

SAFE SYSTEM PILOT APPLICATION SUMMARY

APPLYING SAFE SYSTEM SOLUTIONS IN A RURAL TRIBAL COMMUNITY

CASE STUDY | JUNE 2024

To advance implementation of the Safe System Approach (SSA), Federal Highway Administration (FHWA) developed three (3) resources for measuring SSA alignment—Safe System Project-Based Alignment Framework, Safe System Policy-Based Alignment Framework, and Safe System Roadway Design Hierarchy. These resources were introduced, applied, and refined through a series of eight (8) pilot workshops. The Safe System Pilot Application Summaries provide an overview of each pilot.

The [Project-Based Alignment Framework](#) provides a systematic basis for assessing and scoring crash exposure, crash likelihood, and crash severity along a roadway, in order to characterize alignment with SSA principles for the Safe Roads and Safe Speeds elements and uses safety prompts to characterize alignment in the remaining SSA elements (Safe Users, Safe Vehicles, Post-Crash Care) and Equity.

The Project-based Framework can be used to:

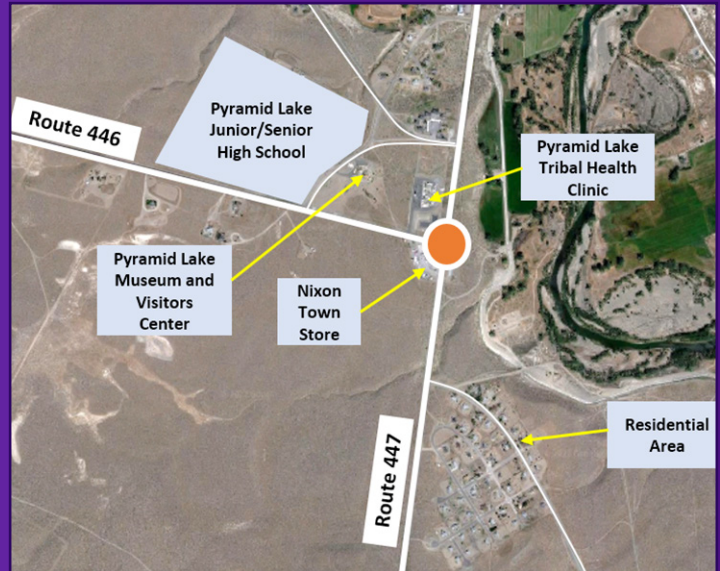
- ✓ **ASSESS EXISTING CONDITIONS** and compare proposed project alternatives through a Safe System lens.
- ✓ **IDENTIFY RISK FACTORS** and infrastructure elements that impact safety at a location.
- ✓ **CONSIDER STRATEGIES** to improve SSA alignment across all five SSA elements.





TOWN OF NIXON PILOT BACKGROUND

Nixon is a rural town in northwest Nevada that is home to the Pyramid Lake Paiute (Tribe). Located along the Truckee River and northeast of the City of Reno, Nixon (Town) is adjacent to two State highway routes, State Route 446 and State Route 447, that intersect at the south end of Town. The State highways are used for access to popular destinations like Pyramid Lake, the Black Rock Desert, and High Rock Canyon, but also bisect the community, which has development along each side of the highways (see figure 1). Every year in late August and early September, both routes experience very heavy traffic associated with the annual Burning Man event held in the Black Rock Desert that attracts tens of thousands of visitors from around the world, including an increase in larger vehicles (e.g., recreational vehicles, trucks, equipment). During the event, and throughout the rest of the year, there are persistent concerns about vehicle speeds into and through the community, as well as limited infrastructure to accommodate all users, particularly near the school and visitor center.



Source: Google Maps.

Figure 1. Map. Study area map.



THE APPROACH

The Safe System pilot applied the Project-Based Alignment Framework to the Town's roadway network. The project team worked with key stakeholders and safety champions from the Tribe, the Town, and Nevada Department of Transportation (NDOT) to evaluate the existing conditions along the two highways, as well as identify potential improvements, using the Project-Based Alignment Framework and a field review in August 2022 during the Burning Man event. The considerations are summarized below.

Safe Roadways and Safe Speeds

- ▶ **Crash Exposure** – Crash exposure is a measure of the extent, based on volume, length, and distance, to which users navigating a facility could be involved in a crash. The roadways in the Town have vehicular volumes at or below 1,300 Annual Average Daily Traffic (AADT) and no roadways exceed two lanes. However, there is a heightened exposure for vulnerable road users along and crossing the roadway, as the community relies heavily on active transportation (e.g., walking, biking, rolling) for mobility. Figure 2 shows a midblock crossing location along Route 446 near the school. Throughout the study area, sidewalks or paths are not provided including at crossing locations.



Source: Google Maps.

Figure 2. Photo. Midblock Pedestrian Crosswalk along Route 446.

- ▶ **Crash Likelihood** – Crash likelihood accounts for the risk factors that influence the probability of a severe crash. This may include elements that influence the opportunity for conflicts between users and the potential for human mistake or error. Some of the risk factors identified by the project team included roadside conditions with steep drop offs and culverts and other fixed objects adjacent to the pavement (as

shown in figure 3), no shoulders, sidewalks, or paths for walking or bicycling, and little to no roadway, intersection, or crosswalk lighting. Additionally, wide driveways are present along both Route 446 and Route 447. Multiple wide driveways increase crash likelihood and pedestrian exposure to vehicle conflicts. Consequently, the existing road network approaching and through the Town had higher scores within this component of the Project-Based Alignment Framework, meaning it was less aligned with Safe System principles, indicating there are opportunities to address identified risk factors with a range of Safe System-focused improvements.

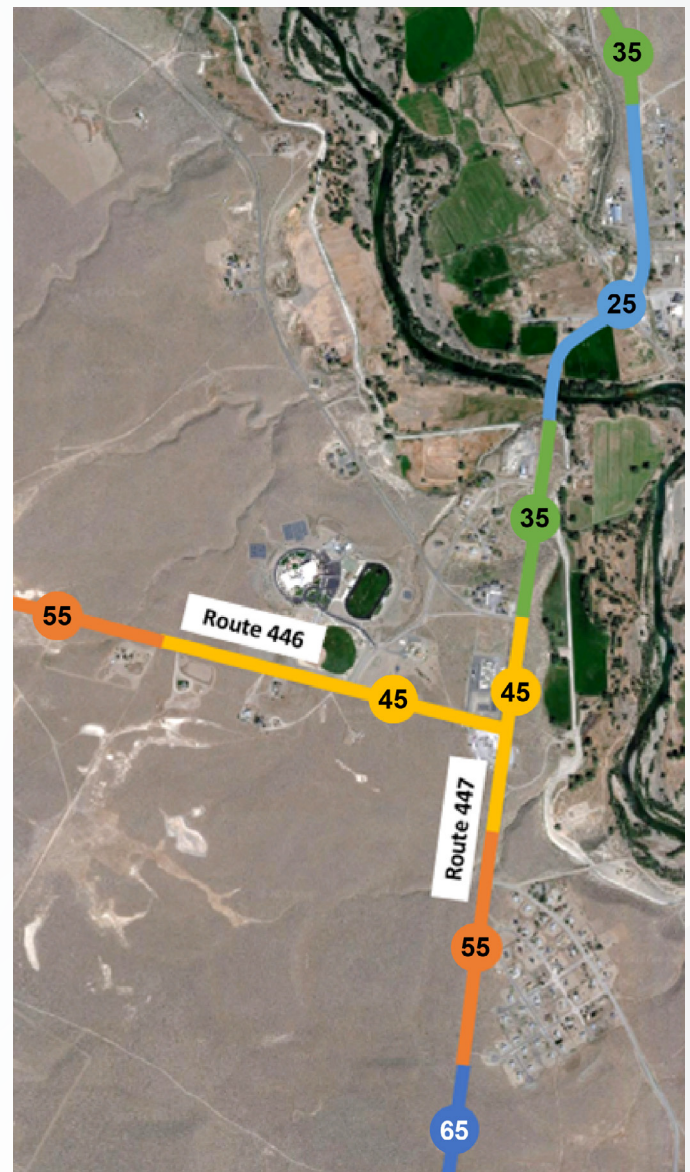


Federal Highway Administration.

Figure 3. Photo. Culvert on east side of Route 447 (looking south).

- ▶ **Crash Severity** – Crash severity focuses on the factors that impact the probability of a serious or fatal injury should a crash occur. A major tenet of the Safe System Approach is managing kinetic energy by reducing collision speed, angle, or mass, to reduce trauma on the human body. Through the study intersection, the posted speed limit is 45 miles per hour (mph); however, just over a half mile south of the intersection, the speed limit is 65 mph with a short transition to 55 mph in between. The speed limit zones are illustrated in figure 4. Speed limits continue to drop north of the intersection. Approaches upon entering the Town do not provide visual cues or countermeasures to alert drivers to reduce their speed. Past speed studies

conducted by NDOT along both Route 446 and Route 447 reveal persistent and worsening speed trends, with some locations seeing vehicles exceeding the posted speed limit by over 15 mph. These higher speeds also led to higher scores in the Project-Based Alignment Framework, especially for vulnerable road users that have higher exposure within the Town.



Source: Google Maps.

Figure 4. Map. Speed Limit Zones along Route 446 and Route 447.

Safe Road Users

The rural context of the Town (refer to figure 2), combined with fairly open highways, create conditions that result in higher speeds. Other than speed limit signs, there are no infrastructure countermeasures or features to suggest to motorists that they should reduce their speeds as they enter the Town. Furthermore, the highways bisect the Tribal community, which relies heavily on walking and biking for mobility, including children who walk or bike to school. The Town lacks infrastructure to accommodate these users. There are visible, worn paths along Route 447 which indicates heavy foot and bicycle traffic along the side of the roadways. Local law enforcement indicated that road user behaviors in Tribal communities tend to be very different than in other areas and compliance with traffic laws are often difficult to enforce.

Safe Vehicles

The roadways do not have ample space (e.g., unpaved shoulders) for vehicle enforcement, breakdowns, or to properly accommodate vehicle pull offs. While the intersection of Route 446 and Route 447 has wide corner

radii to accommodate turning trucks, designs within the Town do not accommodate truck mobility to that extent.

Post-Crash Care

The Town does have a Health Clinic, but the closest urgent care is approximately 50 miles south in Fernley. There is also limited space for emergency vehicle response to pull off near crash scenes.

Equity

The community relies heavily on walking and bicycling for mobility; however, the Town lacks infrastructure to accommodate these users including sidewalks, crosswalks at intersections, and midblock crossings (i.e., crosswalk striping, detectable warning pad, Americans with Disabilities Act (ADA)-compliant ramps, signage, connection to adjacent sidewalks). The infrastructure favors road users in motor vehicles and does not equitably provide safe and efficient accommodations for all road users including those that walk, bicycle, or roll.



OPPORTUNITIES

To improve the Safe System alignment of Routes 446 and 447 through the Town of Nixon, the project team identified various opportunities to increase safety by addressing SSA elements and equity. Recommendations included gateway and intersection treatments, speed management strategies, pedestrian improvements, roadside improvements, and access management improvements.

- ▶ Installing gateway treatments along Route 447 approaching the Town from both directions will alert drivers to slow down and support **Safe Speeds** through the community.
- ▶ Intersection treatments like all-way stop control or roundabouts will encourage **Safe Speeds** and contribute to **Safe Roadways**. Furthermore, the roundabout option will reduce the impact angle of crashes, thus lessening the severity of crashes that do occur.
- ▶ Speed feedback signs, reduced speed ahead warning signs, speed limit adjustments, and other speed management strategies will help generate more **Safe Road Users** while supporting **Safe Speeds** in the area.
- ▶ Providing sidewalks or shared use paths in the area will improve the **Equity** in and around the Town by accommodating all road users, not just those in motor vehicles. Additionally, pedestrian and bicycle facilities and signage like advanced warning signs or Rectangular Rapid Flashing Beacons (RRFB) will contribute to **Safe Road Users** by increasing attentiveness to the bicyclists and pedestrians while providing a dedicated space for pedestrians and bicyclists to safely use the transportation system.
- ▶ Roadside improvements such as shoulder widening and stabilization as well as wider edge lines and rumble strips will reduce crash likelihood in the area and provide **Safe Roadways**. With these accommodations, **Post Crash Care** could also be promoted by providing space for emergency services to provide care outside of the roadway when a crash does occur. In some areas where the shoulders are stabilized, larger vehicles may be accommodated supporting **Safe Vehicles**.
- ▶ Access management modifications like narrowing the driveways or relocating driveways away from the intersection will reduce the crash likelihood and contribute to **Safe Roadways**.



OUTCOMES

As a result of this effort, NDOT has instituted the following:

Prioritizing Safe System Alignment

NDOT is using the outputs of the Project-Based Alignment Framework to reconsider how potential locations may be prioritized and how alternatives should be assessed. NDOT is working internally with the planning and scoping groups to identify the best place to insert the Safe System Framework into the project development process.

Promoting Shared Responsibility for Safety

A comprehensive approach to safety means supporting local and Tribal agencies and using all available resources to achieve safety goals. NDOT provided important technical expertise as part of the pilot project and is providing support to the Pyramid Lake Paiute Tribe in obtaining grant funds to help advance improvements recommended from the study.



APPLYING THE SAFE SYSTEM PROJECT-BASED FRAMEWORK IN YOUR AGENCY

The [Safe System Project-Based Alignment Framework](#) can be used to assess Safe System alignment of any potential project location or set of proposed alternatives. The following is a summary of the lessons learned from the Town pilot that may benefit other agencies applying the Project-Based Alignment Framework.

- ▶ **TAKE A PROACTIVE APPROACH TO SAFETY**—Agencies can use the risk-based assessment provided within the Project-Based Alignment Framework to avoid relying on observed crashes, which are subject to annual fluctuation and underreported in many areas throughout the country.
- ▶ **REVIEW ALL POTENTIAL RESOURCES**—Agencies may take advantage of all potential avenues for resources and funding, especially for unique project locations and unique Safe System solutions. Agencies can use tools such as the Project-Based Alignment Framework to support the implementation of safety treatments where historic quantitative measures may not tell the full story.
- ▶ **BUILD TEAMS OF CHAMPIONS**—Comprehensive input on potential risks and treatments are best derived from diverse groups of practitioners and those navigating the local roadway system daily. Agencies may meet with stakeholders and local representatives for projects early and often, while continuing to engage the public.

“Be sure to include your Safe System partners including, but not limited to, Tribes, local municipalities, MPOs, etc. Your law enforcement partners, public health advocates and community groups can help identify some of these risk areas that may have limited crash data”

– LACEY TISLER

Chief Traffic and Safety Engineer at Nevada Department of Transportation

For more information about the Safe System Project-Based Framework and other FHWA Safe System related tools and resources, please visit:
<https://highways.dot.gov/safety/zero-deaths>.

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U.S. Department of Transportation
Federal Highway Administration

ZERO IS OUR GOAL
A SAFE SYSTEM IS HOW WE GET THERE