

**TRAFFIC DESIGN MEMORANDUM
PROJECT 23558/23559
M-21-B: US 350
OTERO COUNTY, COLORADO**

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Prepared for:



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Project Description

The CDOT Region 2 Bridge Bundle Design Build Project consists of the replacement of a total of nineteen (19) structures bundled together as a single project. These structures are rural bridges on essential highway corridors (US 350, US 24, CO 239 and CO 9) in southeastern and central Colorado. These key corridors provide rural mobility, intra- and interstate commerce, movement of agricultural products and supplies, and access to tourist destinations. The design build project consists of seventeen (17) bridges and two (2) Additionally Requested Elements (AREs) structures.

The fourteen (14) of the structures in this design build project are jointly funded by the USDOT FHWA Competitive Highway Bridge Program grant and the Colorado Bridge Enterprise (Project No. 23558). The remaining five (5) structures are funded solely by the Colorado Bridge Enterprise (Project No. 23559). These projects are combined to form one design-build project. The two ARE structures are part of the five bridges funded by the Colorado Bridge Enterprise.

The nineteen bridges identified to be included in the 'Region 2 Bridge Bundle' were selected based on similarities in the bridge conditions, risk factors, site characteristics, and probable replacement type, with the goal of achieving economy of scale. Seventeen of the bridges being replaced are at least 80 years old. Five of the bridges are Load Restricted, limiting trucking routes through major sections of the US 24 and US 350 corridors. The bundle is comprised of nine timber bridges, four concrete box culverts, one corrugated metal pipe (CMP), four concrete I-beam bridges, and one I-beam bridge with corrugated metal deck.

Project Site

Structure M-21-B is at US 350 milepost 51.682 in Otero County, Colorado, and crosses the Tree Arroyo. Categorized as a R-B Rural Highway in the CDOT State Highway Access Code, US 350 traverses rolling terrain with a 65 mph posted speed limit. In the area of the structure, the highway is approximately 29 feet wide, with two 11-foot lanes and no separation of opposing traffic. US 350 is also a Colorado Scenic & Historic Byway known as the Santa Fe Trail. **Figure 1** shows the project area.

Traffic Data

This segment of US 350 has a 2020 Annual Average Daily Traffic (AADT) of 520 vehicles per day, and a projected 2040 AADT of 726 vehicles per day, according to CDOT's Online Transportation Information Systems (OTIS). Of these daily traffic volumes, 17.7% are heavy vehicles. This roadway has the capacity to accommodate 2,350 vehicles every hour, resulting in a volume to capacity ratio of 0.03. In the year 2040, the volume to capacity ratio results in 0.04.

Two crashes were recorded in the vicinity of the structure location (mileposts 50.00 to 52.00) between January 1, 2015 and December 31, 2019. No crashes occurred at the structure itself. There does not appear to be any pattern of crash type, contributing factors, or impairment of drivers. The lack of any crash related pattern results in no specific modified design features.

Construction Phasing Alternatives

Three construction phasing alternatives have been identified to complete the construction of the proposed replacement structure.



Figure 1: Vicinity Map

Complete Closure with Detour Route

The grant application states that the roadway should not be closed during construction due to lengths of the detour routes. A complete closure of this structure location is not practical as there is no ideal detour route to maintain traffic operations.

Single Lane – Two Way Traffic Operations

Phasing the construction to accommodate a single lane of traffic operations along the route at all times appears to be feasible at this structure location. CDOT's Region 2 Lane Closure Strategy allows for a single lane closure at all hours of the day at this structure location, so long as the lane closure does not exceed ¼ mile. Structure M-21-B is currently a two-lane bridge. Preliminary structural and hydraulic analysis have determined that this structure may be replaced with a single span bridge. In Phase 1, the southern portion of the bridge deck will be removed, and half of the new girders will be placed clearing the existing piers. Traffic will be placed into a single lane, two-way traffic operation on the existing pavement and bridge. In Phase 2, the remainder of the bridge including the piers will be demolished, and the remaining bridge girders will be constructed. Traffic will be shifted onto the new bridge, remaining in a single lane, two-way operation. **Figure 2** illustrates the phasing suggested to accommodate this alternative. By accommodating traffic operations in the current alignment, two-way traffic would utilize a single lane, likely by use of temporary traffic signals. Standards and guidance from Typical Application 12 of the Manual on Uniform Traffic Control Devices shall be followed. The use of temporary traffic signals must follow the 630 Traffic Signal (Portable) special provision. Preliminary traffic analysis indicates an acceptable level of service (LOS) of less than 55 seconds of delay (LOS D or better) on average, given the roadway traffic volumes, length between traffic signals, and speed limit. An acceptable level of service indicates the use of this alternative as feasible.

For the preliminary evaluation we are assuming the following variables: 1000-foot maximum distance between stop bars, speed limit of 40 mph, and a timing plan that uses a 45 second all red and enough green in each direction to clear the queue each cycle. The timing plan we are using for the evaluation is conservative to evaluate the worst-case scenario. The Contractor will be required to submit a traffic control plan to CDOT with a proposed timing plan for evaluation before implementation.

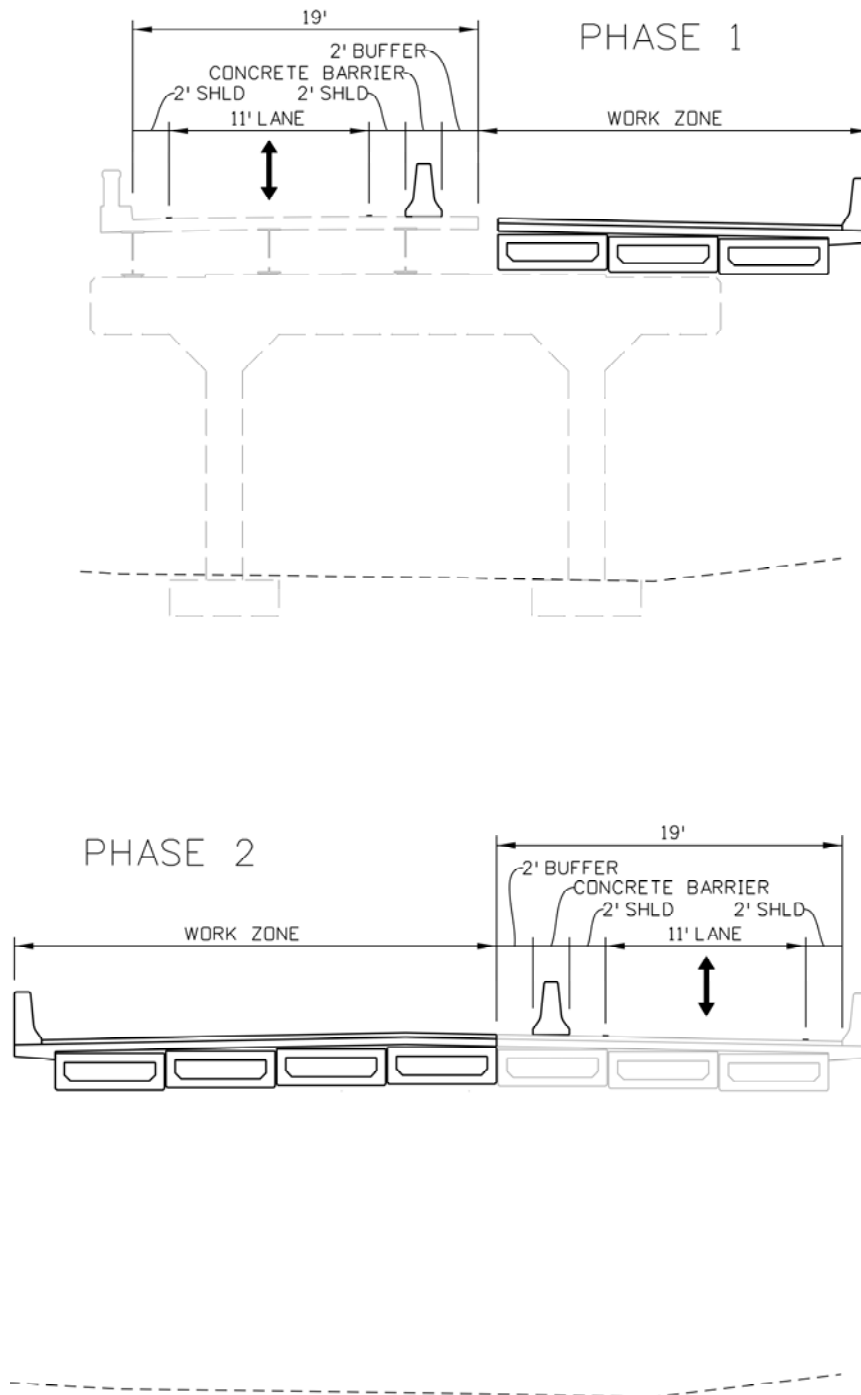


Figure 2: Single Lane – Two Way Phasing

Shoofly

A shoofly alternative was evaluated at this structure location. Enough space exists within CDOT's right-of-way to accommodate a two-lane shoofly on either side of the existing structure, with the southern side preferred to avoid existing utilities. Given the wide drainage area of the Tree Arroyo, significant impacts to accommodate a shoofly are anticipated.

Conclusions:

The recommended traffic control at this structure location, is a single lane, two-way operation. A shoofly alternative would introduce significant impacts, and a detour route is not practical at this structure location. Given that the new structure can be built while maintaining traffic operations on the existing structure, the impacts to traffic and the surrounding area will be minimized.