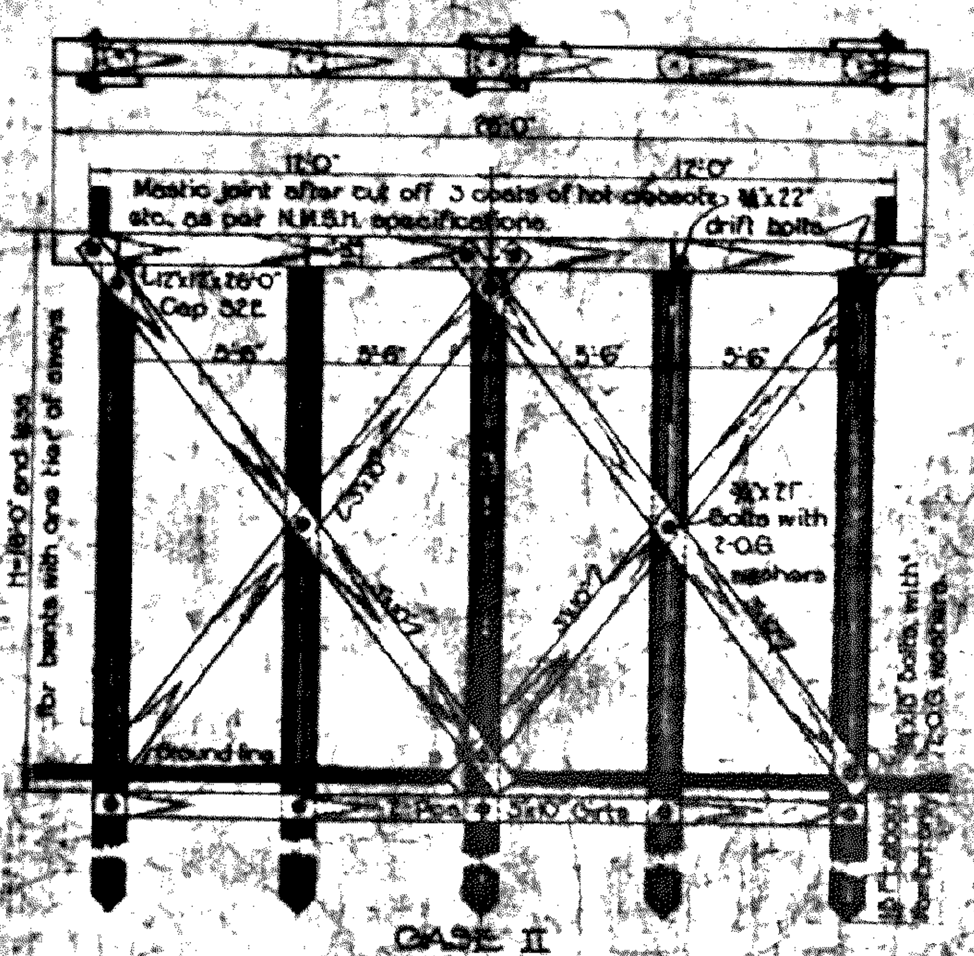
NOTE: USE TYPE-B ABUTMENTS WHERE PILING CANNOT BE DRIVEN. SEE DETAILS A-A AND B-B FOR DETAILS OF ANCHORING POSTS.
HALF END ELEVATION
ABUTMENT TYPE-B



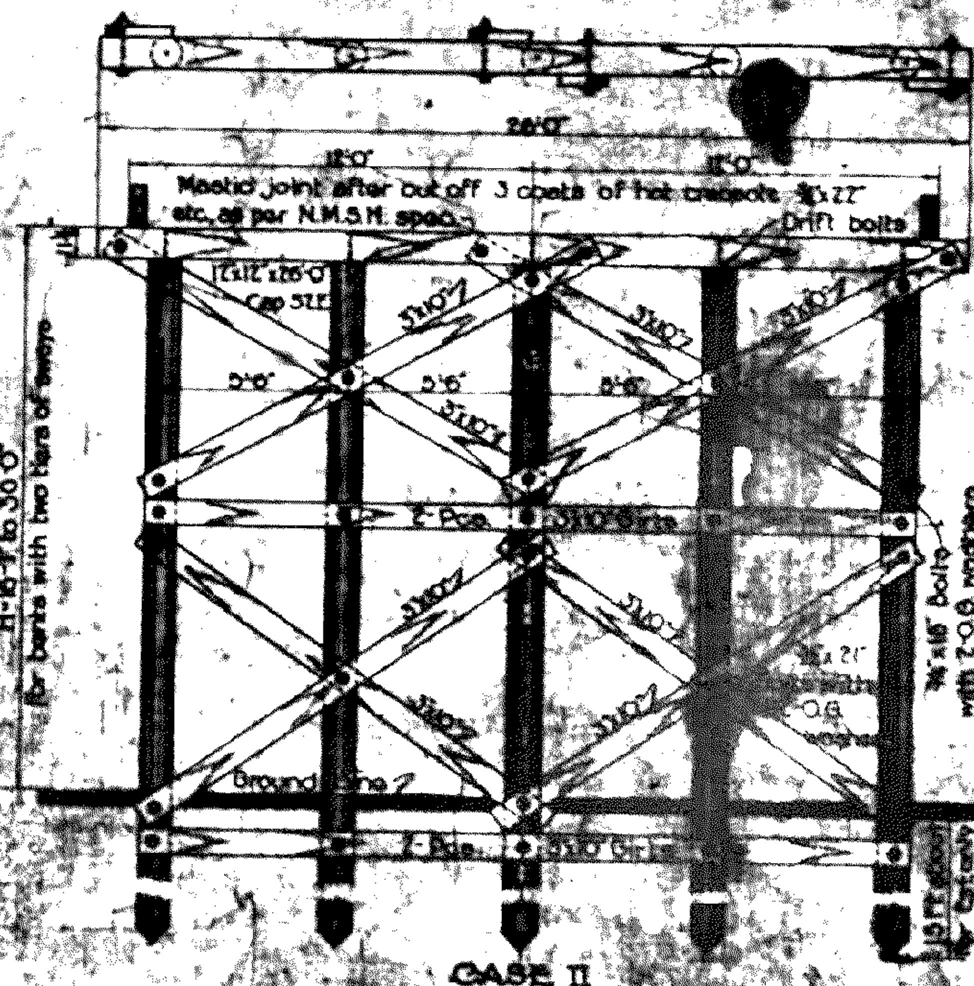
HALF END ELEVATION
ABUTMENT TYPE-C



FOR TRESTLES OVER 30 FT. HIGH USE TOWER BRACING EVERY OTHER PANEL
FOR TRESTLES 15 TO 30 FT. HIGH USE TOWER BRACING EVERY THIRD PANEL

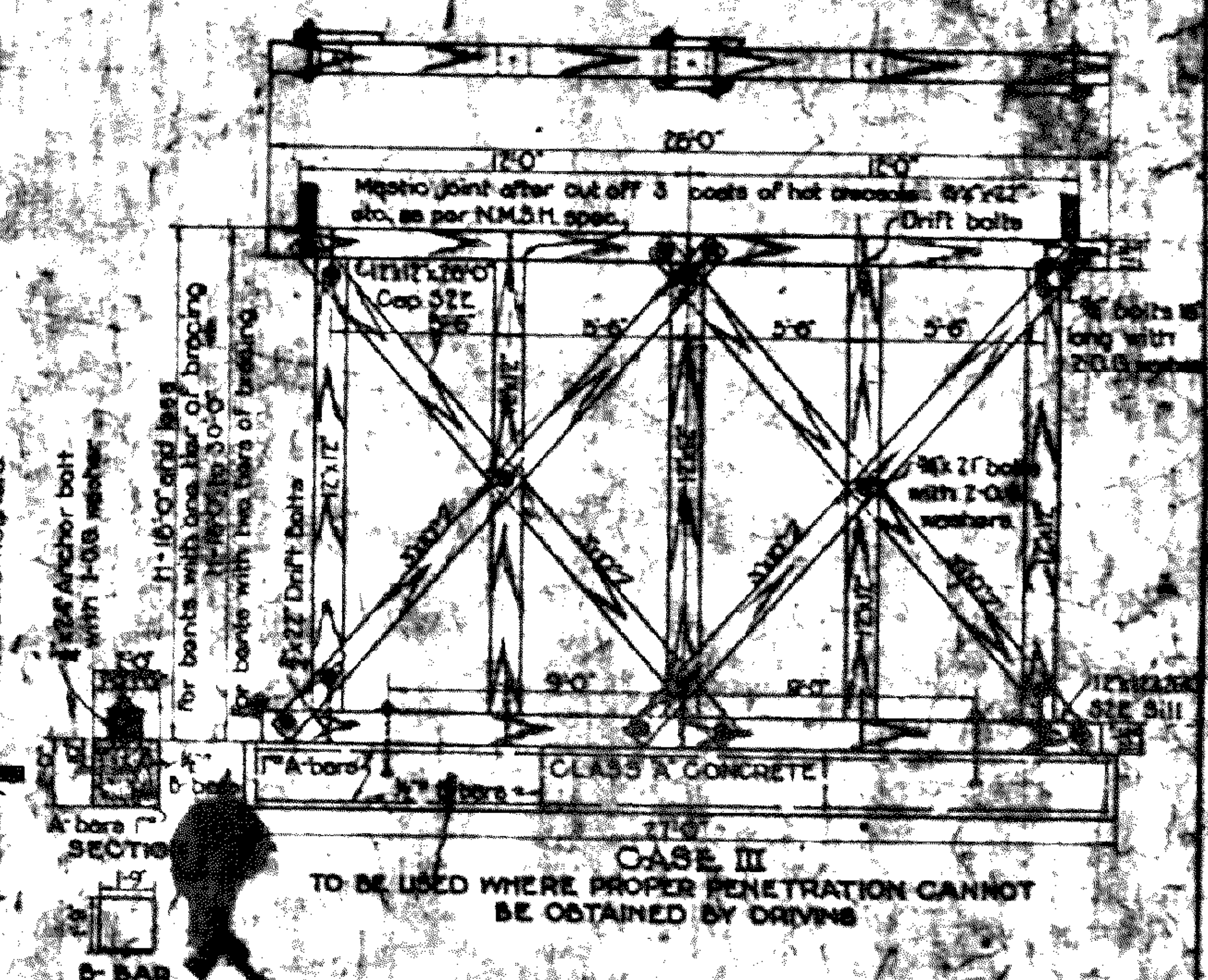


CASE II
ONE TIER OF SWAYS

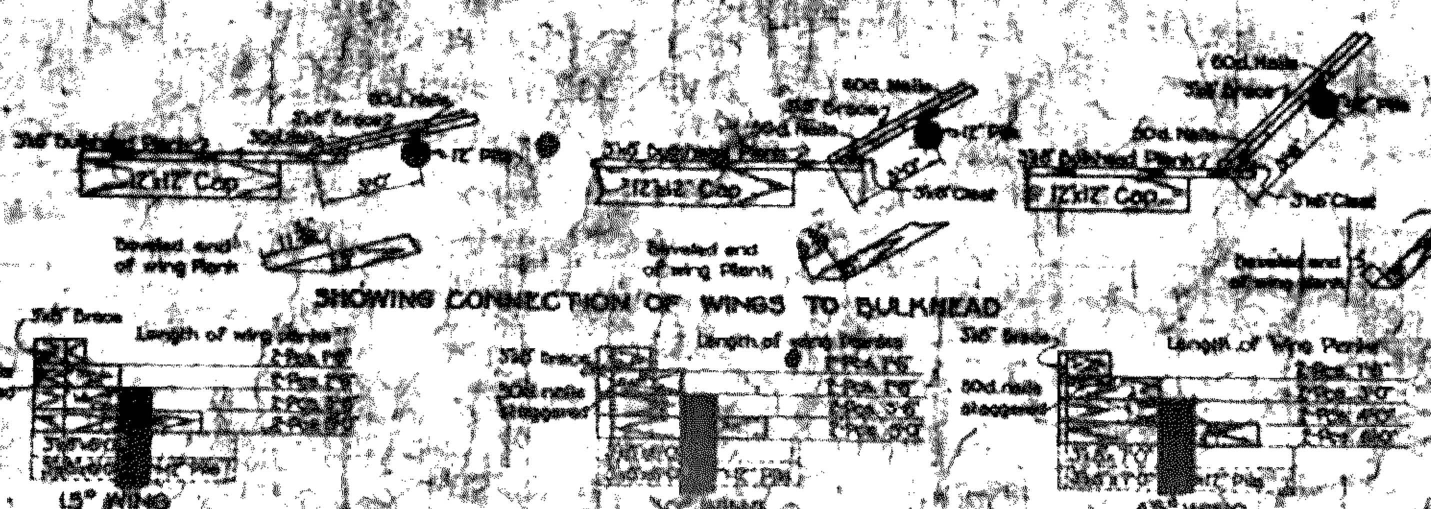


CASE II
TWO TIERS OF SWAYS

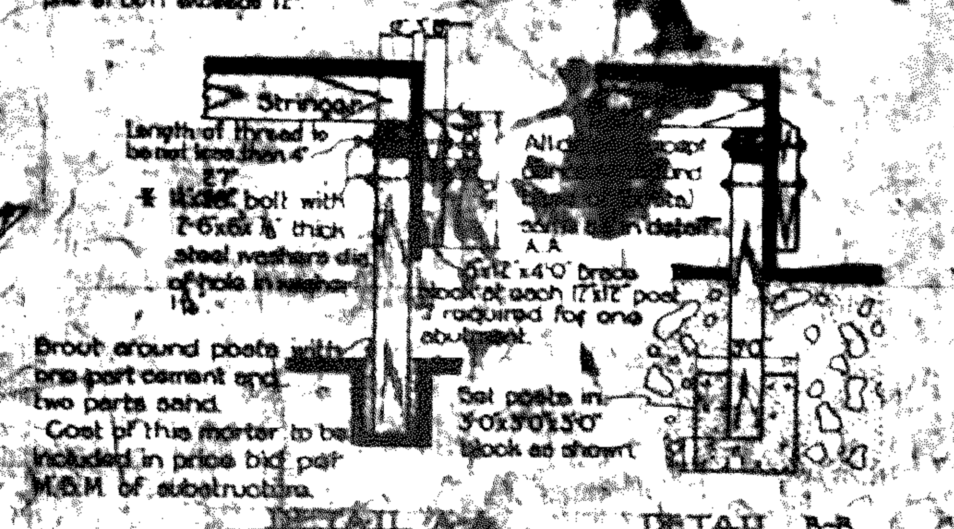
* Where 12"x12" posts are used make 1¼" bolt 27" long measured under head. Where piling are used, bolt length to be increased by amount that diameter of pile at butt exceeds 12".



CASE III
TO BE USED WHERE PROPER PENETRATION CANNOT BE OBTAINED BY DRIVING



SHOWING CONNECTION OF WINGS TO BULKHEAD
FRONT ELEVATION
DOTTED LINE IS ADDITIONAL WING PLANKS WHEN BULKHEAD IS CARRIED DOWN 7'4"



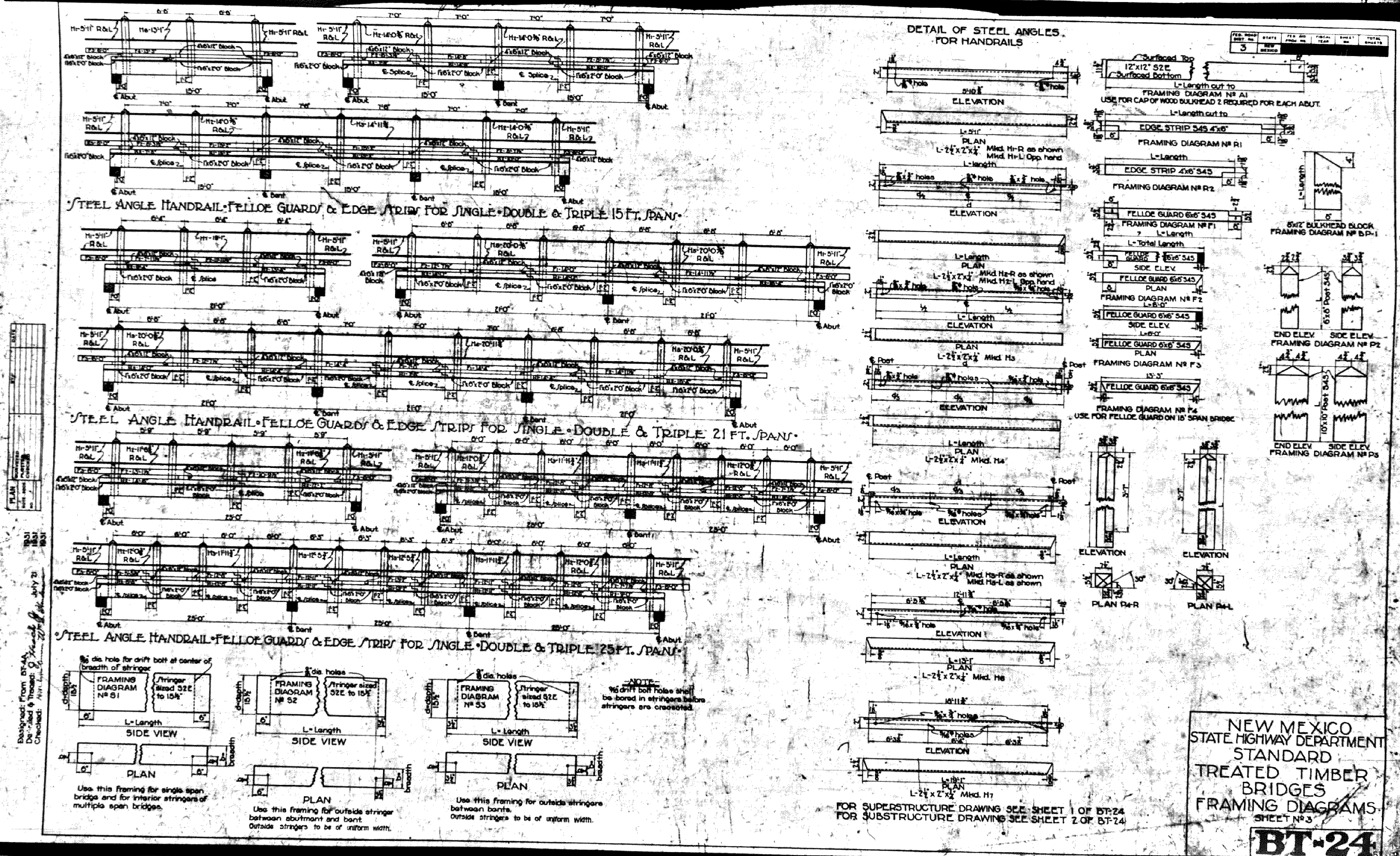
DETAIL A-A (USED IN SOLID ROCK OR SHALE)
DETAIL B-B (USED IN BOULDERS ETC.)

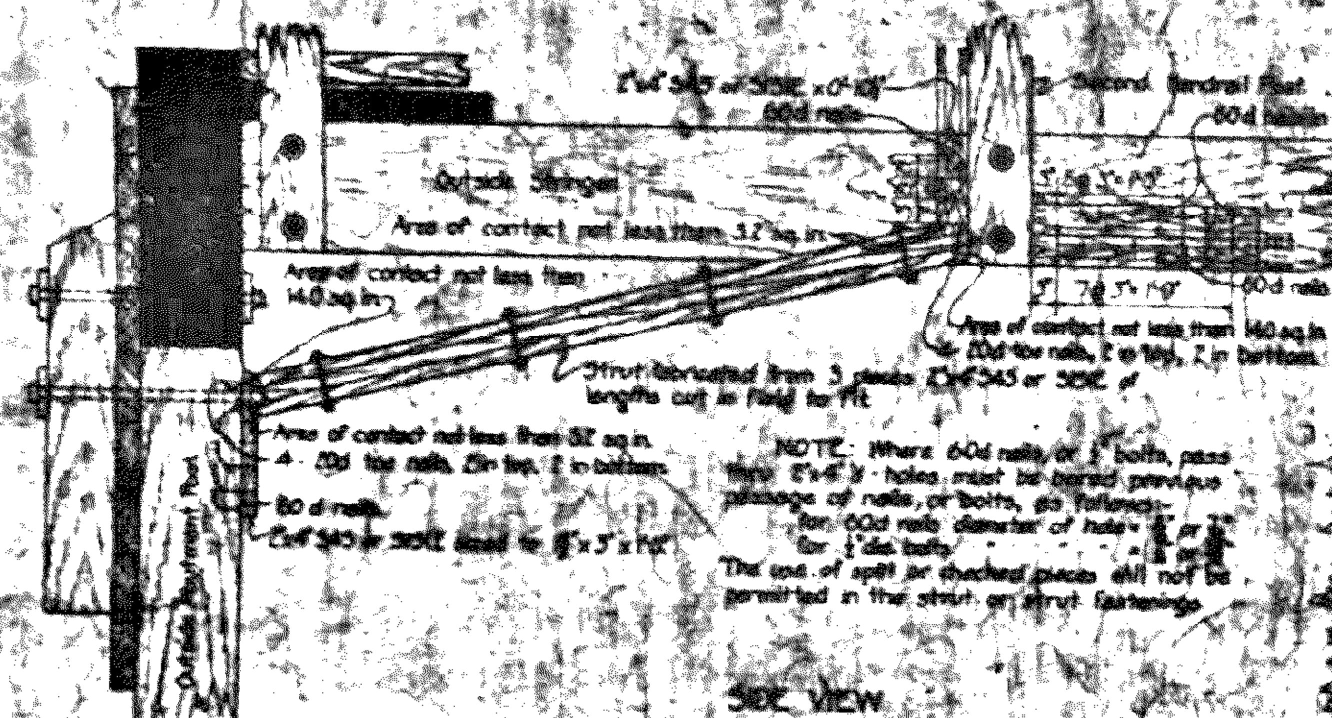
NOTE: Where bulkhead planks do not extend down to bottom of 6x12" block substitute piece of 3x6" of proper length at each 12x12" post to fill space between block & sheet.

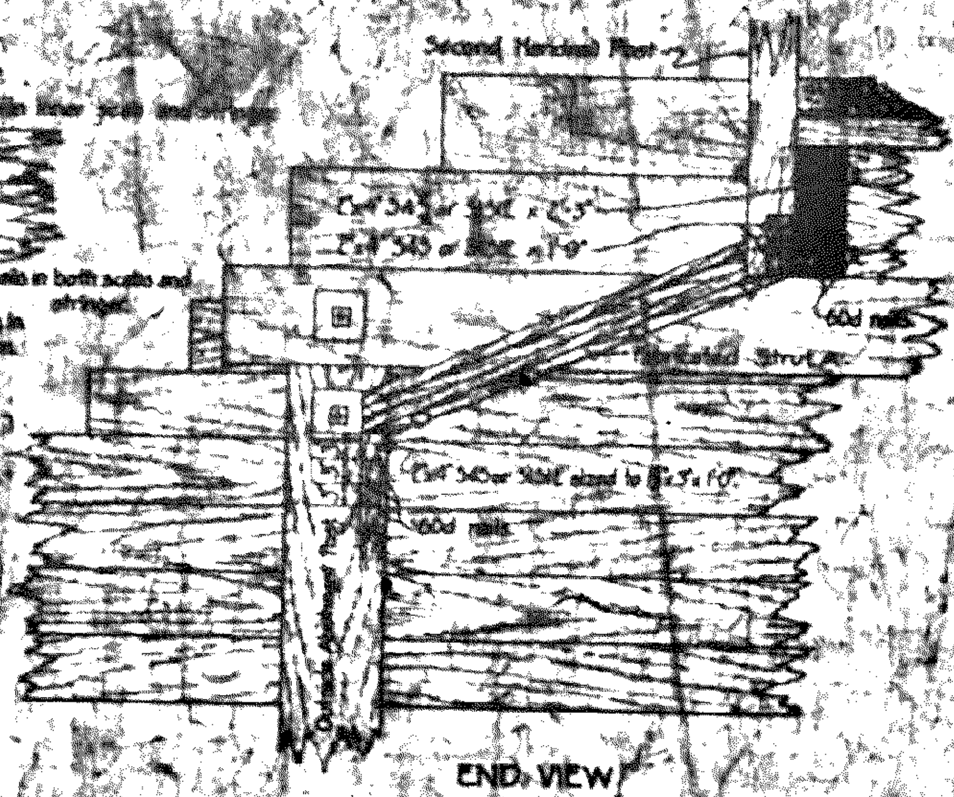
Designed: From BT-4A
Details & Traced: J. Hecht
Checked:
1931

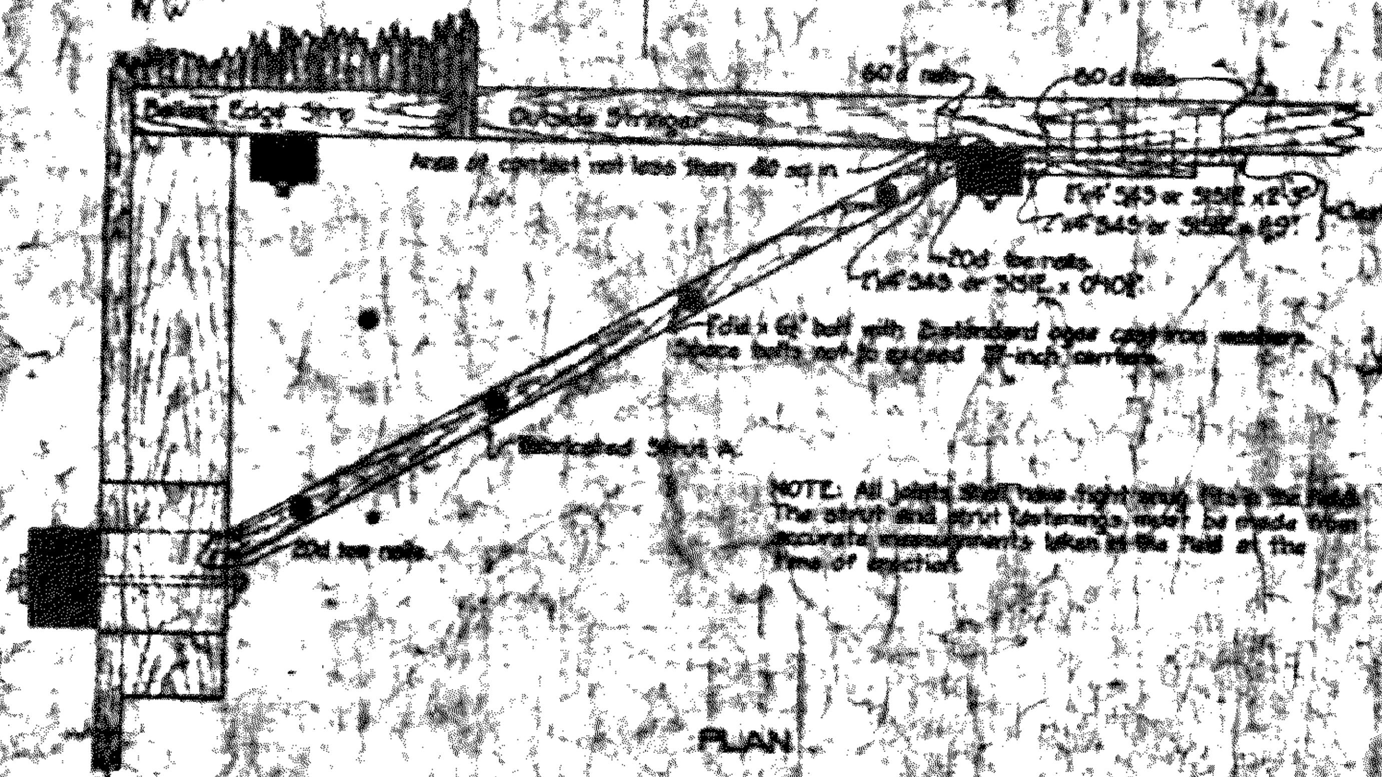
NEW MEXICO STATE HIGHWAY DEPARTMENT
STANDARD TREATED TIMBER BRIDGES SUBSTRUCTURE
SHEET Nº 2

BT-24


STEEL ANGLE HANDRAIL • FELLOE GUARDS & EDGE STRIPS FOR SINGLE • DOUBLE & TRIPLE 15 FT. SPANS •
STEEL ANGLE HANDRAIL • FELLOE GUARDS & EDGE STRIPS FOR SINGLE • DOUBLE & TRIPLE 21 FT. SPANS •
STEEL ANGLE HANDRAIL • FELLOE GUARDS & EDGE STRIPS FOR SINGLE • DOUBLE & TRIPLE 25 FT. SPANS •
DETAIL OF STEEL ANGLES FOR HANDRAILS
ELEVATION
PLAN
12"x12" S2E
Surfaced Top
Surfaced Bottom
FRAMING DIAGRAM Nº A1
USE FOR CAP OF WOOD BULKHEAD 2 REQUIRED FOR EACH ABUT.
EDGE STRIP S4S 4"x6"
FRAMING DIAGRAM Nº R1
EDGE STRIP 4"x6" S4S
FRAMING DIAGRAM Nº R2
FELLOE GUARD 6x6" S4S
FRAMING DIAGRAM Nº F1
FRAMING DIAGRAM Nº F2
FRAMING DIAGRAM Nº F3
FRAMING DIAGRAM Nº F4
USE FOR FELLOE GUARD ON 15' SPAN BRIDGE
6"x12" BULKHEAD BLOCK
FRAMING DIAGRAM Nº BP-1
END ELEV.
SIDE ELEV.
FRAMING DIAGRAM Nº P2
FRAMING DIAGRAM Nº P3
PLAN P4-R
PLAN P4-L
FRAMING DIAGRAM Nº S1
FRAMING DIAGRAM Nº S2
FRAMING DIAGRAM Nº S3
SIDE VIEW
Use this framing for single span bridge and for interior stringers of multiple span bridges.
Use this framing for outside stringer between abutment and bent. Outside stringers to be of uniform width.
Use this framing for outside stringers between bents. Outside stringers to be of uniform width.
—NOTE—
9/16" drift bolt holes shall be bored in stringers before stringers are creosoted.
FOR SUPERSTRUCTURE DRAWING SEE SHEET 1 OF BT-24
FOR SUBSTRUCTURE DRAWING SEE SHEET 2 OF BT-24
NEW MEXICO
STATE HIGHWAY DEPARTMENT
STANDARD
TREATED TIMBER
BRIDGES
FRAMING DIAGRAMS
SHEET Nº 3
BT-24
Designed: From BT-4A
Detailed & Traced:
Checked:
July 21 1931







DETAILS OF OUTSIDE ABUTMENT POST STRUT A

Material Bill for One Strut with its Cleats and Fastenings:-

3 pieces 2"x4" S4S or S1S1E x 20'-0" Treated Bridge Timber
6 20d nails
22 60d nails
4 3/4" dia. x 6 1/2" bolts.
8 3 1/2" O.G. cast iron washers.

PAY QUANTITY FOR ONE STRUT WITH CLEATS AND FASTENINGS

Treated Bridge Timber Substructure: 0.027 M.B.M.

NOTES FOR 4"x6" ALTERNATE STRUT

When called for on the Structure Location Sheet the following alternate members may be used instead of Strut A and Cleat B shown above.

Instead of Strut A use 1 piece 4"x6" S4S of length ordered as follows:-

for 15-ft span, ordered length of strut =	9'-0"
21	8'-8"
25	8'-0"
31	9'-3"

Said 4"x6" shall be toe nailed to the posts as shown for Strut A.
Instead of Cleat B use 1 piece 3"x8" S2E or Rough x 2'-0" fastened to stringer with 14 - 60d nails at 3" ctrs. in 2 rows.

PAY QUANTITY FOR ONE STRUT WITH CLEATS AND FASTENINGS

Treated Bridge Timber Substructure:

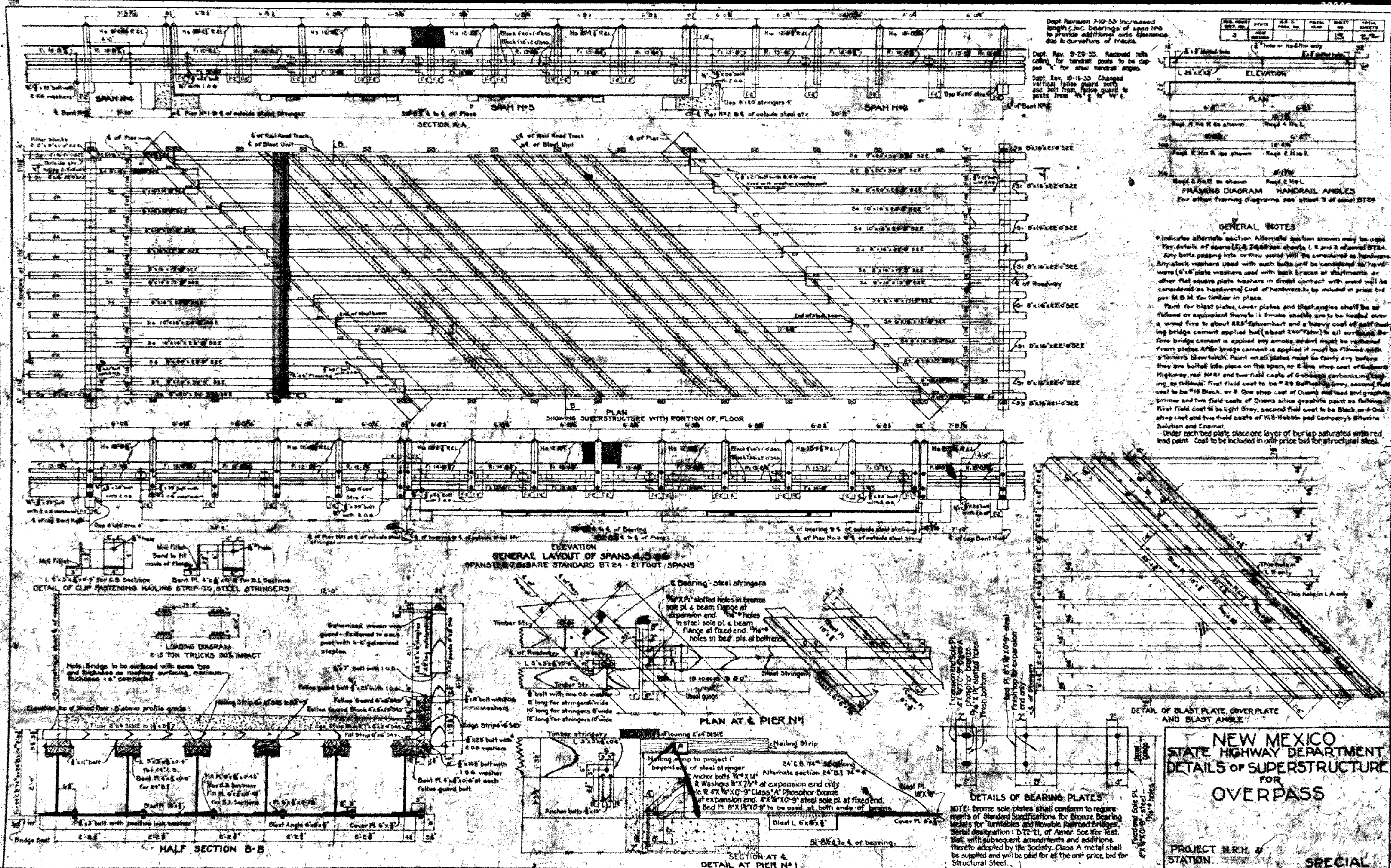
15-ft. span	0.023 M.B.M.
21-ft. span	0.023 M.B.M.
25-ft. span	0.021 M.B.M.
31-ft. span	0.025 M.B.M.

Material Bill for One Strut with its Cleats and Fastenings:-

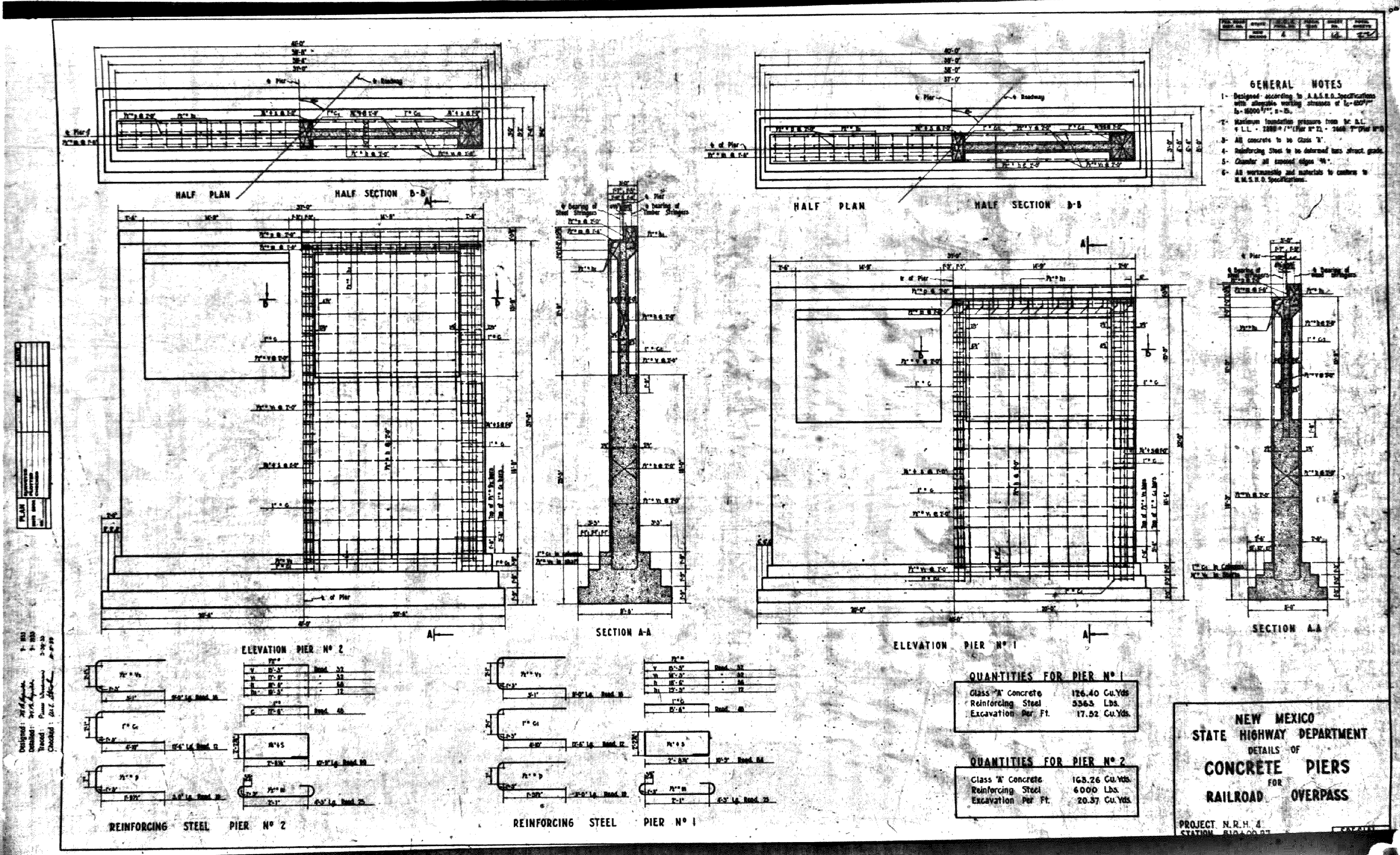
1 piece 4"x6" S4S x required length (8'-0" to 9'-3").
1 3"x8" S2E or Rough x 2'-0" (for Cleat B).
1 2"x4" S4S or S1S1E x 2'-0" (for cleats).
8 20d nails.
20 60d nails.

NEW MEXICO
STATE HIGHWAY DEPARTMENT
STANDARD
TREATED TIMBER
BRIDGES
MISCELLANEOUS

BTM



Dept. Revision 7-10-55 Increased length c.loc. bearings of span Nº6 to provide additional side clearance due to curvature of tracks.
Dept. Rev. 9-29-55. Removed rails calling for handrail posts to be dapped for steel handrail angles.
Dept. Rev. 10-16-55. Changed vertical felloe guard bolts and bolt from felloe guard to posts from ¾" to ⅞".
SPAN Nº4
SPAN Nº5
SPAN Nº6
SECTION A-A
FRAMING DIAGRAM
HANDRAIL ANGLES
For other framing diagrams see sheet 3 of serial BT24
GENERAL NOTES
* Indicates alternate section. Alternate section shown may be used.
For details of spans 1, 2, 3 and 7 see sheets 1, 2 and 3 of serial BT24.
Any bolts passing into or thru wood will be considered as hardware. Any stock washers used with such bolts will be considered as hardware (6"x6" plate washers used with back braces at abutments or other flat square plate washers in direct contact with wood will be considered as hardware). Cost of hardware to be included in price bid per M.B.M. for timber in place.
Paint for blast plates, cover plates and blast angles shall be as follows or equivalent thereto: 1. Smoke shields are to be heated over a wood fire to about 225° Fahrenheit and a heavy coat of self heating bridge cement applied hot (about 240° Fahr.) to all surfaces. Before bridge cement is applied any smoke or dirt must be removed from plates. After bridge cement is applied it must be flamed with a tinners blowtorch. Paint on all plates must be fairly dry before they are bolted into place on the span, or 2. One shop coat of Goheens Highway red Nº81 and two field coats of Goheens carbonizing coating as follows: First field coat to be Nº29 Battleship Grey, second field coat to be Nº15 Black, or 3. One shop coat of Dixons red lead and graphite primer and two field coats of Dixons silica graphite paint as follows: First field coat to be light Grey, second field coat to be Black, or 4. One shop coat and two field coats of Hill-Hubble and Company's Bitumine Solution and Enamel.
Under each bed plate place one layer of burlap saturated with red lead paint. Cost to be included in unit price bid for structural steel.
PLAN
SHOWING SUBSTRUCTURE WITH PORTION OF FLOOR
ELEVATION
GENERAL LAYOUT OF SPANS 4, 5 & 6
SPANS 1, 2, 3 & 7 ARE STANDARD BT24 - 21 FOOT SPANS
DETAIL OF CLIP FASTENING NAILING STRIP TO STEEL STRINGERS
LOADING DIAGRAM
H-15 TON TRUCKS 30% IMPACT
PLAN AT ℄ PIER Nº1
HALF SECTION B-B
SECTION AT ℄
DETAIL AT PIER Nº1
DETAIL OF BLAST PLATE, COVER PLATE AND BLAST ANGLE
DETAILS OF BEARING PLATES
NOTE: Bronze sole plates shall conform to requirements of Standard Specifications for Bronze Bearing Metals for Turntables and Movable Railroad Bridges, Serial designation: B22-21, of Amer. Soc. for Test. Mat. with subsequent amendments and additions thereto adopted by the Society. Class A metal shall be supplied and will be paid for at the unit price bid for Structural Steel.
NEW MEXICO
STATE HIGHWAY DEPARTMENT
DETAILS OF SUPERSTRUCTURE
FOR
OVERPASS
PROJECT N.R.H. 4
STATION
SPECIAL



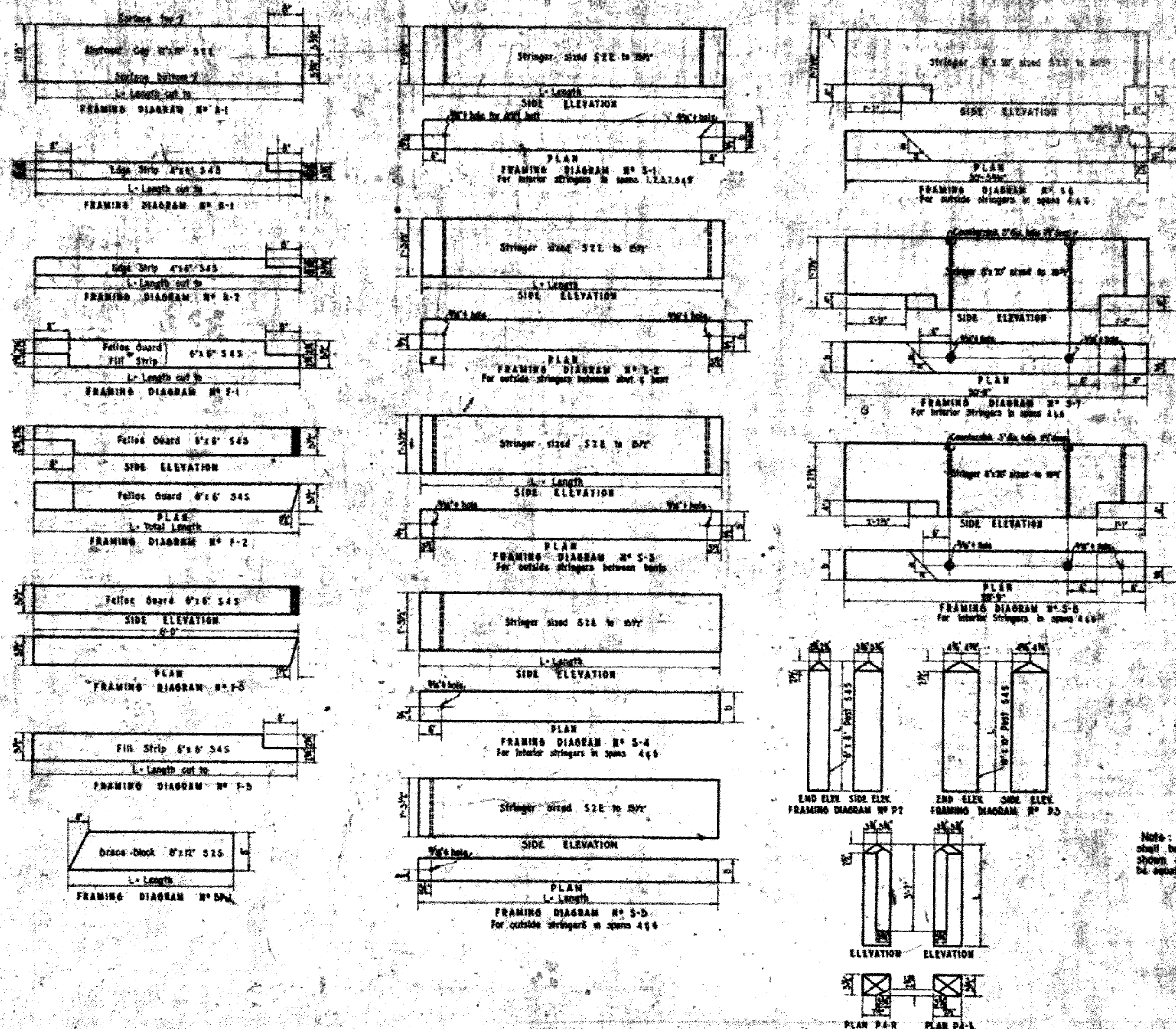
HALF PLAN
HALF SECTION B-B
ELEVATION PIER Nº 2
SECTION A-A
HALF PLAN
HALF SECTION B-B
ELEVATION PIER Nº 1
SECTION A-A
REINFORCING STEEL PIER Nº 2
REINFORCING STEEL PIER Nº 1
GENERAL NOTES
3- All concrete to be Class "A".
QUANTITIES FOR PIER Nº 1
Class "A" Concrete 126.40 Cu.Yds.
Reinforcing Steel 5363 Lbs.
Excavation Per Ft. 17.52 Cu.Yds.
QUANTITIES FOR PIER Nº 2
Class "A" Concrete 163.26 Cu.Yds.
Reinforcing Steel 6000 Lbs.
Excavation Per Ft. 20.37 Cu.Yds.
NEW MEXICO
STATE HIGHWAY DEPARTMENT
DETAILS OF
CONCRETE PIERS
FOR
RAILROAD OVERPASS
PROJECT N.R.H. 4

TIMBER LIST FOR SUPERSTRUCTURE

DESCRIPTION	Nº PIECES	SIZE	SURFACING	NOMINAL LENGTH	LENGTH CUT TO	FEET B.M.	FRAMED PER DIAGRAM Nº
[illegible]	2	4"x6"	S4S	16'	14'-5"	56	E 1
[illegible]	3	4"x6"	S4S	16'	14'-4"	72	E 2
[illegible]	4	4"x6"	S4S	[illegible]	14'-4"	[illegible]	E 1
[illegible]	[illegible]	4"x6"	S4S	[illegible]	14'-5"	[illegible]	E 1
[illegible]	[illegible]	4"x6"	S4S	[illegible]	[illegible]	[illegible]	E 1
[illegible]	[illegible]	4"x6"	S4S	[illegible]	[illegible]	[illegible]	E 1
[illegible]	[illegible]	4"x6"	S4S	[illegible]	[illegible]	[illegible]	E 1
[illegible]	[illegible]	4"x6"	S4S	[illegible]	[illegible]	[illegible]	E 1
[illegible]	[illegible]	4"x6"	S4S	[illegible]	[illegible]	[illegible]	E 1
[illegible]	[illegible]	4"x6"	S4S	[illegible]	[illegible]	[illegible]	E 1
[illegible]	[illegible]	4"x6"	S4S	[illegible]	[illegible]	[illegible]	E 1
[illegible]	[illegible]	4"x6"	S4S	[illegible]	[illegible]	[illegible]	E 1
[illegible]	[illegible]	4"x6"	S4S	[illegible]	[illegible]	[illegible]	E 1
[illegible]	[illegible]	4"x6"	S4S	[illegible]	[illegible]	[illegible]	E 1
[illegible]	[illegible]	4"x6"	S4S	[illegible]	[illegible]	[illegible]	E 1
[illegible]	[illegible]	4"x6"	S4S	[illegible]	[illegible]	[illegible]	E 1
Felloe Guards	[illegible]	6"x6"	S4S	[illegible]	[illegible]	[illegible]	F 1
Felloe Guards	[illegible]	6"x6"	S4S	[illegible]	[illegible]	[illegible]	F 1
Felloe Guards	[illegible]	6"x6"	S4S	[illegible]	[illegible]	[illegible]	F 1
Felloe Guards	[illegible]	6"x6"	S4S	[illegible]	[illegible]	[illegible]	F 1
Felloe Guards	[illegible]	6"x6"	S4S	[illegible]	[illegible]	[illegible]	F 1
Felloe Guards	[illegible]	6"x6"	S4S	[illegible]	[illegible]	[illegible]	F 1
Felloe Guards	[illegible]	6"x6"	S4S	[illegible]	[illegible]	[illegible]	F 1
Felloe Guards	[illegible]	6"x6"	S4S	[illegible]	[illegible]	[illegible]	F 1
Felloe Guards	[illegible]	6"x6"	S4S	16'	[illegible]	[illegible]	F 1
Felloe Guards	[illegible]	6"x6"	S4S	14'	[illegible]	42	F 1
Felloe Guards	[illegible]	6"x6"	S4S	14'	[illegible]	[illegible]	F 1
Felloe Guards	[illegible]	6"x6"	S4S	14'	[illegible]	[illegible]	F 1
Felloe Guards	[illegible]	6"x6"	S4S	14'	[illegible]	32	F 1
Felloe Guards	[illegible]	6"x6"	S4S	16'	[illegible]	48	F 1
Felloe Guards	[illegible]	6"x6"	S4S	[illegible]	[illegible]	42	F 1
Felloe Guards	[illegible]	6"x6"	S4S	16'	[illegible]	48	F 1
Edge Strip Blocks	170 Lin Ft	2"x6"	S4S			85	
Felloe Guard Blocks	[illegible]	4"x6"	S4S	Cut from scraps	1'-0"	170	
Posts	4	[illegible]	S4S	[illegible]	[illegible]	[illegible]	P 3
Posts	1	[illegible]	S4S	[illegible]	[illegible]	48	PA R
Posts	1	[illegible]	S4S	[illegible]	[illegible]	48	PA L
Posts	48	[illegible]	S4S	[illegible]	[illegible]	1152	P 2
Posts	[illegible]	[illegible]	S4S	[illegible]	[illegible]	[illegible]	P 3
Flooring	1608	[illegible]	S1S1E or S4S	24'	[illegible]	25728	
Fill Strips	1	6"x6"	S4S	16'	[illegible]	[illegible]	F 5
Fill Strips	1	6"x6"	S4S	16'	[illegible]	[illegible]	F 5
Fill Strips	4	6"x6"	S4S	14'	[illegible]	[illegible]	F 1
Nailing Strips [illegible]	[illegible]	[illegible]	S4S	16'	[illegible]	[illegible]	
Nailing Strips [illegible]	[illegible]	[illegible]	S4S	[illegible]	[illegible]	[illegible]	
Stringers	4	[illegible]	S2E	[illegible]	[illegible]	[illegible]	S 2
Stringers	[illegible]	[illegible]	S2E	[illegible]	[illegible]	[illegible]	S 5
Stringers	[illegible]	[illegible]	S2E	[illegible]		[illegible]	S 1
Stringers	[illegible]	[illegible]	S2E	[illegible]	[illegible]	160	S 3
Stringers	4	[illegible]	S2E	[illegible]	[illegible]	[illegible]	S 4
Stringers	[illegible]	[illegible]	S2E	[illegible]	[illegible]	[illegible]	S 4
Stringers	[illegible]	[illegible]	S2E	[illegible]	[illegible]	[illegible]	S 4
Stringers	[illegible]	[illegible]	S2E	[illegible]	[illegible]	[illegible]	S 4
Stringers	[illegible]	[illegible]	S2E	[illegible]	[illegible]	[illegible]	S 4
Stringers	[illegible]	[illegible]	S2E	[illegible]	[illegible]	[illegible]	S 4
Stringers	[illegible]	[illegible]	S2E	[illegible]	[illegible]	[illegible]	S 4
Stringers	[illegible]	[illegible]	S2E	[illegible]	[illegible]	[illegible]	S 4
Stringers	[illegible]	[illegible]	S2E	[illegible]	[illegible]	[illegible]	S 8
Stringers	[illegible]	[illegible]	S2E	[illegible]	[illegible]	[illegible]	S 7
Stringers	[illegible]	[illegible]	S2E	[illegible]	[illegible]	[illegible]	S 6
Outside Stringer Splice	[illegible]	[illegible]	S2E	Cut from scraps	[illegible]	[illegible]	
Filler Blocks	4	[illegible]	S2E	[illegible]	[illegible]	[illegible]	
Approach Planks	[illegible]	[illegible]	Rough	[illegible]		144	
Approach Braces	[illegible]	6"x6"	S4S	[illegible]		48	
Approach Braces	[illegible]	6"x6"	S4S	[illegible]		48	
Approach Braces	2	6"x6"	S4S	[illegible]		[illegible]	
Total Superstructure						59356	

TIMBER LIST FOR SUBSTRUCTURE

DESCRIPTION	Nº PIECES	SIZE	SURFACING	NOMINAL LENGTH	LENGTH CUT TO	FEET B.M.	FRAMED PER DIAGRAM Nº
Struts	4	[illegible]	S4S	[illegible]	[illegible]	72	
Cleats	4	[illegible]	S2E	[illegible]	[illegible]	16	
Cleats	4	[illegible]	S4S - S1S1E	[illegible]	[illegible]	[illegible]	
Abutment Caps	[illegible]	[illegible]	S2E	[illegible]	[illegible]	[illegible]	A 1
Shoulder Blocks	4	[illegible]	S2E	[illegible]	5'-0"	240	
Shoulder Blocks	4	[illegible]	S2E	[illegible]	[illegible]	[illegible]	
Brace Blocks	[illegible]	[illegible]	S2E	[illegible]	[illegible]	[illegible]	BP 1
Bulkhead Planks	4	[illegible]	Rough	[illegible]	[illegible]	[illegible]	
Bulkhead Planks	4	[illegible]	Rough	[illegible]		[illegible]	
Bulkhead Planks	4	[illegible]	Rough	[illegible]	17'-0"	144	
Bulkhead Planks	4	[illegible]	Rough	[illegible]		144	
Bulkhead Planks	4	[illegible]	Rough	[illegible]	19'-0"	160	
Bulkhead Planks	4	[illegible]	Rough	[illegible]		160	
Bulkhead Planks	4	[illegible]	Rough	[illegible]	21'-0"	176	
Bulkhead Planks	4	[illegible]	Rough	[illegible]		176	
Bulkhead Planks	4	[illegible]	Rough	[illegible]	[illegible]	[illegible]	
Wing Braces	4	[illegible]	Rough	[illegible]	[illegible]	[illegible]	
Abutment Posts	[illegible]	[illegible]	Rough	[illegible]	[illegible]	[illegible]	
Abutment Posts	[illegible]	[illegible]	Rough	[illegible]	[illegible]	[illegible]	
Bent Caps	[illegible]	[illegible]	S2E	[illegible]		[illegible]	
Bent Sills	[illegible]	[illegible]	S2E	[illegible]		[illegible]	
Bent Posts (Bent Nº 1)	[illegible]	[illegible]	Rough	[illegible]	[illegible]	[illegible]	
Bent Posts (Bent Nº 3)	[illegible]	[illegible]	Rough	[illegible]	[illegible]	[illegible]	
Bent Posts (Bent Nºs 4,5 & 6)	[illegible]	[illegible]	Rough	[illegible]	[illegible]	[illegible]	
Girts	[illegible]	[illegible]	Rough	[illegible]		720	
Sways	[illegible]	[illegible]	Rough	[illegible]		[illegible]	
Sways	[illegible]	[illegible]	Rough	[illegible]		[illegible]	
Sways	[illegible]	[illegible]	Rough	[illegible]		[illegible]	
Longitudinal Sways	[illegible]	[illegible]	Rough	[illegible]		[illegible]	
Longitudinal Sways	[illegible]	[illegible]	Rough	[illegible]		[illegible]	
Longitudinal Girts	[illegible]	[illegible]	Rough	[illegible]		[illegible]	
Bent Posts (Bent Nº 2)	5	[illegible]	Rough	[illegible]	[illegible]	[illegible]	
Total Substructure						28475	



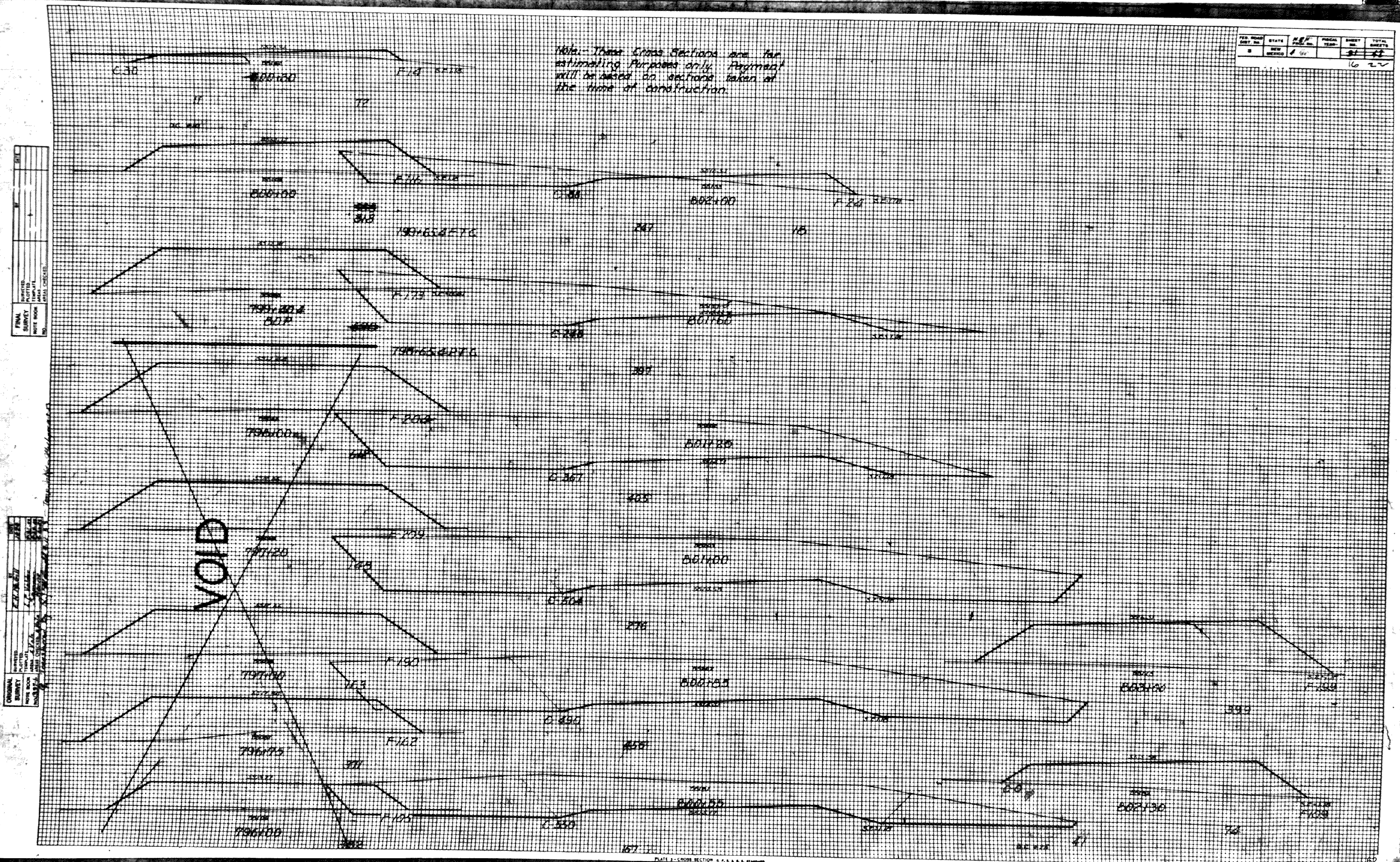
Note: Outside Stringers in spans 1,2,3,7,8 & 9 shall be of uniform width i.e. dimensions b shown on framing diagrams S2, S3 and S6 shall be equal for stringers framed to these diagrams.

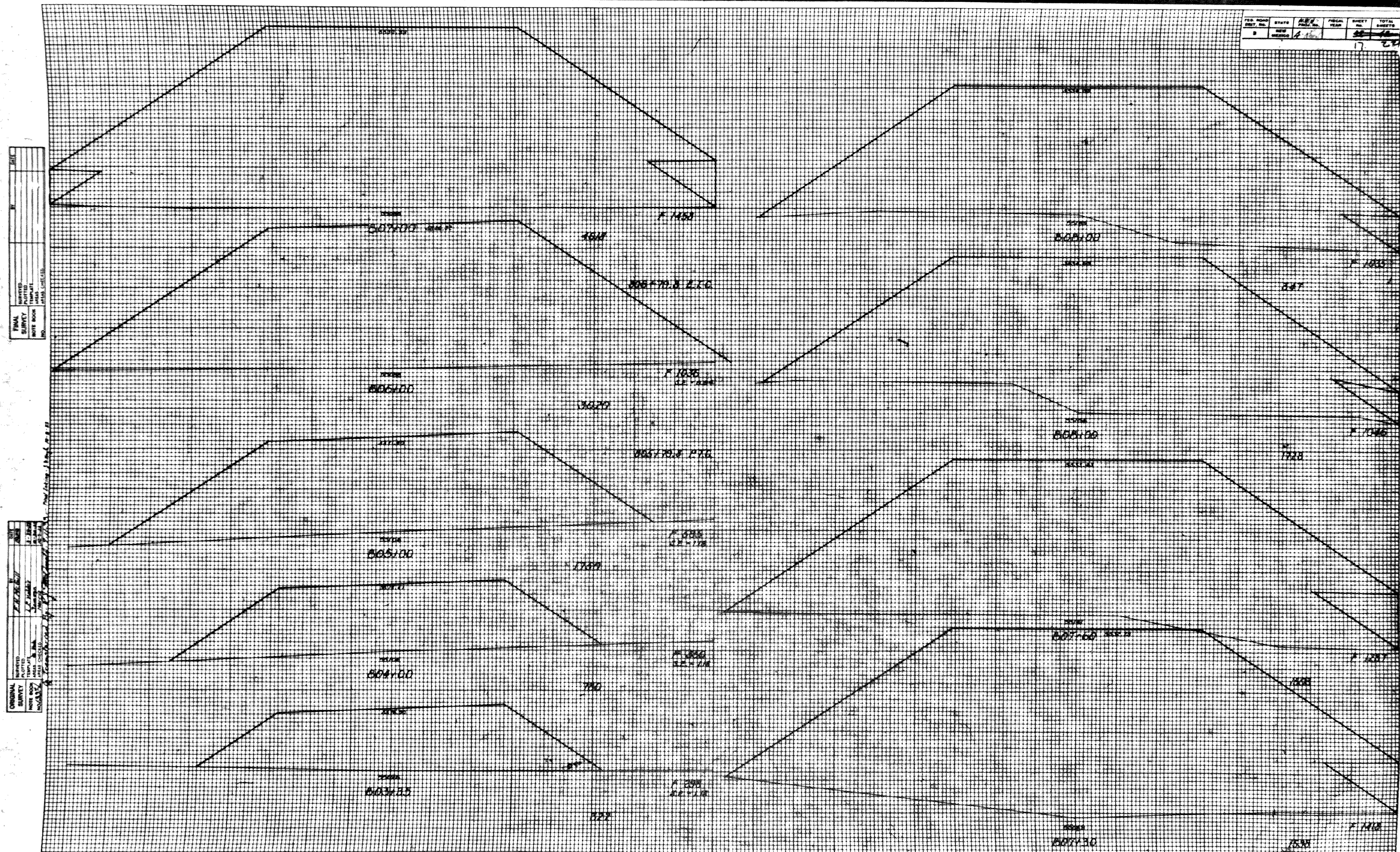
Detailed: P. G. [illegible]
Traced: [illegible]
Chkd. [illegible]

NEW MEXICO
STATE HIGHWAY DEPARTMENT
FRAMING DIAGRAMS
AND
TIMBER LIST
FOR
OVERPASS 45° SKEW LEFT

PROJECT N.R.H.P. 4
STATION 810 + 00.37

SPECIAL


Note.- These Cross Sections are for estimating Purposes only. Payment will be based on sections taken at the time of construction.
NEW MEXICO
C 30
800+80
F 14
800+00
F 16
C 34
802+00
F 24
799+65.4 E.P.T.C.
799+80.4
B.O.P.
F 173
C 248
801+60
798+65.4 P.T.C.
F 204
798+00
801+26
C 367
F 209
797+20
801+00
C 504
F 190
797+00
C 490
F 162
796+75
F 199
F 105
796+00
C 330
800+55
802+30
F 109
VOID
FINAL SURVEY
ORIGINAL SURVEY



F 1458
807+00
4948
808+70.5 E.T.C.
806+00
F 1036
3020
805+70.5 P.T.C.
805+00
1789
804+00
750
803+85
822
F 1035
347
F 1046
1725
807+60
F 1257
1608
807+30
F 1418
1538

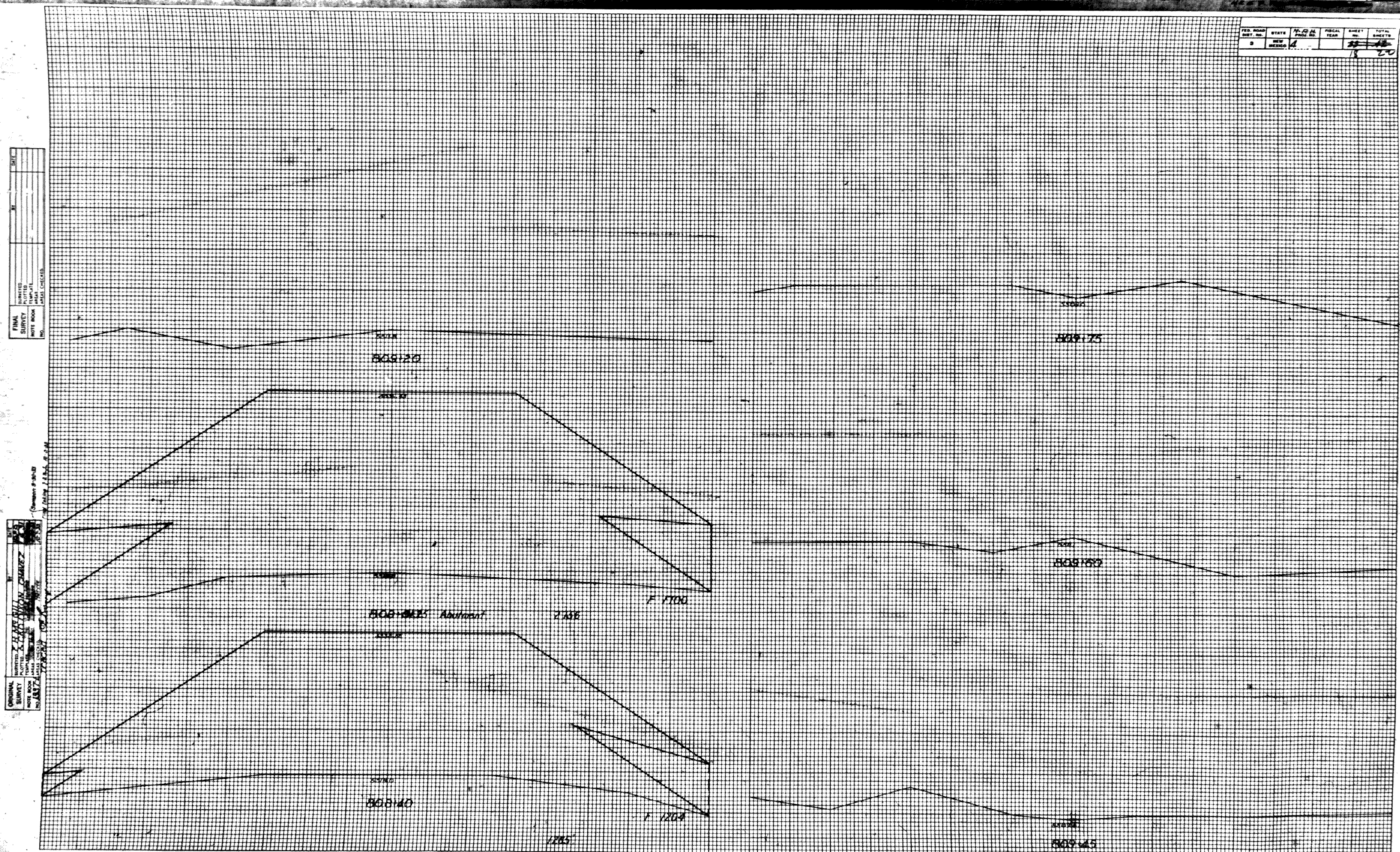
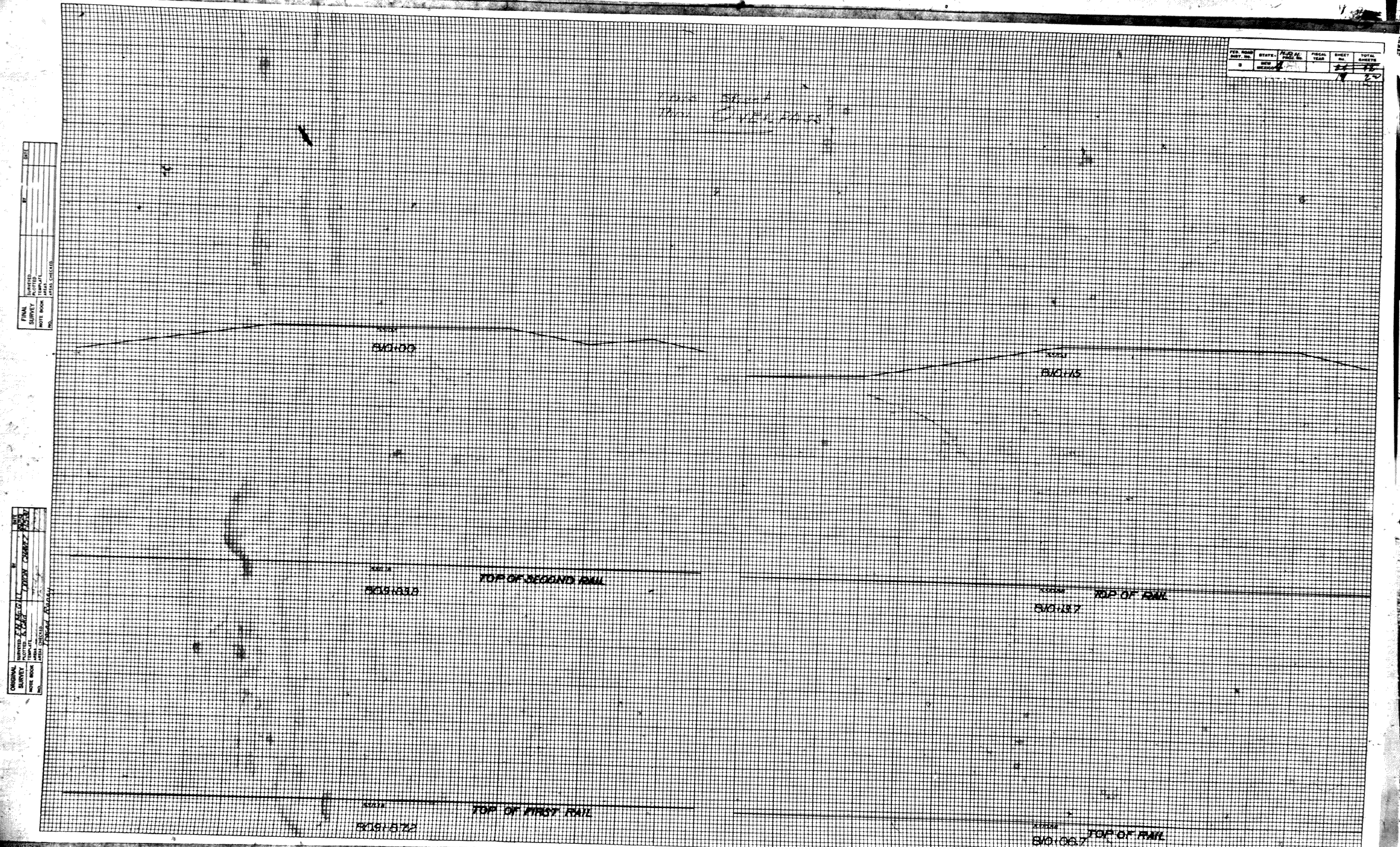
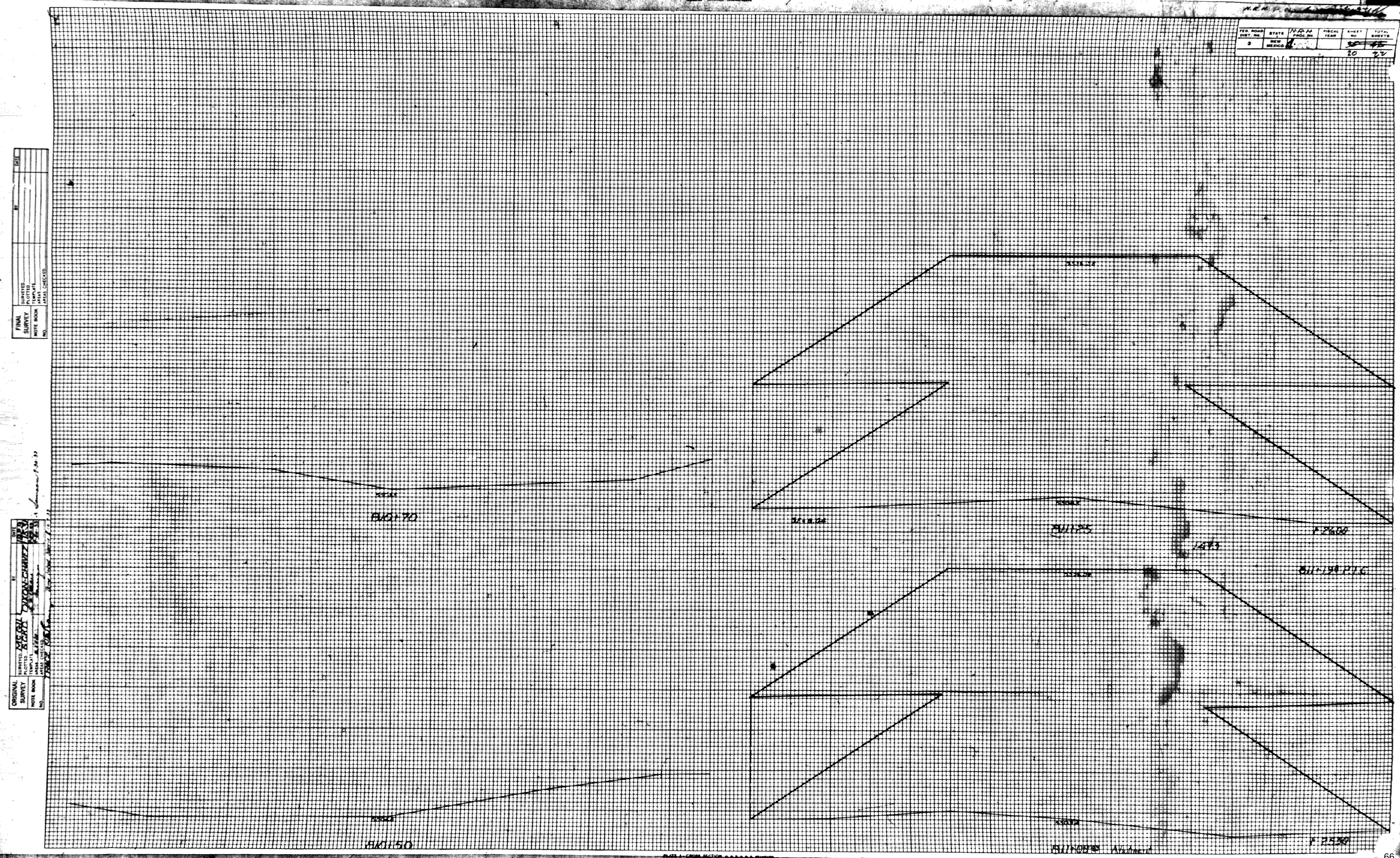
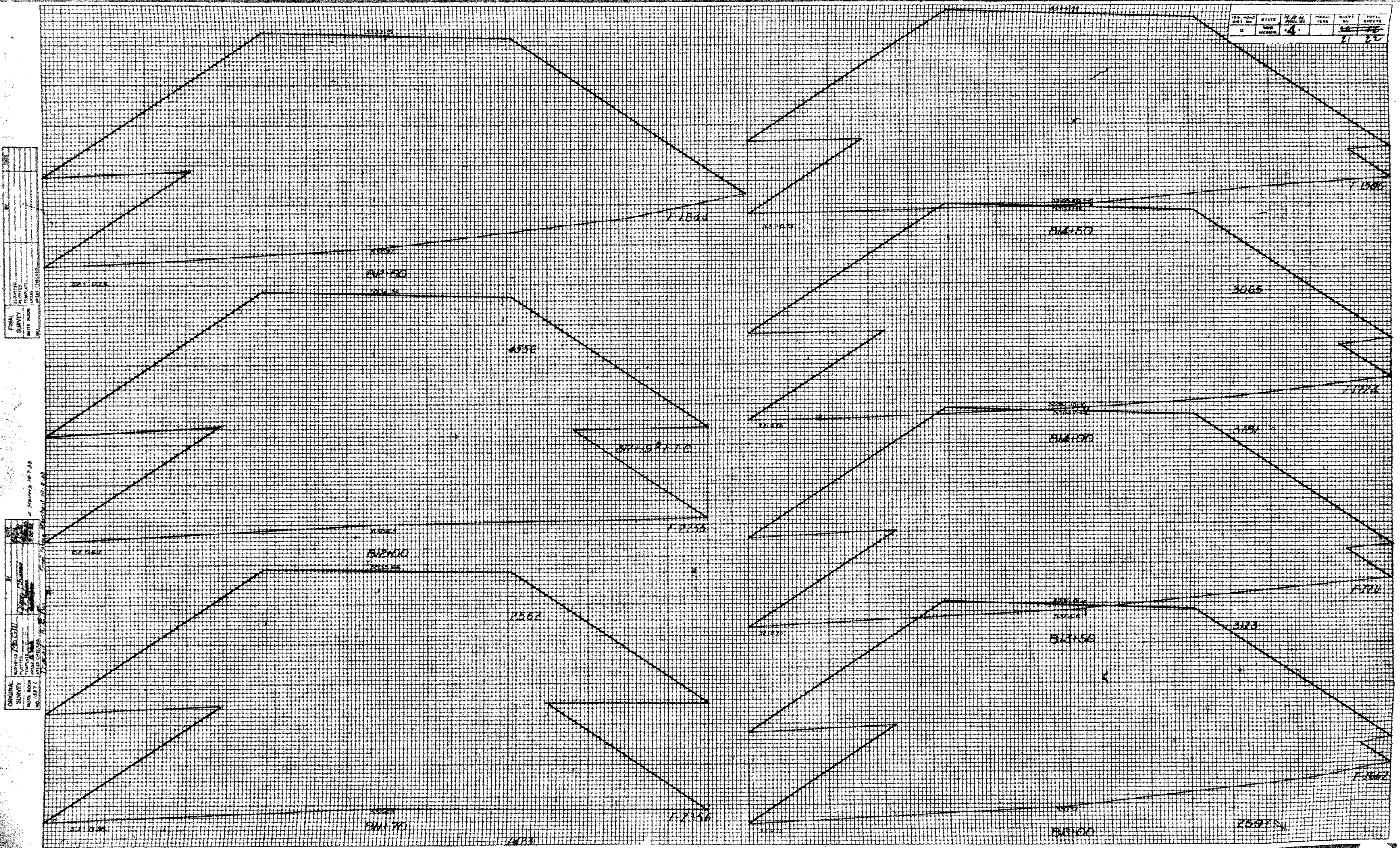


PLATE 3 – CROSS SECTION


FED. ROAD DIST. NO.
STATE
FISCAL YEAR
SHEET NO.
TOTAL SHEETS
3
NEW MEXICO
810+00
810+15
TOP OF SECOND RAIL
TOP OF FIRST RAIL
TOP OF RAIL
810+13.7
810+06.7
ORIGINAL SURVEY
NOTE BOOK
NO.
SURVEYED
PLOTTED
TEMPLATE
AREAS
AREAS CHECKED
FINAL SURVEY



FED. ROAD DIST. NO.
STATE
N.R.M. PROJ. NO.
FISCAL YEAR
SHEET NO.
TOTAL SHEETS
3
NEW MEXICO
20
22
811+70
811+25
F 2600
1473
811+19.8 P.T.C.
811+50
811+08 Abutment
F 2530
ORIGINAL SURVEY
NOTE BOOK
NO.
SURVEYED
PLOTTED
TEMPLATE
AREAS
AREAS CHECKED
DIXON-CHAVEZ



F 1844
812+50
4556
812+19 ± E.T.C.
F 2256
812+00
2562
F 2356
811+70
F 1886
814+50
3065
F 1774
814+00
3181
F 1711
813+50
3123
F 1662
813+00
2597

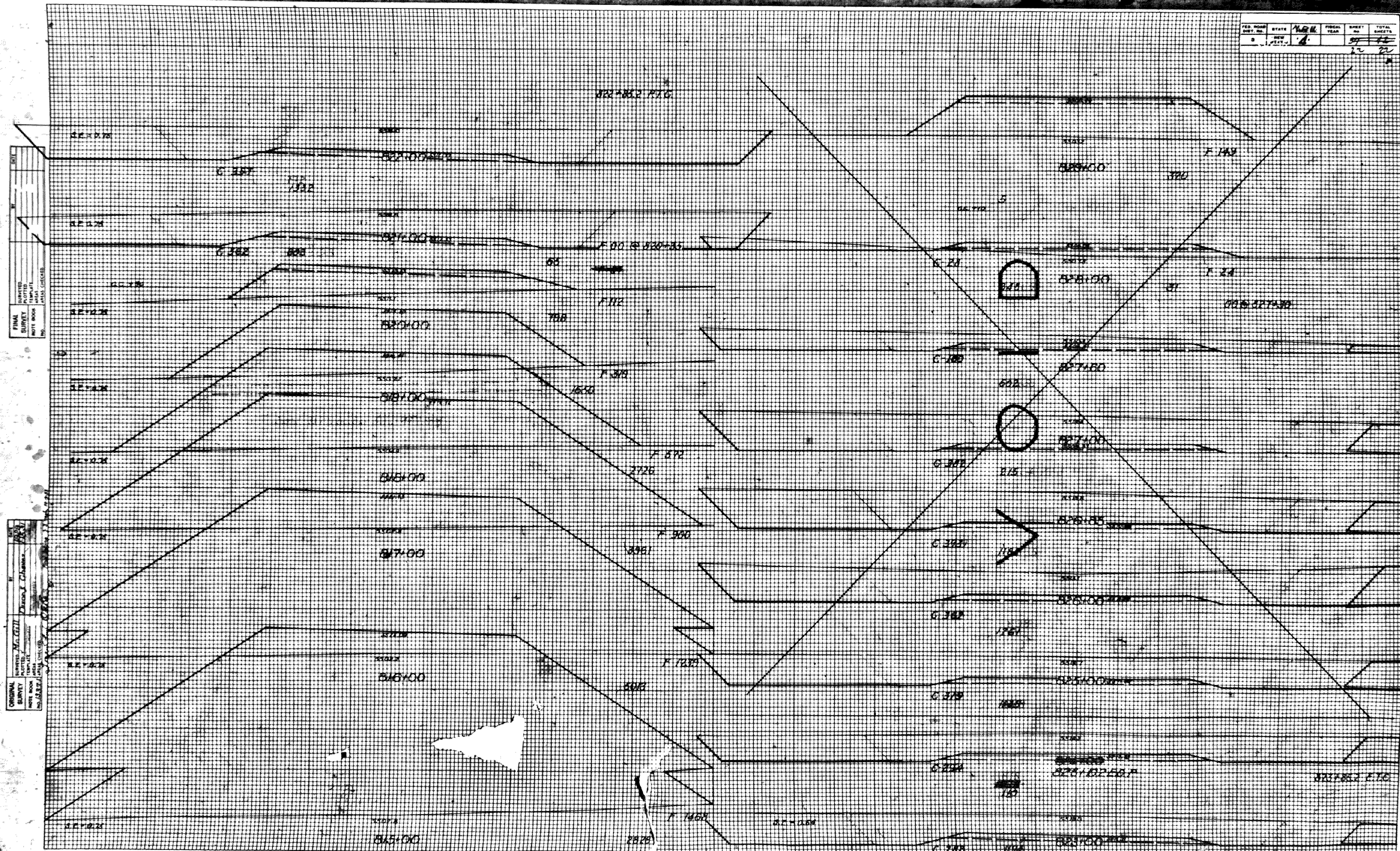


PLATE 3 – CROSS SECTION

KEUFFEL & ESSER CO. NEW YORK

F.H.W.A. REGION NO.	STATE		SHEET NO.	TOTAL SHEETS
6	NEW MEXICO	SP-BO-7506(210)	4-1	

CN-2350

GENERAL NOTES

1. WORKMANSHIP AND MATERIALS SHALL CONFORM TO NEW MEXICO STATE HIGHWAY DEPARTMENT STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION, 1984 EDITION, SUPPLEMENTAL SPECIFICATIONS AND SPECIAL PROVISIONS.

2. BEFORE PROCEEDING WITH THE WORK, THE CONTRACTOR ~~SHALL~~ DID VERIFY, IN THE FIELD, ALL EXISTING STRUCTURE DETAILS, DIMENSIONS AND ELEVATIONS PERTAINING TO THE EXISTING STRUCTURE WHICH ~~WILL BE~~ WAS INVOLVED IN THE NEW CONSTRUCTION.

3. PRINTS OF PLANS SHOWING EXISTING CONSTRUCTION ~~WILL BE~~ WAS AVAILABLE TO CONTRACTOR UPON REQUEST.

4. THE SCOPE OF WORK ON BRIDGE NUMBER 0002 UNDER THIS CONTRACT ~~SHALL BE~~ WERE AS FOLLOWS:
   - A: REMOVE AND REPLACE ALL EXISTING TIMBER SUPERSTRUCTURE MEMBERS.
   - B: REPLACE DAMAGED OR MISSING SUBSTRUCTURE MEMBERS WITH NEW ONES.
   - C: APPLY A FIELD TREATMENT TO THE SUBSTRUCTURE MEMBERS AS SHOWN ON THE CONTRACT PLANS AND/OR AS REQUIRED BY THE PROJECT MANAGER.
   - D: REPAIR CONCRETE PIERS BY REMOVAL AND REPLACEMENT OF UNSOUND CONCRETE WITH NEW MATERIAL, OR BY EPOXY INJECTION. BOTH
   - E: REMOVE AND REPLACE EXISTING DAMAGED, SUBSTANDARD AND INCOMPLETE BRIDGE RAILING WITH NEW METAL BRIDGE RAILING WITH CHAIN LINK.
   - F: FILL IN ERODED AREAS IN END SLOPES.
   - G: APPLY SPECIAL SURFACE FINISH TO EXISTING CONCRETE AS SPECIFIED BELOW.
   - H: RECOAT ALL STEEL SUPERSTRUCTURE COMPONENTS IN SPAN 5.
   - I: PLACEMENT OF AN ASPHALT OVERLAY OVER THE ENTIRE DECK AREA.

5. THE COST OF ALL REMOVALS SPECIFIED ON THESE PLANS ~~IS TO BE~~ WERE INCLUDED IN THE UNIT PRICE BID FOR "REMOVAL OF STRUCTURES AND OBSTRUCTIONS". THE REPLACED ITEMS ~~SHALL BE~~ WERE SALVAGED AND STOCKPILED AT A SITE DESIGNATED BY THE PROJECT MANAGER.

6. FASTENERS. BOLTS, NUTS AND WASHERS ~~SHALL~~ DID COMPLY WITH ASTM A 307 OR BETTER. EXCEPT AS NOTED, ALL METAL FASTENERS ~~SHALL~~ DID CONFORM TO THE SPECIAL PROVISIONS FOR SECTION 550 - TREATED TIMBER AND TO THE "DIMENSIONS AND SPECIFICATIONS FOR CONNECTORS" SHOWN IN AITC TIMBER CONSTRUCTION MANUAL.

7. STRUCTURAL STEEL ~~SHALL BE~~ IS CARBON STEEL CONFORMING TO AASHTO SPECIFICATION M-183 (ASTM A 36) EXCEPT AS NOTED. SHOP PLANS ~~MUST BE~~ WERE APPROVED BY THE ENGINEER BEFORE FABRICATION IS STARTED.

8. EXPANSION JOINT FILLERS. ALL PREFORMED BITUMINOUS JOINT FILLERS ~~SHALL~~ CONFORMED TO A.A.S.H.T.O. SPECIFICATION M 213. COST OF ALL JOINT FILLER IN PLACE IS INCIDENTAL TO THE COMPLETION OF THE WORK AND NO DIRECT PAYMENT ~~WILL BE~~ WAS MADE THEREFOR.

9. BRIDGE NUMBER PLATES. THE CONTRACTOR ~~SHALL BE REQUIRED TO~~ DID FURNISH AND PLACE TWO 6"x4"x3/8" BRIDGE NUMBER PLATES CONFORMING TO THE DESIGN SHOWN. THE COST OF SUCH PLATES IN PLACE IS INCIDENTAL TO THE COMPLETION OF THE WORK AND NO DIRECT PAYMENT ~~WILL BE~~ WAS MADE THEREFOR.

10. THEORETICAL TOP OF DECK ELEVATIONS, AT ANY LOCATIONS REQUIRED, ~~MAY BE~~ WAS OBTAINED FROM THE BRIDGE SECTION UPON REQUEST.

11. A PENETRATING WATER REPELLENT TREATMENT ~~IS TO BE~~ WAS APPLIED TO THE FOLLOWING CONCRETE SURFACES:
    A) TOP AND VERTICAL SURFACES OF CONCRETE PIERS.

THE PENETRATING WATER REPELLENT TREATMENT ~~SHALL~~ DOES EXTEND ~~TWO~~ ONE FOOT BELOW GRADE, ~~WHERE APPLICABLE~~. AS PER PROJECT MANAGER.

12. PAINT. ALL NEW STRUCTURAL STEEL ITEMS, ~~SHALL BE~~ ARE PAINTED IN CONFORMANCE WITH THE REQUIREMENTS OF THE SPECIAL PROVISIONS FOR PROTECTIVE COATING OF NEW RAILING AND MISCELLANEOUS STRUCTURAL STEEL, TYPE 2 - SECTION 615-B. EXISTING STRUCTURAL STEEL MEMBERS, ~~SHALL BE~~ ARE PAINTED IN CONFORMANCE WITH THE REQUIREMENTS OF THE SPECIAL PROVISIONS MODIFYING SECTION 615-C - RECOATING BRIDGES. THE ENTIRE SURFACE AREA OF THE EXISTING STEEL MEMBERS ~~SHALL BE~~ WERE CLEANED TO SSPC-SP-6 REQUIREMENTS.

13. THE COLOR OF THE TOP COAT FOR THE STRUCTURAL STEEL ~~SHALL~~ DOES MATCH THE DUPONT CHART COLOR NO. 33-C "CENTERVILLE". A 1' X 1' COLOR SAMPLE SHALL BE PREPARED BY THE CONTRACTOR AND SUBMITTED TO THE PROJECT MANAGER FOR APPROVAL BY THE LANDSCAPE ARCHITECT PRIOR TO APPLICATION OF THE COATINGS. THIS PANEL SHALL BE USED AS A CONTROL TO MATCH THE STRUCTURAL STEEL COLORS.

14. BRIDGE SEATS. AFTER COMPLETION OF THE BRIDGE AND THE APPROACH ROADWAYS, TOP SURFACES OF ALL BRIDGE SEATS ~~SHALL BE~~ WERE THOROUGHLY CLEANED OF ALL DIRT, AND OTHER DEPOSITED MATERIALS.

15. CARE ~~SHALL BE~~ WAS TAKEN DURING ALL REPAIR AND REMOVAL OPERATIONS TO PREVENT DAMAGE TO STRUCTURAL COMPONENTS BEING RETAINED. ANY DAMAGE TO REMAINING STRUCTURAL COMPONENTS CAUSED BY THE CONTRACTOR'S OPERATIONS ~~SHALL BE~~ WAS SATISFACTORILY REPAIRED OR THE MEMBER REPLACED AS DIRECTED BY THE PROJECT MANAGER AT NO COST TO THE STATE.

16. SPECIAL SURFACE FINISH FOR CONCRETE SURFACES. THE VERTICAL SURFACES AND TOPS OF CONCRETE PIERS ~~SHALL~~ RECEIVED A SPECIAL SURFACE FINISH IN ACCORDANCE WITH THE REQUIREMENTS OF SECTION 509.037 (e) AND SPECIAL PROVISION FOR SPECIAL SURFACE FINISH ON EXISTING CONCRETE - ITEM NO. 509904, DATED APRIL 3, 1985. THE FINISH ~~SHALL BE BY~~ THOROSEAL ~~OR AN APPROVED EQUAL~~. THE FINISH ~~SHALL~~ EXTENDED ~~TWO~~ ONE FOOT BELOW GRADE, WHERE APPLICABLE.

THE COLORS ~~SHALL BE~~ ARE CEMENT GRAY.

WHERE BOTH THE "SPECIAL SURFACE FINISH FOR CONCRETE SURFACES" AND THE "PENETRATING WATER REPELLENT TREATMENT" ARE APPLIED TO A SURFACE, THE PENETRATING WATER REPELLENT TREATMENT ~~SHALL BE~~ WAS APPLIED FIRST AND SPECIAL SURFACE FINISH FOR CONCRETE SURFACES SECOND.

17. TIMBER ~~SHALL BE~~ WAS ~~SOUTHERN PINE, SELECTED STRUCTURAL OR~~ DOUGLAS FIR-LARCH, SELECTED STRUCTURAL.

⚠ 12A. ~~IF~~ THE CONTRACTOR ~~CHOOSES~~ CHOSE TO REMOVE STEEL SUPERSTRUCTURES (INCLUDING BLAST PLATES) TO PERFORM SURFACE PREPARATION PRIOR TO RECOATING EXISTING STEEL MEMBERS, THE CONTRACTOR ~~SHALL~~ DID SUBMIT PLANS IN WRITING AS SPECIFIED IN GENERAL NOTE 18 ON THIS SHEET. THE COST OF REMOVAL, REINSTALLATION, AND HARDWARE THAT MAY BE NECESSARY TO REINSTALL STEEL SUPERSTRUCTURES SHALL BE CONSIDERED INCIDENTAL TO REMOVAL OF STRUCTURES AND OBSTRUCTIONS AND NO DIRECT PAYMENT WILL BE MADE THEREFOR.

18. PRIOR TO REMOVAL AND REINSTALLATION OF THE SUPERSTRUCTURES, THE CONTRACTOR ~~SHALL~~ PLACED A SUITABLE TEMPORARY PROTECTIVE SCREENING BETWEEN THE WORK AREA AND THE TRACKS BELOW TO MINIMIZE THE POSSIBILITY OF DAMAGE TO THE RAILROAD TRAFFIC FROM FALLING MATERIALS. THE TEMPORARY PROTECTIVE SCREENING ~~MAY BE~~ WAS A FALSE DECK OVER THE RAILROAD UNDERNEATH THE EXISTING TIMBER DECK. THE FALSE DECK (PROTECTIVE SCREENING) ~~SHALL~~ PREVENTED DEBRIS FROM THE DECK REMOVAL FROM FALLING ON THE TRACK, ~~SHALL~~ DID NOT RESTRICT EXISTING VERTICAL CLEARANCE, AND ~~SHALL~~ EXTENDED AT LEAST 2 FEET OUTSIDE OF EACH EDGE OF THE EXISTING DECK. THE FALSE DECK ~~SHALL~~ REMAINED IN PLACE DURING ALL TIMBER DECK REMOVAL OPERATIONS. THE CONTRACTOR ~~SHALL~~ SUBMITTED DETAILS OF THE PROPOSED TEMPORARY SCREENING TO THE NMSH&TD BRIDGE ENGINEER AND THE NMSH&TD RAILROAD AND UTILITIES SECTION FOR APPROVAL. THE CONTRACTOR ~~SHALL~~ ALSO SUBMITTED THE DETAILS TO THE AT&SF RAILROAD FOR THEIR APPROVAL. NO REMOVAL OPERATIONS (IN THE VICINITY OF THE RAILROAD TRACKS) ~~SHALL~~ BEGAN UNTIL DETAILS FOR THE TEMPORARY SCREENING HAVE BEEN APPROVED BY THE BRIDGE ENGINEER, THE RAILROAD AND UTILITIES SECTION AND THE AT&SF RAILWAY COMPANY. THE DETAILS ~~SHALL BE~~ WERE SUBMITTED AS SOON AS POSSIBLE TO AVOID POSSIBLE CONSTRUCTION DELAYS IN SECURING RAILROAD APPROVAL. PAYMENT FOR THIS PROTECTION ~~SHALL BE~~ WAS INCIDENTAL TO THE "REMOVAL OF STRUCTURES AND OBSTRUCTIONS" AND NO DIRECT PAYMENT ~~SHALL BE~~ MADE THEREFOR. THE CONTRACTOR IS TO CONTACT MR. LARRY DELANEY, AT&SF RAILWAY AT (505) 857-5045 AND (505) 857-5026, FIVE (5) WORKING DAYS PRIOR TO WORKING WITHIN THE RAILROAD RIGHT-OF-WAY.

19. TIMBER CONSTRUCTION ~~SHALL~~ CONFORMED TO THE DETAILS SHOWN ON SERIAL BT-24 EXCEPT AS MODIFIED ON SHEETS 4-1 THRU 4-11.

STEEL MEMBER SURFACE CLEANING REQUIREMENTS:

A. THE ENTIRE SURFACE AREA OF THE EXISTING STEEL SUPERSTRUCTURE MEMBERS ~~SHALL BE~~ WERE CLEANED TO SSPC-SP-6 REQUIREMENTS. THE COST OF CLEANING AND PRIME COATING OF THESE SURFACES ~~SHALL BE~~ WAS INCLUDED IN THE LUMP SUM PRICE BID FOR RECOATING BRIDGES.

B. THE SPECIAL PROVISIONS FOR PAINTING OPERATIONS SAFETY AND ENVIRONMENTAL REQUIREMENTS SECTION 615-D ~~SHALL~~ DID APPLY TO SURFACE CLEANING OPERATIONS.

C. DEBRIS CONTAINMENT ~~SHALL BE~~ WAS ACCOMPLISHED USING VACUUM BLASTING IN CONJUNCTION WITH A CLASS 4 CONTAINMENT AND VENTILATION SYSTEM AS DESCRIBED IN SSPC GUIDE 61. SYSTEM COMPONENTS ~~SHALL BE~~ WERE AS DESCRIBED BELOW:

CONTAINMENT SYSTEM

MATERIAL	A2,	FLEXIBLE
PERMEABILITY	B1,	IMPERMEABLE
SUPPORT STRUCTURE	C2,	FLEXIBLE
JOINTS	D2,	PARTIAL SEAL
ENTRYWAY	E3,	OPEN SEAM
AIR MAKE UP	F1,	CONTROLLED

VENTILATION SYSTEM

INPUT AIR FLOW	G1,	FORCED
AIR PRESSURE	B3,	NOT REQUIRED
AIR MOVEMENT	I2,	NOT SPECIFIED
EXHAUST DUST FILTRATION	J1,	AIR FILTRATION

THE CONTAINMENT STRUCTURES ~~SHALL~~ DID NOT INFRINGE UPON EXISTING VERTICAL CLEARANCES OVER THE RAILROAD. THE CONTAINMENT SYSTEM SPECIFIED NEED NOT BE PROVIDED IF THE CONTRACTOR UTILIZES VACUUM BLAST CLEANING EQUIPMENT FOR WHICH AT LEAST 95% RECOVERY OF ABRASIVES AND REMOVED PAINT CAN BE CONCLUSIVELY DEMONSTRATED.

SPECIAL PROVISIONS

1. SPECIAL PROVISIONS MODIFYING SECTION 106 - CONTROL OF MATERIALS, DATED JULY 20, 1992.
2. SPECIAL PROVISIONS MODIFYING SECTION 507 - STEEL STRUCTURES, DATED AUGUST 8, 1991.
3. SPECIAL PROVISIONS FOR SPECIAL SURFACE FINISH ON EXISTING CONCRETE ITEM NO. 509904, DATED APRIL 3, 1985.
4. SPECIAL PROVISIONS FOR PENETRATING WATER REPELLENT TREATMENT OF CONCRETE SURFACES - ITEM 516530, DATED JULY 10, 1992.
5. SPECIAL PROVISIONS FOR PIER AND ABUTMENT REPAIRS - ITEM 516545, DATED NOVEMBER 13, 1986.
6. SPECIAL PROVISION FOR EPOXY INJECTION - ITEM 516548, DATED NOVEMBER 13, 1986.
7. SPECIAL PROVISIONS MODIFYING SECTION 550 - TREATED TIMBER, DATED JUNE 14, 1993.
8. SPECIAL PROVISIONS MODIFYING SECTION 607 - FENCE, DATED JUNE 15, 1993.
9. SPECIAL PROVISIONS FOR PROTECTIVE COATING OF NEW RAILING AND MISCELLANEOUS STRUCTURAL STEEL, TYPE 2 - SECTION 615-B, DATED FEBRUARY 24, 1993.
10. SPECIAL PROVISIONS MODIFYING SECTION 615-C - RECOATING BRIDGES, DATED DECEMBER 2, 1993.
11. SPECIAL PROVISIONS FOR PAINTING OPERATIONS SAFETY AND ENVIRONMENTAL REQUIREMENTS - SECTION 615-D, DATED ~~JANUARY 7, 1994.~~ 1/14/94
12. SPECIAL PROVISIONS FOR FILTER FABRIC - SECTION 504-A, DATED MAY 4, 1993.

SUPPLEMENTAL SPECIFICATIONS

1. SUPPLEMENTAL SPECIFICATIONS REPLACING SECTION 106 - CONTROL OF MATERIALS, DATED DECEMBER 15, 1991.

DRAWINGS REQUIRED

SHEET No:	TITLE
4 - 1	GENERAL NOTES
4 - 2	ESTIMATED QUANTITIES AND HARDWARE SCHEDULE
4 - 3	STRUCTURE LOCATION - PLAN AND PROFILE
4 - 4	SUPERSTRUCTURE - TRANSVERSE SECTIONS AND DECK DETAILS
4 - 5	SUPERSTRUCTURE - SPAN 1-4 AND 6-9; TIMBER SPANS
4 - 6	SUPERSTRUCTURE - SPAN 5; STEEL GIRDERS
4 - 7	SUPERSTRUCTURE - RAILING DETAILS
4 - 8	SUBSTRUCTURE - ABUTMENT AND BENT DETAILS
4 - 9	TIMBER QUANTITIES AND DETAILS
4 - 10	MISCELLANEOUS STRUCTURAL DETAILS
4 - 11	METAL BARRIER TERMINAL CONNECTOR DETAILS
4 - 12	SERIAL BT-24 - SHEET NO. 1; SUPERSTRUCTURE DETAILS
4 - 13	SERIAL BT-24 - SHEET NO. 2; SUBSTRUCTURE DETAILS

STANDARD SERIALS REQUIRED

	TITLE	SERIAL NO:
1.	EXCAVATION AND BACKFILL FOR BRIDGES, WALLS AND CBC'S	BEB - 001 - 04
2.	METAL RAILING	BMR - 001 - 005
3.	TREATED TIMBER BRIDGES	BT - 24 SHEET 1 - 2 (*)

(*) WITH MODIFICATIONS SHOWN IN THIS PROJECT i.e. TREATMENT, RAILINGS, PAINT & ENVIRONMENTAL REQUIREMENTS, ETC.

INCIDENTAL ITEMS

1. STRUCTURAL BACKFILL MATERIAL
2. BRIDGE NUMBER PLATES
3. INSTALL TEMPORARY PROTECTIVE SCREENING
4. FIELD TREATMENT OF THE EXISTING TIMBER SUBSTRUCTURE MEMBERS AS REQUIRED
5. FILTER FABRIC
6. ALL HARDWARE IN DIRECT CONTACT WITH WOOD, INCLUDING NUTS.
7. REFLECTIVE SHEETING.

THE RODS AND BOLTS, INCLUDING NUTS AND WASHERS, PASSING THRU THE RAIL POSTS TO THE SUPERSTRUCTURES IS NOT INCIDENTAL. THIS

HARDWARE IS INCLUDED IN THE ITEM 507025 STRUCTURAL STEEL FOR MISCELLANEOUS STRUCTURES AASHTO M 183.

~~NOTE: ITEMS LISTED ABOVE ARE ONLY A GENERAL DESCRIPTION OF THE~~ REQUIRED WORK AND MATERIALS AND MAY NOT BE COMPLETE. PARAGRAPH 104.01 OF THE NEW MEXICO STATE HIGHWAY AND TRANSPORTATION DEPARTMENT STANDARD SPECIFICATIONS APPLIES.

INCIDENTAL WORK OR MATERIALS REQUIRED BY SPECIAL PROVISIONS, SERIALS (STANDARD DETAILS), SUPPLEMENTAL SPECIFICATIONS OR STANDARD SPECIFICATIONS ARE NOT INCLUDED.

DESIGN DATA

DESIGN IS IN ACCORDANCE WITH A.A.S.H.T.O. SPECIFICATIONS, 1989 EDITION, AND INTERIM SPECIFICATIONS TO DATE.

DESIGN STRESSES:
- STRUCTURAL STEEL: A.A.S.H.T.O. M-183, $f_s = 20{,}000$ psi
- REINFORCED CONCRETE: $f_c' = 3{,}000$ psi at 28 days
  - $f_c = 1{,}200$ psi;
  - $f_y = 60{,}000$ psi, $f_s = 24{,}000$ psi,
  - $n = 9$
- TIMBER: SOUTHERN PINE, SELECTED STRUCTURAL OR DOUGLAS FIR-LARCH, SELECT STRUCTURAL. $F_b \geq 1{,}600$ PSI.

LIVE LOAD: H - 15

WEARING SURFACE: THERE IS NO (0 PSF) ALLOWANCE FOR FUTURE WEARING SURFACE WITHOUT REDUCING A LOAD CAPACITY. *)

HORIZONTAL EARTH PRESSURE: 36 PCF EQUIVALENT FLUID PRESSURE AND 2 FT SURCHARGE

WIND VELOCITY: 80 MPH

DESIGN SPEED: 35 MPH

CAPACITY RATINGS:

INVENTORY RATING: H 15, or HS 11.7 *)
OPERATING RATING: H 21, or HS 19.5 *)

*) If a roadway will be overlaid in the future, the capacity ratings shall be re-evaluated.

NO.	DESCRIPTION	DATE	BY
6			
5			
4			
3			
2			
1	Added Note 12A	[illegible]	J.K.

REVISIONS (OR CHANGE NOTICES)

NEW MEXICO
STATE HIGHWAY DEPARTMENT

OLD U.S. 66 OVER THE AT&SF RAILROAD NEAR SUWANEE

BR. NO. 0002

GENERAL NOTES

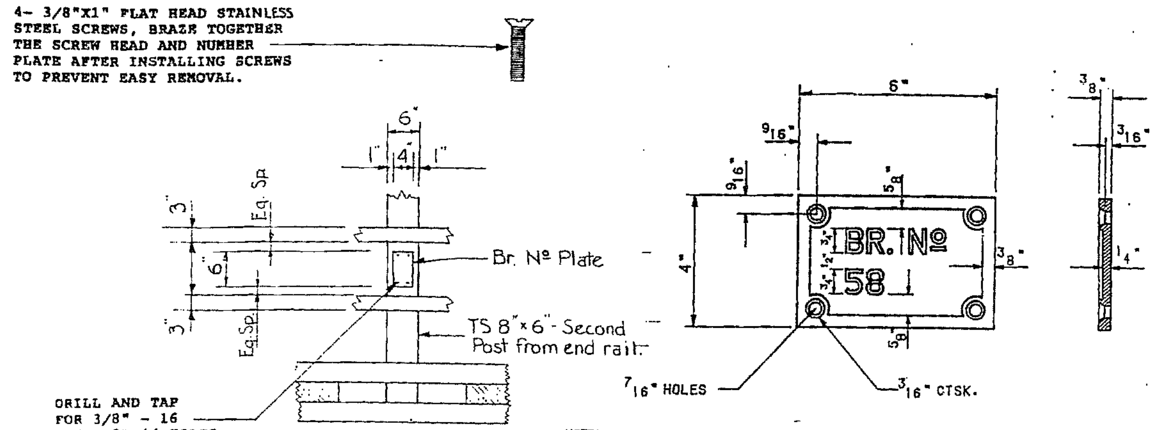
STA. 12+91.50

Approved: [signature] 1/31/94
Bridge Engineer

Designed by: ___ Checked by: ___
Detailed by: ___ Checked by: ___

F.H.W.A. REGION NO.	STATE		SHEET NO.	TOTAL SHEETS
6	NEW MEXICO	SP-BO-7506(210)	4-2	

CN-2950



NOTES:

1. TWO PLATES WITH ATTACHING SCREWS REQUIRED FOR EACH BRIDGE. PLATES ~~SHALL BE~~ WERE CAST-IRON AND HOT-DIP GALVANIZED AND THE LETTERS ~~SHALL BE~~ ARE RAISED BLOCK TYPE OF A NEAT SQUARE CUT DESIGN. THE RAISED FACE OF LETTERS AND PLATE BORDER ~~WILL BE~~ WAS GROUND TO A SMOOTH FINISH.
2. ONE NUMBER PLATE ~~SHALL BE~~ WAS PLACED ON THE ROADWAY FACE OF THE SECOND RAIL POST FROM EACH RAILING END, AND ON THE RIGHT-HAND SIDE, AS ONE APPROACHES THE BRIDGE.
3. BRONZE PLATES AND ACCOMODATING SCREWS ~~MAY BE~~ WERE SUBSTITUTED FOR GALVANIZED CAST IRON.

BRIDGE NUMBER PLATE DETAILS

HARDWARE SCHEDULE

	Item description	Diameter	Length	Quantity	Weight per each pounds	Total Weight pounds
⚠1	Tie Rod "A" (rail post to rail post) w/ 4 hex nuts & 2 washers	1.25" x	26'-0"	~~33~~ 34	~~114~~ 113.5	~~3746~~ 3859
	Tie Rod "B" (rail post to stringers @ spans 1, 3, 7 & 9) w/ 2 hex nuts, 1 cut washer and 1 standard washer	0.75" x	3'-6 1/4"	40	5.9	236
⚠1	Tie Rod "C" (rail post to stringer @ spans 2, 4, 6 & 8) w/ 2 hex nuts, 1 cut washer, 1 standard washer	0.75" x	2'-10 3/4"	~~36~~ 40	5.0	~~180~~ 200
⚠1	Bolts (rail post to felloe guard) w/ 1 hex nut, 1 cut washer, 1 standard washer	0.75" x	14 1/2"	~~33~~ 72	2.0	~~66~~ 144
⚠1	*) Bolts (vertical bolt thru felloe guard at steel stringer) w/ 1 hex nut, 1 cut washer, 1 standard washer	0.625" x	25"	~~32~~ 34	2.2	~~70~~ 75
⚠1	*) Bolts (vertical bolt thru felloe guard at 20" wood stringer) w/ 1 hex nut, 2 standard washers	0.75" x	39"	~~10~~ 12	5.0	~~50~~ 60
⚠1	*) Bolts (vertical bolt thru felloe guard at 16" wood stringer) w/ 1 hex nut, 2 standard washers	0.75" x	35"	~~42~~ 46	4.5	~~189~~ 207
	Bolts (thru rail post at stringer splices) w/ hex nut, 1 cut washer, 1 standard washers	0.625" x	20"	24	2	43
	*) Bolts (thru stringer at stringer splices) w/ hex nut, 2 standard washers	0.625" x	12"	48	1	58
	*) Bolts (for rail post bracing at steel span) w/ hex nut & cut washer	0.75" x	3"	256	0.6	154
	*) Bolts (thru rail post at steel bracing) w/ hex nut & cut washer	0.75" x	10 1/2"	32	1.5	48
	Bolts (rail post bolts thru nailing strip) w/ hex nut & cut washer	0.625" x	25"	16	2.2	35
	*) Bolts (thru nailing strip at interior stringers) w/ hex nut & cut washer	0.625" x	11"	99	1.1	109
	*) Bolts (thru 6" wide stringers at bearing connection to concrete piers) w/ hex nut & standard washer	0.625" x	8"	12	0.8	10
	*) Bolts (thru 8" wide stringers at bearing connection to concrete piers) w/ hex nut & standard washer	0.625" x	10"	12	1.0	12
	*) Bolts (thru 10" wide stringers at bearing connection to concrete piers) w/ hex nut & standard washer	0.625" x	12"	4	1.2	5
	*) Drift Bolts (stringers to caps)	0.625" x	21"	188	1.8	338
	*) Bolts thru stringers S12 & S13 w/ hex nut & 2 washers	0.625" x	21"	8	1.8	14
					Total = ⚠1	~~5363~~ ~~5607~~ 5607

*) Denotes incidental hardware

ESTIMATED QUANTITIES

NUMBER	ITEM	UNIT	BRIDGE NO. 002 - Old US 66 over the Railroad											
			SUPER STRUC TURE	ABUT. NO. 1	BENT NO.1	BENT NO.2	BENT NO.3	PIER NO.1 concrete	PIER NO.2 concrete	BENT NO.4	BENT NO.5	BENT NO.6	ABUT. NO.2	TOTAL
202001	REMOVAL OF STRUCTURES AND OBSTRUCTIONS	L.S.												L.S.
210001	STRUCTURE EXCAVATION FOR BRIDGES	C.Y.		11		4				6			11	28 / ~~32~~
504015	REINFORCING BARS GRADE 60	POUND		125									125	246 ~~250~~
507025	STR. STEEL FOR MISC. STR. AASHTO M-183	POUND	7,300		40	160								7370 ~~7,500~~ ⚠1
509050	STRUCTURAL CONCRETE CLASS A	C.Y.		1									1	2.08 ~~2~~
509904	SPECIAL SURFACE FINISH ON EXISTING CONCRETE	S.F.						2,470	2,500					~~4,970~~ 4748.24
510015	METAL RAILING TYPE D (MODIFIED)	L.F.	459											~~459~~ 458
511006	TREATED TIMBER 1) & 2)	MB.F	59.205	0.049	0.391	0.372	0.275			0.669			0.049	59.774 ~~61.01~~ ~~59.159~~ ⚠1
516530	PENETRATING WATER REPELLANT TREATMENT	S.Y.						280	290					~~570~~ 527.58
516545	PIER AND ABUTMENT REPAIR	S.F.						40	40					81.46 ~~80~~
516548	EPOXY INJECTION	GAL.						0.5	0.5					.651 ~~1~~
603300	ROCK PLATING	S.Y.		585									730	1225.15 ~~1,315~~ ~~1345.42~~
607050	VINYL COATED PEDESTRIAN CHAIN LINK FENCE	L.F.	451											451
615202	RECOATING BRIDGES	L.S.												L.S.
615210	ENVIRONMENTAL REQUIREMENTS	L.S.												L.S.

Notes: 1) Timber quantities for Bent No. 3 include quantities of longitudinal girts connecting bents No. 2 & 3 which are designated for replacement.
2) Timber quantities for Bent No. 4 include quantities of longitudinal sways and girts connecting bents No. 4 & 5 which are designated for replacement.

NO.	DESCRIPTION	DATE	BY
6			
5			
4			
3			
2			
⚠1	Changed Quantities	7/1/94	CB

REVISIONS (OR CHANGE NOTICES)

NEW MEXICO
STATE HIGHWAY DEPARTMENT

OLD U.S. 66 OVER THE AT&SF RAILROAD NEAR SUWANEE

BR. NO. 0002

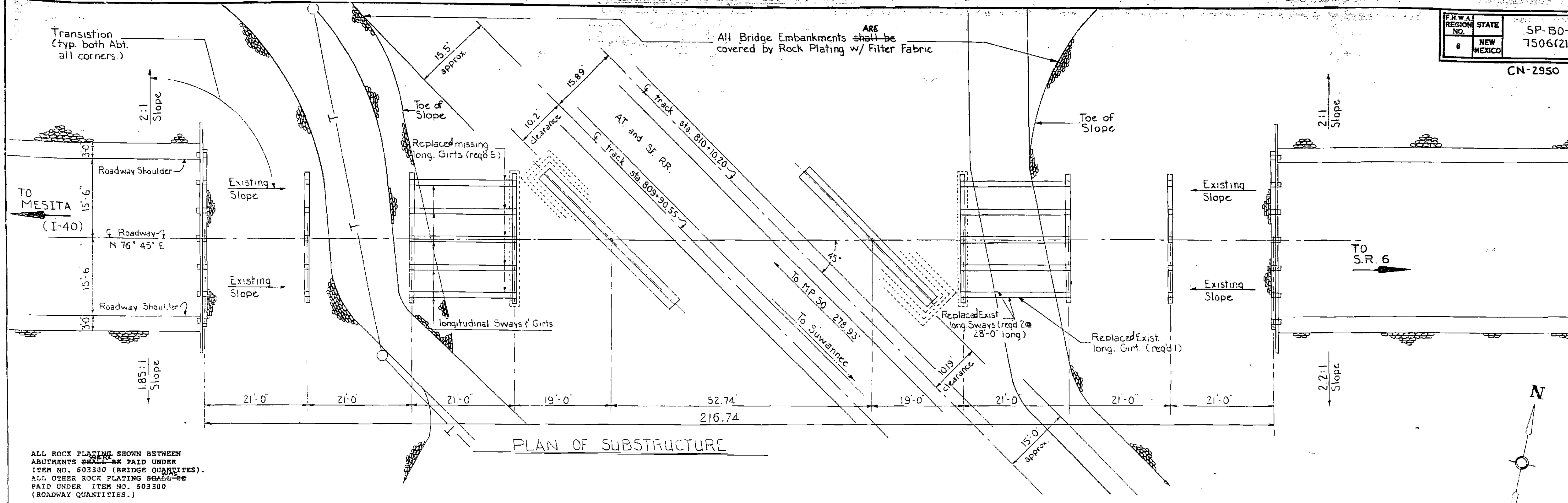
ESTIMATED QUANTITIES AND HARDWARE SCHEDULE

STA. 12+91.50

Approved: [signature] 4/31/94
Bridge Engineer

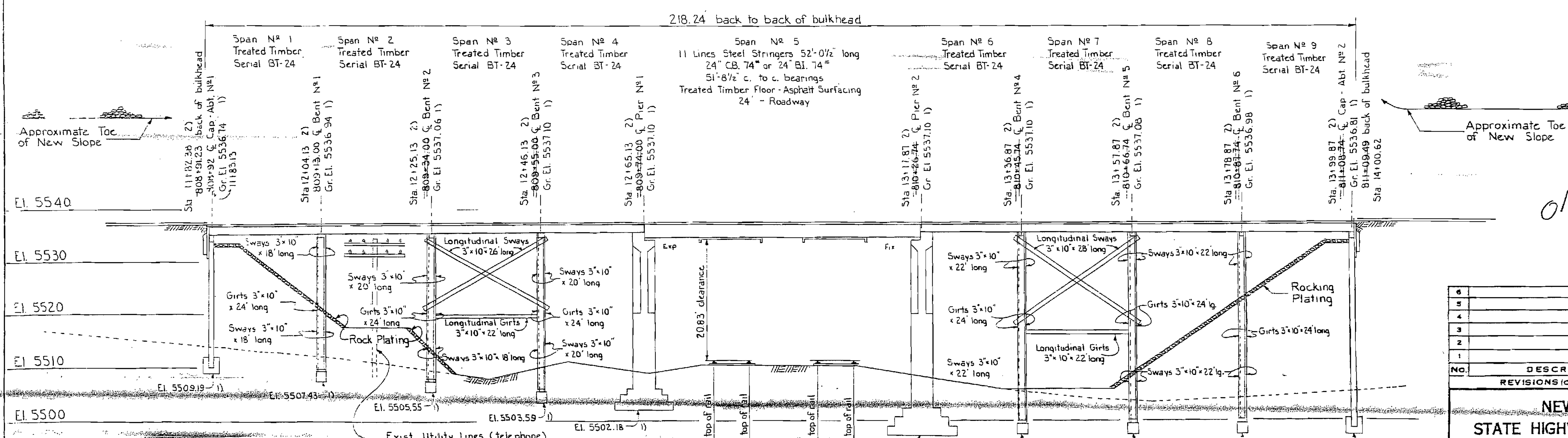
F.H.W.A. REGION NO.	STATE		SHEET NO.	TOTAL SHEETS
6	NEW MEXICO	SP-BO-7506(210)	43	

CN-2950



PLAN OF SUBSTRUCTURE

ALL ROCK PLATING SHOWN BETWEEN ABUTMENTS ~~SHALL BE~~ WERE PAID UNDER ITEM NO. 603300 (BRIDGE QUANTITES). ALL OTHER ROCK PLATING ~~SHALL BE~~ WAS PAID UNDER ITEM NO. 603300 (ROADWAY QUANTITIES.)



LONGITUDINAL SECTION

Notes:

1) The top of timber flooring (Gr. El.) and other elevations shown are taken from "As-built" drawings and differ from recently field-measured elevations (which had no tie to a bench mark) shown on the P & P sheets by approximately -541.5 ft. The bridge Gr. El. shown are at the tops of timber flooring at bents and piers. The P & P sheets show elevations at the top of the existing roadway centerline.

The design thickness of the new bituminous pavement at the centerline of the bridge is 6.25".

2) New stations (created by the District 6 survey crew) are shown. ("As built" stations are crossed out.)

OK

NO.	DESCRIPTION	DATE	BY
6			
5			
4			
3			
2			
1			

REVISIONS (OR CHANGE NOTICES)

NEW MEXICO
STATE HIGHWAY DEPARTMENT

OLD US 66 OVER THE AT&SF RAILROAD NEAR SUWANEE

BR. NO. 0002

STRUCTURE LOCATION PLAN AND PROFILE

STA. 12+91.50

Designed by: — Detailed by: JLW 01/94 Checked by: — Checked by: CB 01/94

Approved: Bridge Engineer

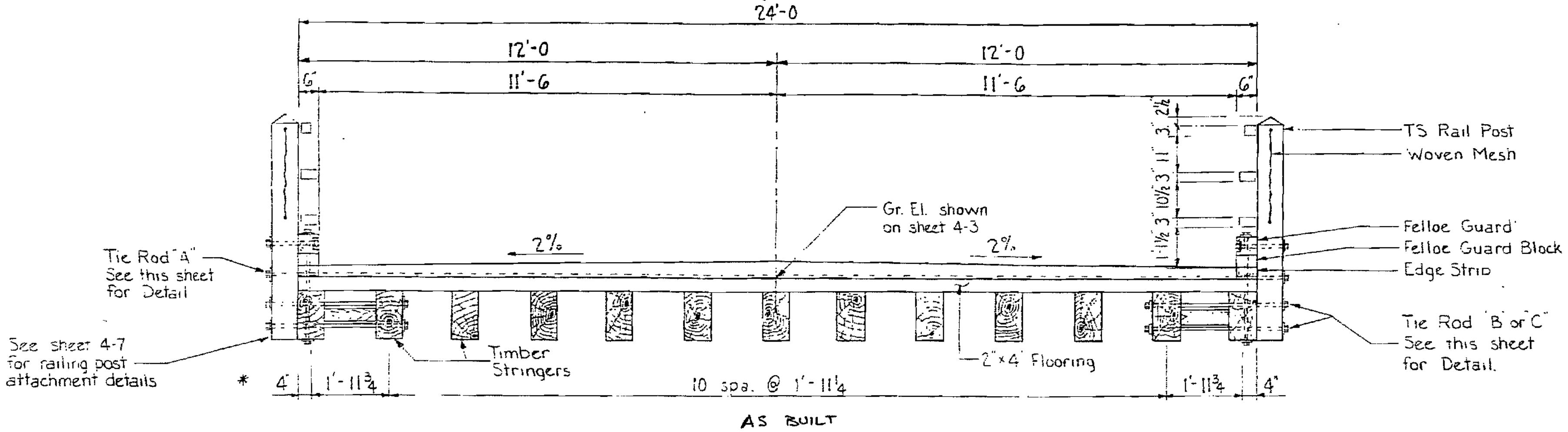
71

SP-BO-7506 (210) NO. SHEET NO. 4-3

F.H.W.A. REGION NO.	STATE		SHEET NO.	TOTAL SHEETS
6	NEW MEXICO	SP-BO-7506(210)	4-4	

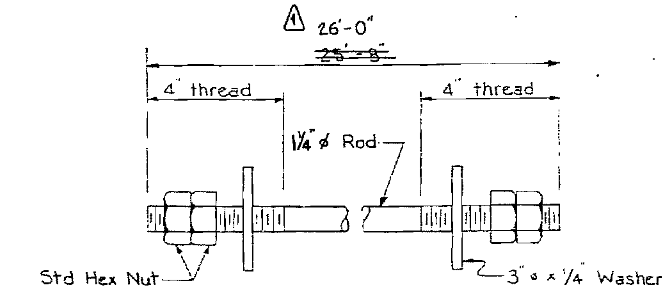
CN-2950

* A stringer spacing shown is for span No. 1, 3, 7 and 9 only. For stringer spacing in span No. 2, 4, 6 and 8 see "PLAN VIEW", sheet No. 4-5 & 4-6.

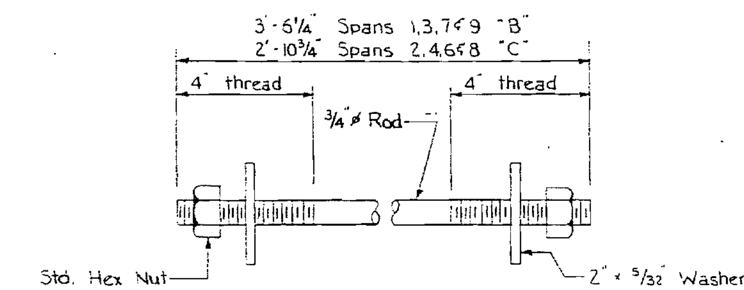


TRANSVERSE SECTION
TIMBER SUPERSTRUCTURE

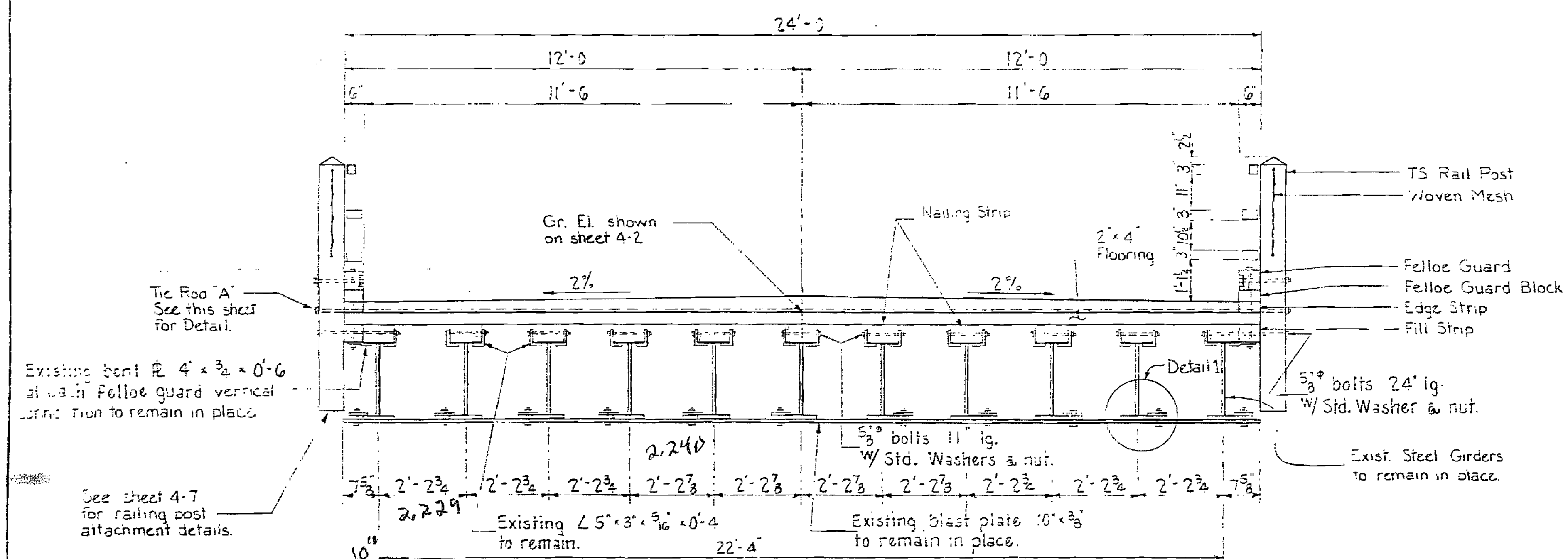
NOTE:
ALL EXISTING TIMBER SUPERSTRUCTURE COMPONENTS ~~ARE TO BE~~ WERE REMOVED. STRINGERS, DECKING, NAILING STRIPS, FELLOE GUARDS, FELLOE GUARD BLOCKS AND EDGE STRIPS ~~ARE TO BE~~ WERE REPLACED AS SHOWN.



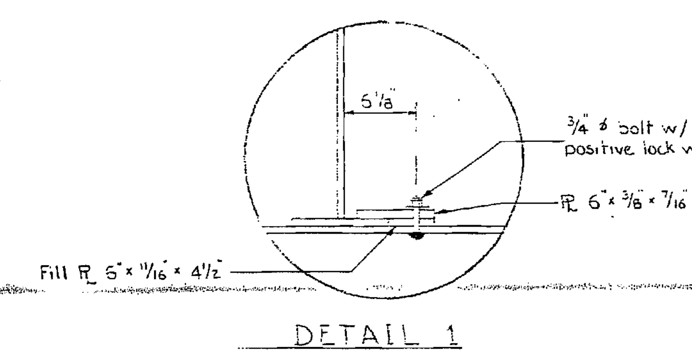
TIE ROD DETAIL "A"
34 Required



TIE ROD DETAIL "B" or "C"
"B" 40 required
"C" 40 required



TRANSVERSE SECTION
STEEL SUPERSTRUCTURE
AS BUILT



DETAIL 1
Existing stringer/blast plate assembly to remain in place

OK

NO.	DESCRIPTION	DATE	BY
6			
5			
4			
3			
2			
1	Changed Tie Rod Detail	7/1/94	CB

REVISIONS (OR CHANGE NOTICES)

NEW MEXICO
STATE HIGHWAY DEPARTMENT

OLD US 66 OVER THE AT&SF RAILROAD NEAR SUWANEE
AS BUILT
BR. NO. 0002

SUPERSTRUCTURE TRANSVERSE SECTION AND DECK DETAILS

STA. 12+91.50

Approved: [signature] Bridge Engineer

Designed by: / Detailed by: / Checked by: / Checked by:

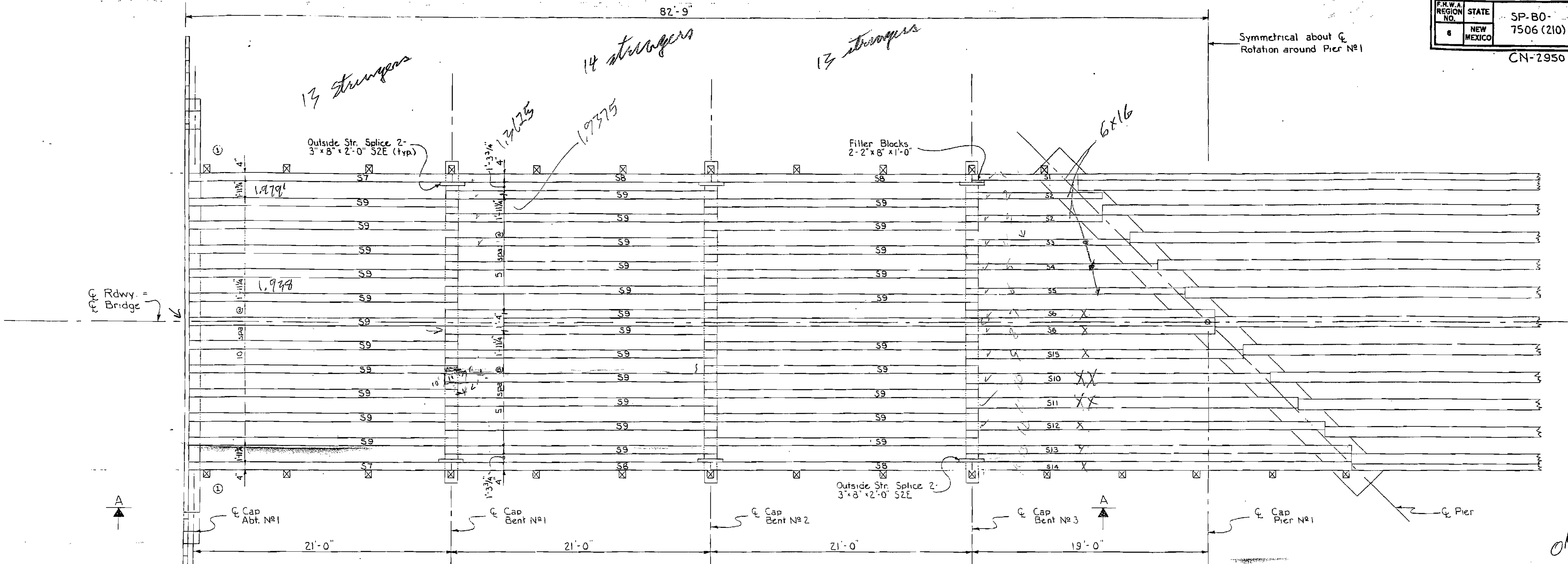
SP-BO-7506(210) NO. SHEET NO. 4-4

72

220

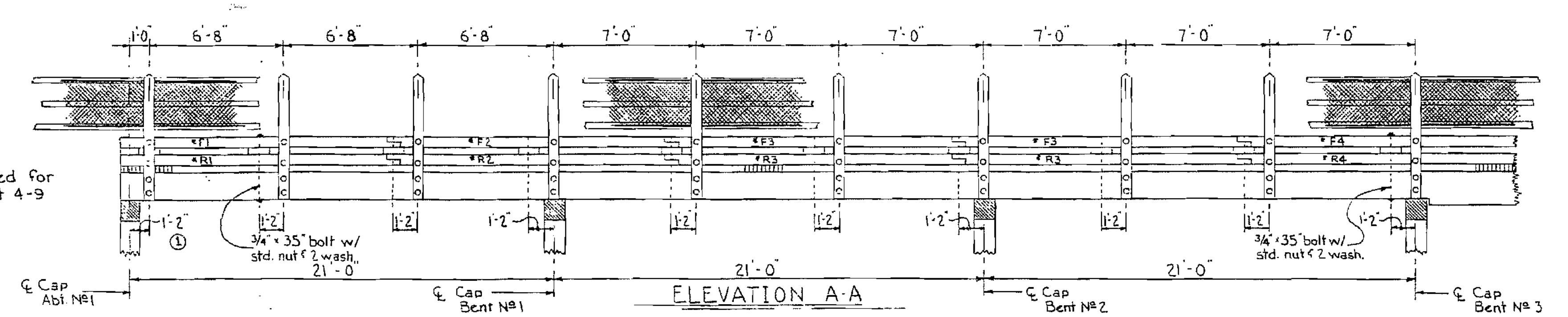
F.H.W.A. REGION NO.	STATE		SHEET NO.	TOTAL SHEETS
6	NEW MEXICO	SP-BO-7506 (210)	4-5	

CN-2950



PLAN
(Showing Spans 1, 2, 3 & 4)

ok



ELEVATION A-A

Note:
① Struts are omitted for clarity. See sheet 4-9 for Details.

6x16 => 5.75x15
8x16 => 7.75x15
10x16 => 9.75x15

STRINGER LEGEND

MARK	DISCRIPTION	MARK	DISCRIPTION
S1	6"X16"X8'-1 3/16"	S9	8"X16"X22'-0"
S2	6"X16"X10'-10"	S10	10"X16"X24'-3"
S3	6"X16"X13'-1"	S11	10"X16"X26"-6"
S4	6"X16"X15'-4"	S12	8"X20"X28'-9"
S5	6"X16"X17'-7"	S13	8"X20"X30'-11"
S6	8"X16"X19'-9"	S14	8"X20"X30'-5 11/16"
S7	8"X16"X21'-6"	S15	8"X16"X22'-0"
S8	8"X16"X21'-0"		

NOTE:
1.) ALL STRINGERS ~~SHALL BE~~ ARE SURFACED ON TWO EDGES (S2E).

2.) SEE SHEET 4-9 FOR FRAMING DETAILS.

NO.	DESCRIPTION	DATE	BY
6			
5			
4			
3			
2			
1			

REVISIONS (OR CHANGE NOTICES)

NEW MEXICO
STATE HIGHWAY DEPARTMENT

OLD US 66 OVER THE AT&SF RAILROAD NEAR SUWANEE

BR. NO. 0002
AS BUILT
SUPERSTRUCTURE
SPANS 1-4 AND 6-9
TIMBER SPANS

STA. 12+91.50

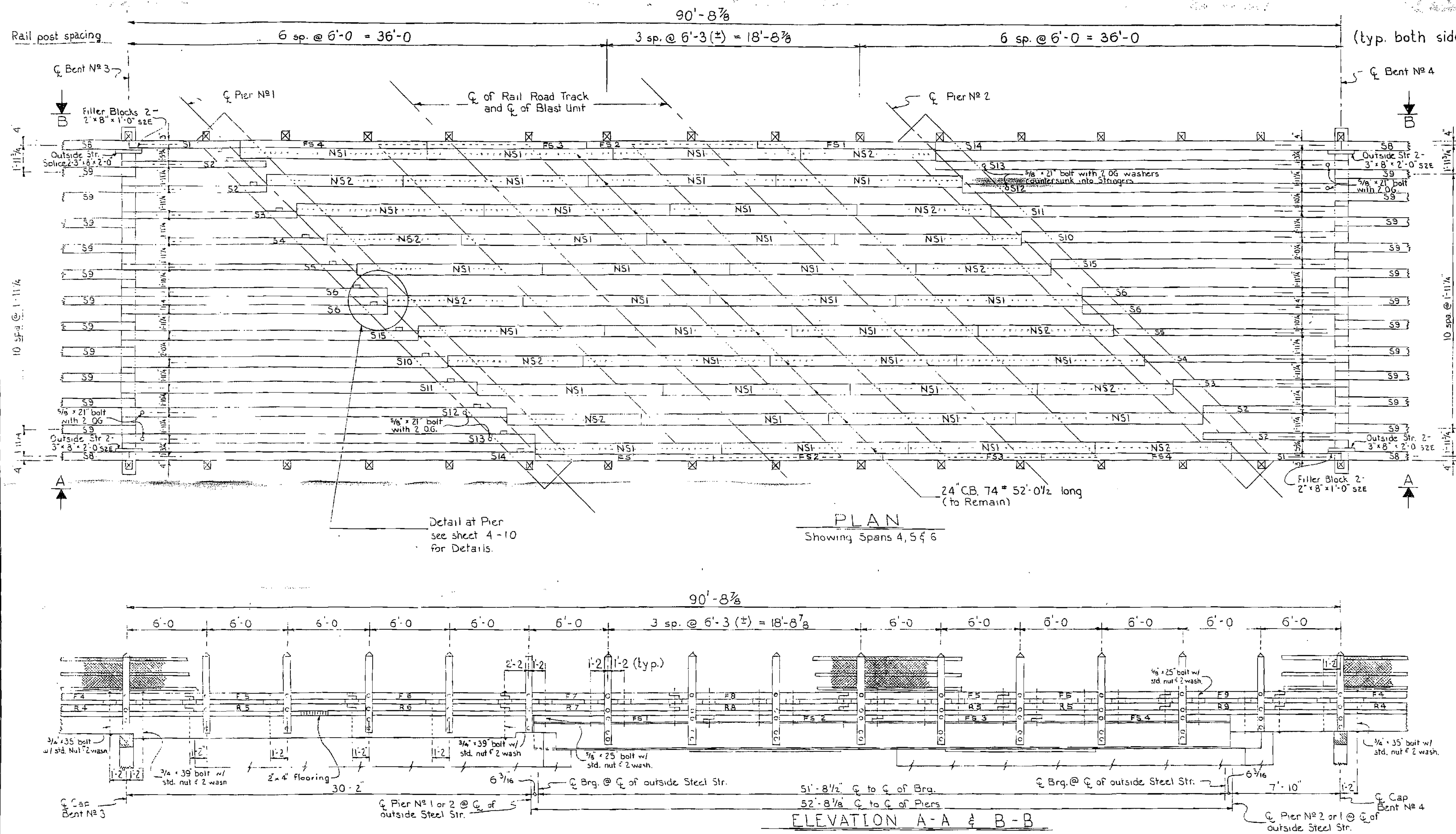
Approved: [signature] 1/31/94
Bridge Engineer

Designed by: CB 01/94 Checked by: JK 01/94
Detailed by: JLW 01/94 Checked by: CJ 01/94

*See Sheet 4-9 for Details.

F.H.W.A. REGION NO.	STATE		SHEET NO.	TOTAL SHEETS
6	NEW MEXICO	SP-BO-7506(210)	4-6	

CN-2950



STRINGER LEGEND

MARK	DISCRIPTION	MARK	DISCRIPTION
S1	6"X16"X8'-1 "	S9	8"X16"X22'-0"
S2	6"X16"X10'-10"	S10	10"X16"X24'-3"
S3	6"X16"X13'-1"	S11	10"X16"X26"-6"
S4	6"X16"X15'-4"	S12	8"X20"X28'-9"
S5	6"X16"X17'-7"	S13	8"X20"X30'-11"
S6	8"X16"X19'-9"	S14	8"X20"X30'-5 "
S7	8"X16"X21'-6"	S15	8"X16"X22'-0"
S8	8"X16"X21'-0"		

NOTE:

1.) ALL STRINGERS ~~SHALL BE~~ ARE SURFACED ON TWO EDGES (S2E).

2.) SEE SHEET 4-9 FOR FRAMING DETAILS.

ok

NO.	DESCRIPTION	DATE	BY
6			
5			
4			
3			
2			
1			

REVISIONS (OR CHANGE NOTICES)

NEW MEXICO
STATE HIGHWAY DEPARTMENT

OLD US 66 OVER THE AT&SF RAILROAD NEAR SUWANEE

BR. NO. 0002
AS BUILT
SUPERSTRUCTURE
SPAN 5 - STEEL GIRDERS

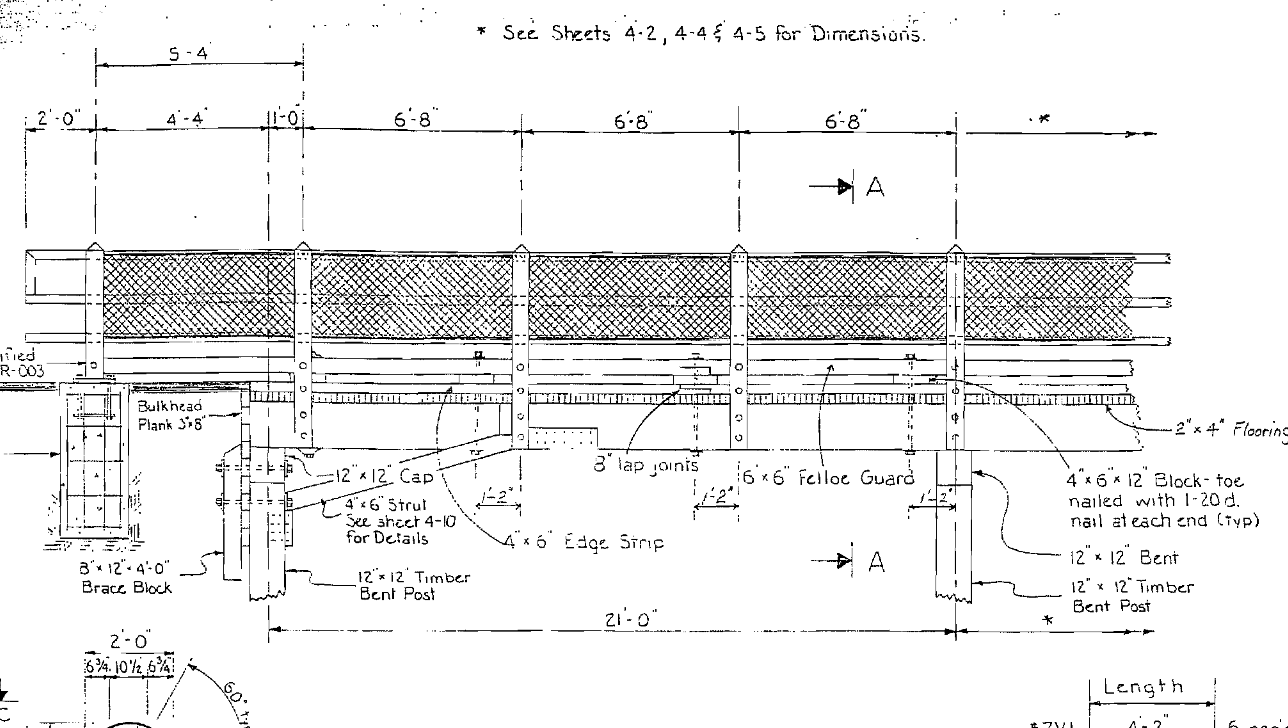
STA. 12+91.50

Approved: [signature] Bridge Engineer

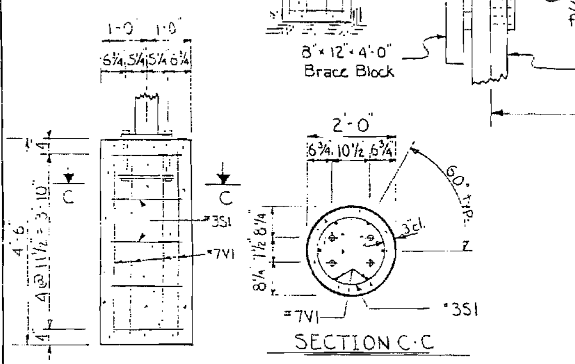
Designed by: CB 01/99
Detailed by:
Checked by:
Checked by:

F.H.W.A. REGION NO.	STATE		SHEET NO.	TOTAL SHEETS
6	NEW MEXICO	SP-BO-7506(210) CN-2950	4-7	

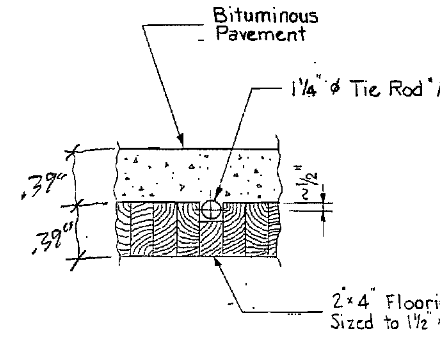
* See Sheets 4-2, 4-4 & 4-5 for Dimensions.



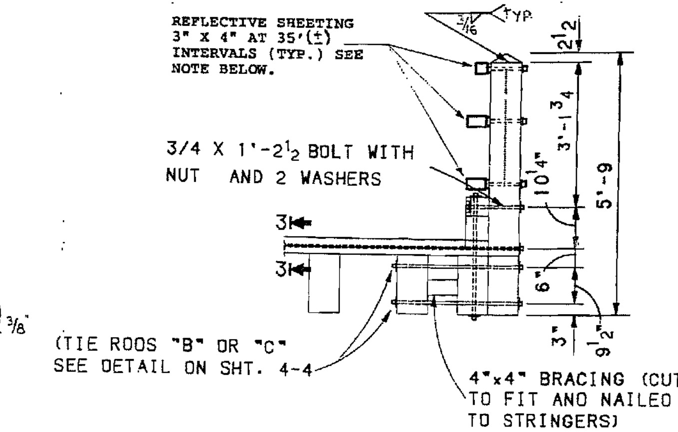
ELEVATION



RAILING FOUNDATION DETAIL



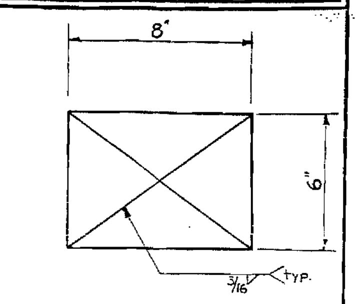
SECTION 3



SECTION A - A

(SHOWING TIMBER SPAN)

NOTE: SEE SHT. NO. 4-10 FOR POST ATTACHMENT AT THE BENTS

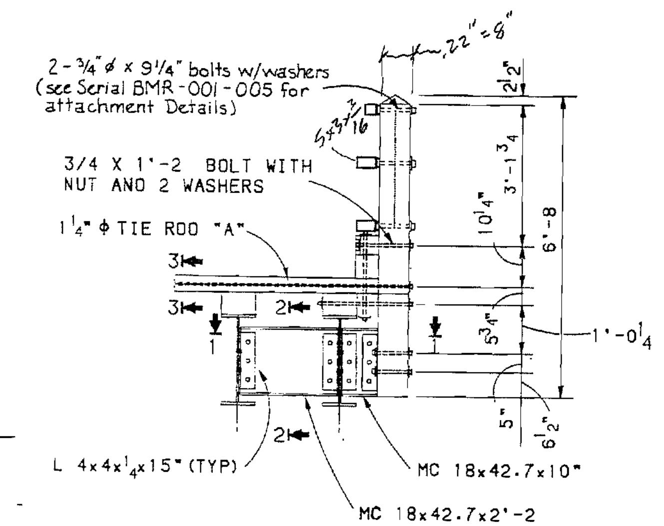


PLAN OF RAIL POST TOP ⚠1

	Length	
#7V1	4'-2"	6 req'd. per foundation total 24 req'd.
#3S1	1'-5⅝"	lg. 5'-6"; 5 reqd. per foundation total 20 req'd.

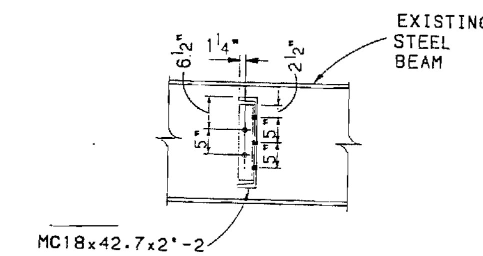
REINFORCING BAR SCHEDULE

NOTE: A YELLOW REFLECTIVE SHEETING 3" X 4", (REFLECTIVITY TYPE III) ~~SHALL BE~~ WAS PLACED ON ALL THREE RAILS AT 35 FEET (±) INTERVALS. (INCIDENTAL TO THE PROJECT.)



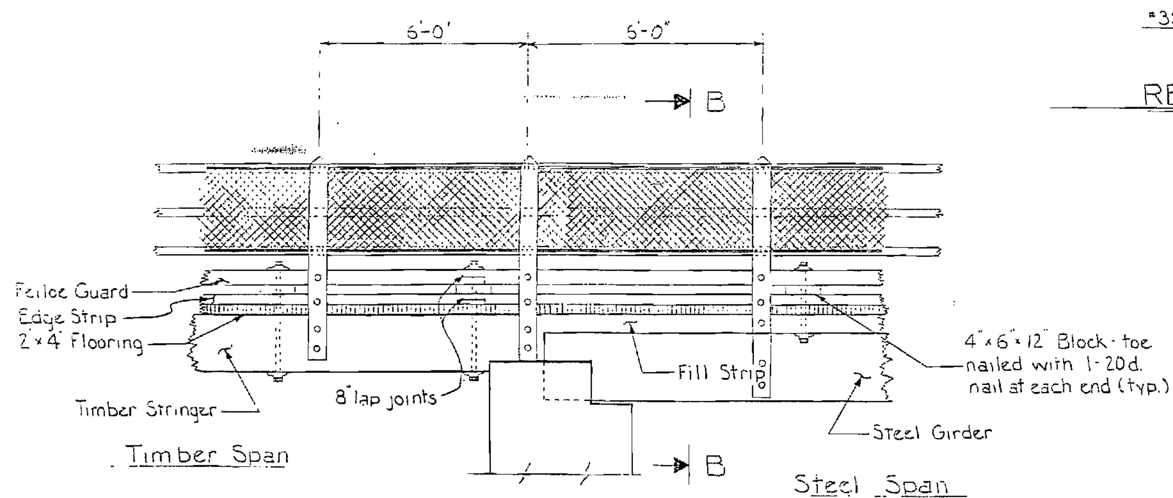
SECTION B - B

(SHOWING STEEL BEAMS)



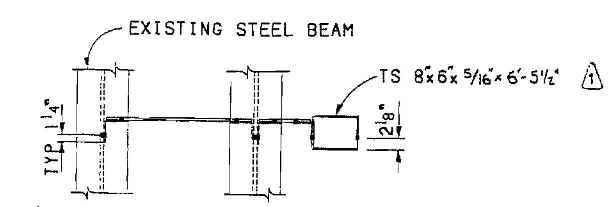
SECTION 2

Note: Structural Steel shown is included in quantities of Item № 50725 ⚠1



ELEVATION

At Concrete Piers



SECTION 1

ERECTION NOTES

1. ALL ATTACHMENTS TO L 3X3X1/4 SHALL USE 3/4" DIA. A307 BOLTS
2. ALL HOLES IN L 4"X4"X1/4 AND RAIL POST ~~SHALL BE~~ WERE DRILLED IN THE SHOP
3. ALL HOLES IN STEEL BEAM WEBS AND CHANNELS ~~SHALL BE~~ WERE DRILLED IN THE FIELD.

ERECTION SEQUENCE OF RAIL POST SUPPORT BRACING

1. DRILL HOLES INTO BEAM WEBS.
2. BOLT 4"X4" ANGLES TO THE BEAM WEBS AND RAIL POST.
3. DRILL HOLES INTO THE CHANNELS.
4. BOLT 4"X4" ANGLES TO THE CHANNELS.

NO.	DESCRIPTION	DATE	BY
6			
5			
4			
3			
2			
⚠1	Added Post Details and Note	7/1/94	S.K.

REVISIONS (OR CHANGE NOTICES)

NEW MEXICO
STATE HIGHWAY DEPARTMENT

OLD US 66 OVER THE AT&SF RAILROAD NEAR SUWANEE

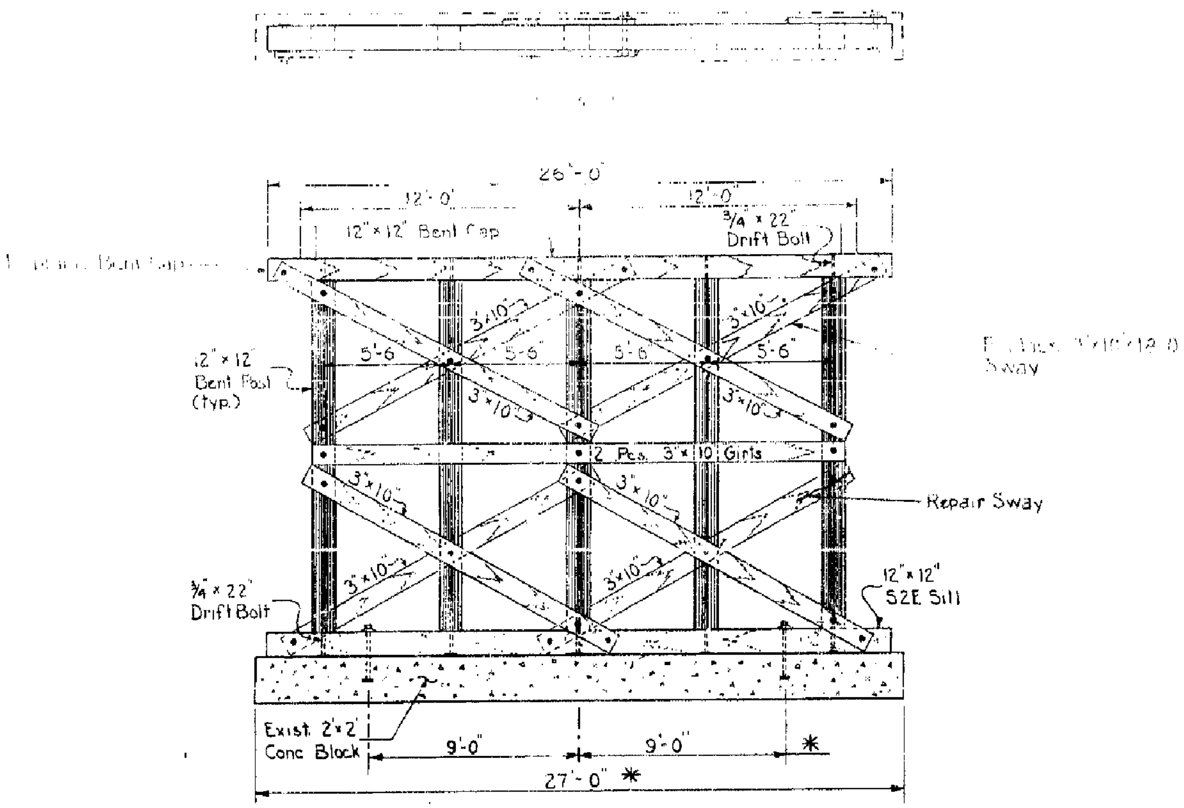
BR. NO. 0002

RAILING DETAILS

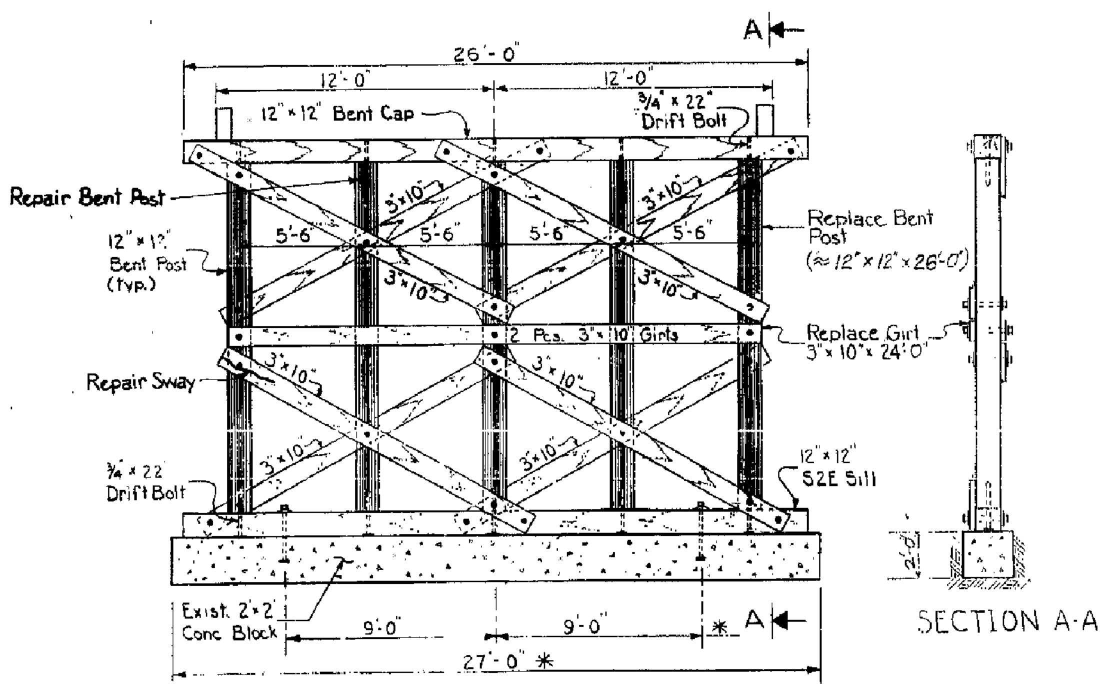
STA. 12+91.50

Designed by: CB 2/94 Checked by: JK 2/94
Detailed by: JLW 01/94 Checked by: CB 2/94

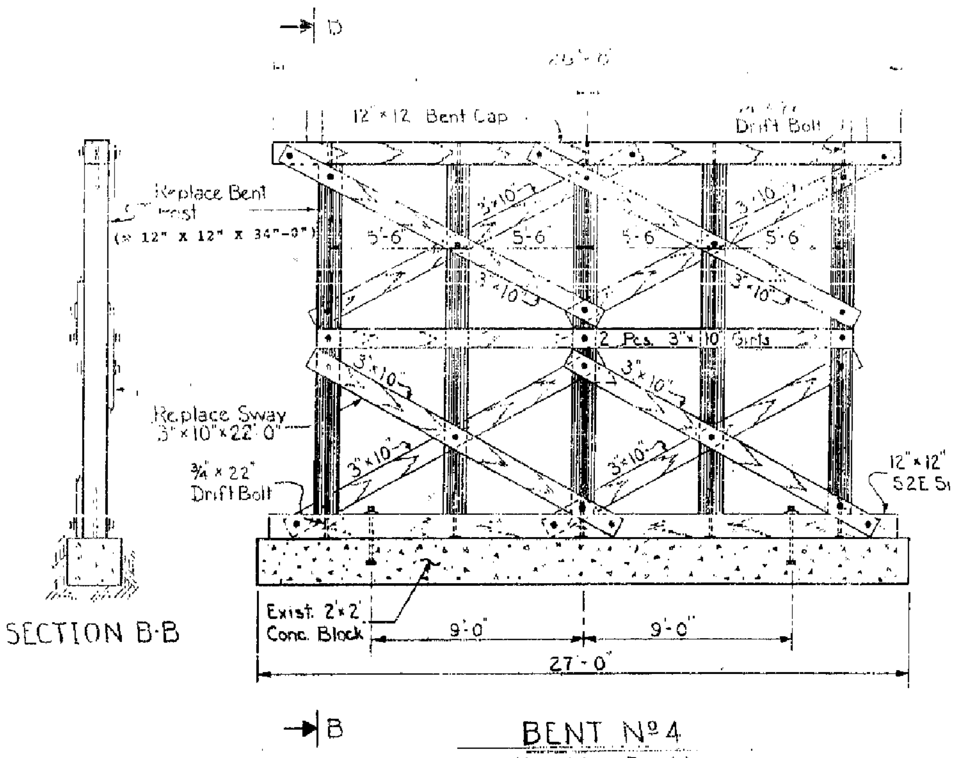
Approved: [signature] 4/1/94
Bridge Engineer



BENT Nº 1
(Looking East)



BENT Nº 2
(Looking East)



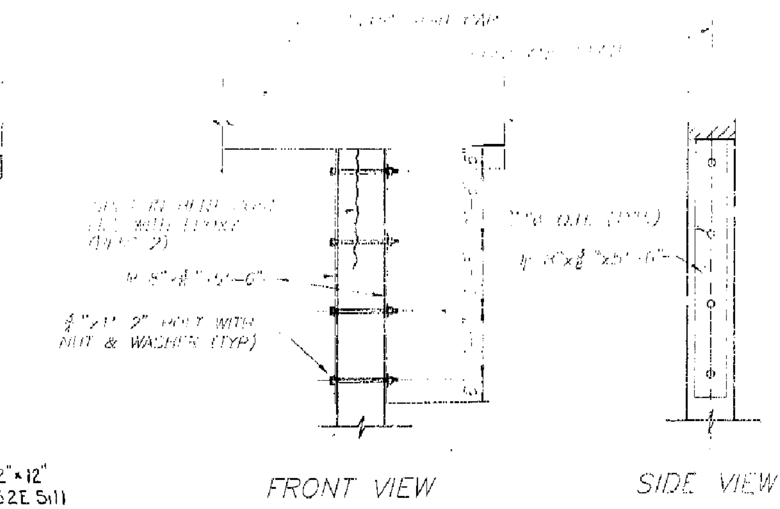
BENT Nº 4
(Looking East)

NOTE:

1.) SEE SHEET 4-3 FOR ADDITIONAL SUBSTRUCTURE MEMBERS TO BE REPLACED (6 LONGITUDINAL GIRTS AND 2 LONGITUDINAL SWAYS.

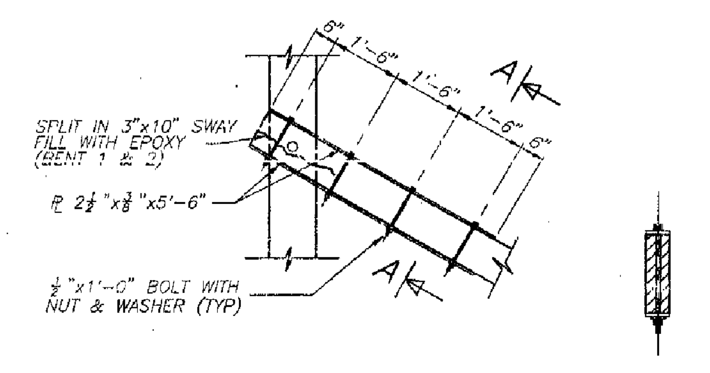
2.) ALL EXISTING MEMBERS ARE TO REMAIN IN PLACE EXCEPT AS NOTED.

3.) SOUTH BENT POSTS NO. 1,3,4,5 AND 6 SHALL BE FIELD TREATED BY TWO LIBERAL APPLICATIONS OF A COMPATIBLE PRESERVATIVE WITH THE ORIGINAL CREOSOTE TREATMENT IN ACCORDANCE WITH AWPA M4 "STANDARD FOR THE CARE OF PRESERVATIVE TREATED WOOD PRODUCTS."

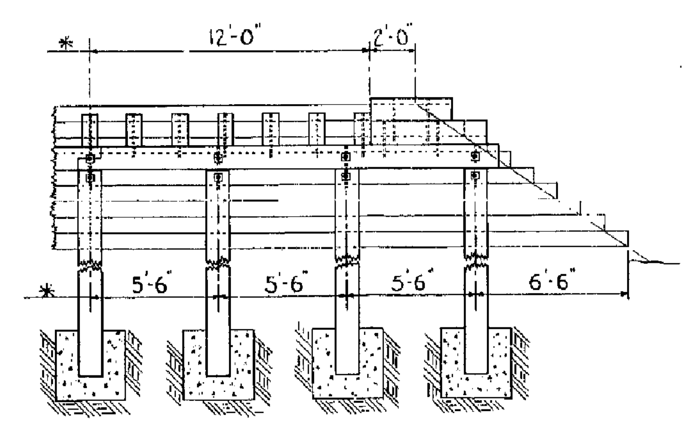


BENT POST REPAIR DETAIL △1

IF SIMILAR SPLITS EXIST UTILIZE THESE DETAILS AS NEEDED.



SWAY REPAIR DETAIL △1



ABUTMENT TYPE - B

* DIMENSIONS SHOWN ARE FOR INFORMATION ONLY AND REPRESENT EXISTING STRUCTURE DETAILS AS SHOWN IN "AS BUILTS" DRAWINGS.

NO.	DESCRIPTION	DATE	BY
6			
5			
4			
3			
2			
△1	Added Timber Repair Details	7/1/94	J.K.

REVISIONS (OR CHANGE NOTICES)

Designed by: JK 01/94 Checked by: CB 1/94
Detailed by: JLW 01/94 Checked by: CB 1/94

F.H.W.A. REGION NO.	STATE		SHEET NO.	TOTAL SHEETS
6	NEW MEXICO	SP-BO-7506(210)	4-9	

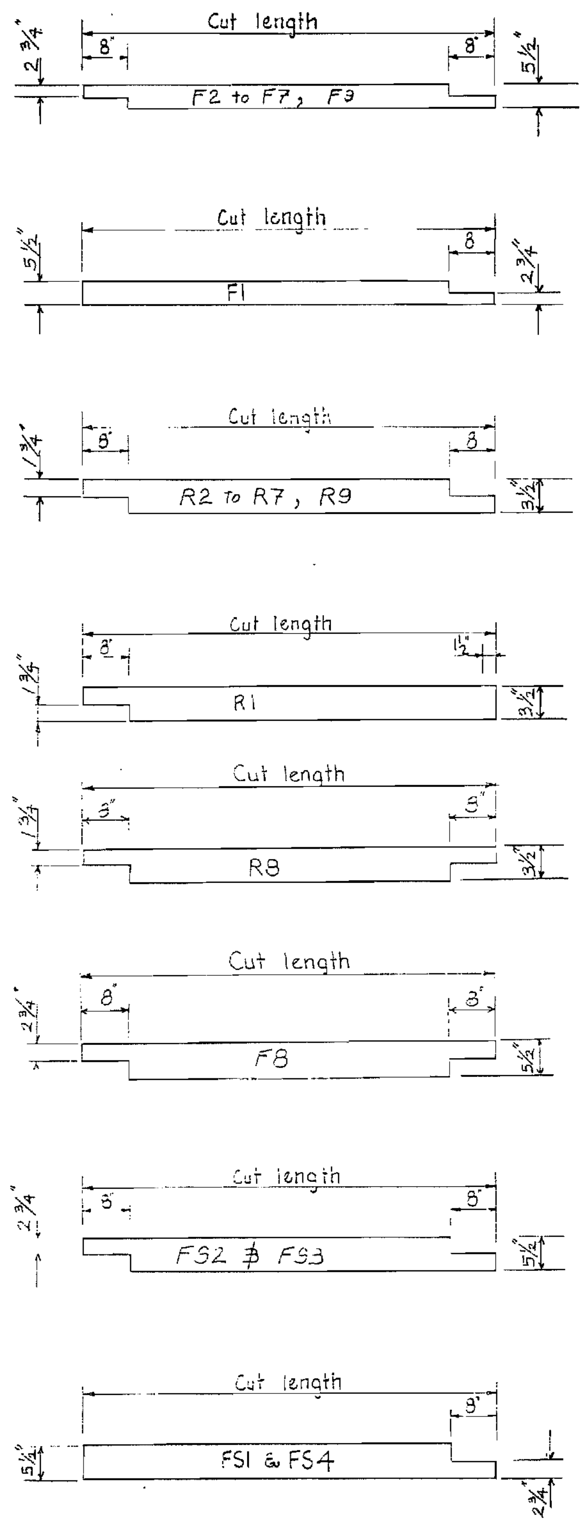
CN-2950

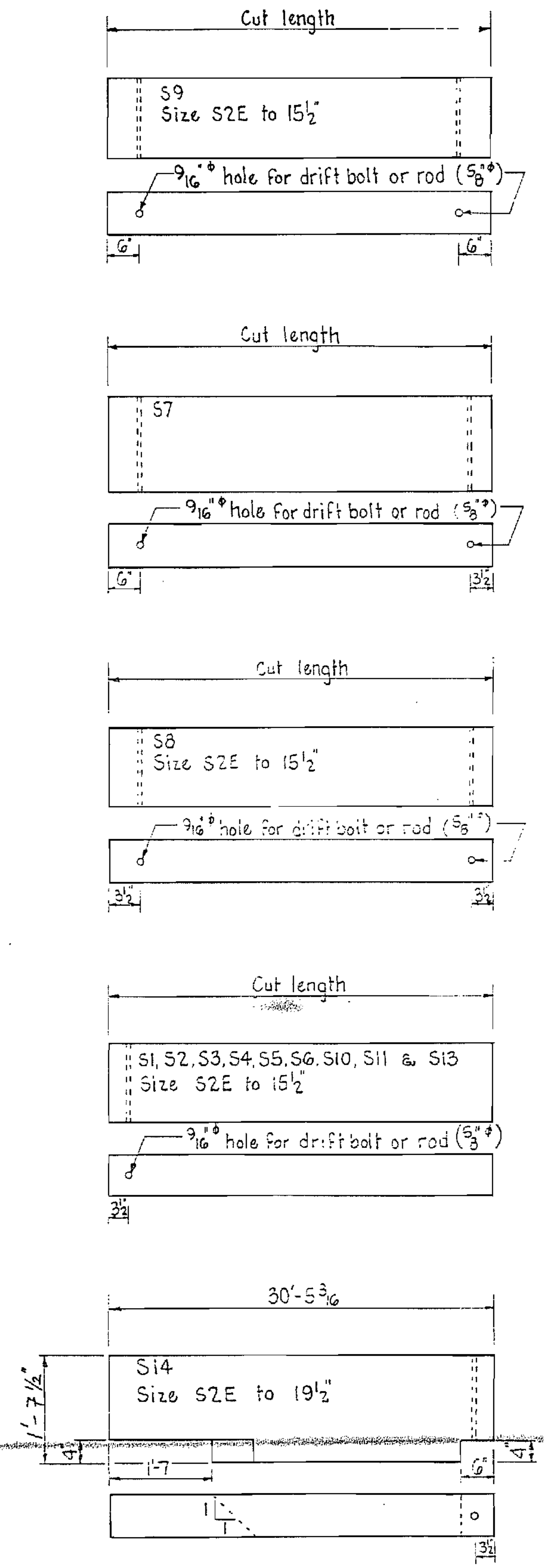
TIMBER LIST FOR SUPERSTRUCTURE — – = NO CUT

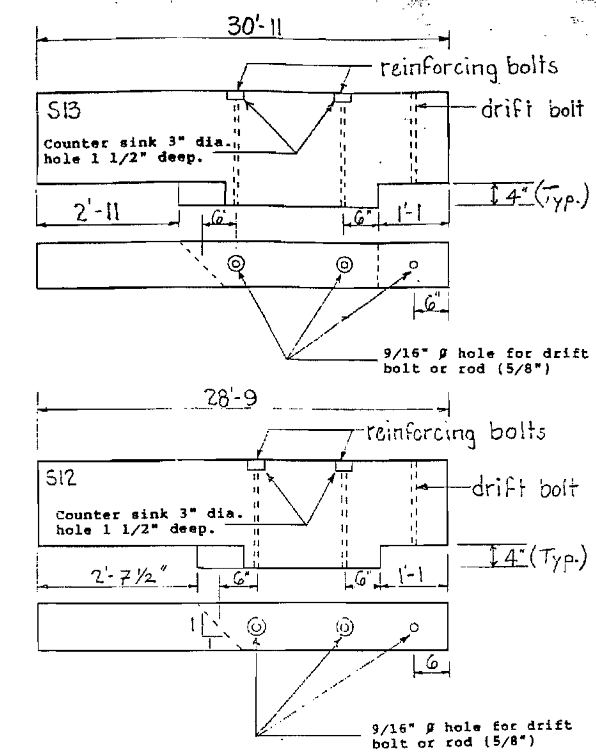
	DISCRIPTION	NO. PCS.	SIZE	SURF.	NOM. LENGTH	CUT L.	M B.F.	MARK	
	EDGE STPS	4	4"x 6"	S4S	14'	14'-0"	0.112	R1	
	EDGE STPS	4	4"x 6"	S4S	16'	14'-4"	0.128	R2	
	EDGE STPS	8	4"x 6"	S4S	16'	14'-8"	0.256	R3	
	EDGE STPS	4	4"x 6"	S4S	14'	13'-8"	0.112	R4	
	EDGE STPS	6	4"x 6"	S4S	14'	12'-8"	0.168	R5	
	EDGE STPS	2	4"x 6"	S4S	12'	11'-8"	0.048	R6	
	EDGE STPS	2	4"x 6"	S4S	14'	13'-11"	0.056	R7	
	EDGE STPS	2	4"x 6"	S4S	14'	13'-2"	0.056	R8	
	EDGE STPS	2	4"x 6"	S4S	10'	9'-0"	0.040	R9	
	FELLOE GD	4	6"x 6"	S4S	20'	18'-1"	0.240	F1	
	FELLOE GD	4	6"x 6"	S4S	16'	14'-4"	0.192	F2	
	FELLOE GD	8	6"x 6"	S4S	16'	14'-8"	0.384	F3	
	FELLOE GD	4	6"x 6"	S4S	14'	13'-8"	0.168	F4	
	FELLOE GD	6	6"x 6"	S4S	14'	12'-8"	0.252	F5	
	FELLOE GD	2	6"x 6"	S4S	12'	11'-8"	0.072	F6	
	FELLOE GD	2	6"x 6"	S4S	14'	13'-11"	0.084	F7	
	FELLOE GD	2	6"x 6"	S4S	14'	13'-2"	0.084	F8	
	FELLOE GD	2	6"x 6"	S4S	10'	9'-0"	0.060	F9	
	FILL STPS	2	6"x 6"	S4S	14'	13'-3 1/2"	0.084	FS1	
	FILL STPS	2	6"x 6"	S4S	14'	13'-2"	0.084	FS2	
	FILL STPS	2	6"x 6"	S4S	14'	12'-8"	0.084	FS3	
	FILL STPS	2	6"x 6"	S4S	16'	15'-1"	0.096	FS4	
2)	NAIL STPS	33	6"x 10"	S4S	14'	14'-0"	2.310	NS1	
2)	NAIL STPS	11	6"x 10"	S4S	12'	10'-2 1/2"	0.660	NS2	
1)	FLOORING	~~1742~~	2"x 4"	S4S	24'	24'-0"	~~27.872~~ 21.358	FL1	68 PCS WERE 2"x2"
	STRINGERS	2	6"x 16"	S2E	10'	8'-1 3/16"	0.160	S1	
	STRINGERS	4	6"x 16"	S2E	12'	10'-10"	0.384	S2	
	STRINGERS	2	6"x 16"	S2E	14'	13'-1"	0.224	S3	
	STRINGERS	2	6"x 16"	S2E	16'	15'-4"	0.256	S4	
	STRINGERS	2	6"x 16"	S2E	18'	17'-7"	0.288	S5	
	STRINGERS	4	8"x 16"	S2E	20'	19'-9"	0.853	S6	
	STRINGERS	4	8"x 16"	S2E	22'	21'-6"	0.939	S7	
	STRINGERS	~~8~~ 7	8"x 16"	S2E	22'	21'-0"	~~1.877~~ 1.643	S8	
	STRINGERS	~~68~~ 66	8"x 16"	S2E	22'	22'-0"	~~15.957~~ 15.488	S9	
	STRINGERS	2	10"x 16"	S2E	26'	24'-3"	0.693	S10	
	STRINGERS	~~2~~ 1	10"x 16"	S2E	28'	26'-6"	~~0.747~~ 0.373	S11	
	STRINGERS	~~2~~ 1	8"x 20"	S2E	30'	28'-9"	~~0.800~~ 0.400	S12	
	STRINGERS	2	8"x 20"	S2E	32'	30'-11"	0.853	S13	
	STRINGERS	2	8"x 20"	S2E	32'	30'-5 11/16"	0.853	S14	
	STRINGERS	2	8"x 16"	S2E	22'	22'-0"	0.469	S15	
	O.S.SPL.	~~24~~ 12	3"x 8"	S2E	2'	2'-0"	.048 ~~0.016~~ ~~.096~~	OS1	
	FILL BLKS	4	2"x 8"	S2E	4'	1'-0"	0.005	FB1	
	SPACERS (FEL. BLKS)	46 ~~92~~	4"x 6"	S4S	2'	1'-0"	~~0.020~~ .184	SB1	
	BRAC BLKS	40	4"x 4"	S2E	2'	AS NEEDED	0.107		
						TOTAL:	~~59.205~~ ~~59.159~~ 57.408		

TIMBER LIST FOR SUBSTRUCTURE — – = NO CUT

DISCRIPTION	NO. PCS.	SIZE	SURF.	NOM. LENGTH	CUT L.	M B.F.	MARK	
STRUTS	~~4~~	4"x 6"	S4S	10'	8'-8"	~~0.080~~	ST1	CONTRACTOR USED EXISTING STRUTS AND CLEATS.
CLEATS	~~4~~	3"x 8"	S2E	2'	2'-0"	~~0.016~~	CL1	
CLEATS	~~4~~	2"x 4"	S4S	2'	0'-10 1/2"	~~0.005~~	CL2	
CLEATS	~~4~~	2"x 4"	S4S	2'	1'-0"	~~0.005~~	CL3	
BNT 1 CAP	1	12"x 12"	S2E	28'	AS NEEDED	0.336	BC1	
BNT 2 PST	1	12"x 12"	ROUGH	26'	AS NEEDED	0.312	BP1	
BNT 4 PST	1	12"x 12"	ROUGH	34'	AS NEEDED	0.408	BP4	
SWAYS	~~2~~ 3	3"x 10"	ROUGH	22'	AS NEEDED	0.~~110~~ .165	SW1	
GIRT	1	3"x 10"	ROUGH	24'	AS NEEDED	0.060	G1	
LON. SWAY	2	3"x 10"	ROUGH	28'	AS NEEDED	0.140	LS1	
LON. GIRT	6	3"x 10"	ROUGH	22'	AS NEEDED	0.330	LG1	
					TOTAL:	~~1.903~~ ~~1.857~~ 1.751		







NOTES:
1) CONTRACTOR ~~MAY~~ DID SPLICE 2"X4" FLOORINGS WITH A TWO-PIECE MAXIMUM. SHORTER PIECES ~~SHALL~~ ARE NOT ~~BE~~ LESS THAN 8 FT IN LENGTH. FLOORING MEMBERS ~~SHALL BE~~ WERE SPLICED ON STRINGERS ONLY AND SPLICES ~~MUST BE~~ ARE STAGGERED WITH A 2 FT MIN.
2) Dress to 5½" x 9"

NO.	DESCRIPTION	DATE	BY
6			
5			
4			
3			
2			
1			

REVISIONS (OR CHANGE NOTICES)

NEW MEXICO
STATE HIGHWAY DEPARTMENT

OLD US 66 OVER THE AT&SF RAILROAD NEAR SUWANEE

BR. NO. 0002

TIMBER QUANTITIES AND MISC. DETAILS

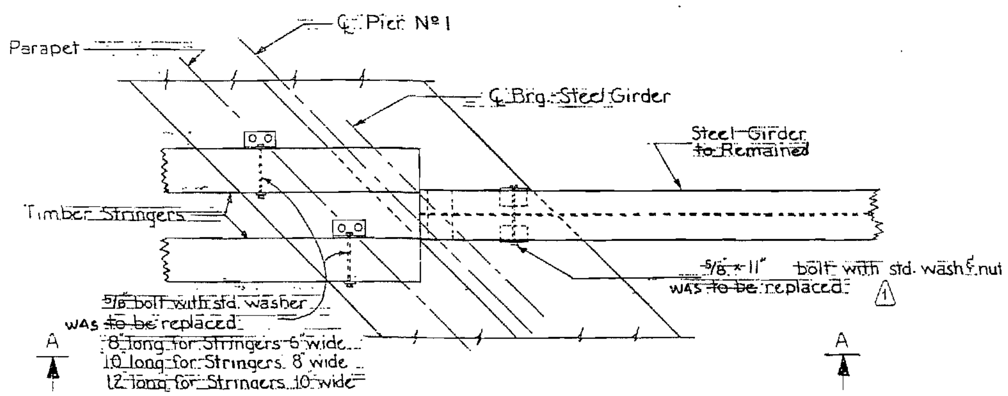
STA. 12+91.50

Approved: [signature] 1/31/94
Bridge Engineer

Designed by: CE 01/94 Checked by:
Detailed by: Checked by:

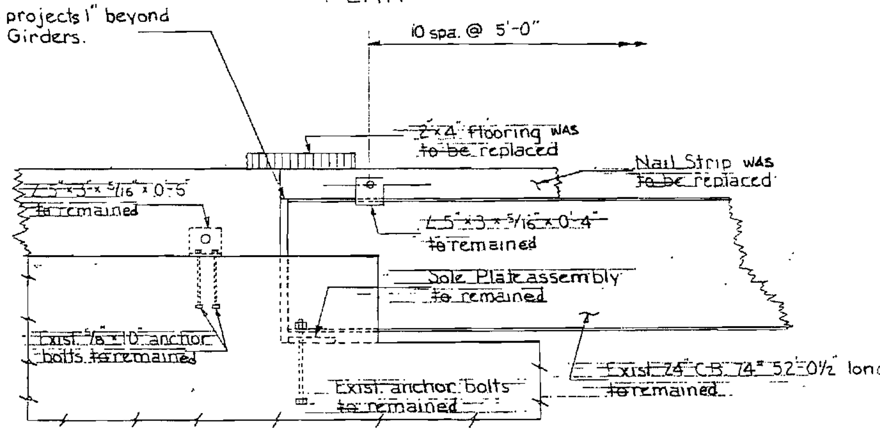
F.H.W.A. REGION NO.	STATE		SHEET NO.	TOTAL SHEETS
6	NEW MEXICO	SP-BO-7506(210)	4-10	

CN-2950

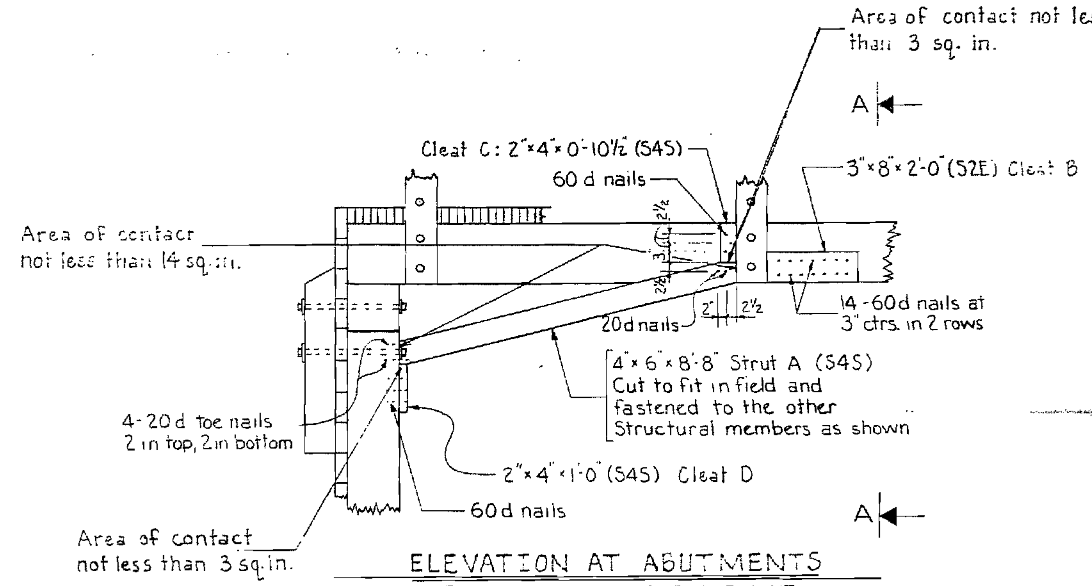


DETAIL AT ℄ PIER Nº 1
PLAN

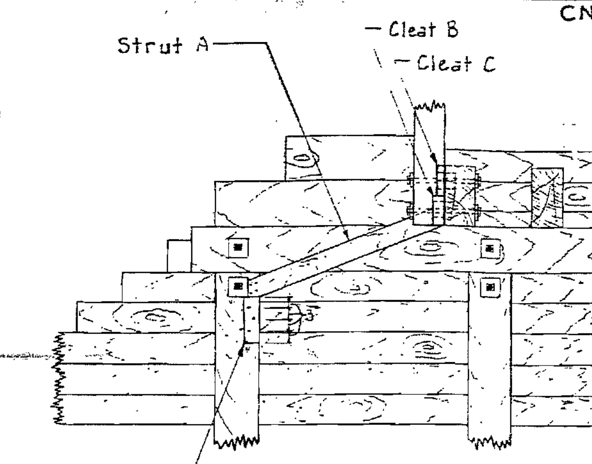
Note
Nailing Strip ~~shall~~ projects 1" beyond the ends of Steel Girders.



DETAIL AT ℄ PIER Nº 1
ELEVATION A-A

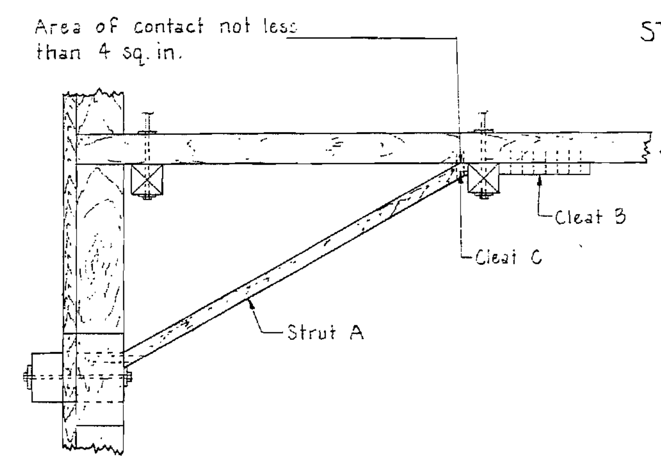


ELEVATION AT ABUTMENTS
STRUT LOCATION AND PLACEMENT



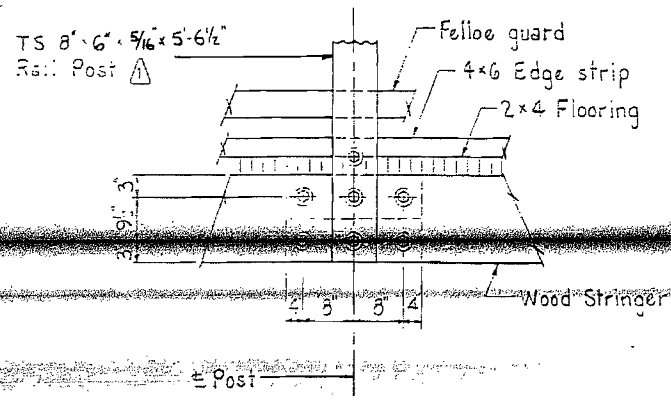
VIEW A-A

STRUT DETAILS

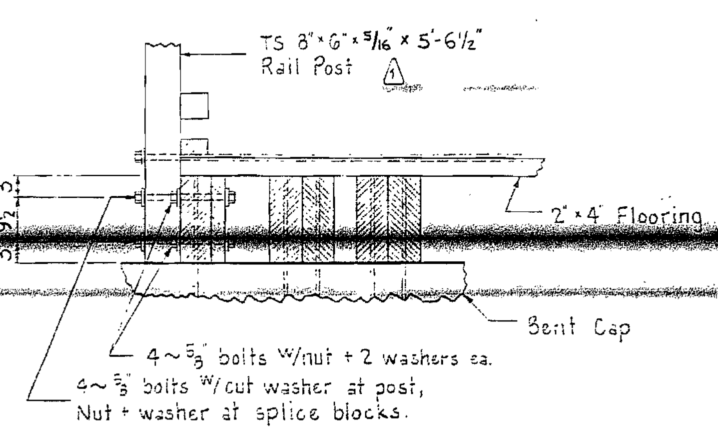


PLAN

Notes: 1. All joints ~~shall~~ have tight snug fits in the field. The strut and strut fastenings must be made from accurate measurements taken in the field at the time of erection. CONTRACTOR USED EXISTING STRUTS & CLEATS AS THEY WERE IN EXCELLENT CONDITION.
2. Where 60d nails pass thru 2"x4"'s, 3/16" or 7/32" diameter holes must be bored previous passage of nails.



ELEVATION



CROSS SECTION

RAILING POST ATTACHMENT AT THE BENTS

Designed by JK 9/94 Checked by CB 9/94
Detailed by JLW & AJS 1/94 Checked by CB 9/94

NO.	DESCRIPTION	DATE	BY
6			
5			
4			
3			
2			
⚠1	Corrections as Noted	7/1/94	J.L.

REVISIONS (OR CHANGE NOTICES)

NEW MEXICO
STATE HIGHWAY DEPARTMENT

OLD US 66 OVER THE AT&SF RAILROAD NEAR SUWANEE

BR. NO. 0002

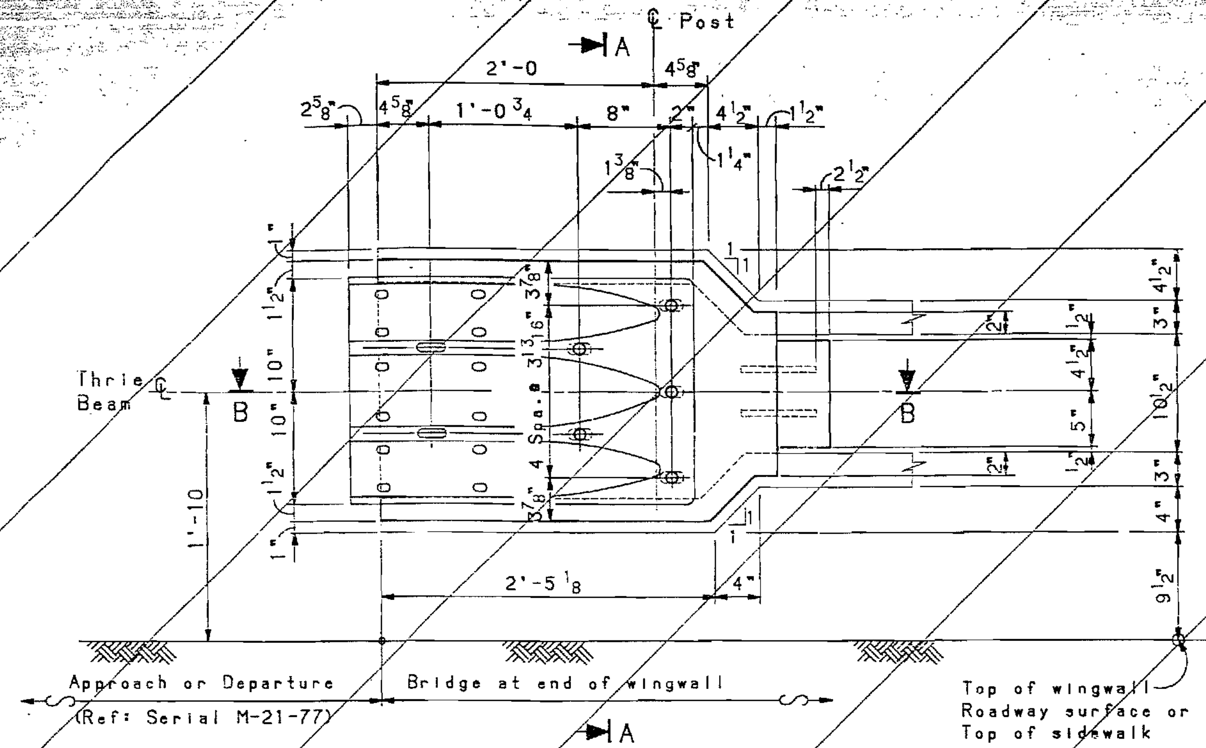
MISCELLANEOUS STRUCTURAL DETAILS

STA. 12+91.50

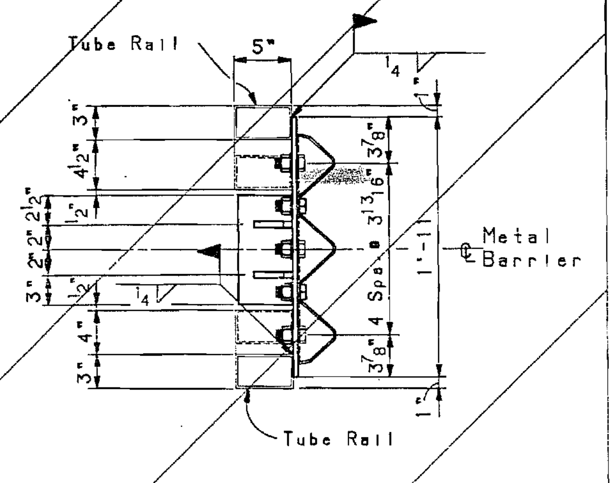
Approved: [signature]
Bridge Engineer

SP-BO-7506(210) NO. 78 SHEET NO. 4-10

26



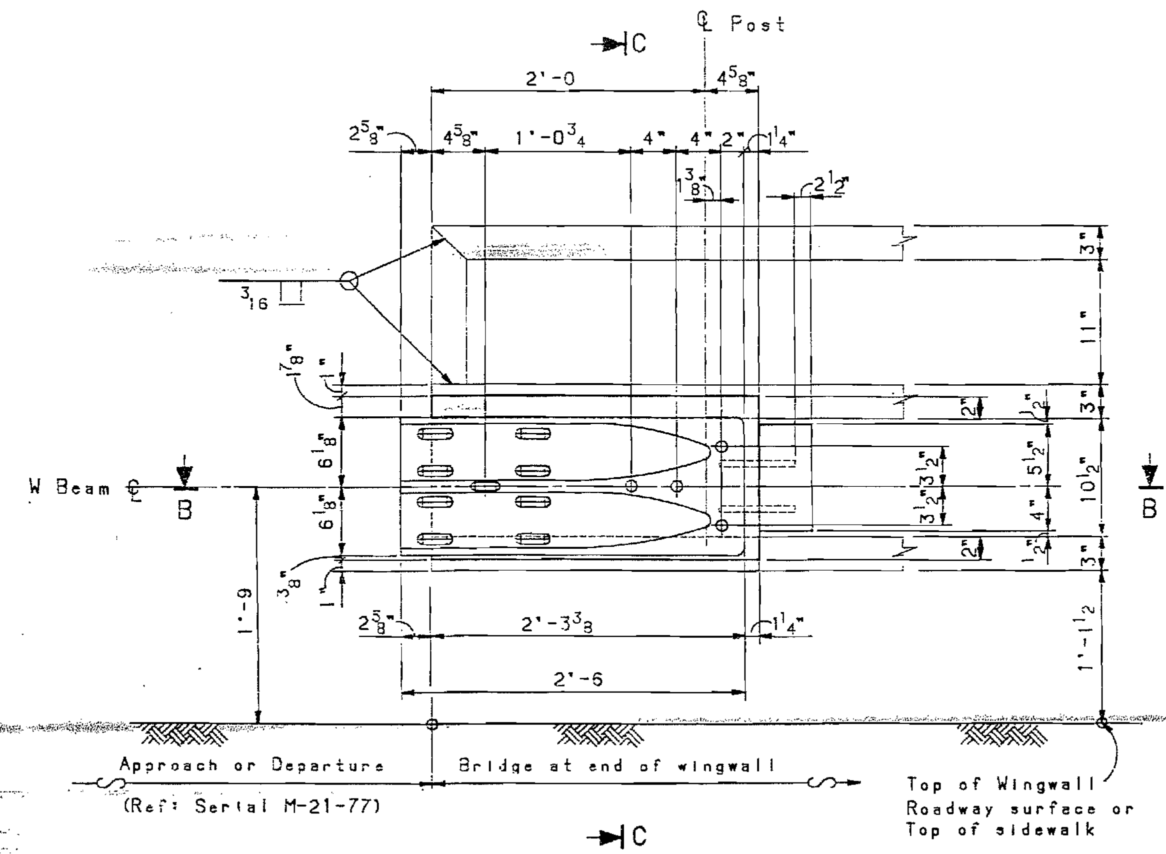
THRIE BEAM METAL BARRIER CONNECTOR



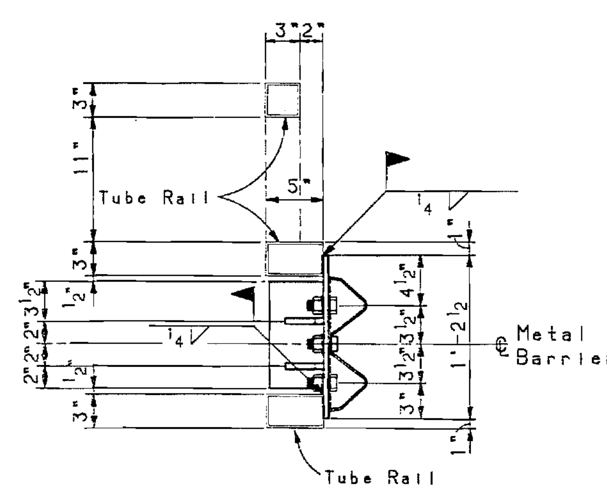
SECTION A-A

NOTES

1. SEE STRUCTURE DETAILS FOR POST SPACING AND OTHER DETAILS NOT SHOWN.
2. STRUCTURAL STEEL ~~SHALL~~ CONFORMS TO A.A.S.H.T.O. SPECIFICATION M-183. PAINTING ~~SHALL~~ CONFORMS WITH THE REQUIREMENTS OF SPECIAL PROVISIONS FOR PROTECTIVE COATING OF NEW BRIDGE RAILING AND MISCELLANEOUS STRUCTURAL STEEL, TYPE 2, SECTION 615-B. BOLTS ~~SHALL~~ CONFORMS TO A.S.T.M. A-307, AND NUTS TO A.S.T.M. A-563, GRADE A. BOLTS, NUTS, AND WASHERS ~~SHALL BE~~ ARE GALVANIZED IN ACCORDANCE WITH A.S.T.M. A-153.
3. THE GUARDRAIL ~~SHALL BE~~ IS W-BEAM, TYPE IV, OF CORROSION RESISTANT STEEL, IN ACCORDANCE WITH A.A.S.H.T.O. SPECIFICATION M-180.
4. TERMINAL CONNECTOR ~~SHALL BE~~ IS A.A.S.H.T.O.-A.R.B.A. STANDARD HM-TF-13/RE-8 FOR W-BEAM WITH CLASS B THICKNESS, AND ~~SHALL BE~~ IS TYPE IV (BECAUSE OF THE CORROSION RESISTANT STEEL) IN ACCORDANCE WITH A.A.S.H.T.O. SPECIFICATION M-180.

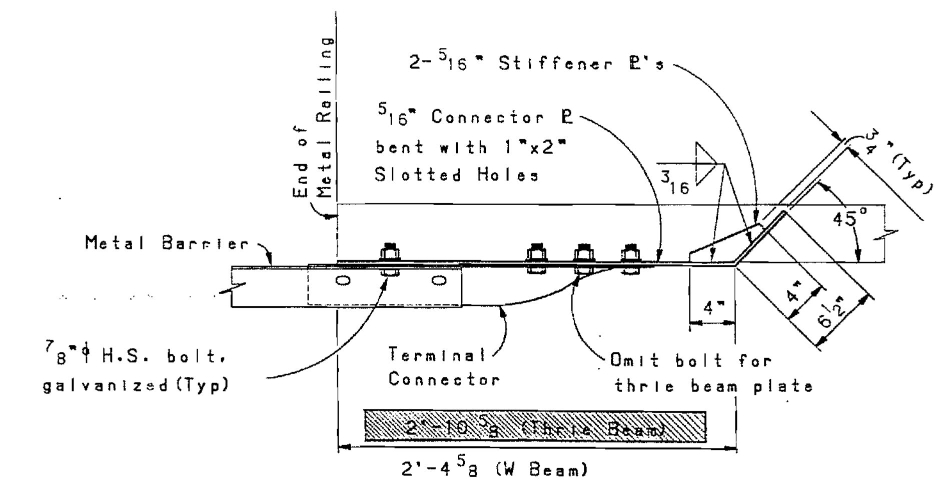


W BEAM METAL BARRIER CONNECTOR



SECTION C-C

NOTE: Lap Metal Barrier and Terminal Connector so that the projecting edge faces away from approaching traffic. DONE



SECTION B-B

NO.	DESCRIPTION	DATE	BY
3			
2			
	REVISIONS (OR CHANGE NOTICES)		

NEW MEXICO STATE HIGHWAY AND TRANSPORTATION DEPARTMENT

METAL BARRIER TERMINAL CONNECTOR DETAILS FOR TYPE "D" MODIFIED BRIDGE RAIL

DATE: SEPTEMBER 1993

DESIGNED BY: S.J.M. 4/92 CHECKED BY: J.K. 9/93
DETAILED BY: J.A.K. 9/93 CHECKED BY:
PLOT DATE: 1/14/94

BRIDGE#1/JIMK/BRIDGE/MISC-DRAWS2000

APPROVED [signature] 1/14/94 BRIDGE ENGINEER

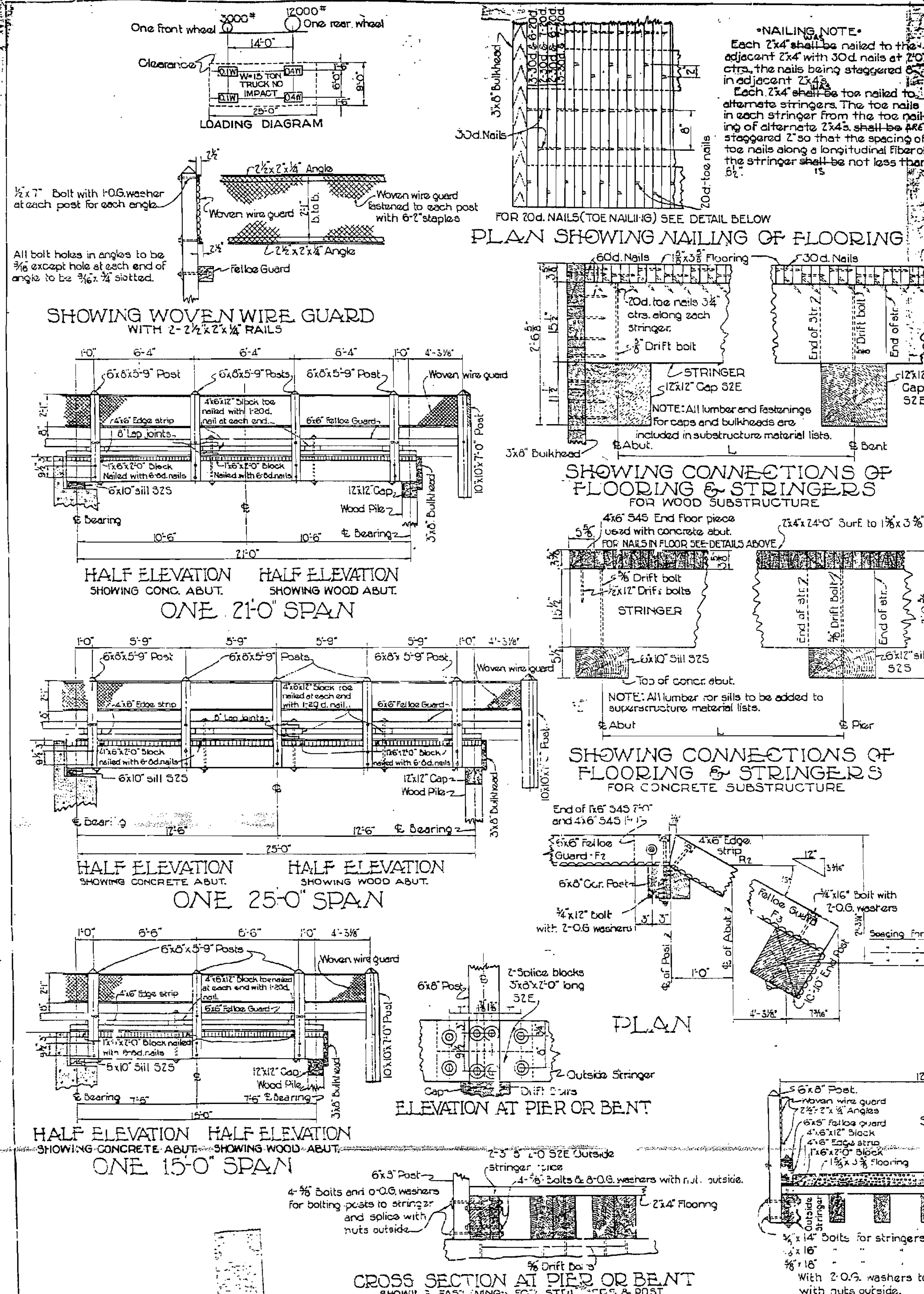
Dept. Revision 12-15-34: Railing & Felloe Guard revised for 15° flare.

Dept. Revision 10-16-33. Changed vertical felloe guard bolts and bolt from felloe guard to posts from 5/8" ϕ to 3/4" ϕ.

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
3	NEW MEXICO			4-12	

Dept. Rev. 7-18-33. Substituted "asphalt" for "creosote oil" in General Note Nº 4. Rev. 1-14-36 added note 13.

Dept. Rev. 9-29-33. Removed note calling for handrail posts to be dapped ¼" for steel hand rail angles.



QUANTITIES IN SUPERSTRUCTURE (USING WOVEN WIRE GUARD)

DESCRIPTION	L=15'0" Single Span PCS.	FT. B.M.	Double Span PCS.	FT. B.M.	Triple Span PCS.	FT. B.M.	L=21'0" Single Span PCS.	FT. B.M.	Double Span PCS.	FT. B.M.	Triple Span PCS.	FT. B.M.	L=25'0" Single Span PCS.	FT. B.M.	Double Span PCS.	FT. B.M.	Triple Span PCS.	FT. B.M.
Ballast-Edge strip 4"x6"x14'0" S4S							2	56	4	112	2	56	2	56	7	196	11	308
" " 4"x6"x16'0" "	2	64	2	64	4	128					5	160	2	64				
" " 4"x6"x18'0" "			2	72	2	72			2	72	2	72			1	36	1	36
" " 4"x6"x20'0" "							1	40										
Edge strip block 1"x6"x2'0" S4S	6	6	10	10	14	14	8	8	14	14	20	20	10	10	18	18	26	26
Felloe Guard 6"x6"x12'0" S4S	2	72	2	72	2	72	4	144	2	72	2	72	4	144	3	108	2	72
" 6"x6"x14'0" "	2	84							4	168	2	84	2	84	6	252	12	504
" 6"x6"x16'0" "			4	192	6	288	1	48	2	96	7	336			1	48		
Felloe Guard blocks 4"x6"x1'0" S4S	6	12	10	20	14	28	8	16	14	28	20	40	10	20	18	36	26	52
Posts 6"x8"x6'0" S4S	6	144	10	240	14	336	8	192	14	336	20	480	10	240	18	432	26	624
" 10"x10"x7'0" "	4	233	4	233	4	233	4	233	4	233	4	233	4	233	4	233	4	233
Flooring 2"x4"x24'0" Surf. to 1⅝"x3⅝"	119	1904	229	3664	340	5440	163	2608	318	5088	473	7568	193	3088	377	6032	562	8992
Stringers 6"x16"x16'0" S2E	13	1664	26	3328	39	4992												
" 8"x16"x22'0" "							13	3051	26	6101	39	9152						
" 10"x16"x26'0" "													13	4507	26	9013	39	13520
Outside stringer splice 3"x8"x2'0" S2E			4	16	8	32			4	16	8	32			4	16	8	32
*TOTAL FEET BOARD MEASURE		4183		7911		11635		6396		12336		18305		8446		16420		24399
Nº6 Woven wire guard including angles	53	Lin. Ft.	83	Lin. Ft.	113	Lin. Ft.	65	Lin. Ft.	107	Lin. Ft.	149	Lin. Ft.	73	Lin. Ft.	123	Lin. Ft.	173	Lin. Ft.
HARDWARE	PCS.	WEIGHT	PCS.	WEIGHT	PCS.	WEIGHT	PCS.	WEIGHT	PCS.	WEIGHT	PCS.	WEIGHT	PCS.	WEIGHT	PCS.	WEIGHT	PCS.	WEIGHT
Drift Bolts Stringers to caps ¾"x21"	26	47.5	52	95.0	78	142.5	26	47.5	52	95.0	78	142.5	26	47.5	52	95.0	78	142.5
Bolts (Felloe Guard-10"x10" Post) ¾"x16"	4	9.5	4	9.5	4	9.5	4	9.5	4	9.5	4	9.5	4	9.5	4	9.5	4	9.5
" (Posts to Felloe Guard) ¾"x12"	10	18.7	14	26.2	18	33.7	12	22.4	18	33.7	24	44.9	14	26.2	22	41.1	30	56.1
" (Posts to Stringer) ¾"x14"	12	17.3	16	23.0	20	28.8												
" (") ¾"x16"							18	25.8	24	38.6	32	51.5						
" (") ¾"x18"													20	35.4	32	56.6	44	77.9
" (Posts to Stringer & Splice) ¾"x16½"			8	13.2	16	26.4												
" (") ¾"x18½"									8	14.6	16	29.3						
" (") ¾"x20½"															8	16.1	16	32.2
" (Stringer to Splice) ¾"x11"			8	9.4	16	18.9												
" (") ¾"x13"									8	10.8	16	21.6						
" (") ¾"x15"															8	12.2	16	24.3
" (Felloe Guard to Stringers) ¾"x35"	6	28.5	10	47.4	14	66.4	8	38.0	14	66.4	20	94.9	10	47.4	18	85.5	26	123.4
" (Hand Rail to Posts) ½"x7"	20	10.4	32	16.6	44	22.9	24	12.5	40	20.8	56	29.1	32	16.6	56	29.1	80	41.6
" (Hand Rail to 10"x10" Posts) ½"x10½"	8	5.7	8	5.7	8	5.7	8	5.7	8	5.7	8	5.7	8	5.7	8	5.7	8	5.7
Staples Wire Guard to posts 2"	60	1.1	84	1.4	108	1.9	72	1.2	108	1.9	144	2.5	84	1.4	132	2.3	180	3.1
O.G. Washers ¾"	24	18.0	64	48.0	104	78.0	32	24.0	80	60.0	128	96.0	40	30.0	96	72.0	152	114.0
" ½"	28	14.0	40	20.0	52	26.0	32	16.0	48	24.0	64	32.0	40	20.0	64	32.0	88	44.0
30d.(Com.) Nails in Floor	1488	62.0	2863	119.3	4250	177.1	2038	84.9	3975	165.6	5913	246.4	2413	100.5	4713	196.4	7025	292.7
20d.(Com.) " "	774	23.0	1489	48.0	2210	71.3	1060	34.2	2067	66.7	3075	99.2	1255	40.5	2451	79.1	3653	117.9
20d.(Com.) Nails for Felloe Grd. Blocks	12	0.4	20	0.6	28	0.9	16	0.5	28	0.9	40	1.3	20	0.6	36	1.2	52	1.7
8d.(Com.) Nails for Edge Strip Blocks	36	0.3	60	0.5	84	0.8	48	0.5	84	0.8	120	1.1	60	0.6	108	1.0	156	1.5
O.G. Washers 1"	40	50.0	56	70.0	72	90.0	48	60.0	72	90.0	96	120.0	56	70.0	88	110.0	120	150.0
+TOTAL WT. OF HARDWARE		308.4		553.9		800.8		382.7		705.0		1027.5		451.9		844.7		1238.1

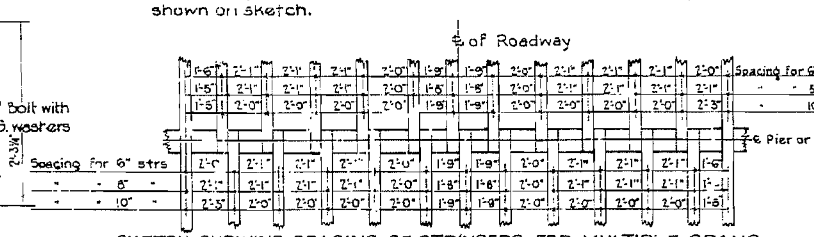
(a) * For concrete substructure deduct (6-Pcs. 2"x4"x24'0") from and add 2-Pcs. 4"x6"x24'0" S4S to above table.

(b) + For concrete substructure add 26 drift bolts ½"x12" (This makes additional hardware 17.3 Lbs. For each bridge)

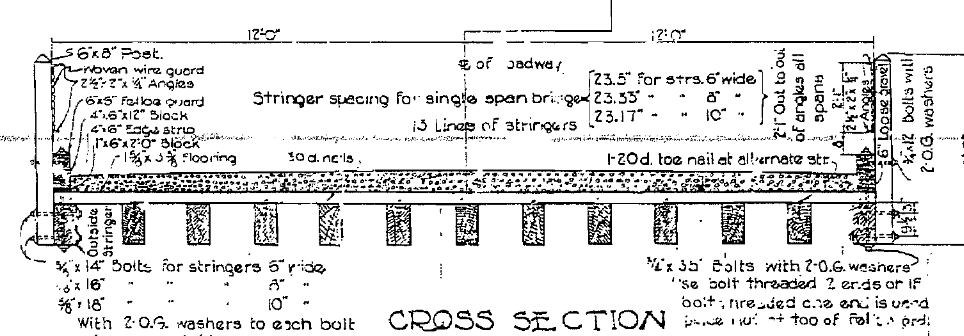
(c) All timber shown above including flooring to be cut to length except that 1"x6" edge strip blocks may be random lengths & cut to 2 Ft. lengths in field

(d) Framing diagrams are shown on sheet 5 of BT-24.

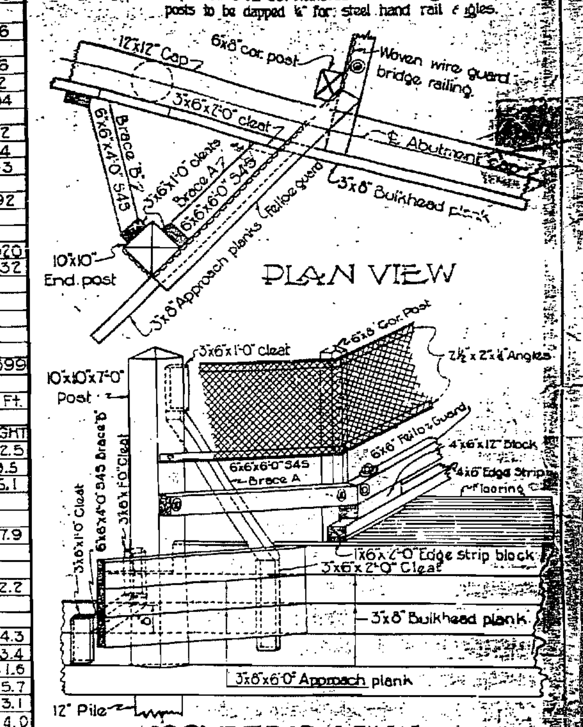
(e) For fill approaches use approach planks and braces to 10"x10" posts as shown on sketch.



SKETCH SHOWING SPACING OF STRINGERS FOR MULTIPLE SPANS
At abutment ends of end spans space centers of stringers as shown for single span bridges by slanting inside stringers in plan.



CROSS SECTION



ISOMETRIC VIEW
SHOWING BRACE TO 10"x10" POST

Braces to be used in fill approaches.
NOTE: Nail each cleat with 4-50d. nails. Nail end of each approach plank with 2-60d nails and end of each brace with 2-50 d. nails.

LUMBER REQUIRED FOR TWO APPROACHES

Approach Plank	12-Pcs. 3"x8"x6'0" Rough	144 Ft. B.M.
Brace B	1-Pc. 6"x6"x16'0" S4S	48
Brace A	2-Pcs. 6"x6"x12'0" S4S	72
Cleats	2-Pcs. 3"x6"x10'0" S4S	30
	TOTAL	294 Ft.B.M.

HARDWARE REQUIRED FOR TWO APPROACHES

96-50d. nails	6.8 Lbs.
48-60d. nails	4.1
TOTAL	10.9 Lbs.

•GENERAL NOTES•

① All timber shall be pressure creosoted 12 pounds per cubic foot in accordance with the New Mexico State Highway Specifications.

② All dapping, cutting, framing of lumber and timbers and boring of drift bolt holes in stringers shall be done before timber is pressure creosoted. Holes bored in field shall have dia. 1/16" less than diameter of bolt and shall be flushed with hot creosote oil before bolts are placed.

③ Timber shall meet the requirements of the 1927 Standard Specifications for grades of dense long leaf and short leaf Southern Yellow Pine of the Southern Pine Association.
Grades shall be as follows with no heartwood requirement and the amount of sap wood shall not be limited.
Stringers, caps, sills, substructure posts and brace blocks shall be dense structural square edge and sound timbers.
Bulkhead plank shall be dense structural square edge and sound plank.
Flooring shall be dense structural square edge and sound plank.
All other timbers and lumber shall be dense square edge and sound.
Loblolly, bull and old field pine or other species with porous, corky or spongy structure will not be accepted.

④ After floor is laid the top surface shall be thoroughly flushed with a coat of hot asphalt which shall be brushed in with a stiff brush or broom

⑤ At inside of felloe guard the washer and head of bolt connecting post to felloe guard shall be countersunk.

⑥ Cost of all hardware in place in finished bridge shall be included in price bid per M. of timber.

⑦ The top and bottom angles of the guard rail shall be given two field coats of white lead paint. The woven wire fabric shall be given one field coat of white lead paint.

⑧ Rail posts are included in and paid for as superstructure timber. Bid price for woven wire bridge railing shall include cost of steel angle rails.

⑨ For substructure see sheet Nº 2. When special substructure is used special drawings will be furnished.

⑩ All bolts to be standard machine bolts with cut threads and hexagon nuts.

⑪ All washers to be standard O.G. cast iron washers, with dimensions not less than the following:

Dia. bolt	Dia. Bottom	Dia. Top	Dia. Hole	Thickness
½"	2¼"	[illegible]	⅝"	[illegible]
⅝"	2[illegible]"	1"	[illegible]	[illegible]
¾"	3¼"	1¾"	⅞"	¾"

⑫ Where cleats are used drill 7/32" dia. or 3/16" dia. holes for the nails. The use of split or checked pieces for cleats will not be permitted.

13 Batter threads on all bolts after nuts are placed and tightened.

NOTE:
When Steel Channel Bridge Railing is called for on the Structure Location sheet, see sheet Nº 5 or Nº 7 of Serial BT-24 for Quantities in Superstructure, Details of Handrail and Framing Diagrams.
Woven Wire Guard Rail will be used only when so noted on the Structure Location Sheet.

NEW MEXICO
STATE HIGHWAY DEPARTMENT
STANDARD
TREATED TIMBER
BRIDGES
SUPERSTRUCTURE
SHEET Nº 1

BT-24

Designed: Detailed & Traced: Checked: 1931 5-23-1931

UP-T2 Nº 1-3-15-35 80

SP-80-7506(210) 4-12

14. Appendix E – Inspection Report

X X

Project Bridge Color Template

Bridge_Number: 00002

Proj_Doc_Date: 1/11/2016

PROJ_DOC_DESC Active

Proj_Control_Number:

Project_Number:

Document Type **INSPECTION REPORTS**

X **PB1** X

NMDOT

New Mexico Department of Transportation

Bridge Management Section **Bridge Inspection Report**

Bridge Number:	**000000000000002**	Inspection Date:	01/11/2016
SR:	80.3	SD/FO:	ND

IDENTIFICATION

Road Route Name:	CI-OLD US-66	Location (9):	0.25 MI W OF JCT NM-6
SHD District (2):	District 6		
Place Code (4):	Unknown	County Code (3):	61 VALENCIA
Feature Intersected (6):	BNSF RAILROAD	Mile Post (11):	0.621 mi
Latitude (16):	34° 57' 19"	Patrol No.	46-42
Project No:	UNKNOWN	Longitude (17):	107° 10' 49"

BRIDGE NOTES

Patrol 46-42, Valencia Co.: 9 simple spans ,21.5 ft, 2 at 21 ft, 18.75 ft, 52.5 ft, 19 ft,2 at 21 ft, 21.5 ft; Treated timber and rolled steel girders, treated timber deck, caps, columns and abutments; Concrete pier wall and cap at RR. Dry riprap on slopes. BNSF MP 50.06. Since last inspection of 1/22/2014 Type III Object Markers was replaced.

Directions:

CONDITION

Deck (58):	6 Satisfactory	Culvert (62):	N N/A (NBI)
Super (59):	6 Satisfactory	Channel/Channel Protection (61):	N N/A (NBI)
Sub (60):	6 Satisfactory		

APPRAISAL

Bridge Rail (36A):	1 Meets Standards	Approach Rail (36C):	1 Meets Standards
Transition (36B):	1 Meets Standards	Approach Rail Ends (36D):	1 Meets Standards
Str Evaluation (67):	5 Above Min Tolerable	Deck Geometry (68):	5 Above Tolerable
Underclearance, Vertical and Horizontal (69):	4 Tolerable		
Waterway Adequacy (71):	N Not applicable	Approach Alignment (72):	5 Above Tolerable
Scour Critical (113):	N Not Over Waterway		

	Team Leader		Reviewed By
Signature and Date	DEMETRIO TRUJILLO 01/11/2016	***Signature and Date***	

LOAD RATING AND POSTING

Inventory Rating Method (65):	2 AS Allowable Stress	Operating Rating Method (63):	2 AS Allowable Stress
Inventory Rating (66):	HS12.1	Operating Rating (64):	HS17.2
Design Load (31):	0 Other or Unknown	Posting (70):	5 At/Above Legal Loads
Posting Status (41):	P Posted for load		

AGE AND SERVICE

Year Built (27):	1934	Detour Length (19):	16.8 mi
Year Reconstructed (106):	1995	ADT (29):	216
Type of Service on (42A):	1 Highway	Year of ADT (30):	2015
Type of Service under (42B):	2 Railroad	Truck ADT (109):	15%
Lanes on (28A):	2	Future ADT (114):	261
Lanes under (28B):	0	Year of Future ADT (115):	2035
Route Posted Speed Limit:			

STRUCTURE TYPE AND MATERIALS

Number of Approach Spans (46):	0	Membrane (108B):	0 None
Main Span Material Design (43 A/B):	7 Wood or Timber	Deck Protection (108C)	None
	02 Stringer/Girder	Number of Spans Main Unit (45):	9
Deck Type (107):	8 Wood or Timber	Wearing Surface (108A):	6 Bituminous
Approach Span Material (44A):	_	Approach Span Material (44B):	-1

GEOMETRIC DATA

Length Max Span (48):	53.15 ft	Structure Length (49):	217.00 ft
Curb/Sdwlk Width L (50A):	0.00 ft	Curb/Sidewalk Width R (50B):	0.00 ft
Width Curb to Curb (51):	23.00 ft	Width Out to Out (52):	23.00 ft
Approach Roadway Width (32): (w/ shoulders)	23.50 ft	Median (33):	0 No median
		Structure Flared (35):	0 No flare
Skew (34):	0.00°	Horizontal Clearance (47):	23.00 ft
Minimum Lateral Underclearance R (55):	9.90 ft	Minimum Vertical Clearance Minus:	0
Minimum Lateral Underclearance L (56):	0.00 ft	Minimum Vertical Clearance Plus:	21.3

CLASSIFICATION

Defense Highway (100):	0 Not a STRAHNET hwy	NBIS Length (112):	
Direction of Traffic (102):	2 2-way traffic	Functional Class (26):	Long Enough
Highway System (104):	0 Not on NHS	Historical Significance (37):	4 Hist sign not determin
Owner (22):	01 State Highway Agency	Custodian (21):	01 State Highway Agency

INSPECTION

Frequency (91):	24 months	Inspection Date (90):	1/11/2016
Next Inspection:	1/11/2018	FC Frequency (92A):	
FC Inspection Date (93A):	NA	Next FC Inspection:	NA
UW Frequency (92B):		UW Inspection Date (93B):	NA
Next UW Inspection:	NA	SI Frequency (92C):	
SI Date (93C):	NA	Next SI:	NA

NMDOT MISC. DATA

Old Bridge Number:		Known Utilities:	N
Stay In Place Forms:	No	Stay In Place Form Type:	0
Overlay Thickness:	0.00	Culvert Fill Depth:	0

SIP Notes:

No SIP forms.

Approach Roadway Condition:

Asphalt pavement has transverse and longitudinal cracks up to 1/8 inch. Transition is smooth. No sholders. Settlement at SW corner. Embankments have steep slopes with minor vegetation and some areas of heavy settlement. Bridge signing: 2 - Weight Limit and 0 - Narrow Bridge Signs (2 missing) and 8 - Type III Object Markers.

Channel & Channel Protection:

Embankment: Riprap is in condition with some areas of lost rock, gravel has areas of moderate erosion, with vegetation. Slope is still steep. No waterway / Over Railroad.

Recommendation and Inspection Notes:

Date 2016-01-11- Present: D.Trujillo, P.Ssalazar; Clear, Breezy, 30 Deg. RECOMMENDATIONS: Long Term: Patrol: Replace Narrow bridge signs. Repair protective fence on bridge rail in span 5 above railroad tracks. Structure was placed on STIP FY 2017 CN 6101000

ELEMENT CONDITION STATE DATA

Str Unit	Elm/Env	Description	Unit	Total Qty	% in 1	Qty. St. 1	% in 2	Qty. St. 2	% in 3	Qty. St. 3	% in 4	Qty. St. 4
0	**31/2**	**Timber Deck**	**sq.ft**	**4,991.00**	**100%**	**4,991.00**	**0%**	**0.00**	**0%**	**0.00**	**0%**	**0.00**
Notes	**Top of timber deck is covered with asphalt and is unobservable and concrete patches covering a steel plate to anchor the timer girder repairs. Underside of deck has some areas of decay and some minor weathering of the outside edges and heavy water stains.**											
0	510/2	Wearing Surfaces	sq.ft	4,991.00	100%	4,991.00	0%	0.00	0%	0.00	0%	0.00
Notes												
0	**107/2**	**Steel Opn Girder/Beam**	**ft**	**591.00**	**100%**	**591.00**	**0%**	**0.00**	**0%**	**0.00**	**0%**	**0.00**
Notes	**Steel girders over the railroad are in good condition and blast plates have minor rust with heavy soot build-up.**											
0	515/2	Steel Protective Coating	sq.ft	5,200.00	100%	5,200.00	0%	0.00	0%	0.00	0%	0.00
Notes												
0	**111/2**	**Timber Open Girder**	**ft**	**2,316.00**	**76%**	**1,749.07**	**24%**	**565.93**	**0%**	**1.00**	**0%**	**0.00**
Notes	**Timber girders have repaired areas with 8' x 8' x 5/8" steel plates as anchors form the 4' x 5" x 5/8" steel straps and 16" x 5" x 5/8" cradles in span 2, girder 4, span 3 on girders 3, 4, 5, 6, span 4 on girders 4,5 and 6 span 6 on girders 5, 6, 8 and 10, span 7 on girders 5, 6, 7, span 8 on girders 5, 6, 8 and span 9 on girders 5, 6, 7, and 8 all repaired areas appear to be in good condition with girder 12 at abutment 1 with heavy crushing and a diagonal split, the remaining timber girders have isolated heavy checks and splits with moderate weathering on the outside girders.**											
0	**206/2**	**Tim Col or Pile Ext**	**each**	**44.00**	**77%**	**34.00**	**23%**	**10.00**	**0%**	**0.00**	**0%**	**0.00**
Notes	**Timber piles have heavy checks and splits with moderate weathering and water stains. Areas of surface rot and discoloration.**											
0	**210/2**	**Re Conc Pier Wall**	**ft**	**72.00**	**100%**	**72.00**	**0%**	**0.00**	**0%**	**0.00**	**0%**	**0.00**
Notes	**Pier walls have isolated horizontal, vertical and map cracks up to 1/32" with isolated small spalls up to 6" x 2" on pier 1..**											
0	**216/2**	**Timber Abutment**	**ft**	**59.00**	**83%**	**48.97**	**17%**	**10.03**	**0%**	**0.00**	**0%**	**0.00**
Notes	**Timber abutments have moderate checks in splits with a 1/32" cracks over timber pile 3 at abutment 1, unable to see if the check is full depth with gaps up to 1/2" at the caps splices and heavy weathering and minor water stains, diagonal bracing has heavy deterioration. Wingwalls have heavy checks and splits.**											
0	**234/2**	**Re Conc Pier Cap**	**ft**	**79.00**	**100%**	**79.00**	**0%**	**0.00**	**0%**	**0.00**	**0%**	**0.00**
Notes	**Concrete cap have isolated horizontal, vertical and map cracks up to 1/32" with isolated spalls up to 6" x 2".**											
0	**235/2**	**Timber Pier Cap**	**ft**	**269.00**	**89%**	**239.00**	**11%**	**30.00**	**0%**	**0.00**	**0%**	**0.00**
Notes	**Timber pier caps have moderate checks and splits with moderate weathering and some minor rot and water stains. Ragged vertical crack at abutment 1 - pile 3.**											
0	**313/2**	**Fixed Bearing**	**each**	**22.00**	**100%**	**22.00**	**0%**	**0.00**	**0%**	**0.00**	**0%**	**0.00**
Notes	**Steel fixed bearings are in good condition.**											
0	515/2	Steel Protective Coating	sq.ft	10,753.15	100%	10,753.15	0%	0.00	0%	0.00	0%	0.00
Notes												
0	**330/2**	**Metal Bridge Railing**	**ft**	**459.00**	**100%**	**459.00**	**0%**	**0.00**	**0%**	**0.00**	**0%**	**0.00**
Notes												
0	515/2	Steel Protective Coating	sq.ft	2,954.40	100%	2,954.40	0%	0.00	0%	0.00	0%	0.00
Notes												
0	**7370/2**	**Rip Rap**	**sq.ft**	**8,902.00**	**93%**	**8,302.00**	**7%**	**600.00**	**0%**	**0.00**	**0%**	**0.00**
Notes	**Loose rock rip-rap has some minor vegetation growth and missing rock with some minor exposure of canvas. Exposed canvas at Abutment 1.**											
0	**7371/2**	**Guardrail**	**(LF)**	**3,514.01**	**100%**	**3,514.01**	**0%**	**0.00**	**0%**	**0.00**	**0%**	**0.00**
Notes	**12" W rail on Steel I beam posts and blocks, no paint, 100% surface rust with breakaway anchors. Numerous waves on approaches from settlement.**											

PAST INSPECTION

Inspection Date: 01/11/2016 Type: 1 Regular NBI

Inspector: TRUJILLO, DEMETRIO Pontis User Key: DTRUJI06 DEMETRIO TRU

Scope:

NBI: ☑ Other: ☐ Element: ☑

Underwater: ☐ Fracture Critical: ☐

INSPECTION NOTES

Structure was placed on STIP FY 2017 CN 6101000

Bridge Posted at 6 Tons; 12/19/05. Beams repaired 06/07. Bridge Posted at 2 Axle: 15 Tons, 3 Axle 15 Tons, 5 Axle: 27 Tons.

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Appendix M. Team Meeting Notes with BNSF

NMDOT

PN/CN 6101000
Cibola County Road C084 (Old US 66)
Bridge Replacement

Meeting Minutes

Subject:	Team Meeting with BNSF
Date:	Wednesday, September 21, 2016
Location:	Project Site
Attendees:	Rais Rizvi, NMDOT CRD Lisa Boyd Vega, NMDOT District 6 Bryan D. Peters, NMDOT District 6 TSE Stephanie Parra, NMDOT District 6 Bob Crossno, NMDOT Bridge Genevieve Head, NMDOT Env. Isaac Chavez, NMDOT CRD Rob Fine, NMDOT Rail Jerome Maestas, NMDOT Rail Danton Bean, HDR Antonio Nunez, HDR Patrick Hoskins, BNSF

The following meeting notes were developed based on the best recollection of HDR staff present as to the topics discussed during the meeting. Please provide prompt response of any revisions or additions to these meeting notes.

Objective:

The overall purpose of the meeting was to coordinate with BNSF on project development.

Discussion:

1. General
   a. Introductions (See Attendees List above.)

2. Purpose of Meeting
   a. Initiate a dialogue with BNSF

3. Scope of Work
   a. Background on Suwanee Bridge No. 2
      i. MOA with ATSF in 1933
      ii. Bridge constructed in 1934
      iii. NMDOT transferred the road to Valencia County in 1961; Valencia County never accepted the road.
      iv. MOA with ATSF in 1994 for Bridge Reconstruction
      v. Bridge reconstructed in 1995
      vi. Bridge has been posted for weight restrictions
      vii. Bridge is narrow and does not meet current standards
      viii. Bridge does not meet current BNSF vertical clearance requirements
      ix. Bridge does not provide space for future BNSF tracks

   b. Phase I Design
      i. BNSF future plans

1. A future third track is requested. At the time of the meeting the location was not known. **Action Item: BNSF to provide location of future track in 1 to 2 weeks.**

ii. Study document will consider alternatives (No Build, Rehabilitation, Build)

1. Question to BNSF "Is a temporary construction at grade crossing a possibility?" BNSF response, "Yes, it is a possibility."
2. Question to BNSF "Is a permanent at grade crossing a possibility?" Yes, it is a possibility, but not preferred. Typically BNSF will accept the closure of 2 at grade crossings for the opening of a new at grade crossing."

iii. Schedule

1. Public meeting is scheduled for the middle of October.
2. The Study document is currently scheduled to be completed by Nov. 7, 2016.
3. The environment phase will begin after the alternative is selected.
4. Preliminary design will be completed by Sept. 2017.

c. Discussion Items

i. BNSF may participate in cost of bridge for future track similar to the Belen, Main St. Bridge. **Action Item: BNSF will discuss cost sharing and respond to NMDOT.**

ii. Bridge and Roadway have cultural significance. NMDOT Env. Bureau expressed preference to keep overpass feel and if possible the feel of the bridge (railing).

iii. Study document needs to discuss alternatives and leaving the bridge in place is not an option because 1. Vertical clearance is inadequate, 2. Horizontal clearance under the bridge is not adequate for future track, and 3. Maintenance cost and risk will continue.

New Mexico DEPARTMENT OF TRANSPORTATION

CN 6101000
Suwanee Bridge Replacement
County Road C084
September 21, 2016 @ 10 AM
Project Site

-Agenda-

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1) **General**
   a) Introduction & Sign-in sheet
2) **Purpose of Meeting**
   a) Initiate a dialogue with BNSF regarding
      - BNSF Future Plans (additional tracks)
      - MOA with BNSF and time frame
      - Engineering issues
3) **Scope of Work**
   a) Background on Suwanee Bridge #2
      - MOA with ATSF 1933
      - Bridge constructed 1934
      - NMDOT donates road to Valencia County 1961
      - Cibola County created 1981 road becomes C084
      - MOA with ATSF regarding partial Bridge reconstruction 1994
      - Bridge partially reconstructed in 1995
   b) Phase I Design
      i) Temporary at grade crossing?
      ii) Permanent at grade crossing?
   c) Schedule
4) **Discussion Items**
   a) MOA with BNSF and time frame
   b) BNSF/NMDOT Construction cost sharing

HDR

NMDOT

PN/CN 6101000

Cibola County Road C084 (Old US 66)

NMDOT

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BRYAN D. PETERS	NMDOT-D6-TSE	(505)240 2485	BRYAND. " " "

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