ADOT

*State Highway-Rail Grade Crossing*

# *Action Plan*


# *Final Report*

**February 2022**

# *State Highway-Rail Grade Crossing* ***Action Plan***

# Final Report

Prepared for

ADOT

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In Association With

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RAILPROS

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# List of Acronyms

AADT ..... Annual Average Daily Traffic
ACC ..... Arizona Corporation Commission
ACIS ..... Arizona Crash Information System
ADOT ..... Arizona Department of Transportation
APS ..... Accident Prediction and Severity Model
BNSF ..... Burlington Northern Santa Fe Railway
COG ..... Council of Governments
EB ..... Empirical Bayes
E2C2 ..... Estimated Engineering Construction Cost
FAST ..... Fixing America's Surface Transportation Act
FHWA ..... Federal Highway Administration
FRA ..... Federal Railroad Administration
GIS ..... Geographic Information System
HSIP ..... Highway Safety Improvement Program
IIJA ..... Infrastructure Investment and Jobs Act
MAG ..... Maricopa Association of Governments
MPD ..... Multimodal Planning Division
MPO ..... Metropolitan Planning Organization
MUTCD ..... Manual on Uniform Traffic Control Devices
PMT ..... Project Management Team
PRS ..... Preliminary Risk Score
RISC ..... Railroad Investigation and Safety Course
RRS ..... Refined Risk Score
RTP ..... Regional Transportation Plan
SHRAP ..... State Highway-Rail Grade Crossing Action Plan
TAC ..... Technical Advisory Committee
TDMS ..... Traffic Data Management System
UP ..... Union Pacific Railroad
USDOT ..... U.S. Department of Transportation
URR ..... Utility and Railroad Engineering Section
ZIBN ..... Zero Inflated Negative Binomial


# Executive Summary

## Executive Summary

The Arizona Department of Transportation (ADOT) has a continuing interest in improving safety at highway-rail crossings in the state of Arizona. For purposes of this plan, a highway-rail grade crossing is defined as the intersection of any roadway (not just a state highway) open to public traffic with railroad tracks that are at the same level or grade. Safety is paramount at highway-rail grade crossings because they are locations where trains can conflict with motor vehicles, pedestrians, and bicyclists. The Federal Railroad Administration (FRA) requires all states and the District of Columbia to update or develop and implement state highway-rail grade crossing action plans (SHRAPs or SAPs).

### *Purpose*

The purpose of Arizona's SHRAP is to identify and develop strategic approaches that ADOT can use to improve safety and reduce fatal and other incidents at highway-rail grade crossings. This new Arizona SHRAP builds upon prior statewide efforts to enhance safety at the nearly 700 active and open public highway-rail grade crossings throughout Arizona.

The development of this SHRAP included:

- Coordination with identified stakeholders and the public to receive input and feedback
- Analysis of relevant highway-rail crossing data
- Identification of trends and high-risk crossings
- Prioritization of specific crossings with treatment recommendations
- Compilation of methodologies, findings, and recommendations

## Goal and Objectives

The overarching goal for this SHRAP is to:

***Improve safety at public crossings where railroads interact with motor vehicles and other modes of transportation.***

The following measurable objectives help identify how to determine if this goal is being achieved:

Reduce the number and rate of incidents at passive crossings (locations that may have static signs and pavement marking but are without warning devices that are activated when an oncoming train is detected)

Reduce the number and rate of incidents at active crossings (locations with warning devices such as gate arms, flashing lights, and bells that are activated when an oncoming train is detected)

Reduce the number and rate of crossing incidents involving all modes of transportation

Reduce the number and rate of incidents, injuries, and fatalities involving trespassers at at-grade crossings

Reduce the severity of incidents (fatalities, injuries, and property damage) at locations with reoccurring incidents

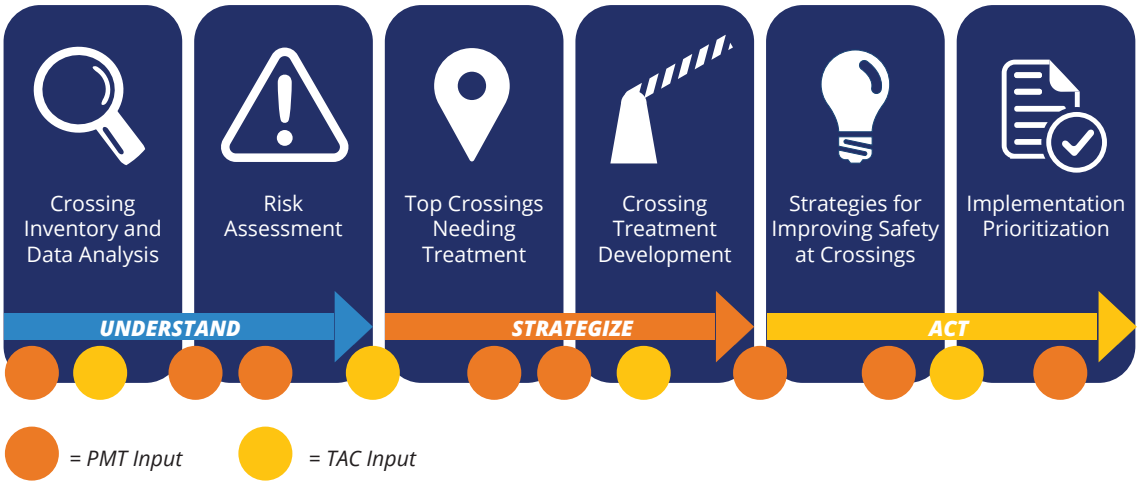
## SHRAP Planning Process

The SHRAP planning process was divided into three main phases (Understand, Strategize, and Act), which consist of six elements. The SHRAP report is structured around the three project phases with individual chapters for each element. Three interim working papers were developed during the planning process. Two groups reviewed the working papers and advised the project team at key points during the project:

- ***Project Management Team (PMT)*** is a small group made up of ADOT staff from the Multimodal Planning Division (MPD) and Utility and Railroad Engineering Section (URR). This group met bi-weekly to facilitate ongoing interaction between the project team and ADOT staff directly responsible for implementing the SHRAP.
- ***Technical Advisory Committee (TAC)*** is a larger group made up of representatives from ADOT, railroad companies, FRA, Federal Highway Administration (FHWA), Arizona Corporation Commission (ACC), Arizona Operation Lifesaver, and several municipal and county agencies. This group met at key points during the project and provided broader input and perspectives.

The planning process is summarized in **Figure ES-1** and shows the points in the planning process where the PMT and TAC provided input.

**Figure ES-1: SHRAP Planning Process**




## Crossing Inventory

Physical characteristics and historical crash data of each active and open public highway-rail crossing were obtained in November 2021 through the FRA Highway-Rail Crossing Inventory, the FRA Highway-Rail crash database, and the Arizona Crash Information System (ACIS) database.

Key findings from the data analysis include:

- Within Arizona, 698 active and open public highway-rail crossings exist
- Of these 698 crossings, 52 percent are in urban areas and 48 percent are in rural areas
- There are 226 crossings (32.5 percent) that have passive warning devices, 41 crossings (5.9 percent) that have flashing lights, and 431 (61.6 percent) that have lights and gates
- A total of 115 highway-rail crashes were reported during the five-year period of 2016 through 2020
- Most crashes resulted in no injury; however, 19 (16.5 percent) were fatal crashes
- The most common highway user actions reported at the time of the crash were "stopped on tracks" and "went around the gates"
- Of the 115 crashes, 83 (72 percent) occurred at crossings with lights and gates, 29 (25 percent) occurred at crossings with flashing lights, and three (less than three percent) occurred at passive crossings When normalized by the level of exposure at each crossing, the highest crash rate was observed at crossings with flashing lights only (no gates)
- Most highway-rail crossings did not have a history of crashes in the past five years. Crashes were reported at 61 crossings, 15 of which recorded more than one collision
- Three "hot-spot" areas were identified:
  - ***Flagstaff*** – forty-seven percent of all fatal crashes occurred at three crossings in Flagstaff; most of these crashes involved pedestrians
  - ***Grand Avenue*** – forty-four percent of all crashes occurred at crossings along Grand Avenue in the Phoenix metropolitan area; however, no fatal crashes were reported
  - ***The intersection of 27th Avenue and Thomas Road (south of Grand Avenue)*** – seventeen percent of all crashes occurred at this intersection in Phoenix; however, no fatal crashes were reported

## Risk Assessment

A risk assessment methodology was developed for prioritizing Arizona's highway-rail grade crossings. The methodology applies the 2020 FRA New Model for Highway-Rail Crossing Accident Prediction, with modifications to incorporate historical crash data, sight distance limitations, roadway geometry, number of lanes, and number of main railroad tracks.

## Top Crossings Needing Treatment

The top ranked crossings, as determined by the aforementioned risk assessment, were reviewed to determine if there are already programmed or recently completed treatments that would address the identified risk or if new treatments need to be recommended. With a goal of identifying 15 crossings where treatments are to be developed as part of the SHRAP effort, the top 26 crossings were reviewed as 11 of those crossings already have programmed or recently completed treatments.

The top 15 crossings needing treatment are shown in **Table ES-1** along with the recommended treatments at each crossing. In some instances, a phased approach is recommended; near-term (within 10 years) and long-term (beyond 10 years) treatments are identified.

**Table ES-1: Summary of Recommended Crossing Treatments**

| Crossing | Recommended Crossing Treatment |
|---|---|
| ***025590V:*** Bethany Home Rd, West of 51st Ave, Glendale | Near-term: Pre-signalization; additional lighting<br>Long-term: Grade separation; crossing closure |
| ***025132G:*** San Francisco St, South of Historic Rte 66, Flagstaff | Automatic pedestrian gates with skirts; addition of pedestrian skirts to vehicle gates; decorative fencing; "second train" blank-out signage; improved lighting |
| ***025129Y:*** Fanning Dr, South of Historic Rte 66, Flagstaff | Automatic outbound vehicle gates with pedestrian skirts; decorative fencing; "second train" blank-out signage; improved lighting |
| ***025418A:*** 59th Ave & Glendale Ave, Glendale | Automatic vehicle gates; automatic pedestrian gates with skirts |
| ***025133N:*** Beaver St, South of Historic Rte 66, Flagstaff | Automatic pedestrian gates with skirts; addition of pedestrian skirts to vehicle gates; decorative fencing; "second train" blank-out signage; improved lighting |
| ***025131A:*** Ponderosa Pkwy, South of Historic Rte 66, Flagstaff | Pre-signalization; improved lighting |
| ***025017A:*** Navajo Blvd/Apache Ave, South of Joy Nevin Ave, Holbrook | Replace sidewalk; extend fencing; replace concrete crossing panel; pre-signalization |
| ***025023D:*** Obed Rd, Joseph City | Repair crossing surface and approach |
| ***025651J:*** Greenway Rd, North of Grand Ave, Surprise | Blank-out signage; pedestrian flashing lights and bells; sidelights; restriping |
| ***741560C:*** University Dr, West of Ash Ave, Tempe | Automatic pedestrian gates and flashers with barriers |
| ***741708G:*** Main St, South of Casa Grande-Picacho Hwy, Eloy | Automatic pedestrian gates and flashers with barriers; pedestrian detectable warning surface and signage |
| ***741100A:*** Massingale Rd, East of I-10 Frontage Rd, Marana | Crossing closure |
| ***741098B:*** Cortaro Farms Rd, East of I-10 Frontage Rd, Marana | Grade separation |
| ***741825C:*** Val Vista Dr, South of Warner Rd, Gilbert | Near-term: Pedestrian flashers, detectable warning surface, and signage; make sidewalk perpendicular to tracks<br>Long-term: Grade separation |
| ***741814P:*** McQueen Rd, South of Baseline Rd, Gilbert | Near-term: Pedestrian fencing, detectable warning surface, and signage; make sidewalk perpendicular to tracks<br>Long-term: Grade separation |

## *Planning-Level Cost Estimates*

Preliminary cost estimates for the grade crossing treatments were prepared for high-level budgeting purposes and are shown in **Table ES-2.**

**Table ES-2: Planning-Level Cost Estimates**

| Crossing | Planning-Level Cost Estimate (2022) |
|---|---|
| ***025590V:*** Bethany Home Rd, West of 51st Ave, Glendale | Near-term: $740,000<br>Long-term: $108.56 million<br>(per Maricopa Association of Governments [MAG] Regional Transportation Plan [RTP]) |
| ***025132G:*** San Francisco St, South of Historic Rte 66, Flagstaff | $590,000 |
| ***025129Y:*** Fanning Dr, South of Historic Rte 66, Flagstaff | $1.06 million |
| ***025418A:*** 59th Ave & Glendale Ave, Glendale | $2.44 million |
| ***025133N:*** Beaver St, South of Historic Rte 66, Flagstaff | $590,000 |
| ***025131A:*** Ponderosa Pkwy, South of Historic Rte 66, Flagstaff | $710,000 |
| ***025017A:*** Apache Ave, South of Joy Nevin Ave, Holbrook | $1.61 million |
| ***025023D:*** Obed Rd, Joseph City | $600,000 |
| ***025651J:*** Greenway Rd, North of Grand Ave, Surprise | $200,000 |
| ***741560C:*** University Dr, West of Ash Ave, Tempe | $1.07 million |
| ***741708G:*** Main St, South of Casa Grande-Picacho Hwy, Eloy | $1.10 million |
| ***741100A:*** Massingale Rd, East of I-10 Frontage Rd, Tucson | $80,000 |
| ***741098B:*** Cortaro Farms Rd, East of I-10 Frontage Rd, Marana | $100.00 million (per Town of Marana) |
| ***741825C:*** Val Vista Dr, South of Warner Rd, Gilbert | Near-term: $330,000<br>Long-term: $24.70 million (per MAG RTP) |
| ***741814P:*** McQueen Rd, South of Baseline Rd, Gilbert | Near-term: $310,000<br>Long-term: $24.30 million (per MAG RTP) |

## *Strategies for Improving Safety at Crossings*

Specific strategies, with corresponding actions, have been developed as part of the SHRAP to help meet the goal and objectives. These strategies have been grouped into categories covering the four Es of highway safety:

- Evaluation Strategies:
  - Strategy 1: Recalculate the Refined Risk Score Every Five Years
  - Strategy 2: Conduct Diagnostic Evaluations at High-Risk Crossings
  - Strategy 3: Improve Data Accuracy
- Engineering Strategies:
  - Strategy 1: Consider Crossing Closures and Separations
  - Strategy 2: Identify Locations for Conventional Highway-Rail Crossing Countermeasures
  - Strategy 3: Identify Locations for Unconventional Highway-Rail Crossing Countermeasures
  - Strategy 4: Address Rural Crossing Needs
  - Strategy 5: Enhance the Arizona Supplement to the Manual on Uniform Traffic Control Devices (MUTCD) to Better Address Highway-Rail Crossings

- Education Strategies:
  - Strategy 1: Support Rail Crossing Safety Public Education and Awareness Efforts
  - Strategy 2: Encourage Reporting of Trains Blocking Crossings
  - Strategy 3: Maintain Regular Agency Coordination
- Enforcement Strategies:
  - Strategy 1: Support Active Enforcement at High-Risk Crossings
  - Strategy 2: Encourage Attendance at Railroad Investigation and Safety Courses

## *Recommended Crossing Treatment Implementation Prioritization*

A set of implementation prioritization criteria was developed and used to prioritize the order in which recommended crossing treatments should be implemented using ADOT's future Railway-Highway Crossings (Section 130) Program funding. Treatments at the 15 crossings were pre-screened based on their likelihood of eligibility for Section 130 funding. This screening eliminated the 741098B (Cortaro Farms Road) crossing from further consideration.

The recommended near-term implementation prioritization into ADOT's Section 130 Program for the crossing treatments at the identified high-risk locations is as follows:

1. San Francisco St, South of Historic Rte 66, Flagstaff
2. Beaver St, South of Historic Rte 66, Flagstaff
3. Bethany Home Rd, West of 51st Ave, Glendale (near-term treatment)
4. Fanning Dr, South of Historic Rte 66, Flagstaff
5. Ponderosa Pkwy, South of Historic Rte 66, Flagstaff
6. 59th Ave & Glendale Ave, Glendale
7. Greenway Rd, North of Grand Ave, Surprise
8. Apache Ave, South of Joy Nevin Ave, Holbrook
9. Main St, South of Casa Grande-Picacho Hwy, Eloy
10. Massingale Rd, East of I-10 Frontage Rd, Tucson
11. University Dr, West of Ash Ave, Tempe
12. McQueen Rd, South of Baseline Rd, Gilbert (near-term treatment)
13. Val Vista Dr, South of Warner Rd, Gilbert (near-term treatment)
14. Obed Rd, Joseph City

Implementation prioritization order and the scope of treatments could change before actual implementation. Factors such as future crash trends, agency funding availability, and changes in the crossing area (traffic volumes, land use, etc.) could influence future programming. This proposed implementation prioritization does not represent a commitment to programming but serves as a guide based on the best available information at this time. Implementation prioritization is independent of potential cost share/agency match as that is unknown currently.

Systemic treatments for rural crossings are recommended to facilitate treatment identification and implementation. The two priority systemic treatment options for rural crossings are upgrading to concrete crossing surfaces and installing active warning devices. A 10 percent set-aside target of Section 130 funding to provide systemic treatments to rural crossings should be considered.

# 2 Introduction

## Introduction

Railroad operations at the federal level are governed by the Federal Railroad Administration (FRA). FRA was created by the Department of Transportation Act of 1966 and strives to "enable the safe, reliable, and efficient movement of people and goods for a strong America, now and in the future" (see https://railroads.dot.gov/). To do this, the FRA promotes safety to reduce fatalities and serious injuries at highway-rail grade crossings.

For purposes of this plan, a highway-rail grade crossing is defined as the intersection of any roadway (not just a state highway) open to public traffic with railroad tracks that are at the same level or grade. Railroad tracks are utilized by trains carrying passengers, freight, and livestock. Safety is paramount at highway-rail grade crossings because they are locations where trains can conflict with motor vehicles, pedestrians, and bicyclists.

On December 14, 2020, the FRA issued a final rule in response to the Fixing America's Surface Transportation Act (FAST). This final rule requires all states and the District of Columbia to update or develop and implement state highway-rail grade crossing action plans (SHRAP or SAP) (see Federal Register Volume 85, No. 240). The final SHRAP submittal deadline is February 14, 2022.

### *Purpose*

Arizona's population continues to grow. Between 2010 and 2020, Arizona's population increased by 12 percent according to the U.S. Census. The population of Arizona reached 7.3 million residents in 2020 and is projected to reach 9.2 million residents by 2040. Population increases have historically generated increases in travel on the public highway network, and this trend is expected to continue in the future. Therefore, it is crucial to continue to promote safety at highway-rail grade crossings.

The Arizona Department of Transportation (ADOT) has a continuing interest in improving safety at highway-rail crossings in the state of Arizona. In 2007, ADOT was involved in creating the State of Arizona Rail Safety & Security Resource Guide, which was intended to reduce train-vehicle collisions and trespassing incidents.

The purpose of Arizona's SHRAP is to identify and develop strategic approaches that ADOT can use to improve safety and reduce fatal and other incidents at highway-rail grade crossings. This new Arizona SHRAP builds upon the 2007 document and recent statewide efforts to enhance safety at the nearly 700 active and open public highway-rail grade crossings throughout Arizona.

The development of this SHRAP included:

- Coordination with identified stakeholders and the public to receive input and feedback
- Analysis of relevant highway-rail crossing data
- Identification of trends and high-risk crossings
- Prioritization of specific crossings with treatment recommendations
- Compilation of methodologies, findings, and recommendations

## Focus

The focus of this SHRAP is road user safety at public highway-rail grade crossings where public roadways intersect with the general railroad system within Arizona. It does not include highway-rail grade crossings of privately-owned roadways even though the public may still have access to these crossings. It also does not include any highway-rail grade crossings of publicly-owned roads that are not part of the public highway network (e.g., crossings located within the secure areas of U.S. military installations) or where railroad tracks are considered inactive and not open to use.

Urban rail transit systems (e.g., light-rail and trolley) that run on their own rail infrastructure are not under FRA jurisdiction. As such, this SHRAP does not address highway-rail crossings of urban rail transit systems in Arizona.

## Goal and Objectives

The overarching goal for this SHRAP is to:

***Improve safety at public crossings where railroads interact with motor vehicles and other modes of transportation.***

The following measurable objectives help identify how to determine if this goal is being achieved:

Reduce the number and rate of incidents at passive crossings (locations that may have static signs and pavement marking but are without warning devices that are activated when an oncoming train is detected)

Reduce the number and rate of incidents at active crossings (locations with warning devices such as gate arms, flashing lights, and bells that are activated when an oncoming train is detected)

Reduce the number and rate of crossing incidents involving all modes of transportation

Reduce the number and rate of incidents, injuries, and fatalities involving trespassers at at-grade crossings

Reduce the severity of incidents (fatalities, injuries, and property damage) at locations with reoccurring incidents

More specific strategies, with corresponding actions, have been developed as part of the SHRAP to help meet the goal and objectives. These strategies have been grouped into categories covering the four Es of highway safety, which are Evaluation, Engineering, Education, and Enforcement, and are presented in Chapter 6 of this document.

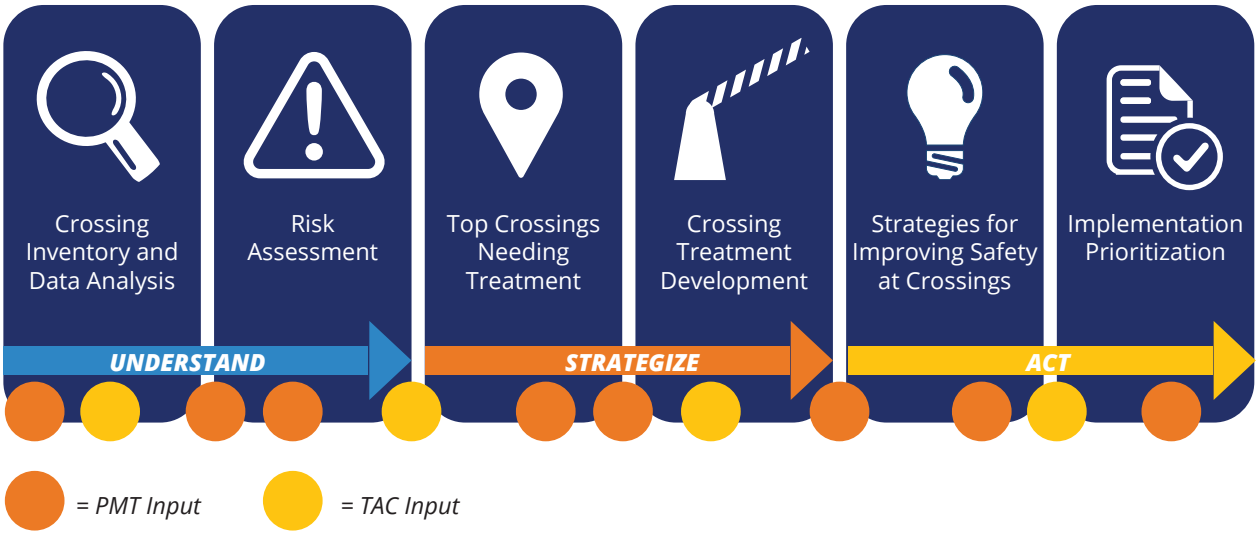
## *SHRAP Planning Process*

The SHRAP planning process was divided into three main phases (Understand, Strategize, and Act), which consist of six elements. The SHRAP report is structured around the three project phases with individual chapters for each element. Three interim working papers were developed during the planning process. Two groups reviewed the working papers and advised the project team at key points during the project:

- ***Project Management Team (PMT)*** is a small group made up of ADOT staff from the Multimodal Planning Division (MPD) and Utility and Railroad Engineering Section (URR). This group met bi-weekly to facilitate ongoing interaction between the project team and ADOT staff directly responsible for implementing the SHRAP.
- ***Technical Advisory Committee (TAC)*** is a larger group made up of representatives from ADOT, railroad companies, FRA, Federal Highway Administration (FHWA), Arizona Corporation Commission (ACC), Arizona Operation Lifesaver, and several municipal and county agencies. This group met at key points during the project and provided broader input and perspectives.

The planning process is summarized in **Figure 1** and shows the points in the planning process where the PMT and TAC provided input.

**Figure 1: SHRAP Planning Process**




# 3 Understand

## Crossing Inventory and Data Analysis

Physical characteristics and historical crash data of each active and open public highway-rail crossing were obtained in November 2021 through the FRA Highway-Rail Crossing Inventory, the FRA Highway-Rail crash database, and the Arizona Crash Information System (ACIS) database. A list of the identified 698 active and open public crossings and their associated attributes is provided in ***Appendix A***. A summary of highway-rail crossing characteristics and historical crashes reported in Arizona for 2016 through 2020 is provided in the subsequent sections.

### *Highway-Rail Crossing Characteristics*

The FRA Highway-Rail Crossing Inventory was reviewed to gather physical characteristics of each crossing, including:

- Annual average daily traffic volume (AADT)
- Number of trains per day
- Train speed
- Urban/rural designation
- Crossing surface material
- Number of highway lanes
- Number of main tracks
- Warning devices

The study team found that some data gaps exist within the FRA inventory database, including missing, erroneous, and outdated data. Where available, the AADT of each location was obtained, along with the year in which the data was collected. Of the historical traffic volume data available, 201 crossings (28.8 percent) had AADT data obtained prior to 2000, 324 (46.4 percent) had AADT data obtained between 2000 and 2010, 166 (23.8 percent) had AADT data obtained after 2010, and seven (1.0 percent) locations did not have associated AADT data. All 698 highway-rail grade crossings were reviewed using aerial imagery and statewide traffic count data (where available) from the ADOT Traffic Data Management System (TDMS). If historical traffic count data was missing, outdated, or otherwise erroneous, an estimate was developed based on nearby traffic volumes, surrounding land use, and access. In December 2021, TAC members provided updated highway traffic volume and train data at several locations, which is reflected in this analysis and has since been incorporated into FRA's Highway-Rail Crossing Inventory.

Of the active and open public crossings, 52 percent are in urban areas, while the remaining 48 percent are in rural areas. The locations of the active and open public crossings are shown in **Figure 2** and high-level statistics of the 698 crossings are shown in **Figure 3.**

TAC members identified 10 crossings that they consider active and open public crossings that are missing from the FRA Highway-Rail Crossing Inventory query for active and open public crossings. These missing crossings were not included in the analysis because additional analysis is needed to confirm why these crossings were excluded from the queried data. The missing crossing locations are listed at the end of ***Appendix A*** for reference.

## *Highway-Rail Crossing Crash History*

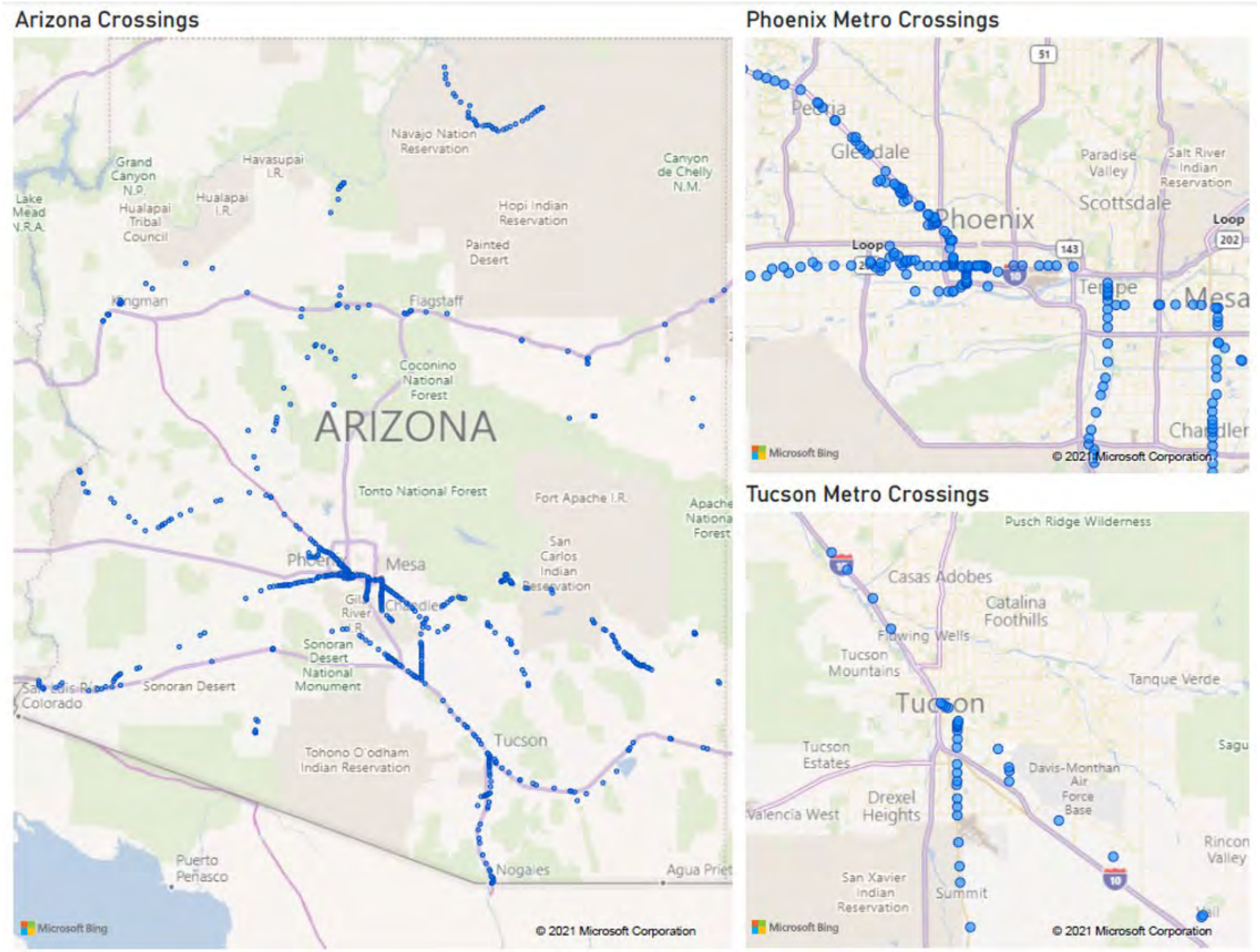
The review of crashes involving rail vehicles for 2016 through 2020 used two data sources: the FRA Highway-Rail Crossing and ADOT ACIS crash databases. The FRA data consists of the highway-rail crashes as reported by the railroad companies. A total of 113 crashes were reported by FRA in Arizona for 2016 through 2020. Of these, 102 crashes occurred at the 698 public grade crossings considered in this project. Data from the ADOT ACIS crash database was reviewed to supplement the FRA data and identify any additional crashes involving rail vehicles and highway users. There are several differences between the databases; the ADOT ACIS database does not include crashes between rail vehicles and pedestrian/bicyclists, does not include crashes under $1,000 in property damage only, and may not fully capture hit-and-run highway-rail crashes involving highway vehicles that fled the scene.

Identification of train-related crashes within the ADOT ACIS crash database involved the following screening process:

1. Filter all crashes by first harmful event; include "railway vehicle train engine" and "light railway railcar vehicle" (Note: Although light-rail crossings are not included in this evaluation, "light railway railcar vehicle" was incorrectly coded often for heavy rail crossings)
2. Filter all crashes by junction relation; include "railway grade crossing"
3. Filter all crashes by control type; include "railroad crossing device"
4. From the group of crashes identified in the steps above, filter to include only crashes that occurred within 500 feet of an existing highway-rail grade crossing

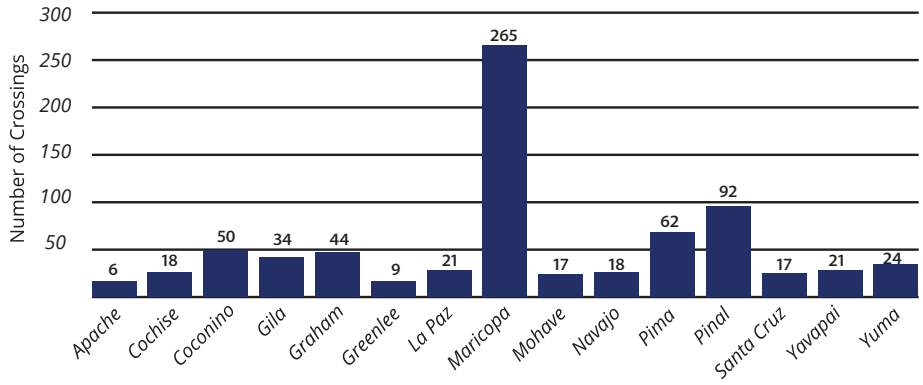
In reviewing the ADOT ACIS crash data for 2016 through 2020, it was determined that 952 crashes involved a first harmful event with a rail vehicle, occurred at a railway grade crossing, or at a railroad crossing device. There were 53 ACIS crashes that matched with crashes in the FRA dataset. When refined further to those crashes occurring within 500 feet of the crossing, another 13 ACIS crashes were identified. Using both data sources, a total of 115 crashes were selected for analysis in this project. A diagram of this process is shown in **Figure 4.**

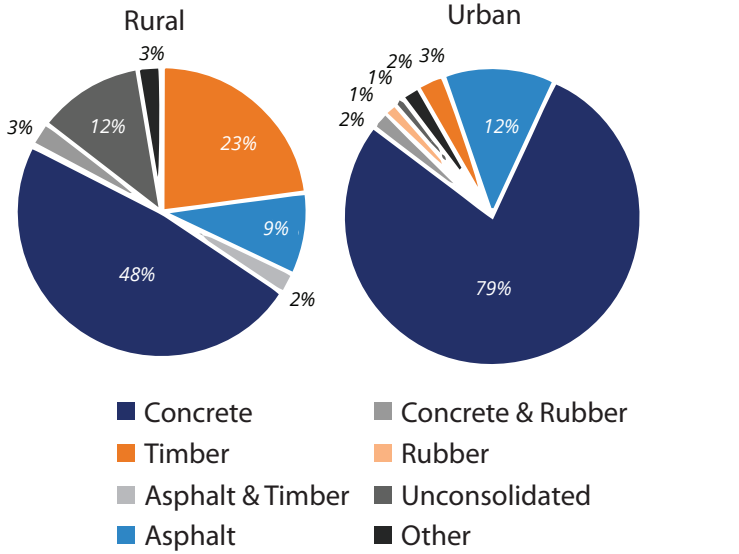
## Figure 2: Active and Open Public Crossing Locations

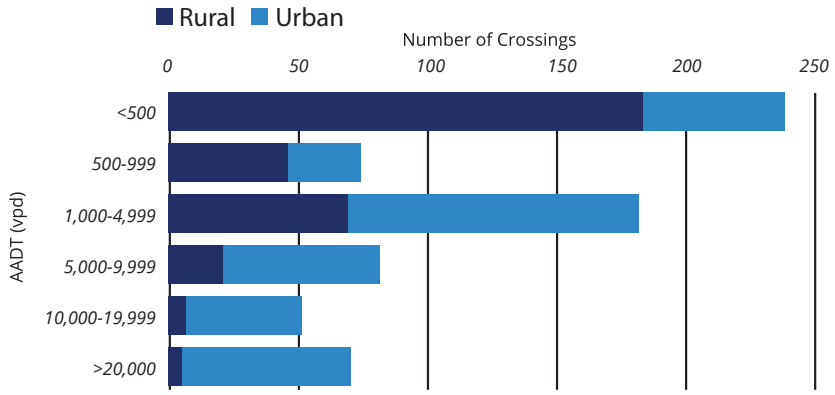


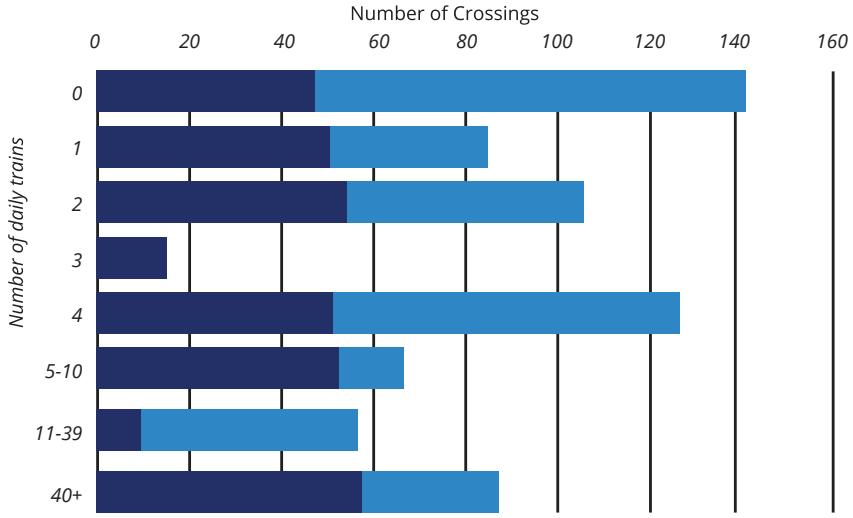

*Source: FRA and ADOT*

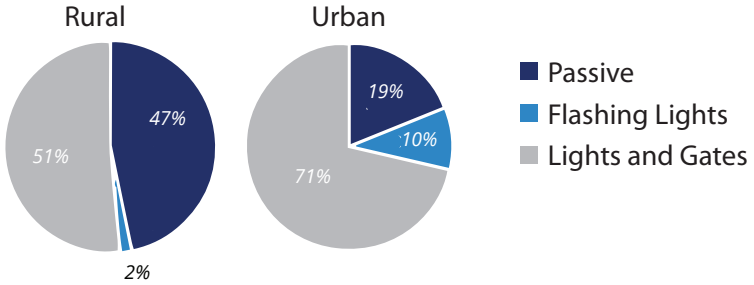
## Figure 3: Active and Open Public Crossing Statistics



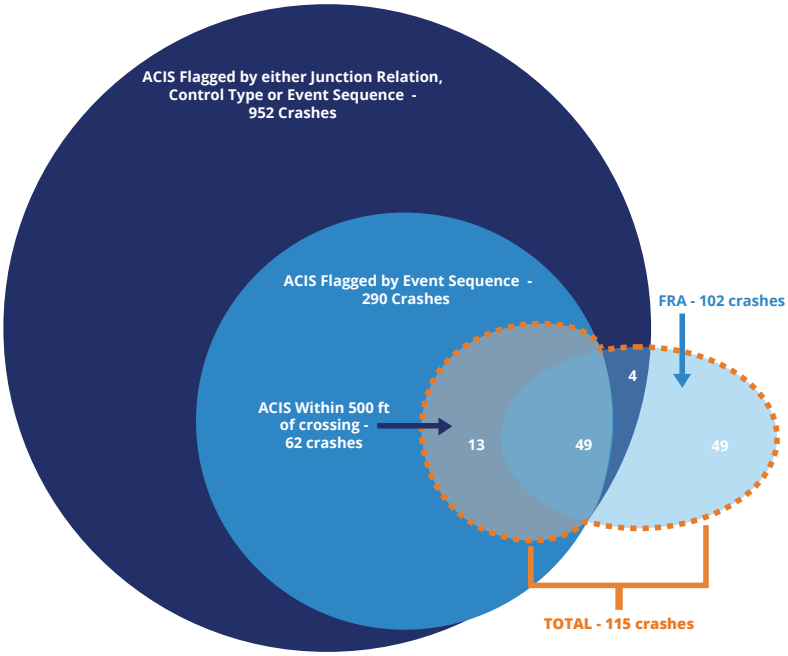




*Source: FRA and ADOT*

## Figure 4: Crash Data Sources and Identified Overlaps Between FRA and ADOT Data

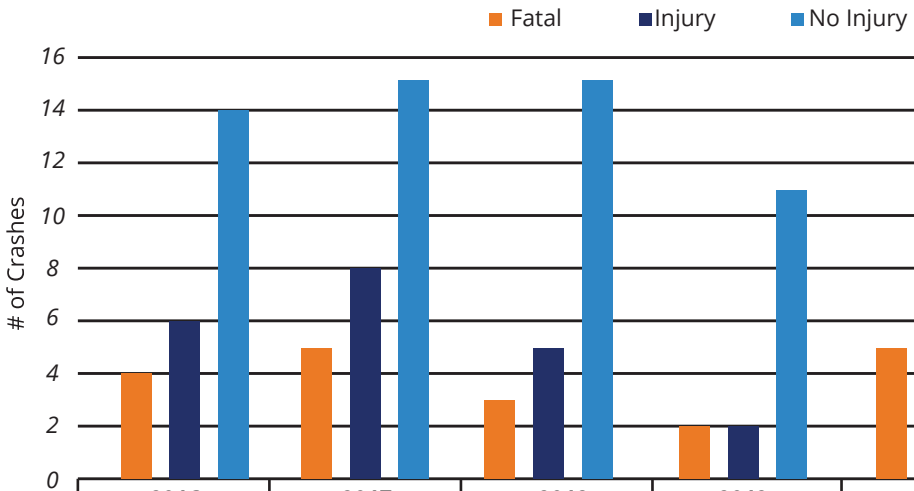



*Source: FRA and ADOT*

Tabular data of the 115 reported crashes are provided in ***Appendix B.*** A summary of crash trends is provided in ***Appendix C***, which details fatal collisions, crashes involving pedestrians and bicyclists, and crashes in two high-crash areas (City of Flagstaff and the Grand Avenue corridor in Maricopa County).

A summary of crashes by year and severity is provided in **Figure 5.** Over the past five years (2016 through 2020), an average of 23 crashes per year were reported at the 698 highway-rail grade crossings. During the five-year period, 19 fatal crashes occurred (20 person fatalities). Of all fatal crashes, 74% involved pedestrians, 21% involved automobiles, and 5% involved bicycles.

## Figure 5: Crashes by Year and Severity




| | 2016 | 2017 | 2018 | 2019 | 2020 | All Years |
|---|---|---|---|---|---|---|
| Fatal | 4 | 5 | 3 | 2 | 5 | 19 |
| Injury | 6 | 8 | 5 | 2 | 5 | 26 |
| No injury | 14 | 15 | 15 | 11 | 15 | 70 |
| Total | 26 | 28 | 23 | 15 | 25 | 115 |

*Source: FRA and ADOT*

## Crossings with Multiple Incidents

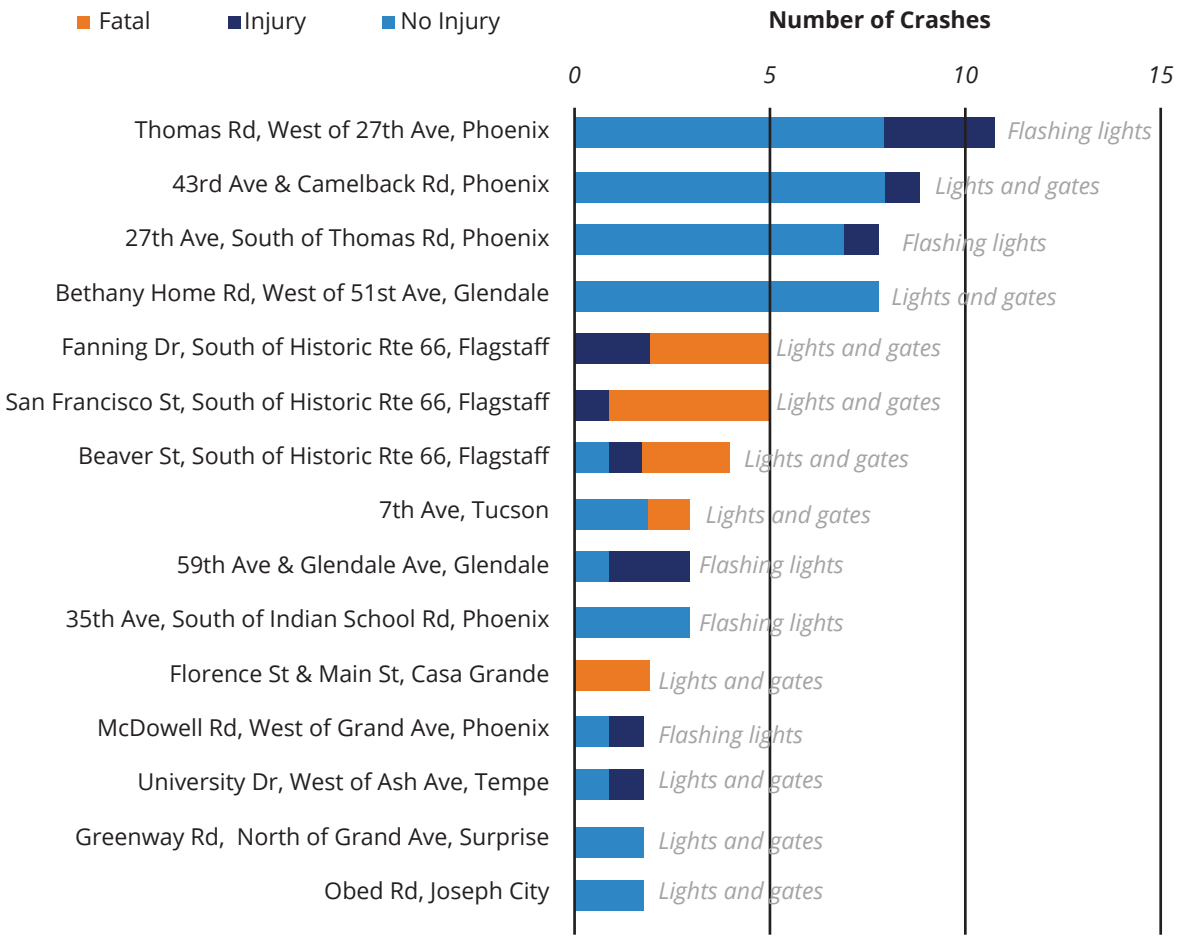
The majority of the 698 highway-rail crossings considered in this project did not have any reported crashes involving highway users for 2016 through 2020. Forty-six crossings (6.6 percent) registered one crash each and fifteen crossings (2.1 percent) registered multiple incidents (two or more crashes). **Figure 6** summarizes the crash frequency and severity at crossings that reported more than one incident in the past five years.

While 65 percent of all highway-rail crashes occurred in Maricopa County, 47 percent of all fatal crashes occurred in Coconino County, more specifically, in the City of Flagstaff. Due to the high frequency of fatal crashes at the City's crossings, the 15 crashes reported at Flagstaff crossings are detailed in ***Appendix B.*** The majority (87 percent) of Flagstaff's crashes involved pedestrians.

Another notable location from the analysis of existing crash data is the intersection of 27th Avenue and Thomas Road, south of Grand Avenue. Due to intersection geometry, two crossings exist within 150 feet of the intersection: one on Thomas Road, approximately 130 feet west of 27th Avenue, and one on 27th Avenue, approximately 130 feet south of Thomas Road. During the five-year period, 19 crashes occurred between the two crossings, accounting for 17 percent of the state's highway-rail crashes. Of the 19 crashes, 13 involved a highway user stopped on the crossing. During the five-year period, no fatal highway-rail crashes were reported at either crossing, likely attributable, at least in part, to the relatively slow speed of many trains at these crossings.

The Grand Avenue corridor in Maricopa County is of concern due to high exposure. Even though 44 percent of the state's highway-rail crashes occurred at crossings along the Grand Avenue corridor, no fatal crashes were reported, again likely attributable, at least in part, to the relatively slow speed of many trains at these crossings. The highest number of crashes occurred between 3 pm and 5 pm and around midnight.

**Figure 6: Crash Frequency and Severity of Multiple-Incident Crossings**




*Source: FRA and ADOT*

## Data Analysis Key Findings

Key findings from the data analysis include:

- Within Arizona, 698 active and open public highway-rail crossings exist
- Of these 698 crossings, 52 percent are in urban areas and 48 percent are in rural areas
- There are 226 crossings (32.5 percent) that have passive warning devices, 41 crossings (5.9 percent) that have flashing lights, and 431 (61.6 percent) that have lights and gates
- A total of 115 highway-rail crashes were reported during the five-year period of 2016 through 2020
- Most crashes resulted in no injury; however, 19 (16.5 percent) were fatal crashes
- The most common highway user actions reported at the time of the crash were "stopped on tracks" and "went around the gates"
- Of the 115 crashes, 83 (72 percent) occurred at crossings with lights and gates, 29 (25 percent) occurred at crossings with flashing lights, and three (less than three percent) occurred at passive crossings. When normalized by the level of exposure at each crossing, the highest crash rate was observed at crossings with flashing lights only (no gates)
- Most highway-rail crossings did not have a history of crashes in the past five years. Crashes were reported at 61 crossings, 15 of which recorded more than one collision
- Three "hot-spot" areas were identified:
  - ***Flagstaff*** – forty-seven percent of all fatal crashes occurred at three crossings in Flagstaff; most of these crashes involved pedestrians
  - ***Grand Avenue*** – forty-four percent of all crashes occurred at crossings along Grand Avenue in the Phoenix metropolitan area; however, no fatal crashes were reported
  - ***The intersection of 27th Avenue and Thomas Road (south of Grand Avenue)*** – seventeen percent of all crashes occurred at this intersection in Phoenix; however, no fatal crashes were reported

# Risk Assessment

## Current ADOT Risk Assessment Method

ADOT currently uses a hazard index to identify highway-rail grade crossings with the greatest level of exposure and most in need of treatments. The hazard index considers the number of trains per day, train speed, type of warning devices(s) present, posted highway speed, daily traffic volume, and number of school buses per day. The hazard index is calculated using the following formula:

$$H = [(V*S_v)/100]*[(T*S_T)/100]*P+1.2\ S_b+ 1.2\ T_p$$

Where:

- H = Hazard Index
- V = AADT
- $S_v$ = Posted highway speed
- T = Number of trains per day
- $S_T$ = Train speed
- P = Protection factor (1.00 for crossbucks, 0.80 for wigwags, 0.55 for 8" flashers (pairs), 0.50 for 12" flashers (pairs), 0.05 for gates with 8" flashers, and 0.0001 for gates with 12" flashers)
- $S_b$ = Number of school buses per day
- $T_p$ = Number of passenger trains per day

The current ADOT risk assessment method includes several factors to quantify exposure, but does not include consideration of historical crash data, urban/rural classification, roadway surface, sight distance, or roadway geometry. The FRA highway-rail inventory and incident databases provide most of this data; however, it is acknowledged that a comprehensive inventory of sight distance and roadway geometry for all locations does not yet exist.

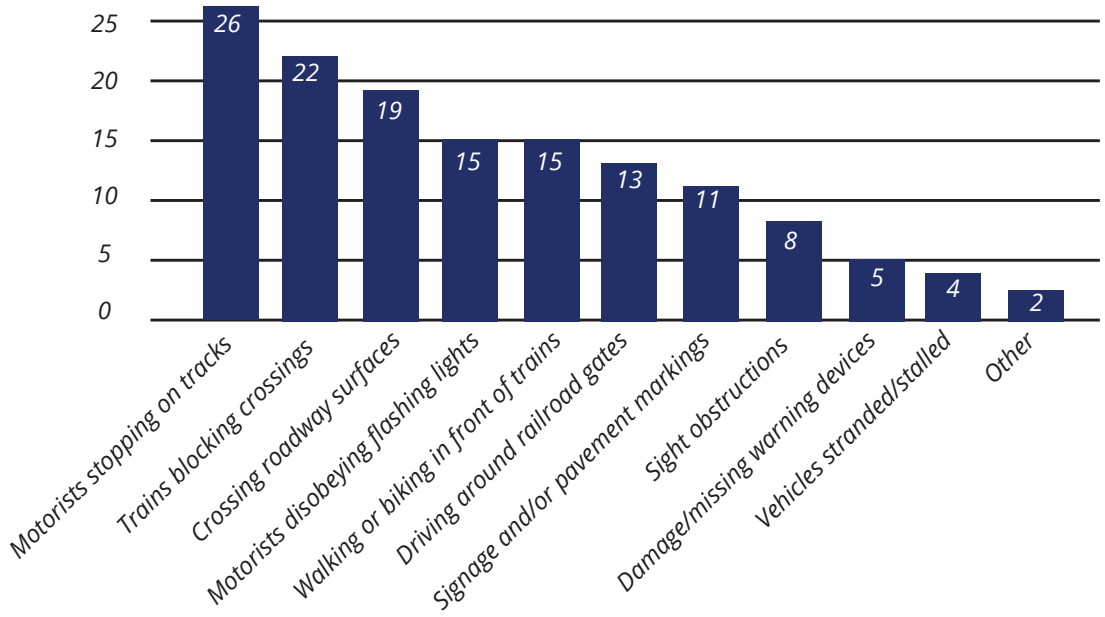
## *Public and Stakeholder Input on Crossing Safety Concerns*

### Public and Stakeholder Survey

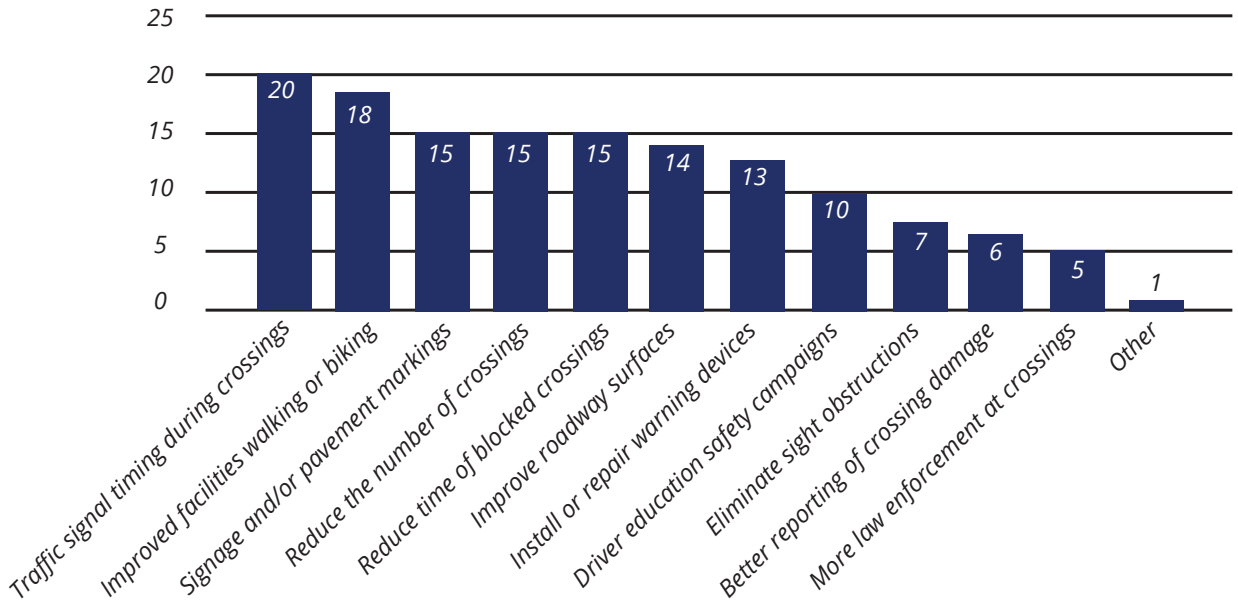
An online survey was made available for local agency staff and the public to gain an understanding of major concerns surrounding highway-rail grade crossings and how to best address those concerns. The survey was available virtually during the month of November 2021. While the survey was targeted and advertised to local agency and railroad staff, it was made available to the public to provide input. A total of 52 respondents took the survey, most of whom were local agency staff.

Three primary questions were asked of survey respondents, which were evaluated to determine if changes to a proposed risk assessment methodology are warranted. The results of this survey are summarized in the following three charts.

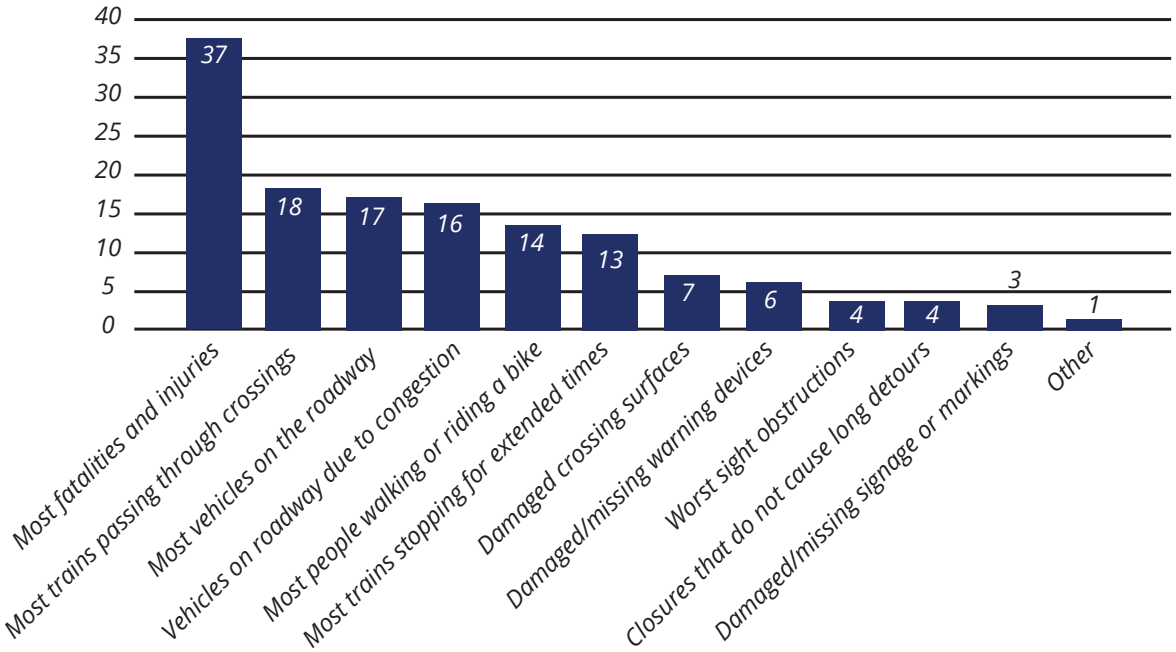
1. What are your greatest concerns regarding safety at highway-rail grade crossings?



**2.** What should be done to better promote safety at highway-rail grade crossings?




**3.** Which highway-rail grade crossings should be improved first to best promote safety?



### Regional Planning Organization Input

The regional planning entities (Metropolitan Planning Organizations [MPOs] and Councils of Governments [COGs] in those areas of the state containing railroad crossings were contacted to make them and their member agencies aware of the SHRAP effort, notify them of the availability of the online survey regarding risk assessment at highway-rail crossings, and to provide an opportunity for them to provide input on highway-rail crossing safety in Arizona. Presentations were made at several MPO/COG committee meetings. A summary of MPO/COG stakeholder input is provided below, with more detailed input provided in ***Appendix D:***

- MPO/COG member agencies would like more information regarding ADOT's Railway-Highway Crossings (Section 130) Program and the kinds of projects eligible for Section 130 funding
- Trains regularly block crossings for long periods, causing significant back-ups; recognizing the potential for a long wait-time, some drivers act rashly at crossings out of fear of having to wait a long time
- Trespassing pedestrians is an ongoing challenge with no easy solutions
- There is interest in, and some confusion regarding, establishing and maintaining railroad quiet zones
- There is interest in grade-separating more crossings but finding sufficient funding is a challenge
- Rural crossings tend to be ignored because there are few crashes, but that does not necessarily mean rural crossings are safer or less risky than urban crossings

## *Proposed Arizona Risk Assessment Methodology*

The Arizona Risk Assessment methodology developed for this project is intended to capture additional physical characteristics and crash history factors that contribute to highway-rail grade safety. Based on input provided by the public and stakeholders and best practices reviewed, the 2020 FRA New Model was selected to serve as the base methodology to identify predicted crashes due to the accuracy of the calibrated model. A risk assessment score is calculated using a combination of predicted crashes, historical (observed) crashes, and several other factors not captured in the 2020 FRA New Model, including roadway geometry, sight distance, number of highway lanes, and number of main tracks.

This approach modifies the method in which observed crashes are considered; review of the 2020 FRA New Model as a part of this project determined that the final ranking strongly favored observed crash trends over predictive safety.

The Arizona Risk Assessment Methodology uses a two-level structure for establishing the predictive safety and incorporating the additional factors. The methodology is described in the subsequent sections.

### Level I: Preliminary Risk Assessment

- ***Step 1: Obtain and process data for evaluation.***
  - Obtain and review the FRA inventory data and resolve any gaps in data (missing erroneous, or outdated).

*Note: For the purposes of this analysis, the surface type of each crossing was grouped according to the categories designated in the 2020 FRA New Model for Highway-Rail Grade Crossing Accident Prediction:*

***Timber or Other*** *(includes timber, metal, unconsolidated, composite, and other) - 148 crossings*

***Asphalt*** *- 75 crossings*

***Asphalt and Timber or Concrete or Rubber*** *- 467 crossings*

***Concrete and Rubber*** *- 8 crossings*

- Obtain and review crash data from the FRA Highway-Rail Incident database and the ADOT ACIS database. Cross-check the datasets and incorporate any appropriate ADOT crash data not included in the FRA database.

- ***Step 2: Calculate the number of predicted crashes for each crossing.***
  - The number of predicted crashes is calculated using the 2020 FRA New Model ($N_{predicted}$), based on exposure, warning devices present, rural/urban classification, crossing surface, maximum timetable speed, and the average daily traffic (equations documented in ***Appendix E***).
  - The logarithmic adjustments described in ***Appendix E*** for exposure, maximum timetable speed, AADT, and total trains per day were calculated based on the current FRA inventory database. The resulting "α" values are provided in **Table 1** along with other statistics.

**Table 1: Sample Description and α Value for Logarithmic Adjustment**

| Attribute | Mean | Standard Deviation | Median | α |
|---|---|---|---|---|
| ***Exposure*** | 40,872 | 114,440 | 2,516 | 0.9996 |
| ***Maximum Time Train Speed*** | 33.6 | 23.3 | 25 | 0.9600 |
| ***Average Annual Daily Traffic*** | 5,506 | 9,062 | 1,113 | 0.9991 |
| ***Total Trains*** | 9.4 | 16.4 | 3 | 0.6667 |

- ***Step 3: Calculate the Preliminary Risk Score.***
  - The Preliminary Risk Score (PRS), as developed in this project, combines the predictive crashes and observed crashes. A scaling adjustment formula is used in lieu of the Empirical Bayes approach used in the 2020 FRA New Model. The scaling adjustment formula was selected to provide improved weighting between predictive crashes and observed crashes. The PRS is calculated using the following formula:

$$PRS = N_{Predicted} * 1000 + N_{Observed}$$

*Note: A scaling factor of 1000 was selected due to the calculated values of $N_{predicted}$, which range from 0.0000 to 0.0033 in this project.*

Where:

- PRS = Preliminary risk score
- $N_{Predicted}$ = Predicted crashes after accounting for excess zeroes
- $N_{Observed}$ = The number of observed crashes at the crossing

- ***Step 4: Rank all highway-rail crossings by Preliminary Risk Score.***
  - Rank all crossings by the PRS to identify the top locations, which move forward in evaluation into the Level II assessment.

## Level II: Refined Risk Assessment

- ***Step 5: Collect additional physical characteristic data on the top locations.***
  - Conduct additional desktop review of the top locations to account for atypical roadway geometry (skew, vertical curvature, horizontal curvature, and more than four intersection approaches), sight distance limitations, number of highway lanes, and number of main railroad tracks. For this project, the top 75 urban and top 75 rural crossings, as identified in the Level I assessment, were included in the Level II assessment.

- ***Step 6: Calculate the Refined Risk Score for the top 75 urban and top 75 rural locations.***
  - The (RRS) is calculated using the following formula:

$$RRS=PRS*SD*RG*HL*MT$$

Where:

- RRS = Refined Risk Score
- PRS = Preliminary Risk Score, calculated as described previously
- SD = Factor for sight distance:
  - 1.0 = no sight distance issue
  - 1.1 = sight distance issue
- RG = Factor for roadway geometry:
  - 1.0 = no skew, no horizontal curvature, vertical curvature is less than six percent
  - 1.05 = vertical curve is greater than six percent
  - 1.10 = horizontal curve or skew (greater than 30 degrees from perpendicular)
  - 1.15 = both vertical and horizontal curvature present, or more than four intersection approaches
- HL = Factor for the number of highway lanes in both directions:
  - 1.0 = roadways with one to two lanes
  - 1.05 = roadways with three to four lanes
  - 1.10 = roadways with five to six lanes
  - 1.15 = roadways with more than six lanes
- MT = Factor for the number of main railroad tracks:
  - 1.0 if 0 main tracks
  - 1.05 if one main track
  - 1.10 if two or more main tracks

- ***Step 7: Re-rank the top locations by the Refined Risk Score.***
  - Determine the final ranking of priority locations based on the RRS, which considers sight distance, roadway geometry, number of highway lanes, and number of main tracks

## *Risk Assessment Rankings*

The Arizona Risk Assessment methodology was used to rank all 698 open and active public at-grade crossings within Arizona. The initial ranking of all locations, based on the PRS (Level I analysis), is provided in ***Appendix F.*** The top 75 urban and top 75 rural crossings were selected to continue to the Level II analysis. The refined ranking of the top 75 urban and top 75 rural crossings, based on the RRS, is shown in ***Appendix G.***

The five urban highway-rail crossings with the greatest risk were identified as:

1. Thomas Road, west of 27th Avenue (Phoenix)
2. 43rd Avenue and Camelback Road (Phoenix)
3. 27th Avenue, south of Thomas Road (Phoenix)
4. Bethany Home Road, west of 51st Avenue (Glendale)
5. San Francisco Street, South of Historic Route 66 (Flagstaff)

The five rural highway crossings with the greatest risk were identified as:

1. Navajo Boulevard/Apache Avenue, South of Joy Nevin Avenue (Holbrook)
2. Obed Road, South of Richards Avenue (Joseph City/Navajo County)
3. Unnamed Roadway, South of Old Highway 66 (Hackberry/Mohave County)
4. San Pedro Street, North of 4th Street (Benson)
5. Sherwood Access Road, South of Historic Route 66 (Williams)

# 4 Strategize

## Top Crossings Needing Treatment

The top ranked crossings, as determined by the aforementioned RRS, were reviewed to determine if there are already programmed or recently completed treatments that would address the identified risk or if new treatments need to be recommended.

ADOT's Section 130: Projects for Programming – 5 Year Plan (2021) was referenced to identify programmed treatments at the top ranked crossings. If treatments are already programmed that are anticipated to address the safety need at a particular crossing, no additional treatments were developed as part of the SHRAP effort. The Arizona Highway Safety Improvement Program (HSIP) Railway-Highway 2021 Annual Report (AZ HSIP Railway-Highway Report) was reviewed to assess if there were recently constructed treatments at the top-ranked crossings. If recent treatments have mitigated identified safety risks, no additional treatments were developed as part of the SHRAP effort.

With a goal of identifying 15 crossings where treatments are to be developed as part of the SHRAP effort, the top 26 crossings were reviewed as 11 of those crossings already have programmed or recently completed treatments. The 26 highest-ranked crossings are listed in ***Table 2***, with the determination of whether or not additional treatments are needed. The top 15 crossings where treatments are needed are highlighted in blue in the table.

Most of the top 15 crossings needing treatment are in urban areas. Inherently, crossings with higher traffic volumes have a greater exposure, which influences risk levels. ADOT recognizes the importance of enhancing safety in rural areas as well. Accordingly, this SHRAP suggests consideration of a 10 percent set-aside target of Section 130 funding to provide systemic treatments to rural crossings.

**Table 2: Top 26 Highway-Rail Crossings per Refined Risk Rankings**

| Refined Ranking | Crossing ID | Location | Number of Crashes (2016-2020) | Preliminary Risk Score[1] | Adequate Sight Distance | Vertical Curve | Horizontal Curve/Skew | Geometry More than 4 Legs | Refined Risk Score[2] | Develop Treatments for Crossing? | Reason for Treatment Development Decision |
|---|---|---|---|---|---|---|---|---|---|---|---|
| *1* | 025617C | Thomas Rd, West of 27th Ave, Phoenix | 11 | 13.506 | No | No | Yes | Yes | 19.734 | No | Per Section 130 5-Year Plan for FY 2022, getting gates, flashers, cantilevers, medians, road widening; no additional treatments anticipated to be needed |
| *2* | 025422P | 43rd Ave & Camelback Rd, Phoenix | 9 | 10.373 | No | No | Yes | Yes | 15.156 | No | Per Section 130 5-Year Plan for FY 2025, getting gates, cantilevers, flashers; no additional treatments anticipated to be needed |
| *3* | 025430G | 27th Ave, South of Thomas Rd, Phoenix | 8 | 10.279 | No | No | Yes | Yes | 15.018 | No | Per Section 130 5-Year Plan for FY 2022, getting gates, flashers, cantilevers, medians, road widening; no additional treatments anticipated to be needed |
| *4* | 025590V | Bethany Home Rd, West of 51st Ave, Glendale | 8 | 9.275 | No | No | Yes | Yes | 13.551 | Yes | Treatments completed recently but per ADOT there are still unresolved issues; considering grade separation |
| *5* | 025132G | San Francisco St, South of Historic Rte 66, Flagstaff | 5 | 6.862 | No | No | No | No | 8.719 | Yes | Advance preemption completed recently; no other identified programmed treatments |
| *6* | 025129Y | Fanning Dr, South of Historic Rte 66, Flagstaff | 5 | 6.946 | Yes | No | No | No | 8.022 | Yes | City looking at potential quiet zone-related refinements to infrastructure |
| *7* | 025425K | 35th Ave, South of Indian School Rd, Phoenix | 3 | 5.392 | No | No | Yes | Yes | 7.878 | No | Planned to be grade-separated; no additional treatments anticipated to be needed |
| *8* | 025418A | 59th Ave & Glendale Ave, Glendale | 3 | 5.590 | No | No | Yes | No | 7.812 | Yes | No identified programmed treatments |
| *9* | 025133N | Beaver St, South of Historic Rte 66, Flagstaff | 4 | 5.896 | No | No | No | No | 7.134 | Yes | Advance preemption completed recently; no other identified programmed treatments |
| *10* | 741124N | 7th Ave, Tucson | 3 | 4.129 | Yes | Yes | Yes | No | 5.224 | No | Conversion of crossing to pedestrian-only crossing is under construction; no additional treatments anticipated to be needed |
| *11* | 025436X | McDowell Rd, West of Grand Ave, Phoenix | 2 | 3.829 | No | No | No | No | 5.086 | No | Per Section 130 5-Year Plan for FY 2026, getting gates, signals; no additional treatments anticipated to be needed |
| *12* | 741363N | Florence St & Main St, Casa Grande | 2 | 3.701 | No | No | No | No | 4.478 | No | Per Section 130 5-Year Plan for FY 2027, getting medians, curbing; no additional treatments anticipated to be needed |
| *13* | 025131A | Ponderosa Pkwy, South of Historic Rte 66, Flagstaff | 1 | 3.366 | Yes | No | No | No | 4.073 | Yes | Advanced preemption completed recently; no other identified programmed treatments |
| *14* | 741122A | 6th St, East of 9th Ave, Tucson | 1 | 2.758 | No | No | Yes | No | 4.038 | No | Grade separation of crossing is under construction; no additional treatments anticipated to be needed |

**Table 2: Top 26 Highway-Rail Crossings per Refined Risk Rankings (continued)**

| Refined Ranking | Crossing ID | Location | Number of Crashes (2016-2020) | Preliminary Risk Score[1] | Adequate Sight Distance | Vertical Curve | Horizontal Curve/Skew | Geometry More than 4 Legs | Refined Risk Score[2] | Develop Treatments for Crossing? | Reason for Treatment Development Decision |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ***15*** | 025017A | Navajo Blvd/Apache Ave, South of Joy Nevin Ave, Holbrook | 1 | 2.762 | No | No | Yes | No | 3.860 | Yes | No identified programmed treatments; crossing under discussion with ADOT, Burlington Northern Santa Fe (BNSF), City of Holbrook, and ACC |
| ***16*** | 025023D | Obed Rd, Joseph City, Navajo County | 2 | 3.108 | Yes | No | Yes | No | 3.761 | Yes | No identified programmed treatments |
| ***17*** | 025651J | Greenway Rd, North of Grand Ave, Surprise | 2 | 3.346 | Yes | No | No | No | 3.689 | Yes | Per Section 130 5-Year Plan for FY 2021, getting advance preemption, but additional treatments are anticipated to be needed |
| ***18*** | 741367R | Trekell Rd, South of Jimmie Kerr Blvd, Casa Grande | 1 | 2.755 | No | No | Yes | No | 3.667 | No | Per recent discussions between the City of Casa Grande and ADOT, no additional treatments anticipated to be needed |
| ***19*** | 741560C | University Dr, West of Ash Ave, Tempe | 2 | 2.863 | No | No | No | No | 3.472 | Yes | No identified programmed treatments; quad gates were installed in 2019 |
| ***20*** | 741104C | Ruthrauff Rd, East of I-10 Frontage Rd, Tucson | 0 | 2.280 | No | No | Yes | No | 3.338 | No | Grade separation of crossing was recently constructed; FRA database should be updated to indicate this crossing is no longer active and open |
| ***21*** | 741708G | Main St, South of Casa Grande-Picacho Hwy, Eloy | 1 | 2.221 | No | No | Yes | No | 3.252 | Yes | No identified programmed treatments |
| ***22*** | 741100A | Massingale Rd, East of I-10 Frontage Rd, Marana | 1 | 2.379 | No | No | Yes | No | 3.166 | Yes | No identified programmed treatments |
| ***23*** | 025424D | Indian School Rd, West of Grand Ave, Phoenix | 1 | 2.302 | No | No | Yes | No | 3.071 | No | Planned to be grade-separated; no additional treatments anticipated to be needed |
| ***24*** | 741098B | W Cortaro Farms Rd, East of I-10 Frontage Rd, Marana | 0 | 2.208 | No | No | No | No | 2.939 | Yes | Planned to be grade-separated as part of a new traffic interchange; no other identified programmed treatments |
| ***25*** | 741825C | Val Vista Dr, South of Warner Rd, Gilbert | 1 | 2.103 | No | No | Yes | No | 2.939 | Yes | No identified programmed treatments |
| ***26*** | 741814P | McQueen Rd, South of Baseline Rd, Gilbert | 1 | 2.100 | No | No | Yes | No | 2.935 | Yes | No identified programmed treatments |

*Notes:*
*[1]The preliminary risk score (PRS) combines the predictive crashes and observed crashes. A higher PRS score implies the location has a greater risk of crashes.*
*[2]The refined risk score (RRS) combines the PRS, sight distance, roadway geometry, number of highway lanes, and number of main tracks. A higher RRS score implies the location has a greater risk of crashes.*

# Crossing Treatment Development

After the top 15 crossings needing treatment were identified, potential treatments were identified and refined using the following process.

## *Crash History Review*

The aforementioned filtered crash datasets were used to review crashes at the top 15 crossings needing treatment. The number of crashes, crash type, user type, and injury severity were assessed to help inform selection of recommended treatments. User type was subdivided by auto, bicycle, or pedestrian, while injury severity leveraged the KABCO scale (K=fatal injury, A=incapacitating injury, B=injury, C=possible injury, O=property damage only). FRA crash reports divide crashes into eight types:

- Stopped on crossing
- Went around the gates
- Did not stop
- Went through gates
- Stopped then proceeded
- Suicide/attempted suicide
- Other
- Unknown

Crash data was reviewed by crash type and user to inform selection of potential treatments. Crash data at each crossing was reviewed to note additional trends, as applicable, such as a high proportion of nighttime crashes or crashes approaching the crossing from one direction.

## *Initial Treatment Identification*

Data collected during the risk assessment was reviewed as part of the treatment evaluation, as well as available aerial and street-level imagery. The FHWA Highway-Rail Crossing Handbook, Third Edition (2019) (Highway-Rail Crossing Handbook) details a variety of potential treatments, their applicability, and provides general advice on striping, illumination, distance between structures, and more. Best practices and existing crossing features were reviewed to identify recommended treatments. The Highway-Rail Crossing Handbook was consulted, in combination with the crash history for each location, to determine which treatments would be most effective based on the known crash types. Where unique circumstances are present, they were identified, and additional treatments were considered.

## *Local Agency Coordination*

After initial treatment concepts were identified, the local agencies with jurisdictional control for the crossings (which includes ADOT for crossings on the state highway system) were contacted to review the treatment concepts and their feasibility. Local agencies were asked to provide additional information related to the crossings, users, and planned and programmed projects that could influence the crossing. The local agencies were given an opportunity to review preliminary crossing treatments and provide input on project need, challenges, and recommended treatments and indicate whether they support the identified treatments or have suggested modifications to those treatments. **Table 3** provides the local agency coordination meeting dates and attendees. Local agency and TAC input was used to refine the treatment recommendations at each crossing.

**Table 3: Input from Local Agency Meetings**

| Agency (Date) | Key Discussion Points |
|---|---|
| ***ADOT (December 6, 2021)*** | • Supports continued discussion regarding the potential treatments at Crossing IDs 025590V, 025017A, and 025651J<br>• Ongoing challenges with Bethany Home Road crossing despite recent treatments<br>• Diagnostic evaluations have already occurred at these three ADOT crossings and the treatments identified there should be reflected in the SHRAP treatments |
| ***City of Flagstaff (December 13, 2021)*** | • Supports continued discussion regarding the potential treatments at Crossing IDs 025132G, 025129Y, 025133N, and 025131A<br>• Prefers channelizing pedestrians and installing pedestrian gates over Z-crossings<br>• Receptive to lighting treatments<br>• Maintaining the existing railroad quiet zone is important<br>• A pre-signal at the Ponderosa Parkway crossing could help address some of the existing preemption-related issues<br>• Aesthetics are important at Beaver Street and San Francisco Street crossings |
| ***City of Eloy (December 14, 2021)*** | • Supports continued discussion regarding the potential treatments at Crossing ID 741708G<br>• Recommendations support plans for pedestrian corridor in area |
| ***City of Tempe (December 15, 2021)*** | • Supports continued discussion regarding the potential treatments at Crossing ID 741560C<br>• Supports automatic pedestrian gates with barriers/fencing<br>• Expressed concerns related to maintenance responsibilities and costs of new infrastructure<br>• Recommended coordination with SRP and other utility owners in the area |
| ***City of Glendale (December 15, 2021)*** | • Supports continued discussion regarding the potential treatments at Crossing ID 025418A<br>• Expects pedestrian activity to increase in the area by the 59th Avenue crossing |
| ***Town of Marana (December 15, 2021)*** | • Would like to delay any potential treatments at this time at Crossing IDs 741100A and 741098B<br>• Cortaro Road traffic interchange reconstruction with grade separation of the crossing is the Town's highest ranked project in the draft regional transportation plan (RTP) and will likely be funded in the next few years so do not want to install treatments that would be removed soon thereafter<br>• Massingale Road crossing may be closed in the next few years in conjunction with the widening of the nearby Tangerine Road crossing so do not want to install treatments that would be removed soon thereafter |
| ***Town of Gilbert (January 3, 2022)*** | • Supports continued discussion regarding the potential treatments at Crossing IDs 741825C and 741814P<br>• Considers McQueen Road crossing a higher priority than the Val Vista Drive crossing<br>• Anticipates grade separation will not occur for at least 10 years |
| ***Navajo County*** | • Navajo County did not respond to requests to provide input on Crossing ID 025023D |

## *Documentation*

Crossing treatment cut sheets are included in ***Appendix H.*** Crossing treatment cut sheets include the information listed in **Table 4.**

**Table 4: Crossing Treatment Cut Sheet Information**

| Crossing Cut Sheet Information | Description |
|---|---|
| ***Crash Summary*** | Five-year crash history |
| ***Aerial Imagery*** | Aerial and street-level imagery of the crossing |
| ***Need for Improvement*** | Need for improvements at the crossing |
| ***Challenges*** | Challenges at the crossing that may influence recommendations |
| ***Other Crossing Considerations*** | Additional information about the crossing that may influence recommendations |
| ***Programmed Projects*** | Programmed treatments per the ADOT Section 130: Projects for Programming – Five-Year Plan (2021) |
| ***Recently Constructed Projects*** | Treatments constructed within the last five years using Section 130 funds per the AZ HSIP Railway-Highway Report |
| ***Recommended Treatments*** | Recommended treatments for the crossing |
| ***SHRAP Strategies Addressed by Recommended Treatments*** | Identifies which SHRAP strategies will be addressed by the treatment(s) |
| ***Effectiveness of Treatments*** | Identifies the effectiveness of treatment(s) qualitatively and quantitatively based on the crash history and Highway-Railway Grade Crossing Action Plan |
| ***Planning-Level Cost*** | Estimated costs of treatment(s) |
| ***Funding Readiness*** | Identifies known funding for treatment(s) and possible eligibility for Section 130 funds |
| ***Local Agency Discussion*** | Local agency input on the crossing and treatment(s) |
| ***Implementation Considerations*** | Identifies feasibility of treatment(s) |

## *Recommended Crossing Treatments*

Recommended treatments were developed pursuant to the process described previously. **Table 5** summarizes the recommended treatments at each crossing. In some instances, a phased approach is recommended; near-term (within 10 years) and long-term (beyond 10 years) treatments are identified accordingly.

**Table 5: Summary of Recommended Crossing Treatments**

| Crossing | Recommended Crossing Treatment |
|---|---|
| ***025590V:*** Bethany Home Rd, West of 51st Ave, Glendale | Near-term: Pre-signalization; additional lighting<br>Long-term: Grade separation; crossing closure |
| ***025132G:*** San Francisco St, South of Historic Rte 66, Flagstaff | Automatic pedestrian gates with skirts; addition of pedestrian skirts to vehicle gates; decorative fencing; "second train" blank-out signage; improved lighting |
| ***025129Y:*** Fanning Dr, South of Historic Rte 66, Flagstaff | Automatic outbound vehicle gates with pedestrian skirts; decorative fencing; "second train" blank-out signage; improved lighting |
| ***025418A:*** 59th Ave & Glendale Ave, Glendale | Automatic vehicle gates; automatic pedestrian gates with skirts |
| ***025133N:*** Beaver St, South of Historic Rte 66, Flagstaff | Automatic pedestrian gates with skirts; addition of pedestrian skirts to vehicle gates; decorative fencing; "second train" blank-out signage; improved lighting |
| ***025131A:*** Ponderosa Pkwy, South of Historic Rte 66, Flagstaff | Pre-signalization; improved lighting |
| ***025017A:*** Navajo Blvd/Apache Ave, South of Joy Nevin Ave, Holbrook | Replace sidewalk; extend fencing; replace concrete crossing panel; pre-signalization |
| ***025023D:*** Obed Rd, Joseph City | Repair crossing surface and approach |
| ***025651J:*** Greenway Rd, North of Grand Ave, Surprise | Blank-out signage; pedestrian flashing lights and bells; sidelights; restriping |
| ***741560C:*** University Dr, West of Ash Ave, Tempe | Automatic pedestrian gates and flashers with barriers |
| ***741708G:*** Main St, South of Casa Grande-Picacho Hwy, Eloy | Automatic pedestrian gates and flashers with barriers; pedestrian detectable warning surface and signage |
| ***741100A:*** Massingale Rd, East of I-10 Frontage Rd, Marana | Crossing closure |
| ***741098B:*** Cortaro Farms Rd, East of I-10 Frontage Rd, Marana | Grade separation |
| ***741825C:*** Val Vista Dr, South of Warner Rd, Gilbert | Near-term: Pedestrian flashers, detectable warning surface, and signage; make sidewalk perpendicular to tracks<br>Long-term: Grade separation |
| ***741814P:*** McQueen Rd, South of Baseline Rd, Gilbert | Near-term: Pedestrian fencing, detectable warning surface, and signage; make sidewalk perpendicular to tracks<br>Long-term: Grade separation |

## *Planning-Level Cost Estimates*

Preliminary cost estimates for the grade crossing treatments were prepared for high-level budgeting purposes and are included in ***Appendix K.*** Using ADOT's Estimated Engineering Construction Cost (E2C2) tool, bid tabs from previous projects, and input from industry experts, unit prices were set for each bid item that could be measured and located via aerial imagery and indirect cost below-the-line percentages were set. It was assumed that any incidental costs to construct measured items will be covered by the unit cost and the 15 percent unidentified items allowance that was used at each crossing. A summary of the planning-level cost estimates for each crossing is provided in **Table 6.** Local agencies and/or relevant planning documents were consulted where applicable to obtain current planning-level cost estimates. The source of these estimates is denoted as applicable.

**Table 6: Planning-Level Cost Estimates**

| Crossing | Planning-Level Cost Estimate (2022) |
|---|---|
| ***025590V:*** Bethany Home Rd, West of 51st Ave, Glendale | Near-term: $740,000<br>Long-term: $108.56 million (per Maricopa Association of Governments [MAG] RTP) |
| ***025132G:*** San Francisco St, South of Historic Rte 66, Flagstaff | $590,000 |
| ***025129Y:*** Fanning Dr, South of Historic Rte 66, Flagstaff | $1.06 million |
| ***025418A:*** 59th Ave & Glendale Ave, Glendale | $2.44 million |
| ***025133N:*** Beaver St, South of Historic Rte 66, Flagstaff | $590,000 |
| ***025131A:*** Ponderosa Pkwy, South of Historic Rte 66, Flagstaff | $710,000 |
| ***025017A:*** Apache Ave, South of Joy Nevin Ave, Holbrook | $1.61 million |
| ***025023D:*** Obed Rd, Joseph City | $600,000 |
| ***025651J:*** Greenway Rd, North of Grand Ave, Surprise | $200,000 |
| ***741560C:*** University Dr, West of Ash Ave, Tempe | $1.07 million |
| ***741708G:*** Main St, South of Casa Grande-Picacho Hwy, Eloy | $1.10 million |
| ***741100A:*** Massingale Rd, East of I-10 Frontage Rd, Tucson | $80,000 |
| ***741098B:*** Cortaro Farms Rd, East of I-10 Frontage Rd, Marana | $100.00 million (per Town of Marana) |
| ***741825C:*** Val Vista Dr, South of Warner Rd, Gilbert | Near-term: $330,000<br>Long-term: $24.70 million (per MAG RTP) |
| ***741814P:*** McQueen Rd, South of Baseline Rd, Gilbert | Near-term: $310,000<br>Long-term: $24.30 million (per MAG RTP) |


# 5

## Act

## Strategies for Improving Safety at Crossings

A wide variety of strategies have been identified to improve safety at highway-rail grade crossings of various types. These strategies are organized into four categories:

***Evaluation.*** Understanding safety hazards and risks is heavily dependent on being able to analyze high-quality and comprehensive data.

***Engineering.*** Strategies for physically modifying highway-grade crossings to improve their visibility or minimize the risk of crashes.

***Education.*** Strategies for raising awareness of safety issues around highway-grade crossings to the public and local agencies.

***Enforcement.*** Strategies for increasing law enforcement's knowledge of high-crash locations and how to investigate rail-involved crashes.

## Evaluation Strategies

This SHRAP, and Arizona's highway-rail safety program in general, is data-driven and strives to recommend treatments that reduce risk. Risk is calculated based on analysis of crash data, inventory and crossing data, and stakeholder input and experience. This section identifies evaluation-based strategies to promote more accurate evaluation of crossing safety risk.

### Evaluation Strategy 1: Recalculate the Refined Risk Score Every Five Years

***Action:*** Apply the 2020 FRA New Model for Highway-Rail Grade Crossing Accident Prediction methodology, with the Refined Risk Assessment described in this SHRAP, to all active and open public crossings at least every five years to identify those crossings with abnormally high risk scores.

### Evaluation Strategy 2: Conduct Diagnostic Evaluations at High-Risk Crossings

***Action:*** Conduct multi-agency diagnostic evaluations at identified high-risk crossings to determine what kinds of treatments will most likely improve crossing safety.

### Evaluation Strategy 3: Improve Data Accuracy

***Action:*** Identify and address inconsistencies between the following databases:

- FRA Highway-Rail Crossing Inventory database
- FRA Highway-Rail crash database
- ACIS crash database

***Action:*** Resolve data gaps that exist within the FRA inventory database, including missing, erroneous, and outdated data.

***Action:*** Update FRA Highway-Rail Crossing Inventory database at least every three years, including the following sections:

- Part I – Location and Classification Information: (23) Type of Land Use; (35) State Contact
- Part II – Railroad Information: all sections as needed
- Part III – Highway or Pathway Traffic Control Device Information: all sections as needed
- Part IV – Physical Characteristics: (4) Is Crossing Illuminated; (6) Intersecting Roadway within 500 feet (7) Smallest Crossing Angle
- Part V – Public Highway Information: (4) Highway Speed Limit; (7) AADT; (8) Estimated Percent Trucks; (9) Regularly Used by School Buses; (10) Emergency Services Route

***Action:*** Create Geographic Information System (GIS) maps with AADT volumes linked to highway-rail grade crossings.

## Engineering Strategies

Highway-rail grade crossing safety treatments range from passive treatments like signage and striping treatments to active treatments like gate arms and bells that are activated as trains approach a crossing. Safety treatments can also include operational treatments related to signal timing. Engineering strategies identify common potential safety treatments to highway-rail grade crossings that may be implemented after further investigation.

## Engineering Strategy 1: Consider Crossing Closures and Separations

***Action:*** Identify candidate locations for highway-rail crossing elimination by:

- Replacing the crossing with a grade-separated facility
- Closing the crossing to vehicle traffic and removing the crossing surface
- Closing the crossing to rail traffic through the abandonment or relocation of the rail line and removal of the rail tracks

***Action:*** Encourage multi-agency partnerships (e.g., FRA, ADOT, railroads, ACC, highway operator) to fund the closure or separation of highway-rail crossings.

***Action:*** Close highway-rail crossings through abandonment of the rail line and removal of the rail tracks where the rail is no longer in use.

The recently passed Infrastructure Investment and Jobs Act (IIJA) has a new FRA program called the "Railroad Crossing Elimination Grant Program". Grants will be awarded for projects that make improvements to highway and pathway rail crossings, such as eliminating highway-rail at-grade crossings that are frequently blocked by trains, adding gates or signals related to a crossing closure, relocating track, or installing grade separation. The program would improve the safety of communities and the mobility of people and goods. At least 20 percent of grant funds are reserved for projects located in rural areas or on tribal lands.

## Engineering Strategy 2: Identify Locations for Conventional Highway-Rail Crossing Countermeasures

***Action:*** Identify locations where common highway-rail grade crossing countermeasures such as the following have the potential to improve safety:

- Advanced preemption to help traffic clear the track area prior to train arrival
- Train-activated lights and gates where they do not currently exist or need to be upgraded
- Crossing surface upgrades to concrete
- Signing and marking installation or replacement
- Sidewalk installation or replacement where pedestrian and/or bicycle activity is high and where sidewalks are missing or need to be upgraded

## Engineering Strategy 3: Identify Locations for Unconventional Highway-Rail Crossing Countermeasures

***Action:*** Identify locations where less common highway-rail grade crossing countermeasures such as the following have the potential to improve safety:

- Audible warnings and horns
- Improving sight distance by removing obstacles such as vegetation
- Pre-signals
- Channelization (e.g., raised medians) with gates
- Pedestrian/bicycle gate arms (with gate skirts if needed)
- Z-crossings for pedestrians and bicyclists
- Grade-separation for pedestrians and bicyclists

## Engineering Strategy 4: Address Rural Crossing Needs

***Action:*** Maintain a prioritized list of high-risk rural highway-rail grade crossing locations.

***Action:*** Consider developing a 10 percent Section 130 funding set-aside target (but not requirement) for treatments in rural areas such as crossing surface upgrades, adding lights and gates, and updating signs and markings.

***Action:*** Implement systemic treatments for rural crossings to facilitate treatment identification and implementation. Based on ADOT's practices for public mainline crossings and the goals and objectives of this SHRAP, the two priority systemic treatment options for rural crossings are:

- ***Upgrade to concrete crossing surfaces.*** Upgrading from timber to concrete crossing surfaces provides smooth and safe travel for motorists approaching and using crossing and improves drainage so that excessive moisture will not cause track settlement; and
- ***Install active warning devices.*** Active warning devices such as flashing signal lights and cantilevered automatic gates provide visual advance notice of the approach of a train.

Additional systemic treatment options include but are not limited to:

- ***Illumination.*** Improved lighting near rail crossings will assist motorists driving during dark conditions, particularly at crossing locations without flashing lights or gates
- ***Signing and striping.*** The MUTCD includes provisions for signs at crossings. Pavement markings provide static messages of warning and guidance, such as exclusion zone markings, edge lines, and dynamic envelop markings
- ***Crossing geometry.*** The ideal crossing geometry is a 90-degree intersection of track and highway with slight-ascending grades on both highway approaches to reduce the flow of surface water
- ***Crossing closure.*** Closing a public mainline crossing should consider public safety, necessity, access, and economics. Should a rural agency determine that a crossing closure is the best course of action, the IIJA provides additional funding for the closure

The IIJA provides additional Section 130 funding and increases the Federal share for projects funded under the Section 130 program from 90 to 100 percent, as well as clarifies that the replacement of functionally obsolete warning devices is an eligible expense. The amount of state incentive payment for at-grade crossing closures increases from $7,500 to $100,000 and the set-aside for compilation and analysis of data increases from two percent to eight percent. With the elimination of the match requirement, it is likely more rural agencies will be able to leverage Section 130 funding for crossing upgrades.

Implementing prioritized systemic treatments can be leveraged to equitably treat rural crossings; however, the additional treatments identified may warrant supplements or substitutions. This should be assessed on a crossing-by-crossing basis in partnership with applicable stakeholders. ***Appendix I*** provides resources for best practices and ***Appendix J*** provides general information on the Section 130 process and supplemental treatments.

### Engineering Strategy 5: Enhance the Arizona Supplement to the MUTCD to Better Address Highway-Rail Crossings

***Action:*** Review the 11th edition of the Manual on Uniform Traffic Control Devices (MUTCD) to understand changes that need to be made to the Arizona Supplement to the MUTCD regarding rail crossing traffic controls.

***Action:*** Develop guidelines (as applicable) for:

- Pedestrian railroad crossing treatments
- Pre-signals at railroad crossings
- Gates at railroad crossings
- Humped crossings
- Dynamic envelope striping and signing

## *Education Strategies*

Education and awareness programs are crucial for successful implementation of highway-rail grade crossing plans. These programs discuss items located at crossings, driver responsibilities, how agencies can educate the public on safety at highway-rail grade crossings, and how agencies and railroads can better coordinate and collaborate.

### Education Strategy 1: Support Rail Crossing Safety Public Education and Awareness Efforts

***Action:*** Continue to support rail crossing safety education through the Arizona Operation Lifesaver program, which promotes rail crossing safety through public awareness campaigns and education initiatives and free safety presentations by authorized volunteers.

***Action:*** Identify gaps in driver education curriculum related to rail safety and integrate rail safety information into driver education classes.

### Education Strategy 2: Encourage Reporting of Trains Blocking Crossings

***Action:*** Make known to highway operators and the public that FRA has a Blocked Crossing Incident Reporter website (fra.dot.gov/blockedcrossings/) and phone hotline (1-800-848-8715 and choose option 3) where travelers can report instances of blocked crossings. State law currently allows trains to block crossings for no more than 10 minutes, so any blocking beyond this timeframe should be reported to FRA.

***Action:*** Conduct policy discussions with the ACC, FRA, and the railroads to determine if the 10-minute rule where blocking a crossing is permitted needs to be adjusted to better promote safety at crossings and reduce congestion on the surrounding street network.

### Education Strategy 3: Maintain Regular Agency Coordination

***Action:*** Leverage the agency connections formed as part of the SHRAP to continue coordination and communications between the railroads, ADOT, ACC, FRA, MPOs/COGs, local agencies, tribal communities, and other stakeholders. Ongoing dialogue should focus on:

- Information and awareness on the Section 130 program
- Changes to rail safety funding indicated in the Infrastructure Investment and Jobs Act
- The mutual impact of railroad and new development
- Crossing closures, consolidations, and separations
- Impacts of blocked crossings
- Division of construction and maintenance responsibilities between the railroads and public agencies
- Railroad quiet zone establishment and maintenance requirements
- Technical information and assistance related to signing, striping and vegetation
- Awareness and information regarding surface hazard mitigation
- Awareness and action on counting average daily traffic near crossings

## *Enforcement Strategies*

Law enforcement staff, agencies, and emergency responders serve as a direct first line of emergency response when rail-highway grade crossing crashes occur. These organizations serve an important role in enforcement efforts at crossings in response to accidents. The follow strategies have been identified to improve enforcement safety efforts at highway-rail grade crossings.

### Enforcement Strategy 1: Support Active Enforcement at High-Risk Crossings

***Action:*** Continue to support Arizona's law enforcement agencies as they enforce laws related to highway-rail grade crossing safety, particularly at high-risk crossings (e.g., those with frequently broken gates, trespassers, near misses, etc.).

### Enforcement Strategy 2: Encourage Attendance at Railroad Investigation and Safety Courses

***Action:*** Inform law enforcement of available Railroad Investigation and Safety Course (RISC) training through Operation Lifesaver.

***Action:*** Encourage Arizona's law enforcement agencies to increase the frequency with which RISC training is conducted for their staff to ensure driver behavior and crossing conditions are accurately captured in collision investigations, including recording pedestrian-only crashes.

# Implementation Prioritization

A set of implementation prioritization criteria was developed and used to prioritize the order in which recommended crossing treatments should be implemented using future Section 130 funding. Treatments at the 15 crossings were pre-screened based on their likelihood of using Section 130 funding.

Grade separation projects at crossings 025590V (Bethany Home Road), 741098B (Cortaro Farms Road), 741825C (Val Vista Drive), and 741814P (McQueen Road) are cost-prohibitive to use only Section 130 funding so they were omitted from implementation prioritization (but could be considered for the FRA Railroad Crossing Elimination Grant Program). This screening eliminated the 741098B (Cortaro Farms Road) crossing from further consideration.

The remaining 14 crossings not screened out were prioritized for implementation based on four primary criteria:

- Refined ranking
- Treatment effectiveness
- Planning-level cost/feasibility
- Stakeholder support

The following sections further define how these criteria were applied.

## *Refined Ranking*

Refined ranking is based on the refined risk assessment score described previously. A higher ranking indicates a perceived higher level of risk at the crossing location. The refined ranking established the need for treatment and was the primary implementation prioritization criterion.

## *Treatment Effectiveness*

Treatments were recommended for the 14 identified crossings based on several factors, including crossing characteristics, crash history, and input from local agencies. Treatment effectiveness consists of a reactive approach to the crash history as well as a proactive approach to mitigating potential risk as identified in the Highway-Rail Crossing Handbook.

The reactive approach evaluated the effectiveness of these treatments on their ability to mitigate the most prevalent historical crash types. The most prevalent historical crashes were identified by highway user action and type.

The proactive approach evaluated the effectiveness treatments could have at reducing future crashes. The ability of a treatment to reduce future crashes was identified from examining recommended treatments and best practices from the Highway-Rail Crossing Handbook.

Treatment effectiveness was evaluated qualitatively and quantitatively when data was available.

### Qualitative Component

A qualitative methodology to rate the effectiveness of these treatments was developed to inform future treatment recommendations. Potential common causes of the crashes recorded at crossings were identified from the data. These causes were associated with their respective crash types. **Table 7** provides a summary of the crash types and their potential causes.

**Table 7: Crossing Crash Types and Potential Causes**

| Crash Type | Potential Cause |
|---|---|
| ***Stopped on crossing*** | • Did not see crossing<br>• Congestion<br>• Did not see or hear train<br>• Could not traverse track |
| ***Went around the gates*** | • Attempted to beat train<br>• Did not see or hear train |
| ***Did not stop*** | • Did not see crossing<br>• Attempted to beat train<br>• Did not see or hear train |
| ***Went through gates*** | • Did not see crossing<br>• Attempted to beat train<br>• Did not see or hear train |
| ***Stopped then proceeded*** | • Did not see or hear train |

*Note: Other, Unknown, and Suicide/Attempted Suicide were excluded because their potential causes could not be accurately identified.*

An effectiveness level was assigned to each treatment based on how well it could mitigate potential causes. Effectiveness levels included High, Low, and N/A. An effectiveness level of "High" generally required most of the potential causes to be mitigated by the recommended treatment. An effectiveness level of "Low" generally required at least one of the potential causes to be mitigated by the recommended treatment. "N/A" was used in cases where rating the effectiveness of a treatment was not applicable due to its crash type or existing crossing conditions—for example, installing vehicle gates would not be a reasonable treatment to mitigate "went through gate" crashes. An effectiveness of treatments table is provided in ***Appendix I.***

### Quantitative Component

The FHWA and FRA Noteworthy Practices Guide: Highway-Railway Grade Crossing Action Plan and Project Prioritization (2016) (Highway-Railway Grade Crossing Action Plan) provided the quantitative effectiveness for some treatments. **Table 8** is recreated from the Highway-Railway Grade Crossing Action Plan. The quantitative component was applied when available.

## *Planning-Level Cost*

As discussed previously, planning-level cost estimates were generated for the recommended treatments and are shown in detail in ***Appendix K***. The total planning-level cost influenced prioritization.

## *Stakeholder Support*

Throughout the crossing identification and prioritization process, stakeholder agencies were engaged to ensure that the recommended treatments aligned with their understanding of the needs of the crossings. Generally, a higher rating indicates stakeholders support the project and it aligns with their ongoing efforts and/or planned treatments. Higher ratings were also provided for crossing treatments with agency support that have been challenging to address.

**Table 8: Effectiveness of Crossing Treatments**

| Treatment | Estimated Cost Range* | Effectiveness** |
|---|---|---|
| ***No signs to passive (crossbuck assembly)*** | $500 to $1,500 | 25% |
| ***Passive to flashing lights*** | $120,000 to $250,000 | 64% |
| ***Passive to flashing lights with gates*** | $150,000 to $300,000 | 88% |
| ***Flashing lights to flashing lights with gates*** | $150,000 to $250,000 | 44% |
| ***Flashing lights with gates to four-quadrant gate system*** | $250,000 to $500,000 | 82% |
| ***Flashing lights with gates to flashing lights with gates and medians*** | $30,000 and up depending on construction and right-of-way acquisition | 80% |
| ***Flashing lights with gates to flashing lights with gates and channelization*** | $15,000 | 75% |
| ***Grade separation*** | $5M to $40M | 100% |
| ***Closure*** | $25,000 to $100,000 | 100% |

*Source: Highway-Railway Grade Crossing Action Plan*

**Based on 2015 dollars.*

***The effectiveness of a treatment refers to the expected reduction in the number of highway-railway collisions at a location. It does not reflect a reduction in the severity of collisions or a reduction in the number of fatalities.*

## *Implementation Prioritization Evaluation*

**Table 9** graphically presents the evaluation of the near-term implementation prioritization criteria. Criteria were not weighted for this evaluation. A qualitative rating is provided for each criterion using the following key:

| Key | | | | |
|---|---|---|---|---|
| Strong Disadvantage | Disadvantage | Neutral | Advantage | Strong Advantage |
| ● | ◑ | ○ | ◑ | ● |

**Table 9: Evaluation for Near-Term Implementation Prioritization**

| Crossing ID: Location | Refined Ranking | Treatment Effectiveness | Planning-Level Cost | Stakeholder Support |
|---|---|---|---|---|
| ***025590V:*** Bethany Home Rd, West of 51st Ave, Glendale | 4 | ◑ | $740,000 | ● |
| ***025132G:*** San Francisco St, South of Historic Rte 66, Flagstaff | 5 | ● | $590,000 | ● |
| ***025129Y:*** Fanning Dr, South of Historic Rte 66, Flagstaff | 6 | ● | $1.06 million | ● |
| ***025418A:*** 59th Ave & Glendale Ave, Glendale | 8 | ● | $2.44 million | ◑ |
| ***025133N:*** Beaver St, South of Historic Rte 66, Flagstaff | 9 | ● | $590,000 | ● |
| ***025131A:*** Ponderosa Pkwy, South of Historic Rte 66, Flagstaff | 13 | ◑ | $710,000 | ● |
| ***025017A:*** Navajo Blvd/ Apache Ave, South of Joy Nevin Ave, Holbrook | 15 | ◑ | $1.61 million | ● |
| ***025023D:*** Obed Rd, Joseph City/Navajo County | 16 | ◑ | $600,000 | N/A |
| ***025651J:*** Greenway Rd, North of Grand Ave, Surprise | 17 | ◑ | $200,000 | ◑ |
| ***741560C:*** University Dr, West of Ash Ave, Tempe | 19 | ◑ | $1.07 million | ◑ |
| ***741708G:*** Main St, South of Casa Grande-Picacho Hwy, Eloy | 21 | ◑ | $1.10 million | ● |
| ***741100A:*** Massingale Rd, East of I-10 Frontage Rd, Marana | 22 | ● | $80,000 | ◑ |
| ***741825C:*** Val Vista Dr, South of Warner Rd, Gilbert | 25 | ◑ | $330,000 | ◑ |
| ***741814P:*** McQueen Rd, South of Baseline Rd, Gilbert | 26 | ◑ | $310,000 | ● |

## *Recommended Crossing Treatment Implementation Prioritization*

The recommended implementation prioritization for the crossing treatments is based on the findings in **Table 9.** Implementation prioritization refers to the general order in which the recommended treatments should be integrated into ADOT's Section 130 program.

Crossing treatment implementation prioritization is recommended as follows:

1. San Francisco St, South of Historic Rte 66, Flagstaff
2. Beaver St, South of Historic Rte 66, Flagstaff
3. Bethany Home Rd, West of 51st Ave, Glendale (near-term treatment)
4. Fanning Dr, South of Historic Rte 66, Flagstaff
5. Ponderosa Pkwy, South of Historic Rte 66, Flagstaff
6. 59th Ave & Glendale Ave, Glendale
7. Greenway Rd, North of Grand Ave, Surprise
8. Apache Ave, South of Joy Nevin Ave, Holbrook
9. Main St, South of Casa Grande-Picacho Hwy, Eloy
10. Massingale Rd, East of I-10 Frontage Rd, Tucson
11. University Dr, West of Ash Ave, Tempe
12. McQueen Rd, South of Baseline Rd, Gilbert (near-term treatment)
13. Val Vista Dr, South of Warner Rd, Gilbert (near-term treatment)
14. Obed Rd, Joseph City

Implementation prioritization order and the scope of treatments could change before actual implementation. Factors such as future crash trends, agency funding availability, and changes in the crossing area (traffic volumes, land use, etc.) could influence future programming. This proposed implementation prioritization does not represent a commitment to programming but serves as a guide based on the best available information at this time. Implementation prioritization is independent of potential cost share/agency match as that is unknown currently.

Systemic treatments for rural crossings are recommended to facilitate treatment identification and implementation. Based on ADOT's practices for public mainline crossings and the goals and objectives of this SHRAP, the two priority systemic treatment options for rural crossings are upgrading to concrete crossing surfaces and installing active warning devices.


# 6

# *Appendices*

# Appendix A - Active and Open Highway-Rail Grade Crossing Inventory

## Table A-1: Active Highway-Rail Grade Crossing Inventory

| # | Crossing ID | Suffix | County | City | Street | Total Trains | AADT | Max Train Speed | Traffic Control Group | Context | Crashes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 025004Y | BNSF | Apache | Houck | Allentown Rd | 72 | 100 | 90 | Lights and Gates | Rural | 1 |
| 2 | 025001D | BNSF | Apache | Lupton | Lupton Rd | 72 | 200 | 90 | Lights and Gates | Rural | 0 |
| 3 | 905134B | SRP | Apache | Navajo | County Rd 7230 | 4 | 450 | 49 | Lights and Gates | Rural | 0 |
| 4 | 025011J | BNSF | Apache | Navajo | NF-2015 | 70 | 1250 | 90 | Lights and Gates | Rural | 0 |
| 5 | 909155H | BNSF | Apache | Navajo | Salt Lake Rd | 0 | 303 | 49 | Lights and Gates | Rural | 0 |
| 6 | 905151S | BNSF | Apache | Navajo | Us 191 | 0 | 1900 | 49 | Lights and Gates | Rural | 0 |
| 7 | 741388J | UP | Cochise | Benson | Airport Rd | 40 | 350 | 55 | Lights and Gates | Rural | 0 |
| 8 | 748709M | UP | Cochise | Benson | Mescal Rd | 40 | 1350 | 55 | Lights and Gates | Rural | 1 |
| 9 | 741386V | UP | Cochise | Benson | N San Pedro St | 40 | 1064 | 55 | Lights and Gates | Rural | 1 |
| 10 | 741382T | UP | Cochise | Benson | Ocotillo Rd | 40 | 3147 | 55 | Lights and Gates | Rural | 0 |
| 11 | 741383A | UP | Cochise | Benson | Patagonia St | 40 | 1397 | 55 | Lights and Gates | Rural | 0 |
| 12 | 741389R | UP | Cochise | Benson | Sibyl Rd | 40 | 500 | 45 | Lights and Gates | Rural | 0 |
| 13 | 741403J | UP | Cochise | Bowie | Central Ave | 40 | 480 | 79 | Lights and Gates | Urban | 0 |
| 14 | 742189K | AZER | Cochise | Bowie | Luzena Ave | 1 | 100 | 10 | Passive | Rural | 0 |
| 15 | 742188D | AZER | Cochise | Bowie | Luzena Ave | 1 | 100 | 10 | Passive | Rural | 0 |
| 16 | 741393F | UP | Cochise | Cochise | N Manzora Rd | 40 | 50 | 79 | Lights and Gates | Rural | 0 |
| 17 | 741390K | UP | Cochise | Dragoon | Dragoon Rd | 40 | 1303 | 79 | Lights and Gates | Rural | 0 |
| 18 | 741405X | UP | Cochise | San Simon | Cochise Ave | 40 | 200 | 79 | Lights and Gates | Rural | 0 |
| 19 | 741406E | UP | Cochise | San Simon | Indian Springs Rd | 40 | 40 | 79 | Lights and Gates | Rural | 0 |
| 20 | 741722C | SPV | Cochise | St David | Benson Tomb. Hwy. | 2 | 6885 | 10 | Lights and Gates | Rural | 0 |
| 21 | 741400N | UP | Cochise | Willcox | Country Club Dr | 40 | 120 | 79 | Lights and Gates | Rural | 0 |
| 22 | 741397H | UP | Cochise | Willcox | Maley St | 40 | 2614 | 79 | Lights and Gates | Rural | 0 |
| 23 | 741399W | UP | Cochise | Willcox | Pattie Rd | 40 | 50 | 79 | Lights and Gates | Rural | 0 |

*Source: FRA*

## Table A-1: Active Highway-Rail Grade Crossing Inventory (continued)

| # | Crossing ID | Suffix | County | City | Street | Total Trains | AADT | Max Train Speed | Traffic Control Group | Context | Crashes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 24 | 741398P | UP | Cochise | Willcox | Stewart St | 40 | 329 | 79 | Lights and Gates | Rural | 0 |
| 25 | 025752V | AZCR | Coconino | Ash Fork | Forest Hwy 182 | 0 | 25 | 20 | Passive | Rural | 0 |
| 26 | 025170R | BNSF | Coconino | Bellemont | Parks Rd | 70 | 528 | 79 | Lights and Gates | Rural | 0 |
| 27 | 025133N | BNSF | Coconino | Flagstaff | Beaver St | 70 | 6237 | 45 | Lights and Gates | Urban | 4 |
| 28 | 025125W | BNSF | Coconino | Flagstaff | Cosnino Rd | 70 | 1624 | 45 | Lights and Gates | Rural | 0 |
| 29 | 025131A | BNSF | Coconino | Flagstaff | Enterprise Rd | 70 | 12323 | 10 | Lights and Gates | Urban | 1 |
| 30 | 025129Y | BNSF | Coconino | Flagstaff | Fanning Dr | 70 | 4617 | 55 | Lights and Gates | Urban | 5 |
| 31 | 025118L | BNSF | Coconino | Flagstaff | Private | 70 | 50 | 90 | Passive | Rural | 0 |
| 32 | 025132G | BNSF | Coconino | Flagstaff | San Francisco St | 70 | 5185 | 45 | Lights and Gates | Urban | 5 |
| 33 | 025099J | BNSF | Coconino | Flagstaff | Steves Blvd | 70 | 2996 | 55 | Lights and Gates | Urban | 0 |
| 34 | 025973X | GCRX | Coconino | Grand Canyon | FR335/Apex | 2 | 25 | 30 | Passive | Rural | 0 |
| 35 | 025972R | GCRX | Coconino | Grand Canyon | FR347 | 2 | 25 | 40 | Passive | Rural | 0 |
| 36 | 025975L | GCRX | Coconino | Grand Canyon | Highland Mary Rd | 2 | 25 | 25 | Passive | Rural | 0 |
| 37 | 025983D | GCRX | Coconino | Grand Canyon | Pedestrian | 4 | 100 | 10 | Passive | Rural | 0 |
| 38 | 025976T | GCRX | Coconino | Grand Canyon | Rowe Well Rd | 2 | 25 | 25 | Passive | Rural | 0 |
| 39 | 025977A | GCRX | Coconino | Grand Canyon | Rowe Well Rd | 2 | 25 | 25 | Passive | Rural | 0 |
| 40 | 025981P | GCRX | Coconino | Grand Canyon | Village Loop Dr | 2 | 1250 | 10 | Lights and Gates | Rural | 0 |
| 41 | 025980H | GCRX | Coconino | Grand Canyon | Village Loop Rd | 2 | 1250 | 10 | Lights and Gates | Rural | 0 |
| 42 | 926922B | GCRX | Coconino | Grand Canyon | Village Loop Rd | 2 | 1250 | 10 | Lights and Gates | Rural | 0 |
| 43 | 874924T | BMLP | Coconino | Page | Bia 201 | 6 | 50 | 55 | Passive | Rural | 0 |
| 44 | 874928V | BMLP | Coconino | Page | Bia 21 | 6 | 50 | 55 | Flashing Lights | Rural | 0 |
| 45 | 874934Y | BMLP | Coconino | Page | Bia 213 | 6 | 50 | 55 | Passive | Rural | 0 |
| 46 | 874940C | BMLP | Coconino | Page | Bia 260 | 6 | 10 | 55 | Passive | Rural | 0 |

*Source: FRA*

## Table A-1: Active Highway-Rail Grade Crossing Inventory (continued)

| # | Crossing ID | Suffix | County | City | Street | Total Trains | AADT | Max Train Speed | Traffic Control Group | Context | Crashes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 47 | 874946T | BMLP | Coconino | Page | Bia 6270/Cow S... | 6 | 242 | 55 | Flashing Lights | Rural | 0 |
| 48 | 874943X | BMLP | Coconino | Page | Bia6261 | 6 | 25 | 55 | Passive | Rural | 0 |
| 49 | 874938B | BMLP | Coconino | Page | M-H Tribal Rd #1 | 6 | 10 | 55 | Passive | Rural | 0 |
| 50 | 874939H | BMLP | Coconino | Page | N-H Tribal Rd #2 | 6 | 10 | 55 | Passive | Rural | 0 |
| 51 | 874941J | BMLP | Coconino | Page | N-H Tribal Rd #3 | 6 | 10 | 55 | Passive | Rural | 0 |
| 52 | 874947A | BMLP | Coconino | Page | N-H Tribal Rd #4 | 6 | 10 | 55 | Passive | Rural | 0 |
| 53 | 874935F | BMLP | Coconino | Page | Preston Mesa Rd | 6 | 50 | 55 | Flashing Lights | Rural | 0 |
| 54 | 874945L | BMLP | Coconino | Page | Shonto Rd | 6 | 136 | 55 | Passive | Rural | 0 |
| 55 | 874942R | BMLP | Coconino | Page | Sour Water Canyon | 6 | 25 | 55 | Passive | Rural | 0 |
| 56 | 874926G | BMLP | Coconino | Page | Tribal Park Rd | 6 | 10 | 55 | Passive | Rural | 0 |
| 57 | 874925A | BMLP | Coconino | Page | Tribal Park Rd | 6 | 10 | 55 | Passive | Rural | 0 |
| 58 | 874922E | BMLP | Coconino | Page | Tribal Park Rd 3 | 6 | 10 | 55 | Passive | Rural | 0 |
| 59 | 874923L | BMLP | Coconino | Page | Tribal Park Rd 4 | 6 | 10 | 55 | Passive | Rural | 0 |
| 60 | 874927N | BMLP | Coconino | Page | Tribal Park Rd 6 | 6 | 10 | 55 | Passive | Rural | 0 |
| 61 | 874929C | BMLP | Coconino | Page | Tribal Park Rd 7 | 6 | 10 | 55 | Passive | Rural | 0 |
| 62 | 874930W | BMLP | Coconino | Page | Tribal Park Rd 8 | 6 | 10 | 55 | Passive | Rural | 0 |
| 63 | 874921X | BMLP | Coconino | Page | Tribal Park Rd | 6 | 50 | 55 | Passive | Rural | 0 |
| 64 | 874931D | BMLP | Coconino | Page | Tribal Rd 1 | 6 | 10 | 55 | Passive | Rural | 0 |
| 65 | 874932K | BMLP | Coconino | Page | Tribal Rd 2 | 6 | 10 | 55 | Passive | Rural | 0 |
| 66 | 874933S | BMLP | Coconino | Page | Tribal Rd 3 | 6 | 10 | 55 | Passive | Rural | 0 |
| 67 | 874937U | BMLP | Coconino | Page | Tribal Rd 4 | 6 | 10 | 55 | Passive | Rural | 0 |
| 68 | 025303F | BNSF | Coconino | Williams | 7th St | 6 | 2500 | 40 | Lights and Gates | Rural | 0 |
| 69 | 025963S | GCRX | Coconino | Williams | Espee Rd | 2 | 652 | 35 | Lights and Gates | Rural | 0 |

*Source: FRA*

## Table A-1: Active Highway-Rail Grade Crossing Inventory (continued)

| # | Crossing ID | Suffix | County | City | Street | Total Trains | AADT | Max Train Speed | Traffic Control Group | Context | Crashes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 70 | 025172E | BNSF | Coconino | Williams | Garland Prairie Rd | 70 | 228 | 90 | Lights and Gates | Rural | 0 |
| 71 | 025302Y | BNSF | Coconino | Williams | Gr Canyon Blvd | 6 | 4334 | 40 | Lights and Gates | Rural | 0 |
| 72 | 025962K | GCRX | Coconino | Williams | Prong Horn Ranch | 2 | 162 | 35 | Lights and Gates | Rural | 0 |
| 73 | 025960W | GCRX | Coconino | Williams | Rodeo Rd | 2 | 500 | 20 | Lights and Gates | Rural | 0 |
| 74 | 025171X | BNSF | Coconino | Williams | Sherwood Forest R | 70 | 182 | 55 | Lights and Gates | Rural | 1 |
| 75 | 741683N | UP | Gila | Chandler Hgts | Hunt Hwy | 0 | 6370 | 0 | Lights and Gates | Urban | 0 |
| 76 | 748716X | AZER | Gila | Claypool | Apache Trail | 2 | 3000 | 10 | Lights and Gates | Rural | 0 |
| 77 | 742364Y | AZER | Gila | Claypool | Bixby Rd | 2 | 910 | 10 | Lights and Gates | Rural | 0 |
| 78 | 742363S | AZER | Gila | Claypool | Pinal Creek Rd | 1 | 910 | 10 | Passive | Rural | 0 |
| 79 | 742342Y | AZER | Gila | Globe | Apache Gold Casino | 1 | 5298 | 25 | Lights and Gates | Rural | 0 |
| 80 | 742348P | AZER | Gila | Globe | Broad St | 1 | 4758 | 10 | Flashing Lights | Urban | 0 |
| 81 | 742352E | AZER | Gila | Globe | Cedar St | 1 | 1296 | 10 | Flashing Lights | Urban | 0 |
| 82 | 742349W | AZER | Gila | Globe | Cottonwood | 1 | 880 | 10 | Lights and Gates | Urban | 0 |
| 83 | 742339R | AZER | Gila | Globe | Cutter Rd | 1 | 3107 | 25 | Lights and Gates | Rural | 0 |
| 84 | 742354T | AZER | Gila | Globe | Hackney Ave | 1 | 1125 | 10 | Lights and Gates | Urban | 0 |
| 85 | 742362K | AZER | Gila | Globe | Jackrabbit | 1 | 500 | 10 | Passive | Rural | 0 |
| 86 | 742347H | AZER | Gila | Globe | Matlock | 4 | 1000 | 30 | Passive | Urban | 0 |
| 87 | 742353L | AZER | Gila | Globe | Mesquite St | 1 | 500 | 10 | Flashing Lights | Urban | 0 |
| 88 | 742357N | AZER | Gila | Globe | Murphy St | 1 | 250 | 10 | Passive | Urban | 0 |
| 89 | 742351X | AZER | Gila | Globe | Oak St | 1 | 2376 | 10 | Flashing Lights | Urban | 0 |
| 90 | 742361D | AZER | Gila | Globe | Silver Hill | 1 | 500 | 10 | Passive | Rural | 0 |
| 91 | 742350R | AZER | Gila | Globe | Sycamore | 1 | 2754 | 10 | Flashing Lights | Urban | 0 |
| 92 | 742386Y | CBRY | Gila | Hayden | Golf Course Rd | 6 | 50 | 25 | Passive | Urban | 0 |

*Source: FRA*

## Table A-1: Active Highway-Rail Grade Crossing Inventory (continued)

| # | Crossing ID | Suffix | County | City | Street | Total Trains | AADT | Max Train Speed | Traffic Control Group | Context | Crashes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 93 | 742374E | AZER | Gila | Miami | Calle De Loma | 4 | 483 | 10 | Passive | Urban | 0 |
| 94 | 742372R | AZER | Gila | Miami | Grover Canyon Rd | 4 | 840 | 10 | Passive | Urban | 0 |
| 95 | 742377A | AZER | Gila | Miami | Kent St | 0 | 483 | 10 | Passive | Urban | 0 |
| 96 | 742380H | AZER | Gila | Miami | Latham Blvd | 0 | 398 | 10 | Passive | Urban | 0 |
| 97 | 742378G | AZER | Gila | Miami | Loomis | 0 | 470 | 10 | Passive | Urban | 0 |
| 98 | 742375L | AZER | Gila | Miami | Marion | 1 | 483 | 10 | Passive | Urban | 1 |
| 99 | 742376T | AZER | Gila | Miami | Mill St | 0 | 483 | 10 | Passive | Urban | 0 |
| 100 | 742373X | AZER | Gila | Miami | New St | 4 | 947 | 10 | Lights and Gates | Urban | 0 |
| 101 | 742369H | AZER | Gila | Miami | Old Oak St | 2 | 1494 | 10 | Lights and Gates | Urban | 0 |
| 102 | 742371J | AZER | Gila | Miami | Pineway St | 4 | 733 | 10 | Lights and Gates | Urban | 0 |
| 103 | 742368B | AZER | Gila | Miami | Ragus Rd | 2 | 2081 | 10 | Lights and Gates | Urban | 0 |
| 104 | 742367U | AZER | Gila | Miami | US 60 East | 2 | 14072 | 10 | Lights and Gates | Urban | 0 |
| 105 | 903609J | AZER | Gila | Miami | US 60 | 5 | 11000 | 10 | Lights and Gates | Urban | 0 |
| 106 | 742336V | AZER | Gila | San Carlos | Aravaipa Rd | 1 | 250 | 25 | Flashing Lights | Rural | 0 |
| 107 | 742332T | AZER | Gila | San Carlos | Bia 2 | 1 | 250 | 25 | Lights and Gates | Rural | 0 |
| 108 | 742335N | AZER | Gila | San Carlos | SR 170 | 1 | 7342 | 25 | Lights and Gates | Rural | 0 |
| 109 | 742306D | AZER | Graham | Bylas | Centerpoint En | 1 | 1009 | 25 | Lights and Gates | Rural | 0 |
| 110 | 742303H | AZER | Graham | Bylas | Geronimo-Goodwin | 1 | 25 | 25 | Passive | Rural | 0 |
| 111 | 973428V | AZER | Graham | Bylas | Home Alone Rd | 1 | 500 | 25 | Lights and Gates | Rural | 0 |
| 112 | 742309Y | AZER | Graham | Bylas | Navajo Rd | 1 | 540 | 25 | Lights and Gates | Rural | 0 |
| 113 | 742253G | AZER | Graham | Central | Central Rd | 1 | 700 | 25 | Lights and Gates | Rural | 0 |
| 114 | 742287B | AZER | Graham | Fort Thomas | Ashurst Cemetary | 1 | 25 | 25 | Passive | Rural | 0 |
| 115 | 742294L | AZER | Graham | Fort Thomas | Black Rock Rd | 1 | 500 | 25 | Passive | Rural | 0 |

*Source: FRA*

## Table A-1: Active Highway-Rail Grade Crossing Inventory (continued)

| # | Crossing ID | Suffix | County | City | Street | Total Trains | AADT | Max Train Speed | Traffic Control Group | Context | Crashes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 116 | 742292X | AZER | Graham | Fort Thomas | Desert Sage Rd | 1 | 250 | 25 | Passive | Rural | 0 |
| 117 | 742302B | AZER | Graham | Fort Thomas | Emery Goodwin W | 1 | 25 | 25 | Passive | Rural | 0 |
| 118 | 742282S | AZER | Graham | Fort Thomas | Redknolls Rd/E | 1 | 50 | 25 | Passive | Rural | 0 |
| 119 | 742286U | AZER | Graham | Fort Thomas | Sub Station Rd | 1 | 52 | 25 | Passive | Rural | 0 |
| 120 | 742260S | AZER | Graham | Pima | 100 East St | 1 | 300 | 25 | Passive | Rural | 0 |
| 121 | 742264U | AZER | Graham | Pima | 100 South St | 1 | 330 | 25 | Lights and Gates | Rural | 0 |
| 122 | 742259X | AZER | Graham | Pima | 200 East St | 1 | 100 | 25 | Passive | Rural | 0 |
| 123 | 742263M | AZER | Graham | Pima | 200 West St | 1 | 50 | 25 | Passive | Rural | 0 |
| 124 | 742258R | AZER | Graham | Pima | 400 East St | 1 | 25 | 25 | Passive | Rural | 0 |
| 125 | 742257J | AZER | Graham | Pima | Alder Ln | 1 | 150 | 25 | Passive | Rural | 0 |
| 126 | 742272L | AZER | Graham | Pima | Glenbar Gin Rd | 1 | 50 | 25 | Passive | Rural | 0 |
| 127 | 742279J | AZER | Graham | Pima | Klondyke Rd | 1 | 100 | 25 | Passive | Rural | 0 |
| 128 | 742268W | AZER | Graham | Pima | Patterson Mesa Rd | 1 | 121 | 25 | Passive | Rural | 0 |
| 129 | 742262F | AZER | Graham | Pima | South 100 West | 1 | 25 | 25 | Passive | Rural | 0 |
| 130 | 742261Y | AZER | Graham | Pima | South Main St | 1 | 2076 | 25 | Lights and Gates | Rural | 0 |
| 131 | 742266H | AZER | Graham | Pima | Tripp Cyn Rd | 1 | 1180 | 25 | Passive | Rural | 0 |
| 132 | 742232N | AZER | Graham | Safford | 11th Ave | 1 | 960 | 10 | Passive | Rural | 0 |
| 133 | 916301D | AZER | Graham | Safford | 14th Ave | 1 | 3806 | 10 | Lights and Gates | Urban | 0 |
| 134 | 742211V | AZER | Graham | Safford | 1st Ave /191 | 1 | 9745 | 10 | Lights and Gates | Urban | 0 |
| 135 | 742239L | AZER | Graham | Safford | 20th Ave | 1 | 11187 | 10 | Lights and Gates | Urban | 0 |
| 136 | 742216E | AZER | Graham | Safford | 5th Ave | 1 | 746 | 10 | Passive | Rural | 0 |
| 137 | 742217L | AZER | Graham | Safford | 6th Ave | 1 | 300 | 10 | Passive | Urban | 0 |
| 138 | 742218T | AZER | Graham | Safford | 7th Ave | 1 | 300 | 10 | Passive | Rural | 0 |

*Source: FRA*

## Table A-1: Active Highway-Rail Grade Crossing Inventory (continued)

| # | Crossing ID | Suffix | County | City | Street | Total Trains | AADT | Max Train Speed | Traffic Control Group | Context | Crashes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 139 | 742219A | AZER | Graham | Safford | 8th Ave | 1 | 5281 | 10 | Lights and Gates | Rural | 0 |
| 140 | 742241M | AZER | Graham | Safford | 8th St | 1 | 6140 | 25 | Lights and Gates | Rural | 0 |
| 141 | 742215X | AZER | Graham | Safford | Central Ave | 2 | 3002 | 10 | Lights and Gates | Urban | 0 |
| 142 | 742203D | AZER | Graham | Safford | Montierth Ln | 1 | 7534 | 25 | Passive | Rural | 0 |
| 143 | 742201P | AZER | Graham | Solomon | Barney Ln | 1 | 694 | 25 | Passive | Rural | 0 |
| 144 | 742202W | AZER | Graham | Solomon | Lone Star Rd | 2 | 1257 | 25 | Lights and Gates | Rural | 0 |
| 145 | 742199R | AZER | Graham | Solomon | Solomon Rd | 1 | 956 | 25 | Passive | Rural | 0 |
| 146 | 742242U | AZER | Graham | Thatcher | 1st Ave | 1 | 2250 | 25 | Lights and Gates | Rural | 0 |
| 147 | 742243B | AZER | Graham | Thatcher | College Ave | 1 | 300 | 25 | Lights and Gates | Urban | 0 |
| 148 | 974922F | AZER | Graham | Thatcher | College Pedestrian | 1 | 25 | 25 | Passive | Rural | 0 |
| 149 | 742247D | AZER | Graham | Thatcher | Palmer Ln | 1 | 673 | 25 | Passive | Rural | 0 |
| 150 | 742245P | AZER | Graham | Thatcher | Reay Ln | 1 | 1500 | 25 | Lights and Gates | Rural | 0 |
| 151 | 742244H | AZER | Graham | Thatcher | Stadium Ave | 1 | 1300 | 25 | Lights and Gates | Urban | 0 |
| 152 | 742249S | AZER | Graham | Thatcher | Webster Rd | 1 | 500 | 25 | Passive | Rural | 0 |
| 153 | 741891P | AZER | Greenlee | Clifton | 2nd St | 1 | 1126 | 25 | Lights and Gates | Rural | 0 |
| 154 | 741892W | AZER | Greenlee | Clifton | Park Ave | 1 | 195 | 25 | Lights and Gates | Rural | 0 |
| 155 | 905170W | PDCM | Greenlee | Clifton | Riverside Dr | 0 | 325 | 10 | Lights and Gates | Rural | 0 |
| 156 | 741890H | AZER | Greenlee | Clifton | Seventh St | 2 | 500 | 25 | Lights and Gates | Rural | 0 |
| 157 | 741893D | AZER | Greenlee | Clifton | US 191 | 1 | 9145 | 25 | Lights and Gates | Rural | 1 |
| 158 | 741894K | AZER | Greenlee | Clifton | US 191 | 1 | 9145 | 25 | Lights and Gates | Rural | 0 |
| 159 | 741895S | AZER | Greenlee | Clifton | Zorilla St | 1 | 500 | 25 | Lights and Gates | Rural | 0 |
| 160 | 741866G | AZER | Greenlee | Duncan | Main St/SR75 | 1 | 2875 | 25 | Lights and Gates | Rural | 0 |
| 161 | 741861X | AZER | Greenlee | Duncan | US 70/ High St | 1 | 3085 | 25 | Lights and Gates | Rural | 0 |

*Source: FRA*

## Table A-1: Active Highway-Rail Grade Crossing Inventory (continued)

| # | Crossing ID | Suffix | County | City | Street | Total Trains | AADT | Max Train Speed | Traffic Control Group | Context | Crashes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 162 | 025922M | ARZC | La Paz | Bouse | Avenue 46E | 3 | 50 | 40 | Passive | Rural | 0 |
| 163 | 025924B | ARZC | La Paz | Bouse | Main St | 3 | 350 | 40 | Lights and Gates | Rural | 0 |
| 164 | 025921F | ARZC | La Paz | Bouse | Mcvey | 3 | 141 | 40 | Lights and Gates | Rural | 0 |
| 165 | 025923U | ARZC | La Paz | Bouse | Private Rd | 4 | 50 | 40 | Passive | Rural | 0 |
| 166 | 025925H | ARZC | La Paz | Bouse | Willamette Dr | 3 | 500 | 40 | Lights and Gates | Rural | 0 |
| 167 | 025933A | ARZC | La Paz | Parker | 11th St | 3 | 1000 | 20 | Lights and Gates | Rural | 0 |
| 168 | 025931L | ARZC | La Paz | Parker | 18th St | 3 | 395 | 20 | Lights and Gates | Rural | 0 |
| 169 | 914399C | ARZC | La Paz | Parker | Central Av | 3 | 50 | 49 | Passive | Rural | 0 |
| 170 | 025928D | ARZC | La Paz | Parker | Mohave | 4 | 386 | 20 | Passive | Rural | 0 |
| 171 | 025927W | ARZC | La Paz | Parker | Noovuna/Shea Rd | 3 | 50 | 20 | Passive | Rural | 0 |
| 172 | 914397N | ARZC | La Paz | Parker | Parker Rd | 4 | 250 | 49 | Passive | Rural | 0 |
| 173 | 025934G | ARZC | La Paz | Parker | SR95/Riverside | 3 | 19870 | 20 | Lights and Gates | Rural | 0 |
| 174 | 025915C | ARZC | La Paz | Salome | Aveneu 62E | 3 | 100 | 49 | Lights and Gates | Rural | 0 |
| 175 | 025918X | ARZC | La Paz | Salome | Avenue 59E | 3 | 100 | 49 | Passive | Rural | 0 |
| 176 | 025917R | ARZC | La Paz | Salome | Center St | 3 | 530 | 49 | Lights and Gates | Rural | 0 |
| 177 | 025916J | ARZC | La Paz | Salome | Hall St | 3 | 500 | 49 | Lights and Gates | Rural | 0 |
| 178 | 025919E | ARZC | La Paz | Salome | Vicksburg Rd | 3 | 100 | 40 | Passive | Rural | 0 |
| 179 | 025912G | ARZC | La Paz | Wenden | Alamo Rd/2nd St | 2 | 357 | 49 | Lights and Gates | Rural | 0 |
| 180 | 025910T | ARZC | La Paz | Wenden | Avenue 69E | 2 | 100 | 49 | Lights and Gates | Rural | 0 |
| 181 | 025909Y | ARZC | La Paz | Wenden | Avenue 74E | 2 | 50 | 49 | Passive | Rural | 0 |
| 182 | 025913N | ARZC | La Paz | Wenden | Back Anderson Rd | 2 | 500 | 49 | Passive | Rural | 0 |
| 183 | 025904P | ARZC | Maricopa | Aguila | Eagle Eye Rd | 2 | 1259 | 40 | Lights and Gates | Rural | 0 |
| 184 | 025903H | ARZC | Maricopa | Aguila | SR71 | 2 | 657 | 40 | Lights and Gates | Rural | 0 |

*Source: FRA*

## Table A-1: Active Highway-Rail Grade Crossing Inventory (continued)

| # | Crossing ID | Suffix | County | City | Street | Total Trains | AADT | Max Train Speed | Traffic Control Group | Context | Crashes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 185 | 741763G | UP | Maricopa | Arlington | 355th St | 2 | 291 | 40 | Lights and Gates | Rural | 0 |
| 186 | 741753B | UP | Maricopa | Arlington | 571st Ave | 0 | 110 | 0 | Lights and Gates | Rural | 0 |
| 187 | 741759S | UP | Maricopa | Arlington | Agua Caliente Rd | 0 | 25 | 0 | Passive | Rural | 0 |
| 188 | 741764N | UP | Maricopa | Arlington | Salome Highway | 2 | 1000 | 40 | Lights and Gates | Rural | 0 |
| 189 | 741796U | UP | Maricopa | Avondale | 4th St | 2 | 2725 | 40 | Lights and Gates | Urban | 0 |
| 190 | 741799P | UP | Maricopa | Avondale | Avondale Blvd | 2 | 23660 | 40 | Lights and Gates | Urban | 0 |
| 191 | 741797B | UP | Maricopa | Avondale | Dysart Rd | 2 | 14497 | 40 | Lights and Gates | Urban | 0 |
| 192 | 741795M | UP | Maricopa | Avondale | South Central Ave | 2 | 8023 | 10 | Lights and Gates | Urban | 0 |
| 193 | 025599G | BNSF | Maricopa | Beardsley | 163rd Ave | 8 | 9150 | 49 | Lights and Gates | Rural | 1 |
| 194 | 025583K | BNSF | Maricopa | Beardsley | Meeker Blvd | 8 | 18000 | 49 | Lights and Gates | Urban | 0 |
| 195 | 025595E | BNSF | Maricopa | Beardsley | Rh Johnson Blvd | 8 | 9100 | 49 | Lights and Gates | Urban | 0 |
| 196 | 741773M | UP | Maricopa | Buckeye | 4th Avenue | 2 | 1095 | 10 | Lights and Gates | Urban | 0 |
| 197 | 741775B | UP | Maricopa | Buckeye | Apache Rd | 2 | 1000 | 40 | Lights and Gates | Urban | 0 |
| 198 | 741774U | UP | Maricopa | Buckeye | Baseline Rd | 2 | 2730 | 40 | Lights and Gates | Urban | 0 |
| 199 | 748157A | UP | Maricopa | Buckeye | Dean Rd | 2 | 1100 | 40 | Lights and Gates | Urban | 0 |
| 200 | 741779D | UP | Maricopa | Buckeye | Jackrabbit Rd | 2 | 3640 | 40 | Lights and Gates | Urban | 0 |
| 201 | 741771Y | UP | Maricopa | Buckeye | Miller Rd | 2 | 8190 | 40 | Lights and Gates | Urban | 0 |
| 202 | 741772F | UP | Maricopa | Buckeye | Miller Rd | 0 | 8190 | 10 | Passive | Urban | 0 |
| 203 | 741780X | UP | Maricopa | Buckeye | Perryville Rd | 2 | 1000 | 40 | Lights and Gates | Urban | 0 |
| 204 | 741776H | UP | Maricopa | Buckeye | Rainbow Rd | 2 | 1820 | 40 | Lights and Gates | Urban | 0 |
| 205 | 741770S | UP | Maricopa | Buckeye | Rooks Rd | 2 | 1800 | 40 | Lights and Gates | Urban | 0 |
| 206 | 741769X | UP | Maricopa | Buckeye | SR 85 Northbound | 2 | 9476 | 40 | Lights and Gates | Urban | 0 |
| 207 | 922558C | UP | Maricopa | Buckeye | SR 85 Southbound | 4 | 9672 | 40 | Lights and Gates | Urban | 0 |

*Source: FRA*

## Table A-1: Active Highway-Rail Grade Crossing Inventory (continued)

| # | Crossing ID | Suffix | County | City | Street | Total Trains | AADT | Max Train Speed | Traffic Control Group | Context | Crashes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 208 | 741768R | UP | Maricopa | Buckeye | Turner Rd | 2 | 277 | 40 | Lights and Gates | Urban | 0 |
| 209 | 741778W | UP | Maricopa | Buckeye | Verrado Way | 2 | 400 | 40 | Lights and Gates | Urban | 0 |
| 210 | 741767J | UP | Maricopa | Buckeye | Wilson Rd | 2 | 100 | 40 | Lights and Gates | Urban | 0 |
| 211 | 741800G | UP | Maricopa | Cashion | South 107th Ave | 2 | 15121 | 40 | Lights and Gates | Urban | 0 |
| 212 | 741581V | UP | Maricopa | Chandler | Allison Rd | 0 | 200 | 10 | Passive | Rural | 0 |
| 213 | 741679Y | UP | Maricopa | Chandler | Appleby Rd | 1 | 200 | 10 | Passive | Urban | 0 |
| 214 | 741671U | UP | Maricopa | Chandler | Chandler Blvd | 1 | 34302 | 10 | Lights and Gates | Urban | 0 |
| 215 | 741580N | UP | Maricopa | Chandler | Chandler Blvd | 0 | 34300 | 10 | Lights and Gates | Urban | 0 |
| 216 | 741681A | UP | Maricopa | Chandler | Chandler Heights | 1 | 12700 | 10 | Lights and Gates | Urban | 0 |
| 217 | 741672B | UP | Maricopa | Chandler | Commonwealth Ave | 1 | 1057 | 10 | Lights and Gates | Urban | 0 |
| 218 | 741670M | UP | Maricopa | Chandler | East Erie St | 1 | 2947 | 10 | Lights and Gates | Urban | 0 |
| 219 | 741664J | UP | Maricopa | Chandler | Elliot Rd | 1 | 24929 | 10 | Lights and Gates | Urban | 0 |
| 220 | 741673H | UP | Maricopa | Chandler | Frye Rd | 1 | 7449 | 10 | Lights and Gates | Urban | 0 |
| 221 | 411019C | UP | Maricopa | Chandler | Frye Rd | 0 | 2500 | 10 | Lights and Gates | Urban | 0 |
| 222 | 741669T | UP | Maricopa | Chandler | Galveston St | 1 | 4766 | 10 | Lights and Gates | Urban | 0 |
| 223 | 741676D | UP | Maricopa | Chandler | Germann Rd | 1 | 14700 | 10 | Lights and Gates | Urban | 0 |
| 224 | 748748D | UP | Maricopa | Chandler | Germann Rd | 0 | 500 | 10 | Passive | Urban | 0 |
| 225 | 741667E | UP | Maricopa | Chandler | Knox Rd | 1 | 4847 | 10 | Lights and Gates | Urban | 0 |
| 226 | 920154A | UP | Maricopa | Chandler | Morelos Pl | 0 | 1250 | 10 | Lights and Gates | Urban | 1 |
| 227 | 741680T | UP | Maricopa | Chandler | Ocotillo Rd | 1 | 8084 | 10 | Lights and Gates | Urban | 0 |
| 228 | 741674P | UP | Maricopa | Chandler | Pecos Rd | 1 | 15800 | 10 | Lights and Gates | Urban | 0 |
| 229 | 741678S | UP | Maricopa | Chandler | Queen Creek Rd | 1 | 6370 | 10 | Lights and Gates | Urban | 0 |
| 230 | 741668L | UP | Maricopa | Chandler | Ray Rd | 1 | 28400 | 10 | Lights and Gates | Urban | 0 |

*Source: FRA*

## Table A-1: Active Highway-Rail Grade Crossing Inventory (continued)

| # | Crossing ID | Suffix | County | City | Street | Total Trains | AADT | Max Train Speed | Traffic Control Group | Context | Crashes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 231 | 741579U | UP | Maricopa | Chandler | Ray Rd | 0 | 28000 | 10 | Lights and Gates | Urban | 0 |
| 232 | 741682G | UP | Maricopa | Chandler | Riggs Rd | 1 | 20930 | 10 | Lights and Gates | Urban | 0 |
| 233 | 741677K | UP | Maricopa | Chandler | Ryan Rd | 1 | 750 | 10 | Passive | Rural | 0 |
| 234 | 748747W | UP | Maricopa | Chandler | Sundust Rd | 0 | 200 | 10 | Passive | Urban | 0 |
| 235 | 741665R | UP | Maricopa | Chandler | Warner Rd | 1 | 25000 | 10 | Lights and Gates | Urban | 0 |
| 236 | 741675W | UP | Maricopa | Chandler | Willis Rd | 1 | 1101 | 10 | Lights and Gates | Urban | 0 |
| 237 | 741582C | UP | Maricopa | Chandler | Willis Rd | 0 | 100 | 10 | Passive | Rural | 0 |
| 238 | 025703Y | BNSF | Maricopa | El Mirage | Dysart Rd | 0 | 28500 | 10 | Lights and Gates | Urban | 0 |
| 239 | 025700D | BNSF | Maricopa | El Mirage | Grand Ave & Ft Rd | 0 | 24780 | 10 | Lights and Gates | Urban | 0 |
| 240 | 025631X | BNSF | Maricopa | El Mirage | Thompson Ranch | 10 | 5532 | 40 | Lights and Gates | Urban | 0 |
| 241 | 741754H | UP | Maricopa | Gila Bend | Agua Caliente Rd | 0 | 25 | 0 | Lights and Gates | Rural | 0 |
| 242 | 840725V | TCG | Maricopa | Gila Bend | Martin Ave | 2 | 500 | 5 | Passive | Rural | 0 |
| 243 | 741082E | UP | Maricopa | Gila Bend | Martin Ave | 31 | 852 | 70 | Lights and Gates | Rural | 0 |
| 244 | 840726C | TCG | Maricopa | Gila Bend | Unk | 2 | 50 | 35 | Passive | Rural | 0 |
| 245 | 741820T | UP | Maricopa | Gilbert | E Elliot Rd | 4 | 22000 | 60 | Lights and Gates | Urban | 0 |
| 246 | 922180W | UP | Maricopa | Gilbert | E Ray Rd | 4 | 18500 | 60 | Lights and Gates | Urban | 0 |
| 247 | 741824V | UP | Maricopa | Gilbert | E Warner Rd | 4 | 24000 | 60 | Lights and Gates | Urban | 0 |
| 248 | 741831F | UP | Maricopa | Gilbert | E Williams Field Rd | 4 | 18500 | 60 | Lights and Gates | Urban | 0 |
| 249 | 741816D | UP | Maricopa | Gilbert | N Cooper Rd | 4 | 24000 | 60 | Lights and Gates | Rural | 1 |
| 250 | 741819Y | UP | Maricopa | Gilbert | N Gilbert Rd | 4 | 27000 | 60 | Lights and Gates | Urban | 0 |
| 251 | 741814P | UP | Maricopa | Gilbert | N Mcqueen Rd | 4 | 29109 | 60 | Lights and Gates | Urban | 1 |
| 252 | 741830Y | UP | Maricopa | Gilbert | S Higley Rd | 4 | 27500 | 60 | Lights and Gates | Rural | 0 |
| 253 | 741823N | UP | Maricopa | Gilbert | S Lindsay Rd | 4 | 29000 | 60 | Lights and Gates | Urban | 0 |

*Source: FRA*

## Table A-1: Active Highway-Rail Grade Crossing Inventory (continued)

| # | Crossing ID | Suffix | County | City | Street | Total Trains | AADT | Max Train Speed | Traffic Control Group | Context | Crashes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 254 | 741833U | UP | Maricopa | Gilbert | Power Rd/Pecos Rd | 2 | 65000 | 60 | Lights and Gates | Urban | 1 |
| 255 | 741832M | UP | Maricopa | Gilbert | S Recker Rd | 4 | 13000 | 60 | Lights and Gates | Urban | 0 |
| 256 | 741825C | UP | Maricopa | Gilbert | S Val Vista Dr | 4 | 34000 | 60 | Lights and Gates | Urban | 1 |
| 257 | 741662V | UP | Maricopa | Gilbert | W Guadalupe Rd | 1 | 15773 | 10 | Lights and Gates | Urban | 1 |
| 258 | 741815W | UP | Maricopa | Gilbert | W Guadalupe Rd | 4 | 15700 | 60 | Lights and Gates | Urban | 0 |
| 259 | 025489W | BNSF | Maricopa | Glendale | 51st Ave | 12 | 20221 | 49 | Flashing Lights | Urban | 0 |
| 260 | 025418A | BNSF | Maricopa | Glendale | 59th Ave/Glendale | 12 | 52000 | 40 | Flashing Lights | Urban | 3 |
| 261 | 025413R | BNSF | Maricopa | Glendale | 67th/Northern Ave | 12 | 20716 | 40 | Lights and Gates | Urban | 0 |
| 262 | 025590V | BNSF | Maricopa | Glendale | Bethany Home Rd | 12 | 19500 | 40 | Lights and Gates | Urban | 8 |
| 263 | 025422P | BNSF | Maricopa | Glendale | Camelback Rd | 12 | 32176 | 40 | Lights and Gates | Urban | 9 |
| 264 | 025488P | BNSF | Maricopa | Glendale | Colter St | 12 | 1000 | 49 | Lights and Gates | Urban | 0 |
| 265 | 025725Y | BNSF | Maricopa | Glendale | Cotton Ln | 0 | 6824 | 10 | Lights and Gates | Urban | 0 |
| 266 | 025459E | BNSF | Maricopa | Glendale | Grand Ave US 60 | 12 | 29376 | 49 | Flashing Lights | Urban | 0 |
| 267 | 025415E | BNSF | Maricopa | Glendale | Myrtle Ave | 12 | 2500 | 40 | Lights and Gates | Urban | 1 |
| 268 | 025712X | BNSF | Maricopa | Glendale | N Litchfield Rd | 0 | 11377 | 10 | Lights and Gates | Urban | 0 |
| 269 | 025460Y | BNSF | Maricopa | Glendale | Northern Ave | 12 | 19058 | 49 | Flashing Lights | Urban | 0 |
| 270 | 025747Y | BNSF | Maricopa | Glendale | Olive Ave | 0 | 4856 | 10 | Lights and Gates | Urban | 0 |
| 271 | 025414X | BNSF | Maricopa | Glendale | Orange Wood Ave | 12 | 1596 | 40 | Lights and Gates | Urban | 0 |
| 272 | 025487H | BNSF | Maricopa | Glendale | Pasadena Ave | 12 | 1000 | 49 | Lights and Gates | Urban | 0 |
| 273 | 025716A | BNSF | Maricopa | Glendale | Reems Rd | 0 | 8190 | 10 | Lights and Gates | Urban | 0 |
| 274 | 025720P | BNSF | Maricopa | Glendale | Sarival Rd | 0 | 1820 | 10 | Lights and Gates | Urban | 0 |
| 275 | 025486B | BNSF | Maricopa | Glendale | Tom Murray Ave | 12 | 2000 | 49 | Lights and Gates | Urban | 0 |
| 276 | 741781E | UP | Maricopa | Goodyear | Cotton Ln | 2 | 16639 | 40 | Lights and Gates | Urban | 0 |

*Source: FRA*

## Table A-1: Active Highway-Rail Grade Crossing Inventory (continued)

| # | Crossing ID | Suffix | County | City | Street | Total Trains | AADT | Max Train Speed | Traffic Control Group | Context | Crashes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 277 | 741783T | UP | Maricopa | Goodyear | Estrella Pkwy | 2 | 14268 | 40 | Lights and Gates | Urban | 0 |
| 278 | 741784A | UP | Maricopa | Goodyear | Litchfield Rd | 2 | 16000 | 40 | Lights and Gates | Urban | 0 |
| 279 | 741782L | UP | Maricopa | Goodyear | Sarival Rd | 2 | 15000 | 40 | Lights and Gates | Urban | 0 |
| 280 | 741661N | UP | Maricopa | Mesa | Baseline Rd | 2 | 24278 | 10 | Lights and Gates | Urban | 1 |
| 281 | 741812B | UP | Maricopa | Mesa | Baseline Rd | 4 | 24278 | 40 | Lights and Gates | Urban | 0 |
| 282 | 741657Y | UP | Maricopa | Mesa | Broadway Rd | 4 | 22069 | 20 | Lights and Gates | Urban | 1 |
| 283 | 741654D | UP | Maricopa | Mesa | Center St | 4 | 5460 | 10 | Lights and Gates | Urban | 0 |
| 284 | 741653W | UP | Maricopa | Mesa | MacDonald St | 4 | 4194 | 20 | Lights and Gates | Urban | 0 |
| 285 | 748736J | UP | Maricopa | Mesa | Pedestrian | 2 | 25 | 40 | Flashing Lights | Urban | 0 |
| 286 | 741663C | UP | Maricopa | Mesa | Pedestrian | 1 | 100 | 10 | Flashing Lights | Urban | 0 |
| 287 | 741650B | UP | Maricopa | Mesa | S Alma School Rd | 4 | 28785 | 40 | Lights and Gates | Urban | 1 |
| 288 | 741649G | UP | Maricopa | Mesa | S Dobson Rd | 4 | 25644 | 40 | Lights and Gates | Urban | 1 |
| 289 | 741651H | UP | Maricopa | Mesa | S Extension Rd | 4 | 9795 | 25 | Lights and Gates | Urban | 0 |
| 290 | 741659M | UP | Maricopa | Mesa | Southern Ave | 4 | 26300 | 40 | Lights and Gates | Urban | 0 |
| 291 | 741658F | UP | Maricopa | Mesa | W 8th Ave | 4 | 6125 | 40 | Lights and Gates | Urban | 0 |
| 292 | 025379L | BNSF | Maricopa | Morristown | Gates Rd | 8 | 196 | 49 | Lights and Gates | Rural | 0 |
| 293 | 741765V | UP | Maricopa | Palo Verde | Johnson Rd | 2 | 243 | 40 | Lights and Gates | Urban | 0 |
| 294 | 741766C | UP | Maricopa | Palo Verde | Palo Verde Rd | 2 | 1023 | 40 | Lights and Gates | Urban | 0 |
| 295 | 025408U | BNSF | Maricopa | Peoria | 75th Ave | 12 | 22000 | 40 | Lights and Gates | Urban | 0 |
| 296 | 025405Y | BNSF | Maricopa | Peoria | 81st Ave | 12 | 8213 | 10 | Lights and Gates | Urban | 0 |
| 297 | 025404S | BNSF | Maricopa | Peoria | 83rd Ave | 10 | 4500 | 40 | Lights and Gates | Urban | 0 |
| 298 | 025401W | BNSF | Maricopa | Peoria | 91st Ave | 10 | 20000 | 40 | Lights and Gates | Urban | 0 |
| 299 | 025409B | BNSF | Maricopa | Peoria | Eb Olive Access | 12 | 2000 | 40 | Lights and Gates | Urban | 0 |

*Source: FRA*

## Table A-1: Active Highway-Rail Grade Crossing Inventory (continued)

| # | Crossing ID | Suffix | County | City | Street | Total Trains | AADT | Max Train Speed | Traffic Control Group | Context | Crashes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 300 | 025403K | BNSF | Maricopa | Peoria | Peoria Ave | 10 | 13391 | 40 | Lights and Gates | Urban | 1 |
| 301 | 025846W | BNSF | Maricopa | Phoenix | 11th Ave | 0 | 9790 | 10 | Passive | Urban | 0 |
| 302 | 741461E | UP | Maricopa | Phoenix | 11th Ave | 4 | 500 | 20 | Passive | Urban | 0 |
| 303 | 025451A | BNSF | Maricopa | Phoenix | 15th Ave | 12 | 2684 | 10 | Lights and Gates | Urban | 0 |
| 304 | 741459D | UP | Maricopa | Phoenix | 15th Ave | 4 | 2804 | 20 | Lights and Gates | Urban | 0 |
| 305 | 025848K | BNSF | Maricopa | Phoenix | 15th Ave | 0 | 8511 | 10 | Lights and Gates | Urban | 0 |
| 306 | 025448S | BNSF | Maricopa | Phoenix | 19th Ave | 12 | 16711 | 20 | Flashing Lights | Urban | 0 |
| 307 | 025852A | BNSF | Maricopa | Phoenix | 19th Ave | 0 | 36852 | 10 | Lights and Gates | Urban | 1 |
| 308 | 741457P | UP | Maricopa | Phoenix | 19th Ave | 4 | 17337 | 25 | Lights and Gates | Urban | 0 |
| 309 | 741474F | UP | Maricopa | Phoenix | 1st St | 4 | 2501 | 10 | Lights and Gates | Urban | 0 |
| 310 | 741534M | UP | Maricopa | Phoenix | 20th St | 4 | 1500 | 40 | Lights and Gates | Urban | 0 |
| 311 | 025434J | BNSF | Maricopa | Phoenix | 22nd Ave | 12 | 2138 | 40 | Lights and Gates | Urban | 0 |
| 312 | 741535U | UP | Maricopa | Phoenix | 24th St | 4 | 21840 | 40 | Lights and Gates | Urban | 0 |
| 313 | 025430G | BNSF | Maricopa | Phoenix | 27th Ave | 12 | 27300 | 40 | Flashing Lights | Urban | 8 |
| 314 | 741451Y | UP | Maricopa | Phoenix | 27th Ave | 2 | 19110 | 10 | Lights and Gates | Urban | 0 |
| 315 | 025510A | BNSF | Maricopa | Phoenix | 28th Ave | 12 | 500 | 49 | Passive | Urban | 0 |
| 316 | 025518E | BNSF | Maricopa | Phoenix | 29th Ave | 12 | 1912 | 49 | Passive | Urban | 0 |
| 317 | 741471K | UP | Maricopa | Phoenix | 2nd Ave | 4 | 456 | 15 | Lights and Gates | Urban | 0 |
| 318 | 741475M | UP | Maricopa | Phoenix | 2nd St | 4 | 694 | 20 | Lights and Gates | Urban | 0 |
| 319 | 025584S | BNSF | Maricopa | Phoenix | 31st Ave | 12 | 5036 | 40 | Lights and Gates | Urban | 0 |
| 320 | 025519L | BNSF | Maricopa | Phoenix | 31st Ave | 12 | 7447 | 49 | Flashing Lights | Urban | 0 |
| 321 | 741449X | UP | Maricopa | Phoenix | 31st Ave | 2 | 3734 | 25 | Lights and Gates | Urban | 0 |
| 322 | 741536B | UP | Maricopa | Phoenix | 32nd St | 4 | 4000 | 40 | Lights and Gates | Urban | 0 |

*Source: FRA*

## Table A-1: Active Highway-Rail Grade Crossing Inventory (continued)

| # | Crossing ID | Suffix | County | City | Street | Total Trains | AADT | Max Train Speed | Traffic Control Group | Context | Crashes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 323 | 025425K | BNSF | Maricopa | Phoenix | 35th Ave | 12 | 36600 | 40 | Flashing Lights | Urban | 3 |
| 324 | 741448R | UP | Maricopa | Phoenix | 35th Ave | 2 | 39368 | 25 | Lights and Gates | Urban | 0 |
| 325 | 741538P | UP | Maricopa | Phoenix | 36th St | 4 | 1289 | 40 | Lights and Gates | Urban | 0 |
| 326 | 748290E | UP | Maricopa | Phoenix | 37th Ave | 0 | 500 | 10 | Passive | Urban | 0 |
| 327 | 920407F | UP | Maricopa | Phoenix | 39th Ave | 0 | 7447 | 10 | Passive | Urban | 0 |
| 328 | 741466N | UP | Maricopa | Phoenix | 3rd Ave | 4 | 2923 | 15 | Lights and Gates | Urban | 0 |
| 329 | 741476U | UP | Maricopa | Phoenix | 3rd St | 4 | 2500 | 10 | Lights and Gates | Urban | 0 |
| 330 | 741539W | UP | Maricopa | Phoenix | 40th St | 4 | 6729 | 40 | Lights and Gates | Urban | 0 |
| 331 | 748794E | UP | Maricopa | Phoenix | 41st Ave | 0 | 200 | 10 | Passive | Urban | 0 |
| 332 | 748795L | UP | Maricopa | Phoenix | 41st Ave | 0 | 200 | 10 | Passive | Urban | 0 |
| 333 | 025491X | BNSF | Maricopa | Phoenix | 43rd Ave | 12 | 31491 | 49 | Flashing Lights | Urban | 1 |
| 334 | 741026X | UP | Maricopa | Phoenix | 43rd Ave | 2 | 21146 | 25 | Lights and Gates | Urban | 0 |
| 335 | 025628P | BNSF | Maricopa | Phoenix | 44th Ave | 12 | 250 | 49 | Passive | Urban | 0 |
| 336 | 748793X | UP | Maricopa | Phoenix | 45th Ave | 0 | 200 | 10 | Passive | Urban | 0 |
| 337 | 748165S | UP | Maricopa | Phoenix | 47th Ave | 0 | 1668 | 10 | Passive | Urban | 0 |
| 338 | 748792R | UP | Maricopa | Phoenix | 47th Ave | 0 | 1668 | 10 | Passive | Urban | 0 |
| 339 | 741542E | UP | Maricopa | Phoenix | 48th St | 4 | 14000 | 40 | Lights and Gates | Urban | 0 |
| 340 | 741477B | UP | Maricopa | Phoenix | 4th St | 4 | 1171 | 10 | Lights and Gates | Urban | 0 |
| 341 | 741022V | UP | Maricopa | Phoenix | 51st Ave | 2 | 39130 | 40 | Lights and Gates | Urban | 0 |
| 342 | 741809T | UP | Maricopa | Phoenix | 67th Ave | 2 | 20020 | 40 | Lights and Gates | Urban | 0 |
| 343 | 741505C | UP | Maricopa | Phoenix | 7th St | 0 | 35000 | 0 | Flashing Lights | Urban | 0 |
| 344 | 025452G | BNSF | Maricopa | Phoenix | 9th Ave | 12 | 1000 | 10 | Lights and Gates | Urban | 0 |
| 345 | 741464A | UP | Maricopa | Phoenix | 9th Ave | 4 | 1000 | 20 | Lights and Gates | Urban | 0 |

*Source: FRA*

## Table A-1: Active Highway-Rail Grade Crossing Inventory (continued)

| # | Crossing ID | Suffix | County | City | Street | Total Trains | AADT | Max Train Speed | Traffic Control Group | Context | Crashes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 346 | 025843B | BNSF | Maricopa | Phoenix | Access Rd Wb | 0 | 9544 | 10 | Lights and Gates | Urban | 0 |
| 347 | 025441U | BNSF | Maricopa | Phoenix | Adams St | 12 | 8111 | 20 | Lights and Gates | Urban | 1 |
| 348 | 025841M | BNSF | Maricopa | Phoenix | Alley | 0 | 969 | 10 | Passive | Urban | 0 |
| 349 | 025538R | BNSF | Maricopa | Phoenix | Alley | 0 | 100 | 10 | Passive | Urban | 0 |
| 350 | 025842U | BNSF | Maricopa | Phoenix | Apache St | 0 | 969 | 10 | Passive | Urban | 0 |
| 351 | 741484L | UP | Maricopa | Phoenix | Buchanan St | 0 | 300 | 10 | Lights and Gates | Urban | 0 |
| 352 | 025830A | BNSF | Maricopa | Phoenix | Buchanan St | 0 | 200 | 10 | Passive | Urban | 0 |
| 353 | 748166Y | UP | Maricopa | Phoenix | Buchanan St | 0 | 100 | 10 | Passive | Urban | 0 |
| 354 | 748168M | UP | Maricopa | Phoenix | Buchanan St | 0 | 100 | 10 | Passive | Urban | 0 |
| 355 | 025836R | BNSF | Maricopa | Phoenix | Buckeye Rd | 0 | 17267 | 10 | Flashing Lights | Urban | 0 |
| 356 | 741028L | UP | Maricopa | Phoenix | Buckeye Rd | 0 | 26109 | 10 | Lights and Gates | Urban | 0 |
| 357 | 025509F | BNSF | Maricopa | Phoenix | Cheery Lynn Rd | 12 | 1000 | 49 | Passive | Urban | 0 |
| 358 | 025433C | BNSF | Maricopa | Phoenix | Encanto Blvd | 12 | 9575 | 40 | Lights and Gates | Urban | 0 |
| 359 | 025845P | BNSF | Maricopa | Phoenix | Fwy Access Rd Eb | 0 | 9790 | 10 | Lights and Gates | Urban | 1 |
| 360 | 025493L | BNSF | Maricopa | Phoenix | Glenrosa Ave | 12 | 1000 | 49 | Lights and Gates | Urban | 0 |
| 361 | 025629W | BNSF | Maricopa | Phoenix | Grand Av Frontage | 12 | 4384 | 49 | Flashing Lights | Urban | 0 |
| 362 | 025630R | BNSF | Maricopa | Phoenix | Grand Av Frontage | 12 | 3323 | 49 | Flashing Lights | Urban | 0 |
| 363 | 025832N | BNSF | Maricopa | Phoenix | Grant St | 0 | 8511 | 10 | Flashing Lights | Urban | 0 |
| 364 | 748169U | UP | Maricopa | Phoenix | Hadley St | 0 | 500 | 10 | Passive | Urban | 0 |
| 365 | 741514B | UP | Maricopa | Phoenix | Hadley St | 0 | 2000 | 10 | Passive | Urban | 0 |
| 366 | 025492E | BNSF | Maricopa | Phoenix | Highland Ave | 12 | 1000 | 49 | Lights and Gates | Urban | 0 |
| 367 | 025582D | BNSF | Maricopa | Phoenix | Highland Ave | 12 | 500 | 49 | Lights and Gates | Urban | 0 |
| 368 | 741454U | UP | Maricopa | Phoenix | I 17 NB Frontage | 2 | 5000 | 25 | Lights and Gates | Urban | 0 |

*Source: FRA*

## Table A-1: Active Highway-Rail Grade Crossing Inventory (continued)

| # | Crossing ID | Suffix | County | City | Street | Total Trains | AADT | Max Train Speed | Traffic Control Group | Context | Crashes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 369 | 025424D | BNSF | Maricopa | Phoenix | Indian School Rd | 12 | 21282 | 40 | Lights and Gates | Urban | 1 |
| 370 | 025446D | BNSF | Maricopa | Phoenix | Jefferson St | 12 | 8455 | 20 | Lights and Gates | Urban | 0 |
| 371 | 748385M | UP | Maricopa | Phoenix | Jefferson St | 0 | 175 | 10 | Passive | Urban | 0 |
| 372 | 748740Y | UP | Maricopa | Phoenix | Jefferson St | 0 | 500 | 10 | Passive | Urban | 0 |
| 373 | 741492D | UP | Maricopa | Phoenix | Lincoln 6th St | 0 | 4619 | 10 | Flashing Lights | Urban | 1 |
| 374 | 025831G | BNSF | Maricopa | Phoenix | Lincoln St | 0 | 500 | 10 | Passive | Urban | 0 |
| 375 | 025596L | BNSF | Maricopa | Phoenix | Lower Buckeye Rd | 0 | 22000 | 10 | Flashing Lights | Urban | 0 |
| 376 | 025856C | BNSF | Maricopa | Phoenix | Lower Buckeye Rd | 0 | 22000 | 10 | Flashing Lights | Urban | 0 |
| 377 | 025865B | BNSF | Maricopa | Phoenix | Lower Buckeye Rd | 0 | 22000 | 10 | Flashing Lights | Urban | 0 |
| 378 | 741443G | UP | Maricopa | Phoenix | Lower Buckeye Rd | 0 | 21613 | 10 | Lights and Gates | Urban | 0 |
| 379 | 025447K | BNSF | Maricopa | Phoenix | Madison St | 12 | 437 | 20 | Flashing Lights | Urban | 0 |
| 380 | 741020G | UP | Maricopa | Phoenix | Madison St | 0 | 200 | 10 | Passive | Urban | 0 |
| 381 | 025436X | BNSF | Maricopa | Phoenix | McDowell Rd | 12 | 16418 | 40 | Flashing Lights | Urban | 2 |
| 382 | 025536C | BNSF | Maricopa | Phoenix | McDowell Rd | 0 | 16418 | 10 | Flashing Lights | Urban | 0 |
| 383 | 025548W | BNSF | Maricopa | Phoenix | Mcdowell Rd | 0 | 16418 | 10 | Flashing Lights | Urban | 0 |
| 384 | 025490R | BNSF | Maricopa | Phoenix | Missouri Ave | 12 | 8000 | 49 | Lights and Gates | Urban | 0 |
| 385 | 025840F | BNSF | Maricopa | Phoenix | Mohave St | 0 | 5000 | 10 | Lights and Gates | Urban | 0 |
| 386 | 025439T | BNSF | Maricopa | Phoenix | Monroe St | 12 | 270 | 20 | Lights and Gates | Urban | 0 |
| 387 | 025428F | BNSF | Maricopa | Phoenix | Osborn Rd | 12 | 2500 | 40 | Lights and Gates | Urban | 0 |
| 388 | 741472S | UP | Maricopa | Phoenix | Pedestrian | 2 | 25 | 60 | Flashing Lights | Urban | 0 |
| 389 | 025838E | BNSF | Maricopa | Phoenix | Pima St | 0 | 500 | 10 | Lights and Gates | Urban | 0 |
| 390 | 748334C | UP | Maricopa | Phoenix | Roosevelt St | 0 | 2500 | 10 | Passive | Urban | 0 |
| 391 | 741452F | UP | Maricopa | Phoenix | S Black Canyon Hwy | 2 | 4692 | 25 | Lights and Gates | Urban | 1 |

*Source: FRA*

## Table A-1: Active Highway-Rail Grade Crossing Inventory (continued)

| # | Crossing ID | Suffix | County | City | Street | Total Trains | AADT | Max Train Speed | Traffic Control Group | Context | Crashes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 392 | 025617C | BNSF | Maricopa | Phoenix | Thomas Rd | 12 | 40276 | 40 | Flashing Lights | Urban | 11 |
| 393 | 025517X | BNSF | Maricopa | Phoenix | Thomas Rd | 12 | 40276 | 49 | Flashing Lights | Urban | 0 |
| 394 | 025494T | BNSF | Maricopa | Phoenix | Turney Ave | 12 | 500 | 49 | Passive | Urban | 0 |
| 395 | 025648B | BNSF | Maricopa | Phoenix | Turney Ave | 12 | 100 | 49 | Passive | Urban | 0 |
| 396 | 025438L | BNSF | Maricopa | Phoenix | Van Buren Ave | 12 | 18661 | 20 | Flashing Lights | Urban | 0 |
| 397 | 741024J | UP | Maricopa | Phoenix | Van Buren St | 0 | 22750 | 10 | Lights and Gates | Urban | 0 |
| 398 | 025834C | BNSF | Maricopa | Phoenix | W Hadley St | 0 | 307 | 10 | Lights and Gates | Urban | 0 |
| 399 | 025443H | BNSF | Maricopa | Phoenix | Washington St | 12 | 291 | 20 | Lights and Gates | Urban | 1 |
| 400 | 748384F | UP | Maricopa | Phoenix | Washington St | 0 | 1000 | 10 | Passive | Urban | 0 |
| 401 | 025850L | BNSF | Maricopa | Phoenix | Watkins Rd | 0 | 2521 | 10 | Passive | Urban | 1 |
| 402 | 748796T | UP | Maricopa | Phoenix | W Washington St | 0 | 500 | 10 | Passive | Urban | 0 |
| 403 | 741411B | UP | Maricopa | Queen Creek | Bella Vista Rd | 4 | 5600 | 60 | Lights and Gates | Rural | 0 |
| 404 | 741841L | UP | Maricopa | Queen Creek | Combs Rd | 4 | 9497 | 60 | Lights and Gates | Rural | 0 |
| 405 | 741835H | UP | Maricopa | Queen Creek | Ellsworth Ave | 4 | 13650 | 60 | Lights and Gates | Urban | 0 |
| 406 | 176281Y | UP | Maricopa | Queen Creek | Gantzel Rd | 4 | 14182 | 60 | Lights and Gates | Rural | 0 |
| 407 | 741837W | UP | Maricopa | Queen Creek | Ocotillo Rd | 4 | 10108 | 60 | Lights and Gates | Urban | 0 |
| 408 | 741840E | UP | Maricopa | Queen Creek | Rittenhouse Rd | 0 | 37586 | 10 | Lights and Gates | Rural | 0 |
| 409 | 741834B | UP | Maricopa | Queen Creek | Sossaman Rd | 4 | 9100 | 60 | Lights and Gates | Urban | 0 |
| 410 | 025399X | BNSF | Maricopa | Sun City | 103rd Ave | 10 | 12171 | 40 | Lights and Gates | Urban | 1 |
| 411 | 025397J | BNSF | Maricopa | Sun City | 111th Ave | 10 | 7840 | 40 | Lights and Gates | Urban | 0 |
| 412 | 025400P | BNSF | Maricopa | Sun City | 99th Ave | 10 | 21000 | 40 | Lights and Gates | Urban | 0 |
| 413 | 025398R | BNSF | Maricopa | Sun City | Del Webb Blvd | 10 | 19200 | 40 | Lights and Gates | Urban | 0 |
| 414 | 025393G | BNSF | Maricopa | Surprise | Dysart Rd | 10 | 5320 | 49 | Lights and Gates | Urban | 0 |

*Source: FRA*

## Table A-1: Active Highway-Rail Grade Crossing Inventory (continued)

| # | Crossing ID | Suffix | County | City | Street | Total Trains | AADT | Max Train Speed | Traffic Control Group | Context | Crashes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 415 | 025651J | BNSF | Maricopa | Surprise | Greenway Rd | 10 | 9555 | 10 | Lights and Gates | Urban | 2 |
| 416 | 025708H | BNSF | Maricopa | Surprise | W Cactus Rd | 0 | 200 | 10 | Lights and Gates | Rural | 0 |
| 417 | 025709P | BNSF | Maricopa | Surprise | W Peoria Ave | 0 | 3640 | 10 | Lights and Gates | Urban | 0 |
| 418 | 741563X | UP | Maricopa | Tempe | 10th St | 4 | 1188 | 25 | Lights and Gates | Urban | 0 |
| 419 | 741564E | UP | Maricopa | Tempe | 13th St | 4 | 4520 | 60 | Lights and Gates | Urban | 0 |
| 420 | 741547N | UP | Maricopa | Tempe | 1st St | 4 | 1646 | 25 | Lights and Gates | Urban | 0 |
| 421 | 741562R | UP | Maricopa | Tempe | 9th St | 4 | 1052 | 25 | Lights and Gates | Urban | 1 |
| 422 | 741570H | UP | Maricopa | Tempe | Baseline Rd | 0 | 39602 | 10 | Lights and Gates | Urban | 0 |
| 423 | 741565L | UP | Maricopa | Tempe | Broadway Rd | 0 | 32415 | 10 | Lights and Gates | Urban | 0 |
| 424 | 748318T | UP | Maricopa | Tempe | Carver Rd | 0 | 2500 | 10 | Lights and Gates | Urban | 0 |
| 425 | 741583J | UP | Maricopa | Tempe | College Ave | 4 | 5497 | 40 | Lights and Gates | Urban | 0 |
| 426 | 741575S | UP | Maricopa | Tempe | Elliot Rd/Kyrene Rd | 0 | 25398 | 10 | Flashing Lights | Urban | 0 |
| 427 | 741573D | UP | Maricopa | Tempe | Guadalupe Rd | 0 | 20647 | 10 | Lights and Gates | Urban | 0 |
| 428 | 748300H | UP | Maricopa | Tempe | Pedestrian | 0 | 25 | 10 | Passive | Urban | 0 |
| 429 | 741645E | UP | Maricopa | Tempe | Rural Rd | 4 | 39510 | 40 | Lights and Gates | Urban | 0 |
| 430 | 741568G | UP | Maricopa | Tempe | Southern Ave | 0 | 26000 | 10 | Lights and Gates | Urban | 0 |
| 431 | 748176E | UP | Maricopa | Tempe | SR 101 Frontage N | 4 | 9508 | 40 | Lights and Gates | Urban | 1 |
| 432 | 741647T | UP | Maricopa | Tempe | SR 101 Frontage S | 4 | 11442 | 40 | Lights and Gates | Urban | 1 |
| 433 | 741560C | UP | Maricopa | Tempe | University Dr | 4 | 31888 | 25 | Lights and Gates | Urban | 2 |
| 434 | 741578M | UP | Maricopa | Tempe | Warner Rd | 0 | 22730 | 10 | Lights and Gates | Urban | 0 |
| 435 | 741561J | UP | Maricopa | Tempe | W 5th St | 4 | 8751 | 10 | Lights and Gates | Urban | 1 |
| 436 | 748499A | UP | Maricopa | Tolleson | 104th Ave | 0 | 50 | 10 | Passive | Urban | 0 |
| 437 | 741808L | UP | Maricopa | Tolleson | 75th Ave | 2 | 22751 | 40 | Lights and Gates | Urban | 0 |

*Source: FRA*

## Table A-1: Active Highway-Rail Grade Crossing Inventory (continued)

| # | Crossing ID | Suffix | County | City | Street | Total Trains | AADT | Max Train Speed | Traffic Control Group | Context | Crashes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 438 | 741806X | UP | Maricopa | Tolleson | 83rd Ave | 2 | 23660 | 40 | Lights and Gates | Urban | 0 |
| 439 | 741804J | UP | Maricopa | Tolleson | 91st Ave | 2 | 15780 | 40 | Lights and Gates | Urban | 0 |
| 440 | 741802V | UP | Maricopa | Tolleson | 99th Ave | 2 | 19110 | 40 | Lights and Gates | Urban | 0 |
| 441 | 920123B | UP | Maricopa | Tolleson | Washington St | 0 | 250 | 10 | Passive | Urban | 0 |
| 442 | 971751W | UP | Maricopa | Tolleson | W Tonto St | 0 | 200 | 10 | Passive | Urban | 0 |
| 443 | 025374C | BNSF | Maricopa | Wickenburg | Apache St | 8 | 1700 | 35 | Lights and Gates | Urban | 0 |
| 444 | 025371G | BNSF | Maricopa | Wickenburg | Vulture Mine Rd | 8 | 3603 | 35 | Lights and Gates | Rural | 0 |
| 445 | 025373V | BNSF | Maricopa | Wickenburg | Yavapai St | 8 | 3200 | 35 | Lights and Gates | Urban | 0 |
| 446 | 025597T | BNSF | Maricopa | Wittmann | 203rd Ave | 8 | 316 | 49 | Lights and Gates | Urban | 0 |
| 447 | 025382U | BNSF | Maricopa | Wittmann | Center St | 8 | 1639 | 49 | Lights and Gates | Urban | 0 |
| 448 | 025231E | BNSF | Mohave | Hackberry | Old Hwy 66 | 62 | 158 | 90 | Passive | Rural | 0 |
| 449 | 025247B | BNSF | Mohave | Kingman | 2nd St | 64 | 652 | 10 | Lights and Gates | Urban | 0 |
| 450 | 025246U | BNSF | Mohave | Kingman | 4th St | 64 | 1271 | 40 | Lights and Gates | Urban | 0 |
| 451 | 971609T | KGTR | Mohave | Kingman | Bonanza Dr | 0 | 1000 | 10 | Passive | Urban | 0 |
| 452 | 971610M | KGTR | Mohave | Kingman | Commerce Dr | 0 | 500 | 10 | Passive | Urban | 0 |
| 453 | 025632E | BNSF | Mohave | Kingman | Finance Way | 0 | 200 | 90 | Passive | Rural | 0 |
| 454 | 025238C | BNSF | Mohave | Kingman | Industrial Blvd | 64 | 500 | 90 | Passive | Urban | 0 |
| 455 | 025770T | BNSF | Mohave | Kingman | Interstate Way W | 0 | 400 | 90 | Passive | Rural | 0 |
| 456 | 025772G | BNSF | Mohave | Kingman | Mohave Airport Dr | 0 | 4845 | 90 | Passive | Rural | 0 |
| 457 | 025277T | BNSF | Mohave | Kingman | NB Frontage Rd | 64 | 1000 | 10 | Lights and Gates | Rural | 0 |
| 458 | 025237V | BNSF | Mohave | Kingman | Santa Fe Dr | 64 | 50 | 90 | Passive | Rural | 0 |
| 459 | 025771A | BNSF | Mohave | Kingman | Santa Fe Dr | 0 | 500 | 90 | Passive | Rural | 0 |
| 460 | 971604J | KGTR | Mohave | Kingman | Santa Fe Dr | 0 | 100 | 10 | Passive | Urban | 0 |

*Source: FRA*

## Table A-1: Active Highway-Rail Grade Crossing Inventory (continued)

| # | Crossing ID | Suffix | County | City | Street | Total Trains | AADT | Max Train Speed | Traffic Control Group | Context | Crashes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 461 | 025279G | BNSF | Mohave | Kingman | SB Frontage Rd | 64 | 1000 | 80 | Lights and Gates | Rural | 0 |
| 462 | 025245M | BNSF | Mohave | Kingman | Topeka St | 86 | 1000 | 45 | Lights and Gates | Urban | 0 |
| 463 | 025215V | BNSF | Mohave | Peach Springs | Diamond Creek Rd | 64 | 909 | 55 | Lights and Gates | Rural | 0 |
| 464 | 025227P | BNSF | Mohave | Valentine | Hackberry Rd | 62 | 151 | 80 | Lights and Gates | Rural | 0 |
| 465 | 025017A | BNSF | Navajo | Holbrook | Navajo Blvd | 70 | 10129 | 90 | Lights and Gates | Rural | 1 |
| 466 | 847145D | APA | Navajo | Holbrook | Romero St | 0 | 100 | 25 | Lights and Gates | Rural | 0 |
| 467 | 847146K | APA | Navajo | Holbrook | SR377 | 0 | 200 | 30 | Lights and Gates | Rural | 0 |
| 468 | 025023D | BNSF | Navajo | Joseph City | Richards Ave | 68 | 401 | 90 | Lights and Gates | Rural | 2 |
| 469 | 874948G | BMLP | Navajo | Page | N-H Tribal Rd #1 | 6 | 10 | 55 | Passive | Rural | 0 |
| 470 | 874950H | BMLP | Navajo | Page | N-H Tribal Rd #4 | 6 | 10 | 55 | Passive | Rural | 0 |
| 471 | 874952W | BMLP | Navajo | Page | Shonto Rd | 6 | 109 | 55 | Passive | Rural | 0 |
| 472 | 874949N | BMLP | Navajo | Page | State Rte 98 | 6 | 2427 | 55 | Lights and Gates | Rural | 0 |
| 473 | 874951P | BMLP | Navajo | Page | Tribal Park Rd | 6 | 10 | 55 | Passive | Rural | 0 |
| 474 | 874954K | BMLP | Navajo | Page | Tribal Park Rd#3 | 6 | 10 | 55 | Passive | Rural | 0 |
| 475 | 874955S | BMLP | Navajo | Page | Tribal Park Rd#4 | 6 | 10 | 55 | Passive | Rural | 0 |
| 476 | 874953D | BMLP | Navajo | Page | Tribal Park Rd.#2 | 6 | 10 | 55 | Passive | Rural | 0 |
| 477 | 903249N | APA | Navajo | Snowflake | Industrial Dr | 0 | 300 | 15 | Passive | Rural | 0 |
| 478 | 847151G | APA | Navajo | Snowflake | Reed Ranch Rd | 0 | 25 | 30 | Passive | Rural | 0 |
| 479 | 903246T | APA | Navajo | Snowflake | Unknown Rd | 0 | 25 | 25 | Passive | Rural | 0 |
| 480 | 903248G | APA | Navajo | Snowflake | West Garden Ln | 0 | 100 | 25 | Passive | Rural | 0 |
| 481 | 025031V | BNSF | Navajo | Winslow | Clear Creek Rd | 0 | 257 | 10 | Passive | Urban | 0 |
| 482 | 025033J | BNSF | Navajo | Winslow | Washington St | 0 | 1264 | 10 | Passive | Urban | 0 |
| 483 | 840738W | TCG | Pima | Ajo | 2nd Ave | 2 | 300 | 35 | Passive | Rural | 0 |

*Source: FRA*

## Table A-1: Active Highway-Rail Grade Crossing Inventory (continued)

| # | Crossing ID | Suffix | County | City | Street | Total Trains | AADT | Max Train Speed | Traffic Control Group | Context | Crashes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 484 | 840739D | TCG | Pima | Ajo | Ajo Tucson Hwy | 2 | 2215 | 5 | Passive | Urban | 0 |
| 485 | 903405X | PDCN | Pima | Ajo | Ajo-Tucson Hwy | 0 | 2500 | 4 | Passive | Urban | 0 |
| 486 | 903406E | PDCN | Pima | Ajo | Ajo-Tucson Hwy | 0 | 2500 | 1 | Passive | Urban | 0 |
| 487 | 840735B | TCG | Pima | Ajo | Mead | 2 | 25 | 35 | Passive | Rural | 0 |
| 488 | 840736H | TCG | Pima | Ajo | Mead Rd | 2 | 100 | 35 | Passive | Rural | 0 |
| 489 | 840737P | TCG | Pima | Ajo | Rasmussen Rd | 2 | 527 | 35 | Passive | Rural | 0 |
| 490 | 742140B | UP | Pima | Continental | Madera Canyon Rd | 4 | 3889 | 40 | Lights and Gates | Rural | 0 |
| 491 | 741089C | UP | Pima | Marana | I-10 Frontage EB | 0 | 1747 | 10 | Flashing Lights | Rural | 0 |
| 492 | 741091D | UP | Pima | Marana | I-10 Frontage WB | 0 | 685 | 10 | Flashing Lights | Urban | 0 |
| 493 | 922399X | UP | Pima | Marana | W Cochise Canyon Tr | 40 | 5940 | 79 | Lights and Gates | Urban | 0 |
| 494 | 741098B | UP | Pima | Marana | W Cortaro Farms Rd | 40 | 23570 | 79 | Lights and Gates | Urban | 0 |
| 495 | 741088V | UP | Pima | Marana | W Tangerine Rd | 40 | 6498 | 79 | Lights and Gates | Urban | 0 |
| 496 | 742159T | UP | Pima | Sahuarita | La Canada Dr | 2 | 5089 | 10 | Lights and Gates | Rural | 0 |
| 497 | 742152V | UP | Pima | Sahuarita | La Villita Dr | 2 | 1788 | 10 | Lights and Gates | Rural | 0 |
| 498 | 748402B | UP | Pima | Sahuarita | Madera Highlands Pkwy | 4 | 1000 | 40 | Lights and Gates | Rural | 0 |
| 499 | 742171A | UP | Pima | Sahuarita | Mission Rd | 2 | 533 | 10 | Lights and Gates | Rural | 0 |
| 500 | 742123K | UP | Pima | Sahuarita | Nogales Hwy | 2 | 13064 | 10 | Lights and Gates | Rural | 0 |
| 501 | 748177L | UP | Pima | Sahuarita | Quail Crossing Blvd | 4 | 8127 | 40 | Lights and Gates | Rural | 0 |
| 502 | 742129B | UP | Pima | Sahuarita | Sahuarita Rd | 4 | 9357 | 10 | Lights and Gates | Rural | 0 |
| 503 | 742154J | UP | Pima | Sahuarita | Twin Buttes Rd | 2 | 936 | 10 | Passive | Rural | 0 |
| 504 | 742156X | UP | Pima | Sahuarita | Twin Buttes Rd | 2 | 936 | 10 | Passive | Rural | 0 |
| 505 | 742166D | UP | Pima | Sahuarita | Twin Buttes Rd | 2 | 570 | 10 | Lights and Gates | Rural | 0 |
| 506 | 742172G | UP | Pima | Sahuarita | US 89 Nogales Hwy | 2 | 7478 | 10 | Lights and Gates | Rural | 0 |

*Source: FRA*

## Table A-1: Active Highway-Rail Grade Crossing Inventory (continued)

| # | Crossing ID | Suffix | County | City | Street | Total Trains | AADT | Max Train Speed | Traffic Control Group | Context | Crashes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 507 | 742155R | UP | Pima | Sahuarita | W El Toro Rd | 2 | 100 | 10 | Passive | Rural | 0 |
| 508 | 742164P | UP | Pima | Sahuarita | W Twin Butte Rd | 2 | 570 | 10 | Passive | Rural | 0 |
| 509 | 742047U | UP | Pima | Tucson | 17th St | 4 | 1000 | 10 | Lights and Gates | Urban | 0 |
| 510 | 742049H | UP | Pima | Tucson | 18th St | 4 | 1222 | 10 | Lights and Gates | Urban | 0 |
| 511 | 742100D | UP | Pima | Tucson | 19th St | 4 | 1200 | 10 | Lights and Gates | Urban | 0 |
| 512 | 742103Y | UP | Pima | Tucson | 20th St | 4 | 1200 | 20 | Lights and Gates | Urban | 0 |
| 513 | 742104F | UP | Pima | Tucson | 22nd St | 4 | 31783 | 20 | Lights and Gates | Urban | 1 |
| 514 | 742107B | UP | Pima | Tucson | 36th St | 4 | 4219 | 20 | Lights and Gates | Urban | 0 |
| 515 | 741292U | UP | Pima | Tucson | 36th St | 0 | 7047 | 10 | Lights and Gates | Urban | 0 |
| 516 | 741121T | UP | Pima | Tucson | 5th St | 40 | 350 | 40 | Lights and Gates | Urban | 0 |
| 517 | 741124N | UP | Pima | Tucson | 7th Ave | 40 | 499 | 40 | Lights and Gates | Urban | 3 |
| 518 | 748710G | UP | Pima | Tucson | Aero Park Blvd | 4 | 4749 | 40 | Lights and Gates | Urban | 0 |
| 519 | 742120P | UP | Pima | Tucson | Aerospace Pkwy | 4 | 4749 | 40 | Lights and Gates | Urban | 0 |
| 520 | 741295P | UP | Pima | Tucson | Ajo Way | 40 | 15000 | 55 | Lights and Gates | Urban | 0 |
| 521 | 742115T | UP | Pima | Tucson | Bilby Rd | 4 | 5971 | 40 | Lights and Gates | Urban | 0 |
| 522 | 748804H | UP | Pima | Tucson | Contractors Way | 0 | 7000 | 10 | Lights and Gates | Urban | 0 |
| 523 | 742114L | UP | Pima | Tucson | Drexel Rd | 4 | 10395 | 40 | Lights and Gates | Urban | 0 |
| 524 | 742109P | UP | Pima | Tucson | E Ajo Way | 4 | 22223 | 20 | Lights and Gates | Urban | 0 |
| 525 | 742110J | UP | Pima | Tucson | Fair Ave | 4 | 1170 | 20 | Lights and Gates | Urban | 0 |
| 526 | 742113E | UP | Pima | Tucson | Fletcher Ave | 0 | 499 | 10 | Passive | Urban | 0 |
| 527 | 741297D | UP | Pima | Tucson | Irvington Rd | 40 | 17698 | 10 | Lights and Gates | Urban | 0 |
| 528 | 742112X | UP | Pima | Tucson | Irvington Rd | 4 | 23022 | 20 | Lights and Gates | Urban | 0 |
| 529 | 742126F | UP | Pima | Tucson | Lumber St | 4 | 500 | 40 | Lights and Gates | Rural | 0 |

*Source: FRA*

## Table A-1: Active Highway-Rail Grade Crossing Inventory (continued)

| # | Crossing ID | Suffix | County | City | Street | Total Trains | AADT | Max Train Speed | Traffic Control Group | Context | Crashes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 530 | 741120L | UP | Pima | Tucson | Main St/Granada Av | 40 | 7651 | 40 | Lights and Gates | Urban | 0 |
| 531 | 741122A | UP | Pima | Tucson | N 9th Ave/W 6th St | 40 | 21548 | 40 | Lights and Gates | Urban | 1 |
| 532 | 742122D | UP | Pima | Tucson | Old Nogales Hwy | 4 | 5913 | 40 | Lights and Gates | Rural | 1 |
| 533 | 741104C | UP | Pima | Tucson | Ruthrauff Rd | 40 | 32755 | 70 | Lights and Gates | Urban | 0 |
| 534 | 742106U | UP | Pima | Tucson | Silverlake Rd | 4 | 11074 | 20 | Lights and Gates | Urban | 0 |
| 535 | 742045F | UP | Pima | Tucson | Toole Ave | 4 | 1000 | 10 | Lights and Gates | Urban | 0 |
| 536 | 742116A | UP | Pima | Tucson | Valencia Rd | 4 | 37908 | 40 | Lights and Gates | Urban | 0 |
| 537 | 741102N | UP | Pima | Tucson | W Joiner Rd | 40 | 1400 | 70 | Lights and Gates | Urban | 0 |
| 538 | 741100A | UP | Pima | Marana | W Massingale Rd | 40 | 500 | 79 | Lights and Gates | Urban | 1 |
| 539 | 741308N | UP | Pima | Vail | Agua Verde Creek R | 40 | 300 | 79 | Lights and Gates | Rural | 0 |
| 540 | 741303E | UP | Pima | Vail | Colossal Cave Rd | 40 | 12950 | 79 | Lights and Gates | Rural | 0 |
| 541 | 741304L | UP | Pima | Vail | Colossal Cave Rd | 40 | 12950 | 79 | Lights and Gates | Rural | 0 |
| 542 | 741310P | UP | Pima | Vail | Red Hill Ranch Rd | 40 | 200 | 65 | Passive | Rural | 0 |
| 543 | 741299S | UP | Pima | Vail | Rita Rd | 40 | 12458 | 79 | Lights and Gates | Rural | 0 |
| 544 | 741298K | UP | Pima | Vail | Wilmot Rd | 40 | 6336 | 79 | Lights and Gates | Urban | 0 |
| 545 | 741351U | UP | Pinal | Casa Grande | Anderson Rd | 40 | 3273 | 75 | Lights and Gates | Rural | 0 |
| 546 | 748159N | UP | Pinal | Casa Grande | Casa Grande Hwy | 0 | 4624 | 10 | Lights and Gates | Urban | 0 |
| 547 | 741372M | UP | Pinal | Casa Grande | Cox Rd | 40 | 500 | 75 | Lights and Gates | Rural | 1 |
| 548 | 741361A | UP | Pinal | Casa Grande | E Main Ave | 0 | 50 | 10 | Passive | Urban | 0 |
| 549 | 741357K | UP | Pinal | Casa Grande | Ethington Rd | 40 | 50 | 75 | Lights and Gates | Rural | 0 |
| 550 | 741363N | UP | Pinal | Casa Grande | Florence St | 40 | 3475 | 75 | Lights and Gates | Urban | 2 |
| 551 | 741347E | UP | Pinal | Casa Grande | Hartman Rd | 38 | 300 | 75 | Lights and Gates | Rural | 0 |
| 552 | 741364V | UP | Pinal | Casa Grande | Hermosillo St | 40 | 905 | 75 | Lights and Gates | Urban | 0 |

*Source: FRA*

## Table A-1: Active Highway-Rail Grade Crossing Inventory (continued)

| # | Crossing ID | Suffix | County | City | Street | Total Trains | AADT | Max Train Speed | Traffic Control Group | Context | Crashes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 553 | 748160H | UP | Pinal | Casa Grande | Hwy 238 | 0 | 6361 | 10 | Lights and Gates | Urban | 0 |
| 554 | 741368X | UP | Pinal | Casa Grande | Keeling Rd | 40 | 150 | 75 | Lights and Gates | Rural | 0 |
| 555 | 741369E | UP | Pinal | Casa Grande | Main Ave | 0 | 50 | 10 | Passive | Rural | 0 |
| 556 | 741370Y | UP | Pinal | Casa Grande | Main Ave | 0 | 50 | 10 | Passive | Rural | 0 |
| 557 | 741353H | UP | Pinal | Casa Grande | Montgomery Rd | 40 | 100 | 75 | Lights and Gates | Rural | 0 |
| 558 | 741371F | UP | Pinal | Casa Grande | Peart Rd | 40 | 2000 | 75 | Lights and Gates | Rural | 0 |
| 559 | 741362G | UP | Pinal | Casa Grande | Sacaton St | 40 | 1339 | 75 | Lights and Gates | Urban | 0 |
| 560 | 741374B | UP | Pinal | Casa Grande | Sunland Gin Rd | 40 | 5095 | 75 | Lights and Gates | Rural | 0 |
| 561 | 741358S | UP | Pinal | Casa Grande | Thornton Rd | 40 | 6500 | 75 | Lights and Gates | Urban | 0 |
| 562 | 741367R | UP | Pinal | Casa Grande | Trekell Rd | 40 | 4940 | 75 | Lights and Gates | Urban | 1 |
| 563 | 748156T | UP | Pinal | Casa Grande | US 84 | 0 | 5619 | 10 | Lights and Gates | Urban | 0 |
| 564 | 741359Y | UP | Pinal | Casa Grande | W Main Ave | 0 | 1100 | 10 | Passive | Urban | 0 |
| 565 | 741428E | UP | Pinal | Coolidge | Central Ave | 4 | 2756 | 60 | Lights and Gates | Urban | 0 |
| 566 | 741429L | UP | Pinal | Coolidge | Coolidge Ave | 4 | 3140 | 60 | Lights and Gates | Urban | 0 |
| 567 | 741431M | UP | Pinal | Coolidge | Martin Rd | 4 | 858 | 60 | Lights and Gates | Urban | 0 |
| 568 | 741434H | UP | Pinal | Coolidge | Randolph Rd | 4 | 500 | 60 | Lights and Gates | Rural | 0 |
| 569 | 741427X | UP | Pinal | Coolidge | W Vah Ki Inn Rd | 4 | 3269 | 60 | Lights and Gates | Urban | 0 |
| 570 | 741377W | UP | Pinal | Eloy | Battaglia Rd | 40 | 3323 | 75 | Lights and Gates | Rural | 0 |
| 571 | 411017N | UP | Pinal | Eloy | Davidson St | 0 | 250 | 10 | Passive | Urban | 0 |
| 572 | 741707A | UP | Pinal | Eloy | Eleven Mile Rd | 40 | 1500 | 75 | Lights and Gates | Urban | 0 |
| 573 | 741376P | UP | Pinal | Eloy | Houser Rd | 40 | 2000 | 75 | Lights and Gates | Rural | 0 |
| 574 | 741708G | UP | Pinal | Eloy | Main St | 40 | 800 | 75 | Lights and Gates | Urban | 1 |
| 575 | 741709N | UP | Pinal | Eloy | Sunshine Blvd | 40 | 3672 | 75 | Lights and Gates | Urban | 0 |

*Source: FRA*

## Table A-1: Active Highway-Rail Grade Crossing Inventory (continued)

| # | Crossing ID | Suffix | County | City | Street | Total Trains | AADT | Max Train Speed | Traffic Control Group | Context | Crashes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 576 | 741375H | UP | Pinal | Eloy | Toltec Rd | 40 | 2000 | 75 | Lights and Gates | Rural | 0 |
| 577 | 741409A | CBRY | Pinal | Florence | Arizona Farms Rd | 2 | 2608 | 20 | Lights and Gates | Rural | 0 |
| 578 | 741416K | UP | Pinal | Florence | Arizona Farms Rd | 4 | 2608 | 60 | Lights and Gates | Rural | 1 |
| 579 | 741418Y | UP | Pinal | Florence | Cr | 4 | 25 | 60 | Passive | Rural | 0 |
| 580 | 742410X | CBRY | Pinal | Florence | Felix Rd | 2 | 1441 | 20 | Lights and Gates | Rural | 0 |
| 581 | 853082P | MAA | Pinal | Florence | Florence Hwy/SR79 | 2 | 5489 | 5 | Lights and Gates | Rural | 0 |
| 582 | 853087Y | MAA | Pinal | Florence | Forest Hwy 357 | 2 | 50 | 10 | Passive | Rural | 0 |
| 583 | 853084D | MAA | Pinal | Florence | Globe Hwy/US60 | 2 | 9015 | 5 | Flashing Lights | Rural | 0 |
| 584 | 853085K | MAA | Pinal | Florence | Hewitt | 2 | 25 | 10 | Passive | Rural | 0 |
| 585 | 853086S | MAA | Pinal | Florence | Hewitt | 2 | 25 | 10 | Passive | Rural | 0 |
| 586 | 741417S | UP | Pinal | Florence | Hunt Hwy | 4 | 12560 | 60 | Lights and Gates | Urban | 0 |
| 587 | 853081H | MAA | Pinal | Florence | Judd | 2 | 3174 | 5 | Passive | Rural | 0 |
| 588 | 853083W | MAA | Pinal | Florence | N Desert Wells Rd | 0 | 25 | 10 | Passive | Rural | 0 |
| 589 | 742403M | CBRY | Pinal | Florence | Price Rd | 2 | 50 | 30 | Passive | Rural | 0 |
| 590 | 742404U | CBRY | Pinal | Florence | Price Rd | 2 | 50 | 25 | Passive | Rural | 0 |
| 591 | 974564Y | MAA | Pinal | Florence | Rc Discharge | 0 | 50 | 10 | Passive | Rural | 0 |
| 592 | 974558V | MAA | Pinal | Florence | S Desert Wells | 0 | 50 | 10 | Passive | Rural | 0 |
| 593 | 742407P | CBRY | Pinal | Florence | SR79 | 2 | 7530 | 25 | Lights and Gates | Urban | 0 |
| 594 | 846113U | SMA | Pinal | Hayden | | 4 | 100 | 45 | Passive | Rural | 0 |
| 595 | 846114B | SMA | Pinal | Hayden | | 4 | 100 | 45 | Passive | Rural | 0 |
| 596 | 742390N | CBRY | Pinal | Hayden | SR177 | 4 | 3375 | 25 | Lights and Gates | Rural | 0 |
| 597 | 846115H | SMA | Pinal | Kearny | | 4 | 50 | 45 | Passive | Rural | 0 |
| 598 | 742397L | CBRY | Pinal | Kearny | Diamond Ranch Rd | 16 | 50 | 25 | Passive | Rural | 0 |

*Source: FRA*

## Table A-1: Active Highway-Rail Grade Crossing Inventory (continued)

| # | Crossing ID | Suffix | County | City | Street | Total Trains | AADT | Max Train Speed | Traffic Control Group | Context | Crashes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 599 | 742396E | CBRY | Pinal | Kearny | Florence Kel Hwy | 2 | 272 | 25 | Passive | Rural | 0 |
| 600 | 874878U | CBRY | Pinal | Kearny | Ray Jct Rd | 10 | 248 | 12 | Passive | Rural | 0 |
| 601 | 874879B | CBRY | Pinal | Kearny | SR177 | 12 | 2313 | 15 | Lights and Gates | Rural | 0 |
| 602 | 742393J | CBRY | Pinal | Kearny | Tilbury | 16 | 2303 | 30 | Lights and Gates | Rural | 0 |
| 603 | 846117W | SMA | Pinal | Mammoth | | 4 | 50 | 45 | Passive | Rural | 0 |
| 604 | 846118D | SMA | Pinal | Mammoth | | 4 | 50 | 45 | Passive | Rural | 0 |
| 605 | 846119K | SMA | Pinal | Mammoth | Old Tiger Rd | 4 | 300 | 20 | Passive | Rural | 0 |
| 606 | 846120E | SMA | Pinal | Mammoth | SR77 | 4 | 3834 | 20 | Lights and Gates | Rural | 0 |
| 607 | 741340G | UP | Pinal | Maricopa | 83rd Ave | 40 | 145 | 79 | Lights and Gates | Rural | 0 |
| 608 | 741342V | UP | Pinal | Maricopa | N Ralston Rd | 38 | 1776 | 75 | Lights and Gates | Rural | 1 |
| 609 | 741346X | UP | Pinal | Maricopa | N White/Parker Rd | 38 | 3273 | 75 | Lights and Gates | Rural | 0 |
| 610 | 741345R | UP | Pinal | Maricopa | Porter Rd | 38 | 6772 | 75 | Lights and Gates | Rural | 0 |
| 611 | 741341N | UP | Pinal | Maricopa | Rio Bravo Rd | 40 | 1747 | 79 | Lights and Gates | Rural | 0 |
| 612 | 741700C | UP | Pinal | Picacho | Alsdorf Rd | 4 | 25 | 60 | Passive | Rural | 0 |
| 613 | 741696P | UP | Pinal | Picacho | Arical Rd | 4 | 25 | 60 | Passive | Rural | 0 |
| 614 | 741699K | UP | Pinal | Picacho | Battaglia Dr | 4 | 1330 | 60 | Passive | Rural | 0 |
| 615 | 741441T | UP | Pinal | Picacho | Cornman Rd | 4 | 25 | 60 | Passive | Rural | 0 |
| 616 | 741442A | UP | Pinal | Picacho | Hanna Rd | 4 | 30 | 60 | Passive | Rural | 0 |
| 617 | 741698D | UP | Pinal | Picacho | Houser Rd | 4 | 290 | 60 | Lights and Gates | Rural | 0 |
| 618 | 741701J | UP | Pinal | Picacho | Milligan Rd | 4 | 541 | 60 | Lights and Gates | Rural | 0 |
| 619 | 741712W | UP | Pinal | Picacho | Picacho Blvd | 40 | 327 | 79 | Lights and Gates | Rural | 0 |
| 620 | 741697W | UP | Pinal | Picacho | Shedd Rd | 4 | 933 | 60 | Passive | Rural | 0 |
| 621 | 741432U | UP | Pinal | Randolph | Bartlett Rd | 4 | 201 | 60 | Lights and Gates | Rural | 0 |

*Source: FRA*

## Table A-1: Active Highway-Rail Grade Crossing Inventory (continued)

| # | Crossing ID | Suffix | County | City | Street | Total Trains | AADT | Max Train Speed | Traffic Control Group | Context | Crashes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 622 | 741435P | UP | Pinal | Randolph | Kleck Rd | 4 | 50 | 60 | Lights and Gates | Rural | 0 |
| 623 | 741440L | UP | Pinal | Randolph | Selma Hwy | 4 | 1750 | 60 | Passive | Rural | 0 |
| 624 | 741437D | UP | Pinal | Randolph | Steele Rd | 4 | 2399 | 60 | Lights and Gates | Rural | 0 |
| 625 | 741436W | UP | Pinal | Randolph | Storey Rd | 4 | 50 | 60 | Passive | Rural | 0 |
| 626 | 741716Y | UP | Pinal | Red Rock | Missile Base Rd | 40 | 100 | 79 | Lights and Gates | Rural | 0 |
| 627 | 741714K | UP | Pinal | Red Rock | Park Link Dr | 40 | 460 | 79 | Lights and Gates | Rural | 0 |
| 628 | 741706T | UP | Pinal | Sacaton | Cr | 0 | 207 | 0 | Passive | Rural | 0 |
| 629 | 741703X | UP | Pinal | Sacaton | Cr | 0 | 25 | 0 | Passive | Rural | 0 |
| 630 | 741705L | UP | Pinal | Sacaton | Cr | 0 | 25 | 0 | Passive | Rural | 0 |
| 631 | 741704E | UP | Pinal | Sacaton | Desert View Rd | 0 | 25 | 0 | Passive | Rural | 0 |
| 632 | 741702R | UP | Pinal | Sacaton | Gilbert Rd | 0 | 6766 | 0 | Lights and Gates | Rural | 1 |
| 633 | 853090G | MAA | Pinal | Superior | Forest Hwy 252 T. | 2 | 25 | 10 | Passive | Rural | 0 |
| 634 | 853092V | MAA | Pinal | Superior | Forest Hwy 8 T. | 2 | 25 | 10 | Passive | Rural | 0 |
| 635 | 853091N | MAA | Pinal | Superior | Nunez Ranch Rd... | 2 | 25 | 10 | Passive | Rural | 0 |
| 636 | 853093C | MAA | Pinal | Superior | Silver King Rd | 2 | 25 | 10 | Passive | Rural | 0 |
| 637 | 742002M | UP | Santa Cruz | Amado | Amado Rd | 4 | 100 | 40 | Passive | Rural | 0 |
| 638 | 742005H | UP | Santa Cruz | Amado | Chavez Siding Rd | 4 | 1056 | 40 | Passive | Rural | 0 |
| 639 | 742148F | UP | Santa Cruz | Amado | Elephant Head Rd | 4 | 1056 | 40 | Lights and Gates | Rural | 0 |
| 640 | 742036G | UP | Santa Cruz | Nogales | Baffert Dr | 2 | 7702 | 25 | Lights and Gates | Urban | 0 |
| 641 | 742037N | UP | Santa Cruz | Nogales | Calle Sonora | 4 | 5021 | 25 | Lights and Gates | Urban | 0 |
| 642 | 742041D | UP | Santa Cruz | Nogales | Court St | 2 | 3582 | 10 | Lights and Gates | Urban | 0 |
| 643 | 742038V | UP | Santa Cruz | Nogales | E Doe St | 4 | 3386 | 20 | Lights and Gates | Urban | 0 |
| 644 | 742040W | UP | Santa Cruz | Nogales | Morley Ave | 2 | 6014 | 20 | Lights and Gates | Urban | 0 |

*Source: FRA*

## Table A-1: Active Highway-Rail Grade Crossing Inventory (continued)

| # | Crossing ID | Suffix | County | City | Street | Total Trains | AADT | Max Train Speed | Traffic Control Group | Context | Crashes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 645 | 742042K | UP | Santa Cruz | Nogales | Park St | 2 | 2802 | 10 | Lights and Gates | Urban | 0 |
| 646 | 742034T | UP | Santa Cruz | Nogales | Produce Row | 4 | 4540 | 25 | Lights and Gates | Urban | 0 |
| 647 | 753573M | UP | Santa Cruz | Nogales | Ruby Rd | 4 | 7098 | 25 | Lights and Gates | Rural | 0 |
| 648 | 742024M | UP | Santa Cruz | Nogales | South River Rd | 4 | 521 | 25 | Lights and Gates | Rural | 0 |
| 649 | 742035A | UP | Santa Cruz | Nogales | W Escondido Dr | 4 | 200 | 25 | Passive | Urban | 0 |
| 650 | 742032E | UP | Santa Cruz | Nogales | W Gold Hill Rd | 4 | 2135 | 25 | Lights and Gates | Urban | 0 |
| 651 | 742018J | UP | Santa Cruz | Rio Rico | Palo Parado Rd | 4 | 1165 | 40 | Lights and Gates | Rural | 0 |
| 652 | 742022Y | UP | Santa Cruz | Rio Rico | Rio Rico Dr | 4 | 10941 | 40 | Lights and Gates | Rural | 0 |
| 653 | 742007W | UP | Santa Cruz | Tubac | Bridge Rd | 4 | 442 | 40 | Passive | Rural | 0 |
| 654 | 025320W | BNSF | Yavapai | Ash Fork | Bullock Rd | 6 | 250 | 40 | Lights and Gates | Rural | 0 |
| 655 | 025314T | BNSF | Yavapai | Ash Fork | Double A Ranch Rd | 6 | 1615 | 35 | Lights and Gates | Rural | 0 |
| 656 | 025325F | BNSF | Yavapai | Ash Fork | Drake Rd | 6 | 1265 | 30 | Lights and Gates | Rural | 0 |
| 657 | 933885T | DSC | Yavapai | Ash Fork | Drake Rd | 0 | 25 | 10 | Passive | Rural | 0 |
| 658 | 933886A | DSC | Yavapai | Ash Fork | Drake Rd | 0 | 25 | 10 | Passive | Rural | 0 |
| 659 | 025751N | AZCR | Yavapai | Ash Fork | Drake Rd/FR 492 | 0 | 1265 | 10 | Passive | Rural | 0 |
| 660 | 025764P | AZCR | Yavapai | Clarkdale | Broadway | 0 | 1795 | 10 | Passive | Rural | 0 |
| 661 | 025365D | BNSF | Yavapai | Congress | State Hwy | 6 | 1000 | 30 | Lights and Gates | Rural | 0 |
| 662 | 025362H | BNSF | Yavapai | Hillside | Date Creek Rd | 6 | 96 | 30 | Lights and Gates | Rural | 0 |
| 663 | 025356E | BNSF | Yavapai | Hillside | Old Granthams Rd | 6 | 50 | 10 | Passive | Rural | 1 |
| 664 | 025754J | AZCR | Yavapai | Jerome | Forest Hwy 492A | 0 | 25 | 20 | Passive | Rural | 0 |
| 665 | 025755R | AZCR | Yavapai | Jerome | Perkinsville Rd | 0 | 100 | 20 | Passive | Rural | 0 |
| 666 | 025354R | BNSF | Yavapai | Kirkland | State Hwy | 6 | 614 | 30 | Lights and Gates | Rural | 0 |
| 667 | 025327U | BNSF | Yavapai | Paulden | USFS Rd | 6 | 50 | 49 | Passive | Rural | 0 |

*Source: FRA*

## Table A-1: Active Highway-Rail Grade Crossing Inventory (continued)

| # | Crossing ID | Suffix | County | City | Street | Total Trains | AADT | Max Train Speed | Traffic Control Group | Context | Crashes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 668 | 025336T | BNSF | Yavapai | Paulden | USFS Rd | 6 | 50 | 49 | Passive | Rural | 0 |
| 669 | 025205P | BNSF | Yavapai | Peach Springs | Hyde Park Rd | 64 | 1264 | 55 | Lights and Gates | Rural | 0 |
| 670 | 025200F | BNSF | Yavapai | Seligman | Fort Rock Rd | 64 | 594 | 79 | Lights and Gates | Rural | 0 |
| 671 | 025347F | BNSF | Yavapai | Skull Valley | Iron Springs Rd | 6 | 1448 | 40 | Lights and Gates | Rural | 0 |
| 672 | 025351V | BNSF | Yavapai | Skull Valley | Skull Valley Conn | 6 | 300 | 40 | Passive | Rural | 0 |
| 673 | 025350N | BNSF | Yavapai | Skull Valley | Sterling Ranch | 6 | 300 | 40 | Passive | Rural | 0 |
| 674 | 025901U | ARZC | Yavapai | Wickenburg | County Rd | 2 | 50 | 40 | Passive | Rural | 0 |
| 675 | 742087S | UP | Yuma | Dateland | Paloma Harquahala Rd | 0 | 50 | 0 | Lights and Gates | Rural | 0 |
| 676 | 742090A | UP | Yuma | Dateland | Sentinel Rd | 40 | 50 | 79 | Passive | Rural | 0 |
| 677 | 741746R | UP | Yuma | Roll | 4th St | 0 | 1000 | 10 | Lights and Gates | Rural | 0 |
| 678 | 741743V | UP | Yuma | Roll | 5th St | 0 | 510 | 10 | Lights and Gates | Rural | 0 |
| 679 | 741742N | UP | Yuma | Roll | 6th St | 0 | 165 | 10 | Lights and Gates | Rural | 0 |
| 680 | 741741G | UP | Yuma | Roll | Ave 37 E | 0 | 25 | 10 | Passive | Rural | 0 |
| 681 | 741745J | UP | Yuma | Roll | Ave 39 E | 0 | 1000 | 10 | Lights and Gates | Rural | 0 |
| 682 | 741747X | UP | Yuma | Roll | Ave 40 E | 0 | 595 | 10 | Lights and Gates | Rural | 0 |
| 683 | 741750F | UP | Yuma | Roll | Cr | 0 | 25 | 10 | Passive | Rural | 0 |
| 684 | 742073J | UP | Yuma | Tacna | Ave 36 E | 40 | 844 | 79 | Lights and Gates | Rural | 0 |
| 685 | 742075X | UP | Yuma | Tacna | Ave 40 E | 40 | 1215 | 75 | Lights and Gates | Rural | 0 |
| 686 | 742071V | UP | Yuma | Wellton | Ave 31 E | 40 | 500 | 79 | Lights and Gates | Rural | 0 |
| 687 | 741735D | UP | Yuma | Wellton | Ave 33 E | 0 | 361 | 10 | Lights and Gates | Rural | 0 |
| 688 | 742067F | UP | Yuma | Wellton | S Ave 25 E | 40 | 248 | 70 | Lights and Gates | Rural | 0 |
| 689 | 742069U | UP | Yuma | Wellton | Williams St | 38 | 4891 | 79 | Lights and Gates | Rural | 0 |
| 690 | 760781F | UP | Yuma | Yuma | 10th St | 0 | 1000 | 10 | Passive | Urban | 0 |

*Source: FRA*

**Table A-1: Active Highway-Rail Grade Crossing Inventory (continued)**

| # | Crossing ID | Suffix | County | City | Street | Total Trains | AADT | Max Train Speed | Traffic Control Group | Context | Crashes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ***691*** | 912026W | UP | Yuma | Yuma | 24th St | 0 | 9010 | 10 | Lights and Gates | Urban | 0 |
| ***692*** | 922549D | UP | Yuma | Yuma | 30th St | 0 | 300 | 10 | Passive | Urban | 0 |
| ***693*** | 753584A | UP | Yuma | Yuma | Ave 11 E | 40 | 6611 | 70 | Lights and Gates | Urban | 0 |
| ***694*** | 742052R | UP | Yuma | Yuma | Ave 9 E | 37 | 6127 | 79 | Lights and Gates | Urban | 0 |
| ***695*** | 903109L | UP | Yuma | Yuma | Factor Ave | 0 | 200 | 10 | Passive | Urban | 0 |
| ***696*** | 760772G | UNK | Yuma | Yuma | Penitentary St | 0 | 4576 | 0 | Passive | Urban | 0 |
| ***697*** | 742055L | UP | Yuma | Yuma | Rifle Range Rd/ Blaisdell Rd | 40 | 1000 | 79 | Lights and Gates | Rural | 0 |
| ***698*** | 748179A | UP | Yuma | Yuma | Short Way St | 0 | 230 | 10 | Lights and Gates | Urban | 0 |

## Crossing Locations Missing from the FRA Highway-Rail Crossing Inventory

- 025703Y: Dysart Road at Thunderbird Road/Waddell Road, El Mirage
- 025700D: Grand Avenue north of Santa Fe Lane, El Mirage
- 748720M: Elliot Road east of Wintersburg Road, Arlington/Maricopa County
- 025974E: Coconino Street west of Backcountry Road, Grand Canyon Village
- 025978G: Kennel Road east of Rowe Well Road, Grand Canyon Village
- 025979N: Private Road east of Village Loop Drive, Grand Canyon Village
- 742177R: Rancho Sahuarita Boulevard north of El Toro Road, Sahuarita
- 742182M: Mineral Hill Road east of Nogales Highway, Sahuarita
- 742387F: Golf Course Road west of SR 177, Hayden
- 905131F: Black Knoll Road, Navajo County

*Source: FRA*

# Appendix B - Highway-Rail Grade Crossing Crash Records

## Table B-1: Highway-Rail Grade Crossing Crash Records

| Incident ID | Date and Time | Crossing ID | Crossing Location | Highway | Severity | Context | Traffic Control |
|---|---|---|---|---|---|---|---|
| ***Apache County*** | | | | | | | |
| ***SW0616201*** | 6/18/2016 1:20 | 025004Y | Allentown Rd, Houck | Auto | No injury | Rural | Lights and Gates |
| ***Cochise County*** | | | | | | | |
| ***1017ST014*** | 10/12/2017 20:50 | 741386V | San Pedro St, North of 4th St, Benson | Pedestrian | Fatal | Rural | Lights and Gates |
| ***1018ST032*** | 10/31/2018 9:00 | 748709M | Mescal Rd, Benson | Truck | No injury | Rural | Lights and Gates |
| ***Coconino County*** | | | | | | | |
| ***SW0216200*** | 2/20/2016 7:48 | 025129Y | Fanning Dr, South of Historic Rte 66, Flagstaff | Pedestrian | Fatal | Urban | Lights and Gates |
| ***SW0916200*** | 9/2/2016 17:49 | 025129Y | Fanning Dr, South of Historic Rte 66, Flagstaff | Pedestrian | Fatal | Urban | Lights and Gates |
| ***SW1217200*** | 12/9/2017 16:13 | 025129Y | Fanning Dr, South of Historic Rte 66, Flagstaff | Pedestrian | Injury | Urban | Lights and Gates |
| ***SW0219205*** | 2/26/2019 18:45 | 025129Y | Fanning Dr, South of Historic Rte 66, Flagstaff | Pedestrian | Injury | Urban | Lights and Gates |
| ***SW1220205*** | 12/26/2020 14:55 | 025129Y | Fanning Dr, South of Historic Rte 66, Flagstaff | Pedestrian | Fatal | Urban | Lights and Gates |
| ***SW0618202*** | 6/12/2018 19:10 | 025131A | Ponderosa Pkwy, South of Historic Rte 66, Flagstaff | Auto | No injury | Urban | Lights and Gates |
| ***SW0917201*** | 9/15/2017 18:31 | 025132G | San Francisco St, South of Historic Rte 66, Flagstaff | Pedestrian | Fatal | Urban | Lights and Gates |
| ***SW0917202*** | 9/17/2017 23:45 | 025132G | San Francisco St, South of Historic Rte 66, Flagstaff | Pedestrian | Fatal | Urban | Lights and Gates |
| ***SW0818202*** | 8/26/2018 0:54 | 025132G | San Francisco St, South of Historic Rte 66, Flagstaff | Pedestrian | Fatal | Urban | Lights and Gates |

*Source: FRA and ADOT*

**Table B-1: Highway-Rail Grade Crossing Crash Records (continued)**

| Incident ID | Date and Time | Crossing ID | Crossing Location | Highway | Severity | Context | Traffic Control |
|---|---|---|---|---|---|---|---|
| ***SW0120201*** | 1/1/2020 22:00 | 025132G | San Francisco St, South of Historic Rte 66, Flagstaff | Pedestrian | Fatal | Urban | Lights and Gates |
| ***SW1120202*** | 11/29/2020 14:30 | 025132G | San Francisco St, South of Historic Rte 66, Flagstaff | Pedestrian | Injury | Urban | Lights and Gates |
| ***SW0117201*** | 1/26/2017 1:03 | 025133N | Beaver St, South of Historic Rte 66, Flagstaff | Auto | No injury | Urban | Lights and Gates |
| ***SW1217204*** | 12/30/2017 1:38 | 025133N | Beaver St, South of Historic Rte 66, Flagstaff | Pedestrian | Injury | Urban | Lights and Gates |
| ***SW0720201*** | 7/19/2020 15:51 | 025133N | Beaver St, South of Historic Rte 66, Flagstaff | Pedestrian | Fatal | Urban | Lights and Gates |
| ***SW0820203*** | 8/11/2020 1:50 | 025133N | Beaver St, South of Historic Rte 66, Flagstaff | Pedestrian | Fatal | Urban | Lights and Gates |
| ***SW0219204*** | 2/22/2019 15:30 | 025171X | Sherwood Access Rd, Williams | Auto | No injury | Rural | Lights and Gates |
| ***Gila County*** | | | | | | | |
| ***ACIS_3606032*** | 10/26/2019 17:17 | 742375L | Marion St & Railroad Ave, Claypool | Auto | No injury | Urban | Passive |
| ***Greenlee County*** | | | | | | | |
| ***AZE249917G*** | 3/20/2017 12:15 | 741893D | US Highway 191, Clifton | Auto | No injury | Rural | Lights and Gates |
| ***Maricopa County*** | | | | | | | |
| ***0919ST007*** | 9/11/2019 14:00 | 920154A | 56th St & Morelos Pl, Chandler | Truck | No injury | Urban | Lights and Gates |
| ***ACIS_3551686*** | 8/22/2019 23:30 | 741662V | Guadalupe Rd, East of Fiesta Blvd, Gilbert | Auto | Injury | Urban | Lights and Gates |
| ***1016ST008*** | 10/20/2016 14:30 | 741816D | Cooper Rd, South of Guadalupe Rd, Gilbert | Auto | Injury | Rural | Lights and Gates |
| ***0118ST021*** | 1/24/2018 1:50 | 741825C | Val Vista Dr, South of Warner Rd, Gilbert | Auto | Fatal | Urban | Lights and Gates |

*Source: FRA and ADOT*

**Table B-1: Highway-Rail Grade Crossing Crash Records (continued)**

| Incident ID | Date and Time | Crossing ID | Crossing Location | Highway | Severity | Context | Traffic Control |
|---|---|---|---|---|---|---|---|
| *1219ST009* | 12/19/2019 19:26 | 741833U | Power Rd & Pecos Rd, Gilbert | Auto | No injury | Urban | Lights and Gates |
| *SW0517200* | 5/5/2017 9:01 | 025415E | Grand Ave & Myrtle Ave, Glendale | Truck | No injury | Urban | Lights and Gates |
| *SW0116200* | 1/7/2016 0:10 | 025418A | 59th Ave & Glendale Ave, Glendale | Auto | No injury | Urban | Flashing Lights |
| *ACIS_3380318* | 6/14/2018 6:15 | 025418A | 59th Ave & Glendale Ave, Glendale | Auto | Injury | Urban | Flashing Lights |
| *SW0620201* | 6/11/2020 13:13 | 025418A | 59th Ave & Glendale Ave, Glendale | Pedestrian | Injury | Urban | Flashing Lights |
| *SW0217201* | 2/13/2017 3:51 | 025590V | Bethany Home Rd, West of 51st Ave, Glendale | Bicycle | No injury | Urban | Lights and Gates |
| *SW0217202* | 2/13/2017 7:49 | 025590V | Bethany Home Rd, West of 51st Ave, Glendale | Truck | No injury | Urban | Lights and Gates |
| *SW0517202* | 5/22/2017 8:15 | 025590V | Bethany Home Rd, West of 51st Ave, Glendale | Auto | No injury | Urban | Lights and Gates |
| *SW0617204* | 6/24/2017 18:44 | 025590V | Bethany Home Rd, West of 51st Ave, Glendale | Other | No injury | Urban | Lights and Gates |
| *SW0817200* | 8/15/2017 17:43 | 025590V | Bethany Home Rd, West of 51st Ave, Glendale | Auto | No injury | Urban | Lights and Gates |
| *SW1218201* | 12/11/2018 12:24 | 025590V | Bethany Home Rd, West of 51st Ave, Glendale | Truck | No injury | Urban | Lights and Gates |
| *ACIS_3473677* | 2/16/2019 2:18 | 025590V | Bethany Home Rd, West of 51st Ave, Glendale | Auto | No injury | Urban | Lights and Gates |
| *SW0620203* | 6/25/2020 3:00 | 025590V | Bethany Home Rd, West of 51st Ave, Glendale | Auto | No injury | Urban | Lights and Gates |
| *1020LA040* | 10/29/2020 18:07 | 741814P | McQueen Rd, South of Baseline Rd, Gilbert | Auto | Fatal | Urban | Lights and Gates |
| *1018ST012* | 10/11/2018 10:05 | 741649G | Dobson Rd, South of Main St, Mesa | Motorcycle | No injury | Urban | Lights and Gates |
| *1119ST004* | 11/2/2019 14:36 | 741650B | Alma School Rd, South of Main St, Mesa | Auto | No injury | Urban | Lights and Gates |

*Source: FRA and ADOT*

**Table B-1: Highway-Rail Grade Crossing Crash Records (continued)**

| Incident ID | Date and Time | Crossing ID | Crossing Location | Highway | Severity | Context | Traffic Control |
|---|---|---|---|---|---|---|---|
| *0316ST010* | 3/18/2016 10:00 | 741657Y | Broadway Rd, West of Center St, Mesa | Auto | Injury | Urban | Lights and Gates |
| *1117ST014* | 11/16/2017 12:36 | 741661N | Baseline Rd, West of McQueen Rd, Mesa | Auto | No injury | Urban | Lights and Gates |
| *ACIS_3164760* | 10/16/2016 18:31 | 025403K | Peoria Ave, East of Grand Ave, Peoria | Motorcycle | Injury | Urban | Lights and Gates |
| *SW0716201* | 7/24/2016 21:21 | 025422P | 43rd Ave & Camelback Rd, Phoenix | Other | No injury | Urban | Lights and Gates |
| *SW0916202* | 9/27/2016 17:55 | 025422P | 43rd Ave & Camelback Rd, Phoenix | Auto | No injury | Urban | Lights and Gates |
| *SW1216202* | 12/30/2016 18:40 | 025422P | 43rd Ave & Camelback Rd, Phoenix | Auto | No injury | Urban | Lights and Gates |
| *SW0317201* | 3/5/2017 21:20 | 025422P | 43rd Ave & Camelback Rd, Phoenix | Other | No injury | Urban | Lights and Gates |
| *SW0417202* | 4/5/2017 2:15 | 025422P | 43rd Ave & Camelback Rd, Phoenix | Auto | No injury | Urban | Lights and Gates |
| *SW0717200* | 7/11/2017 15:30 | 025422P | 43rd Ave & Camelback Rd, Phoenix | Other | Injury | Urban | Lights and Gates |
| *SW0120202* | 1/28/2020 0:22 | 025422P | 43rd Ave & Camelback Rd, Phoenix | Auto | No injury | Urban | Lights and Gates |
| *SW0820201* | 8/5/2020 19:42 | 025422P | 43rd Ave & Camelback Rd, Phoenix | Auto | No injury | Urban | Lights and Gates |
| *SW1220202* | 12/8/2020 0:12 | 025422P | 43rd Ave & Camelback Rd, Phoenix | Auto | No injury | Urban | Lights and Gates |
| *SW0416200* | 4/20/2016 15:04 | 025424D | Indian School Rd, West of Grand Ave, Phoenix | Auto | No injury | Urban | Lights and Gates |
| *ACIS_3092216* | 6/2/2016 22:18 | 025425K | 35th Ave, South of Indian School Rd, Phoenix | Auto | No injury | Urban | Flashing Lights |
| *SW0616200* | 6/3/2016 0:20 | 025425K | 35th Ave, South of Indian School Rd, Phoenix | Auto | No injury | Urban | Flashing Lights |
| *SW1217202* | 12/24/2017 13:30 | 025425K | 35th Ave, South of Indian School Rd, Phoenix | Auto | No injury | Urban | Flashing Lights |

*Source: FRA and ADOT*

**Table B-1: Highway-Rail Grade Crossing Crash Records (continued)**

| Incident ID | Date and Time | Crossing ID | Crossing Location | Highway | Severity | Context | Traffic Control |
|---|---|---|---|---|---|---|---|
| ***SW0716200*** | 7/16/2016 15:07 | 025430G | 27th Ave, South of Thomas Rd, Phoenix | Auto | No injury | Urban | Flashing Lights |
| ***SW0617203*** | 6/23/2017 17:11 | 025430G | 27th Ave, South of Thomas Rd, Phoenix | Auto | No injury | Urban | Flashing Lights |
| ***SW0918202*** | 9/26/2018 17:07 | 025430G | 27th Ave, South of Thomas Rd, Phoenix | Auto | No injury | Urban | Flashing Lights |
| ***SW0919201*** | 9/15/2019 15:35 | 025430G | 27th Ave, South of Thomas Rd, Phoenix | Auto | No injury | Urban | Flashing Lights |
| ***SW0920204*** | 9/16/2020 17:46 | 025430G | 27th Ave, South of Thomas Rd, Phoenix | Auto | No injury | Urban | Flashing Lights |
| ***SW0920205*** | 9/24/2020 16:10 | 025430G | 27th Ave, South of Thomas Rd, Phoenix | Truck | No injury | Urban | Flashing Lights |
| ***SW1020201*** | 10/8/2020 14:30 | 025430G | 27th Ave, South of Thomas Rd, Phoenix | Pedestrian | Injury | Urban | Flashing Lights |
| ***SW1220204*** | 12/23/2020 10:44 | 025430G | 27th Ave, South of Thomas Rd, Phoenix | Auto | No injury | Urban | Flashing Lights |
| ***SW0818201*** | 8/1/2018 1:52 | 025436X | McDowell Rd, West of Grand Ave, Phoenix | Auto | No injury | Urban | Flashing Lights |
| ***SW0918203*** | 9/30/2018 5:25 | 025436X | McDowell Rd, West of Grand Ave, Phoenix | Auto | Injury | Urban | Flashing Lights |
| ***ACIS_3307726*** | 12/13/2017 8:23 | 025441U | 19th Ave & Adams St, Phoenix | Auto | Injury | Urban | Lights and Gates |
| ***SW0516200*** | 5/26/2016 16:20 | 025443H | 19th Ave & Washington St, Phoenix | Auto | No injury | Urban | Lights and Gates |
| ***SW0820204*** | 8/23/2020 19:23 | 025491X | 43rd Ave, South of Camelback Rd, Phoenix | Auto | No injury | Urban | Flashing Lights |
| ***SW1116201*** | 11/12/2016 6:14 | 025617C | Thomas Rd, West of 27th Ave, Phoenix | Auto | No injury | Urban | Flashing Lights |
| ***SW0617200*** | 6/2/2017 12:20 | 025617C | Thomas Rd, West of 27th Ave, Phoenix | Auto | Injury | Urban | Flashing Lights |
| ***SW1117200*** | 11/1/2017 11:30 | 025617C | Thomas Rd, West of 27th Ave, Phoenix | Auto | Injury | Urban | Flashing Lights |

*Source: FRA and ADOT*

**Table B-1: Highway-Rail Grade Crossing Crash Records (continued)**

| Incident ID | Date and Time | Crossing ID | Crossing Location | Highway | Severity | Context | Traffic Control |
|---|---|---|---|---|---|---|---|
| *SW0518202* | 5/21/2018 20:18 | 025617C | Thomas Rd, West of 27th Ave, Phoenix | Auto | No injury | Urban | Flashing Lights |
| *SW1018201* | 10/15/2018 11:22 | 025617C | Thomas Rd, West of 27th Ave, Phoenix | Truck | No injury | Urban | Flashing Lights |
| *SW1018202* | 10/23/2018 20:39 | 025617C | Thomas Rd, West of 27th Ave, Phoenix | Auto | No injury | Urban | Flashing Lights |
| *SW0419201* | 4/9/2019 15:07 | 025617C | Thomas Rd, West of 27th Ave, Phoenix | Auto | No injury | Urban | Flashing Lights |
| *SW0220201* | 2/27/2020 16:25 | 025617C | Thomas Rd, West of 27th Ave, Phoenix | Auto | No injury | Urban | Flashing Lights |
| *SW0520201* | 5/6/2020 16:30 | 025617C | Thomas Rd, West of 27th Ave, Phoenix | Auto | No injury | Urban | Flashing Lights |
| *SW0920203* | 9/11/2020 3:55 | 025617C | Thomas Rd, West of 27th Ave, Phoenix | Auto | No injury | Urban | Flashing Lights |
| *SW1120201* | 11/13/2020 0:25 | 025617C | Thomas Rd, West of 27th Ave, Phoenix | Auto | Injury | Urban | Flashing Lights |
| *ACIS_3394132* | 7/23/2018 10:13 | 025845P | 11th Ave & Maricopa Fwy, Phoenix | Truck | No injury | Urban | Lights and Gates |
| *SW0918201* | 9/13/2018 10:54 | 025850L | Watkins Rd, East of 16th Ave, Phoenix | Truck | Injury | Urban | Passive |
| *SW0219201* | 2/4/2019 11:00 | 025852A | 19th Ave, North of Lower Buckeye Rd, Phoenix | Auto | No injury | Urban | Lights and Gates |
| *1116ST003* | 11/9/2016 16:23 | 741452F | 23rd Ave, South of Jefferson St, Phoenix | Motorcycle | Injury | Urban | Lights and Gates |
| *ACIS_3461826* | 1/7/2019 0:35 | 741492D | Lincoln St, West of 7th St, Phoenix | Auto | No injury | Urban | Flashing Lights |
| *SW1217201* | 12/22/2017 16:29 | 025399X | 103rd Ave, North of Grand Ave, Sun City | Auto | No injury | Urban | Lights and Gates |
| *SW0218200* | 2/3/2018 16:10 | 025599G | Grand Ave & 163rd Ave, Sun City | Auto | Injury | Rural | Lights and Gates |
| *ACIS_3438414* | 10/23/2018 18:55 | 025651J | Greenway Rd, North of Grand Ave, Surprise | Auto | No injury | Urban | Lights and Gates |

*Source: FRA and ADOT*

**Table B-1: Highway-Rail Grade Crossing Crash Records (continued)**

| Incident ID | Date and Time | Crossing ID | Crossing Location | Highway | Severity | Context | Traffic Control |
|---|---|---|---|---|---|---|---|
| ***SW0720202*** | 7/21/2020 0:01 | 025651J | Greenway Rd, North of Grand Ave, Surprise | Auto | No injury | Urban | Lights and Gates |
| ***0717ST031*** | 7/31/2017 23:50 | 741560C | University Dr, West of Ash Ave, Tempe | Pedestrian | Injury | Urban | Lights and Gates |
| ***0118ST013*** | 1/13/2018 11:00 | 741560C | University Dr, West of Ash Ave, Tempe | Pedestrian | No injury | Urban | Lights and Gates |
| ***0219ST019*** | 2/16/2019 3:28 | 741561J | Ash Ave & 5th St, Tempe | Auto | No injury | Urban | Lights and Gates |
| ***0716ST019*** | 7/27/2016 4:28 | 741562R | 9th St, West of Ash Ave, Tempe | Auto | No injury | Urban | Lights and Gates |
| ***0518ST009*** | 5/9/2018 12:45 | 741647T | S Price Rd, South of Apache Blvd, Tempe | Auto | Injury | Urban | Lights and Gates |
| ***1218ST002*** | 12/1/2018 23:35 | 748176E | N Price Rd, South of Apache Blvd, Tempe | Auto | No injury | Urban | Lights and Gates |
| ***Navajo County*** | | | | | | | |
| ***SW0817201*** | 8/20/2017 14:52 | 025017A | Apache Ave, South of Joy Nevin Ave, Holbrook | Auto | Fatal | Rural | Lights and Gates |
| ***SW0316200*** | 3/11/2016 23:05 | 025023D | Obed Rd, Joseph City | Auto | No injury | Rural | Lights and Gates |
| ***SW0820205*** | 8/31/2020 22:30 | 025023D | Obed Rd, Joseph City | Auto | No injury | Rural | Lights and Gates |
| ***Pima County*** | | | | | | | |
| ***1020LA032*** | 10/17/2020 1:08 | 741100A | Massingale Rd, East of I-10 Frontage Rd, Marana | Auto | No injury | Urban | Lights and Gates |
| ***0120ST019*** | 1/25/2020 18:49 | 741122A | 6th St, East of 9th Ave, Tucson | Pedestrian | Injury | Urban | Lights and Gates |
| ***ACIS_3051938*** | 2/13/2016 2:18 | 741124N | 7th Ave, Tucson | Auto | No injury | Urban | Lights and Gates |
| ***0416ST009*** | 4/29/2016 17:05 | 741124N | 7th Ave, Tucson | Pedestrian | Fatal | Urban | Lights and Gates |

*Source: FRA and ADOT*

**Table B-1: Highway-Rail Grade Crossing Crash Records (continued)**

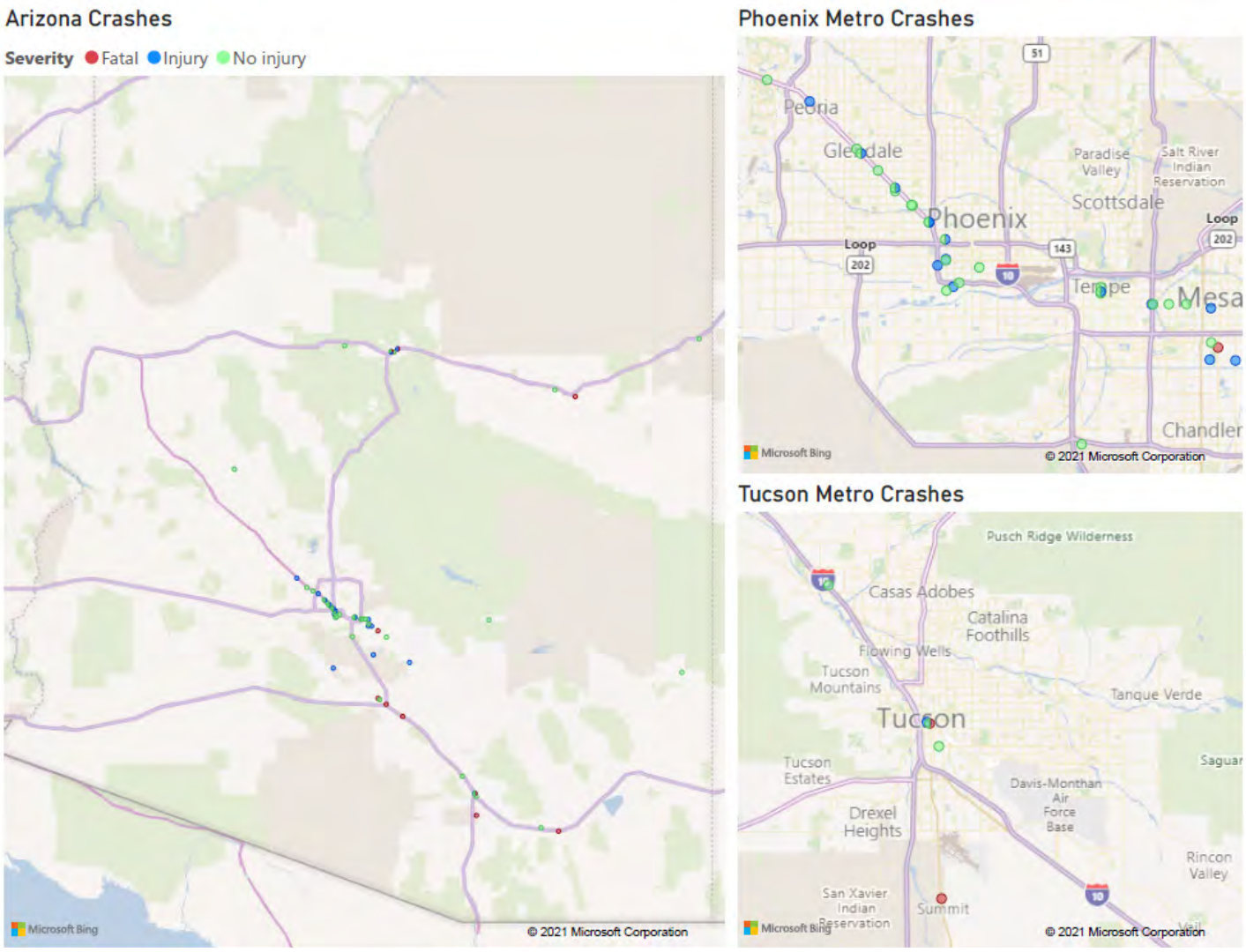
| Incident ID | Date and Time | Crossing ID | Crossing Location | Highway | Severity | Context | Traffic Control |
|---|---|---|---|---|---|---|---|
| *ACIS_3300903* | 11/9/2017 1:34 | 741124N | 7th Ave, Tucson | Auto | No injury | Urban | Lights and Gates |
| *1218ST028* | 12/14/2018 4:15 | 742104F | 22nd St, West of Euclid Ave, Tucson | Auto | No injury | Urban | Lights and Gates |
| *0119ST011* | 1/4/2019 13:10 | 742122D | Old Nogales Hwy, Tucson | Pedestrian | Fatal | Rural | Lights and Gates |
| ***Pinal County*** | | | | | | | |
| *0816ST013* | 8/28/2016 19:55 | 741363N | Florence St & Main St, Casa Grande | Pedestrian | Fatal | Urban | Lights and Gates |
| *0918ST015* | 9/25/2018 21:40 | 741363N | Florence St & Main St, Casa Grande | Pedestrian | Fatal | Urban | Lights and Gates |
| *0318ST007* | 3/10/2018 12:15 | 741367R | Trekell Rd, South of Jimmie Kerr Blvd, Casa Grande | Truck | No injury | Urban | Lights and Gates |
| *1119ST005* | 11/11/2019 2:16 | 741372M | Cox Rd, South of Jimmie Kerr Blvd, Casa Grande | Auto | Fatal | Rural | Lights and Gates |
| *0117ST016* | 1/24/2017 16:52 | 741708G | Main St, South of Casa Grande-Picacho Hwy, Eloy | Bicycle | Fatal | Urban | Lights and Gates |
| *0816ST001* | 8/2/2016 15:34 | 741416K | Arizona Farms Rd, East of Hunt Highway, Florence | Truck | Injury | Rural | Lights and Gates |
| *1217ST006* | 12/6/2017 20:10 | 741342V | Ralston Rd, South of Maricopa Rd, Maricopa | Auto | Injury | Rural | Lights and Gates |
| *ACIS_3218160* | 12/5/2016 21:32 | 741702R | Gilbert Rd, North of County Rd 282 | Auto | Injury | Rural | Lights and Gates |
| ***Yavapai County*** | | | | | | | |
| *SW0320202* | 3/24/2020 8:16 | 025356E | Hillside Rd, Hillside | Truck | No injury | Rural | Passive |

*Source: FRA and ADOT*

# Appendix C - Highway-Rail Grade Crossing Crash Summaries

**Figure C-1** shows the locations of all crashes recorded as occurring at highway-rail grade crossings.

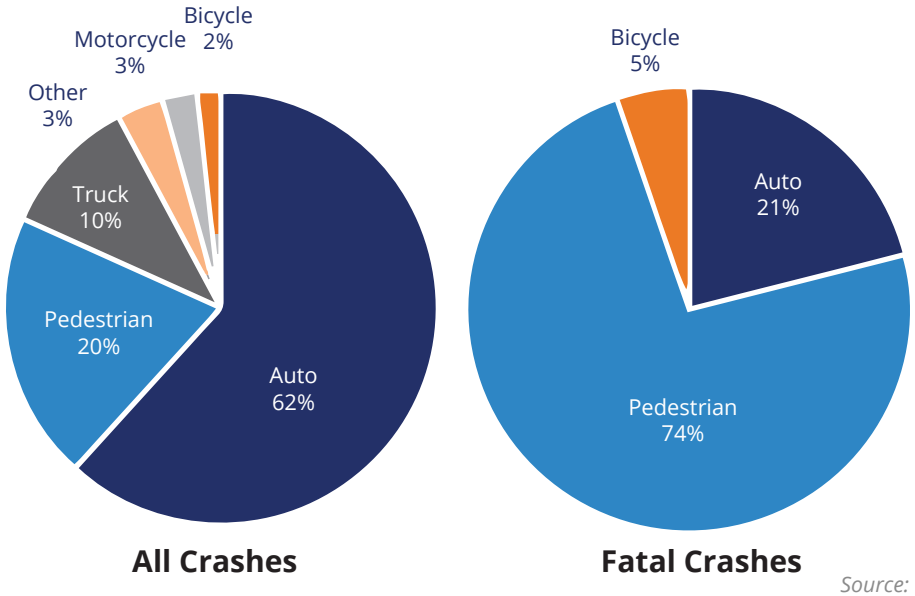
## Figure C-1: Highway-Rail Grade Crossing Crash Locations




*Source: FRA and ADOT*

**Figure C-2** shows the distribution of crashes by highway user type. Most highway-rail crashes (62 percent) involved motor vehicles, 20 percent involved pedestrians and 2 percent involved bicyclists.

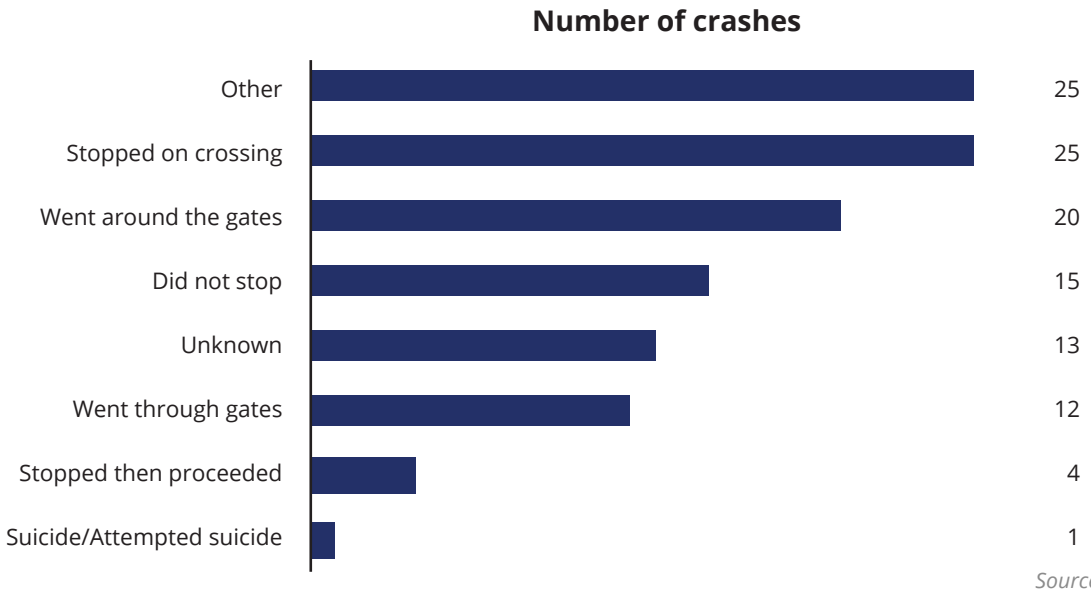
**Figure C-2: Highway-Rail Grade Crossing Crashes by Highway User Type**




*Source: FRA and ADOT*

The most frequent actions reported involving the highway user at the time of the collusion include "other", "stopped on crossing", and "went around the gates". **Figure C-3** shows the frequency of crashes by the identified highway user action. This data field is provided in the FRA database, but not within the ADOT ACIS database. Therefore, highway user action of the ADOT ACIS crashes (13) are listed as "unknown" in **Figure C-3.**

**Figure C-3: Highway-Rail Grade Crossing Crashes by Highway User Action**

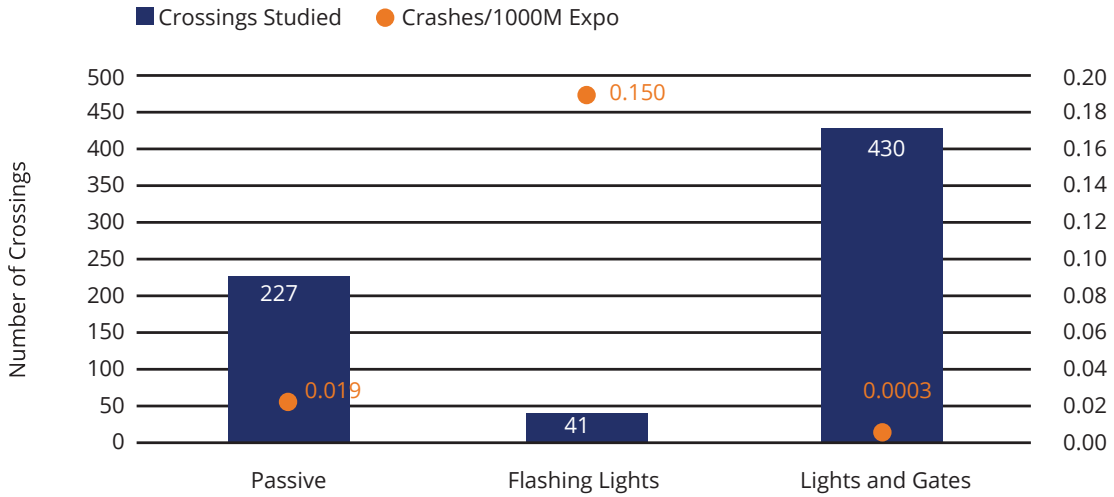



*Source: FRA and ADOT*

Additionally, it was observed that 68 percent of all crashes occurred at BNSF railroad crossings (the operator along Grand Avenue) and 30 percent of all crashes were at Union Pacific (UP) railroad crossings. The period of the day with the highest number of crashes was from 3 pm to 7 pm, and from midnight to 2 am. Regarding urban and rural contexts, 86 percent of Arizona's crashes occurred at urban crossings, and 21 percent of fatal crashes occurred at rural crossings. This share correlates to the distribution of highway traffic: 85 percent of all AADT was reported at urban crossings.

Of the 115 crashes, 83 (72 percent) occurred at crossings with lights and gates, 29 (25 percent) occurred at crossings with flashing lights, and 3 (<3 percent) occurred at passive crossings. **Figure C-4** depicts the number of each crossings per warning device and the crash rate for each warning device group. When normalized by the level of exposure at each crossing (product of AADT, daily train volume, and number of years), the highest crash rate was observed at crossings with flashing lights only (no gates).

**Figure C-4: Number of Highway-Rail Grade Crossings and Crash Rate by Warning Device Group**




*Source: FRA and ADOT*

## Crossings with Fatal Crashes

A total of 19 fatal crashes between rail vehicles and highway users were reported at 12 Arizona crossings from 2016 to 2020. All twelve crossings operate under lights and gates controls. The most common action of highway users on those crashes were going around or through the gates (11 crashes). Most fatal crashes involved pedestrians.

Details about the reported fatal crashes are reported in **Table C-1**.

## Table C-1: Description of Fatal Highway-Rail Crashes, 2016 to 2020

| Crossing ID | Location | Crashes | | Date | Highway User | Highway User Action |
|---|---|---|---|---|---|---|
| | | Total | Fatal | | | |
| ***025132G*** | San Francisco St South of Historic Rte 66 (Flagstaff) | 5 | 4 | Sep-17 | Pedestrian | Other |
| | | | | Sep-17 | Pedestrian | Other |
| | | | | Aug-18 | Pedestrian | Went around gates |
| | | | | Jan-20 | Pedestrian | Went around gates |
| ***025129Y*** | Fanning Drive South of Historic Rte 66 (Flagstaff) | 5 | 3 | Feb-16 | Pedestrian | Other |
| | | | | Sep-16 | Pedestrian | Other |
| | | | | Dec-20 | Pedestrian | Went around gates |
| ***025133N*** | Beaver St South of Historic Rte 66 (Flagstaff) | 4 | 2 | Jul-20 | Pedestrian | Went around gates |
| | | | | Aug-20 | Pedestrian | Went around gates |
| ***741363N*** | Florence St & Main St (Casa Grande) | 2 | 2 | Aug-16 | Pedestrian | Went around gates |
| | | | | Sep-18 | Pedestrian | Went around gates |
| ***741124N*** | 7th Ave (Tucson) | 3 | 1 | Apr-16 | Pedestrian | Other |
| ***025017A*** | Navajo Blvd/Apache Ave & Joy Nevin Ave (Holbrook) | 1 | 1 | Aug-17 | Pick-up Truck | Went thru gate |
| ***741372M*** | Cox Rd & Jimmie Kerr Blvd (Casa Grande) | 1 | 1 | Nov-19 | Auto | Other |
| ***741708G*** | Main St & Casa Grande-Picacho Hwy (Eloy) | 1 | 1 | Jan-17 | Bicycle | Went around gates |
| ***741814P*** | McQueen Rd South of Baseline Rd (Gilbert) | 1 | 1 | Oct-20 | Auto | Did not stop |
| ***742122D*** | Old Nogales Hwy (Tucson) | 1 | 1 | Jan-19 | Pedestrian | Went around gates |
| ***741386V*** | San Pedro St & 4th St (Benson) | 1 | 1 | Oct-17 | Pedestrian | Suicide/Attempted suicide |
| ***741825C*** | Val Vista Dr South of Warner Rd (Gilbert) | 1 | 1 | Jan-18 | Auto | Went thru the gate |

*Source: FRA and ADOT*

# Appendix D – COG/MPO Stakeholder Presentation Notes

## Yuma Metropolitan Planning Organization (November 10, 2021)

***Michael Grandy, Kimley-Horn, Presenter***

- Jennifer Albers
  - Avenue 9E contains the railroad crossing of most concern to the City of Yuma
    - There was a bicyclist fatality here a few years ago
    - Traffic has increased over the years as Yuma has grown
    - There are several schools in the area
    - Many of the long back-ups happen when trains stop while blocking the crossing; drivers aware of past long waits at crossings often gun it or make illegal maneuvers to try to beat the train and avoid getting stuck at the crossing for long periods of time
- Frank Sanchez
  - Fortuna Avenue has the railroad crossing of most concern to Yuma County
    - Long back-ups are frequent due to trains stopping and blocking the crossing for extended periods of time, sometimes backing traffic up to 24th Street on the south leg
- Paul Ward
  - It would be helpful to see a map with all the crossings included in the SHRAP database
  - It would be helpful if the survey deadline could be extended to provide member agencies with more time to take the survey

## Western Arizona Council of Governments (November 10, 2021)

***Michael Grandy, Kimley-Horn, Presenter***

- Phillip Wisely
  - The Hualapai Tribe has three railroad crossings
    - Two are passive crossings on narrow dirt roads with sight distance concerns
    - One is an active crossing on Diamond Creek Road where a railroad overpass is programmed to be constructed
    - More information on the railroad crossings can be found in the Hualapai Tribe's Long Range Transportation Plan and the Safety Plan
  - Would like to use Section 130 funding for the design of the railroad overpass if that is an eligible project for that funding
- Jack Plaunty
  - The City of Kingman has never used Section 130 funding and would like more information on the program and what types of projects are eligible
  - Please email the link to the SHRAP survey
- Steve Latoski
  - Mohave County has some railroad spur crossings in industrial areas but no major issues or concerns as far as he knows

## MetroPlan (November 17, 2021)

***Michael Grandy, Kimley-Horn, Presenter***

- Dave Wessel
  - Confirmed Kimley-Horn had all of the crossings in the Flagstaff area in the map shown

- Rick Barrett
  - Quiet zones should be listed as a potential treatment – they take a lot of work and data
  - There are a lot of incidents that do not take place at crossings
  - Beaver and San Francisco
    - Went to a quiet zone there by using one-way streets but still having problems because gate arms are only for the direction of vehicle travel and pedestrians can travel either direction; also, some pedestrians go around the gates
  - Flagstaff has two tracks with potential to add a third track at some point in the future
  - Maybe the speed of trains has something to do with the number of fatalities – the main BNSF transcontinental route go through Flagstaff
  - Longitudinal fencing along the tracks will help a lot with trespassing, but there is a dispute of who is responsible to pay for those treatments
  - Need to establish a diagnostic team to do a quiet zone
  - To get rid of the wayside horns at Steves and Fanning but maintain the quiet zone, other treatments would be needed like quad gates or a raised median so drivers cannot drive around the gates
  - Quad gates are estimated to be $1M per crossing
  - Some of the fatalities might happen when a pedestrian waits for a train to clear one track and then gets hit by a train on the second track when they don't realize there are two sets of tracks
- Dave Wessel
  - Steves and Fanning have wayside horns and quiet zones but quad gates or other treatments are being considered to eliminate noise from wayside horns
  - What are the safety benefits to using the four-quadrant gates compared to wayside horns?
  - Some incidents may not take place at the crossings
    - Are there longitudinal treatments as opposed to lateral treatments that can be implemented to discourage trespassing?
- Jeff Bauman
  - Pedestrian activity in downtown is the biggest issue in Flagstaff
  - Has tried to utilize Section 130 funding mechanism, but the proposed treatments weren't eligible for those funds
  - Need some more information on how to use Section 130 funds
  - There is an active crossing at Babbitt Drive on a railroad spur. It is on a private roadway but it preempts the adjacent public traffic signal at Babbitt Drive/Butler Avenue. The building it serves is currently vacant so not in use
  - There is a passive crossing on Cottage Drive near Elden Street where ACC had Flagstaff put up signs and markings recently but it does not appear to be in use
- Anne Dunno
  - The number of BNSF trains is projected to continue to grow in the future
  - Could we consider pedestrian overpasses? The City is looking at some pedestrian railroad overpasses for a FUTS trail near City Hall
  - Hazardous material on trains; how is that considered for the safety of people standing near the tracks?

- Dan Folke
  - Community confused about quiet zones – some require wayside horns and some don't; the east side of the city has asked how they can get a typical quiet zone without wayside horns
  - BNSF said they don't want the City changing safety countermeasures at the Steves and Fanning crossings until the City comes up with a safety plan for addressing the pedestrian crash issues at railroad crossings in the Flagstaff area
  - Want to understand why incidents occur at a higher rate in Flagstaff than in other populated area
  - Who reviews the proposed quiet zone treatments? FRA does based on the Quiet Zone Calculator results, with ACC and ADOT concurring. The railroad companies technically do not get to approve or disapprove proposed quiet zone treatments but they can make it challenging for treatments to happen that they don't agree with

## Central Arizona Governments (November 18, 2021)

***Keith Christian, Kimley-Horn, Presenter***

- Travis Ashbaugh
  - Asarco Dr/Golf Course Rd/SR 177 is a dirt road crossing that needs some work
  - Couldn't recall any incidents that had occurred at the crossing but it is a safety concern
  - Is there a way to look specifically at rural crossings so that the top crossings in the prioritized list aren't only urban crossings with higher volumes/occurrence of incidents?
  - Are agencies required to match funds for Section 130 projects?
- Rick Powers
  - Globe is in the process of moving the Broad Street/Jesse Hayes Road crossing to Buena Vista/Hill Street
    - Was paid for by the agency – not the railroad or ADOT
    - Used the ACC process
  - Has used Section 130 funding in the past – the railroad is required to pay a certain percentage and then ADOT provides the rest of the funding; no local match required

## SouthEastern Arizona Governments Organization (November 18, 2021)

***Mark Hoffman, ADOT, Presenter***

- Michael Bryce
  - In Graham County, there are issues with responsiveness for repairing surface conditions at multiple crossings
- Vernon Batty
  - In Pima, 200 N/Trip Canyon Rd has safety issues with surface condition at crossing not being addressed by the railroad
- Leonard Fontes
  - In Santa Cruz County, there is a need for a grade-separated railroad crossing on Ruby Rd near Potrero Creek
- Barney Bigman
  - For the San Carlos Apache Tribe, there are issues with the surface condition at the railroad crossing on Casino Way

## Sierra Vista Metropolitan Planning Organization (November 13, 2021)

***Email response from Karen Lamberton, SVMPO (no presentation made)***

- Information on railroads in Cochise County/southeastern Arizona can be found in the Cochise County Long-Range Transportation Plan from 2015. It is dated, but in a County growing at this slow rate the information is still accurate. Other than minor maintenance activities, improvements at these crossings have not been made to date nor have recommendations proactively been followed-up on. Since this plan was adopted, one at-grade crossing in Willcox went to a quiet zone/no-horn zone, with some roadway improvements made associated with that activity (median placed, signs put up)
- The Sierra Vista MPO Long-Range Transportation Plan from 2021 also has some information on railroads
- The railroad crossing of most concern then, and now, is in the St. David area. A children's foster camp was allowed to develop beyond that crossing with a condition they "work" with the railroad for legal access and improving safety at that site. That was ten years ago? I suppose it could be argued that it is fine – "nothing" of concern has happened as of yet although they drive these children within the railroad right-of-way and across a very unsafe (in my opinion) at-grade crossing
- The other area of concern related to railroad crossings is the one associated with the current overpass on Highway 191 near I-10. This is in ADOT's five-year plan for improvement. Critical that this overpass be reconstructed – not necessarily for the railroad but that reconstruction will result in some need for coordination with the railroad
- This County has had incidents of injuries, serious ones, related to bicyclists crossing railroad lines. As bicycling increases in our region – several national bicycle tours are run here, practice rides for the El Tour de Tucson rides, an initiating three-day Sky Island Tour ride this next year planned, I expect to see more conflicts with railroad lines and bicyclists. However, the cost to change an at-grade crossing to avoid the potential of a bicyclists catching their wheel is from a cost-benefit analysis we need to prioritize those locations with lots of trains and lots of vehicles first
- I would conclude that I feel there is a need for a developing a higher level state liaison with our railroad companies, a single point of contact to deal with our railroad owners on issues ranging from encroachment to weed abatement. Right now it is a challenging hurdle to even find who to talk to about any sort of railroad issue. ADOT, as a transportation agency, is supposed to be multi-modal in outreach, not vehicle centric, but the other modes of travel must scramble at the table to get beyond plans to implementation. Implementation ought to be phased, reasonable, able to be accomplished within a projected timeframe, and I would also comment that there is a need for partnerships with our local agencies brokered by the State with the railroad companies

# Appendix E – Risk Assessment Best Practices

A literature review was conducted to identify best practices and risk assessment methodologies used by other states. The 2019 Highway-Rail Crossing Handbook (3rd Edition), published by U.S. Department of Transportation (USDOT) Federal Railroad Administration (FRA) and Federal Highway Administration (FHWA) identifies risk assessment methodologies. The methods consider the potential reduction in the number and/or severity of collisions, traffic volumes, train/vehicle exposure, hazardous material freight, and other criteria as appropriate in each state.

National surveys have been conducted to identify best practices for developing risk assessment methodologies for individual states. The findings of the Ohio DOT Evaluation of Grade Crossing Hazard Ranking Models study (2016) and the Nevada DOT Development of Revised Grade Crossing Hazard Index Model study (2017) were reviewed to summarize commonly used methodologies. At the time the 2016 Ohio DOT study was published, 19 states were using the USDOT Accident Prediction Model, 5 states were using the New Hampshire Hazard Index, and at least 7 states had adopted a state-specific formula, model, or hazard index.

## USDOT Accident Prediction and Severity Model (APS)

The Highway Safety Acts of 1973 and 1976, as well as the Surface Transportation Assistance Act of 1978, provided funding to individual states to improve safety at public highway-rail grade crossings. FRA funded a research study to provide guidance to state agencies on how to best prioritize and allocate funds for treatments, based on accident prediction formulas. The methodology was published by FRA in 1982 in the *Summary of the Department of Transportation Rail-Highway Crossing Accident Prediction Formulas and Resource Allocation Method*. The methodology has since been adapted to an FRA web platform for greater accessibility to state agencies (GradeDec.Net).

The model predicts the likelihood of crashes at each highway-rail crossing by considering the level of exposure (daily trains and daily traffic volumes), number of main tracks, number of trains during daylight hours, presence of a paved highway, train speed, highway type, and the number of highway lanes. The crash prediction also considers recent crash history, as well as a normalizing constant, which is adjusted periodically to best fit collision trends. The crash prediction formulas are documented below:

$$a = K*EI*MT*DT*HP*MS*HT*HL$$

Where:

- a = Initial collision prediction (crashes per year)
- K = Formula constant
- EI = Factor for exposure index (highway traffic x train traffic)
- MT = Factor for number of main tracks
- DT = Factor for number of through trains during daylight hours
- HP = Factor for paved highway surface
- MS = Factor for maximum timetable speed
- HT = Factor for highway type
- HL = Factor for number of highway lanes

The collision prediction is refined by incorporating the frequency of historical crashes using the formula below:

$$B = T_0/(T_0+T)*(a) + T/(T_0+T)*(N/T)$$

Where:

- B = Refined secondary collision prediction (crashes per year)
- a = Initial collision prediction
- $T_0$ = Formula weighting factor ($T_0$= 1/(0.5+a))
- N = Number of observed collisions
- T = Years of observation

The USDOT model considers many factors for exposure, but also does not account for sight distance or roadway geometry. This model does consider historical crash data; however, due to infrequency and unpredictability of crashes, this can result in bias towards locations with observed crashes.

## New Hampshire Hazard Index

Hazard indexes can serve as a simplified tool for assessing exposure; typically focusing on the number of trains, number of vehicles, and the existing warning devices present. The New Hampshire Hazard Index is explained below; this base formula is often modified by other states to include additional factors, such as speed, sight distance, geometric factors, crash data, frequency of hazardous materials, and roadway classification:

$$HI = V*T*PF$$

Where:

- HI = Hazard Index
- V = Average daily traffic volume
- T = Average daily train volume
- PF = Protection factor (1.0 for passive, 0.6 for flashing lights, 0.1 for gates)

The simplicity of a hazard index can be ideal for agencies with limited resources to maintain prioritization; however, does not provide the same level of predictive factors contained in other models.

## 2020 FRA New Model for Highway-Rail Grade Crossing Accident Prediction

Research funded by the Federal Railroad Administration developed a new model that employs modern analysis methods and recent data trends. The new model also addresses limitations of the previous APS model and to provide a more robust tool for analysts. The new model is shown to outperform the APS by multiple measures. The new model enables more accurate risk ranking of grade crossings, more rational allocation of resources for public safety treatments at grade crossings, and the ability to assess the statistical significance of variances in the measured risk at grade crossings.

The 2020 New Model proposes a methodology that combines a count model, a Zero Inflated Negative Binomial (ZIBN) model, and an Empirical Bayes adjustment to correct for regression-to-mean bias.

***Step 1:***

$$N_{CountPredicted} = e^{([-8.3592 + 0.1902 * lExpo - 0.2848 * D_2 - 0.8577 * D_3 + 0.3935 * RurUrb + 0.1318 * XSurfID2s + 0.6876 * lMaxTtSpd + 0.1063 * lAadt])}$$

The first step on the method is to calculate the number of crashes using a count model. The coefficients obtained from the estimated count model are applied to the proposed formulation as shown below.

Where:

- $N_{CountPredicted}$ = Predicted accidents of count model (data for left-hand side of regression are counts of accidents at crossings in 5-year period)
- lExpo = adjusted Exposure. Exposure is equal to average annual daily traffic times daily trains
- D2 = 1 if warning device type is lights, 0 otherwise
- D3 = 1 if warning device type is gates, 0 otherwise
- RurUrb = 1 if urban, 0 if Rural
- XSurfID2s = 1 if Timber, 2 if Asphalt, 3 if Asphalt and Timber OR Concrete OR Rubber, 4 if Concrete and Rubber
- lMaxTtSpd = adjusted maximum timetable speed (integer between 0 and 99), and
- lAadt is adjusted AADT

Some variables need to be logarithmically adjusted for the model estimation and application. The adjustment of Exposure, Maximum Timetable Train Speed, and AADT shall be performed using the following equation:

$$lx = \log (1+\alpha x)$$

Where:

- x = the original variable
- α = factor selected so that for the median value of x, ln(1+α)=ln(x). In other words, α = 1-[1/median(x)]

***Step 2:***

The second step on the proposed method involves the calculation of the probability of a grade crossing have a non-zero number of crashes, using the following equation:

$$P_{InflatedZero} = z/(1+z)$$

Where:

- $P_{InflatedZero}$ = The probability that the grade crossing is an "excess zero", and z is given by:

$$z = e^{([-1.1708-1.0109*lTotalTrains])}$$

Where:

- TotalTrains = adjusted total number of daily trains.

***Step 3:***

The third step is to apply the Zero Inflated Negative Binomial (ZINB) Combined Model according to the following equation:

$$N_{Predicted} = N_{CountPredicted}*(1-P_{InflatedZero})$$

Where:

- $N_{Predicted}$ = Predicted accidents after accounting for excess zeroes
- $N_{CountPredicted}$ = Predicted accidents of count model (data for left-hand side of regression are counts of accidents at crossings in 5-year period), from the count model
- $P_{InflatedZero}$ = The probability that the grade crossing is an "excess zero"

***Step 4:***

The fourth and final step of the new model is to adjust the predicted counts to correct for "regression-to-mean" bias using the following Empirical Bayes (EB) Prediction Adjustment method:

$$N_{Expected} = w*N_{Predicted}+(1-w)*N_{Observed}$$

Where:

- $N_{Expected}$ = The adjusted number of predicted accidents
- $N_{Predicted}$ = Predicted accidents after accounting for excess zeroes, calculated in the following equation:
- $N_{Observed}$ = The number of observed accidents (i.e., count of accidents at the grade crossing)
- w = weighting factor, given by:

$$w = 1/(1+(V[N_{Predicted}]) / N_{Predicted})$$

Where:

- $N_{Predicted\ =}$ Predicted accidents after accounting for excess zeroes, calculated in the following equation
- $V[N_{Predicted}]$ = Variance of Crossing's Predicted Number of Accidents

The variance of Crossing's Predicted Number of Accidents ($V[N_{Predicted}]$) is given by:

$$V[N_{Predicted}] = N_{Predicted}*1+[N_{CountPredicted}+(P_{InflatedZero}+1/\theta)]$$

Where:

- $N_{Predicted}$ = Predicted accidents after accounting for excess zeroes
- $N_{CountPredicted}$ = Predicted accidents of count model (data for left-hand side of regression are counts of accidents at crossings in 5-year period), from the count model
- $P_{InflatedZero}$ = The probability that the grade crossing is an "excess zero"
- θ = inverse of the overdispersion parameter α from the ZINB regression (θ is estimated to be 0.7716)

The 2020 FRA New Model includes a comprehensive set of factors in the predictive safety analysis. The number of expected crashes is estimated using a combination of predictive safety and historical (observed) crash data. The model includes the surface material of the crossing, urban/rural classification, but does not include roadway geometry, sight distance, number of highway lanes, or number of main tracks. Like the USDOT APS Model, this model does consider historical crash data; however, due to infrequency and unpredictability of crashes, this can result in bias towards locations with observed crashes.

# Appendix F – Prioritized List of Highway-Rail Grade Crossings by Risk Score

## Table F-1: Prioritized List of Highway-Rail Grade Crossings by Risk Score

| Level I Rank | #Appendix A | Crossing ID | County | Location | N Predicted | N Observed | Preliminary Risk Score | Refined Risk Score |
|---|---|---|---|---|---|---|---|---|
| 1 | 392 | 025617C | MARICOPA | Thomas Rd, West of 27th Ave, Phoenix | 0.0025 | 11 | 13.51 | 19.73 |
| 2 | 263 | 025422P | MARICOPA | 43rd Ave & Camelback Rd, Phoenix | 0.0014 | 9 | 10.37 | 15.16 |
| 3 | 313 | 025430G | MARICOPA | 27th Ave, South of Thomas Rd, Phoenix | 0.0023 | 8 | 10.28 | 15.02 |
| 4 | 262 | 025590V | MARICOPA | Bethany Home Rd, West of 51st Ave, Glendale | 0.0013 | 8 | 9.28 | 13.55 |
| 5 | 30 | 025129Y | COCONINO | Fanning Dr, South of Rte 66, Flagstaff | 0.0019 | 5 | 6.95 | 8.02 |
| 6 | 32 | 025132G | COCONINO | San Francisco St, South of Rte 66, Flagstaff | 0.0019 | 5 | 6.86 | 8.72 |
| 7 | 27 | 025133N | COCONINO | Beaver St, South of Rte 66, Flagstaff | 0.0019 | 4 | 5.90 | 7.13 |
| 8 | 260 | 025418A | MARICOPA | 59th Ave & Glendale Ave, Glendale | 0.0026 | 3 | 5.59 | 7.81 |
| 9 | 323 | 025425K | MARICOPA | 35th Ave, South of Indian School Rd, Phoenix | 0.0024 | 3 | 5.39 | 7.88 |
| 10 | 517 | 741124N | PIMA | 7th Ave, Tucson | 0.0011 | 3 | 4.13 | 5.22 |
| 11 | 381 | 025436X | MARICOPA | McDowell Rd, West of Grand Ave, Phoenix | 0.0018 | 2 | 3.83 | 5.09 |
| 12 | 550 | 741363N | PINAL | Florence St & Main St, Casa Grande | 0.0017 | 2 | 3.70 | 4.48 |
| 13 | 29 | 025131A | COCONINO | Ponderosa Pkwy, South of Rte 66, Flagstaff | 0.0024 | 1 | 3.37 | 4.07 |
| 14 | 415 | 025651J | MARICOPA | Greenway Rd, North of Grand Ave, Surprise | 0.0013 | 2 | 3.35 | 3.69 |
| 15 | 468 | 025023D | NAVAJO | Obed Rd, Joseph City | 0.0011 | 2 | 3.11 | 3.76 |
| 16 | 433 | 741560C | MARICOPA | University Dr, West of Ash Ave, Tempe | 0.0009 | 2 | 2.86 | 3.47 |
| 17 | 465 | 025017A | NAVAJO | Apache Ave, South of Joy Nevin Ave, Holbrook | 0.0018 | 1 | 2.76 | 3.86 |
| 18 | 531 | 741122A | PIMA | 6th St, East of 9th Ave, Tucson | 0.0018 | 1 | 2.76 | 4.04 |
| 19 | 562 | 741367R | PINAL | Trekell Rd, S. of Jimmie Kerr Blvd, Casa Grande | 0.0018 | 1 | 2.76 | 3.67 |
| 20 | 538 | 741100A | PIMA | Massingale Rd, E. of I-10 Frontage Rd, Marana | 0.0014 | 1 | 2.38 | 3.17 |
| 21 | 448 | 025231E | MOHAVE | Old Hwy 66, Hackberry | 0.0023 | 0 | 2.32 | 2.68 |
| 22 | 369 | 025424D | MARICOPA | Indian School Rd, West of Grand Ave, Phoenix | 0.0013 | 1 | 2.30 | 3.07 |
| 23 | 533 | 741104C | PIMA | Ruthrauff Rd, Tucson | 0.0023 | 0 | 2.28 | 3.34 |
| 24 | 574 | 741708G | PINAL | Main St, S. of Casa Grande-Picacho Hwy, Eloy | 0.0012 | 1 | 2.22 | 3.25 |
| 25 | 494 | 741098B | PIMA | W Cortaro Farms Rd, Marana | 0.0022 | 0 | 2.21 | 2.94 |
| 26 | 300 | 025403K | MARICOPA | Peoria Ave, East of Grand Ave, Peoria | 0.0012 | 1 | 2.16 | 2.75 |
| 27 | 256 | 741825C | MARICOPA | Val Vista Dr, South of Warner Rd, Gilbert | 0.0011 | 1 | 2.10 | 2.94 |

Top 75 Urban Crossing  Top 75 Rural Crossing

## Table F-1: Prioritized List of Highway-Rail Grade Crossings by Risk Score (continued)

| Level I Rank | #Appendix A | Crossing ID | County | Location | N Predicted | N Observed | Preliminary Risk Score | Refined Risk Score |
|---|---|---|---|---|---|---|---|---|
| 28 | 251 | 741814P | MARICOPA | McQueen Rd, South of Baseline Rd, Gilbert | 0.0011 | 1 | 2.10 | 2.94 |
| 29 | 249 | 741816D | MARICOPA | Cooper Rd, South of Guadalupe Rd, Gilbert | 0.0011 | 1 | 2.10 | 2.93 |
| 30 | 608 | 741342V | PINAL | Ralston Rd, South of Maricopa Rd, Maricopa | 0.0011 | 1 | 2.06 | 2.27 |
| 31 | 410 | 025399X | MARICOPA | 103rd Ave, North of Grand Ave, Sun City | 0.0010 | 1 | 2.02 | 2.22 |
| 32 | 254 | 741833U | MARICOPA | Power Rd & Pecos Rd, Gilbert | 0.0010 | 1 | 2.01 | 2.55 |
| 33 | 267 | 025415E | MARICOPA | Grand Ave & Myrtle Ave, Glendale | 0.0010 | 1 | 1.99 | 2.65 |
| 34 | 520 | 741295P | PIMA | Ajo Way, Tucson | 0.0020 | 0 | 1.98 | 2.40 |
| 35 | 287 | 741650B | MARICOPA | Alma School Rd, South of Main St, Mesa | 0.0010 | 1 | 1.98 | 2.51 |
| 36 | 288 | 741649G | MARICOPA | Dobson Rd, South of Main St, Mesa | 0.0010 | 1 | 1.96 | 2.49 |
| 37 | 347 | 025441U | MARICOPA | 19th Ave & Adams St, Phoenix | 0.0009 | 1 | 1.94 | 2.35 |
| 38 | 9 | 741386V | COCHISE | San Pedro St, North of 4th St, Benson | 0.0009 | 1 | 1.92 | 2.33 |
| 39 | 495 | 741088V | PIMA | W Tangerine Rd, Marana | 0.0019 | 0 | 1.92 | 2.32 |
| 40 | 74 | 025171X | COCONINO | Sherwood Access Rd, Williams | 0.0009 | 1 | 1.92 | 2.32 |
| 41 | 561 | 741358S | PINAL | Thornton Rd, Casa Grande | 0.0019 | 0 | 1.91 | 2.32 |
| 42 | 8 | 748709M | COCHISE | Mescal Rd, Benson | 0.0009 | 1 | 1.91 | 2.10 |
| 43 | 544 | 741298K | PIMA | Wilmot Rd, VAIL | 0.0019 | 0 | 1.88 | 2.50 |
| 44 | 493 | 922399X | PIMA | W Cochie Canyon Tr, Marana | 0.0019 | 0 | 1.88 | 2.38 |
| 45 | 396 | 025438L | MARICOPA | Van Buren Ave, Phoenix | 0.0019 | 0 | 1.87 | 2.38 |
| 46 | 432 | 741647T | MARICOPA | S Price Rd, South of Apache Blvd, Tempe | 0.0009 | 1 | 1.87 | 2.16 |
| 47 | 431 | 748176E | MARICOPA | N Price Rd, South of Apache Blvd, Tempe | 0.0008 | 1 | 1.85 | 2.13 |
| 48 | 542 | 741310P | PIMA | Red Hill Ranch Rd, Vail | 0.0018 | 0 | 1.84 | 2.13 |
| 49 | 316 | 025518E | MARICOPA | 29th Ave, Phoenix | 0.0018 | 0 | 1.83 | 2.22 |
| 50 | 306 | 025448S | MARICOPA | 19th Ave, Phoenix | 0.0018 | 0 | 1.83 | 2.56 |
| 51 | 1 | 025004Y | APACHE | Allentown Rd, Houck | 0.0008 | 1 | 1.83 | 2.01 |
| 52 | 693 | 753584A | YUMA | Ave 11 E, Yuma | 0.0018 | 0 | 1.80 | 2.29 |
| 53 | 513 | 742104F | PIMA | 22nd St, West of Euclid Ave, Tucson | 0.0008 | 1 | 1.80 | 2.18 |
| 54 | 694 | 742052R | YUMA | Ave 9 E, Yuma | 0.0018 | 0 | 1.79 | 2.07 |
| 55 | 282 | 741657Y | MARICOPA | Broadway Rd, West of Center St, Mesa | 0.0008 | 1 | 1.77 | 2.48 |
| 56 | 315 | 025510A | MARICOPA | 28th Ave, Phoenix | 0.0018 | 0 | 1.76 | 2.13 |
| 57 | 394 | 025494T | MARICOPA | Turney Ave, Phoenix | 0.0018 | 0 | 1.76 | 1.94 |
| 58 | 575 | 741709N | PINAL | Sunshine Blvd, Eloy | 0.0018 | 0 | 1.76 | 2.57 |
| 59 | 193 | 025599G | MARICOPA | Grand Ave & 163rd Ave, Sun City | 0.0007 | 1 | 1.74 | 2.01 |
| 60 | 399 | 025443H | MARICOPA | 19th Ave & Washington St, Phoenix | 0.0007 | 1 | 1.70 | 1.79 |

Top 75 Urban Crossing  Top 75 Rural Crossing

## Table F-1: Prioritized List of Highway-Rail Grade Crossings by Risk Score (continued)

| Level I Rank | #Appendix A | Crossing ID | County | Location | N Predicted | N Observed | Preliminary Risk Score | Refined Risk Score |
|---|---|---|---|---|---|---|---|---|
| 61 | 333 | 025491X | MARICOPA | 43rd Ave, South of Camelback Rd, Phoenix | 0.0006 | 1 | 1.64 | 2.18 |
| 62 | 33 | 025099J | COCONINO | Steves Blvd, Flagstaff | 0.0016 | 0 | 1.62 | 2.16 |
| 63 | 530 | 741120L | PIMA | Main St/Granada Av, Tucson | 0.0016 | 0 | 1.60 | 2.24 |
| 64 | 98 | 742375L | GILA | Marion St & Railroad Ave, Claypool | 0.0006 | 1 | 1.57 | 1.90 |
| 65 | 435 | 741561J | MARICOPA | Ash Ave & 5th St, Tempe | 0.0006 | 1 | 1.57 | 1.90 |
| 66 | 676 | 742090A | YUMA | Sentinel Rd, Dateland | 0.0016 | 0 | 1.56 | 1.72 |
| 67 | 421 | 741562R | MARICOPA | 9th St, West of Ash Ave, Tempe | 0.0006 | 1 | 1.56 | 1.98 |
| 68 | 462 | 025245M | MOHAVE | Topeka St, Kingman | 0.0015 | 0 | 1.55 | 2.05 |
| 69 | 578 | 741416K | PINAL | Arizona Farms Rd, East of Hunt Hwy, Florence | 0.0005 | 1 | 1.54 | 1.78 |
| 70 | 547 | 741372M | PINAL | Cox Rd, South of Jimmie Kerr Blvd, Casa Grande | 0.0005 | 1 | 1.54 | 2.05 |
| 71 | 280 | 741661N | MARICOPA | Baseline Rd, West of McQueen Rd, Mesa | 0.0005 | 1 | 1.53 | 1.86 |
| 72 | 572 | 741707A | PINAL | Eleven Mile Rd, Eloy | 0.0015 | 0 | 1.52 | 2.13 |
| 73 | 537 | 741102N | PIMA | W Joiner Rd, Tucson | 0.0015 | 0 | 1.52 | 1.84 |
| 74 | 391 | 741452F | MARICOPA | 23rd Ave, South of Jefferson St, Phoenix | 0.0005 | 1 | 1.52 | 1.75 |
| 75 | 552 | 741364V | PINAL | Hermosillo St, Casa Grande | 0.0015 | 0 | 1.51 | 1.83 |
| 76 | 450 | 025246U | MOHAVE | 4th St, Kingman | 0.0014 | 0 | 1.44 | 1.92 |
| 77 | 257 | 741662V | MARICOPA | Guadalupe Rd, East of Fiesta Blvd, Gilbert | 0.0004 | 1 | 1.43 | 1.65 |
| 78 | 543 | 741299S | PIMA | Rita Rd, Vail | 0.0014 | 0 | 1.41 | 1.63 |
| 79 | 335 | 025628P | MARICOPA | 44th Ave, Phoenix | 0.0014 | 0 | 1.41 | 1.71 |
| 80 | 663 | 025356E | YAVAPAI | Hillside Rd, Hillside | 0.0004 | 1 | 1.40 | 1.78 |
| 81 | 13 | 741403J | COCHISE | Central Ave, Bowie | 0.0014 | 0 | 1.40 | 1.54 |
| 82 | 541 | 741304L | PIMA | Colossal Cave Rd, Vail | 0.0014 | 0 | 1.38 | 1.75 |
| 83 | 540 | 741303E | PIMA | Colossal Cave Rd, Vail | 0.0014 | 0 | 1.38 | 1.59 |
| 84 | 559 | 741362G | PINAL | Sacaton St, Casa Grande | 0.0014 | 0 | 1.36 | 1.64 |
| 85 | 157 | 741893D | GREENLEE | US Highway 191, Clifton | 0.0003 | 1 | 1.34 | 1.55 |
| 86 | 295 | 025408U | MARICOPA | 75th Ave, Peoria | 0.0013 | 0 | 1.30 | 1.91 |
| 87 | 373 | 741492D | MARICOPA | Lincoln St, West of 7th St, Phoenix | 0.0003 | 1 | 1.29 | 1.56 |
| 88 | 401 | 025850L | MARICOPA | Watkins Rd, East of 16th Ave, Phoenix | 0.0003 | 1 | 1.27 | 1.40 |
| 89 | 610 | 741345R | PINAL | Porter Rd, Maricopa | 0.0013 | 0 | 1.26 | 1.61 |
| 90 | 261 | 025413R | MARICOPA | 67th/Northern Ave, Glendale | 0.0013 | 0 | 1.26 | 2.02 |
| 91 | 4 | 025011J | APACHE | NF-2015, Navajo | 0.0013 | 0 | 1.25 | 1.67 |
| 92 | 414 | 025393G | MARICOPA | Dysart Rd, Surprise | 0.0012 | 0 | 1.25 | 1.59 |
| 93 | 412 | 025400P | MARICOPA | 99th Ave, Sun City | 0.0012 | 0 | 1.23 | 1.56 |

Top 75 Urban Crossing  Top 75 Rural Crossing

## Table F-1: Prioritized List of Highway-Rail Grade Crossings by Risk Score (continued)

| Level I Rank | #Appendix A | Crossing ID | County | Location | N Predicted | N Observed | Preliminary Risk Score | Refined Risk Score |
|---|---|---|---|---|---|---|---|---|
| 94 | 560 | 741374B | PINAL | Sunland Gin Rd, Casa Grande | 0.0012 | 0 | 1.22 | 1.48 |
| 95 | 623 | 741440L | PINAL | Selma Hwy, Randolph | 0.0012 | 0 | 1.22 | 1.41 |
| 96 | 413 | 025398R | MARICOPA | Del Webb Blvd, Sun City | 0.0012 | 0 | 1.22 | 1.70 |
| 97 | 194 | 025583K | MARICOPA | Meeker Blvd, Beardsley | 0.0012 | 0 | 1.21 | 1.61 |
| 98 | 527 | 741297D | PIMA | Irvington Rd, Tucson | 0.0012 | 0 | 1.21 | - |
| 99 | 22 | 741397H | COCHISE | Maley St, Willcox | 0.0012 | 0 | 1.21 | 1.46 |
| 100 | 689 | 742069U | YUMA | Williams St, Wellton | 0.0012 | 0 | 1.18 | 1.43 |
| 101 | 614 | 741699K | PINAL | Battaglia Dr, Picacho | 0.0012 | 0 | 1.18 | 1.24 |
| 102 | 307 | 025852A | MARICOPA | 19th Ave, North of Lower Buckeye Rd, Phoenix | 0.0002 | 1 | 1.17 | - |
| 103 | 298 | 025401W | MARICOPA | 91st Ave, Peoria | 0.0012 | 0 | 1.17 | - |
| 104 | 609 | 741346X | PINAL | N White/Parker Rd, Maricopa | 0.0012 | 0 | 1.15 | 1.39 |
| 105 | 359 | 025845P | MARICOPA | 11th Ave & Maricopa Fwy, Phoenix | 0.0001 | 1 | 1.15 | - |
| 106 | 379 | 025447K | MARICOPA | Madison St, Phoenix | 0.0011 | 0 | 1.15 | - |
| 107 | 570 | 741377W | PINAL | Battaglia Rd, Eloy | 0.0011 | 0 | 1.15 | 1.52 |
| 108 | 226 | 920154A | MARICOPA | 56th St & Morelos Pl, Chandler | 0.0001 | 1 | 1.15 | - |
| 109 | 620 | 741697W | PINAL | Shedd Rd, Picacho | 0.0011 | 0 | 1.12 | 1.18 |
| 110 | 302 | 741461E | MARICOPA | 11th Ave, Phoenix | 0.0011 | 0 | 1.12 | - |
| 111 | 248 | 741831F | MARICOPA | E Williams Field Rd, Gilbert | 0.0011 | 0 | 1.11 | - |
| 112 | 311 | 025434J | MARICOPA | 22nd Ave, Phoenix | 0.0011 | 0 | 1.10 | - |
| 113 | 611 | 741341N | PINAL | Rio Bravo Rd, Maricopa | 0.0011 | 0 | 1.09 | 1.32 |
| 114 | 411 | 025397J | MARICOPA | 111th Ave, Sun City | 0.0011 | 0 | 1.08 | - |
| 115 | 253 | 741823N | MARICOPA | S Lindsay Rd, Gilbert | 0.0011 | 0 | 1.08 | - |
| 116 | 195 | 025595E | MARICOPA | Rh Johnson Blvd, Beardsley | 0.0011 | 0 | 1.08 | - |
| 117 | 370 | 025446D | MARICOPA | Jefferson St, Phoenix | 0.0011 | 0 | 1.08 | - |
| 118 | 516 | 741121T | PIMA | 5th St, Tucson | 0.0011 | 0 | 1.08 | - |
| 119 | 384 | 025490R | MARICOPA | Missouri Ave, Phoenix | 0.0011 | 0 | 1.07 | - |
| 120 | 626 | 741716Y | PINAL | Missile Base Rd, Red Rock | 0.0011 | 0 | 1.07 | 1.29 |
| 121 | 627 | 741714K | PINAL | Park Link Dr, Red Rock | 0.0011 | 0 | 1.06 | 1.28 |
| 122 | 10 | 741382T | COCHISE | Ocotillo Rd, Benson | 0.0011 | 0 | 1.06 | 1.48 |
| 123 | 28 | 025125W | COCONINO | Cosnino Rd, Flagstaff | 0.0011 | 0 | 1.06 | 1.34 |
| 124 | 86 | 742347H | GILA | Matlock, Globe | 0.0011 | 0 | 1.06 | - |
| 125 | 632 | 741702R | PINAL | Gilbert Rd, North of County Rd 282 | 0.0001 | 1 | 1.05 | 1.05 |
| 126 | 250 | 741819Y | MARICOPA | N Gilbert Rd, Gilbert | 0.0011 | 0 | 1.05 | - |
| 127 | 17 | 741390K | COCHISE | Dragoon Rd, Dragoon | 0.0010 | 0 | 1.05 | 1.27 |
| 128 | 685 | 742075X | YUMA | Ave 40 E, Tacna | 0.0010 | 0 | 1.05 | 1.10 |

Top 75 Urban Crossing  Top 75 Rural Crossing

## Table F-1: Prioritized List of Highway-Rail Grade Crossings by Risk Score (continued)

| Level I Rank | #Appendix A | Crossing ID | County | Location | N Predicted | N Observed | Preliminary Risk Score | Refined Risk Score |
|---|---|---|---|---|---|---|---|---|
| 129 | 247 | 741824V | MARICOPA | E Warner Rd, Gilbert | 0.0010 | 0 | 1.04 | - |
| 130 | 252 | 741830Y | MARICOPA | S Higley Rd, Gilbert | 0.0010 | 0 | 1.04 | - |
| 131 | 240 | 025631X | MARICOPA | Thompson Ranch, El Mirage | 0.0010 | 0 | 1.04 | - |
| 132 | 246 | 922180W | MARICOPA | E Ray Rd, Gilbert | 0.0010 | 0 | 1.04 | - |
| 133 | 245 | 741820T | MARICOPA | E Elliot Rd, Gilbert | 0.0010 | 0 | 1.03 | - |
| 134 | 670 | 025200F | YAVAPAI | Fort Rock Rd, Seligman | 0.0010 | 0 | 1.03 | 1.25 |
| 135 | 275 | 025486B | MARICOPA | Tom Murray Ave, Glendale | 0.0010 | 0 | 1.02 | - |
| 136 | 463 | 025215V | MOHAVE | Diamond Creek Rd, Peach Springs | 0.0010 | 0 | 1.02 | 1.12 |
| 137 | 697 | 742055L | YUMA | Rifle Range Rd/ Blaisdell Rd, Yuma | 0.0010 | 0 | 1.02 | 1.23 |
| 138 | 429 | 741645E | MARICOPA | Rural Rd, Tempe | 0.0010 | 0 | 1.02 | - |
| 139 | 258 | 741815W | MARICOPA | W Guadalupe Rd, Gilbert | 0.0010 | 0 | 1.02 | - |
| 140 | 638 | 742005H | SANTA CRUZ | Chavez Siding Rd, Amado | 0.0010 | 0 | 1.01 | 1.17 |
| 141 | 536 | 742116A | PIMA | Valencia Rd, Tucson | 0.0010 | 0 | 1.01 | - |
| 142 | 684 | 742073J | YUMA | Ave 36 E, Tacna | 0.0010 | 0 | 1.00 | 1.15 |
| 143 | 2 | 025001D | APACHE | Lupton Rd, Lupton | 0.0010 | 0 | 1.00 | 1.21 |
| 144 | 387 | 025428F | MARICOPA | Osborn Rd, Phoenix | 0.0010 | 0 | 0.99 | - |
| 145 | 573 | 741376P | PINAL | Houser Rd, Eloy | 0.0010 | 0 | 0.99 | 1.20 |
| 146 | 586 | 741417S | PINAL | Hunt Hwy, Florence | 0.0010 | 0 | 0.99 | - |
| 147 | 545 | 741351U | PINAL | Anderson Rd, Casa Grande | 0.0010 | 0 | 0.98 | 1.19 |
| 148 | 297 | 025404S | MARICOPA | 83rd Ave, Peoria | 0.0010 | 0 | 0.98 | - |
| 149 | 576 | 741375H | PINAL | Toltec Rd, Eloy | 0.0010 | 0 | 0.98 | 1.30 |
| 150 | 405 | 741835H | MARICOPA | Ellsworth Ave, Queen Creek | 0.0010 | 0 | 0.98 | - |
| 151 | 255 | 741832M | MARICOPA | S Recker Rd, Gilbert | 0.0010 | 0 | 0.97 | - |
| 152 | 290 | 741659M | MARICOPA | Southern Ave, Mesa | 0.0010 | 0 | 0.96 | - |
| 153 | 299 | 025409B | MARICOPA | Eb Olive Access, Peoria | 0.0010 | 0 | 0.96 | - |
| 154 | 409 | 741834B | MARICOPA | Sossaman Rd, Queen Creek | 0.0010 | 0 | 0.96 | - |
| 155 | 281 | 741812B | MARICOPA | Baseline Rd, Mesa | 0.0010 | 0 | 0.95 | - |
| 156 | 11 | 741383A | COCHISE | Patagonia St, Benson | 0.0010 | 0 | 0.95 | 1.16 |
| 157 | 70 | 025172E | COCONINO | Garland Prairie Rd, Williams | 0.0010 | 0 | 0.95 | 1.27 |
| 158 | 366 | 025492E | MARICOPA | Highland Ave, Phoenix | 0.0009 | 0 | 0.93 | - |
| 159 | 686 | 742071V | YUMA | Ave 31 E, Wellton | 0.0009 | 0 | 0.93 | 0.98 |
| 160 | 653 | 742007W | SANTA CRUZ | Bridge Rd, Tubac | 0.0009 | 0 | 0.91 | 1.15 |
| 161 | 358 | 025433C | MARICOPA | Encanto Blvd, Phoenix | 0.0009 | 0 | 0.90 | - |
| 162 | 407 | 741837W | MARICOPA | Ocotillo Rd, Queen Creek | 0.0009 | 0 | 0.90 | - |

Top 75 Urban Crossing  Top 75 Rural Crossing

## Table F-1: Prioritized List of Highway-Rail Grade Crossings by Risk Score (continued)

| Level I Rank | #Appendix A | Crossing ID | County | Location | N Predicted | N Observed | Preliminary Risk Score | Refined Risk Score |
|---|---|---|---|---|---|---|---|---|
| 163 | 312 | 741535U | MARICOPA | 24th St, Phoenix | 0.0009 | 0 | 0.90 | - |
| 164 | 449 | 025247B | MOHAVE | 2nd St, Kingman | 0.0009 | 0 | 0.89 | - |
| 165 | 339 | 741542E | MARICOPA | 48th St, Phoenix | 0.0009 | 0 | 0.89 | - |
| 166 | 24 | 741398P | COCHISE | Stewart St, Willcox | 0.0009 | 0 | 0.88 | 1.07 |
| 167 | 447 | 025382U | MARICOPA | Center St, Wittmann | 0.0009 | 0 | 0.88 | - |
| 168 | 539 | 741308N | PIMA | Agua Verde Creek R, Vail | 0.0009 | 0 | 0.87 | 0.91 |
| 169 | 445 | 025373V | MARICOPA | Yavapai St, Wickenburg | 0.0009 | 0 | 0.87 | - |
| 170 | 419 | 741564E | MARICOPA | 13th St, Tempe | 0.0009 | 0 | 0.87 | - |
| 171 | 342 | 741809T | MARICOPA | 67th Ave, Phoenix | 0.0009 | 0 | 0.86 | - |
| 172 | 464 | 025227P | MOHAVE | Hackberry Rd, Valentine | 0.0009 | 0 | 0.86 | 1.09 |
| 173 | 393 | 025517X | MARICOPA | Thomas Rd, Phoenix | 0.0009 | 0 | 0.86 | - |
| 174 | 367 | 025582D | MARICOPA | Highland Ave, Phoenix | 0.0009 | 0 | 0.85 | - |
| 175 | 207 | 922558C | MARICOPA | Sr 85 Southbound, Buckeye | 0.0008 | 0 | 0.85 | - |
| 176 | 551 | 741347E | PINAL | Hartman Rd, Casa Grande | 0.0008 | 0 | 0.85 | 1.13 |
| 177 | 558 | 741371F | PINAL | Peart Rd, Casa Grande | 0.0008 | 0 | 0.85 | 1.13 |
| 178 | 243 | 741082E | MARICOPA | Martin Ave, Gila Bend | 0.0008 | 0 | 0.84 | 0.97 |
| 179 | 341 | 741022V | MARICOPA | 51st Ave, Phoenix | 0.0008 | 0 | 0.83 | - |
| 180 | 319 | 025584S | MARICOPA | 31st Ave, Phoenix | 0.0008 | 0 | 0.83 | - |
| 181 | 523 | 742114L | PIMA | Drexel Rd, Tucson | 0.0008 | 0 | 0.83 | - |
| 182 | 566 | 741429L | PINAL | Coolidge Ave, Coolidge | 0.0008 | 0 | 0.83 | - |
| 183 | 565 | 741428E | PINAL | Central Ave, Coolidge | 0.0008 | 0 | 0.82 | - |
| 184 | 569 | 741427X | PINAL | W Vah Ki Inn Rd, Coolidge | 0.0008 | 0 | 0.82 | - |
| 185 | 191 | 741797B | MARICOPA | Dysart Rd, Avondale | 0.0008 | 0 | 0.82 | - |
| 186 | 688 | 742067F | YUMA | S Ave 25 E, Wellton | 0.0008 | 0 | 0.82 | 1.09 |
| 187 | 649 | 742035A | SANTA CRUZ | W Escondido Dr, Nogales | 0.0008 | 0 | 0.81 | - |
| 188 | 619 | 741712W | PINAL | Picacho Blvd, Picacho | 0.0008 | 0 | 0.81 | 1.08 |
| 189 | 142 | 742203D | GRAHAM | Montierth Ln, Safford | 0.0008 | 0 | 0.80 | 1.02 |
| 190 | 266 | 025459E | MARICOPA | Grand Ave Us 60, Glendale | 0.0008 | 0 | 0.80 | - |
| 191 | 443 | 025374C | MARICOPA | Apache St, Wickenburg | 0.0008 | 0 | 0.80 | - |
| 192 | 291 | 741658F | MARICOPA | W 8th Ave, Mesa | 0.0008 | 0 | 0.80 | - |
| 193 | 7 | 741388J | COCHISE | Airport Rd, Benson | 0.0008 | 0 | 0.80 | 0.97 |
| 194 | 93 | 742374E | GILA | Calle De Loma, Miami | 0.0008 | 0 | 0.80 | - |
| 195 | 308 | 741457P | MARICOPA | 19th Ave, Phoenix | 0.0008 | 0 | 0.80 | - |
| 196 | 18 | 741405X | COCHISE | Cochise Ave, San Simon | 0.0008 | 0 | 0.80 | 0.88 |
| 197 | 607 | 741340G | PINAL | 83rd Ave, Maricopa | 0.0008 | 0 | 0.79 | 0.87 |

Top 75 Urban Crossing  Top 75 Rural Crossing

## Table F-1: Prioritized List of Highway-Rail Grade Crossings by Risk Score (continued)

| Level I Rank | #Appendix A | Crossing ID | County | Location | N Predicted | N Observed | Preliminary Risk Score | Refined Risk Score |
|---|---|---|---|---|---|---|---|---|
| 198 | 669 | 025205P | YAVAPAI | Hyde Park Rd, Peach Springs | 0.0008 | 0 | 0.79 | 0.91 |
| 199 | 190 | 741799P | MARICOPA | Avondale Blvd, Avondale | 0.0008 | 0 | 0.79 | - |
| 200 | 26 | 025170R | COCONINO | Parks Rd, Bellemont | 0.0008 | 0 | 0.79 | 1.05 |
| 201 | 425 | 741583J | MARICOPA | College Ave, Tempe | 0.0008 | 0 | 0.79 | - |
| 202 | 521 | 742115T | PIMA | Bilby Rd, Tucson | 0.0008 | 0 | 0.79 | - |
| 203 | 259 | 025489W | MARICOPA | 51st Ave, Glendale | 0.0008 | 0 | 0.79 | - |
| 204 | 437 | 741808L | MARICOPA | 75th Ave, Tolleson | 0.0008 | 0 | 0.78 | - |
| 205 | 296 | 025405Y | MARICOPA | 81st Ave, Peoria | 0.0008 | 0 | 0.78 | - |
| 206 | 528 | 742112X | PIMA | Irvington Rd, Tucson | 0.0008 | 0 | 0.78 | - |
| 207 | 554 | 741368X | PINAL | Keeling Rd, Casa Grande | 0.0008 | 0 | 0.77 | 1.03 |
| 208 | 21 | 741400N | COCHISE | Country Club Dr, Willcox | 0.0008 | 0 | 0.77 | 0.94 |
| 209 | 519 | 742120P | PIMA | Aerospace Pkwy, Tucson | 0.0008 | 0 | 0.77 | - |
| 210 | 518 | 748710G | PIMA | Aero Park Blvd, Tucson | 0.0008 | 0 | 0.77 | - |
| 211 | 438 | 741806X | MARICOPA | 83rd Ave, Tolleson | 0.0008 | 0 | 0.77 | - |
| 212 | 524 | 742109P | PIMA | E Ajo Way, Tucson | 0.0008 | 0 | 0.77 | - |
| 213 | 269 | 025460Y | MARICOPA | Northern Ave, Glendale | 0.0008 | 0 | 0.77 | - |
| 214 | 625 | 741436W | PINAL | Storey Rd, Randolph | 0.0008 | 0 | 0.77 | 0.89 |
| 215 | 92 | 742386Y | GILA | Golf Course Rd, Hayden | 0.0008 | 0 | 0.77 | - |
| 216 | 440 | 741802V | MARICOPA | 99th Ave, Tolleson | 0.0008 | 0 | 0.77 | - |
| 217 | 322 | 741536B | MARICOPA | 32nd St, Phoenix | 0.0008 | 0 | 0.76 | - |
| 218 | 276 | 741781E | MARICOPA | Cotton Ln, Goodyear | 0.0008 | 0 | 0.75 | - |
| 219 | 637 | 742002M | SANTA CRUZ | Amado Rd, Amado | 0.0007 | 0 | 0.75 | 0.87 |
| 220 | 439 | 741804J | MARICOPA | 91st Ave, Tolleson | 0.0007 | 0 | 0.75 | - |
| 221 | 278 | 741784A | MARICOPA | Litchfield Rd, Goodyear | 0.0007 | 0 | 0.75 | - |
| 222 | 672 | 025351V | YAVAPAI | Skull Valley Conn, Skull Valley | 0.0007 | 0 | 0.75 | 0.95 |
| 223 | 673 | 025350N | YAVAPAI | Sterling Ranch, Skull Valley | 0.0007 | 0 | 0.75 | 0.91 |
| 224 | 94 | 742372R | GILA | Grover Canyon Rd, Miami | 0.0007 | 0 | 0.75 | - |
| 225 | 19 | 741406E | COCHISE | Indian Springs Rd, San Simon | 0.0007 | 0 | 0.75 | 0.99 |
| 226 | 211 | 741800G | MARICOPA | South 107th Ave, Cashion | 0.0007 | 0 | 0.74 | - |
| 227 | 279 | 741782L | MARICOPA | Sarival Rd, Goodyear | 0.0007 | 0 | 0.74 | - |
| 228 | 23 | 741399W | COCHISE | Pattie Rd, Willcox | 0.0007 | 0 | 0.74 | 0.99 |
| 229 | 289 | 741651H | MARICOPA | S Extension Rd, Mesa | 0.0007 | 0 | 0.74 | - |
| 230 | 54 | 874945L | COCONINO | Shonto Rd, Page | 0.0007 | 0 | 0.74 | 0.82 |
| 231 | 277 | 741783T | MARICOPA | Estrella Pkwy, Goodyear | 0.0007 | 0 | 0.74 | - |
| 232 | 324 | 741448R | MARICOPA | 35th Ave, Phoenix | 0.0007 | 0 | 0.73 | - |

Top 75 Urban Crossing  Top 75 Rural Crossing

## Table F-1: Prioritized List of Highway-Rail Grade Crossings by Risk Score (continued)

| Level I Rank | #Appendix A | Crossing ID | County | Location | N Predicted | N Observed | Preliminary Risk Score | Refined Risk Score |
|---|---|---|---|---|---|---|---|---|
| 233 | 616 | 741442A | PINAL | Hanna Rd, Picacho | 0.0007 | 0 | 0.72 | 0.76 |
| 234 | 330 | 741539W | MARICOPA | 40th St, Phoenix | 0.0007 | 0 | 0.72 | - |
| 235 | 471 | 874952W | NAVAJO | Shonto Rd, Page | 0.0007 | 0 | 0.72 | 0.83 |
| 236 | 271 | 025414X | MARICOPA | Orange Wood Ave, Glendale | 0.0007 | 0 | 0.72 | - |
| 237 | 272 | 025487H | MARICOPA | Pasadena Ave, Glendale | 0.0007 | 0 | 0.72 | - |
| 238 | 264 | 025488P | MARICOPA | Colter St, Glendale | 0.0007 | 0 | 0.72 | - |
| 239 | 360 | 025493L | MARICOPA | Glenrosa Ave, Phoenix | 0.0007 | 0 | 0.72 | - |
| 240 | 446 | 025597T | MARICOPA | 203rd Ave, Wittmann | 0.0007 | 0 | 0.71 | - |
| 241 | 567 | 741431M | PINAL | Martin Rd, Coolidge | 0.0007 | 0 | 0.71 | - |
| 242 | 357 | 025509F | MARICOPA | Cheery Lynn Rd, Phoenix | 0.0007 | 0 | 0.71 | - |
| 243 | 579 | 741418Y | PINAL | Cr, Florence | 0.0007 | 0 | 0.71 | 0.90 |
| 244 | 615 | 741441T | PINAL | Cornman Rd, Picacho | 0.0007 | 0 | 0.71 | - |
| 245 | 613 | 741696P | PINAL | Arical Rd, Picacho | 0.0007 | 0 | 0.71 | - |
| 246 | 612 | 741700C | PINAL | Alsdorf Rd, Picacho | 0.0007 | 0 | 0.71 | - |
| 247 | 534 | 742106U | PIMA | Silverlake Rd , Tucson | 0.0007 | 0 | 0.71 | - |
| 248 | 386 | 025439T | MARICOPA | Monroe St, Phoenix | 0.0007 | 0 | 0.69 | - |
| 249 | 56 | 874926G | COCONINO | Tribal Park Rd, Page | 0.0007 | 0 | 0.69 | - |
| 250 | 206 | 741769X | MARICOPA | Sr 85 Northbound, Buckeye | 0.0007 | 0 | 0.69 | - |
| 251 | 16 | 741393F | COCHISE | N Manzora Rd, Cochise | 0.0007 | 0 | 0.69 | - |
| 252 | 320 | 025519L | MARICOPA | 31st Ave, Phoenix | 0.0007 | 0 | 0.69 | - |
| 253 | 201 | 741771Y | MARICOPA | Miller Rd, Buckeye | 0.0007 | 0 | 0.69 | - |
| 254 | 549 | 741357K | PINAL | Ethington Rd, Casa Grande | 0.0007 | 0 | 0.68 | - |
| 255 | 641 | 742037N | SANTA CRUZ | Calle Sonora, Nogales | 0.0007 | 0 | 0.68 | - |
| 256 | 594 | 846113U | PINAL | 0, Hayden | 0.0007 | 0 | 0.68 | - |
| 257 | 595 | 846114B | PINAL | 0, Hayden | 0.0007 | 0 | 0.68 | - |
| 258 | 334 | 741026X | MARICOPA | 43rd Ave, Phoenix | 0.0007 | 0 | 0.68 | - |
| 259 | 406 | 176281Y | MARICOPA | Gantzel Rd, Queen Creek | 0.0007 | 0 | 0.68 | - |
| 260 | 646 | 742034T | SANTA CRUZ | Produce Row, Nogales | 0.0007 | 0 | 0.67 | - |
| 261 | 310 | 741534M | MARICOPA | 20th St, Phoenix | 0.0007 | 0 | 0.67 | - |
| 262 | 650 | 742032E | SANTA CRUZ | W Gold Hill Rd, Nogales | 0.0007 | 0 | 0.66 | - |
| 263 | 602 | 742393J | PINAL | Tilbury, Kearny | 0.0007 | 0 | 0.66 | - |
| 264 | 325 | 741538P | MARICOPA | 36th St, Phoenix | 0.0007 | 0 | 0.65 | - |
| 265 | 80 | 742348P | GILA | Broad St, Globe | 0.0007 | 0 | 0.65 | - |

Top 75 Urban Crossing  Top 75 Rural Crossing

## Table F-1: Prioritized List of Highway-Rail Grade Crossings by Risk Score (continued)

| Level I Rank | #Appendix A | Crossing ID | County | Location | N Predicted | N Observed | Preliminary Risk Score | Refined Risk Score |
|---|---|---|---|---|---|---|---|---|
| 266 | 605 | 846119K | PINAL | Old Tiger Rd, Mammoth | 0.0007 | 0 | 0.65 | - |
| 267 | 557 | 741353H | PINAL | Montgomery Rd, Casa Grande | 0.0007 | 0 | 0.65 | - |
| 268 | 388 | 741472S | MARICOPA | Pedestrian, Phoenix | 0.0007 | 0 | 0.65 | - |
| 269 | 63 | 874921X | COCONINO | Tribal Park Rd, Page | 0.0007 | 0 | 0.65 | - |
| 270 | 43 | 874924T | COCONINO | Bia 201, Page | 0.0007 | 0 | 0.65 | - |
| 271 | 45 | 874934Y | COCONINO | Bia 213, Page | 0.0007 | 0 | 0.65 | - |
| 272 | 105 | 903609J | GILA | Us 60, Miami | 0.0007 | 0 | 0.65 | - |
| 273 | 12 | 741389R | COCHISE | Sibyl Rd, Benson | 0.0006 | 0 | 0.65 | - |
| 274 | 404 | 741841L | MARICOPA | Combs Rd, Queen Creek | 0.0006 | 0 | 0.65 | - |
| 275 | 514 | 742107B | PIMA | 36th St, Tucson | 0.0006 | 0 | 0.65 | - |
| 276 | 361 | 025629W | MARICOPA | Grand Av Frontage, Phoenix | 0.0006 | 0 | 0.65 | - |
| 277 | 213 | 741679Y | MARICOPA | Appleby Rd, Chandler | 0.0006 | 0 | 0.64 | - |
| 278 | 170 | 025928D | LA PAZ | Mohave, Parker | 0.0006 | 0 | 0.64 | - |
| 279 | 131 | 742266H | GRAHAM | Tripp Cyn Rd, Pima | 0.0006 | 0 | 0.63 | - |
| 280 | 667 | 025327U | YAVAPAI | Usfs Rd, Paulden | 0.0006 | 0 | 0.63 | - |
| 281 | 668 | 025336T | YAVAPAI | Usfs Rd, Paulden | 0.0006 | 0 | 0.63 | - |
| 282 | 284 | 741653W | MARICOPA | Macdonald St, Mesa | 0.0006 | 0 | 0.62 | - |
| 283 | 362 | 025630R | MARICOPA | Grand Av Frontage, Phoenix | 0.0006 | 0 | 0.62 | - |
| 284 | 182 | 025913N | LA PAZ | Back Anderson Rd, Wenden | 0.0006 | 0 | 0.62 | - |
| 285 | 200 | 741779D | MARICOPA | Jackrabbit Rd, Buckeye | 0.0006 | 0 | 0.61 | - |
| 286 | 91 | 742350R | GILA | Sycamore, Globe | 0.0006 | 0 | 0.61 | - |
| 287 | 403 | 741411B | MARICOPA | Bella Vista Rd, Queen Creek | 0.0006 | 0 | 0.61 | - |
| 288 | 643 | 742038V | SANTA CRUZ | E Doe St, Nogales | 0.0006 | 0 | 0.61 | - |
| 289 | 600 | 874878U | PINAL | Ray Jct Rd, Kearny | 0.0006 | 0 | 0.60 | - |
| 290 | 47 | 874946T | COCONINO | Bia 6270/Cow S..., Page | 0.0006 | 0 | 0.60 | - |
| 291 | 89 | 742351X | GILA | Oak St, Globe | 0.0006 | 0 | 0.60 | - |
| 292 | 55 | 874942R | COCONINO | Sour Water Canyon, Page | 0.0006 | 0 | 0.60 | - |
| 293 | 48 | 874943X | COCONINO | Bia6261, Page | 0.0006 | 0 | 0.60 | - |
| 294 | 189 | 741796U | MARICOPA | 4th St, Avondale | 0.0006 | 0 | 0.60 | - |
| 295 | 640 | 742036G | SANTA CRUZ | Baffert Dr, Nogales | 0.0006 | 0 | 0.59 | - |
| 296 | 344 | 025452G | MARICOPA | 9th Ave, Phoenix | 0.0006 | 0 | 0.59 | - |
| 297 | 472 | 874949N | NAVAJO | State Rte 98, Page | 0.0006 | 0 | 0.59 | - |
| 298 | 303 | 025451A | MARICOPA | 15th Ave, Phoenix | 0.0006 | 0 | 0.59 | - |
| 299 | 209 | 741778W | MARICOPA | Verrado Way, Buckeye | 0.0006 | 0 | 0.59 | - |

Top 75 Urban Crossing  Top 75 Rural Crossing

## Table F-1: Prioritized List of Highway-Rail Grade Crossings by Risk Score (continued)

| Level I Rank | #Appendix A | Crossing ID | County | Location | N Predicted | N Observed | Preliminary Risk Score | Refined Risk Score |
|---|---|---|---|---|---|---|---|---|
| 300 | 420 | 741547N | MARICOPA | 1st St, Tempe | 0.0006 | 0 | 0.59 | - |
| 301 | 304 | 741459D | MARICOPA | 15th Ave, Phoenix | 0.0006 | 0 | 0.59 | - |
| 302 | 204 | 741776H | MARICOPA | Rainbow Rd, Buckeye | 0.0006 | 0 | 0.59 | - |
| 303 | 444 | 025371G | MARICOPA | Vulture Mine Rd, Wickenburg | 0.0006 | 0 | 0.58 | - |
| 304 | 71 | 025302Y | COCONINO | Gr Canyon Blvd, Williams | 0.0006 | 0 | 0.58 | - |
| 305 | 652 | 742022Y | SANTA CRUZ | Rio Rico Dr, Rio Rico | 0.0006 | 0 | 0.58 | - |
| 306 | 285 | 748736J | MARICOPA | Pedestrian, Mesa | 0.0006 | 0 | 0.58 | - |
| 307 | 593 | 742407P | PINAL | Sr79, Florence | 0.0006 | 0 | 0.58 | - |
| 308 | 294 | 741766C | MARICOPA | Palo Verde Rd, Palo Verde | 0.0006 | 0 | 0.58 | - |
| 309 | 88 | 742357N | GILA | Murphy St, Globe | 0.0006 | 0 | 0.57 | - |
| 310 | 454 | 025238C | MOHAVE | Industrial Blvd, Kingman | 0.0006 | 0 | 0.57 | - |
| 311 | 328 | 741466N | MARICOPA | 3rd Ave, Phoenix | 0.0006 | 0 | 0.57 | - |
| 312 | 418 | 741563X | MARICOPA | 10th St, Tempe | 0.0006 | 0 | 0.57 | - |
| 313 | 205 | 741770S | MARICOPA | Rooks Rd, Buckeye | 0.0006 | 0 | 0.56 | - |
| 314 | 175 | 025918X | LA PAZ | Avenue 59E, Salome | 0.0006 | 0 | 0.56 | - |
| 315 | 199 | 748157A | MARICOPA | Dean Rd, Buckeye | 0.0006 | 0 | 0.56 | - |
| 316 | 501 | 748177L | PIMA | Quail Crossing Blvd, Sahuarita | 0.0006 | 0 | 0.56 | - |
| 317 | 504 | 742156X | PIMA | Twin Buttes Rd, Sahuarita | 0.0006 | 0 | 0.56 | - |
| 318 | 368 | 741454U | MARICOPA | I 17 Nb Frontage, Phoenix | 0.0006 | 0 | 0.56 | - |
| 319 | 503 | 742154J | PIMA | Twin Buttes Rd, Sahuarita | 0.0006 | 0 | 0.55 | - |
| 320 | 81 | 742352E | GILA | Cedar St, Globe | 0.0006 | 0 | 0.55 | - |
| 321 | 198 | 741774U | MARICOPA | Baseline Rd, Buckeye | 0.0005 | 0 | 0.55 | - |
| 322 | 603 | 846117W | PINAL | 0, Mammoth | 0.0005 | 0 | 0.55 | - |
| 323 | 604 | 846118D | PINAL | 0, Mammoth | 0.0005 | 0 | 0.55 | - |
| 324 | 321 | 741449X | MARICOPA | 31st Ave, Phoenix | 0.0005 | 0 | 0.54 | - |
| 325 | 644 | 742040W | SANTA CRUZ | Morley Ave, Nogales | 0.0005 | 0 | 0.54 | - |
| 326 | 137 | 742217L | GRAHAM | 6th Ave, Safford | 0.0005 | 0 | 0.53 | - |
| 327 | 58 | 874922E | COCONINO | Tribal Park Rd 3, Page | 0.0005 | 0 | 0.53 | - |
| 328 | 59 | 874923L | COCONINO | Tribal Park Rd 4, Page | 0.0005 | 0 | 0.53 | - |
| 329 | 57 | 874925A | COCONINO | Tribal Park Rd, Page | 0.0005 | 0 | 0.53 | - |
| 330 | 60 | 874927N | COCONINO | Tribal Park Rd 6, Page | 0.0005 | 0 | 0.53 | - |
| 331 | 61 | 874929C | COCONINO | Tribal Park Rd 7, Page | 0.0005 | 0 | 0.53 | - |
| 332 | 62 | 874930W | COCONINO | Tribal Park Rd 8, Page | 0.0005 | 0 | 0.53 | - |
| 333 | 64 | 874931D | COCONINO | Tribal Rd 1, Page | 0.0005 | 0 | 0.53 | - |

Top 75 Urban Crossing  Top 75 Rural Crossing

## Table F-1: Prioritized List of Highway-Rail Grade Crossings by Risk Score (continued)

| Level I Rank | #Appendix A | Crossing ID | County | Location | N Predicted | N Observed | Preliminary Risk Score | Refined Risk Score |
|---|---|---|---|---|---|---|---|---|
| 334 | 65 | 874932K | COCONINO | Tribal Rd 2, Page | 0.0005 | 0 | 0.53 | - |
| 335 | 66 | 874933S | COCONINO | Tribal Rd 3, Page | 0.0005 | 0 | 0.53 | - |
| 336 | 67 | 874937U | COCONINO | Tribal Rd 4, Page | 0.0005 | 0 | 0.53 | - |
| 337 | 49 | 874938B | COCONINO | M-H Tribal Rd #1, Page | 0.0005 | 0 | 0.53 | - |
| 338 | 50 | 874939H | COCONINO | N-H Tribal Rd #2, Page | 0.0005 | 0 | 0.53 | - |
| 339 | 46 | 874940C | COCONINO | Bia 260, Page | 0.0005 | 0 | 0.53 | - |
| 340 | 51 | 874941J | COCONINO | N-H Tribal Rd #3, Page | 0.0005 | 0 | 0.53 | - |
| 341 | 52 | 874947A | COCONINO | N-H Tribal Rd #4, Page | 0.0005 | 0 | 0.53 | - |
| 342 | 469 | 874948G | NAVAJO | N-H Tribal Rd #1, Page | 0.0005 | 0 | 0.53 | - |
| 343 | 470 | 874950H | NAVAJO | N-H Tribal Rd #4, Page | 0.0005 | 0 | 0.53 | - |
| 344 | 473 | 874951P | NAVAJO | Tribal Park Rd, Page | 0.0005 | 0 | 0.53 | - |
| 345 | 476 | 874953D | NAVAJO | Tribal Park Rd.#2, Page | 0.0005 | 0 | 0.53 | - |
| 346 | 474 | 874954K | NAVAJO | Tribal Park Rd#3, Page | 0.0005 | 0 | 0.53 | - |
| 347 | 475 | 874955S | NAVAJO | Tribal Park Rd#4, Page | 0.0005 | 0 | 0.53 | - |
| 348 | 512 | 742103Y | PIMA | 20th St, Tucson | 0.0005 | 0 | 0.53 | - |
| 349 | 178 | 025919E | LA PAZ | Vicksburg Rd, Salome | 0.0005 | 0 | 0.53 | - |
| 350 | 525 | 742110J | PIMA | Fair Ave, Tucson | 0.0005 | 0 | 0.53 | - |
| 351 | 165 | 025923U | LA PAZ | Private Rd, Bouse | 0.0005 | 0 | 0.53 | - |
| 352 | 197 | 741775B | MARICOPA | Apache Rd, Buckeye | 0.0005 | 0 | 0.52 | - |
| 353 | 283 | 741654D | MARICOPA | Center St, Mesa | 0.0005 | 0 | 0.52 | - |
| 354 | 671 | 025347F | YAVAPAI | Iron Springs Rd, Skull Valley | 0.0005 | 0 | 0.52 | - |
| 355 | 143 | 742201P | GRAHAM | Barney Ln, Solomon | 0.0005 | 0 | 0.52 | - |
| 356 | 345 | 741464A | MARICOPA | 9th Ave, Phoenix | 0.0005 | 0 | 0.52 | - |
| 357 | 203 | 741780X | MARICOPA | Perryville Rd, Buckeye | 0.0005 | 0 | 0.52 | - |
| 358 | 597 | 846115H | PINAL | 0, Kearny | 0.0005 | 0 | 0.52 | - |
| 359 | 314 | 741451Y | MARICOPA | 27th Ave, Phoenix | 0.0005 | 0 | 0.50 | - |
| 360 | 104 | 742367U | GILA | Us 60 East, Miami | 0.0005 | 0 | 0.50 | - |
| 361 | 490 | 742140B | PIMA | Madera Canyon Rd, Continental | 0.0005 | 0 | 0.50 | - |
| 362 | 149 | 742247D | GRAHAM | Palmer Ln, Thatcher | 0.0005 | 0 | 0.50 | - |
| 363 | 318 | 741475M | MARICOPA | 2nd St, Phoenix | 0.0005 | 0 | 0.49 | - |
| 364 | 601 | 874879B | PINAL | Sr177, Kearny | 0.0005 | 0 | 0.49 | - |
| 365 | 44 | 874928V | COCONINO | Bia 21, Page | 0.0005 | 0 | 0.49 | - |
| 366 | 53 | 874935F | COCONINO | Preston Mesa Rd, Page | 0.0005 | 0 | 0.49 | - |
| 367 | 132 | 742232N | GRAHAM | 11th Ave, Safford | 0.0005 | 0 | 0.49 | - |
| 368 | 106 | 742336V | GILA | Aravaipa Rd, San Carlos | 0.0005 | 0 | 0.49 | - |
| 369 | 655 | 025314T | YAVAPAI | Double A Ranch Rd, Ash Fork | 0.0005 | 0 | 0.49 | - |

Top 75 Urban Crossing  Top 75 Rural Crossing

## Table F-1: Prioritized List of Highway-Rail Grade Crossings by Risk Score (continued)

| Level I Rank | #Appendix A | Crossing ID | County | Location | N Predicted | N Observed | Preliminary Risk Score | Refined Risk Score |
|---|---|---|---|---|---|---|---|---|
| 370 | 162 | 025922M | LA PAZ | Avenue 46E, Bouse | 0.0005 | 0 | 0.49 | - |
| 371 | 293 | 741765V | MARICOPA | Johnson Rd, Palo Verde | 0.0005 | 0 | 0.48 | - |
| 372 | 115 | 742294L | GRAHAM | Black Rock Rd, Fort Thomas | 0.0005 | 0 | 0.48 | - |
| 373 | 309 | 741474F | MARICOPA | 1st St, Phoenix | 0.0005 | 0 | 0.48 | - |
| 374 | 329 | 741476U | MARICOPA | 3rd St, Phoenix | 0.0005 | 0 | 0.48 | - |
| 375 | 647 | 753573M | SANTA CRUZ | Ruby Rd, Nogales | 0.0005 | 0 | 0.48 | - |
| 376 | 214 | 741671U | MARICOPA | Chandler Blvd, Chandler | 0.0005 | 0 | 0.47 | - |
| 377 | 173 | 025934G | LA PAZ | Sr95/Riverside, Parker | 0.0005 | 0 | 0.47 | - |
| 378 | 120 | 742260S | GRAHAM | 100 East St, Pima | 0.0005 | 0 | 0.46 | - |
| 379 | 169 | 914399C | LA PAZ | Central Av, Parker | 0.0005 | 0 | 0.46 | - |
| 380 | 145 | 742199R | GRAHAM | Solomon Rd, Solomon | 0.0005 | 0 | 0.46 | - |
| 381 | 230 | 741668L | MARICOPA | Ray Rd, Chandler | 0.0005 | 0 | 0.46 | - |
| 382 | 181 | 025909Y | LA PAZ | Avenue 74E, Wenden | 0.0005 | 0 | 0.46 | - |
| 383 | 208 | 741768R | MARICOPA | Turner Rd, Buckeye | 0.0005 | 0 | 0.46 | - |
| 384 | 235 | 741665R | MARICOPA | Warner Rd, Chandler | 0.0005 | 0 | 0.46 | - |
| 385 | 219 | 741664J | MARICOPA | Elliot Rd, Chandler | 0.0005 | 0 | 0.46 | - |
| 386 | 87 | 742353L | GILA | Mesquite St, Globe | 0.0005 | 0 | 0.45 | - |
| 387 | 151 | 742244H | GRAHAM | Stadium Ave, Thatcher | 0.0004 | 0 | 0.45 | - |
| 388 | 152 | 742249S | GRAHAM | Webster Rd, Thatcher | 0.0004 | 0 | 0.45 | - |
| 389 | 102 | 742371J | GILA | Pineway St, Miami | 0.0004 | 0 | 0.45 | - |
| 390 | 232 | 741682G | MARICOPA | Riggs Rd, Chandler | 0.0004 | 0 | 0.45 | - |
| 391 | 618 | 741701J | PINAL | Milligan Rd, Picacho | 0.0004 | 0 | 0.44 | - |
| 392 | 621 | 741432U | PINAL | Bartlett Rd, Randolph | 0.0004 | 0 | 0.44 | - |
| 393 | 125 | 742257J | GRAHAM | Alder Ln, Pima | 0.0004 | 0 | 0.44 | - |
| 394 | 292 | 025379L | MARICOPA | Gates Rd, Morristown | 0.0004 | 0 | 0.44 | - |
| 395 | 510 | 742049H | PIMA | 18th St, Tucson | 0.0004 | 0 | 0.44 | - |
| 396 | 192 | 741795M | MARICOPA | South Central Ave, Avondale | 0.0004 | 0 | 0.44 | - |
| 397 | 511 | 742100D | PIMA | 19th St, Tucson | 0.0004 | 0 | 0.44 | - |
| 398 | 340 | 741477B | MARICOPA | 4th St, Phoenix | 0.0004 | 0 | 0.44 | - |
| 399 | 196 | 741773M | MARICOPA | 4th Avenue, Buckeye | 0.0004 | 0 | 0.44 | - |
| 400 | 674 | 025901U | YAVAPAI | County Rd, Wickenburg | 0.0004 | 0 | 0.44 | - |
| 401 | 651 | 742018J | SANTA CRUZ | Palo Parado Rd, Rio Rico | 0.0004 | 0 | 0.44 | - |
| 402 | 116 | 742292X | GRAHAM | Desert Sage Rd, Fort Thomas | 0.0004 | 0 | 0.43 | - |
| 403 | 317 | 741471K | MARICOPA | 2nd Ave, Phoenix | 0.0004 | 0 | 0.43 | - |

Top 75 Urban Crossing  Top 75 Rural Crossing

## Table F-1: Prioritized List of Highway-Rail Grade Crossings by Risk Score (continued)

| Level I Rank | #Appendix A | Crossing ID | County | Location | N Predicted | N Observed | Preliminary Risk Score | Refined Risk Score |
|---|---|---|---|---|---|---|---|---|
| 404 | 456 | 025772G | MOHAVE | Mohave Airport Dr, Kingman | 0.0004 | 0 | 0.43 | - |
| 405 | 228 | 741674P | MARICOPA | Pecos Rd, Chandler | 0.0004 | 0 | 0.43 | - |
| 406 | 639 | 742148F | SANTA CRUZ | Elephant Head Rd, Amado | 0.0004 | 0 | 0.43 | - |
| 407 | 535 | 742045F | PIMA | Toole Ave, Tucson | 0.0004 | 0 | 0.43 | - |
| 408 | 509 | 742047U | PIMA | 17th St, Tucson | 0.0004 | 0 | 0.43 | - |
| 409 | 498 | 748402B | PIMA | Madera Highlands Pkwy, Sahuarita | 0.0004 | 0 | 0.43 | - |
| 410 | 223 | 741676D | MARICOPA | Germann Rd, Chandler | 0.0004 | 0 | 0.43 | - |
| 411 | 136 | 742216E | GRAHAM | 5th Ave, Safford | 0.0004 | 0 | 0.43 | - |
| 412 | 661 | 025365D | YAVAPAI | State Hwy, Congress | 0.0004 | 0 | 0.42 | - |
| 413 | 244 | 840726C | MARICOPA | Unk, Gila Bend | 0.0004 | 0 | 0.42 | - |
| 414 | 507 | 742155R | PIMA | W El Toro Rd, Sahuarita | 0.0004 | 0 | 0.42 | - |
| 415 | 606 | 846120E | PINAL | Sr77, Mammoth | 0.0004 | 0 | 0.42 | - |
| 416 | 642 | 742041D | SANTA CRUZ | Court St, Nogales | 0.0004 | 0 | 0.42 | - |
| 417 | 68 | 025303F | COCONINO | 7th St, Williams | 0.0004 | 0 | 0.42 | - |
| 418 | 128 | 742268W | GRAHAM | Patterson Mesa Rd, Pima | 0.0004 | 0 | 0.41 | - |
| 419 | 596 | 742390N | PINAL | Sr177, Hayden | 0.0004 | 0 | 0.41 | - |
| 420 | 135 | 742239L | GRAHAM | 20th Ave, Safford | 0.0004 | 0 | 0.41 | - |
| 421 | 617 | 741698D | PINAL | Houser Rd, Picacho | 0.0004 | 0 | 0.41 | - |
| 422 | 141 | 742215X | GRAHAM | Central Ave, Safford | 0.0004 | 0 | 0.41 | - |
| 423 | 216 | 741681A | MARICOPA | Chandler Heights, Chandler | 0.0004 | 0 | 0.41 | - |
| 424 | 233 | 741677K | MARICOPA | Ryan Rd, Chandler | 0.0004 | 0 | 0.40 | - |
| 425 | 645 | 742042K | SANTA CRUZ | Park St, Nogales | 0.0004 | 0 | 0.40 | - |
| 426 | 122 | 742259X | GRAHAM | 200 East St, Pima | 0.0004 | 0 | 0.40 | - |
| 427 | 134 | 742211V | GRAHAM | 1st Ave /191, Safford | 0.0004 | 0 | 0.40 | - |
| 428 | 589 | 742403M | PINAL | Price Rd, Florence | 0.0004 | 0 | 0.40 | - |
| 429 | 35 | 025972R | COCONINO | Fr347, Grand Canyon | 0.0004 | 0 | 0.40 | - |
| 430 | 508 | 742164P | PIMA | W Twin Butte Rd, Sahuarita | 0.0004 | 0 | 0.40 | - |
| 431 | 286 | 741663C | MARICOPA | Pedestrian, Mesa | 0.0004 | 0 | 0.40 | - |
| 432 | 100 | 742373X | GILA | New St, Miami | 0.0004 | 0 | 0.40 | - |
| 433 | 568 | 741434H | PINAL | Randolph Rd, Coolidge | 0.0004 | 0 | 0.40 | - |
| 434 | 227 | 741680T | MARICOPA | Ocotillo Rd, Chandler | 0.0004 | 0 | 0.39 | - |
| 435 | 529 | 742126F | PIMA | Lumber St, Tucson | 0.0004 | 0 | 0.39 | - |
| 436 | 220 | 741673H | MARICOPA | Frye Rd, Chandler | 0.0004 | 0 | 0.39 | - |

Top 75 Urban Crossing  Top 75 Rural Crossing

## Table F-1: Prioritized List of Highway-Rail Grade Crossings by Risk Score (continued)

| Level I Rank | #Appendix A | Crossing ID | County | Location | N Predicted | N Observed | Preliminary Risk Score | Refined Risk Score |
|---|---|---|---|---|---|---|---|---|
| 437 | 37 | 025983D | COCONINO | Pedestrian, Grand Canyon | 0.0004 | 0 | 0.39 | - |
| 438 | 103 | 742368B | GILA | Ragus Rd, Miami | 0.0004 | 0 | 0.39 | - |
| 439 | 622 | 741435P | PINAL | Kleck Rd, Randolph | 0.0004 | 0 | 0.39 | - |
| 440 | 148 | 974922F | GRAHAM | College Pedestrian, Thatcher | 0.0004 | 0 | 0.39 | - |
| 441 | 179 | 025912G | LA PAZ | Alamo Rd/2nd St, Wenden | 0.0004 | 0 | 0.39 | - |
| 442 | 502 | 742129B | PIMA | Sahuarita Rd, Sahuarita | 0.0004 | 0 | 0.38 | - |
| 443 | 229 | 741678S | MARICOPA | Queen Creek Rd, Chandler | 0.0004 | 0 | 0.38 | - |
| 444 | 177 | 025916J | LA PAZ | Hall St, Salome | 0.0004 | 0 | 0.38 | - |
| 445 | 590 | 742404U | PINAL | Price Rd, Florence | 0.0004 | 0 | 0.38 | - |
| 446 | 242 | 840725V | MARICOPA | Martin Ave, Gila Bend | 0.0004 | 0 | 0.38 | - |
| 447 | 202 | 741772F | MARICOPA | Miller Rd, Buckeye | 0.0004 | 0 | 0.37 | - |
| 448 | 225 | 741667E | MARICOPA | Knox Rd, Chandler | 0.0004 | 0 | 0.37 | - |
| 449 | 222 | 741669T | MARICOPA | Galveston St, Chandler | 0.0004 | 0 | 0.37 | - |
| 450 | 34 | 025973X | COCONINO | Fr335/Apex, Grand Canyon | 0.0004 | 0 | 0.37 | - |
| 451 | 133 | 916301D | GRAHAM | 14th Ave, Safford | 0.0004 | 0 | 0.37 | - |
| 452 | 455 | 025770T | MOHAVE | Interstate Way W, Kingman | 0.0004 | 0 | 0.37 | - |
| 453 | 459 | 025771A | MOHAVE | Santa Fe Dr, Kingman | 0.0004 | 0 | 0.37 | - |
| 454 | 183 | 025904P | MARICOPA | Eagle Eye Rd, Aguila | 0.0004 | 0 | 0.36 | - |
| 455 | 166 | 025925H | LA PAZ | Willamette Dr, Bouse | 0.0004 | 0 | 0.36 | - |
| 456 | 138 | 742218T | GRAHAM | 7th Ave, Safford | 0.0004 | 0 | 0.36 | - |
| 457 | 210 | 741767J | MARICOPA | Wilson Rd, Buckeye | 0.0004 | 0 | 0.36 | - |
| 458 | 390 | 748334C | MARICOPA | Roosevelt St, Phoenix | 0.0004 | 0 | 0.35 | - |
| 459 | 188 | 741764N | MARICOPA | Salome Highway, Arlington | 0.0004 | 0 | 0.35 | - |
| 460 | 453 | 025632E | MOHAVE | Finance Way, Kingman | 0.0004 | 0 | 0.35 | - |
| 461 | 36 | 025975L | COCONINO | Highland Mary Rd, Grand Canyon | 0.0003 | 0 | 0.35 | - |
| 462 | 38 | 025976T | COCONINO | Rowe Well Rd, Grand Canyon | 0.0003 | 0 | 0.35 | - |
| 463 | 39 | 025977A | COCONINO | Rowe Well Rd, Grand Canyon | 0.0003 | 0 | 0.35 | - |
| 464 | 218 | 741670M | MARICOPA | East Erie St, Chandler | 0.0003 | 0 | 0.35 | - |
| 465 | 648 | 742024M | SANTA CRUZ | South River Rd, Nogales | 0.0003 | 0 | 0.34 | - |
| 466 | 564 | 741359Y | PINAL | W Main Ave, Casa Grande | 0.0003 | 0 | 0.34 | - |
| 467 | 400 | 748384F | MARICOPA | Washington St, Phoenix | 0.0003 | 0 | 0.34 | - |
| 468 | 690 | 760781F | YUMA | 10th St, Yuma | 0.0003 | 0 | 0.34 | - |
| 469 | 185 | 741763G | MARICOPA | 355th St, Arlington | 0.0003 | 0 | 0.34 | - |
| 470 | 127 | 742279J | GRAHAM | Klondyke Rd, Pima | 0.0003 | 0 | 0.34 | - |
| 471 | 90 | 742361D | GILA | Silver Hill, Globe | 0.0003 | 0 | 0.34 | - |

Top 75 Urban Crossing  Top 75 Rural Crossing

## Table F-1: Prioritized List of Highway-Rail Grade Crossings by Risk Score (continued)

| Level I Rank | #Appendix A | Crossing ID | County | Location | N Predicted | N Observed | Preliminary Risk Score | Refined Risk Score |
|---|---|---|---|---|---|---|---|---|
| 472 | 85 | 742362K | GILA | Jackrabbit, Globe | 0.0003 | 0 | 0.34 | - |
| 473 | 108 | 742335N | GILA | Sr 170, San Carlos | 0.0003 | 0 | 0.34 | - |
| 474 | 656 | 025325F | YAVAPAI | Drake Rd, Ash Fork | 0.0003 | 0 | 0.33 | - |
| 475 | 184 | 025903H | MARICOPA | Sr71, Aguila | 0.0003 | 0 | 0.33 | - |
| 476 | 147 | 742243B | GRAHAM | College Ave, Thatcher | 0.0003 | 0 | 0.33 | - |
| 477 | 301 | 025846W | MARICOPA | 11th Ave, Phoenix | 0.0003 | 0 | 0.33 | - |
| 478 | 364 | 748169U | MARICOPA | Hadley St, Phoenix | 0.0003 | 0 | 0.33 | - |
| 479 | 372 | 748740Y | MARICOPA | Jefferson St, Phoenix | 0.0003 | 0 | 0.33 | - |
| 480 | 224 | 748748D | MARICOPA | Germann Rd, Chandler | 0.0003 | 0 | 0.33 | - |
| 481 | 451 | 971609T | MOHAVE | Bonanza Dr, Kingman | 0.0003 | 0 | 0.33 | - |
| 482 | 452 | 971610M | MOHAVE | Commerce Dr, Kingman | 0.0003 | 0 | 0.33 | - |
| 483 | 500 | 742123K | PIMA | Nogales Hwy, Sahuarita | 0.0003 | 0 | 0.33 | - |
| 484 | 140 | 742241M | GRAHAM | 8th St, Safford | 0.0003 | 0 | 0.33 | - |
| 485 | 624 | 741437D | PINAL | Steele Rd, Randolph | 0.0003 | 0 | 0.33 | - |
| 486 | 478 | 847151G | NAVAJO | Reed Ranch Rd, Snowflake | 0.0003 | 0 | 0.33 | - |
| 487 | 479 | 903246T | NAVAJO | Unknown Rd, Snowflake | 0.0003 | 0 | 0.33 | - |
| 488 | 327 | 920407F | MARICOPA | 39th Ave, Phoenix | 0.0003 | 0 | 0.33 | - |
| 489 | 79 | 742342Y | GILA | Apache Gold Casino, Globe | 0.0003 | 0 | 0.33 | - |
| 490 | 123 | 742263M | GRAHAM | 200 West St, Pima | 0.0003 | 0 | 0.32 | - |
| 491 | 126 | 742272L | GRAHAM | Glenbar Gin Rd, Pima | 0.0003 | 0 | 0.32 | - |
| 492 | 78 | 742363S | GILA | Pinal Creek Rd, Claypool | 0.0003 | 0 | 0.32 | - |
| 493 | 69 | 025963S | COCONINO | Espee Rd, Williams | 0.0003 | 0 | 0.32 | - |
| 494 | 101 | 742369H | GILA | Old Oak St, Miami | 0.0003 | 0 | 0.32 | - |
| 495 | 467 | 847146K | NAVAJO | Sr377, Holbrook | 0.0003 | 0 | 0.32 | - |
| 496 | 654 | 025320W | YAVAPAI | Bullock Rd, Ash Fork | 0.0003 | 0 | 0.32 | - |
| 497 | 571 | 411017N | PINAL | Davidson St, Eloy | 0.0003 | 0 | 0.32 | - |
| 498 | 441 | 920123B | MARICOPA | Washington St, Tolleson | 0.0003 | 0 | 0.32 | - |
| 499 | 234 | 748747W | MARICOPA | Sundust Rd, Chandler | 0.0003 | 0 | 0.32 | - |
| 500 | 442 | 971751W | MARICOPA | W Tonto St, Tolleson | 0.0003 | 0 | 0.32 | - |
| 501 | 3 | 905134B | APACHE | County Rd 7230, Navajo | 0.0003 | 0 | 0.31 | - |
| 502 | 666 | 025354R | YAVAPAI | State Hwy, Kirkland | 0.0003 | 0 | 0.31 | - |
| 503 | 365 | 741514B | MARICOPA | Hadley St, Phoenix | 0.0003 | 0 | 0.31 | - |
| 504 | 20 | 741722C | COCHISE | Benson Tomb. Hwy., St David | 0.0003 | 0 | 0.31 | - |
| 505 | 506 | 742172G | PIMA | Us 89 Nogales Hwy, Sahuarita | 0.0003 | 0 | 0.31 | - |
| 506 | 337 | 748165S | MARICOPA | 47th Ave, Phoenix | 0.0003 | 0 | 0.30 | - |
| 507 | 338 | 748792R | MARICOPA | 47th Ave, Phoenix | 0.0003 | 0 | 0.30 | - |

Top 75 Urban Crossing  Top 75 Rural Crossing

## Table F-1: Prioritized List of Highway-Rail Grade Crossings by Risk Score (continued)

| Level I Rank | #Appendix A | Crossing ID | County | Location | N Predicted | N Observed | Preliminary Risk Score | Refined Risk Score |
|---|---|---|---|---|---|---|---|---|
| 508 | 144 | 742202W | GRAHAM | Lone Star Rd, Solomon | 0.0003 | 0 | 0.30 | - |
| 509 | 217 | 741672B | MARICOPA | Commonwealth Ave, Chandler | 0.0003 | 0 | 0.30 | - |
| 510 | 163 | 025924B | LA PAZ | Main St, Bouse | 0.0003 | 0 | 0.30 | - |
| 511 | 83 | 742339R | GILA | Cutter Rd, Globe | 0.0003 | 0 | 0.30 | - |
| 512 | 350 | 025842U | MARICOPA | Apache St, Phoenix | 0.0003 | 0 | 0.30 | - |
| 513 | 124 | 742258R | GRAHAM | 400 East St, Pima | 0.0003 | 0 | 0.30 | - |
| 514 | 129 | 742262F | GRAHAM | South 100 West, Pima | 0.0003 | 0 | 0.30 | - |
| 515 | 110 | 742303H | GRAHAM | Geronimo-Goodwin, Bylas | 0.0003 | 0 | 0.30 | - |
| 516 | 146 | 742242U | GRAHAM | 1st Ave, Thatcher | 0.0003 | 0 | 0.30 | - |
| 517 | 426 | 741575S | MARICOPA | Elliot Rd/Kyrene Rd, Tempe | 0.0003 | 0 | 0.30 | - |
| 518 | 548 | 741361A | PINAL | E Main Ave, Casa Grande | 0.0003 | 0 | 0.30 | - |
| 519 | 436 | 748499A | MARICOPA | 104th Ave, Tolleson | 0.0003 | 0 | 0.30 | - |
| 520 | 176 | 025917R | LA PAZ | Center St, Salome | 0.0003 | 0 | 0.30 | - |
| 521 | 161 | 741861X | GREENLEE | Us 70/ High St, Duncan | 0.0003 | 0 | 0.29 | - |
| 522 | 130 | 742261Y | GRAHAM | South Main St, Pima | 0.0003 | 0 | 0.29 | - |
| 523 | 355 | 025836R | MARICOPA | Buckeye Rd, Phoenix | 0.0003 | 0 | 0.29 | - |
| 524 | 375 | 025596L | MARICOPA | Lower Buckeye Rd, Phoenix | 0.0003 | 0 | 0.29 | - |
| 525 | 376 | 025856C | MARICOPA | Lower Buckeye Rd, Phoenix | 0.0003 | 0 | 0.29 | - |
| 526 | 377 | 025865B | MARICOPA | Lower Buckeye Rd, Phoenix | 0.0003 | 0 | 0.29 | - |
| 527 | 496 | 742159T | PIMA | La Canada Dr, Sahuarita | 0.0003 | 0 | 0.29 | - |
| 528 | 382 | 025536C | MARICOPA | Mcdowell Rd, Phoenix | 0.0003 | 0 | 0.29 | - |
| 529 | 160 | 741866G | GREENLEE | Main St/Sr75, Duncan | 0.0003 | 0 | 0.29 | - |
| 530 | 326 | 748290E | MARICOPA | 37th Ave, Phoenix | 0.0003 | 0 | 0.29 | - |
| 531 | 402 | 748796T | MARICOPA | W Washington St, Phoenix | 0.0003 | 0 | 0.29 | - |
| 532 | 460 | 971604J | MOHAVE | Santa Fe Dr, Kingman | 0.0003 | 0 | 0.29 | - |
| 533 | 526 | 742113E | PIMA | Fletcher Ave, Tucson | 0.0003 | 0 | 0.29 | - |
| 534 | 99 | 742376T | GILA | Mill St, Miami | 0.0003 | 0 | 0.29 | - |
| 535 | 95 | 742377A | GILA | Kent St, Miami | 0.0003 | 0 | 0.29 | - |
| 536 | 97 | 742378G | GILA | Loomis, Miami | 0.0003 | 0 | 0.29 | - |
| 537 | 428 | 748300H | MARICOPA | Pedestrian, Tempe | 0.0003 | 0 | 0.29 | - |
| 538 | 363 | 025832N | MARICOPA | Grant St, Phoenix | 0.0003 | 0 | 0.28 | - |
| 539 | 692 | 922549D | YUMA | 30th St, Yuma | 0.0003 | 0 | 0.28 | - |
| 540 | 481 | 025031V | NAVAJO | Clear Creek Rd, Winslow | 0.0003 | 0 | 0.28 | - |
| 541 | 336 | 748793X | MARICOPA | 45th Ave, Phoenix | 0.0003 | 0 | 0.28 | - |
| 542 | 331 | 748794E | MARICOPA | 41st Ave, Phoenix | 0.0003 | 0 | 0.28 | - |
| 543 | 332 | 748795L | MARICOPA | 41st Ave, Phoenix | 0.0003 | 0 | 0.28 | - |

Top 75 Urban Crossing  Top 75 Rural Crossing

## Table F-1: Prioritized List of Highway-Rail Grade Crossings by Risk Score (continued)

| Level I Rank | #Appendix A | Crossing ID | County | Location | N Predicted | N Observed | Preliminary Risk Score | Refined Risk Score |
|---|---|---|---|---|---|---|---|---|
| 544 | 695 | 903109L | YUMA | Factor Ave, Yuma | 0.0003 | 0 | 0.28 | - |
| 545 | 76 | 748716X | GILA | Apache Trail, Claypool | 0.0003 | 0 | 0.28 | - |
| 546 | 371 | 748385M | MARICOPA | Jefferson St, Phoenix | 0.0003 | 0 | 0.27 | - |
| 547 | 72 | 025962K | COCONINO | Prong Horn Ranch, Williams | 0.0003 | 0 | 0.27 | - |
| 548 | 353 | 748166Y | MARICOPA | Buchanan St, Phoenix | 0.0003 | 0 | 0.27 | - |
| 549 | 354 | 748168M | MARICOPA | Buchanan St, Phoenix | 0.0003 | 0 | 0.27 | - |
| 550 | 236 | 741675W | MARICOPA | Willis Rd, Chandler | 0.0003 | 0 | 0.27 | - |
| 551 | 153 | 741891P | GREENLEE | 2nd St, Clifton | 0.0003 | 0 | 0.26 | - |
| 552 | 73 | 025960W | COCONINO | Rodeo Rd, Williams | 0.0003 | 0 | 0.26 | - |
| 553 | 348 | 025841M | MARICOPA | Alley, Phoenix | 0.0003 | 0 | 0.26 | - |
| 554 | 662 | 025362H | YAVAPAI | Date Creek Rd, Hillside | 0.0003 | 0 | 0.26 | - |
| 555 | 139 | 742219A | GRAHAM | 8th Ave, Safford | 0.0003 | 0 | 0.26 | - |
| 556 | 158 | 741894K | GREENLEE | Us 191, Clifton | 0.0003 | 0 | 0.26 | - |
| 557 | 82 | 742349W | GILA | Cottonwood, Globe | 0.0003 | 0 | 0.26 | - |
| 558 | 117 | 742302B | GRAHAM | Emery Goodwin W, Fort Thomas | 0.0003 | 0 | 0.26 | - |
| 559 | 111 | 973428V | GRAHAM | Home Alone Rd, Bylas | 0.0003 | 0 | 0.26 | - |
| 560 | 497 | 742152V | PIMA | La Villita Dr, Sahuarita | 0.0003 | 0 | 0.25 | - |
| 561 | 96 | 742380H | GILA | Latham Blvd, Miami | 0.0003 | 0 | 0.25 | - |
| 562 | 121 | 742264U | GRAHAM | 100 South St, Pima | 0.0003 | 0 | 0.25 | - |
| 563 | 374 | 025831G | MARICOPA | Lincoln St, Phoenix | 0.0003 | 0 | 0.25 | - |
| 564 | 482 | 025033J | NAVAJO | Washington St, Winslow | 0.0003 | 0 | 0.25 | - |
| 565 | 577 | 741409A | PINAL | Arizona Farms Rd, Florence | 0.0003 | 0 | 0.25 | - |
| 566 | 119 | 742286U | GRAHAM | Sub Station Rd, Fort Thomas | 0.0003 | 0 | 0.25 | - |
| 567 | 492 | 741091D | PIMA | I-10 Frontage Wb, Marana | 0.0002 | 0 | 0.25 | - |
| 568 | 167 | 025933A | LA PAZ | 11th St, Parker | 0.0002 | 0 | 0.25 | - |
| 569 | 118 | 742282S | GRAHAM | Redknolls Rd/E, Fort Thomas | 0.0002 | 0 | 0.25 | - |
| 570 | 41 | 025980H | COCONINO | Village Loop Rd, Grand Canyon | 0.0002 | 0 | 0.25 | - |
| 571 | 40 | 025981P | COCONINO | Village Loop Dr, Grand Canyon | 0.0002 | 0 | 0.25 | - |
| 572 | 42 | 926922B | COCONINO | Village Loop Rd, Grand Canyon | 0.0002 | 0 | 0.25 | - |
| 573 | 156 | 741890H | GREENLEE | Seventh St, Clifton | 0.0002 | 0 | 0.24 | - |
| 574 | 352 | 025830A | MARICOPA | Buchanan St, Phoenix | 0.0002 | 0 | 0.24 | - |
| 575 | 174 | 025915C | LA PAZ | Avenue 62E, Salome | 0.0002 | 0 | 0.24 | - |
| 576 | 112 | 742309Y | GRAHAM | Navajo Rd, Bylas | 0.0002 | 0 | 0.24 | - |
| 577 | 164 | 025921F | LA PAZ | Mcvey, Bouse | 0.0002 | 0 | 0.24 | - |
| 578 | 84 | 742354T | GILA | Hackney Ave, Globe | 0.0002 | 0 | 0.23 | - |
| 579 | 349 | 025538R | MARICOPA | Alley, Phoenix | 0.0002 | 0 | 0.23 | - |

Top 75 Urban Crossing  Top 75 Rural Crossing

## Table F-1: Prioritized List of Highway-Rail Grade Crossings by Risk Score (continued)

| Level I Rank | #Appendix A | Crossing ID | County | Location | N Predicted | N Observed | Preliminary Risk Score | Refined Risk Score |
|---|---|---|---|---|---|---|---|---|
| 580 | 113 | 742253G | GRAHAM | Central Rd, Central | 0.0002 | 0 | 0.23 | - |
| 581 | 580 | 742410X | PINAL | Felix Rd, Florence | 0.0002 | 0 | 0.23 | - |
| 582 | 109 | 742306D | GRAHAM | Centerpoint En, Bylas | 0.0002 | 0 | 0.23 | - |
| 583 | 77 | 742364Y | GILA | Bixby Rd, Claypool | 0.0002 | 0 | 0.23 | - |
| 584 | 15 | 742188D | COCHISE | Luzena Ave, Bowie | 0.0002 | 0 | 0.23 | - |
| 585 | 14 | 742189K | COCHISE | Luzena Ave, Bowie | 0.0002 | 0 | 0.23 | - |
| 586 | 114 | 742287B | GRAHAM | Ashurst Cemetary, Fort Thomas | 0.0002 | 0 | 0.23 | - |
| 587 | 150 | 742245P | GRAHAM | Reay Ln, Thatcher | 0.0002 | 0 | 0.22 | - |
| 588 | 383 | 025548W | MARICOPA | Mcdowell Rd, Phoenix | 0.0002 | 0 | 0.22 | - |
| 589 | 168 | 025931L | LA PAZ | 18th St, Parker | 0.0002 | 0 | 0.22 | - |
| 590 | 499 | 742171A | PIMA | Mission Rd, Sahuarita | 0.0002 | 0 | 0.22 | - |
| 591 | 505 | 742166D | PIMA | Twin Buttes Rd, Sahuarita | 0.0002 | 0 | 0.22 | - |
| 592 | 180 | 025910T | LA PAZ | Avenue 69E, Wenden | 0.0002 | 0 | 0.21 | - |
| 593 | 212 | 741581V | MARICOPA | Allison Rd, Chandler | 0.0002 | 0 | 0.21 | - |
| 594 | 237 | 741582C | MARICOPA | Willis Rd, Chandler | 0.0002 | 0 | 0.21 | - |
| 595 | 480 | 903248G | NAVAJO | West Garden Ln, Snowflake | 0.0002 | 0 | 0.21 | - |
| 596 | 107 | 742332T | GILA | Bia 2, San Carlos | 0.0002 | 0 | 0.21 | - |
| 597 | 555 | 741369E | PINAL | Main Ave, Casa Grande | 0.0002 | 0 | 0.20 | - |
| 598 | 556 | 741370Y | PINAL | Main Ave, Casa Grande | 0.0002 | 0 | 0.20 | - |
| 599 | 680 | 741741G | YUMA | Ave 37 E, Roll | 0.0002 | 0 | 0.19 | - |
| 600 | 665 | 025755R | YAVAPAI | Perkinsville Rd, Jerome | 0.0002 | 0 | 0.19 | - |
| 601 | 660 | 025764P | YAVAPAI | Broadway, Clarkdale | 0.0002 | 0 | 0.18 | - |
| 602 | 25 | 025752V | COCONINO | Forest Hwy 182, Ash Fork | 0.0002 | 0 | 0.18 | - |
| 603 | 664 | 025754J | YAVAPAI | Forest Hwy 492a, Jerome | 0.0002 | 0 | 0.18 | - |
| 604 | 696 | 760772G | YUMA | Penitentary St, Yuma | 0.0002 | 0 | 0.18 | - |
| 605 | 159 | 741895S | GREENLEE | Zorilla St, Clifton | 0.0002 | 0 | 0.18 | - |
| 606 | 659 | 025751N | YAVAPAI | Drake Rd/Fr 492, Ash Fork | 0.0002 | 0 | 0.18 | - |
| 607 | 587 | 853081H | PINAL | Judd, Florence | 0.0002 | 0 | 0.18 | - |
| 608 | 461 | 025279G | MOHAVE | Sb Frontage Rd, Kingman | 0.0002 | 0 | 0.18 | - |
| 609 | 491 | 741089C | PIMA | I-10 Frontage Eb, Marana | 0.0002 | 0 | 0.18 | - |
| 610 | 417 | 025709P | MARICOPA | W Peoria Ave, Surprise | 0.0002 | 0 | 0.17 | - |
| 611 | 422 | 741570H | MARICOPA | Baseline Rd, Tempe | 0.0002 | 0 | 0.17 | - |
| 612 | 423 | 741565L | MARICOPA | Broadway Rd, Tempe | 0.0002 | 0 | 0.17 | - |
| 613 | 466 | 847145D | NAVAJO | Romero St, Holbrook | 0.0002 | 0 | 0.17 | - |
| 614 | 238 | 025703Y | MARICOPA | Dysart Rd, El Mirage | 0.0002 | 0 | 0.17 | - |
| 615 | 231 | 741579U | MARICOPA | Ray Rd, Chandler | 0.0002 | 0 | 0.17 | - |

Top 75 Urban Crossing  Top 75 Rural Crossing

## Table F-1: Prioritized List of Highway-Rail Grade Crossings by Risk Score (continued)

| Level I Rank | #Appendix A | Crossing ID | County | Location | N Predicted | N Observed | Preliminary Risk Score | Refined Risk Score |
|---|---|---|---|---|---|---|---|---|
| 616 | 430 | 741568G | MARICOPA | Southern Ave, Tempe | 0.0002 | 0 | 0.17 | - |
| 617 | 239 | 025700D | MARICOPA | Grand Ave & Ft Rd, El Mirage | 0.0002 | 0 | 0.17 | - |
| 618 | 477 | 903249N | NAVAJO | Industrial Dr, Snowflake | 0.0002 | 0 | 0.17 | - |
| 619 | 434 | 741578M | MARICOPA | Warner Rd, Tempe | 0.0002 | 0 | 0.17 | - |
| 620 | 356 | 741028L | MARICOPA | Buckeye Rd, Phoenix | 0.0002 | 0 | 0.17 | - |
| 621 | 427 | 741573D | MARICOPA | Guadalupe Rd, Tempe | 0.0002 | 0 | 0.17 | - |
| 622 | 378 | 741443G | MARICOPA | Lower Buckeye Rd, Phoenix | 0.0002 | 0 | 0.17 | - |
| 623 | 397 | 741024J | MARICOPA | Van Buren St, Phoenix | 0.0002 | 0 | 0.16 | - |
| 624 | 215 | 741580N | MARICOPA | Chandler Blvd, Chandler | 0.0002 | 0 | 0.16 | - |
| 625 | 583 | 853084D | PINAL | Globe Hwy/Us60, Florence | 0.0002 | 0 | 0.16 | - |
| 626 | 154 | 741892W | GREENLEE | Park Ave, Clifton | 0.0002 | 0 | 0.16 | - |
| 627 | 268 | 025712X | MARICOPA | N Litchfield Rd, Glendale | 0.0002 | 0 | 0.16 | - |
| 628 | 691 | 912026W | YUMA | 24th St, Yuma | 0.0002 | 0 | 0.16 | - |
| 629 | 305 | 025848K | MARICOPA | 15th Ave, Phoenix | 0.0002 | 0 | 0.16 | - |
| 630 | 563 | 748156T | PINAL | Us 84, Casa Grande | 0.0002 | 0 | 0.16 | - |
| 631 | 515 | 741292U | PIMA | 36th St, Tucson | 0.0002 | 0 | 0.16 | - |
| 632 | 522 | 748804H | PIMA | Contractors Way, Tucson | 0.0002 | 0 | 0.16 | - |
| 633 | 265 | 025725Y | MARICOPA | Cotton Ln, Glendale | 0.0002 | 0 | 0.16 | - |
| 634 | 553 | 748160H | PINAL | Hwy 238, Casa Grande | 0.0002 | 0 | 0.16 | - |
| 635 | 270 | 025747Y | MARICOPA | Olive Ave, Glendale | 0.0002 | 0 | 0.16 | - |
| 636 | 546 | 748159N | PINAL | Casa Grande Hwy, Casa Grande | 0.0002 | 0 | 0.16 | - |
| 637 | 582 | 853087Y | PINAL | Forest Hwy 357, Florence | 0.0002 | 0 | 0.15 | - |
| 638 | 592 | 974558V | PINAL | S Desert Wells, Florence | 0.0002 | 0 | 0.15 | - |
| 639 | 591 | 974564Y | PINAL | Rc Discharge, Florence | 0.0002 | 0 | 0.15 | - |
| 640 | 221 | 411019C | MARICOPA | Frye Rd, Chandler | 0.0002 | 0 | 0.15 | - |
| 641 | 424 | 748318T | MARICOPA | Carver Rd, Tempe | 0.0002 | 0 | 0.15 | - |
| 642 | 6 | 905151S | APACHE | Us 191, Navajo | 0.0001 | 0 | 0.15 | - |
| 643 | 683 | 741750F | YUMA | Cr, ROLL | 0.0001 | 0 | 0.15 | - |
| 644 | 588 | 853083W | PINAL | N Desert Wells Rd, Florence | 0.0001 | 0 | 0.15 | - |
| 645 | 584 | 853085K | PINAL | Hewitt, Florence | 0.0001 | 0 | 0.15 | - |
| 646 | 585 | 853086S | PINAL | Hewitt, Florence | 0.0001 | 0 | 0.15 | - |
| 647 | 633 | 853090G | PINAL | Forest Hwy 252 T, Superior | 0.0001 | 0 | 0.15 | - |
| 648 | 635 | 853091N | PINAL | Nunez Ranch Rd, Superior | 0.0001 | 0 | 0.15 | - |
| 649 | 634 | 853092V | PINAL | Forest Hwy 8 T., Superior | 0.0001 | 0 | 0.15 | - |
| 650 | 636 | 853093C | PINAL | Silver King Rd, Superior | 0.0001 | 0 | 0.15 | - |
| 651 | 346 | 025843B | MARICOPA | Access Rd Wb, Phoenix | 0.0001 | 0 | 0.15 | - |

Top 75 Urban Crossing  Top 75 Rural Crossing

## Table F-1: Prioritized List of Highway-Rail Grade Crossings by Risk Score (continued)

| Level I Rank | #Appendix A | Crossing ID | County | Location | N Predicted | N Observed | Preliminary Risk Score | Refined Risk Score |
|---|---|---|---|---|---|---|---|---|
| 652 | 351 | 741484L | MARICOPA | Buchanan St, Phoenix | 0.0001 | 0 | 0.14 | - |
| 653 | 385 | 025840F | MARICOPA | Mohave St, Phoenix | 0.0001 | 0 | 0.14 | - |
| 654 | 698 | 748179A | YUMA | Short Way St, Yuma | 0.0001 | 0 | 0.13 | - |
| 655 | 273 | 025716A | MARICOPA | Reems Rd, Glendale | 0.0001 | 0 | 0.13 | - |
| 656 | 389 | 025838E | MARICOPA | Pima St, Phoenix | 0.0001 | 0 | 0.12 | - |
| 657 | 398 | 025834C | MARICOPA | W Hadley St, Phoenix | 0.0001 | 0 | 0.12 | - |
| 658 | 408 | 741840E | MARICOPA | Rittenhouse Rd, Queen Creek | 0.0001 | 0 | 0.11 | - |
| 659 | 274 | 025720P | MARICOPA | Sarival Rd, Glendale | 0.0001 | 0 | 0.11 | - |
| 660 | 5 | 909155H | APACHE | Salt Lake Rd, Navajo | 0.0001 | 0 | 0.11 | - |
| 661 | 416 | 025708H | MARICOPA | W Cactus Rd, Surprise | 0.0001 | 0 | 0.11 | - |
| 662 | 155 | 905170W | GREENLEE | Riverside Dr, Clifton | 0.0001 | 0 | 0.10 | - |
| 663 | 457 | 025277T | MOHAVE | Nb Frontage Rd, Kingman | 0.0001 | 0 | 0.10 | - |
| 664 | 687 | 741735D | YUMA | Ave 33 E, Wellton | 0.0001 | 0 | 0.09 | - |
| 665 | 628 | 741706T | PINAL | Cr, Sacaton | 0.0001 | 0 | 0.09 | - |
| 666 | 679 | 741742N | YUMA | 6th St, Roll | 0.0001 | 0 | 0.09 | - |
| 667 | 581 | 853082P | PINAL | Florence Hwy/Sr79, Florence | 0.0001 | 0 | 0.09 | - |
| 668 | 681 | 741745J | YUMA | Ave 39 E, Roll | 0.0001 | 0 | 0.09 | - |
| 669 | 678 | 741743V | YUMA | 5th St, Roll | 0.0001 | 0 | 0.08 | - |
| 670 | 75 | 741683N | GILA | Hunt Hwy, Chandler Heights | 0.0001 | 0 | 0.07 | - |
| 671 | 677 | 741746R | YUMA | 4th St, Roll | 0.0001 | 0 | 0.07 | - |
| 672 | 629 | 741703X | PINAL | Cr, Sacaton | 0.0001 | 0 | 0.07 | - |
| 673 | 631 | 741704E | PINAL | Desert View Rd, Sacaton | 0.0001 | 0 | 0.07 | - |
| 674 | 630 | 741705L | PINAL | Cr, Sacaton | 0.0001 | 0 | 0.07 | - |
| 675 | 682 | 741747X | YUMA | Ave 40 E, Roll | 0.0001 | 0 | 0.07 | - |
| 676 | 187 | 741759S | MARICOPA | Agua Caliente Rd, Arlington | 0.0001 | 0 | 0.07 | - |
| 677 | 186 | 741753B | MARICOPA | 571st Ave, Arlington | 0.0000 | 0 | 0.03 | - |
| 678 | 241 | 741754H | MARICOPA | Agua Caliente Rd, Gila Bend | 0.0000 | 0 | 0.03 | - |
|  | 599 | 742396E | PINAL | Florence Kel Hwy, Kearny | 0.0006 | 0 | N/A[2] | - |
|  | 172 | 914397N | LA PAZ | Parker Rd, Parker | 0.0006 | 0 | N/A[2] | - |
|  | 171 | 025927W | LA PAZ | Noovuna/Shea Rd, Parker | 0.0004 | 0 | N/A[2] | - |
|  | 458 | 025237V | MOHAVE | Santa Fe Dr, Kingman | 0.0004 | 0 | N/A[2] | - |
|  | 657 | 933885T | YAVAPAI | Drake Rd, Ash Fork | 0.0002 | 0 | N/A[2] | - |
|  | 658 | 933886A | YAVAPAI | Drake Rd, Ash Fork | 0.0002 | 0 | N/A[2] | - |
|  | 484 | 840739D | PIMA | Ajo Tucson Hwy, Ajo | 0.0007 | 0 | N/A[2] | - |
|  | 489 | 840737P | PIMA | Rasmussen Rd, Ajo | 0.0006 | 0 | N/A[2] | - |

Top 75 Urban Crossing  Top 75 Rural Crossing

## Table F-1: Prioritized List of Highway-Rail Grade Crossings by Risk Score (continued)

| Level I Rank | #Appendix A | Crossing ID | County | Location | N Predicted | N Observed | Preliminary Risk Score | Refined Risk Score |
|---|---|---|---|---|---|---|---|---|
| | ***483*** | ***840738W*** | PIMA | 2nd Ave, Ajo | 0.0006 | 0 | N/A[2] | - |
| | ***488*** | ***840736H*** | PIMA | Mead Rd, Ajo | 0.0005 | 0 | N/A[2] | - |
| | ***487*** | ***840735B*** | PIMA | Mead, Ajo | 0.0004 | 0 | N/A[2] | - |
| | ***485*** | ***903405X*** | PIMA | Ajo-Tucson Hwy, Ajo | 0.0002 | 0 | N/A[2] | - |
| | ***486*** | ***903406E*** | PIMA | Ajo-Tucson Hwy, Ajo | 0.0002 | 0 | N/A[2] | - |
| | ***343*** | ***741505C*** | MARICOPA | 7th St, Phoenix | 0.0001 | 0 | N/A[2] | - |
| | ***599*** | ***742396E*** | MARICOPA | Florence Kel Hwy, Kearny | 0.0014 | 0 | N/A[2] | - |
| | ***532*** | ***742122D*** | PIMA | Old Nogales Hwy, Tucson | 0.0005 | 1 | N/A[1] | - |
| | ***31*** | ***025118L*** | COCONINO | Private, Flagstaff | 0.0015 | 0 | N/A[1] | - |
| | ***598*** | ***742397L*** | PINAL | Diamond Ranch Rd, Kearny | 0.0008 | 0 | N/A[1] | - |
| | ***380*** | ***741020G*** | MARICOPA | Madison St, Phoenix | 0.0003 | 0 | N/A[1] | - |
| | ***675*** | ***742087S*** | YUMA | Paloma Harquahala Rd, Dateland | 0.0000 | 0 | N/A[1] | - |

Top 75 Urban Crossing  Top 75 Rural Crossing

*Notes:*

*[1] Omitted – Private Crossing*

*[2] Omitted – Not an Active, At-Grade Crossing*

# Appendix G – Top 75 Urban and Rural Crossings by Refined Risk Score

## Table G-1: Top 75 Urban Highway-Rail Grade Crossing based on Refined Risk Score

| Level II Urban Rank | Level I Rank | Crossing ID | Location | N Predicted | N Observed | Preliminary Risk Score | Adequate Sight Distance | Vertical Curve | Horizontal Curve/ Skew | Geometry More Than 4 Legs | Refined Risk Score |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ***U01*** | 1 | 025617C | Thomas Rd, West of 27th Ave, Phoenix | 0.0025 | 11 | 13.51 | No | No | Yes | Yes | 19.73 |
| ***U02*** | 2 | 025422P | 43rd Ave & Camelback Rd, Phoenix | 0.0014 | 9 | 10.37 | No | No | Yes | Yes | 15.16 |
| ***U03*** | 3 | 025430G | 27th Ave, South of Thomas Rd, Phoenix | 0.0023 | 8 | 10.28 | No | No | Yes | Yes | 15.02 |
| ***U04*** | 4 | 025590V | Bethany Home Rd, West of 51st Ave, Glendale | 0.0013 | 8 | 9.28 | No | No | Yes | Yes | 13.55 |
| ***U05*** | 6 | 025132G | San Francisco St, South of Historic Rte 66, Flagstaff | 0.0019 | 5 | 6.86 | No | No | No | No | 8.72 |
| ***U06*** | 5 | 025129Y | Fanning Dr, South of Historic Rte 66, Flagstaff | 0.0019 | 5 | 6.95 | Yes | No | No | No | 8.02 |
| ***U07*** | 9 | 025425K | 35th Ave, South of Indian School Rd, Phoenix | 0.0024 | 3 | 5.39 | No | No | Yes | Yes | 7.88 |
| ***U08*** | 8 | 025418A | 59th Ave & Glendale Ave, Glendale | 0.0026 | 3 | 5.59 | No | No | Yes | No | 7.81 |
| ***U09*** | 7 | 025133N | Beaver St, South of Historic Rte 66, Flagstaff | 0.0019 | 4 | 5.90 | No | No | No | No | 7.13 |
| ***U10*** | 10 | 741124N | 7th Ave, Tucson | 0.0011 | 3 | 4.13 | Yes | Yes | Yes | No | 5.22 |

**Table G-1: Top 75 Urban Highway-Rail Grade Crossing based on Refined Risk Score (continued)**

| Level II Urban Rank | Level I Rank | Crossing ID | Location | N Predicted | N Observed | Preliminary Risk Score | Adequate Sight Distance | Vertical Curve | Horizontal Curve/ Skew | Geometry More Than 4 Legs | Refined Risk Score |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ***U11*** | 11 | 025436X | McDowell Rd, West of Grand Ave, Phoenix | 0.0018 | 2 | 3.83 | No | No | No | No | 5.09 |
| ***U12*** | 12 | 741363N | Florence St & Main St, Casa Grande | 0.0017 | 2 | 3.70 | No | No | No | No | 4.48 |
| ***U13*** | 13 | 025131A | Ponderosa Pkwy, South of Historic Rte 66, Flagstaff | 0.0024 | 1 | 3.37 | Yes | No | No | No | 4.07 |
| ***U14*** | 18 | 741122A | 6th St, East of 9th Ave, Tucson | 0.0018 | 1 | 2.76 | No | No | Yes | No | 4.04 |
| ***U15*** | 14 | 025651J | Greenway Rd, North of Grand Ave, Surprise | 0.0013 | 2 | 3.35 | Yes | No | No | No | 3.69 |
| ***U16*** | 19 | 741367R | Trekell Rd, South of Jimmie Kerr Blvd, Casa Grande | 0.0018 | 1 | 2.76 | No | No | Yes | No | 3.67 |
| ***U17*** | 16 | 741560C | University Dr, West of Ash Ave, Tempe | 0.0009 | 2 | 2.86 | No | No | No | No | 3.47 |
| ***U18*** | 23 | 741104C | Ruthrauff Rd, Tucson | 0.0023 | 0 | 2.28 | No | No | Yes | No | 3.34 |
| ***U19*** | 24 | 741708G | Main St, South of Casa Grande-Picacho Hwy, Eloy | 0.0012 | 1 | 2.22 | No | No | Yes | No | 3.25 |
| ***U20*** | 20 | 741100A | Massingale Rd, East of I-10 Frontage Rd, Marana | 0.0014 | 1 | 2.38 | No | No | Yes | No | 3.17 |

**Table G-1: Top 75 Urban Highway-Rail Grade Crossing based on Refined Risk Score (continued)**

| Level II Urban Rank | Level I Rank | Crossing ID | Location | N Predicted | N Observed | Preliminary Risk Score | Adequate Sight Distance | Vertical Curve | Horizontal Curve/ Skew | Geometry More Than 4 Legs | Refined Risk Score |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ***U21*** | 22 | 025424D | Indian School Rd, West of Grand Ave, Phoenix | 0.0013 | 1 | 2.30 | No | No | Yes | No | 3.07 |
| ***U22*** | 25 | 741098B | W Cortaro Farms Rd, Marana | 0.0022 | 0 | 2.21 | No | No | No | No | 2.94 |
| ***U23*** | 27 | 741825C | Val Vista Dr, South of Warner Rd, Gilbert | 0.0011 | 1 | 2.10 | No | No | Yes | No | 2.94 |
| ***U24*** | 28 | 741814P | McQueen Rd, South of Baseline Rd, Gilbert | 0.0011 | 1 | 2.10 | No | No | Yes | No | 2.94 |
| ***U25*** | 29 | 741816D | Cooper Rd, South of Guadalupe Rd, Gilbert | 0.0011 | 1 | 2.10 | No | No | Yes | No | 2.93 |
| ***U26*** | 26 | 025403K | Peoria Ave, East of Grand Ave, Peoria | 0.0012 | 1 | 2.16 | No | No | No | No | 2.75 |
| ***U27*** | 33 | 025415E | Grand Ave & Myrtle Ave, Glendale | 0.0010 | 1 | 1.99 | No | No | Yes | No | 2.65 |
| ***U28*** | 58 | 741709N | Sunshine Blvd, Eloy | 0.0018 | 0 | 1.76 | No | No | Yes | No | 2.57 |
| ***U29*** | 50 | 025448S | 19th Ave, Phoenix | 0.0018 | 0 | 1.83 | No | No | Yes | No | 2.56 |
| ***U30*** | 32 | 741833U | Power Rd & Pecos Rd, Gilbert | 0.0010 | 1 | 2.01 | Yes | No | Yes | No | 2.55 |
| ***U31*** | 35 | 741650B | Alma School Rd, South of Main St, Mesa | 0.0010 | 1 | 1.98 | No | No | No | No | 2.51 |
| ***U32*** | 43 | 741298K | Wilmot Rd, Vail | 0.0019 | 0 | 1.88 | No | No | Yes | No | 2.50 |

**Table G-1: Top 75 Urban Highway-Rail Grade Crossing based on Refined Risk Score (continued)**

| Level II Urban Rank | Level I Rank | Crossing ID | Location | N Predicted | N Observed | Preliminary Risk Score | Adequate Sight Distance | Vertical Curve | Horizontal Curve/ Skew | Geometry More Than 4 Legs | Refined Risk Score |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ***U33*** | 36 | 741649G | Dobson Rd, South of Main St, Mesa | 0.0010 | 1 | 1.96 | No | No | No | No | 2.49 |
| ***U34*** | 55 | 741657Y | Broadway Rd, West of Center St, Mesa | 0.0008 | 1 | 1.77 | No | No | Yes | No | 2.48 |
| ***U35*** | 34 | 741295P | Ajo Way, Tucson | 0.0020 | 0 | 1.98 | No | No | No | No | 2.40 |
| ***U36*** | 44 | 922399X | W Cochise Canyon Tr, Marana | 0.0019 | 0 | 1.88 | No | No | No | No | 2.38 |
| ***U37*** | 45 | 025438L | Van Buren Ave, Phoenix | 0.0019 | 0 | 1.87 | No | No | No | No | 2.38 |
| ***U38*** | 37 | 025441U | 19th Ave & Adams St, Phoenix | 0.0009 | 1 | 1.94 | No | No | No | No | 2.35 |
| ***U39*** | 39 | 741088V | W Tangerine Rd, Marana | 0.0019 | 0 | 1.92 | No | No | No | No | 2.32 |
| ***U40*** | 41 | 741358S | Thornton Rd, Casa Grande | 0.0019 | 0 | 1.91 | Yes | No | Yes | No | 2.32 |
| ***U41*** | 52 | 753584A | Ave 11 E, Yuma | 0.0018 | 0 | 1.80 | No | Yes | No | No | 2.29 |
| ***U42*** | 63 | 741120L | Main St/Granada Av, Tucson | 0.0016 | 0 | 1.60 | No | No | Yes | No | 2.24 |
| ***U43*** | 31 | 025399X | 103rd Ave, North of Grand Ave, Sun City | 0.0010 | 1 | 2.02 | Yes | No | No | No | 2.22 |
| ***U44*** | 49 | 025518E | 29th Ave, Phoenix | 0.0018 | 0 | 1.83 | No | No | Yes | No | 2.22 |
| ***U45*** | 53 | 742104F | 22nd St, West of Euclid Ave, Tucson | 0.0008 | 1 | 1.80 | No | No | No | No | 2.18 |

**Table G-1: Top 75 Urban Highway-Rail Grade Crossing based on Refined Risk Score (continued)**

| Level II Urban Rank | Level I Rank | Crossing ID | Location | N Predicted | N Observed | Preliminary Risk Score | Adequate Sight Distance | Vertical Curve | Horizontal Curve/ Skew | Geometry More Than 4 Legs | Refined Risk Score |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ***U46*** | 61 | 025491X | 43rd Ave, South of Camelback Rd, Phoenix | 0.0006 | 1 | 1.64 | No | No | Yes | No | 2.18 |
| ***U47*** | 62 | 025099J | Steves Blvd, Flagstaff | 0.0016 | 0 | 1.62 | No | No | No | No | 2.16 |
| ***U48*** | 46 | 741647T | S Price Rd, South of Apache Blvd, Tempe | 0.0009 | 1 | 1.87 | No | No | No | No | 2.16 |
| ***U49*** | 47 | 748176E | N Price Rd, South of Apache Blvd, Tempe | 0.0008 | 1 | 1.85 | No | No | No | No | 2.13 |
| ***U50*** | 56 | 025510A | 28th Ave, Phoenix | 0.0018 | 0 | 1.76 | No | No | Yes | No | 2.13 |
| ***U51*** | 72 | 741707A | Eleven Mile Rd, Eloy | 0.0015 | 0 | 1.52 | No | No | Yes | No | 2.13 |
| ***U52*** | 54 | 742052R | Ave 9 E, Yuma | 0.0018 | 0 | 1.79 | No | No | No | No | 2.07 |
| ***U53*** | 68 | 025245M | Topeka St, Kingman | 0.0015 | 0 | 1.55 | No | Yes | Yes | No | 2.05 |
| ***U54*** | 90 | 025413R | 67th/Northern Ave, Glendale | 0.0013 | 0 | 1.26 | No | No | Yes | Yes | 2.02 |
| ***U55*** | 67 | 741562R | 9th St, West of Ash Ave, Tempe | 0.0006 | 1 | 1.56 | No | No | Yes | No | 1.98 |
| ***U56*** | 57 | 025494T | Turney Ave, Phoenix | 0.0018 | 0 | 1.76 | No | No | No | No | 1.94 |
| ***U57*** | 76 | 025246U | 4th St, Kingman | 0.0014 | 0 | 1.44 | No | Yes | No | No | 1.92 |
| ***U58*** | 86 | 025408U | 75th Ave, Peoria | 0.0013 | 0 | 1.30 | No | No | Yes | Yes | 1.91 |
| ***U59*** | 64 | 742375L | Marion St & Railroad Ave, Claypool | 0.0006 | 1 | 1.57 | No | Yes | No | No | 1.90 |

**Table G-1: Top 75 Urban Highway-Rail Grade Crossing based on Refined Risk Score (continued)**

| Level II Urban Rank | Level I Rank | Crossing ID | Location | N Predicted | N Observed | Preliminary Risk Score | Adequate Sight Distance | Vertical Curve | Horizontal Curve/ Skew | Geometry More Than 4 Legs | Refined Risk Score |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ***U60*** | 65 | 741561J | Ash Ave & 5th St, Tempe | 0.0006 | 1 | 1.57 | No | No | No | No | 1.90 |
| ***U61*** | 71 | 741661N | Baseline Rd, West of McQueen Rd, Mesa | 0.0005 | 1 | 1.53 | No | No | No | No | 1.86 |
| ***U62*** | 73 | 741102N | W Joiner Rd, Tucson | 0.0015 | 0 | 1.52 | No | No | No | No | 1.84 |
| ***U63*** | 75 | 741364V | Hermosillo St, Casa Grande | 0.0015 | 0 | 1.51 | No | No | No | No | 1.83 |
| ***U64*** | 60 | 025443H | 19th Ave & Washington St, Phoenix | 0.0007 | 1 | 1.70 | Yes | No | No | No | 1.79 |
| ***U65*** | 74 | 741452F | 23rd Ave, South of Jefferson St, Phoenix | 0.0005 | 1 | 1.52 | No | No | No | No | 1.75 |
| ***U66*** | 79 | 025628P | 44th Ave, Phoenix | 0.0014 | 0 | 1.41 | No | No | Yes | No | 1.71 |
| ***U67*** | 96 | 025398R | Del Webb Blvd, Sun City | 0.0012 | 0 | 1.22 | No | No | Yes | No | 1.70 |
| ***U68*** | 77 | 741662V | Guadalupe Rd, East of Fiesta Blvd, Gilbert | 0.0004 | 1 | 1.43 | No | No | No | No | 1.65 |
| ***U69*** | 84 | 741362G | Sacaton St, Casa Grande | 0.0014 | 0 | 1.36 | No | No | No | No | 1.64 |
| ***U70*** | 97 | 025583K | Meeker Blvd, Beardsley | 0.0012 | 0 | 1.21 | No | No | No | No | 1.61 |
| ***U71*** | 92 | 025393G | Dysart Rd, Surprise | 0.0012 | 0 | 1.25 | Yes | No | Yes | No | 1.59 |
| ***U72*** | 93 | 025400P | 99th Ave, Sun City | 0.0012 | 0 | 1.23 | No | No | No | No | 1.56 |

**Table G-1: Top 75 Urban Highway-Rail Grade Crossing based on Refined Risk Score (continued)**

| Level II Urban Rank | Level I Rank | Crossing ID | Location | N Predicted | N Observed | Preliminary Risk Score | Adequate Sight Distance | Vertical Curve | Horizontal Curve/ Skew | Geometry More Than 4 Legs | Refined Risk Score |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ***U73*** | 87 | 741492D | Lincoln St, West of 7th St, Phoenix | 0.0003 | 1 | 1.29 | No | No | No | No | 1.56 |
| ***U74*** | 81 | 741403J | Central Ave, Bowie | 0.0014 | 0 | 1.40 | Yes | No | No | No | 1.54 |
| ***U75*** | 88 | 025850L | Watkins Rd, East of 16th Ave, Phoenix | 0.0003 | 1 | 1.27 | No | No | No | No | 1.40 |

## Table G-2: Top 75 Rural Highway-Rail Grade Crossing based on Refined Risk Score

| Level II Rural Rank | Level I Rank | Crossing ID | Location | N Predicted | N Observed | Preliminary Risk Score | Adequate Sight Distance | Vertical Curve | Horizontal Curve/ Skew | Geometry More Than 4 Legs | Refined Risk Score |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ***R01*** | 17 | 025017A | Apache Ave, South of Joy Nevin Ave, Holbrook | 0.0018 | 1 | 2.76 | No | No | Yes | No | 3.86 |
| ***R02*** | 15 | 025023D | Obed Rd, Joseph City | 0.0011 | 2 | 3.11 | Yes | No | Yes | No | 3.76 |
| ***R03*** | 21 | 025231E | Old Hwy 66, Hackberry | 0.0023 | 0 | 2.32 | Yes | Yes | No | No | 2.68 |
| ***R04*** | 38 | 741386V | San Pedro St, North of 4th St, Benson | 0.0009 | 1 | 1.92 | No | No | No | No | 2.33 |
| ***R05*** | 40 | 025171X | Sherwood Access Rd, Williams | 0.0009 | 1 | 1.92 | No | No | No | No | 2.32 |
| ***R06*** | 30 | 741342V | Ralston Rd, South of Maricopa Rd, Maricopa | 0.0011 | 1 | 2.06 | Yes | No | No | No | 2.27 |
| ***R07*** | 48 | 741310P | Red Hill Ranch Rd, Vail | 0.0018 | 0 | 1.84 | No | No | No | No | 2.13 |
| ***R08*** | 42 | 748709M | Mescal Rd, Benson | 0.0009 | 1 | 1.91 | Yes | No | No | No | 2.10 |
| ***R09*** | 70 | 741372M | Cox Rd, South of Jimmie Kerr Blvd, Casa Grande | 0.0005 | 1 | 1.54 | No | No | Yes | No | 2.05 |
| ***R10*** | 59 | 025599G | Grand Ave & 163rd Ave, Sun City | 0.0007 | 1 | 1.74 | Yes | No | No | No | 2.01 |
| ***R11*** | 51 | 025004Y | Allentown Rd, Houck | 0.0008 | 1 | 1.83 | Yes | No | No | No | 2.01 |
| ***R12*** | 69 | 741416K | Arizona Farms Rd, East of Hunt Highway, Florence | 0.0005 | 1 | 1.54 | No | No | No | No | 1.78 |
| ***R13*** | 80 | 025356E | Hillside Rd, Hillside | 0.0004 | 1 | 1.40 | No | No | Yes | No | 1.78 |
| ***R14*** | 82 | 741304L | Colossal Cave Rd, Vail | 0.0014 | 0 | 1.38 | No | No | Yes | No | 1.75 |
| ***R15*** | 66 | 742090A | Sentinel Rd, Dateland | 0.0016 | 0 | 1.56 | Yes | No | No | No | 1.72 |
| ***R16*** | 91 | 025011J | NF-2015, Navajo | 0.0013 | 0 | 1.25 | No | No | Yes | No | 1.67 |
| ***R17*** | 78 | 741299S | Rita Rd, Vail | 0.0014 | 0 | 1.41 | Yes | No | No | No | 1.63 |
| ***R18*** | 89 | 741345R | Porter Rd, Maricopa | 0.0013 | 0 | 1.26 | No | No | No | No | 1.61 |
| ***R19*** | 83 | 741303E | Colossal Cave Rd, Vail | 0.0014 | 0 | 1.38 | No | No | No | No | 1.59 |

## Table G-2: Top 75 Rural Highway-Rail Grade Crossing based on Refined Risk Score (continued)

| Level II Rural Rank | Level I Rank | Crossing ID | Location | N Predicted | N Observed | Preliminary Risk Score | Adequate Sight Distance | Vertical Curve | Horizontal Curve/ Skew | Geometry More Than 4 Legs | Refined Risk Score |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ***R20*** | 85 | 741893D | US Highway 191, Clifton | 0.0003 | 1 | 1.34 | Yes | No | Yes | No | 1.55 |
| ***R21*** | 107 | 741377W | Battaglia Rd, Eloy | 0.0011 | 0 | 1.15 | No | No | Yes | No | 1.52 |
| ***R22*** | 122 | 741382T | Ocotillo Rd, Benson | 0.0011 | 0 | 1.06 | No | No | Yes | No | 1.48 |
| ***R23*** | 94 | 741374B | Sunland Gin Rd, Casa Grande | 0.0012 | 0 | 1.22 | Yes | No | Yes | No | 1.48 |
| ***R24*** | 99 | 741397H | Maley St, Willcox | 0.0012 | 0 | 1.21 | No | No | No | No | 1.46 |
| ***R25*** | 100 | 742069U | Williams St, Wellton | 0.0012 | 0 | 1.18 | No | No | No | No | 1.43 |
| ***R26*** | 95 | 741440L | Selma Hwy, Randolph | 0.0012 | 0 | 1.22 | No | No | No | No | 1.41 |
| ***R27*** | 104 | 741346X | N White/Parker Rd, Maricopa | 0.0012 | 0 | 1.15 | Yes | No | Yes | No | 1.39 |
| ***R28*** | 123 | 025125W | Cosnino Rd, Flagstaff | 0.0011 | 0 | 1.06 | No | Yes | No | No | 1.34 |
| ***R29*** | 113 | 741341N | Rio Bravo Rd, Maricopa | 0.0011 | 0 | 1.09 | No | No | No | No | 1.32 |
| ***R30*** | 149 | 741375H | Toltec Rd, Eloy | 0.0010 | 0 | 0.98 | No | No | Yes | No | 1.30 |
| ***R31*** | 120 | 741716Y | Missile Base Rd, Red Rock | 0.0011 | 0 | 1.07 | Yes | No | Yes | No | 1.29 |
| ***R32*** | 121 | 741714K | Park Link Dr, Red Rock | 0.0011 | 0 | 1.06 | Yes | No | Yes | No | 1.28 |
| ***R33*** | 127 | 741390K | Dragoon Rd, Dragoon | 0.0010 | 0 | 1.05 | No | No | No | No | 1.27 |
| ***R34*** | 157 | 025172E | Garland Prairie Rd, Williams | 0.0010 | 0 | 0.95 | No | No | Yes | No | 1.27 |
| ***R35*** | 134 | 025200F | Fort Rock Rd, Seligman | 0.0010 | 0 | 1.03 | No | No | No | No | 1.25 |
| ***R36*** | 101 | 741699K | Battaglia Dr, Picacho | 0.0012 | 0 | 1.18 | Yes | No | No | No | 1.24 |
| ***R37*** | 137 | 742055L | Rifle Range Rd/ Blaisdell Rd, Yuma | 0.0010 | 0 | 1.02 | No | No | No | No | 1.23 |
| ***R38*** | 143 | 025001D | Lupton Rd, Lupton | 0.0010 | 0 | 1.00 | Yes | No | Yes | No | 1.21 |
| ***R39*** | 145 | 741376P | Houser Rd, Eloy | 0.0010 | 0 | 0.99 | Yes | No | Yes | No | 1.20 |
| ***R40*** | 147 | 741351U | Anderson Rd, Casa Grande | 0.0010 | 0 | 0.98 | Yes | No | Yes | No | 1.19 |
| ***R41*** | 109 | 741697W | Shedd Rd, Picacho | 0.0011 | 0 | 1.12 | Yes | No | No | No | 1.18 |

## Table G-2: Top 75 Rural Highway-Rail Grade Crossing based on Refined Risk Score (continued)

| Level II Rural Rank | Level I Rank | Crossing ID | Location | N Predicted | N Observed | Preliminary Risk Score | Adequate Sight Distance | Vertical Curve | Horizontal Curve/ Skew | Geometry More Than 4 Legs | Refined Risk Score |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ***R42*** | 140 | 742005H | Chavez Siding Rd, Amado | 0.0010 | 0 | 1.01 | Yes | No | Yes | No | 1.17 |
| ***R43*** | 156 | 741383A | Patagonia St, Benson | 0.0010 | 0 | 0.95 | No | No | No | No | 1.16 |
| ***R44*** | 142 | 742073J | Ave 36 E, Tacna | 0.0010 | 0 | 1.00 | Yes | No | Yes | No | 1.15 |
| ***R45*** | 160 | 742007W | Bridge Rd, Tubac | 0.0009 | 0 | 0.91 | No | No | Yes | No | 1.15 |
| ***R46*** | 176 | 741347E | Hartman Rd, Casa Grande | 0.0008 | 0 | 0.85 | No | No | Yes | No | 1.13 |
| ***R47*** | 177 | 741371F | Peart Rd, Casa Grande | 0.0008 | 0 | 0.85 | No | No | Yes | No | 1.13 |
| ***R48*** | 136 | 025215V | Diamond Creek Rd, Peach Springs | 0.0010 | 0 | 1.02 | Yes | No | No | No | 1.12 |
| ***R49*** | 128 | 742075X | Ave 40 E, Tacna | 0.0010 | 0 | 1.05 | Yes | No | No | No | 1.10 |
| ***R50*** | 186 | 742067F | S Ave 25 E, Wellton | 0.0008 | 0 | 0.82 | No | No | Yes | No | 1.09 |
| ***R51*** | 172 | 025227P | Hackberry Rd, Valentine | 0.0009 | 0 | 0.86 | Yes | Yes | Yes | No | 1.09 |
| ***R52*** | 188 | 741712W | Picacho Blvd, Picacho | 0.0008 | 0 | 0.81 | No | No | Yes | No | 1.08 |
| ***R53*** | 166 | 741398P | Stewart St, Willcox | 0.0009 | 0 | 0.88 | No | No | No | No | 1.07 |
| ***R54*** | 125 | 741702R | Gilbert Rd, North of County Rd 282 | 0.0001 | 1 | 1.05 | Yes | No | No | No | 1.05 |
| ***R55*** | 200 | 025170R | Parks Rd, Bellemont | 0.0008 | 0 | 0.79 | No | No | Yes | No | 1.05 |
| ***R56*** | 207 | 741368X | Keeling Rd, Casa Grande | 0.0008 | 0 | 0.77 | No | No | Yes | No | 1.03 |
| ***R57*** | 189 | 742203D | Montierth Ln, Safford | 0.0008 | 0 | 0.80 | No | No | Yes | No | 1.02 |
| ***R58*** | 225 | 741406E | Indian Springs Rd, San Simon | 0.0007 | 0 | 0.75 | No | No | Yes | No | 0.99 |
| ***R59*** | 228 | 741399W | Pattie Rd, Willcox | 0.0007 | 0 | 0.74 | No | No | Yes | No | 0.99 |
| ***R60*** | 159 | 742071V | Ave 31 E, Wellton | 0.0009 | 0 | 0.93 | Yes | No | No | No | 0.98 |
| ***R61*** | 178 | 741082E | Martin Ave, Gila Bend | 0.0008 | 0 | 0.84 | No | No | No | No | 0.97 |
| ***R62*** | 193 | 741388J | Airport Rd, Benson | 0.0008 | 0 | 0.80 | No | No | No | No | 0.97 |
| ***R63*** | 222 | 025351V | Skull Valley Conn, Skull Valley | 0.0007 | 0 | 0.75 | No | No | Yes | No | 0.95 |

**Table G-2: Top 75 Rural Highway-Rail Grade Crossing based on Refined Risk Score (continued)**

| Level II Rural Rank | Level I Rank | Crossing ID | Location | N Predicted | N Observed | Preliminary Risk Score | Adequate Sight Distance | Vertical Curve | Horizontal Curve/ Skew | Geometry More Than 4 Legs | Refined Risk Score |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ***R64*** | 208 | 741400N | Country Club Dr, Willcox | 0.0008 | 0 | 0.77 | Yes | No | Yes | No | 0.94 |
| ***R65*** | 168 | 741308N | Agua Verde Creek R, Vail | 0.0009 | 0 | 0.87 | Yes | No | No | No | 0.91 |
| ***R66*** | 198 | 025205P | Hyde Park Rd, Peach Springs | 0.0008 | 0 | 0.79 | Yes | Yes | No | No | 0.91 |
| ***R67*** | 223 | 025350N | Sterling Ranch, Skull Valley | 0.0007 | 0 | 0.75 | No | Yes | No | No | 0.91 |
| ***R68*** | 243 | 741418Y | Cr, Florence | 0.0007 | 0 | 0.71 | No | No | No | Yes | 0.90 |
| ***R69*** | 214 | 741436W | Storey Rd, Randolph | 0.0008 | 0 | 0.77 | No | No | No | No | 0.89 |
| ***R70*** | 196 | 741405X | Cochise Ave, San Simon | 0.0008 | 0 | 0.80 | Yes | No | No | No | 0.88 |
| ***R71*** | 197 | 741340G | 83rd Ave, Maricopa | 0.0008 | 0 | 0.79 | Yes | No | No | No | 0.87 |
| ***R72*** | 219 | 742002M | Amado Rd, Amado | 0.0007 | 0 | 0.75 | Yes | No | Yes | No | 0.87 |
| ***R73*** | 235 | 874952W | Shonto Rd, Page | 0.0007 | 0 | 0.72 | Yes | No | Yes | No | 0.83 |
| ***R74*** | 230 | 874945L | Shonto Rd, Page | 0.0007 | 0 | 0.74 | Yes | Yes | No | No | 0.82 |
| ***R75*** | 233 | 741442A | Hanna Rd, Picacho | 0.0007 | 0 | 0.72 | Yes | No | No | No | 0.76 |

# Appendix H – Crossing Treatment Cut Sheets

# Crossing ID: 025590V-Bethany Home Rd, West of 51st Ave, Glendale

**Refined Ranking**
4

**Refined Ranking Score**
13.551

**Annual Average Daily Traffic Volume (AADT)**
18111

**Number of Roadway Lanes**
6

**Number of Trains per Day**
12

**Number of Main Tracks**
1

**Train Speed**
40

**Urban/Rural Designation**
Urban

**Crossing Surface Material**
Concrete

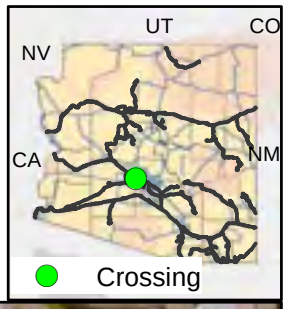
**Adequate Sight Distance**
No

**Horizontal or Vertical Curve/Skew**
Yes

**Current Warning Devices**
Lights and Gates

**Geometry More Than 4 Legs**
Yes

## Vicinity Map




## Crossing Location

# Crossing ID: 025590V-Bethany Home Rd, West of 51st Ave, Glendale

**Table 1: 2016-2020 Crash Summary**

| Crash Type | Number | User Type and Injury Severity | | |
|---|---|---|---|---|
| | | Auto (No Injury, Injury, Fatal) | Bicycle (No Injury, Injury, Fatal) | Pedestrian (No Injury, Injury, Fatal) |
| Stopped on crossing | 3 | 3,0,0 | 0,0,0 | 0,0,0 |
| Went around the gates | 0 | 0,0,0 | 0,0,0 | 0,0,0 |
| Did not stop | 1 | 0,0,0 | 1,0,0 | 0,0,0 |
| Went thru gates | 0 | 0,0,0 | 0,0,0 | 0,0,0 |
| Stopped then proceeded | 2 | 2,0,0 | 0,0,0 | 0,0,0 |
| Suicide/attempted suicide | 0 | 0,0,0 | 0,0,0 | 0,0,0 |
| Other | 1 | 1,0,0 | 0,0,0 | 0,0,0 |
| Unknown | 1 | 1,0,0 | 0,0,0 | 0,0,0 |

*Source: FRA database and ADOT ACIS database (2016-2020)*

**Figure 1: Shadow Reduces Visibility of Gates**

*Source: Google Street View, looking east*

# Crossing ID: 025590V-Bethany Home Rd, West of 51st Ave, Glendale

## Need for Improvement

Despite recent treatments, this crossing continues to have multiple crashes. A task force has been established to review the crossing, including ADOT, ACC, City of Glendale, and BNSF. This is an active discussion; the next meeting is in February 2022. BNSF indicated 104 incidents have occurred here since the last treatments were implemented; BNSF sends staff to the crossing five or six times a month. Presently, the task force is considering grade separation as a long-term solution or closing the crossing as a last resort treatment. Nearer-term treatments such as a pre-signal and lighting are recommended in the interim.

## Challenges

Intersection skew. Overpass casts shadow, impacting visibility of gates eastbound, and southeast to westbound drivers have limited visibility of approaching trains. Six of seven crashes with vehicle direction of travel reported were traveling eastbound. Seven of eight crashes occurred during dusk, dawn, or nighttime conditions. Limited visibility of “Stop Here on Red” sign for center lanes. Recent treatments have been implemented but crashes continue to occur at the crossing. Recently, there have been more crashes involving the gate being struck at this crossing. Maintenance and costs of repairs for the gate are costly.

## Other Crossing Considerations

Median and partial grade separation are present. Glendale recently extended the left turn bays on Grand Avenue. In addition, there is a large development expected on the southwest corner of this intersection that will generate high volumes of truck traffic.

## Programmed Projects

No programmed projects within next five years.

## Recently Constructed Projects

Installed advanced preemption, left turn signal adjustments, lights, gates, cantilever and concrete surface.

## Recommended Treatments

Recommended treatments include:

1. Pre-signal on west leg (near-term).
2. Additional lighting under the overpass (near-term).
3. Grade separation (long-term).

# Crossing ID: 025590V-Bethany Home Rd, West of 51st Ave, Glendale

## SHRAP Strategies Addressed by Treatments

- Identify Locations for Unconventional Highway-Rail Crossing Countermeasures
- Consider Crossing Closures and Separations

## Effectiveness of Treatments

| Treatment | Crash Type | Effectiveness | |
|---|---|---|---|
| | | Qualitative | Quantitative (%)* |
| Pre-signal | Stopped on crossing | High | Not Available |
| | Went around gates | Low | |
| | Did not stop | High | |
| | Went through gates | High | |
| | Stopped then proceeded | N/A | |
| Improved Lighting | Stopped on crossing | High | Not Available |
| | Went around gates | Low | |
| | Did not stop | High | |
| | Went through gates | High | |
| | Stopped then proceeded | Low | |
| Grade Separation | Stopped on crossing | High | 100% |
| | Went around gates | High | |
| | Did not stop | High | |
| | Went through gates | High | |
| | Stopped then proceeded | High | |

**Source: Noteworthy Practices Guide: Highway-Railway Grade Crossing Action Plan and Project Prioritization (2016)*

Best Practices/Considerations:

- Pre-signals can be an effective way to manage queueing and reduce crashes at railroad crossings.
- Where the clear storage distance (CSD) is greater than that which is typical for a pre-signal, 50-75 feet to 200-250 feet, a combination pre-signal/queue cutter should be considered.
- Illuminate crossing and 100-foot approach zone.
- Wherever possible, a grade separation or crossing closure will be the most effective treatment to reduce railroad crashes.

## Planning-Level Cost

The estimated cost for the pre-signal and additional lighting is $740,000. The estimated cost for grade separation is $108.56 million per the draft MAG Regional Transportation Plan.

Crossing closure costs were not estimated as this is reserved as a “last resort.”

# Crossing ID: 025590V-Bethany Home Rd, West of 51st Ave, Glendale

## Funding Readiness

No funding has been identified for the near-term and long-term treatments. The pre-signal and improved lighting appear eligible for Section 130 funds. Grade separation is cost-prohibitive to use only Section 130 funds. The draft MAG Regional Transportation Plan that is currently being updated shows grade separation at this crossing being funded in Phase II.

## Local Agency Discussion

Local agencies including ADOT, ACC, City of Glendale, and BNSF support continued discussion regarding the recommended treatments. An on-crossing diagnostic was held between the stakeholders to observe and discuss potential treatments. Adjustments to the left turn signal timing were made as one of the treatments. Pre-signal and additional lighting should be implemented. The effectiveness of these treatments should be observed at the crossing.

## Implementation Considerations

The pre-signal and improved lighting are feasible and relatively straightforward treatments. Implementation of these treatments should be coordinated with the MAG program to avoid “throw away” infrastructure. Ongoing maintenance responsibilities and costs will need to be addressed. Implementing grade separation will require a significant amount of funding and design and construction would be complex given there is already one grade-separated structure in the area and that the railroad tracks cross very close to the intersection.

# Crossing ID: 025132G-San Francisco St, South of Historic Rte 66, Flagstaff

**Refined Ranking**
5

**Refined Ranking Score**
8.719

**Annual Average Daily Traffic Volume (AADT)**
5185

**Number of Roadway Lanes**
3

**Number of Trains per Day**
77

**Number of Main Tracks**
2

**Train Speed**
45

**Urban/Rural Designation**
Urban

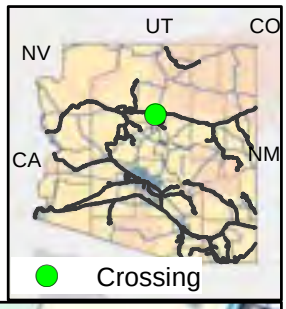
**Crossing Surface Material**
Concrete

**Adequate Sight Distance**
No

**Horizontal or Vertical Curve/Skew**
No

**Current Warning Devices**
Lights and Gates

**Geometry More Than 4 Legs**
No




## Crossing Location

## Vicinity Map

# Crossing ID: 025132G-San Francisco St, South of Historic Rte 66, Flagstaff

**Table 1: 2016-2020 Crash Summary**

| Crash Type | Number | User Type and Injury Severity | | |
|---|---|---|---|---|
| | | Auto (No Injury, Injury, Fatal) | Bicycle (No Injury, Injury, Fatal) | Pedestrian (No Injury, Injury, Fatal) |
| Stopped on crossing | 0 | 0,0,0 | 0,0,0 | 0,0,0 |
| Went around the gates | 3 | 0,0,0 | 0,0,0 | 0,1,2 |
| Did not stop | 0 | 0,0,0 | 0,0,0 | 0,0,0 |
| Went thru gates | 0 | 0,0,0 | 0,0,0 | 0,0,0 |
| Stopped then proceeded | 0 | 0,0,0 | 0,0,0 | 0,0,0 |
| Suicide/attempted suicide | 0 | 0,0,0 | 0,0,0 | 0,0,0 |
| Other | 2 | 0,0,0 | 0,0,0 | 0,0,2 |
| Unknown | 0 | 0,0,0 | 0,0,0 | 0,0,0 |

*Source: FRA database and ADOT ACIS database (2016-2020)*

**Figure 1: Bidirectional Pedestrian/Bicycle Gates Not Present**

*Source: Google Street View, looking south*

# Crossing ID: 025132G-San Francisco St, South of Historic Rte 66, Flagstaff

**Figure 2: Pedestrian Signage and Fencing**


*Source: Google Street View, looking south*

## Need for Improvement

There are high volumes of pedestrians at this crossing, including students, general residential population, tourists, and homeless individuals. This crossing has been challenging for many years and has been difficult to address. This is a historic area, so aesthetics are important to the community. Trespassing is also a concern in the area.

## Challenges

Four of five crashes are coded as a pedestrian headed northbound. Four of five crashes occurred during dusk or dark lighting conditions. There are two main tracks and one spur track to cross. At least one crash, and potentially more, was due to a pedestrian being hit by a second train. Train-pedestrian crash data from 2010 through 2021 indicated pedestrians often “race” the train at this crossing.

## Other Crossing Considerations

There is a detectable warning surface and some fencing present. The vehicular gates cross the sidewalk but are only present for the northbound vehicular direction of travel on this one-way street. Pedestrian signage is present. Crossing is in a quiet zone.

# Crossing ID: 025132G-San Francisco St, South of Historic Rte 66, Flagstaff

## Programmed Projects

No programmed projects within next five years.

## Recently Constructed Projects

Advanced preemption.

Miscellaneous treatments were recommended as part of a 2018 diagnostic; any outstanding items should be implemented. These include increasing the widths of the grade crossing pads, on east side, to BNSF standards. BNSF should consider securing access gate to right-of-way access in southeast quadrant when not in use. Additional signage such as “W10-2, W10-3, and W10-4” should be considered on each parallel highway approach following MUTCD Section 8B.6. Vegetation blocking the W10- , “No Train Horn” sign should be removed consider moving sign. City staff noted need to confirm pavement markings satisfy requirements listed in MUTCD Section 8B. Grade separating the bicycle/pedestrian crossing was deemed infeasible as part of the diagnostic.

## Recommended Treatments

Recommended treatments include:

1. Automatic pedestrian gates with skirt added to existing mast flashers on north side of crossing across the sidewalk on both sides of the street with additional barriers/fencing to discourage trespassing. Add skirt to existing vehicle gates at crossing. Decorative fencing could be considered to channelize pedestrians to prevent them from circumventing warning devices.
2. “Second Train” signage near all four pedestrian crossings.
3. Improved lighting; consideration to the local dark sky ordinance should be given.

Increased enforcement of pedestrian trespassing should be encouraged. Additional community outreach with Operation Lifesaver is encouraged to educate the public about rail crossing safety.

## SHRAP Strategies Addressed by Treatments

- Identify Locations for Unconventional Highway-Rail Crossing Countermeasures
- Support Rail Crossing Safety Public Education and Awareness Efforts
- Support Active Enforcement at High-Risk Crossings

# Crossing ID: 025132G-San Francisco St, South of Historic Rte 66, Flagstaff

## Effectiveness of Treatments

| Treatment | Crash Type | Effectiveness | |
|---|---|---|---|
| | | Qualitative | Quantitative (%)* |
| Pedestrian Gates with Additional Barriers/Fencing and Gate Skirts | Stopped on crossing | High | Not Available |
| | Went around gates | High | |
| | Did not stop | High | |
| | Went through gates | N/A | |
| | Stopped then proceeded | N/A | |
| "Second Train" Signage | Stopped on crossing | Low | Not Available |
| | Went around gates | N/A | |
| | Did not stop | Low | |
| | Went through gates | Low | |
| | Stopped then proceeded | High | |
| Improved Lighting | Stopped on crossing | High | Not Available |
| | Went around gates | Low | |
| | Did not stop | High | |
| | Went through gates | High | |
| | Stopped then proceeded | Low | |

**Source: Noteworthy Practices Guide: Highway-Railway Grade Crossing Action Plan and Project Prioritization (2016)*

Best Practices/Considerations:

- Pedestrian gates should be considered where pedestrian volumes and/or crashes are high.
- Crossing gate "skirts" should be considered at locations where pedestrians frequently circumvent the gate arm.
- "Second Train" signage should be considered near pedestrian crossings where there are multiple tracks to cross.
- Illuminate crossing and 100-foot approach zone.

## Planning-Level Cost

The estimated cost for the pedestrian gates, fencing, skirts, "Second Train" signage, and additional lighting is $590,000.

## Funding Readiness

No funding has been identified for these treatments but they appear to be eligible for Section 130 funds.

# Crossing ID: 025132G-San Francisco St, South of Historic Rte 66, Flagstaff

## Local Agency Discussion

The City of Flagstaff supports continued discussion regarding the recommended treatments. There is a need to have additional pedestrian facilities due to high pedestrian activity in the area. Consider using gates and fencing that align with area aesthetics; City staff noted acrylic fencing could be considered. The City of Flagstaff indicated pedestrian gates and fencing are preferable to a Z-crossing.

## Implementation Considerations

These treatments are feasible and relatively straightforward. Ongoing maintenance responsibilities and costs will need to be addressed.

# Crossing ID: 025129Y-Fanning Dr, South of Historic Rte 66, Flagstaff

**Refined Ranking**
6

**Refined Ranking Score**
8.022

**Annual Average Daily Traffic Volume (AADT)**
4617

**Number of Roadway Lanes**
4

**Number of Trains per Day**
77

**Number of Main Tracks**
2

**Train Speed**
55

**Urban/Rural Designation**
Urban

**Crossing Surface Material**
Asphalt and Concrete

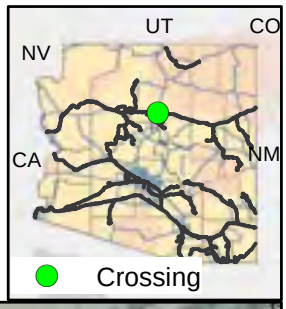
**Adequate Sight Distance**
Yes

**Horizontal or Vertical Curve/Skew**
No

**Current Warning Devices**
Lights and Gates

**Geometry More Than 4 Legs**
No

**Vicinity Map**




**Crossing Location**

# Crossing ID: 025129Y-Fanning Dr, South of Historic Rte 66, Flagstaff

**Table 1: 2016-2020 Crash Summary**

| Crash Type | Number | User Type and Injury Severity | | |
|---|---|---|---|---|
| | | Auto (No Injury, Injury, Fatal) | Bicycle (No Injury, Injury, Fatal) | Pedestrian (No Injury, Injury, Fatal) |
| Stopped on crossing | 0 | 0,0,0 | 0,0,0 | 0,0,0 |
| Went around the gates | 1 | 0,0,0 | 0,0,0 | 0,0,1 |
| Did not stop | 0 | 0,0,0 | 0,0,0 | 0,0,0 |
| Went thru gates | 0 | 0,0,0 | 0,0,0 | 0,0,0 |
| Stopped then proceeded | 0 | 0,0,0 | 0,0,0 | 0,0,0 |
| Suicide/attempted suicide | 0 | 0,0,0 | 0,0,0 | 0,0,0 |
| Other | 4 | 0,0,0 | 0,0,0 | 0,2,2 |
| Unknown | 0 | 0,0,0 | 0,0,0 | 0,0,0 |

*Source: FRA database and ADOT ACIS database (2016-2020)*

**Figure 1: Fanning Drive Crossing**

*Source: Google Street View, looking south*

# Crossing ID: 025129Y-Fanning Dr, South of Historic Rte 66, Flagstaff

**Figure 2: Pedestrian Warnings at Crossing**


*Source: Google Street View, looking north*

## Need for Improvement

There are high volumes of pedestrians at this crossing. There is a homeless shelter on one side of the tracks and a convenience store on the opposite side, which are pedestrian generators/attractors. This crossing has been challenging for many years and has been difficult to address. Trespassing is also a concern in the area.

## Challenges

Five of five crashes are coded as a pedestrian heading northbound. Four of the five crashes are coded as “moving over crossing”. There are two main tracks to cross. Crash data indicated one crash was due to a pedestrian being hit by a second train; other reports did not specifically denote a second train strike.

# Crossing ID: 025129Y-Fanning Dr, South of Historic Rte 66, Flagstaff

## Other Crossing Considerations

There is a detectable warning surface. There are vehicle gates present that cross the sidewalk in the vehicular direction of travel, but no other barriers in the area. Crossing is in a quiet zone. Wayside horns are present, but the City of Flagstaff has expressed interest in finding another supplementary safety measure to replace the wayside horns that is quiet zone-eligible but produces less noise.

## Programmed Projects

No programmed projects within next five years.

## Recently Constructed Projects

None.

The 2018 diagnostic recommended coordination with the City for preemption. The outcome of this recommendation is unknown; coordination should occur if it has not. Other recommendations from the diagnostic that should be considered include relocating BNSF right-of-way access on southwest quadrant to a location along Industrial Drive. Consider using gates and fencing that align with area aesthetic; City staff noted acrylic fencing could be considered. The additional proposed vehicle gates would effectively create a four-quadrant gate scenario, which qualifies as a quiet zone supplementary safety measure, meaning the wayside horns could be eliminated. Consider medians and bollards to deter users from circumventing gates. Additional signage such as “W10-2, W10-3, and W10-4” should be considered on each parallel highway approach following MUTCD Section 8B.6. Grade separating the bicycle/pedestrian crossing was deemed infeasible. City staff noted need to confirm pavement markings satisfy requirements listed in MUTCD Section 8B.

## Recommended Treatments

Recommended treatments include:

1. Automatic vehicle gates with skirt on both outbound sides of the crossing that also extend across the sidewalk with barriers/fencing to discourage trespassing. Fencing should be provided to channelize pedestrians to prevent them from circumventing warning devices. Add skirt to existing vehicle gates at crossing.
2. Add “Second Train” blank out signage near all four pedestrian crossings.
3. Improved lighting; consideration to the local dark say ordinance should be given.

Increased enforcement of pedestrian trespassing should be encouraged. Additional community outreach with Operation Lifesaver is encouraged to educate the public about rail crossing safety.

## SHRAP Strategies Addressed by Treatments

- Identify Locations for Unconventional Highway-Rail Crossing Countermeasures
- Support Rail Crossing Safety Public Education and Awareness Efforts

## Crossing ID: 025129Y-Fanning Dr, South of Historic Rte 66, Flagstaff

- Support Active Enforcement at High-Risk Crossings

### Effectiveness of Treatments

| Treatment | Crash Type | Effectiveness | |
|---|---|---|---|
| | | Qualitative | Quantitative (%)* |
| Vehicle Gates with Skirt and Barriers/Fencing | Stopped on crossing | High | Not Available |
| | Went around gates | High | |
| | Did not stop | High | |
| | Went through gates | N/A | |
| | Stopped then proceeded | N/A | |
| "Second Train" Signage | Stopped on crossing | Low | Not Available |
| | Went around gates | N/A | |
| | Did not stop | Low | |
| | Went through gates | Low | |
| | Stopped then proceeded | High | |
| Improved Lighting | Stopped on crossing | High | Not Available |
| | Went around gates | Low | |
| | Did not stop | High | |
| | Went through gates | High | |
| | Stopped then proceeded | Low | |

**Source: Noteworthy Practices Guide: Highway-Railway Grade Crossing Action Plan and Project Prioritization (2016)*

Best Practices/Considerations:

- Crossing gate "skirts" should be considered at locations where pedestrians frequently circumvent the gate arm.
- "Second Train" signage should be considered near pedestrian crossings where there are multiple tracks to cross.
- Illuminate crossing and 100-foot approach zone.

### Planning-Level Cost

The estimated cost for the vehicle gates, fencing, skirts, "second train" blank out signage, and additional lighting is $1.06 million.

### Funding Readiness

No funding has been identified for these treatments but they appear to be eligible for Section 130 funds.

### Local Agency Discussion

The City of Flagstaff supports continued discussion regarding the treatments.

## Crossing ID: 025129Y-Fanning Dr, South of Historic Rte 66, Flagstaff

### Implementation Considerations

These treatments are feasible and relatively straightforward. Ongoing maintenance responsibilities and costs will need to be addressed.

## Crossing ID: 025418A-59th Ave & Glendale Ave, Glendale

**Refined Ranking**
8

**Refined Ranking Score**
7.812

**Annual Average Daily Traffic Volume (AADT)**
52000

**Number of Roadway Lanes**
6

**Number of Trains per Day**
12

**Number of Main Tracks**
1

**Train Speed**
40

**Urban/Rural Designation**
Urban

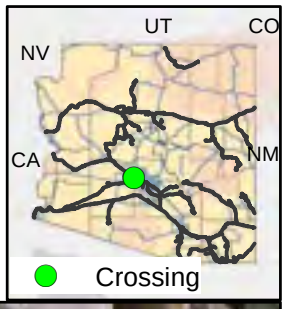
**Crossing Surface Material**
Concrete

**Adequate Sight Distance**
No

**Horizontal or Vertical Curve/Skew**
Yes

**Current Warning Devices**
Flashing Lights

**Geometry More Than 4 Legs**
No




### Crossing Location

### Vicinity Map

# Crossing ID: 025418A- 59th Ave & Glendale Ave, Glendale

**Table 1: 2016-2020 Crash Summary**

| Crash Type | Number | User Type and Injury Severity | | |
|---|---|---|---|---|
| | | Auto (No Injury, Injury, Fatal) | Bicycle (No Injury, Injury, Fatal) | Pedestrian (No Injury, Injury, Fatal) |
| Stopped on crossing | 0 | 0,0,0 | 0,0,0 | 0,0,0 |
| Went around the gates | 0 | 0,0,0 | 0,0,0 | 0,0,0 |
| Did not stop | 1 | 0,0,0 | 0,0,0 | 0,1,0 |
| Went thru gates | 0 | 0,0,0 | 0,0,0 | 0,0,0 |
| Stopped then proceeded | 1 | 1,0,0 | 0,0,0 | 0,0,0 |
| Suicide/attempted suicide | 0 | 0,0,0 | 0,0,0 | 0,0,0 |
| Other | 0 | 0,0,0 | 0,0,0 | 0,0,0 |
| Unknown | 1 | 0,1,0 | 0,0,0 | 0,0,0 |

*Source: FRA database and ADOT ACIS database (2016-2020)*

**Figure 1: Crossing Considerations**

*Source: Google Street View, looking south*

# Crossing ID: 025418A- 59th Ave & Glendale Ave, Glendale

**Figure 2: Northbound Right Turn Lane**

*Source: Google Street View, looking north*

## Need for Improvement

This crossing had three train-related crashes in the last five years - two involving vehicles and one (a fatality) involving a pedestrian.

## Challenges

The City of Glendale noted this intersection experiences high volumes of pedestrian traffic; specifically, this intersection is near the historic district and many pedestrians pass through. The City of Glendale has a parking garage in the northeast corner of the intersection and noted their driveway configuration may change. The size and geometry of the intersection makes it difficult for both pedestrians and vehicle to navigate. Gates are not present; staff noted they were not aware of any opposition to gates. There is visual clutter at the crossing, which adds to complexity.

## Other Crossing Considerations

Median is present. Protected/permitted left-turns on all legs are present. There is signal preemption for the train and there are advanced message boards. The intersection is difficult to navigate. The southbound to westbound right turn is difficult to navigate.

## Programmed Projects

No programmed projects within next five years.

## Recently Constructed Projects

None.

## Recommended Treatments

Recommended treatments include:

1. Automatic vehicle gates.
2. Automatic pedestrian gates with skirt placed across the sidewalk on the southeast corner and the northwest corner for the direction of travel not covered by the vehicle gates.

# Crossing ID: 025418A- 59th Ave & Glendale Ave, Glendale

## SHRAP Strategies Addressed by Treatments

- Identify Locations for Conventional Highway-Rail Crossing Countermeasures
- Identify Locations for Unconventional Highway-Rail Crossing Countermeasures

## Effectiveness of Treatments

| Treatment | Crash Type | Effectiveness | |
|---|---|---|---|
| | | Qualitative | Quantitative (%)* |
| Vehicle Gates | Stopped on crossing | High | 88% |
| | Went around gates | High | |
| | Did not stop | High | |
| | Went through gates | High | |
| | Stopped then proceeded | High | |
| Pedestrian Gates with Skirt | Stopped on crossing | High | Not Available |
| | Went around gates | High | |
| | Did not stop | High | |
| | Went through gates | N/A | |
| | Stopped then proceeded | N/A | |

**Source: Noteworthy Practices Guide: Highway-Railway Grade Crossing Action Plan and Project Prioritization (2016)*

Best Practices/Considerations:

- Vehicle gates should be considered where vehicle volumes and/or crashes are high.
- Pedestrian gates should be considered where pedestrian volumes and/or crashes are high.
- Crossing gate “skirts” should be considered at locations where pedestrians frequently circumvent the gate arm.

## Planning-Level Cost

The estimated cost for the vehicle gates and pedestrian gates with skirts is $2.44 million.

## Funding Readiness

No funding has been identified for these treatments but they appear eligible for Section 130 funds.

## Local Agency Discussion

The City of Glendale supports continued discussion regarding the recommended treatments. Treatments for pedestrians are encouraged as there is high pedestrian activity in the area that will likely increase.

## Implementation Considerations

These treatments are feasible and relatively straightforward. Ongoing maintenance responsibilities and costs will need to be addressed.

# Crossing ID: 025133N-Beaver St, South of Historic Rte 66, Flagstaff

**Refined Ranking**
9

**Refined Ranking Score**
7.134

**Annual Average Daily Traffic Volume (AADT)**
5961

**Number of Roadway Lanes**
2

**Number of Trains per Day**
77

**Number of Main Tracks**
2

**Train Speed**
45

**Urban/Rural Designation**
Urban

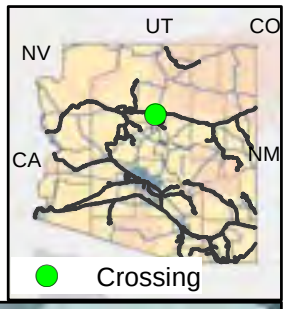
**Crossing Surface Material**
Asphalt and Concrete

**Adequate Sight Distance**
No

**Horizontal or Vertical Curve/Skew**
No

**Current Warning Devices**
Lights and Gates

**Geometry More Than 4 Legs**
No




## Crossing Location

## Vicinity Map

# Crossing ID: 025133N- Beaver St, South of Historic Rte 66, Flagstaff

**Table 1: 2016-2020 Crash Summary**

| Crash Type | Number | User Type and Injury Severity | | |
|---|---|---|---|---|
| | | Auto (No Injury, Injury, Fatal) | Bicycle (No Injury, Injury, Fatal) | Pedestrian (No Injury, Injury, Fatal) |
| Stopped on crossing | 0 | 0,0,0 | 0,0,0 | 0,0,0 |
| Went around the gates | 2 | 0,0,0 | 0,0,0 | 0,0,2 |
| Did not stop | 0 | 0,0,0 | 0,0,0 | 0,0,0 |
| Went thru gates | 0 | 0,0,0 | 0,0,0 | 0,0,0 |
| Stopped then proceeded | 0 | 0,0,0 | 0,0,0 | 0,0,0 |
| Suicide/attempted suicide | 0 | 0,0,0 | 0,0,0 | 0,0,0 |
| Other | 2 | 1,0,0 | 0,0,0 | 0,1,0 |
| Unknown | 0 | 0,0,0 | 0,0,0 | 0,0,0 |

*Source: FRA database and ADOT ACIS database (2016-2020)*

**Figure 1: Street-Level View**

*Source: Google Street View, looking south*

# Crossing ID: 025133N- Beaver St, South of Historic Rte 66, Flagstaff

**Figure 2: Pedestrian Warnings**


*Source: Google Street View, looking north*

## Need for Improvement

There are high volumes of pedestrians at this crossing, including students, general residential population, tourists, and homeless individuals. This crossing has been challenging for many years and has been difficult to address. This is a historic area, so aesthetics are important to the community. Trespassing is also a concern in the area.

## Challenges:

Three of the four crashes were coded as occurring during nighttime conditions. There are two main tracks to cross. Per the 2018 diagnostic, the crossing has a history of wrong way drivers.

## Other Crossing Considerations

Beaver Street is one-way southbound. Automatic gates and flashers are installed at the crossing in the vehicular direction of travel. Pedestrian warning signs are installed on the south leg of the crossing and detectable warning strips are present. Crossing is located in a quiet zone.

# Crossing ID: 025133N- Beaver St, South of Historic Rte 66, Flagstaff

## Programmed Projects

No programmed projects within next five years.

## Recently Constructed Projects

Advanced preemption.

Miscellaneous treatments were recommended as part of a 2018 diagnostic; any outstanding items should be implemented. Grade separating the bicycle/pedestrian crossing was deemed infeasible as part of the diagnostic. Recommendations included additional signage such as “W10-2, W10-3, and W10-4” should be considered on each parallel highway approach following MUTCD Section 8B.6. City staff noted need to confirm pavement markings satisfy requirements listed in MUTCD Section 8B. Consider replacing R15-2P “2 Track” sign on northeast quadrant.

## Recommended Treatments

Recommended treatments include:

1. Automatic pedestrian gates with skirt added to existing mast flashers on south side of crossing across the sidewalk on both sides of the street with additional barriers/fencing. Add skirt to existing vehicle gates at crossing. Decorative fencing is included to channelize pedestrians to prevent them from circumventing warning devices.
2. “Second Train” signage near all four pedestrian crossings.
3. Improved lighting; consideration to the local dark sky ordinance should be given.

Increased enforcement of pedestrian trespassing should be encouraged. Additional community outreach with Operation Lifesaver is encouraged to educate the public about rail crossing safety.

## SHRAP Strategies Addressed by Treatments

- Identify Locations for Unconventional Highway-Rail Crossing Countermeasures
- Support Rail Crossing Safety Public Education and Awareness Efforts
- Support Active Enforcement at High-Risk Crossings

# Crossing ID: 025133N- Beaver St, South of Historic Rte 66, Flagstaff

## Effectiveness of Treatments

| Treatment | Crash Type | Effectiveness | |
|---|---|---|---|
| | | Qualitative | Quantitative (%)* |
| Pedestrian Gates with Additional Barriers/Fencing and Gate Skirts | Stopped on crossing | High | Not Available |
| | Went around gates | High | |
| | Did not stop | High | |
| | Went through gates | N/A | |
| | Stopped then proceeded | N/A | |
| "Second Train" Signage | Stopped on crossing | Low | Not Available |
| | Went around gates | N/A | |
| | Did not stop | Low | |
| | Went through gates | Low | |
| | Stopped then proceeded | High | |
| Improved Lighting | Stopped on crossing | High | Not Available |
| | Went around gates | Low | |
| | Did not stop | High | |
| | Went through gates | High | |
| | Stopped then proceeded | Low | |

**Source: Noteworthy Practices Guide: Highway-Railway Grade Crossing Action Plan and Project Prioritization (2016)*

Best Practices/Considerations:

- Pedestrian gates should be considered where pedestrian volumes and/or crashes are high.
- Crossing gate "skirts" should be considered at locations where pedestrians frequently circumvent the gate arm.
- "Second Train" signage should be considered near pedestrian crossings where there are multiple tracks to cross.
- Illuminate crossing and 100-foot approach zone.

## Planning-Level Cost

The estimated cost for the pedestrian gates, fencing, skirts, "second train" signage, and additional lighting is $590,000.

## Funding Readiness

No funding has been identified for these treatments but they appear eligible for Section 130 funds.

# Crossing ID: 025133N- Beaver St, South of Historic Rte 66, Flagstaff

## Local Agency Discussion

The City of Flagstaff supports continued discussion regarding the recommended treatments. There is a need to have additional pedestrian facilities due to high pedestrian activity in the area. Consider using gates and fencing that align with area aesthetics; City staff noted acrylic fencing could be considered. The City of Flagstaff indicated pedestrian gates and fencing are preferable to a Z-crossing.

## Implementation Considerations

These treatments are feasible and relatively straightforward. Ongoing maintenance responsibilities and costs will need to be addressed.

# Crossing ID: 025121A-Ponderosa Pkwy, South of Historic Rte 66, Flagstaff

**Refined Ranking**
13

**Refined Ranking Score**
4.073

**Annual Average Daily Traffic Volume (AADT)**
21089

**Number of Roadway Lanes**
6

**Number of Trains per Day**
77

**Number of Main Tracks**
2

**Train Speed**
55

**Urban/Rural Designation**
Urban

**Crossing Surface Material**
Asphalt and Concrete

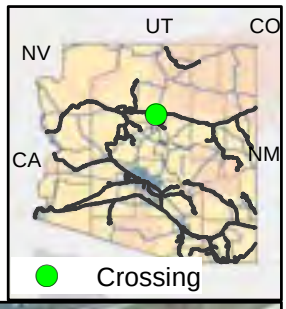
**Adequate Sight Distance**
Yes

**Horizontal or Vertical Curve/Skew**
No

**Current Warning Devices**
Lights and Gates

**Geometry More Than 4 Legs**
No

**Vicinity Map**




**Crossing Location**

# Crossing ID: 025131A-Ponderosa Pkwy, South of Historic Rte 66, Flagstaff

**Table 1: 2016-2020 Crash Summary**

| Crash Type | Number | User Type and Injury Severity | | |
|---|---|---|---|---|
| | | Auto (No Injury, Injury, Fatal) | Bicycle (No Injury, Injury, Fatal) | Pedestrian (No Injury, Injury, Fatal) |
| Stopped on crossing | 1 | 1,0,0 | 0,0,0 | 0,0,0 |
| Went around the gates | 0 | 0,0,0 | 0,0,0 | 0,0,0 |
| Did not stop | 0 | 0,0,0 | 0,0,0 | 0,0,0 |
| Went thru gates | 0 | 0,0,0 | 0,0,0 | 0,0,0 |
| Stopped then proceeded | 0 | 0,0,0 | 0,0,0 | 0,0,0 |
| Suicide/attempted suicide | 0 | 0,0,0 | 0,0,0 | 0,0,0 |
| Other | 0 | 0,0,0 | 0,0,0 | 0,0,0 |
| Unknown | 0 | 0,0,0 | 0,0,0 | 0,0,0 |

*Source: FRA database and ADOT ACIS database (2016-2020)*

**Figure 1: Spur/Tracks Merge**

*Source: Google Street View, looking north*

# Crossing ID: 025131A-Ponderosa Pkwy, South of Historic Rte 66, Flagstaff

**Figure 2: Gates and Flashers**

*Source: Google Street View, looking south*

**Figure 3: Pedestrian Signage and Markings**

*Source: Google Street View, looking north*

# Crossing ID: 025131A-Ponderosa Pkwy, South of Historic Rte 66, Flagstaff

## Need for Improvement

The crossing is very wide as there are two main tracks and two spur tracks. City staff noted residents are familiar with the crossing configuration but speculate tourists are not. The crossing configuration is unique, even to this area.

## Challenges

Tracks merge at location, creating a wide crossing. Crossing is very close to adjacent intersection. The signal is maintained by ADOT. Sometimes gate arms go up, but traffic light is still red, resulting in vehicles stacking on the tracks, which is an issue if another train then soon comes before the intersection queue can clear.

## Other Crossing Considerations

Median and automatic gates present. Sidewalks with pavement markings and signage present. Crossing is in a quiet zone.

## Programmed Projects

No programmed projects within next five years.

## Recently Constructed Projects

Advanced preemption.

Miscellaneous treatments were recommended as part of a 2018 diagnostic; any outstanding items should be implemented. Recommendations included additional signage such as “W10-2, W10-3, and W10-4” should be considered on each parallel highway approach following MUTCD Section 8B.6. City staff noted need to confirm pavement markings satisfy requirements listed in MUTCD Section 8B. Repair or replacement of the crossing pad in the southwest quadrant should be considered; the exposed steel and concrete creates an unsafe crossing condition for highway users. Increasing the widths of the grade crossing pads, on east and west side, to BNSF standards should be considered. Stop bar on southeast quadrant needs to be moved approximately 8 feet upstream from cantilever warning devices. Relocate “Do Not Stop on Tracks” sign from northeast quadrant to stop line on southeast quadrant.

## Recommended Treatments

Recommended treatments include:

1. Pre-signal on south leg for northbound traffic.
2. Improved lighting; consideration to the local dark sky ordinance should be given.

## SHRAP Strategies Addressed by Treatments

- Identify Locations for Unconventional Highway-Rail Crossing Countermeasures

# Crossing ID: 025131A-Ponderosa Pkwy, South of Historic Rte 66, Flagstaff

## Effectiveness of Treatments

| Treatment | Crash Type | Effectiveness | |
|---|---|---|---|
| | | Qualitative | Quantitative (%)* |
| Pre-signal | Stopped on crossing | High | Not Available |
| | Went around gates | Low | |
| | Did not stop | High | |
| | Went through gates | High | |
| | Stopped then proceeded | N/A | |
| Improved Lighting | Stopped on crossing | High | Not Available |
| | Went around gates | Low | |
| | Did not stop | High | |
| | Went through gates | High | |
| | Stopped then proceeded | Low | |

**Source: Noteworthy Practices Guide: Highway-Railway Grade Crossing Action Plan and Project Prioritization (2016)*

Best Practices/Considerations:

- Pre-signals can be an effective way to manage queueing and reduce crashes at railroad crossings.
- Where the clear storage distance (CSD) is greater than that which is typical for a pre-signal, 50-75 feet to 200-250 feet, a combination pre-signal/queue cutter should be considered.
- Illuminate crossing and 100-foot approach zone.

## Planning-Level Cost

The estimated cost for the pre-signal and additional lighting is $710,000.

## Funding Readiness

No funding has been identified for these treatments but they appear to be eligible for Section 130 funds.

## Local Agency Discussion

The City of Flagstaff supports continued discussion regarding the recommended treatments. Striping an exclusion zone is not desirable. The City noted ADOT had discussed a pre-signal here in the past, which they would support if ADOT owns/maintains/coordinates.

## Implementation Considerations

These treatments are feasible and relatively straightforward. Ongoing maintenance responsibilities and costs will need to be addressed.

# Crossing ID: 025017A-Apache Ave, South of Joy Nevin Ave, Holbrook

**Refined Ranking**
15

**Refined Ranking Score**
3.86

**Annual Average Daily Traffic Volume (AADT)**
14728

**Number of Roadway Lanes**
4

**Number of Trains per Day**
77

**Number of Main Tracks**
2

**Train Speed**
90

**Urban/Rural Designation**
Rural

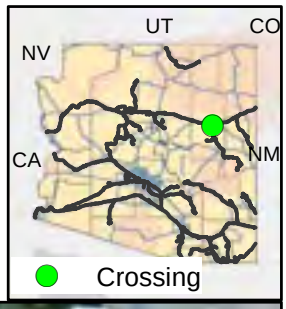
**Crossing Surface Material**
Asphalt and Concrete

**Adequate Sight Distance**
No

**Horizontal or Vertical Curve/Skew**
Yes

**Current Warning Devices**
Lights and Gates

**Geometry More Than 4 Legs**
No




## Crossing Location

## Vicinity Map

# Crossing ID: 025017A- Apache Ave, South of Joy Nevin Ave, Holbrook

**Table 1: 2016-2020 Crash Summary**

| Crash Type | Number | User Type and Injury Severity | | |
|---|---|---|---|---|
| | | Auto (No Injury, Injury, Fatal) | Bicycle (No Injury, Injury, Fatal) | Pedestrian (No Injury, Injury, Fatal) |
| Stopped on crossing | 0 | 0,0,0 | 0,0,0 | 0,0,0 |
| Went around the gates | 0 | 0,0,0 | 0,0,0 | 0,0,0 |
| Did not stop | 0 | 0,0,0 | 0,0,0 | 0,0,0 |
| Went thru gates | 1 | 0,0,1 | 0,0,0 | 0,0,0 |
| Stopped then proceeded | 0 | 0,0,0 | 0,0,0 | 0,0,0 |
| Suicide/attempted suicide | 0 | 0,0,0 | 0,0,0 | 0,0,0 |
| Other | 0 | 0,0,0 | 0,0,0 | 0,0,0 |
| Unknown | 0 | 0,0,0 | 0,0,0 | 0,0,0 |

*Source: FRA database and ADOT ACIS database (2016-2020)*

**Figure 1: Gates and Flashers**


*Source: Google Street View, looking north*

# Crossing ID: 025017A- Apache Ave, South of Joy Nevin Ave, Holbrook

**Figure 2: Pedestrian Gates and Fencing**

*Source: Google Street View, looking south*

## Need for Improvement

This crossing had one train-related crash in the last five years that involved a vehicle and resulted in a fatality.

## Challenges

Vehicles stack back into the crossing periodically due to the adjacent traffic signal. Per agency input, northbound vehicles have a downgrade approaching the crossing and often are speeding.

## Other Crossing Considerations

Automatic gates, flashers, pedestrian gates, and fences/barrier present.

## Programmed Projects

No programmed projects within next five years.

## Recently Constructed Projects

None.

# Crossing ID: 025017A- Apache Ave, South of Joy Nevin Ave, Holbrook

## Recommended Treatments

Recommended treatments include:

1. Sidewalk replacement and extension of fencing to align with pedestrian gate.
2. Concrete crossing panel replacement across entire crossing.
3. Pre-signal on south side of crossing for northbound traffic.

## SHRAP Strategies Addressed by Treatments

- Identify Locations for Conventional Highway-Rail Crossing Countermeasures
- Identify Locations for Unconventional Highway-Rail Crossing Countermeasures
- Address Rural Crossing Needs

## Effectiveness of Treatments

| Treatment | Crash Type | Effectiveness | |
|---|---|---|---|
| | | Qualitative | Quantitative (%)* |
| Sidewalk Replacement with Additional Barriers/Fencing | Stopped on crossing | Low | Not Available |
| | Went around gates | N/A | |
| | Did not stop | Low | |
| | Went through gates | Low | |
| | Stopped then proceeded | N/A | |
| Crossing Surface Replacement | Stopped on crossing | High | Not Available |
| | Went around gates | N/A | |
| | Did not stop | N/A | |
| | Went through gates | N/A | |
| | Stopped then proceeded | N/A | |
| Pre-signal | Stopped on crossing | High | Not Available |
| | Went around gates | Low | |
| | Did not stop | High | |
| | Went through gates | High | |
| | Stopped then proceeded | Low | |

**Source: Noteworthy Practices Guide: Highway-Railway Grade Crossing Action Plan and Project Prioritization (2016)*

Best Practices/Considerations:

- Sidewalks and crossing surfaces should meet current standards and provide a smooth travel path for all travelers.
- Pre-signals can be an effective way to manage queueing and reduce crashes at railroad crossings.
- Where the clear storage distance (CSD) is greater than that which is typical for a pre-signal, 50-75 feet to 200-250 feet, a combination pre-signal/queue cutter should be considered.

# Crossing ID: 025017A- Apache Ave, South of Joy Nevin Ave, Holbrook

## Planning-Level Cost

The estimated cost for replacing the sidewalk and crossing panels, extending the fencing, and installing a pre-signal is $1.61 million.

## Funding Readiness

No funding has been identified for these treatments but they appear to be eligible for Section 130 funds.

## Local Agency Discussion

ADOT, BNSF, and ACC performed a diagnostic evaluation of the crossing. ADOT and BNSF expressed maintenance issues with this crossing; the crossing is comprised of wooden ties and concrete planks. Additionally, agencies observed vehicles periodically “stack” on railroad tracks as they are stopped by the red light at Hopi Dr/Business Route I-40.

## Implementation Considerations

These treatments are feasible and relatively straightforward. Ongoing maintenance responsibilities and costs will need to be addressed.

## Crossing ID: 025023D-Obed Rd, Joseph City, Navajo County

**Refined Ranking**
16

**Refined Ranking Score**
3.761

**Annual Average Daily Traffic Volume (AADT)**
401

**Number of Roadway Lanes**
2

**Number of Trains per Day**
77

**Number of Main Tracks**
2

**Train Speed**
90

**Urban/Rural Designation**
Rural

**Crossing Surface Material**
Asphalt and Concrete

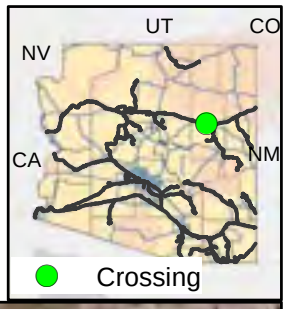
**Adequate Sight Distance**
Yes

**Horizontal or Vertical Curve/Skew**
Yes

**Current Warning Devices**
Lights and Gates

**Geometry More Than 4 Legs**
No

**Vicinity Map**




**Crossing Location**

# Crossing ID: 025023D- Obed Rd, Joseph City, Navajo County

**Table 1: 2016-2020 Crash Summary**

| Crash Type | Number | User Type and Injury Severity | | |
|---|---|---|---|---|
| | | Auto (No Injury, Injury, Fatal) | Bicycle (No Injury, Injury, Fatal) | Pedestrian (No Injury, Injury, Fatal) |
| Stopped on crossing | 0 | 0,0,0 | 0,0,0 | 0,0,0 |
| Went around the gates | 0 | 0,0,0 | 0,0,0 | 0,0,0 |
| Did not stop | 0 | 0,0,0 | 0,0,0 | 0,0,0 |
| Went thru gates | 0 | 0,0,0 | 0,0,0 | 0,0,0 |
| Stopped then proceeded | 0 | 0,0,0 | 0,0,0 | 0,0,0 |
| Suicide/attempted suicide | 0 | 0,0,0 | 0,0,0 | 0,0,0 |
| Other | 2 | 2,0,0 | 0,0,0 | 0,0,0 |
| Unknown | 0 | 0,0,0 | 0,0,0 | 0,0,0 |

*Source: FRA database and ADOT ACIS database (2016-2020)*

**Figure 1: Gates and Flashers**

*Source: Google Street View, looking south*

## Need for Improvement

This crossing had two train-related crashes in the last five years - both of which involved unoccupied vehicles.

## Challenges

Both crashes involved unoccupied vehicles stuck on crossing. One vehicle had a flat tire. Both crashes occurred during dark conditions.

# Crossing ID: 025023D- Obed Rd, Joseph City, Navajo County

## Other Crossing Considerations

Automatic gates and flashers installed at crossing. The local agency and law enforcement could be engaged to help ascertain why the vehicles were abandoned at the crossing. BNSF staff speculate people could be abandoning these vehicles. Coordination should occur prior to project initiation to verify project need.

## Programmed Projects

No programmed projects within next five years.

## Recently Constructed Projects

None.

## Recommended Treatments

Recommended treatments include:

1. Crossing surface and approach evaluation and repairs.

## SHRAP Strategies Addressed by Treatments

- Address Rural Crossing Needs

## Effectiveness of Treatments

| Treatment | Crash Type | Effectiveness | |
|---|---|---|---|
| | | Qualitative | Quantitative (%)* |
| Crossing Surface | Stopped on crossing | High | Not Available |
| | Went around gates | N/A | |
| | Did not stop | N/A | |
| | Went through gates | N/A | |
| | Stopped then proceeded | N/A | |

**Source: Noteworthy Practices Guide: Highway-Railway Grade Crossing Action Plan and Project Prioritization (2016)*

Best Practices/Considerations:

- Sidewalks and crossing surfaces should meet current standards and provide a smooth travel path for all travelers.

## Planning-Level Cost

The estimated cost for evaluating and repairing the crossing surface and approaches is $600,000.

## Funding Readiness

No funding has been identified for this treatment but it appears to be eligible for Section 130 funds.

# Crossing ID: 025023D- Obed Rd, Joseph City, Navajo County

## Local Agency Discussion

Navajo County has not provided input regarding the proposed treatments.

## Implementation Considerations

These treatments are feasible and relatively straightforward. Ongoing maintenance responsibilities and costs will need to be addressed. If there is not local agency support, it would likely be a challenge to obtain a local funding match if it is required.

# Crossing ID: 025651J-Greenway Rd, North of Grand Ave, Surprise

**Refined Ranking**
17

**Refined Ranking Score**
3.689

**Annual Average Daily Traffic Volume (AADT)**
9555

**Number of Roadway Lanes**
4

**Number of Trains per Day**
10

**Number of Main Tracks**
1

**Train Speed**
49

**Urban/Rural Designation**
Urban

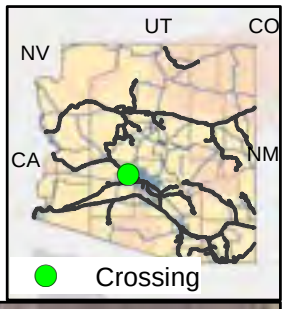
**Crossing Surface Material**
Asphalt and Concrete

**Adequate Sight Distance**
Yes

**Horizontal or Vertical Curve/Skew**
No

**Current Warning Devices**
Lights and Gates

**Geometry More Than 4 Legs**
No




## Crossing Location

## Vicinity Map

# Crossing ID: 025651J-Greenway Rd, North of Grand Ave, Surprise

**Table 1: 2016-2020 Crash Summary**

| Crash Type | Number | User Type and Injury Severity | | |
|---|---|---|---|---|
| | | Auto (No Injury, Injury, Fatal) | Bicycle (No Injury, Injury, Fatal) | Pedestrian (No Injury, Injury, Fatal) |
| Stopped on crossing | 0 | 0,0,0 | 0,0,0 | 0,0,0 |
| Went around the gates | 0 | 0,0,0 | 0,0,0 | 0,0,0 |
| Did not stop | 0 | 0,0,0 | 0,0,0 | 0,0,0 |
| Went thru gates | 0 | 0,0,0 | 0,0,0 | 0,0,0 |
| Stopped then proceeded | 0 | 0,0,0 | 0,0,0 | 0,0,0 |
| Suicide/attempted suicide | 0 | 0,0,0 | 0,0,0 | 0,0,0 |
| Other | 1 | 1,0,0 | 0,0,0 | 0,0,0 |
| Unknown | 1 | 1,0,0 | 0,0,0 | 0,0,0 |

*Source: FRA database and ADOT ACIS database (2016-2020)*

**Figure 1: Flashers and Gates, Faded or Missing Pavement Markings**


*Source: Google Street View, looking north*

# Crossing ID: 025651J-Greenway Rd, North of Grand Ave, Surprise

**Figure 2: Street-Level View Southwest Bound**

*Source: Google Street View, looking west*

**Figure 3: Limited Pedestrian/Bicycle Warning Devices**

*Source: Google Street View, looking west*

# Crossing ID: 025651J-Greenway Rd, North of Grand Ave, Surprise

## Need for Improvement

This crossing had two train-related crashes in the last five years - both of which involved vehicles.

## Challenges

Crossing is very close to adjacent intersection. Traffic signal is operated by ADOT. Travel lanes don't align across intersection.

## Other Crossing Considerations

Median and automatic gates present. Pavement markings faded on Greenway Road east of the intersection. Limited pedestrian/bicycle warning devices. One of the two crashes involved a police officer that abandoned the vehicle in pursuit of a wrong-way driver.

## Programmed Projects

Per Section 130 5-Year Plan for FY 2021, advanced preemption is programmed, but additional treatments are anticipated to be needed.

## Recently Constructed Projects

None. A diagnostic was recently completed.

## Recommended Treatments

Recommended treatments include:

1. Two blank-out signs that alert traffic turning from Grand Ave of the presence of a train.
2. Two pedestrian flashing lights and bells in off quadrants.
3. Set of sidelights for southbound left turn.
4. Restriping southwest bound approach to intersection.

## SHRAP Strategies Addressed by Treatments

- Identify Locations for Conventional Highway-Rail Crossing Countermeasures
- Identify Locations for Unconventional Highway-Rail Crossing Countermeasures

# Crossing ID: 025651J-Greenway Rd, North of Grand Ave, Surprise

## Effectiveness of Treatments

| Treatment | Crash Type | Effectiveness | |
|---|---|---|---|
| | | Qualitative | Quantitative (%)* |
| Blank-out Signs | Stopped on crossing | High | Not Available |
| | Went around gates | Low | |
| | Did not stop | Low | |
| | Went through gates | Low | |
| | Stopped then proceeded | N/A | |
| Pedestrian Flashing Lights and Bells | Stopped on crossing | High | Not Available |
| | Went around gates | Low | |
| | Did not stop | High | |
| | Went through gates | High | |
| | Stopped then proceeded | Low | |
| Sidelights | Stopped on crossing | High | Not Available |
| | Went around gates | Low | |
| | Did not stop | High | |
| | Went through gates | High | |
| | Stopped then proceeded | Low | |
| Restriping Pavement Markings | Stopped on crossing | Low | Not Available |
| | Went around gates | N/A | |
| | Did not stop | Low | |
| | Went through gates | Low | |
| | Stopped then proceeded | N/A | |

**Source: Noteworthy Practices Guide: Highway-Railway Grade Crossing Action Plan and Project Prioritization (2016)*

Best Practices/Considerations:

- Static and active warning devices should be installed to provide advance notice of the presence of a train as long as they do not create too much visual clutter.

## Planning-Level Cost

The estimated cost for installing blank-out signs, pedestrian flashing lights and bells, sidelights, and updated pavement markings is $200,000.

## Funding Readiness

No funding has been identified for these treatments but they appear to be eligible for Section 130 funds.

## Local Agency Discussion

ADOT, ACC, and BNSF performed a diagnostic evaluation of the crossing. The recommended treatments incorporate those recommendations.

# Crossing ID: 025651J-Greenway Rd, North of Grand Ave, Surprise

## Implementation Considerations

These treatments are feasible and relatively straightforward. Ongoing maintenance responsibilities and costs will need to be addressed.

# Crossing ID: 741560C-University Dr, West of Ash Ave, Tempe

**Refined Ranking**
19

**Refined Ranking Score**
3.472

**Annual Average Daily Traffic Volume (AADT)**
31888

**Number of Roadway Lanes**
4

**Number of Trains per Day**
4

**Number of Main Tracks**
1

**Train Speed**
25

**Urban/Rural Designation**
Urban

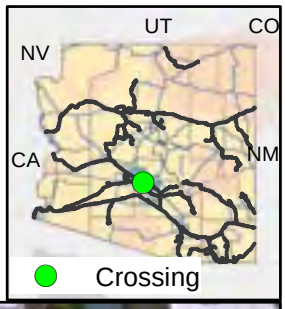
**Crossing Surface Material**
Asphalt and Concrete

**Adequate Sight Distance**
No

**Horizontal or Vertical Curve/Skew**
No

**Current Warning Devices**
Lights and Gates

**Geometry More Than 4 Legs**
No




## Crossing Location

## Vicinity Map

# Crossing ID: 741560C-University Dr, West of Ash Ave, Tempe

**Table 1: 2016-2020 Crash Summary**

| Crash Type | Number | User Type and Injury Severity | | |
|---|---|---|---|---|
| | | Auto (No Injury, Injury, Fatal) | Bicycle (No Injury, Injury, Fatal) | Pedestrian (No Injury, Injury, Fatal) |
| Stopped on crossing | 0 | 0,0,0 | 0,0,0 | 0,0,0 |
| Went around the gates | 2 | 0,0,0 | 0,0,0 | 1,1,0 |
| Did not stop | 0 | 0,0,0 | 0,0,0 | 0,0,0 |
| Went thru gates | 0 | 0,0,0 | 0,0,0 | 0,0,0 |
| Stopped then proceeded | 0 | 0,0,0 | 0,0,0 | 0,0,0 |
| Suicide/attempted suicide | 0 | 0,0,0 | 0,0,0 | 0,0,0 |
| Other | 0 | 0,0,0 | 0,0,0 | 0,0,0 |
| Unknown | 0 | 0,0,0 | 0,0,0 | 0,0,0 |

*Source: FRA database and ADOT ACIS database (2016-2020)*

**Figure 1: Street-Level View of University Drive Crossing**

*Source: Google Street View, looking west*

# Crossing ID: 741560C-University Dr, West of Ash Ave, Tempe

**Figure 2: Lighting and Pedestrian Signage**

*Source: Google Street View, looking east*

## Need for Improvement

There are high volumes of pedestrians at this crossing including students and general population. Recent improvements by a private developer, including installation of quad gates, do not address pedestrian crossings along the sidewalk.

## Challenges

Constrained right-of-way. Pedestrian crashes occurred before quad gates were installed in 2019, but pedestrian gates are not present. There are SRP utility lines that run along the railroad.

## Other Crossing Considerations

Median and quad gates present. Crossing is in a quiet zone.

## Programmed Projects

No programmed projects within next five years.

## Recently Constructed Projects

Quadrant gates installed in 2019. Median extension installed in approximately 2016.

# Crossing ID: 741560C-University Dr, West of Ash Ave, Tempe

## Recommended Treatments

Recommended treatments include:

1. Automatic pedestrian gates with barriers/fencing.

## SHRAP Strategies Addressed by Treatments

- Identify Locations for Unconventional Highway-Rail Crossing Countermeasures

## Effectiveness of Treatments

| Treatment | Crash Type | Effectiveness | |
|---|---|---|---|
| | | Qualitative | Quantitative (%)* |
| Pedestrian Gates with Barriers/Fencing | Stopped on crossing | High | Not Available |
| | Went around gates | High | |
| | Did not stop | High | |
| | Went through gates | N/A | |
| | Stopped then proceeded | N/A | |

**Source: Noteworthy Practices Guide: Highway-Railway Grade Crossing Action Plan and Project Prioritization (2016)*

Best Practices/Considerations:

- Pedestrian gates and associated equipment should be considered where pedestrian volumes and/or crashes are high.

## Planning-Level Cost

The estimated cost for installing pedestrian gates and associated equipment is $1.07 million.

## Funding Readiness

No funding has been identified for this improvement but it appears to be eligible for Section 130 funds.

## Local Agency Discussion

The City of Tempe supported continued discussion regarding the recommended treatments. Future treatments including detectable warning surfaces at sidewalks and pavement refurbishment/maintenance are expected to be completed by a private developer. Further coordination with SRP and other utility owners in the area is recommended. The City of Tempe expressed concerns related to maintenance responsibilities and costs of new infrastructure.

## Implementation Considerations

These improvements are feasible and relatively straightforward. Ongoing maintenance responsibilities and costs will need to be addressed.

# Crossing ID: 741708G-Main St, South of Casa Grande-Picacho Hwy, Eloy

**Refined Ranking**
21

**Refined Ranking Score**
3.252

**Annual Average Daily Traffic Volume (AADT)**
219

**Number of Roadway Lanes**
5

**Number of Trains per Day**
40

**Number of Main Tracks**
2

**Train Speed**
75

**Urban/Rural Designation**
Urban

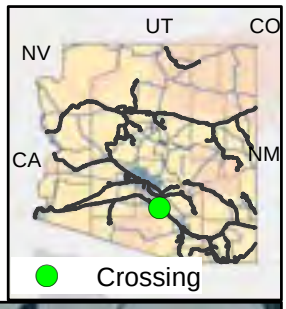
**Crossing Surface Material**
Asphalt and Concrete

**Adequate Sight Distance**
No

**Horizontal or Vertical Curve/Skew**
Yes

**Current Warning Devices**
Lights and Gates

**Geometry More Than 4 Legs**
No




## Crossing Location

## Vicinity Map

# Crossing ID: 741708G-Main St, South of Casa Grande-Picacho Hwy, Eloy

**Table 1: 2016-2020 Crash Summary**

| Crash Type | Number | User Type and Injury Severity | | |
|---|---|---|---|---|
| | | Auto (No Injury, Injury, Fatal) | Bicycle (No Injury, Injury, Fatal) | Pedestrian (No Injury, Injury, Fatal) |
| Stopped on crossing | 0 | 0,0,0 | 0,0,0 | 0,0,0 |
| Went around the gates | 1 | 0,0,0 | 0,0,1 | 0,0,0 |
| Did not stop | 0 | 0,0,0 | 0,0,0 | 0,0,0 |
| Went thru gates | 0 | 0,0,0 | 0,0,0 | 0,0,0 |
| Stopped then proceeded | 0 | 0,0,0 | 0,0,0 | 0,0,0 |
| Suicide/attempted suicide | 0 | 0,0,0 | 0,0,0 | 0,0,0 |
| Other | 0 | 0,0,0 | 0,0,0 | 0,0,0 |
| Unknown | 0 | 0,0,0 | 0,0,0 | 0,0,0 |

*Source: FRA database and ADOT ACIS database (2016-2020)*

**Figure 1: Limited Pedestrian/Bicycle Warning Devices**

*Source: Google Street View, looking north*

# Crossing ID: 741708G-Main St, South of Casa Grande-Picacho Hwy, Eloy

## Need for Improvement

The City of Eloy noted this area experiences heavy pedestrian volumes. The City is closing one lane on Casa Grande-Picacho Highway (also known as Frontier Street) and installing pedestrian facilities and signals to enhance pedestrian safety. One signal will be located west of Main Street. The City is updating the striping on the north side of this crossing. The City has closed a nearby intersection with 3rd Street to improve pedestrian safety.

## Challenges

Crash data indicates cyclist went around the gates. Available online imagery depicts contraflow cyclist on the sidewalk; cyclists and pedestrians may be using the sidewalk in both directions.

## Other Crossing Considerations

Median present.

## Programmed Projects

No Section 130 programmed projects within next five years. The City is actively working to improve pedestrian safety in this area.

## Recently Constructed Projects

City modifications unrelated to the crossing are underway in the area to improve pedestrian safety.

## Recommended Treatments

Recommended treatments include:

1. Bidirectional pedestrian gates and flashers with barriers/fencing.
2. Pedestrian detectable warning surface and signage (both directions).

## SHRAP Strategies Addressed by Treatments

- Identify Locations for Unconventional Highway-Rail Crossing Countermeasures

# Crossing ID: 741708G-Main St, South of Casa Grande-Picacho Hwy, Eloy

## Effectiveness of Treatments

| Treatment | Crash Type | Effectiveness | |
|---|---|---|---|
| | | Qualitative | Quantitative (%)* |
| Pedestrian Gates and Flashers with Barriers/Fencing | Stopped on crossing | High | Not Available |
| | Went around gates | High | |
| | Did not stop | High | |
| | Went through gates | N/A | |
| | Stopped then proceeded | N/A | |
| Pedestrian Warning Surface, Markings, and Signage | Stopped on crossing | Low | Not Available |
| | Went around gates | N/A | |
| | Did not stop | Low | |
| | Went through gates | N/A | |
| | Stopped then proceeded | N/A | |

**Source: Noteworthy Practices Guide: Highway-Railway Grade Crossing Action Plan and Project Prioritization (2016)*

Best Practices/Considerations:

- Pedestrian gates and associated equipment should be considered where pedestrian volumes and/or crashes are high.

## Planning-Level Cost

The estimated cost for installing pedestrian gates and associated equipment is $1.10 million.

## Funding Readiness

No funding has been identified for these treatments, but they appear to be eligible for Section 130 funds.

## Local Agency Discussion

The City of Eloy supports continued discussion regarding the recommended treatments. Eloy is investing in this area to improve pedestrian safety; these treatments complement those activities and support creation of a pedestrian corridor.

## Implementation Considerations

These treatments are feasible and relatively straightforward. Ongoing maintenance responsibilities and costs will need to be addressed.

# Crossing ID: 741100A-Massingale Rd, East of I-10 Frontage Rd, Marana

**Refined Ranking**
22

**Refined Ranking Score**
3.166

**Annual Average Daily Traffic Volume (AADT)**
500

**Number of Roadway Lanes**
2

**Number of Trains per Day**
40

**Number of Main Tracks**
2

**Train Speed**
79

**Urban/Rural Designation**
Urban

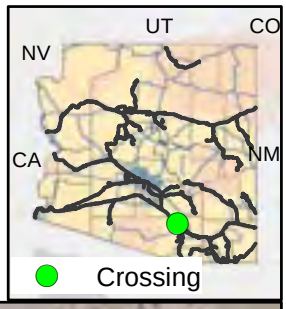
**Crossing Surface Material**
Asphalt and Concrete

**Adequate Sight Distance**
No

**Horizontal or Vertical Curve/Skew**
Yes

**Current Warning Devices**
Lights and Gates

**Geometry More Than 4 Legs**
No




## Crossing Location

## Vicinity Map

# Crossing ID: 741100A-Massingale Rd, East of I-10 Frontage Rd, Marana

**Table 1: 2016-2020 Crash Summary**

| Crash Type | Number | User Type and Injury Severity | | |
|---|---|---|---|---|
| | | Auto (No Injury, Injury, Fatal) | Bicycle (No Injury, Injury, Fatal) | Pedestrian (No Injury, Injury, Fatal) |
| Stopped on crossing | 0 | 0,0,0 | 0,0,0 | 0,0,0 |
| Went around the gates | 0 | 0,0,0 | 0,0,0 | 0,0,0 |
| Did not stop | 0 | 0,0,0 | 0,0,0 | 0,0,0 |
| Went thru gates | 0 | 0,0,0 | 0,0,0 | 0,0,0 |
| Stopped then proceeded | 0 | 0,0,0 | 0,0,0 | 0,0,0 |
| Suicide/attempted suicide | 0 | 0,0,0 | 0,0,0 | 0,0,0 |
| Other | 1 | 1,0,0 | 0,0,0 | 0,0,0 |
| Unknown | 0 | 0,0,0 | 0,0,0 | 0,0,0 |

*Source: FRA database and ADOT ACIS database (2016-2020)*

**Figure 1: Existing Flashers and Gates**


*Source: Google Street View, looking east*

# Crossing ID: 741100A-Massingale Rd, East of I-10 Frontage Rd, Marana

## Need for Improvement

This crossing had one train-related crash in the last five years, which involved a vehicle.

## Challenges

Short distance from I-10 Frontage Road to crossing. No pedestrian facilities.

## Other Crossing Considerations

Flashers and gates present. No sidewalks. Crossing is in a quiet zone. Staff indicated the Town is considering closing this crossing to facilitate widening the crossing at Tangerine Road to accommodate development. This closing is not programmed but could be closed within the next five years. This crossing was closed during the recent Ina Road construction on I-10 and it did not create operational challenges for the Town.

## Programmed Projects

No programmed projects within next five years.

## Recently Constructed Projects

None.

## Recommended Treatments

Recommended treatments include:

1. Crossing closure in conjunction with widening the crossing at Tangerine Rd

## SHRAP Strategies Addressed by Treatments

- Consider Crossing Closures and Separations

## Effectiveness of Treatments

| Treatment | Crash Type | Effectiveness | |
|---|---|---|---|
| | | Qualitative | Quantitative (%)* |
| Crossing Closure | Stopped on crossing | High | 100% |
| | Went around gates | High | |
| | Did not stop | High | |
| | Went through gates | High | |
| | Stopped then proceeded | High | |

**Source: Noteworthy Practices Guide: Highway-Railway Grade Crossing Action Plan and Project Prioritization (2016)*

# Crossing ID: 741100A-Massingale Rd, East of I-10 Frontage Rd, Marana

Best Practices/Considerations:

- Wherever possible, a grade separation or crossing closure will be the most effective treatment to reduce railroad crashes.
- Consideration to public safety, need, access, and economics should be taken before closing crossings.

## Planning-Level Cost

The estimated cost for closing the crossing is $80,000.

## Funding Readiness

No funding has been identified for the closure, but it appears eligible for Section 130 funds.

## Local Agency Discussion

Installing a median was discussed but would likely require widening the crossing. The Town of Marana noted the potential for closing to accommodate widening the crossing at Tangerine Road. This location could be monitored until the Town makes a determination related to closure.

## Implementation Considerations

The closure treatment is feasible and relatively straightforward. Timeframe for implementation will likely be driven by timeframe for widening the Tangerine Road crossing.

# Crossing ID: 741098B-Cortaro Farms Rd, East of I-10 Frontage Rd, Marana

**Refined Ranking**
24

**Refined Ranking Score**
2.939

**Annual Average Daily Traffic Volume (AADT)**
19381

**Number of Roadway Lanes**
6

**Number of Trains per Day**
40

**Number of Main Tracks**
2

**Train Speed**
79

**Urban/Rural Designation**
Urban

**Crossing Surface Material**
Asphalt and Concrete

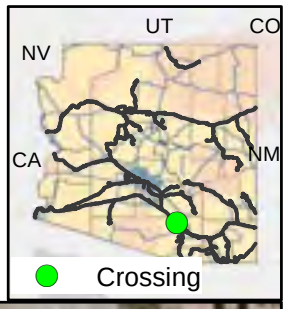
**Adequate Sight Distance**
No

**Horizontal or Vertical Curve/Skew**
No

**Current Warning Devices**
Lights and Gates

**Geometry More Than 4 Legs**
No

**Vicinity Map**




**Crossing Location**

# Crossing ID: 741098B-Cortaro Farms Rd, East of I-10 Frontage Rd, Marana

**Table 1: 2016-2020 Crash Summary**

| Crash Type | Number | User Type and Injury Severity | | |
|---|---|---|---|---|
| | | Auto (No Injury, Injury, Fatal) | Bicycle (No Injury, Injury, Fatal) | Pedestrian (No Injury, Injury, Fatal) |
| Stopped on crossing | 0 | 0,0,0 | 0,0,0 | 0,0,0 |
| Went around the gates | 0 | 0,0,0 | 0,0,0 | 0,0,0 |
| Did not stop | 0 | 0,0,0 | 0,0,0 | 0,0,0 |
| Went thru gates | 0 | 0,0,0 | 0,0,0 | 0,0,0 |
| Stopped then proceeded | 0 | 0,0,0 | 0,0,0 | 0,0,0 |
| Suicide/attempted suicide | 0 | 0,0,0 | 0,0,0 | 0,0,0 |
| Other | 0 | 0,0,0 | 0,0,0 | 0,0,0 |
| Unknown | 0 | 0,0,0 | 0,0,0 | 0,0,0 |

*Source: FRA database and ADOT ACIS database (2016-2020)*

**Figure 1: Street-Level View Eastbound - Flashers and Gates**

*Source: Google Street View, looking east*

# Crossing ID: 741098B-Cortaro Farms Rd, East of I-10 Frontage Rd, Marana

**Figure 2: Street-Level View Westbound**

*Source: Google Street View, looking west*

**Figure 3: Discontinuous Sidewalks**

*Source: Google Street View, looking west*

# Crossing ID: 741098B-Cortaro Farms Rd, East of I-10 Frontage Rd, Marana

**Figure 4: "Sign Clutter" Eastbound; Visibility Obstructed**


*Source: Google Street View, looking west*

## Need for Improvement

This crossing did not have any train-related crashes in the last five years but was identified as having high potential for future crashes.

## Challenges

Short distance from I-10 Frontage Road to crossing. Sight clutter obstructs visibility.

## Other Crossing Considerations

Median and automatic gates present. Discontinuous sidewalks. Crossing is in a quiet zone. Dual left turn lanes headed to eastbound I-10 were added in May 2021 to improve operations. This was achieved by converting the shared through/left-turn lane to a left-turn lane. There is limited pedestrian activity at this crossing.

## Programmed Projects

No programmed treatments within next five years. Town staff indicated rebuilding this traffic interchange (TI) is the Town's highest priority for the RTA Next, the successor of the current local transportation tax. The Town noted ADOT may reconstruct the TI if the project is not funded through the RTA. The timing of implementation is currently unknown. This intersection is planned to be grade separated from the railroad as part of the reconstruction.

## Recently Constructed Projects

None.

# Crossing ID: 741098B-Cortaro Farms Rd, East of I-10 Frontage Rd, Marana

## Recommended Treatments

Recommended treatments include:

1. Grade separation.

## SHRAP Strategies Addressed by Treatments

- Consider Crossing Closures and Separations

## Effectiveness of Treatments

| Treatment | Crash Type | Effectiveness | |
|---|---|---|---|
| | | Qualitative | Quantitative (%)* |
| Grade Separation | Stopped on crossing | High | 100% |
| | Went around gates | High | |
| | Did not stop | High | |
| | Went through gates | High | |
| | Stopped then proceeded | High | |

**Source: Noteworthy Practices Guide: Highway-Railway Grade Crossing Action Plan and Project Prioritization (2016)*

Best Practices/Considerations:

- Wherever possible, a grade separation or crossing closure will be the most effective treatment to reduce railroad crashes.

## Planning-Level Cost

The estimated cost for grade separation is $100 million per preliminary estimates provided by the Town of Marana.

## Funding Readiness

Grade separation is cost-prohibitive to use only Section 130 funds. The draft RTA Regional Transportation Plan that is currently being updated is anticipated to include grade separation at this crossing.

## Local Agency Discussion

Future treatments will upgrade the I-10/Cortaro Farms Rd TI, likely resulting in grade separation. Minor potential interim treatments were discussed, including reevaluating intersection signage and providing continuous sidewalks. The Town noted challenges associated with signing the intersection, and expressed a preference to see if the TI would be funded before constructing sidewalks. The Town noted pedestrian crossings are prohibited on the south side of the TI. This location could be monitored in the near-term until more information related to programming the TI is available.

# Crossing ID: 741098B-Cortaro Farms Rd, East of I-10 Frontage Rd, Marana

## Implementation Considerations

If funding is available, grade separation can be achieved. The region is prioritizing this treatment.

## Crossing ID: 741825C-Val Vista Dr, South of Warner Rd, Gilbert

**Refined Ranking**
25

**Refined Ranking Score**
2.939

**Annual Average Daily Traffic Volume (AADT)**
29603

**Number of Roadway Lanes**
6

**Number of Trains per Day**
4

**Number of Main Tracks**
1

**Train Speed**
60

**Urban/Rural Designation**
Urban

**Crossing Surface Material**
Asphalt and Concrete

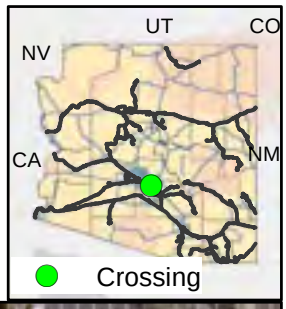
**Adequate Sight Distance**
No

**Horizontal or Vertical Curve/Skew**
Yes

**Current Warning Devices**
Lights and Gates

**Geometry More Than 4 Legs**
No

**Vicinity Map**




**Crossing Location**

# Crossing ID: 741825C-Val Vista Dr, South of Warner Rd, Gilbert

**Table 1: 2016-2020 Crash Summary**

| Crash Type | Number | User Type and Injury Severity | | |
|---|---|---|---|---|
| | | Auto (No Injury, Injury, Fatal) | Bicycle (No Injury, Injury, Fatal) | Pedestrian (No Injury, Injury, Fatal) |
| Stopped on crossing | 0 | 0,0,0 | 0,0,0 | 0,0,0 |
| Went around the gates | 0 | 0,0,0 | 0,0,0 | 0,0,0 |
| Did not stop | 0 | 0,0,0 | 0,0,0 | 0,0,0 |
| Went thru gates | 1 | 0,0,1 | 0,0,0 | 0,0,0 |
| Stopped then proceeded | 0 | 0,0,0 | 0,0,0 | 0,0,0 |
| Suicide/attempted suicide | 0 | 0,0,0 | 0,0,0 | 0,0,0 |
| Other | 0 | 0,0,0 | 0,0,0 | 0,0,0 |
| Unknown | 0 | 0,0,0 | 0,0,0 | 0,0,0 |

*Source: FRA database and ADOT ACIS database (2016-2020)*

**Figure 1: Gates and Flashers**

*Source: Google Street View, looking north*

# Crossing ID: 741825C-Val Vista Dr, South of Warner Rd, Gilbert

**Figure 2: Limited Pedestrian/Bicycle Warning Devices**


*Source: Google Street View, looking south*

## Need for Improvement

This crossing had one train-related crash in the last five years, which involved a vehicle and resulted in a fatality. Gilbert recently participated in a diagnostic review of this crossing; the diagnostic has not been finalized, but preliminary recommendations are included herein.

## Challenges

Skewed crossing. High traffic volumes.

## Other Crossing Considerations

Median and automatic gates present. Sidewalks and bicycle lanes present. Crash occurred during dark conditions. Crash data indicated the driver was moving over crossing with activated gates fully descended. City staff noted the driver had fallen asleep. Access to the SRP Santan Generating Station is approximately 65 feet north of the crossing.

# Crossing ID: 741825C-Val Vista Dr, South of Warner Rd, Gilbert

## Programmed Projects

No programmed projects within next five years.

## Recently Constructed Projects

None.

## Recommended Treatments

Recommended treatments include:

1. Pedestrian signage and detectable warning surface.
2. Reconstruct sidewalk to provide a perpendicular approach to the crossing.
3. Install new pedestrian flashers at the northeast corner.
4. Grade separation (long-term).

## SHRAP Strategies Addressed by Treatments

- Identify Locations for Unconventional Highway-Rail Crossing Countermeasures
- Consider Crossing Closures and Separations

# Crossing ID: 741825C-Val Vista Dr, South of Warner Rd, Gilbert

## Effectiveness of Treatments

| Treatment | Crash Type | Effectiveness | |
|---|---|---|---|
| | | Qualitative | Quantitative (%)* |
| Pedestrian Signage and Warning Surface | Stopped on crossing | Low | Not Available |
| | Went around gates | N/A | |
| | Did not stop | Low | |
| | Went through gates | Low | |
| | Stopped then proceeded | N/A | |
| Reconstruct Sidewalk | Stopped on crossing | Low | Not Available |
| | Went around gates | N/A | |
| | Did not stop | N/A | |
| | Went through gates | N/A | |
| | Stopped then proceeded | N/A | |
| Pedestrian Flashers | Stopped on crossing | High | Not Available |
| | Went around gates | Low | |
| | Did not stop | High | |
| | Went through gates | High | |
| | Stopped then proceeded | Low | |
| Grade Separation | Stopped on crossing | High | 100% |
| | Went around gates | High | |
| | Did not stop | High | |
| | Went through gates | High | |
| | Stopped then proceeded | High | |

**Source: Noteworthy Practices Guide: Highway-Railway Grade Crossing Action Plan and Project Prioritization (2016)*

Best Practices/Considerations:

- Warning signage and surfaces should advise travelers they are approaching a railroad crossing.
- Wherever possible, a grade separation or crossing closure will be the most effective treatment to reduce railroad crashes.

## Planning-Level Cost

The estimated cost for installing pedestrian signage and warning surfaces and gate strike signage is $330,000.

The estimated cost for grade separation is $24.7 million per the draft MAG Regional Transportation Plan.

# Crossing ID: 741825C-Val Vista Dr, South of Warner Rd, Gilbert

## Funding Readiness

No funding has been identified for the warning signage and surfaces, but they appear eligible for Section 130 funds. Grade separation is cost-prohibitive to use only Section 130 funds. The draft MAG Regional Transportation Plan that is currently being updated shows grade separation at this crossing being funded in Phase II.

## Local Agency Discussion

The Town of Gilbert supports treatments by others at the crossing in advance of grade separation.

## Implementation Considerations

The recommended near-term treatments are feasible and relatively straightforward treatments. Ongoing maintenance responsibilities and costs will need to be addressed. Grade separation is costly but highly effective.

# Crossing ID: 741814P-McQueen Rd, South of Baseline Rd, Gilbert

**Refined Ranking**
26

**Refined Ranking Score**
2.935

**Annual Average Daily Traffic Volume (AADT)**
29109

**Number of Roadway Lanes**
6

**Number of Trains per Day**
4

**Number of Main Tracks**
1

**Train Speed**
60

**Urban/Rural Designation**
Urban

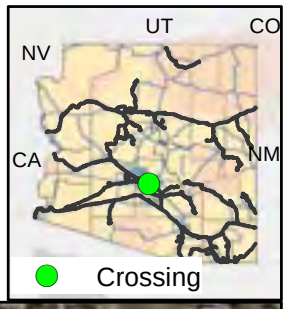
**Crossing Surface Material**
Asphalt and Concrete

**Adequate Sight Distance**
No

**Horizontal or Vertical Curve/Skew**
Yes

**Current Warning Devices**
Lights and Gates

**Geometry More Than 4 Legs**
No




## Crossing Location

## Vicinity Map

# Crossing ID: 741814P-McQueen Rd, South of Baseline Rd, Gilbert

**Table 1: 2016-2020 Crash Summary**

| Crash Type | Number | User Type and Injury Severity | | |
|---|---|---|---|---|
| | | Auto (No Injury, Injury, Fatal) | Bicycle (No Injury, Injury, Fatal) | Pedestrian (No Injury, Injury, Fatal) |
| Stopped on crossing | 0 | 0,0,0 | 0,0,0 | 0,0,0 |
| Went around the gates | 0 | 0,0,0 | 0,0,0 | 0,0,0 |
| Did not stop | 1 | 0,0,1 | 0,0,0 | 0,0,0 |
| Went thru gates | 0 | 0,0,0 | 0,0,0 | 0,0,0 |
| Stopped then proceeded | 0 | 0,0,0 | 0,0,0 | 0,0,0 |
| Suicide/attempted suicide | 0 | 0,0,0 | 0,0,0 | 0,0,0 |
| Other | 0 | 0,0,0 | 0,0,0 | 0,0,0 |
| Unknown | 0 | 0,0,0 | 0,0,0 | 0,0,0 |

*Source: FRA database and ADOT ACIS database (2016-2020)*

**Figure 1: Gates and Flashers**

*Source: Google Street View, looking south*

# Crossing ID: 741814P-McQueen Rd, South of Baseline Rd, Gilbert

**Figure 2: Limited Pedestrian/Bicycle Warning Devices**


*Source: Google Street View, looking north*

## Need for Improvement

This crossing had one train-related crash in the last five years, which involved a vehicle and resulted in a fatality. Town of Gilbert staff indicated this crossing is higher priority to them compared to the Val Vista Road crossing. There have been four broken gate reports here in the past five years.

## Challenges

Skewed crossing. High traffic volumes. Constrained right-of-way.

## Other Crossing Considerations

Median and automatic gates present. Sidewalks and bicycle lanes present.

## Programmed Projects

No programmed projects within next five years.

## Recently Constructed Projects

None.

# Crossing ID: 741814P-McQueen Rd, South of Baseline Rd, Gilbert

## Recommended Treatments

Recommended treatments include:

1. Gate strike signage to discourage drivers from trying to beat the gates.
2. Pedestrian fencing at the southwest corner.
3. Pedestrian signage and detectable warning surface.
4. Reconstruct sidewalk to provide perpendicular approach to tracks. Provide larger offset from mast – counterweight is currently in the sidewalk path.
5. Grade separation (long-term).

## SHRAP Strategies Addressed by Treatments

- Identify Locations for Unconventional Highway-Rail Crossing Countermeasures
- Consider Crossing Closures and Separations

# Crossing ID: 741814P-McQueen Rd, South of Baseline Rd, Gilbert

## Effectiveness of Treatments

| Treatment | Crash Type | Effectiveness | |
|---|---|---|---|
| | | Qualitative | Quantitative (%)* |
| "Gate Strike" Signage | Stopped on crossing | High | Not Available |
| | Went around gates | Low | |
| | Did not stop | Low | |
| | Went through gates | Low | |
| | Stopped then proceeded | N/A | |
| Pedestrian Fencing | Stopped on crossing | Low | Not Available |
| | Went around gates | N/A | |
| | Did not stop | Low | |
| | Went through gates | Low | |
| | Stopped then proceeded | N/A | |
| Pedestrian Signage and Warning Surfaces | Stopped on crossing | Low | Not Available |
| | Went around gates | N/A | |
| | Did not stop | Low | |
| | Went through gates | Low | |
| | Stopped then proceeded | N/A | |
| Reconstruct Sidewalk | Stopped on crossing | Low | Not Available |
| | Went around gates | N/A | |
| | Did not stop | N/A | |
| | Went through gates | N/A | |
| | Stopped then proceeded | N/A | |
| Grade Separation | Stopped on crossing | High | 100% |
| | Went around gates | High | |
| | Did not stop | High | |
| | Went through gates | High | |
| | Stopped then proceeded | High | |

**Source: Noteworthy Practices Guide: Highway-Railway Grade Crossing Action Plan and Project Prioritization (2016)*

Best Practices/Considerations:

- Warning signage and surfaces should advise travelers they are approaching a railroad crossing.
- Wherever possible, a grade separation or crossing closure will be the most effective treatment to reduce railroad crashes.

## Planning-Level Cost

The estimated cost for installing pedestrian signage and warning surfaces and gate strike signage is $310,000.

The estimated cost for grade separation is $24.3 million per the draft MAG Regional Transportation Plan.

# Crossing ID: 741814P-McQueen Rd, South of Baseline Rd, Gilbert

## Funding Readiness

No funding has been identified for the warning signage and surfaces but they appear to be eligible for Section 130 funds. Grade separation is cost-prohibitive to use only Section 130 funds. The draft MAG Regional Transportation Plan that is currently being updated shows grade separation at this crossing being funded in Phase V.

## Local Agency Discussion

The Town of Gilbert supports treatments by others at the crossing in advance of grade separation.

## Implementation Considerations

The warning signage and surfaces are feasible and relatively straightforward treatments. Ongoing maintenance responsibilities and costs will need to be addressed.

# Appendix I – Best Practices and Effectiveness of Treatments

## Table I-1: Effectiveness of Treatments

| | | Passive Treatments | | | | | |
|---|---|---|---|---|---|---|---|
| | | Signage (Passive) | | Pavement Markings | | | |
| | | Regulatory | Warning | Exclusion Zone (Keep Clear) | Dynamic Envelope | Edge Lines | Relocate Stop Bar |
| Crash Types (User action) | *Stopped on Crossing* | Low | Low | High | Low | Low | Low |
| | *Went around the gates* | N/A | N/A | N/A | N/A | N/A | N/A |
| | *Did not stop* | Low | Low | Low | Low | Low | Low |
| | *Went through gates* | Low | Low | Low | Low | Low | Low |
| | *Stopped then proceeded* | N/A | N/A | N/A | N/A | N/A | N/A |
| | *Suicide/Attempted Suicide* | N/A | N/A | N/A | N/A | N/A | N/A |

| | | Active Treatments | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Signals | | | Audible | | Automatic Gates | | |
| | | Flashing Light Signals | Cantilevered Flashing Light Signals | Supplemental Flashing Light Signals | Audible Warning | Wayside Horn | Automatic Gates | Four-Quadrant Gates | Barrier Gate |
| Crash Types (User action) | *Stopped on Crossing* | High | High | High | High | High | High | High | High |
| | *Went around the gates* | Low | Low | Low | Low | Low | N/A | High | N/A |
| | *Did not stop* | High | High | High | High | High | High | Low | High |
| | *Went through gates* | High | High | High | High | High | N/A | N/A | N/A |
| | *Stopped then proceeded* | Low | Low | Low | Low | Low | Low | High | Low |
| | *Suicide/Attempted Suicide* | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |

| | | Site Improvements | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Sight Distance/Removing Obstacles | | Illumination | Use of Channelization with Gates | | | | Safety Barriers | Crossing Surface | Crossing Closure |
| | | Clear Zone | Sight Distance | Illumination | Barrier Wall System | Wide Raised Median | Non-Mountable Curb Islands | Mountable Raised Curb System | Guardrails and Crash Cushions | Concrete Crossing Surface | Crossing Closure |
| Crash Types (User action) | *Stopped on Crossing* | High | High | High | High | High | High | High | N/A | High | High |
| | *Went around the gates* | Low | Low | Low | High | High | High | Low | N/A | N/A | High |
| | *Did not stop* | High | High | High | High | N/A | N/A | N/A | N/A | N/A | High |
| | *Went through gates* | High | High | High | N/A | N/A | N/A | N/A | N/A | N/A | High |
| | *Stopped then proceeded* | Low | Low | Low | High | High | High | Low | N/A | N/A | High |
| | *Suicide/Attempted Suicide* | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | High |

**Table I-1: Effectiveness of Treatments (continued)**

| | | Other | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Preemption of Traffic Signals | | | Pedestrian and Bicycles | | | | | |
| | | Preemption of Traffic Signals | Pre-signals | Active Advance Warning Signs | Sidewalks | Pedestrian Refugee Areas | Pedestrian Swing Gates | Fencing | Pedestrian Gates (Automatic) | Pedestrian Barriers |
| *Crash Types (User action)* | ***Stopped on Crossing*** | High | High | High | High | High | High | High | N/A | High |
| | ***Went around the gates*** | Low | Low | Low | High | High | High | Low | N/A | N/A |
| | ***Did not stop*** | High | High | High | High | N/A | N/A | N/A | N/A | N/A |
| | ***Went through gates*** | High | High | High | N/A | N/A | N/A | N/A | N/A | N/A |
| | ***Stopped then proceeded*** | Low | Low | Low | High | High | High | Low | N/A | N/A |
| | ***Suicide/Attempted Suicide*** | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |

## Table I-2: Best Practices Table

| Category | Best Practice Treatment | Applicability | Advice |
|---|---|---|---|
| ***Passive Treatment*** | Arrow Markings | At locations where lane reductions are necessary | 1.) Arrow markings should be placed 100 feet in advance of the stop line. 2.) Avoid placement of pavement arrows immediately in advance of the tracks; it may be necessary to place two sets of markings, one between the crossing and the downstream highway and another set well in advance of the crossing. |
| ***Site Improvements*** | Crossing Geometry | All locations, when practical | The ideal crossing geometry is a 90-degree intersection of track and highway with slight-ascending grades on both highway approaches to reduce the flow of surface water toward the crossing. Few crossings have this ideal geometry because of topography or limitations of ROW for both the highway and the railroad. Every effort should be made to construct new crossings in this manner. |
| | Crossing Surfaces | All locations, when practical | Proper preparation of the track structure and good drainage of the subgrade are essential to good performance from any type of crossing surface. Excessive moisture in the soil can cause track settlement, accompanied by penetration of mud into the ballast section. Moisture can enter the subgrade and ballast section from above, below, and/or adjacent subgrade areas. Surface and subsurface drainage should be intercepted and discharged away from the crossing. |
| | Illumination | All locations, when practical. Practical location may include:<br><br>nighttime train operations, low train speeds, blockage of crossings for long periods at night, collision history indicating that motorists often fail to detect trains or traffic control devices at night, horizontal and/or vertical alignment of highway approach such that vehicle headlight beam does not fall on the train until the vehicle has passed the safe stopping distance, restricted sight or stopping distance in rural areas, humped crossings where oncoming vehicle headlights are visible under trains, low ambient light levels | Illuminate crossing and 100-foot approach zone. |
| ***Preemption of Traffic Signals*** | Pre-Signal and Queue Cutter Design Considerations | 1.)Where a downstream traffic signal may cause traffic to back up toward and/or through a grade crossing 2.) Traffic queues from a railroad crossing have the potential to interfere with a nearby highway traffic signal | At a signalized intersection located within 200 feet or less of a crossing, where the intersection traffic control signals are preempted by the approach of a train, all movements from the signalized intersection approaching the crossing should be prohibited during the signal preemption sequences. |
| | | Where the clear storage distance (CSD) is greater than that which is typical for a pre-signal, 50-75 feet to 200-250 feet | A combination pre-signal/queue cutter should be considered. |
| | Management of Queueing at Frontage Roads | At locations with frontage roads | Utilize stop signs. |
| | Adjacent Rail Crossings | At locations with adjacent rail crossings | The recommended practice is dependent upon the distance between the two crossings:<br><br>1.) Adjacent crossings within 100 feet—the crossings should be treated as one individual crossing.<br><br>2.) Adjacent crossings with 100 to 200 feet of separation—Additional signs or other appropriate traffic control devices should be used to inform approaching road users of the long distance to cross the tracks. “Interior” active devices (such as flashing-light signals with or without crossing gates) may be omitted.<br><br>3.) Adjacent crossings over 200 feet apart—Where the distance between tracks exceeds 200 feet, the operation of the devices should provide for additional time for vehicles to clear the extended MTCD. |

**Table I-2: Best Practices Table (continued)**

| Category | Best Practice Treatment | Applicability | Advice |
|---|---|---|---|
| ***Warning Time*** | Train Detection and Device Activation | When devices need to be actuated in advance of train arrival to allow road users to clear the track area | Active crossing warning devices, usually incorporate some "fail-safe" design principles. In other words, the crossing warning system is designed to give an indication of an approaching train whenever the system fails. Crossing signals are normally dark unless a train is approaching or occupying the crossing, so there is no indication to the road user when power has failed. Therefore, crossing control systems include stand-by battery power should commercial power be terminated for any reason. Solar energy may be used to charge storage batteries to power signals at crossings in remote locations. |
| | Constant Warning Time Track Circuit | When devices need to be actuated in advance of train arrival to allow road users to clear the track area | 1.) The MUTCD and FRA regulations (49 CFR 234.225) require that the system provide for a minimum of 20 seconds of warning time. 2.) When determining if the minimum 20 seconds of warning time should be increased, some factors that should be considered include but are not limited to the following:<br><br>a.) Track clearance distances due to multiple tracks and/or angled crossings (add 1 second for each 10 feet of added crossing length in excess of 35 feet).<br><br>b.) The crossing is located within proximity of a highway intersection controlled by STOP signs where vehicles have a tendency of stopping on the crossing.<br><br>c.) The crossing is regularly used by long tractor-trailer vehicles.<br><br>d.) The crossing is regularly used by vehicles required to make mandatory stops before proceeding over the crossing (such as school buses and hazardous materials vehicles).<br><br>e.) The crossing's active traffic control devices are interconnected with other highway traffic signal systems.<br><br>f.) It is necessary to provide at least 5 seconds between the time the approach lane gates to the crossing are fully lowered and when the train reaches the crossing (49 CFR 234.223).<br><br>g.) The crossing is regularly used by pedestrians and non-motorized components.<br><br>h.) The crossing and approaches are not level.<br><br>i.) Additional warning time is needed to accommodate a four-quadrant gate system.<br><br>j.) Other factors regarding crossing location as appropriate. |
| ***Pedestrians and Bikes*** | Channelization | At locations with pedestrian and bike traffic/ volumes | Pedestrian movements should be channelized to designated engineered crossing locations which provide warnings and controls designed for pedestrian use. |
| | Accessibility Standards | At locations with pedestrian and bike traffic/ volumes | Minimum widths and clearances, Accessible routes and pedestrian pathways, Curb ramps and ramps, Detectable warning strips, Protruding objects, utilizing 90 degree crossings. |
| | Pedestrian Automatic Gate Skirts | At locations where pedestrians frequently circumvent the gate arm | Consider gate skirts. |
| | Stop Lines and Detectable Warnings | At locations with pedestrian and bike traffic/ volumes | Detectable warning surfaces mark boundaries between pedestrian and vehicular ways where there is no raised curb. Detectable warning surfaces contrast visually with adjacent walking surfaces, either light-on-dark, or dark-on-light. |
| ***New Crossings*** | New Crossings | New crossings (particularly on mainline tracks) should not be permitted unless no other viable alternatives exist. | Opening a new public highway-rail crossing should consider public safety, necessity, access, and economics. Consideration should be given to closing one or more existing crossings. |
| ***Relocation*** | Relocation | When communities are disproportionally adversely affected by noise, traffic delays, visual quality, and the land use "barrier" | The new location should provide proper alignment, minimum grades, and adequate drainage. Sufficient ROW should be available to provide the necessary horizontal clearances, additional rail facilities as service grows, and a buffer for abating noise and vibrations. The number of crossings should be minimized. |
| ***Crossing Closure*** | Crossing Closure | Wherever possible | 1.) A grade separation or crossing closure will be the most effective treatment to reduce railroad crashes. 2.) Closing a public highway-rail crossing should consider public safety, necessity, access, and economics. |
| ***Grade Separation*** | Grade Separation | Wherever possible | A grade separation or crossing closure will be the most effective treatment to reduce railroad crashes. |
| ***Inactive or Abandoned*** | Inactive or Abandoned | At locations where tracks were formally abandoned or inactive | 1.) Confirm status of tracks. 2.) Remove tracks if applicable. |

# Appendix J – Guide for Implementing Crossing Treatments

# Section 130 Process, Roles, and Responsibilities

## *Section 130 Program*

Section 130 is a federally funded program. Its purpose is to provide for safety improvements at highway-rail crossings. The Federal Highway Administration (FHWA) provides project funding through the Section 130 – Railway-Highway Crossing Program (RHCP).

Per FHWA, the Section 130 program funds are eligible for projects at all public crossings including roadways, bike trails and pedestrian paths. Fifty percent of a state's apportionment under 23 USC 130(e) is dedicated for the installation of protective devices at crossings. The remainder of the funding apportionment can be used for any hazard elimination project, including protective devices.

Per the Code of Federal Regulations (CFR), Title 23, Section 646.216 (e) Authorizations (1), the costs of preliminary engineering, right-of-way acquisition, and construction incurred after the date each phase of the work is included in an approved statewide transportation improvement program and authorized by the FHWA are eligible for Federal-aid participation.

In accordance with the CFR, Section 130 projects are currently funded at a 90/10 cost split with the federal share 90 percent and a local match of ten percent. The railroad is not required to contribute any funding to a project. However, the railroad may voluntarily contribute funding to move a project forward.

Recently, the Infrastructure Investment and Jobs Act" (IIJA) (Public Law 117-58, also known as the "Bipartisan Infrastructure Law") was signed. It appears that the new law may increase the federal share to 100 percent and eliminate the 50 percent set-aside for protective devices, as well as have a few other modifications for Section 130 projects.

### ADOT Utility and Railroad Engineering Section

The ADOT Utility and Railroad Engineering Section manages the Section 130 program in Arizona. More information on the Utility and Railroad Engineering Section can be found at: *https://azdot.gov/business/engineering-and-construction/utility-and-railroad-engineering/railroad.*

### Section 130 Project Process

At the beginning of each year potential, projects for safety upgrades are added to the Section 130 Project Array. ADOT, the railroads, local agencies, and the Arizona Corporation Commission (ACC) are involved in determining projects that will be added to the Array. An on-site diagnostic meeting is held as part of the determining process. When a project is ready to move forward for funding programming there are a number of steps to follow. Once the process is started, it takes approximately two years to be ready for construction. A general summary of the Section 130 project process is as follows:

- On-site diagnostic meeting is held (if it hasn't already been completed). ADOT, railroad, local agency, and ACC participate in the diagnostic;
- Intergovernmental Agreement (IGA) between ADOT and local road agency is completed;
- ADOT requests FHWA authorization for funding for Preliminary Engineering (PE)/Design (three-month process);
- Project is placed on the State Transportation Improvement Plan (eSTIP) and MPO/COG Transportation Improvement Plan (TIP) if applicable (this is part of the authorization process);
- FHWA authorizes PE phase;
- ADOT gives Notice to Proceed (NTP) to railroad and local agency for PE phase;
- PE agreement between ADOT and the railroad is processed;
- Design plans begin by local agency;
- Environmental Clearance - begin process once have solid plans. This is a three- to nine-month process. Complex projects typically take more time than this;

- Utility Clearance – local agency begins process. If geotechnical drilling/investigation (potholing), surveying, or utility designation is needed within the railroad right-of-way, the local agency will need to obtain right of entry permits from the railroad. Installation of new utilities will also require right of entry permits;
- ADOT requests FHWA authorization for funding for the Right-of-Way (ROW) phase (three-month process);
- FHWA authorizes ROW phase;
- ADOT gives NTP to local agency for ROW phase;
- ROW Acquisition - local agency begins process;
- Construction Agreement (C&M) – between ADOT and railroad;
- C&M Agreement between railroad and local agency;
- ACC application and hearing (six- to nine-month process). Concrete surface work only with construction by railroad does not require a hearing;
- Environmental Clearance completed;
- Utility Clearance completed. All utility relocations must be completed prior to construction;
- ROW Clearance completed;
- Plans, specifications, and estimates (PS&E) at 100 percent;
- ADOT requests FHWA authorization for funding construction phase. (three-month process);
- FHWA authorizes construction phase;
- ADOT gives NTP to railroad and local agency to begin construction;
- Railroad orders materials and schedules their work;
- Local agency procurement, advertise, bid, Council award, for civil portion of work (approximately six-month process). Bid documents must include the railroad requirements. The local agency's contractor submits application to the railroad to permit the civil work in railroad ROW; and
- Construction to be completed within fifteen months of the Opinion and Order (O&O) decision from the ACC hearing.

### Arizona Corporation Commission

The ACC is responsible for oversight of railroad operations and ensuring that public highway-rail crossings are constructed and maintained in a safe manner (Arizona Revised Statutes Title 40 40-336 40-337). The ACC is involved with nearly all highway-rail crossing projects and may be involved throughout the project process. Their involvement includes, but is not limited to, assisting with determining projects to add to the Section 130 Array, participating in diagnostic meetings, and completing an inspection after a project is completed.

Modifications to an existing public crossing may require a hearing and a resulting O&O decision from ACC. A minimum of six months is needed for the ACC process, from the time of application submittal to the judge's O&O decision.

## *Process for Local Agencies for Other Funding Sources Besides Section 130*

If a local agency is proposing project work that is above, at, or below track elevation and within the railroad right-of-way, railroad permission is required. Early communication is key for timely clearance.

The Construction & Maintenance agreement is only between the railroad and the local agency. If the local agency will use a Contractor, a "right of entry agreement" is required between the Contractor and the railroad. A right of entry agreement may take between one to two months to execute, and the Contractor will not be allowed into the railroad ROW until the right of entry is executed.

A general summary of the typical railroad process is as follows:

- Local agency notifies railroad about the project. The Railroad may require an authorization for preliminary engineering and plan review at this time. Authorization commits the Local agency for paying for Railroad review of the project;
- If there are proposed changes to existing public crossings, an O&O may be required from the ACC. It is highly recommended to communicate with ACC staff early in the project process to determine how much they may need to be involved;
- If an O&O is expected for the project, the first formal action with the ACC will be on the onsite diagnostic meeting. This meeting involves the railroad, the ACC, the local agency, and other parties. This meeting is typically held within two months of the initial railroad contact. This meeting will go over how the roadway projects affects the railroad ROW, with input from all parties on what work by the Railroad and by the Local agency will be needed;
- PE authorization is given to the railroad outlining for what they need to design. Railroad design can take two to four months for each submittal and will include an estimate for the construction work;
- The local agency will determine how much new permanent and temporary construction easement is needed;
- If geotechnical drilling/investigation, surveying, or utility designation is needed within the railroad right-of-way, the Local agency will need to obtain right of entry permits from the railroad. Installation of new utilities will also require right of entry permits. The costs of these permits are usually separate from the Construction & Maintenance Agreement and can be applied for before the Construction & Maintenance Agreement is submitted;
- Once the railroad design and estimates are provided, a draft Construction & Maintenance agreement may be prepared by the railroad. Once an underpass or overpass structure has 60 percent plans approved by the railroad, a new agreement formation will be triggered;
- The railroad will require final 100 percent signed and sealed engineering plans before they can send the Local agency the Agreement. It takes a minimum of four to six months after designs and estimates are received to finalize the Agreement.
- Once the Local agency and the railroad execute the Agreement, the initial ACC application for an O&O can be filled out. A minimum of 90 days is needed to obtain the O&O. Information and guidance on the ACC application can be found on the ACC website or by using the link provided: *http://www.azcc.gov/safety/railroad;* and
- Once the O&O has been received the Local agency can provide an Authorization to Construct to the railroad. It may take as much as a year from Notice to Construct to when the railroad work is completed. If the project involves roadwork that will be done by a contractor, the contractor must notify the railroad representative once the contractor is allowed to proceed with the work.

## *Best Practices for Crossing Treatments*

The Highway-Railway Grade Crossing Action Plan details the best practices for developing a SHRAP, including the evaluation of grade crossings, the effectiveness of the most common treatments, and noteworthy prioritization practices. The best practices address a range of needs, from vehicles stopped on crossings to pedestrian- and bicycle-involved incidents, and provide a variety of treatment options, from pavement markings to crossing closures. The following highlights treatment types and some strategies.

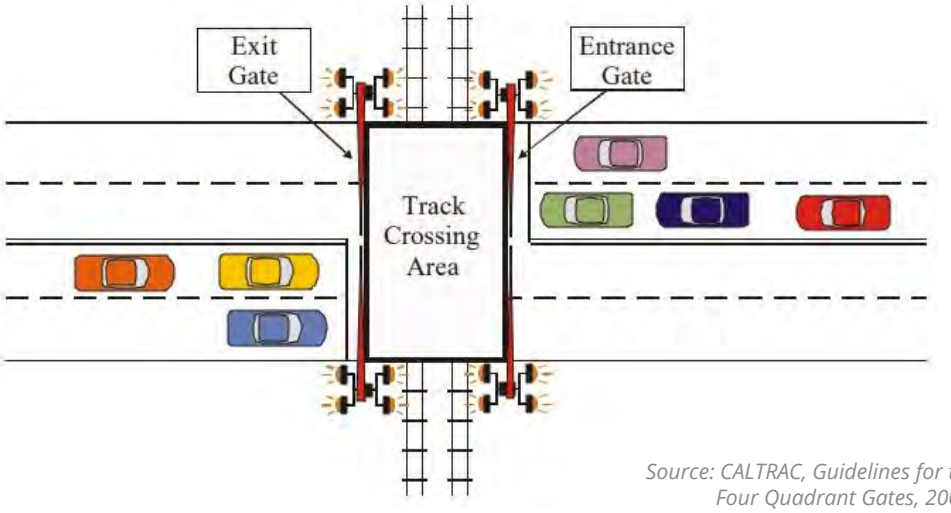
### Passive Treatments

Passive treatments involve signage and pavement markings. Signage includes regulatory and warning signs. Pavement markings include exclusions zones, dynamic envelopes, edge lines, and relocation of the stop bar.

## Active Treatments

Active treatments are designed to catch the attention of motorists and pedestrians, and include signals, audible cues, and automatic gates. Signals may include flashing light signals, cantilever flashing light signals, and supplemental flashing light signals. Audible treatments may include audible warnings and wayside horns. Automatic gates may include four-quadrant gates, shown in **Figure J-1**, and barrier gates.

**Figure J-1: Four Quadrant Gates**




*Source: CALTRAC, Guidelines for the Use of Four Quadrant Gates, 2000*

## Site Improvements

Site improvements around the crossing can have an impact on the safety of motorists and pedestrians. Improving sight distance and illumination, adding channelization or safety barriers, improving the crossing surface, and closing the crossing are some of the many improvements that can be implemented around the crossing.

Channelization can be achieved through barrier wall systems, wide raised medians, non-mountable curb islands, guardrails, and crash cushions. These improvements are installed on or near the roadway and not the crossing itself but may be eligible for Section 130 funding.

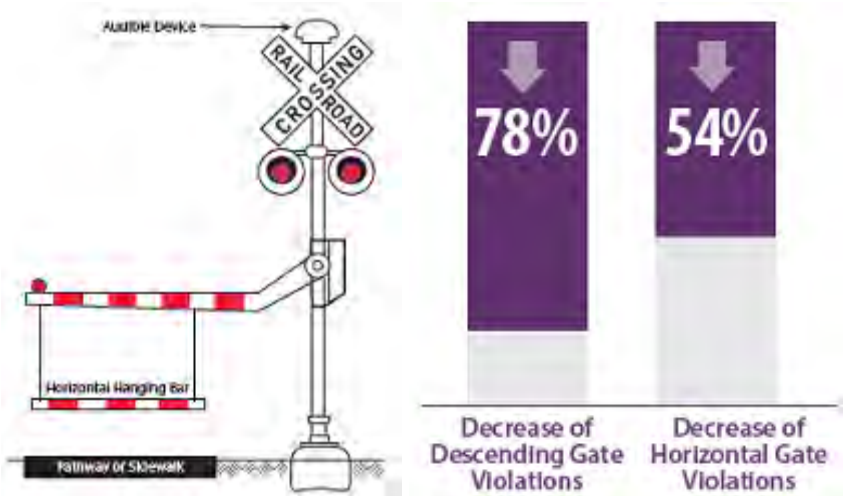
## Pedestrian and Bicycle Treatments

Pedestrian barriers may be used to create a "maze" which forces pedestrians to turn and look both ways approaching a sidewalk crossing, especially in urban area where there is no fenced in right-of-way. These barriers can also incorporate a pedestrian refuge zone between the trackway and adjacent roadway.

Pedestrian automatic gates are the same as standard automatic crossing gates except the gate arms are shorter. When activated by an approaching train, the automatic gates are used to physically prevent pedestrians from crossing the tracks. This type of gate may be used in areas where pedestrian risk of a collision is medium to high, such as areas where stopping sight distance is inadequate and pedestrian volume is significant. The preferred method is to provide pedestrian automatic gates in all four quadrants, either using separate pedestrian gates or with a combination of pedestrian gates and vehicular gates extending across the sidewalk.

Since publication of Highway-Railway Grade Crossing Action Plan, additional treatments have been identified for use by FHWA. Crossing gate "skirts" shown in **Figure J-2**, which are constructed by attaching a horizontal hanging bar to the gate arm, have been shown to be effective at reducing the likelihood that pedestrian will violate a lowered crossing gate. An FRA study on the effect of crossing gate skirts found that pedestrian horizontal gate violations decreased by more than fifty percent at locations where the crossing gate skirt was present.

**Figure J-2: Pedestrian Gate Skirt**




*Source: USDOT FRA, Effect of Gate Skirts on Pedestrian Behavior at a Highway-Rail Grade Crossing Final Report, 2013.*

Conical trespasser matting, shown in **Figure J-3**, can deter pedestrians from traversing the tracks at spots other than the appropriate crossing. The conical matting creates an uneven surface that is difficult to walk or bike across, thus encouraging pedestrians back to the appropriate crossing over the tracks.

**Figure J-3: Conical Trespasser Matting and 'Another Train Coming' Warning Sign**


*Source: BNSF Railway*

Digital signage, shown in **Figure J-3**, warns users of a second train approaching the crossing. At crossings with two or more tracks, pedestrians and vehicles may not be able to see an oncoming train if one is currently crossing the tracks. The sign provides advance notice of the approaching train to discourage pedestrians and vehicles crossing the tracks before they are clear.

## Signing and Striping and the MUTCD

Part 8 of the Manual on Uniform Traffic Control Devices (MUTCD) and of the Arizona Supplement to the MUTCD outlines the required and recommended traffic control devices that are used at highway-rail grade crossings in the state of Arizona. Signing and striping are important components of the traffic control devices for grade crossings and specific typical standards are set within the MUTCD, though these standards may

be overridden with the support of an engineering study on a per-location basis. Maintenance of signing and striping at crossings is not eligible for Section 130 funding; installation of new signage or pavement markings may be eligible.

More information on signing and striping for highway-rail grade crossings can be found on the FHWA website or by using the link provided: *https://mutcd.fhwa.dot.gov/pdfs/2009r1r2/part8.pdf*.

The Arizona Supplement to the MUTCD can be found on the ADOT website or by using the link provided: *https://azdot.gov/sites/default/files/2019/07/arizona-supplement-to-the-manual-on-uniform-traffic-control-devices-2009-mutcd-edition.pdf*.

## Additional Railroad-Related Information

The following provides additional information on quiet zones and grade-separated crossings, two railroad-related topics about which local agencies often have questions.

### Quiet Zones

According to the FRA, a quiet zone is "a location where railroads have been directed to cease the routine sounding of their horns when approaching public highway-rail grade crossings." Train horns may still be used in emergency situations or to comply with other Federal regulations or railroad operating rules. Localities desiring to establish a quiet zone are first required to mitigate the increased risk caused by the absence of a horn.

Every public grade crossing in a quiet zone must be equipped at minimum with the standard or conventional automatic warning devices, i.e., flashing lights and gates. Local governments must work in cooperation with the railroad that owns the track, and the appropriate state transportation authority to convene a diagnostic team to assess the risk of collision at each grade crossing where they wish to establish a quiet zone. Examples of additional safety engineering improvements that may be necessary to reduce the risk of collisions include medians on one or both sides of the tracks; a four-quadrant gate system; converting a two-way street into a one-way street; permanent closure of the crossing to highway traffic; or approved variation of these treatments.

Information and guidance on establishing a quiet zone can be found on the FRA website or by using the link provided: *https://railroads.dot.gov/highway-rail-crossing-and-trespasser-programs/train-horn-rulequiet-zones/train-horn-rule-and-quiet*.

### Grade-Separated Crossings

A grade-separated crossing is a possible alternative for the elimination of a highway-rail crossing, according to the Highway-Rail Crossing Handbook. Closure of a crossing, whether through grade separation or removal of roadway access, provides the highest level of crossing safety compared to other alternatives, as well as reductions in certain types of collisions, decreased delays to highway and rail traffic, and lowered maintenance costs.

Crossing closures are usually accomplished by closing the highway. Grade separation is a highly effective yet expensive alternative that must be coordinated across multiple agencies, including the local government, the railroad that owns the track, and the appropriate state transportation agency. Achieving consensus is integral to the closure process and may be dependent on States laws authorizing closure.

More information on crossing closures, including grade-separated facilities, can be found on the FHWA website or by using the link provided: *https://safety.fhwa.dot.gov/hsip/xings/com_roaduser/fhwasa18040/chp2.cfm*.

# Appendix K – Planning-Level Cost Estimates

**ARIZONA DEPARTMENT OF TRANSPORTATION**
**CONSTRUCTION COST ESTIMATE SUMMARY**

**CROSSING ID:** 025017A
**PROJECT** Apache Ave, South of Joy Nevin Ave, Holbrook

**AGENCY:** ADOT
**ESTIMATE LEVEL:** LEVEL 0
**DATE:** 1/12/2022

**PROJECT DETAILS**

Potential improvements include:

1. Sidewalk replacement and extension of fencing to align with pedestrian gate.

2. Concrete crossing panel replacement across entire crossing.

3. Pre-signal on south side of crossing for northbound traffic.


| ITEM | MAJOR ITEM DESCRIPTION | UNIT | QUANTITY | UNIT COST | TOTAL COST |
|---|---|---|---|---|---|
| 200 | **REMOVALS** | | | | |
| | REMOVAL OF PAVEMENT | SQ.YD. | - | - | - |
| | REMOVAL OF TREES | EACH | - | - | - |
| | REMOVAL OF SIGNS | EACH | - | - | - |
| | REMOVAL OF SIGNALS | EACH | - | - | - |
| | REMOVAL OF DRIVEWAYS | EACH | - | - | - |
| | MISCELLANEOUS ITEMS | L.SUM | - | - | - |
| | **TOTAL ITEM 200** | | | | - |
| 300 & 400 | **BASE AND SURFACE TREATMENT** | | | | |
| | CONCRETE PAVEMENT | SQ.YD. | - | - | - |
| | ASPHALT PAVEMENT | SQ.YD. | - | - | - |
| | MISCELLANEOUS ITEMS | L.SUM | - | - | - |
| | **TOTAL ITEM 300 & 400** | | | | - |
| 500 | **DRAINAGE** | | | | |
| | PIPE CULVERT | L.FT. | - | - | - |
| | DRAINAGE STRUCTURE | EACH | - | - | - |
| | MISCELLANEOUS ITEMS | L.SUM | - | - | - |
| | **TOTAL ITEM 500** | | | | - |
| 600 | **STRUCTURES** | | | | |
| | RAILROAD OVERPASS | SQ. FT. | - | - | - |
| | PEDESTRIAN BRIDGE | SQ. FT. | - | - | - |
| | MISCELLANEOUS ITEMS | L.SUM | - | - | - |
| | **TOTAL ITEM 600** | | | | - |
| 700 | **TRAFFIC ENGINEERING** | | | | |
| | PAVEMENT MARKING | L.FT. | - | - | - |
| | TRANSVERSE PAVEMENT MARKING | EACH | - | - | - |
| | SIGNING | MILE | - | - | - |
| | CANTILEVERED FLASHING-LIGHT SIGNALS | EACH | - | - | - |
| | SUPPLEMENTAL FLASHING-LIGHT SIGNALS | EACH | - | - | - |
| | WAYSIDE HORN | EACH | - | - | - |
| | FOUR-QUADRANT GATE ARMS | EACH | - | - | - |
| | BARRIER GATE ARM | EACH | - | - | - |
| | PEDESTRIAN GATE ARM | EACH | - | - | - |
| | PEDESTRIAN SWING GATE | EACH | - | - | - |
| | VEHICLE PRESENCE DETECTION SYSTEM | EACH | - | - | - |
| | TRAFFIC SIGNAL ADVANCE PREEMPTION | EACH | - | - | - |
| | TRAFFIC SIGNAL | EACH | 1 | $ 125,000.00 | $ 125,000 |
| | FLAGGING SERVICES (RAILROAD) | DAY | 14 | $ 1,750.00 | $ 24,500 |
| | FLAGGING SERVICES (CONTRACTOR) | DAY | 14 | $ 1,750.00 | $ 24,500 |
| | LIGHTING | EACH | - | - | - |
| | MISCELLANEOUS ITEMS | L.SUM | - | - | - |
| | **TOTAL ITEM 700** | | | | $ 174,000 |
| 800 | **ROADSIDE DEVELOPMENT** | | | | |
| | LANDSCAPING AND TOPSOIL | SQ.YD. | - | - | - |
| | NEW UTILITIES | L.SUM | - | - | - |
| | UTILITY RELOCATION | L.SUM | - | - | - |
| | MISCELLANEOUS ITEMS | L.SUM | - | - | - |
| | **TOTAL ITEM 800** | | | | - |

# ARIZONA DEPARTMENT OF TRANSPORTATION
## CONSTRUCTION COST ESTIMATE SUMMARY

**CROSSING ID:** 025017A
**PROJECT NAME:** Apache Ave, South of Joy Nevin Ave,

**AGENCY:** ADOT
**ESTIMATE LEVEL:** LEVEL 0
**DATE:** 1/12/2022

| ITEM | MAJOR ITEM DESCRIPTION | UNIT | QUANTITY | UNIT COST | TOTAL COST |
|---|---|---|---|---|---|
| 900 | **INCIDENTALS** | | | | |
| | CONCRETE CURB | L.FT. | - | - | - |
| | CONCRETE BARRIER | L.FT. | - | - | - |
| | CONCRETE CROSSING PANELS | T. FT. | 173 | $ 2,200.00 | $ 380,600 |
| | CONCRETE SIDEWALK | SQ.FT. | 2,400 | $ 50.00 | $ 120,000 |
| | MEDIAN PAVERS | SQ.YD. | - | - | - |
| | FENCE | L.FT. | 400 | $ 15.00 | $ 6,000 |
| | REMOVE/REPLACE TRACK | T. FT. | - | - | - |
| | MISCELLANEOUS ITEMS | L.SUM | - | - | - |
| | **TOTAL ITEM 900** | | | | $ 507,000 |
| | **SUBTOTAL A (ITEM SUBTOTAL)** | | | | **$ 681,000** |
| PW | **PROJECT WIDE** | | | | |
| | TRAFFIC CONTROL (8% OF SUBTOTAL A) | | | 8% | $ 54,500 |
| | DUST PALLIATIVE (0% OF SUBTOTAL A)(INCLUDED IN FURNISH WATER) | | | 0% | $ 0 |
| | QUALITY CONTROL (1% OF SUBTOTAL A) | | | 1% | $ 6,900 |
| | CONSTRUCTION SURVEYING (2% OF SUBTOTAL A) | | | 2% | $ 13,700 |
| | EROSION CONTROL (1% OF SUBTOTAL A) | | | 1% | $ 6,900 |
| | MOBILIZATION (10% OF SUBTOTAL A) | | | 10% | $ 68,100 |
| | UNIDENTIFIED ITEMS (15% OF SUBTOTAL A) | | | 15% | $ 102,200 |
| | **SUBTOTAL B (SUBTOTAL A + PROJECT WIDE)** | | | | **$ 933,300** |
| OTHER PROJ | **OTHER PROJECT COSTS** | | | | |
| | DPS TRAFFIC CONTROL (0% OF SUBTOTAL A) | | | 0% | $ 0 |
| | JOINT PROJECT AGREEMENT ITEMS (0% OF SUBTOTAL A) | | | 0% | $ 0 |
| | CONTRACTOR INCENTIVES (0% OF SUBTOTAL A) | | | 0% | $ 0 |
| | ENVIRONMENTAL MITIGATION (0.5% OF SUBTOTAL A) | | | 1% | $ 3,500 |
| | **BASE YEAR CONSTRUCTION COST (EXCLUDING UTILITIES & R/W)** | | | | **$ 936,800** |
| BELOW | **BELOW THE LINE ITEMS** | | | | |
| | POST DESIGN SERVICES (1% OF BASE YEAR CONSTRUCTION COST) | | | 1% | $ 9,400 |
| | CONSTRUCTION CONTINGENCIES (5% OF BASE YEAR CONSTRUCTION COST) | | | 5% | $ 46,900 |
| | CONSTRUCTION ENGINEERING (14% OF BASE YEAR CONSTRUCTION COST) | | | 14% | $ 131,200 |
| | **SUBTOTAL BASE YEAR CONSTRUCTION** | | | | **$ 1,124,300** |
| | INDIRECT COST ALLOCATION (10.5% OF BASE YEAR CONSTRUCTION) | | | 10.5% | $ 98,400 |
| | **BASE YEAR DEPARTMENT CONSTRUCTION COST (EXCLUDING UTILITIES & R/W)** | | | | **$ 1,222,700** |
| | | | | | |
| DES | **PREDESIGN AND FINAL DESIGN** | | | | |
| | PREDESIGN/NEPA/PI SERVICES (10% OF BASE YEAR CONSTRUCTION COST) | | | 10% | $ 93,400 |
| | INDIRECT COST ALLOCATION (10.5% OF ALL PREDESIGN COSTS) | | | 10.5% | $ 9,900 |
| | **SUBTOTAL PREDESIGN** | | | | **$ 103,300** |
| | FINAL DESIGN SERVICES (8% OF BASE YEAR CONSTRUCTION COST) | | | 8% | $ 75,000 |
| | INDIRECT COST ALLOCATION (10.5% OF ALL FINAL DESIGN COSTS) | | | 10.5% | $ 7,900 |
| | **SUBTOTAL FINAL DESIGN** | | | | **$ 82,900** |
| | **TOTAL ESTIMATED DESIGN COST** | | | | **$186,200** |
| | | | | | |
| UTIL | **UTILITY RELOCATION** | | | | |
| | UTILITIES (NEW FACILITIES/RELOCATIONS) | | | 14% | $ 171,200 |
| | INDIRECT COST ALLOCATION (10.5% OF ALL UTILITY COSTS) | | | 10.5% | $ 18,000 |
| | **TOTAL ESTIMATED UTILITY COST** | | | | **$189,200** |
| | | | | | |
| R/W | **RIGHT-OF-WAY** | | | | |
| | RIGHT-OF-WAY | $250,000 | ACR | 0.02 | $ 4,600 |
| | INDIRECT COST ALLOCATION (10.5% OF ALL RIGHT-OF-WAY COSTS) | | | 10.5% | $ 500 |
| | **TOTAL ESTIMATED RIGHT-OF-WAY COSTS** | | | | **$5,100** |
| | **TOTAL ESTIMATED PROJECT COST** | | | | **$1,603,200** |
| | **TOTAL ESTIMATED PROJECT COST (USE)** | | | | **$1,610,000** |

**ARIZONA DEPARTMENT OF TRANSPORTATION**
**CONSTRUCTION COST ESTIMATE SUMMARY**

**CROSSING ID:** 025023D
**PROJECT** Obed Rd, Joseph City

**AGENCY:** ADOT
**ESTIMATE LEVEL:** LEVEL 0
**DATE:** 1/12/2022

**PROJECT DETAILS**

Potential improvements include:

1. Crossing surface and approach evaluation and repairs.


| ITEM | MAJOR ITEM DESCRIPTION | UNIT | QUANTITY | UNIT COST | TOTAL COST |
|---|---|---|---|---|---|
| 200 | **REMOVALS** | | | | |
| | REMOVAL OF PAVEMENT | SQ.YD. | 1,223 | $ 20.00 | $ 24,500 |
| | REMOVAL OF TREES | EACH | - | - | - |
| | REMOVAL OF SIGNS | EACH | - | - | - |
| | REMOVAL OF SIGNALS | EACH | - | - | - |
| | REMOVAL OF DRIVEWAYS | EACH | - | - | - |
| | MISCELLANEOUS ITEMS | L.SUM | - | - | - |
| | **TOTAL ITEM 200** | | | | $ 25,000 |
| 300 & 400 | **BASE AND SURFACE TREATMENT** | | | | |
| | CONCRETE PAVEMENT | SQ.YD. | - | - | - |
| | ASPHALT PAVEMENT | SQ.YD. | 1,223 | $ 50.00 | $ 61,200 |
| | MISCELLANEOUS ITEMS | L.SUM | - | - | - |
| | **TOTAL ITEM 300 & 400** | | | | $ 62,000 |
| 500 | **DRAINAGE** | | | | |
| | PIPE CULVERT | L.FT. | - | - | - |
| | DRAINAGE STRUCTURE | EACH | - | - | - |
| | MISCELLANEOUS ITEMS | L.SUM | - | - | - |
| | **TOTAL ITEM 500** | | | | - |
| 600 | **STRUCTURES** | | | | |
| | RAILROAD OVERPASS | SQ. FT. | - | - | - |
| | PEDESTRIAN BRIDGE | SQ. FT. | - | - | - |
| | MISCELLANEOUS ITEMS | L.SUM | - | - | - |
| | **TOTAL ITEM 600** | | | | - |
| 700 | **TRAFFIC ENGINEERING** | | | | |
| | PAVEMENT MARKING | L.FT. | - | - | - |
| | TRANSVERSE PAVEMENT MARKING | EACH | - | - | - |
| | SIGNING | MILE | - | - | - |
| | CANTILEVERED FLASHING-LIGHT SIGNALS | EACH | - | - | - |
| | SUPPLEMENTAL FLASHING-LIGHT SIGNALS | EACH | - | - | - |
| | WAYSIDE HORN | EACH | - | - | - |
| | FOUR-QUADRANT GATE ARMS | EACH | - | - | - |
| | BARRIER GATE ARM | EACH | - | - | - |
| | PEDESTRIAN GATE ARM | EACH | - | - | - |
| | PEDESTRIAN SWING GATE | EACH | - | - | - |
| | VEHICLE PRESENCE DETECTION SYSTEM | EACH | - | - | - |
| | TRAFFIC SIGNAL ADVANCE PREEMPTION | EACH | - | - | - |
| | TRAFFIC SIGNAL | EACH | - | - | - |
| | FLAGGING SERVICES (RAILROAD) | DAY | 7 | $ 1,750.00 | $ 12,250 |
| | FLAGGING SERVICES (CONTRACTOR) | DAY | 7 | $ 1,750.00 | $ 12,250 |
| | LIGHTING | EACH | - | - | - |
| | MISCELLANEOUS ITEMS | L.SUM | - | - | - |
| | **TOTAL ITEM 700** | | | | $ 25,000 |
| 800 | **ROADSIDE DEVELOPMENT** | | | | |
| | LANDSCAPING AND TOPSOIL | SQ.YD. | - | - | - |
| | NEW UTILITIES | L.SUM | - | - | - |
| | UTILITY RELOCATION | L.SUM | - | - | - |
| | MISCELLANEOUS ITEMS | L.SUM | - | - | - |
| | **TOTAL ITEM 800** | | | | - |

# ARIZONA DEPARTMENT OF TRANSPORTATION
## CONSTRUCTION COST ESTIMATE SUMMARY

**CROSSING ID:** 025023D
**PROJECT NAME:** Obed Rd, Joseph City

**AGENCY:** ADOT
**ESTIMATE LEVEL:** LEVEL 0
**DATE:** 1/12/2022

| ITEM | MAJOR ITEM DESCRIPTION | UNIT | QUANTITY | UNIT COST | TOTAL COST |
|---|---|---|---|---|---|
| 900 | **INCIDENTALS** | | | | |
| | CONCRETE CURB | L.FT. | - | - | - |
| | CONCRETE BARRIER | L.FT. | - | - | - |
| | CONCRETE CROSSING PANELS | T. FT. | 64 | $ 2,200.00 | $ 140,800 |
| | CONCRETE SIDEWALK | SQ.FT. | - | - | - |
| | MEDIAN PAVERS | SQ.YD. | - | - | - |
| | FENCE | L.FT. | - | - | - |
| | REMOVE/REPLACE TRACK | T. FT. | - | - | - |
| | MISCELLANEOUS ITEMS | L.SUM | - | - | - |
| | **TOTAL ITEM 900** | | | | $ 141,000 |
| | **SUBTOTAL A (ITEM SUBTOTAL)** | | | | **$ 253,000** |
| PW | **PROJECT WIDE** | | | | |
| | TRAFFIC CONTROL (8% OF SUBTOTAL A) | | | 8% | $ 20,300 |
| | DUST PALLIATIVE (0% OF SUBTOTAL A)(INCLUDED IN FURNISH WATER) | | | 0% | $ 0 |
| | QUALITY CONTROL (1% OF SUBTOTAL A) | | | 1% | $ 2,600 |
| | CONSTRUCTION SURVEYING (2% OF SUBTOTAL A) | | | 2% | $ 5,100 |
| | EROSION CONTROL (1% OF SUBTOTAL A) | | | 1% | $ 2,600 |
| | MOBILIZATION (10% OF SUBTOTAL A) | | | 10% | $ 25,300 |
| | UNIDENTIFIED ITEMS (15% OF SUBTOTAL A) | | | 15% | $ 38,000 |
| | **SUBTOTAL B (SUBTOTAL A + PROJECT WIDE)** | | | | **$ 346,900** |
| OTHER PROJ | **OTHER PROJECT COSTS** | | | | |
| | DPS TRAFFIC CONTROL (0% OF SUBTOTAL A) | | | 0% | $ 0 |
| | JOINT PROJECT AGREEMENT ITEMS (0% OF SUBTOTAL A) | | | 0% | $ 0 |
| | CONTRACTOR INCENTIVES (0% OF SUBTOTAL A) | | | 0% | $ 0 |
| | ENVIRONMENTAL MITIGATION (0.5% OF SUBTOTAL A) | | | 1% | $ 1,300 |
| | **BASE YEAR CONSTRUCTION COST (EXCLUDING UTILITIES & R/W)** | | | | **$ 348,200** |
| BELOW | **BELOW THE LINE ITEMS** | | | | |
| | POST DESIGN SERVICES (1% OF BASE YEAR CONSTRUCTION COST) | | | 1% | $ 3,500 |
| | CONSTRUCTION CONTINGENCIES (5% OF BASE YEAR CONSTRUCTION COST) | | | 5% | $ 17,500 |
| | CONSTRUCTION ENGINEERING (14% OF BASE YEAR CONSTRUCTION COST) | | | 14% | $ 48,800 |
| | **SUBTOTAL BASE YEAR CONSTRUCTION** | | | | **$ 418,000** |
| | INDIRECT COST ALLOCATION (10.5% OF BASE YEAR CONSTRUCTION) | | | 10.5% | $ 36,600 |
| | **BASE YEAR DEPARTMENT CONSTRUCTION COST (EXCLUDING UTILITIES & R/W)** | | | | **$ 454,600** |
| | | | | | |
| DES | **PREDESIGN AND FINAL DESIGN** | | | | |
| | PREDESIGN/NEPA/PI SERVICES (10% OF BASE YEAR CONSTRUCTION COST) | | | 10% | $ 34,700 |
| | INDIRECT COST ALLOCATION (10.5% OF ALL PREDESIGN COSTS) | | | 10.5% | $ 3,700 |
| | **SUBTOTAL PREDESIGN** | | | | **$ 38,400** |
| | FINAL DESIGN SERVICES (8% OF BASE YEAR CONSTRUCTION COST) | | | 8% | $ 27,900 |
| | INDIRECT COST ALLOCATION (10.5% OF ALL FINAL DESIGN COSTS) | | | 10.5% | $ 3,000 |
| | **SUBTOTAL FINAL DESIGN** | | | | **$ 30,900** |
| | **TOTAL ESTIMATED DESIGN COST** | | | | **$69,300** |
| | | | | | |
| UTIL | **UTILITY RELOCATION** | | | | |
| | UTILITIES (NEW FACILITIES/RELOCATIONS) | | | 14% | $ 63,700 |
| | INDIRECT COST ALLOCATION (10.5% OF ALL UTILITY COSTS) | | | 10.5% | $ 6,700 |
| | **TOTAL ESTIMATED UTILITY COST** | | | | **$70,400** |
| | | | | | |
| R/W | **RIGHT-OF-WAY** | | | | |
| | RIGHT-OF-WAY | $250,000 | ACR | 0.00 | $ 0 |
| | INDIRECT COST ALLOCATION (10.5% OF ALL RIGHT-OF-WAY COSTS) | | | 10.5% | $ 0 |
| | **TOTAL ESTIMATED RIGHT-OF-WAY COSTS** | | | | **$0** |
| | **TOTAL ESTIMATED PROJECT COST** | | | | **$594,300** |
| | **TOTAL ESTIMATED PROJECT COST (USE)** | | | | **$600,000** |

**ARIZONA DEPARTMENT OF TRANSPORTATION**
**CONSTRUCTION COST ESTIMATE SUMMARY**

**CROSSING ID:** 025129Y
**PROJECT** Fanning Dr, South of Historic Rte 66, Flagstaff

**AGENCY:** ADOT
**ESTIMATE LEVEL:** LEVEL 0
**DATE:** 1/12/2022

**PROJECT DETAILS**

1. Automatic vehicle gates with skirt on both outbound sides of the crossing that also extend across the sidewalk with barriers/fencing to discourage trespassing.
2. Enhanced lighting.
3. Enhanced fencing
4. Blank-out sign warning of another train coming

| ITEM | MAJOR ITEM DESCRIPTION | UNIT | QUANTITY | UNIT COST | TOTAL COST |
|---|---|---|---|---|---|
| 200 | **REMOVALS** | | | | |
| | REMOVAL OF PAVEMENT | SQ.YD. | - | - | - |
| | REMOVAL OF TREES | EACH | - | - | - |
| | REMOVAL OF SIGNS | EACH | - | - | - |
| | REMOVAL OF SIGNALS | EACH | - | - | - |
| | REMOVAL OF DRIVEWAYS | EACH | - | - | - |
| | MISCELLANEOUS ITEMS | L.SUM | - | - | - |
| | **TOTAL ITEM 200** | | | | - |
| 300 & 400 | **BASE AND SURFACE TREATMENT** | | | | |
| | CONCRETE PAVEMENT | SQ.YD. | - | - | - |
| | ASPHALT PAVEMENT | SQ.YD. | - | - | - |
| | MISCELLANEOUS ITEMS | L.SUM | - | - | - |
| | **TOTAL ITEM 300 & 400** | | | | - |
| 500 | **DRAINAGE** | | | | |
| | PIPE CULVERT | L.FT. | - | - | - |
| | DRAINAGE STRUCTURE | EACH | - | - | - |
| | MISCELLANEOUS ITEMS | L.SUM | - | - | - |
| | **TOTAL ITEM 500** | | | | - |
| 600 | **STRUCTURES** | | | | |
| | RAILROAD OVERPASS | SQ. FT. | - | - | - |
| | PEDESTRIAN BRIDGE | SQ. FT. | - | - | - |
| | MISCELLANEOUS ITEMS | L.SUM | - | - | - |
| | **TOTAL ITEM 600** | | | | - |
| 700 | **TRAFFIC ENGINEERING** | | | | |
| | PAVEMENT MARKING | L.FT. | - | - | - |
| | TRANSVERSE PAVEMENT MARKING | EACH | - | - | - |
| | SIGNING | MILE | - | - | - |
| | CANTILEVERED FLASHING-LIGHT SIGNALS | EACH | - | - | - |
| | SUPPLEMENTAL FLASHING-LIGHT SIGNALS | EACH | - | - | - |
| | WAYSIDE HORN | EACH | - | - | - |
| | FOUR-QUADRANT GATE ARMS | EACH | - | - | - |
| | BARRIER GATE ARM | EACH | 2 | $ 200,000.00 | $ 400,000 |
| | PEDESTRIAN GATE ARM | EACH | - | - | - |
| | PEDESTRIAN SWING GATE | EACH | - | - | - |
| | VEHICLE PRESENCE DETECTION SYSTEM | EACH | - | - | - |
| | TRAFFIC SIGNAL ADVANCE PREEMPTION | EACH | - | - | - |
| | TRAFFIC SIGNAL | EACH | - | - | - |
| | FLAGGING SERVICES (RAILROAD) | DAY | 7 | $ 1,750.00 | $ 12,250 |
| | FLAGGING SERVICES (CONTRACTOR) | DAY | 7 | $ 1,750.00 | $ 12,250 |
| | LIGHTING | EACH | 4 | $ 2,500.00 | $ 10,000 |
| | MISCELLANEOUS ITEMS (BLANK-OUT SIGN) | L.SUM | 1 | $ 10,000.00 | $ 10,000 |
| | **TOTAL ITEM 700** | | | | $ 445,000 |
| 800 | **ROADSIDE DEVELOPMENT** | | | | |
| | LANDSCAPING AND TOPSOIL | SQ.YD. | - | - | - |
| | NEW UTILITIES | L.SUM | - | - | - |
| | UTILITY RELOCATION | L.SUM | - | - | - |
| | MISCELLANEOUS ITEMS | L.SUM | - | - | - |
| | **TOTAL ITEM 800** | | | | - |

# ARIZONA DEPARTMENT OF TRANSPORTATION
## CONSTRUCTION COST ESTIMATE SUMMARY

**CROSSING ID:** 025129Y
**PROJECT NAME:** Fanning Dr, South of Historic Rte 66,

**AGENCY:** ADOT
**ESTIMATE LEVEL:** LEVEL 0
**DATE:** 1/12/2022

| ITEM | MAJOR ITEM DESCRIPTION | UNIT | QUANTITY | UNIT COST | TOTAL COST |
|---|---|---|---|---|---|
| 900 | **INCIDENTALS** | | | | |
| | CONCRETE CURB | L.FT. | - | - | - |
| | CONCRETE BARRIER | L.FT. | - | - | - |
| | CONCRETE CROSSING PANELS | T. FT. | - | - | - |
| | CONCRETE SIDEWALK | SQ.FT. | - | - | - |
| | MEDIAN PAVERS | SQ.YD. | - | - | - |
| | FENCE | L.FT. | 400 | $ 15.00 | $ 6,000 |
| | REMOVE/REPLACE TRACK | T. FT. | - | - | - |
| | MISCELLANEOUS ITEMS | L.SUM | - | - | - |
| | **TOTAL ITEM 900** | | | | $ 6,000 |
| | **SUBTOTAL A (ITEM SUBTOTAL)** | | | | **$ 451,000** |
| PW | **PROJECT WIDE** | | | | |
| | TRAFFIC CONTROL (8% OF SUBTOTAL A) | | | 8% | $ 36,100 |
| | DUST PALLIATIVE (0% OF SUBTOTAL A)(INCLUDED IN FURNISH WATER) | | | 0% | $ 0 |
| | QUALITY CONTROL (1% OF SUBTOTAL A) | | | 1% | $ 4,600 |
| | CONSTRUCTION SURVEYING (2% OF SUBTOTAL A) | | | 2% | $ 9,100 |
| | EROSION CONTROL (1% OF SUBTOTAL A) | | | 1% | $ 4,600 |
| | MOBILIZATION (10% OF SUBTOTAL A) | | | 10% | $ 45,100 |
| | UNIDENTIFIED ITEMS (15% OF SUBTOTAL A) | | | 15% | $ 67,700 |
| | **SUBTOTAL B (SUBTOTAL A + PROJECT WIDE)** | | | | **$ 618,200** |
| OTHER PROJ | **OTHER PROJECT COSTS** | | | | |
| | DPS TRAFFIC CONTROL (0% OF SUBTOTAL A) | | | 0% | $ 0 |
| | JOINT PROJECT AGREEMENT ITEMS (0% OF SUBTOTAL A) | | | 0% | $ 0 |
| | CONTRACTOR INCENTIVES (0% OF SUBTOTAL A) | | | 0% | $ 0 |
| | ENVIRONMENTAL MITIGATION (0.5% OF SUBTOTAL A) | | | 1% | $ 2,300 |
| | **BASE YEAR CONSTRUCTION COST (EXCLUDING UTILITIES & R/W)** | | | | **$ 620,500** |
| BELOW | **BELOW THE LINE ITEMS** | | | | |
| | POST DESIGN SERVICES (1% OF BASE YEAR CONSTRUCTION COST) | | | 1% | $ 6,300 |
| | CONSTRUCTION CONTINGENCIES (5% OF BASE YEAR CONSTRUCTION COST) | | | 5% | $ 31,100 |
| | CONSTRUCTION ENGINEERING (14% OF BASE YEAR CONSTRUCTION COST) | | | 14% | $ 86,900 |
| | **SUBTOTAL BASE YEAR CONSTRUCTION** | | | | **$ 744,800** |
| | INDIRECT COST ALLOCATION (10.5% OF BASE YEAR CONSTRUCTION) | | | 10.5% | $ 65,200 |
| | **BASE YEAR DEPARTMENT CONSTRUCTION COST (EXCLUDING UTILITIES & R/W)** | | | | **$ 810,000** |
| | | | | | |
| DES | **PREDESIGN AND FINAL DESIGN** | | | | |
| | PREDESIGN/NEPA/PI SERVICES (10% OF BASE YEAR CONSTRUCTION COST) | | | 10% | $ 61,900 |
| | INDIRECT COST ALLOCATION (10.5% OF ALL PREDESIGN COSTS) | | | 10.5% | $ 6,500 |
| | **SUBTOTAL PREDESIGN** | | | | **$ 68,400** |
| | FINAL DESIGN SERVICES (8% OF BASE YEAR CONSTRUCTION COST) | | | 8% | $ 49,700 |
| | INDIRECT COST ALLOCATION (10.5% OF ALL FINAL DESIGN COSTS) | | | 10.5% | $ 5,300 |
| | **SUBTOTAL FINAL DESIGN** | | | | **$ 55,000** |
| | **TOTAL ESTIMATED DESIGN COST** | | | | **$123,400** |
| | | | | | |
| UTIL | **UTILITY RELOCATION** | | | | |
| | UTILITIES (NEW FACILITIES/RELOCATIONS) | | | 14% | $ 113,400 |
| | INDIRECT COST ALLOCATION (10.5% OF ALL UTILITY COSTS) | | | 10.5% | $ 12,000 |
| | **TOTAL ESTIMATED UTILITY COST** | | | | **$125,400** |
| | | | | | |
| R/W | **RIGHT-OF-WAY** | | | | |
| | RIGHT-OF-WAY | $250,000 | ACR | 0.00 | $ 0 |
| | INDIRECT COST ALLOCATION (10.5% OF ALL RIGHT-OF-WAY COSTS) | | | 10.5% | $ 0 |
| | **TOTAL ESTIMATED RIGHT-OF-WAY COSTS** | | | | **$0** |
| | **TOTAL ESTIMATED PROJECT COST** | | | | **$1,058,800** |
| | **TOTAL ESTIMATED PROJECT COST (USE)** | | | | **$1,060,000** |

**ARIZONA DEPARTMENT OF TRANSPORTATION**
**CONSTRUCTION COST ESTIMATE SUMMARY**

**CROSSING ID:** 025131A
**PROJECT** Ponderosa Pkwy, South of Historic Rte 66, Flagstaff

**AGENCY:** ADOT
**ESTIMATE LEVEL:** LEVEL 0
**DATE:** 1/31/2022

**PROJECT DETAILS**

Potential improvements include:

1. Pre-signal on south leg for northbound traffic.

2.Improved lighting; consideration to the local dark sky ordinance should be given.

| ITEM | MAJOR ITEM DESCRIPTION | UNIT | QUANTITY | UNIT COST | TOTAL COST |
|---|---|---|---|---|---|
| 200 | **REMOVALS** | | | | |
| | REMOVAL OF PAVEMENT | SQ.YD. | - | - | - |
| | REMOVAL OF TREES | EACH | - | - | - |
| | REMOVAL OF SIGNS | EACH | - | - | - |
| | REMOVAL OF SIGNALS | EACH | - | - | - |
| | REMOVAL OF DRIVEWAYS | EACH | - | - | - |
| | MISCELLANEOUS ITEMS | L.SUM | - | - | - |
| | **TOTAL ITEM 200** | | | | - |
| 300 & 400 | **BASE AND SURFACE TREATMENT** | | | | |
| | CONCRETE PAVEMENT | SQ.YD. | - | - | - |
| | ASPHALT PAVEMENT | SQ.YD. | - | - | - |
| | MISCELLANEOUS ITEMS | L.SUM | - | - | - |
| | **TOTAL ITEM 300 & 400** | | | | - |
| 500 | **DRAINAGE** | | | | |
| | PIPE CULVERT | L.FT. | - | - | - |
| | DRAINAGE STRUCTURE | EACH | - | - | - |
| | MISCELLANEOUS ITEMS | L.SUM | - | - | - |
| | **TOTAL ITEM 500** | | | | - |
| 600 | **STRUCTURES** | | | | |
| | RAILROAD OVERPASS | SQ. FT. | - | - | - |
| | PEDESTRIAN BRIDGE | SQ. FT. | - | - | - |
| | MISCELLANEOUS ITEMS | L.SUM | - | - | - |
| | **TOTAL ITEM 600** | | | | - |
| 700 | **TRAFFIC ENGINEERING** | | | | |
| | PAVEMENT MARKING | L.FT. | - | - | - |
| | TRANSVERSE PAVEMENT MARKING | EACH | - | - | - |
| | SIGNING | MILE | - | - | - |
| | CANTILEVERED FLASHING-LIGHT SIGNALS | EACH | - | - | - |
| | SUPPLEMENTAL FLASHING-LIGHT SIGNALS | EACH | - | - | - |
| | WAYSIDE HORN | EACH | - | - | - |
| | FOUR-QUADRANT GATE ARMS | EACH | - | - | - |
| | BARRIER GATE ARM | EACH | - | - | - |
| | PEDESTRIAN GATE ARM | EACH | - | - | - |
| | PEDESTRIAN SWING GATE | EACH | - | - | - |
| | VEHICLE PRESENCE DETECTION SYSTEM | EACH | - | - | - |
| | TRAFFIC SIGNAL ADVANCE PREEMPTION | EACH | 1 | $ 165,000.00 | $ 165,000 |
| | TRAFFIC SIGNAL | EACH | 1 | $ 125,000.00 | $ 125,000 |
| | FLAGGING SERVICES (RAILROAD) | DAY | - | - | - |
| | FLAGGING SERVICES (CONTRACTOR) | DAY | - | - | - |
| | LIGHTING | EACH | 4 | $ 2,500.00 | $ 10,000 |
| | MISCELLANEOUS ITEMS | L.SUM | - | - | - |
| | **TOTAL ITEM 700** | | | | $ 300,000 |
| 800 | **ROADSIDE DEVELOPMENT** | | | | |
| | LANDSCAPING AND TOPSOIL | SQ.YD. | - | - | - |
| | NEW UTILITIES | L.SUM | - | - | - |
| | UTILITY RELOCATION | L.SUM | - | - | - |
| | MISCELLANEOUS ITEMS | L.SUM | - | - | - |
| | **TOTAL ITEM 800** | | | | - |

# ARIZONA DEPARTMENT OF TRANSPORTATION
## CONSTRUCTION COST ESTIMATE SUMMARY

**CROSSING ID:** 025131A
**PROJECT NAME:** Ponderosa Pkwy, South of Historic Rte

**AGENCY:** ADOT
**ESTIMATE LEVEL:** LEVEL 0
**DATE:** 1/31/2022

| ITEM | MAJOR ITEM DESCRIPTION | UNIT | QUANTITY | UNIT COST | TOTAL COST |
|---|---|---|---|---|---|
| 900 | **INCIDENTALS** | | | | |
| | CONCRETE CURB | L.FT. | - | - | - |
| | CONCRETE BARRIER | L.FT. | - | - | - |
| | CONCRETE CROSSING PANELS | T. FT. | - | - | - |
| | CONCRETE SIDEWALK | SQ.FT. | - | - | - |
| | MEDIAN PAVERS | SQ.YD. | - | - | - |
| | FENCE | L.FT. | - | - | - |
| | REMOVE/REPLACE TRACK | T. FT. | - | - | - |
| | MISCELLANEOUS ITEMS | L.SUM | - | - | - |
| | **TOTAL ITEM 900** | | | | - |
| | **SUBTOTAL A (ITEM SUBTOTAL)** | | | | **$ 300,000** |
| PW | **PROJECT WIDE** | | | | |
| | TRAFFIC CONTROL (8% OF SUBTOTAL A) | | | 8% | $ 24,000 |
| | DUST PALLIATIVE (0% OF SUBTOTAL A)(INCLUDED IN FURNISH WATER) | | | 0% | $ 0 |
| | QUALITY CONTROL (1% OF SUBTOTAL A) | | | 1% | $ 3,000 |
| | CONSTRUCTION SURVEYING (2% OF SUBTOTAL A) | | | 2% | $ 6,000 |
| | EROSION CONTROL (1% OF SUBTOTAL A) | | | 1% | $ 3,000 |
| | MOBILIZATION (10% OF SUBTOTAL A) | | | 10% | $ 30,000 |
| | UNIDENTIFIED ITEMS (15% OF SUBTOTAL A) | | | 15% | $ 45,000 |
| | **SUBTOTAL B (SUBTOTAL A + PROJECT WIDE)** | | | | **$ 411,000** |
| OTHER PROJ | **OTHER PROJECT COSTS** | | | | |
| | DPS TRAFFIC CONTROL (0% OF SUBTOTAL A) | | | 0% | $ 0 |
| | JOINT PROJECT AGREEMENT ITEMS (0% OF SUBTOTAL A) | | | 0% | $ 0 |
| | CONTRACTOR INCENTIVES (0% OF SUBTOTAL A) | | | 0% | $ 0 |
| | ENVIRONMENTAL MITIGATION (0.5% OF SUBTOTAL A) | | | 1% | $ 1,500 |
| | **BASE YEAR CONSTRUCTION COST (EXCLUDING UTILITIES & R/W)** | | | | **$ 412,500** |
| BELOW | **BELOW THE LINE ITEMS** | | | | |
| | POST DESIGN SERVICES (1% OF BASE YEAR CONSTRUCTION COST) | | | 1% | $ 4,200 |
| | CONSTRUCTION CONTINGENCIES (5% OF BASE YEAR CONSTRUCTION COST) | | | 5% | $ 20,700 |
| | CONSTRUCTION ENGINEERING (14% OF BASE YEAR CONSTRUCTION COST) | | | 14% | $ 57,800 |
| | **SUBTOTAL BASE YEAR CONSTRUCTION** | | | | **$ 495,200** |
| | INDIRECT COST ALLOCATION (10.5% OF BASE YEAR CONSTRUCTION) | | | 10.5% | $ 43,400 |
| | **BASE YEAR DEPARTMENT CONSTRUCTION COST (EXCLUDING UTILITIES & R/W)** | | | | **$ 538,600** |
| | | | | | |
| DES | **PREDESIGN AND FINAL DESIGN** | | | | |
| | PREDESIGN/NEPA/PI SERVICES (10% OF BASE YEAR CONSTRUCTION COST) | | | 10% | $ 41,100 |
| | INDIRECT COST ALLOCATION (10.5% OF ALL PREDESIGN COSTS) | | | 10.5% | $ 4,400 |
| | **SUBTOTAL PREDESIGN** | | | | **$ 45,500** |
| | FINAL DESIGN SERVICES (8% OF BASE YEAR CONSTRUCTION COST) | | | 8% | $ 33,000 |
| | INDIRECT COST ALLOCATION (10.5% OF ALL FINAL DESIGN COSTS) | | | 10.5% | $ 3,500 |
| | **SUBTOTAL FINAL DESIGN** | | | | **$ 36,500** |
| | **TOTAL ESTIMATED DESIGN COST** | | | | **$82,000** |
| | | | | | |
| UTIL | **UTILITY RELOCATION** | | | | |
| | UTILITIES (NEW FACILITIES/RELOCATIONS) | | | 14% | $ 75,500 |
| | INDIRECT COST ALLOCATION (10.5% OF ALL UTILITY COSTS) | | | 10.5% | $ 8,000 |
| | **TOTAL ESTIMATED UTILITY COST** | | | | **$83,500** |
| | | | | | |
| R/W | **RIGHT-OF-WAY** | | | | |
| | RIGHT-OF-WAY | $250,000 | ACR | 0.00 | $ 0 |
| | INDIRECT COST ALLOCATION (10.5% OF ALL RIGHT-OF-WAY COSTS) | | | 10.5% | $ 0 |
| | **TOTAL ESTIMATED RIGHT-OF-WAY COSTS** | | | | **$0** |
| | **TOTAL ESTIMATED PROJECT COST** | | | | **$704,100** |
| | **TOTAL ESTIMATED PROJECT COST (USE)** | | | | **$710,000** |

**ARIZONA DEPARTMENT OF TRANSPORTATION**
**CONSTRUCTION COST ESTIMATE SUMMARY**

**CROSSING ID:** 025132G
**PROJECT** San Francisco St, South of Historic Rte 66, Flagstaff

**AGENCY:** ADOT
**ESTIMATE LEVEL:** LEVEL 0
**DATE:** 1/12/2022

**PROJECT DETAILS**

1. Automatic pedestrian gates with skirt to existing mast flashers on north side of crossing across the sidewalk on both sides of the street with additional barriers/fencing to discourage trespassing. Decorative fencing could be considered.

2. "Second train" signage near all four pedestrian crossings.

| ITEM | MAJOR ITEM DESCRIPTION | UNIT | QUANTITY | UNIT COST | TOTAL COST |
|---|---|---|---|---|---|
| **200** | **REMOVALS** | | | | |
| | REMOVAL OF PAVEMENT | SQ.YD. | - | - | - |
| | REMOVAL OF TREES | EACH | - | - | - |
| | REMOVAL OF SIGNS | EACH | - | - | - |
| | REMOVAL OF SIGNALS | EACH | - | - | - |
| | REMOVAL OF DRIVEWAYS | EACH | - | - | - |
| | MISCELLANEOUS ITEMS | L.SUM | - | - | - |
| | **TOTAL ITEM 200** | | | | - |
| **300 & 400** | **BASE AND SURFACE TREATMENT** | | | | |
| | CONCRETE PAVEMENT | SQ.YD. | - | - | - |
| | ASPHALT PAVEMENT | SQ.YD. | - | - | - |
| | MISCELLANEOUS ITEMS | L.SUM | - | - | - |
| | **TOTAL ITEM 300 & 400** | | | | - |
| **500** | **DRAINAGE** | | | | |
| | PIPE CULVERT | L.FT. | - | - | - |
| | DRAINAGE STRUCTURE | EACH | - | - | - |
| | MISCELLANEOUS ITEMS | L.SUM | - | - | - |
| | **TOTAL ITEM 500** | | | | - |
| **600** | **STRUCTURES** | | | | |
| | RAILROAD OVERPASS | SQ. FT. | - | - | - |
| | PEDESTRIAN BRIDGE | SQ. FT. | - | - | - |
| | MISCELLANEOUS ITEMS | L.SUM | - | - | - |
| | **TOTAL ITEM 600** | | | | - |
| **700** | **TRAFFIC ENGINEERING** | | | | |
| | PAVEMENT MARKING | L.FT. | - | - | - |
| | TRANSVERSE PAVEMENT MARKING | EACH | - | - | - |
| | SIGNING | MILE | - | - | - |
| | CANTILEVERED FLASHING-LIGHT SIGNALS | EACH | - | - | - |
| | SUPPLEMENTAL FLASHING-LIGHT SIGNALS | EACH | - | - | - |
| | WAYSIDE HORN | EACH | - | - | - |
| | FOUR-QUADRANT GATE ARMS | EACH | - | - | - |
| | BARRIER GATE ARM | EACH | - | - | - |
| | PEDESTRIAN GATE ARM | EACH | 2 | $ 100,000.00 | $ 200,000 |
| | PEDESTRIAN SWING GATE | EACH | - | - | - |
| | VEHICLE PRESENCE DETECTION SYSTEM | EACH | - | - | - |
| | TRAFFIC SIGNAL ADVANCE PREEMPTION | EACH | - | - | - |
| | TRAFFIC SIGNAL | EACH | - | - | - |
| | FLAGGING SERVICES (RAILROAD) | DAY | 7 | $ 1,750.00 | $ 12,250 |
| | FLAGGING SERVICES (CONTRACTOR) | DAY | 7 | $ 1,750.00 | $ 12,250 |
| | LIGHTING | EACH | 4 | $ 2,500.00 | $ 10,000 |
| | MISCELLANEOUS ITEMS (BLANK-OUT SIGN) | L.SUM | 1 | $ 10,000.00 | $ 10,000 |
| | **TOTAL ITEM 700** | | | | $ 245,000 |
| **800** | **ROADSIDE DEVELOPMENT** | | | | |
| | LANDSCAPING AND TOPSOIL | SQ.YD. | - | - | - |
| | NEW UTILITIES | L.SUM | - | - | - |
| | UTILITY RELOCATION | L.SUM | - | - | - |
| | MISCELLANEOUS ITEMS | L.SUM | - | - | - |
| | **TOTAL ITEM 800** | | | | - |

# ARIZONA DEPARTMENT OF TRANSPORTATION
## CONSTRUCTION COST ESTIMATE SUMMARY

**CROSSING ID:** 025132G
**PROJECT NAME:** San Francisco St, South of Historic Rte 66,

**AGENCY:** ADOT
**ESTIMATE LEVEL:** LEVEL 0
**DATE:** 1/12/2022

| ITEM | MAJOR ITEM DESCRIPTION | UNIT | QUANTITY | UNIT COST | TOTAL COST |
|---|---|---|---|---|---|
| 900 | **INCIDENTALS** | | | | |
| | CONCRETE CURB | L.FT. | - | - | - |
| | CONCRETE BARRIER | L.FT. | - | - | - |
| | CONCRETE CROSSING PANELS | T. FT. | - | - | - |
| | CONCRETE SIDEWALK | SQ.FT. | - | - | - |
| | MEDIAN PAVERS | SQ.YD. | - | - | - |
| | FENCE | L.FT. | 400 | $ 15.00 | $ 6,000 |
| | REMOVE/REPLACE TRACK | T. FT. | - | - | - |
| | MISCELLANEOUS ITEMS | L.SUM | - | - | - |
| | **TOTAL ITEM 900** | | | | $ 6,000 |
| | **SUBTOTAL A (ITEM SUBTOTAL)** | | | | **$ 251,000** |
| PW | **PROJECT WIDE** | | | | |
| | TRAFFIC CONTROL (8% OF SUBTOTAL A) | | | 8% | $ 20,100 |
| | DUST PALLIATIVE (0% OF SUBTOTAL A)(INCLUDED IN FURNISH WATER) | | | 0% | $ 0 |
| | QUALITY CONTROL (1% OF SUBTOTAL A) | | | 1% | $ 2,600 |
| | CONSTRUCTION SURVEYING (2% OF SUBTOTAL A) | | | 2% | $ 5,100 |
| | EROSION CONTROL (1% OF SUBTOTAL A) | | | 1% | $ 2,600 |
| | MOBILIZATION (10% OF SUBTOTAL A) | | | 10% | $ 25,100 |
| | UNIDENTIFIED ITEMS (15% OF SUBTOTAL A) | | | 15% | $ 37,700 |
| | **SUBTOTAL B (SUBTOTAL A + PROJECT WIDE)** | | | | **$ 344,200** |
| OTHER PROJ | **OTHER PROJECT COSTS** | | | | |
| | DPS TRAFFIC CONTROL (0% OF SUBTOTAL A) | | | 0% | $ 0 |
| | JOINT PROJECT AGREEMENT ITEMS (0% OF SUBTOTAL A) | | | 0% | $ 0 |
| | CONTRACTOR INCENTIVES (0% OF SUBTOTAL A) | | | 0% | $ 0 |
| | ENVIRONMENTAL MITIGATION (0.5% OF SUBTOTAL A) | | | 1% | $ 1,300 |
| | **BASE YEAR CONSTRUCTION COST (EXCLUDING UTILITIES & R/W)** | | | | **$ 345,500** |
| BELOW | **BELOW THE LINE ITEMS** | | | | |
| | POST DESIGN SERVICES (1% OF BASE YEAR CONSTRUCTION COST) | | | 1% | $ 3,500 |
| | CONSTRUCTION CONTINGENCIES (5% OF BASE YEAR CONSTRUCTION COST) | | | 5% | $ 17,300 |
| | CONSTRUCTION ENGINEERING (14% OF BASE YEAR CONSTRUCTION COST) | | | 14% | $ 48,400 |
| | **SUBTOTAL BASE YEAR CONSTRUCTION** | | | | **$ 414,700** |
| | INDIRECT COST ALLOCATION (10.5% OF BASE YEAR CONSTRUCTION) | | | 10.5% | $ 36,300 |
| | **BASE YEAR DEPARTMENT CONSTRUCTION COST (EXCLUDING UTILITIES & R/W)** | | | | **$ 451,000** |
| | | | | | |
| DES | **PREDESIGN AND FINAL DESIGN** | | | | |
| | PREDESIGN/NEPA/PI SERVICES (10% OF BASE YEAR CONSTRUCTION COST) | | | 10% | $ 34,500 |
| | INDIRECT COST ALLOCATION (10.5% OF ALL PREDESIGN COSTS) | | | 10.5% | $ 3,700 |
| | **SUBTOTAL PREDESIGN** | | | | **$ 38,200** |
| | FINAL DESIGN SERVICES (8% OF BASE YEAR CONSTRUCTION COST) | | | 8% | $ 27,700 |
| | INDIRECT COST ALLOCATION (10.5% OF ALL FINAL DESIGN COSTS) | | | 10.5% | $ 3,000 |
| | **SUBTOTAL FINAL DESIGN** | | | | **$ 30,700** |
| | **TOTAL ESTIMATED DESIGN COST** | | | | **$68,900** |
| | | | | | |
| UTIL | **UTILITY RELOCATION** | | | | |
| | UTILITIES (NEW FACILITIES/RELOCATIONS) | | | 14% | $ 63,200 |
| | INDIRECT COST ALLOCATION (10.5% OF ALL UTILITY COSTS) | | | 10.5% | $ 6,700 |
| | **TOTAL ESTIMATED UTILITY COST** | | | | **$69,900** |
| | | | | | |
| R/W | **RIGHT-OF-WAY** | | | | |
| | RIGHT-OF-WAY | $250,000 | ACR | 0.00 | $ 0 |
| | INDIRECT COST ALLOCATION (10.5% OF ALL RIGHT-OF-WAY COSTS) | | | 10.5% | $ 0 |
| | **TOTAL ESTIMATED RIGHT-OF-WAY COSTS** | | | | **$0** |
| | **TOTAL ESTIMATED PROJECT COST** | | | | **$589,800** |
| | **TOTAL ESTIMATED PROJECT COST (USE)** | | | | **$590,000** |

**ARIZONA DEPARTMENT OF TRANSPORTATION**
**CONSTRUCTION COST ESTIMATE SUMMARY**

**CROSSING ID:** 025113N
**PROJECT** Beaver St, South of Historic Rte 66, Flagstaff

**AGENCY:** ADOT
**ESTIMATE LEVEL:** LEVEL 0
**DATE:** 1/12/2022

**PROJECT DETAILS**

1. Automatic pedestrian gates with skirt to existing mast flashers on south side of crossing across the sidewalk on both sides of the street with additional barriers/fencing to discourage trespassing. Decorative fencing could be considered.

2. "Second train" signage near all four pedestrian crossings.

| ITEM | MAJOR ITEM DESCRIPTION | UNIT | QUANTITY | UNIT COST | TOTAL COST |
|---|---|---|---|---|---|
| **200** | **REMOVALS** | | | | |
| | REMOVAL OF PAVEMENT | SQ.YD. | - | - | - |
| | REMOVAL OF TREES | EACH | - | - | - |
| | REMOVAL OF SIGNS | EACH | - | - | - |
| | REMOVAL OF SIGNALS | EACH | - | - | - |
| | REMOVAL OF DRIVEWAYS | EACH | - | - | - |
| | MISCELLANEOUS ITEMS | L.SUM | - | - | - |
| | **TOTAL ITEM 200** | | | | - |
| **300 & 400** | **BASE AND SURFACE TREATMENT** | | | | |
| | CONCRETE PAVEMENT | SQ.YD. | - | - | - |
| | ASPHALT PAVEMENT | SQ.YD. | - | - | - |
| | MISCELLANEOUS ITEMS | L.SUM | - | - | - |
| | **TOTAL ITEM 300 & 400** | | | | - |
| **500** | **DRAINAGE** | | | | |
| | PIPE CULVERT | L.FT. | - | - | - |
| | DRAINAGE STRUCTURE | EACH | - | - | - |
| | MISCELLANEOUS ITEMS | L.SUM | - | - | - |
| | **TOTAL ITEM 500** | | | | - |
| **600** | **STRUCTURES** | | | | |
| | RAILROAD OVERPASS | SQ. FT. | - | - | - |
| | PEDESTRIAN BRIDGE | SQ. FT. | - | - | - |
| | MISCELLANEOUS ITEMS | L.SUM | - | - | - |
| | **TOTAL ITEM 600** | | | | - |
| **700** | **TRAFFIC ENGINEERING** | | | | |
| | PAVEMENT MARKING | L.FT. | - | - | - |
| | TRANSVERSE PAVEMENT MARKING | EACH | - | - | - |
| | SIGNING | MILE | - | - | - |
| | CANTILEVERED FLASHING-LIGHT SIGNALS | EACH | - | - | - |
| | SUPPLEMENTAL FLASHING-LIGHT SIGNALS | EACH | - | - | - |
| | WAYSIDE HORN | EACH | - | - | - |
| | FOUR-QUADRANT GATE ARMS | EACH | - | - | - |
| | BARRIER GATE ARM | EACH | - | - | - |
| | PEDESTRIAN GATE ARM | EACH | 2 | $ 100,000.00 | $ 200,000 |
| | PEDESTRIAN SWING GATE | EACH | - | - | - |
| | VEHICLE PRESENCE DETECTION SYSTEM | EACH | - | - | - |
| | TRAFFIC SIGNAL ADVANCE PREEMPTION | EACH | - | - | - |
| | TRAFFIC SIGNAL | EACH | - | - | - |
| | FLAGGING SERVICES (RAILROAD) | DAY | 7 | $ 1,750.00 | $ 12,250 |
| | FLAGGING SERVICES (CONTRACTOR) | DAY | 7 | $ 1,750.00 | $ 12,250 |
| | LIGHTING | EACH | 4 | $ 2,500.00 | $ 10,000 |
| | MISCELLANEOUS ITEMS (BLANK-OUT SIGN) | L.SUM | 1 | $ 10,000.00 | $ 10,000 |
| | **TOTAL ITEM 700** | | | | $ 245,000 |
| **800** | **ROADSIDE DEVELOPMENT** | | | | |
| | LANDSCAPING AND TOPSOIL | SQ.YD. | - | - | - |
| | NEW UTILITIES | L.SUM | - | - | - |
| | UTILITY RELOCATION | L.SUM | - | - | - |
| | MISCELLANEOUS ITEMS | L.SUM | - | - | - |
| | **TOTAL ITEM 800** | | | | - |

# ARIZONA DEPARTMENT OF TRANSPORTATION
## CONSTRUCTION COST ESTIMATE SUMMARY

**CROSSING ID:** 025113N **AGENCY:** ADOT
**PROJECT NAME:** Beaver St, South of Historic Rte 66, **ESTIMATE LEVEL:** LEVEL 0
**DATE:** 1/12/2022

| ITEM | MAJOR ITEM DESCRIPTION | UNIT | QUANTITY | UNIT COST | TOTAL COST |
|---|---|---|---|---|---|
| 900 | **INCIDENTALS** | | | | |
| | CONCRETE CURB | L.FT. | - | - | - |
| | CONCRETE BARRIER | L.FT. | - | - | - |
| | CONCRETE CROSSING PANELS | T. FT. | - | - | - |
| | CONCRETE SIDEWALK | SQ.FT. | - | - | - |
| | MEDIAN PAVERS | SQ.YD. | - | - | - |
| | FENCE | L.FT. | 400 | $ 15.00 | $ 6,000 |
| | REMOVE/REPLACE TRACK | T. FT. | - | - | - |
| | MISCELLANEOUS ITEMS | L.SUM | - | - | - |
| | **TOTAL ITEM 900** | | | | $ 6,000 |
| | **SUBTOTAL A (ITEM SUBTOTAL)** | | | | **$ 251,000** |
| PW | **PROJECT WIDE** | | | | |
| | TRAFFIC CONTROL (8% OF SUBTOTAL A) | | | 8% | $ 20,100 |
| | DUST PALLIATIVE (0% OF SUBTOTAL A)(INCLUDED IN FURNISH WATER) | | | 0% | $ 0 |
| | QUALITY CONTROL (1% OF SUBTOTAL A) | | | 1% | $ 2,600 |
| | CONSTRUCTION SURVEYING (2% OF SUBTOTAL A) | | | 2% | $ 5,100 |
| | EROSION CONTROL (1% OF SUBTOTAL A) | | | 1% | $ 2,600 |
| | MOBILIZATION (10% OF SUBTOTAL A) | | | 10% | $ 25,100 |
| | UNIDENTIFIED ITEMS (15% OF SUBTOTAL A) | | | 15% | $ 37,700 |
| | **SUBTOTAL B (SUBTOTAL A + PROJECT WIDE)** | | | | **$ 344,200** |
| OTHER PROJ | **OTHER PROJECT COSTS** | | | | |
| | DPS TRAFFIC CONTROL (0% OF SUBTOTAL A) | | | 0% | $ 0 |
| | JOINT PROJECT AGREEMENT ITEMS (0% OF SUBTOTAL A) | | | 0% | $ 0 |
| | CONTRACTOR INCENTIVES (0% OF SUBTOTAL A) | | | 0% | $ 0 |
| | ENVIRONMENTAL MITIGATION (0.5% OF SUBTOTAL A) | | | 1% | $ 1,300 |
| | **BASE YEAR CONSTRUCTION COST (EXCLUDING UTILITIES & R/W)** | | | | **$ 345,500** |
| BELOW | **BELOW THE LINE ITEMS** | | | | |
| | POST DESIGN SERVICES (1% OF BASE YEAR CONSTRUCTION COST) | | | 1% | $ 3,500 |
| | CONSTRUCTION CONTINGENCIES (5% OF BASE YEAR CONSTRUCTION COST) | | | 5% | $ 17,300 |
| | CONSTRUCTION ENGINEERING (14% OF BASE YEAR CONSTRUCTION COST) | | | 14% | $ 48,400 |
| | **SUBTOTAL BASE YEAR CONSTRUCTION** | | | | **$ 414,700** |
| | INDIRECT COST ALLOCATION (10.5% OF BASE YEAR CONSTRUCTION) | | | 10.5% | $ 36,300 |
| | **BASE YEAR DEPARTMENT CONSTRUCTION COST (EXCLUDING UTILITIES & R/W)** | | | | **$ 451,000** |
| DES | **PREDESIGN AND FINAL DESIGN** | | | | |
| | PREDESIGN/NEPA/PI SERVICES (10% OF BASE YEAR CONSTRUCTION COST) | | | 10% | $ 34,500 |
| | INDIRECT COST ALLOCATION (10.5% OF ALL PREDESIGN COSTS) | | | 10.5% | $ 3,700 |
| | **SUBTOTAL PREDESIGN** | | | | **$ 38,200** |
| | FINAL DESIGN SERVICES (8% OF BASE YEAR CONSTRUCTION COST) | | | 8% | $ 27,700 |
| | INDIRECT COST ALLOCATION (10.5% OF ALL FINAL DESIGN COSTS) | | | 10.5% | $ 3,000 |
| | **SUBTOTAL FINAL DESIGN** | | | | **$ 30,700** |
| | **TOTAL ESTIMATED DESIGN COST** | | | | **$68,900** |
| UTIL | **UTILITY RELOCATION** | | | | |
| | UTILITIES (NEW FACILITIES/RELOCATIONS) | | | 14% | $ 63,200 |
| | INDIRECT COST ALLOCATION (10.5% OF ALL UTILITY COSTS) | | | 10.5% | $ 6,700 |
| | **TOTAL ESTIMATED UTILITY COST** | | | | **$69,900** |
| R/W | **RIGHT-OF-WAY** | | | | |
| | RIGHT-OF-WAY | $250,000 | ACR | 0.00 | $ 0 |
| | INDIRECT COST ALLOCATION (10.5% OF ALL RIGHT-OF-WAY COSTS) | | | 10.5% | $ 0 |
| | **TOTAL ESTIMATED RIGHT-OF-WAY COSTS** | | | | **$0** |
| | **TOTAL ESTIMATED PROJECT COST** | | | | **$589,800** |
| | **TOTAL ESTIMATED PROJECT COST (USE)** | | | | **$590,000** |

**ARIZONA DEPARTMENT OF TRANSPORTATION**
**CONSTRUCTION COST ESTIMATE SUMMARY**

**CROSSING ID:** 025418A
**PROJECT** 59th Ave & Glendale Ave, Glendale

**AGENCY:** ADOT
**ESTIMATE LEVEL:** LEVEL 0
**DATE:** 1/12/2022

**PROJECT DETAILS**

Potential improvements include:
1. Automatic vehicle gates.
2. Automatic pedestrian gates with skirt placed across the sidewalk on the southeast corner and the northwest corner for the direction of travel not covered by the vehicle gates.

| ITEM | MAJOR ITEM DESCRIPTION | UNIT | QUANTITY | UNIT COST | TOTAL COST |
|---|---|---|---|---|---|
| 200 | **REMOVALS** | | | | |
| | REMOVAL OF PAVEMENT | SQ.YD. | - | - | - |
| | REMOVAL OF TREES | EACH | - | - | - |
| | REMOVAL OF SIGNS | EACH | - | - | - |
| | REMOVAL OF SIGNALS | EACH | - | - | - |
| | REMOVAL OF DRIVEWAYS | EACH | - | - | - |
| | MISCELLANEOUS ITEMS | L.SUM | - | - | - |
| | **TOTAL ITEM 200** | | | | - |
| 300 & 400 | **BASE AND SURFACE TREATMENT** | | | | |
| | CONCRETE PAVEMENT | SQ.YD. | - | - | - |
| | ASPHALT PAVEMENT | SQ.YD. | - | - | - |
| | MISCELLANEOUS ITEMS | L.SUM | - | - | - |
| | **TOTAL ITEM 300 & 400** | | | | - |
| 500 | **DRAINAGE** | | | | |
| | PIPE CULVERT | L.FT. | - | - | - |
| | DRAINAGE STRUCTURE | EACH | - | - | - |
| | MISCELLANEOUS ITEMS | L.SUM | - | - | - |
| | **TOTAL ITEM 500** | | | | - |
| 600 | **STRUCTURES** | | | | |
| | RAILROAD OVERPASS | SQ. FT. | - | - | - |
| | PEDESTRIAN BRIDGE | SQ. FT. | - | - | - |
| | MISCELLANEOUS ITEMS | L.SUM | - | - | - |
| | **TOTAL ITEM 600** | | | | - |
| 700 | **TRAFFIC ENGINEERING** | | | | |
| | PAVEMENT MARKING | L.FT. | - | - | - |
| | TRANSVERSE PAVEMENT MARKING | EACH | 1 | $ 500.00 | $ 500 |
| | SIGNING | MILE | - | - | - |
| | CANTILEVERED FLASHING-LIGHT SIGNALS | EACH | - | - | - |
| | SUPPLEMENTAL FLASHING-LIGHT SIGNALS | EACH | - | - | - |
| | WAYSIDE HORN | EACH | - | - | - |
| | FOUR-QUADRANT GATE ARMS | EACH | - | - | - |
| | BARRIER GATE ARM | EACH | 4 | $ 200,000.00 | $ 800,000 |
| | PEDESTRIAN GATE ARM | EACH | 2 | $ 100,000.00 | $ 200,000 |
| | PEDESTRIAN SWING GATE | EACH | - | - | - |
| | VEHICLE PRESENCE DETECTION SYSTEM | EACH | - | - | - |
| | TRAFFIC SIGNAL ADVANCE PREEMPTION | EACH | - | - | - |
| | TRAFFIC SIGNAL | EACH | - | - | - |
| | FLAGGING SERVICES (RAILROAD) | DAY | - | - | - |
| | FLAGGING SERVICES (CONTRACTOR) | DAY | - | - | - |
| | LIGHTING | EACH | - | - | - |
| | MISCELLANEOUS ITEMS | L.SUM | - | - | - |
| | **TOTAL ITEM 700** | | | | $ 1,001,000 |
| 800 | **ROADSIDE DEVELOPMENT** | | | | |
| | LANDSCAPING AND TOPSOIL | SQ.YD. | - | - | - |
| | NEW UTILITIES | L.SUM | - | - | - |
| | UTILITY RELOCATION | L.SUM | - | - | - |
| | MISCELLANEOUS ITEMS | L.SUM | - | - | - |
| | **TOTAL ITEM 800** | | | | - |

# ARIZONA DEPARTMENT OF TRANSPORTATION
## CONSTRUCTION COST ESTIMATE SUMMARY

**CROSSING ID:** 025418A
**PROJECT NAME:** 59th Ave & Glendale Ave, Glendale

**AGENCY:** ADOT
**ESTIMATE LEVEL:** LEVEL 0
**DATE:** 1/12/2022

| ITEM | MAJOR ITEM DESCRIPTION | UNIT | QUANTITY | UNIT COST | TOTAL COST |
|---|---|---|---|---|---|
| 900 | **INCIDENTALS** | | | | |
| | CONCRETE CURB | L.FT. | - | - | - |
| | CONCRETE BARRIER | L.FT. | - | - | - |
| | CONCRETE CROSSING PANELS | T. FT. | - | - | - |
| | CONCRETE SIDEWALK | SQ.FT. | 720 | $ 50.00 | $ 36,000 |
| | MEDIAN PAVERS | SQ.YD. | - | - | - |
| | FENCE | L.FT. | 120 | $ 15.00 | $ 1,800 |
| | REMOVE/REPLACE TRACK | T. FT. | - | - | - |
| | MISCELLANEOUS ITEMS | L.SUM | - | - | - |
| | **TOTAL ITEM 900** | | | | $ 38,000 |
| | **SUBTOTAL A (ITEM SUBTOTAL)** | | | | **$ 1,039,000** |
| PW | **PROJECT WIDE** | | | | |
| | TRAFFIC CONTROL (8% OF SUBTOTAL A) | | | 8% | $ 83,200 |
| | DUST PALLIATIVE (0% OF SUBTOTAL A)(INCLUDED IN FURNISH WATER) | | | 0% | $ 0 |
| | QUALITY CONTROL (1% OF SUBTOTAL A) | | | 1% | $ 10,400 |
| | CONSTRUCTION SURVEYING (2% OF SUBTOTAL A) | | | 2% | $ 20,800 |
| | EROSION CONTROL (1% OF SUBTOTAL A) | | | 1% | $ 10,400 |
| | MOBILIZATION (10% OF SUBTOTAL A) | | | 10% | $ 103,900 |
| | UNIDENTIFIED ITEMS (15% OF SUBTOTAL A) | | | 15% | $ 155,900 |
| | **SUBTOTAL B (SUBTOTAL A + PROJECT WIDE)** | | | | **$ 1,423,600** |
| OTHER PROJ | **OTHER PROJECT COSTS** | | | | |
| | DPS TRAFFIC CONTROL (0% OF SUBTOTAL A) | | | 0% | $ 0 |
| | JOINT PROJECT AGREEMENT ITEMS (0% OF SUBTOTAL A) | | | 0% | $ 0 |
| | CONTRACTOR INCENTIVES (0% OF SUBTOTAL A) | | | 0% | $ 0 |
| | ENVIRONMENTAL MITIGATION (0.5% OF SUBTOTAL A) | | | 1% | $ 5,200 |
| | **BASE YEAR CONSTRUCTION COST (EXCLUDING UTILITIES & R/W)** | | | | **$ 1,428,800** |
| BELOW | **BELOW THE LINE ITEMS** | | | | |
| | POST DESIGN SERVICES (1% OF BASE YEAR CONSTRUCTION COST) | | | 1% | $ 14,300 |
| | CONSTRUCTION CONTINGENCIES (5% OF BASE YEAR CONSTRUCTION COST) | | | 5% | $ 71,500 |
| | CONSTRUCTION ENGINEERING (14% OF BASE YEAR CONSTRUCTION COST) | | | 14% | $ 200,100 |
| | **SUBTOTAL BASE YEAR CONSTRUCTION** | | | | **$ 1,714,700** |
| | INDIRECT COST ALLOCATION (10.5% OF BASE YEAR CONSTRUCTION) | | | 10.5% | $ 150,100 |
| | **BASE YEAR DEPARTMENT CONSTRUCTION COST (EXCLUDING UTILITIES & R/W)** | | | | **$ 1,864,800** |
| | | | | | |
| DES | **PREDESIGN AND FINAL DESIGN** | | | | |
| | PREDESIGN/NEPA/PI SERVICES (10% OF BASE YEAR CONSTRUCTION COST) | | | 10% | $ 142,400 |
| | INDIRECT COST ALLOCATION (10.5% OF ALL PREDESIGN COSTS) | | | 10.5% | $ 15,000 |
| | **SUBTOTAL PREDESIGN** | | | | **$ 157,400** |
| | FINAL DESIGN SERVICES (8% OF BASE YEAR CONSTRUCTION COST) | | | 8% | $ 114,400 |
| | INDIRECT COST ALLOCATION (10.5% OF ALL FINAL DESIGN COSTS) | | | 10.5% | $ 12,100 |
| | **SUBTOTAL FINAL DESIGN** | | | | **$ 126,500** |
| | **TOTAL ESTIMATED DESIGN COST** | | | | **$283,900** |
| | | | | | |
| UTIL | **UTILITY RELOCATION** | | | | |
| | UTILITIES (NEW FACILITIES/RELOCATIONS) | | | 14% | $ 261,100 |
| | INDIRECT COST ALLOCATION (10.5% OF ALL UTILITY COSTS) | | | 10.5% | $ 27,500 |
| | **TOTAL ESTIMATED UTILITY COST** | | | | **$288,600** |
| | | | | | |
| R/W | **RIGHT-OF-WAY** | | | | |
| | RIGHT-OF-WAY | $250,000 | ACR | 0.00 | $ 0 |
| | INDIRECT COST ALLOCATION (10.5% OF ALL RIGHT-OF-WAY COSTS) | | | 10.5% | $ 0 |
| | **TOTAL ESTIMATED RIGHT-OF-WAY COSTS** | | | | **$0** |
| | **TOTAL ESTIMATED PROJECT COST** | | | | **$2,437,300** |
| | **TOTAL ESTIMATED PROJECT COST (USE)** | | | | **$2,440,000** |

# ARIZONA DEPARTMENT OF TRANSPORTATION
## CONSTRUCTION COST ESTIMATE SUMMARY

**CROSSING ID:** 025590V
**PROJECT NAME:** Bethany Home Rd, West of 51st Ave, Glendale

**AGENCY:** ADOT
**ESTIMATE LEVEL:** LEVEL 0
**DATE:** 1/12/2022

**PROJECT DETAILS**

Potential improvements include:

1. Pre-signal on west leg.

2. Improved lighting under the overpass.


| ITEM | MAJOR ITEM DESCRIPTION | UNIT | QUANTITY | UNIT COST | TOTAL COST |
|---|---|---|---|---|---|
| **200** | **REMOVALS** | | | | |
| | REMOVAL OF PAVEMENT | SQ.YD. | - | - | - |
| | REMOVAL OF TREES | EACH | - | - | - |
| | REMOVAL OF SIGNS | EACH | - | - | - |
| | REMOVAL OF SIGNALS | EACH | - | - | - |
| | REMOVAL OF DRIVEWAYS | EACH | - | - | - |
| | MISCELLANEOUS ITEMS | L.SUM | - | - | - |
| | **TOTAL ITEM 200** | | | | - |
| **300 & 400** | **BASE AND SURFACE TREATMENT** | | | | |
| | CONCRETE PAVEMENT | SQ.YD. | - | - | - |
| | ASPHALT PAVEMENT | SQ.YD. | - | - | - |
| | MISCELLANEOUS ITEMS | L.SUM | - | - | - |
| | **TOTAL ITEM 300 & 400** | | | | - |
| **500** | **DRAINAGE** | | | | |
| | PIPE CULVERT | L.FT. | - | - | - |
| | DRAINAGE STRUCTURE | EACH | - | - | - |
| | MISCELLANEOUS ITEMS | L.SUM | - | - | - |
| | **TOTAL ITEM 500** | | | | - |
| **600** | **STRUCTURES** | | | | |
| | RAILROAD OVERPASS | SQ. FT. | - | - | - |
| | PEDESTRIAN BRIDGE | SQ. FT. | - | - | - |
| | MISCELLANEOUS ITEMS | L.SUM | - | - | - |
| | **TOTAL ITEM 600** | | | | - |
| **700** | **TRAFFIC ENGINEERING** | | | | |
| | PAVEMENT MARKING | L.FT. | - | - | - |
| | TRANSVERSE PAVEMENT MARKING | EACH | 4 | $ 500.00 | $ 2,000 |
| | SIGNING | MILE | - | - | - |
| | CANTILEVERED FLASHING-LIGHT SIGNALS | EACH | - | - | - |
| | SUPPLEMENTAL FLASHING-LIGHT SIGNALS | EACH | - | - | - |
| | WAYSIDE HORN | EACH | - | - | - |
| | FOUR-QUADRANT GATE ARMS | EACH | - | - | - |
| | BARRIER GATE ARM | EACH | - | - | - |
| | PEDESTRIAN GATE ARM | EACH | - | - | - |
| | PEDESTRIAN SWING GATE | EACH | - | - | - |
| | VEHICLE PRESENCE DETECTION SYSTEM | EACH | - | - | - |
| | TRAFFIC SIGNAL ADVANCE PREEMPTION | EACH | 1 | $ 165,000.00 | $ 165,000 |
| | TRAFFIC SIGNAL | EACH | 1 | $ 125,000.00 | $ 125,000 |
| | FLAGGING SERVICES (RAILROAD) | DAY | - | - | - |
| | FLAGGING SERVICES (CONTRACTOR) | DAY | - | - | - |
| | LIGHTING | EACH | 4 | $ 2,500.00 | $ 10,000 |
| | MISCELLANEOUS ITEMS | L.SUM | - | - | - |
| | **TOTAL ITEM 700** | | | | $ 302,000 |
| **800** | **ROADSIDE DEVELOPMENT** | | | | |
| | LANDSCAPING AND TOPSOIL | SQ.YD. | - | - | - |
| | NEW UTILITIES | L.SUM | - | - | - |
| | UTILITY RELOCATION | L.SUM | - | - | - |
| | MISCELLANEOUS ITEMS | L.SUM | - | - | - |
| | **TOTAL ITEM 800** | | | | - |

# ARIZONA DEPARTMENT OF TRANSPORTATION
## CONSTRUCTION COST ESTIMATE SUMMARY

**CROSSING ID:** 025590V
**PROJECT NAME:** Bethany Home Rd, West of 51st Ave, Glendale

**AGENCY:** ADOT
**ESTIMATE LEVEL:** LEVEL 0
**DATE:** 1/12/2022

| ITEM | MAJOR ITEM DESCRIPTION | UNIT | QUANTITY | UNIT COST | TOTAL COST |
|---|---|---|---|---|---|
| **900** | **INCIDENTALS** | | | | |
| | CONCRETE CURB | L.FT. | - | - | - |
| | CONCRETE BARRIER | L.FT. | - | - | - |
| | CONCRETE CROSSING PANELS | T. FT. | - | - | - |
| | CONCRETE SIDEWALK | SQ.FT. | 180 | $ 50.00 | $ 9,000 |
| | MEDIAN PAVERS | SQ.YD. | - | - | - |
| | FENCE | L.FT. | - | - | - |
| | REMOVE/REPLACE TRACK | T. FT. | - | - | - |
| | MISCELLANEOUS ITEMS | L.SUM | - | - | - |
| | **TOTAL ITEM 900** | | | | $ 9,000 |
| | **SUBTOTAL A (ITEM SUBTOTAL)** | | | | **$ 311,000** |
| **PW** | **PROJECT WIDE** | | | | |
| | TRAFFIC CONTROL (8% OF SUBTOTAL A) | | | 8% | $ 24,900 |
| | DUST PALLIATIVE (0% OF SUBTOTAL A)(INCLUDED IN FURNISH WATER) | | | 0% | $ 0 |
| | QUALITY CONTROL (1% OF SUBTOTAL A) | | | 1% | $ 3,200 |
| | CONSTRUCTION SURVEYING (2% OF SUBTOTAL A) | | | 2% | $ 6,300 |
| | EROSION CONTROL (1% OF SUBTOTAL A) | | | 1% | $ 3,200 |
| | MOBILIZATION (10% OF SUBTOTAL A) | | | 10% | $ 31,100 |
| | UNIDENTIFIED ITEMS (15% OF SUBTOTAL A) | | | 15% | $ 46,700 |
| | **SUBTOTAL B (SUBTOTAL A + PROJECT WIDE)** | | | | **$ 426,400** |
| **OTHER PROJ** | **OTHER PROJECT COSTS** | | | | |
| | DPS TRAFFIC CONTROL (0% OF SUBTOTAL A) | | | 0% | $ 0 |
| | JOINT PROJECT AGREEMENT ITEMS (0% OF SUBTOTAL A) | | | 0% | $ 0 |
| | CONTRACTOR INCENTIVES (0% OF SUBTOTAL A) | | | 0% | $ 0 |
| | ENVIRONMENTAL MITIGATION (0.5% OF SUBTOTAL A) | | | 1% | $ 1,600 |
| | **BASE YEAR CONSTRUCTION COST (EXCLUDING UTILITIES & R/W)** | | | | **$ 428,000** |
| **BELOW** | **BELOW THE LINE ITEMS** | | | | |
| | POST DESIGN SERVICES (1% OF BASE YEAR CONSTRUCTION COST) | | | 1% | $ 4,300 |
| | CONSTRUCTION CONTINGENCIES (5% OF BASE YEAR CONSTRUCTION COST) | | | 5% | $ 21,400 |
| | CONSTRUCTION ENGINEERING (14% OF BASE YEAR CONSTRUCTION COST) | | | 14% | $ 60,000 |
| | **SUBTOTAL BASE YEAR CONSTRUCTION** | | | | **$ 513,700** |
| | INDIRECT COST ALLOCATION (10.5% OF BASE YEAR CONSTRUCTION) | | | 10.5% | $ 45,000 |
| | **BASE YEAR DEPARTMENT CONSTRUCTION COST (EXCLUDING UTILITIES & R/W)** | | | | **$ 558,700** |
| | | | | | |
| **DES** | **PREDESIGN AND FINAL DESIGN** | | | | |
| | PREDESIGN/NEPA/PI SERVICES (10% OF BASE YEAR CONSTRUCTION COST) | | | 10% | $ 42,700 |
| | INDIRECT COST ALLOCATION (10.5% OF ALL PREDESIGN COSTS) | | | 10.5% | $ 4,500 |
| | **SUBTOTAL PREDESIGN** | | | | **$ 47,200** |
| | FINAL DESIGN SERVICES (8% OF BASE YEAR CONSTRUCTION COST) | | | 8% | $ 34,300 |
| | INDIRECT COST ALLOCATION (10.5% OF ALL FINAL DESIGN COSTS) | | | 10.5% | $ 3,700 |
| | **SUBTOTAL FINAL DESIGN** | | | | **$ 38,000** |
| | **TOTAL ESTIMATED DESIGN COST** | | | | **$85,200** |
| | | | | | |
| **UTIL** | **UTILITY RELOCATION** | | | | |
| | UTILITIES (NEW FACILITIES/RELOCATIONS) | | | 14% | $ 78,300 |
| | INDIRECT COST ALLOCATION (10.5% OF ALL UTILITY COSTS) | | | 11% | $ 8,300 |
| | **TOTAL ESTIMATED UTILITY COST** | | | | **$86,600** |
| | | | | | |
| **R/W** | **RIGHT-OF-WAY** | | | | |
| | RIGHT-OF-WAY | $250,000 | ACR | 0.00 | $ 0 |
| | INDIRECT COST ALLOCATION (10.5% OF ALL RIGHT-OF-WAY COSTS) | | | 10.5% | $ 0 |
| | **TOTAL ESTIMATED RIGHT-OF-WAY COSTS** | | | | **$0** |
| | **TOTAL ESTIMATED PROJECT COST** | | | | **$730,500** |
| | **TOTAL ESTIMATED PROJECT COST (USE)** | | | | **$740,000** |

**ARIZONA DEPARTMENT OF TRANSPORTATION**
**CONSTRUCTION COST ESTIMATE SUMMARY**

**CROSSING ID:** 025651J
**PROJECT** Greenway Rd, North of Grand Ave, Surprise

**AGENCY:** ADOT
**ESTIMATE LEVEL:** LEVEL 0
**DATE:** 1/12/2022

**PROJECT DETAILS**

Potential improvements include:
1. Two blank-out signs that alert traffic turning from Grand Ave of the presense of a train.
2. Two pedestrian flashing lights and bells in off quadrants.
3. Set of sidelights for southbound left turn.
4. Restriping southwest bound approach to intersection.


| ITEM | MAJOR ITEM DESCRIPTION | UNIT | QUANTITY | UNIT COST | TOTAL COST |
|---|---|---|---|---|---|
| 200 | **REMOVALS** | | | | |
| | REMOVAL OF PAVEMENT | SQ.YD. | - | - | - |
| | REMOVAL OF TREES | EACH | - | - | - |
| | REMOVAL OF SIGNS | EACH | - | - | - |
| | REMOVAL OF SIGNALS | EACH | - | - | - |
| | REMOVAL OF DRIVEWAYS | EACH | - | - | - |
| | MISCELLANEOUS ITEMS | L.SUM | - | - | - |
| | **TOTAL ITEM 200** | | | | - |
| 300 & 400 | **BASE AND SURFACE TREATMENT** | | | | |
| | CONCRETE PAVEMENT | SQ.YD. | - | - | - |
| | ASPHALT PAVEMENT | SQ.YD. | - | - | - |
| | MISCELLANEOUS ITEMS | L.SUM | - | - | - |
| | **TOTAL ITEM 300 & 400** | | | | - |
| 500 | **DRAINAGE** | | | | |
| | PIPE CULVERT | L.FT. | - | - | - |
| | DRAINAGE STRUCTURE | EACH | - | - | - |
| | MISCELLANEOUS ITEMS | L.SUM | - | - | - |
| | **TOTAL ITEM 500** | | | | - |
| 600 | **STRUCTURES** | | | | |
| | RAILROAD OVERPASS | SQ. FT. | - | - | - |
| | PEDESTRIAN BRIDGE | SQ. FT. | - | - | - |
| | MISCELLANEOUS ITEMS | L.SUM | - | - | - |
| | **TOTAL ITEM 600** | | | | - |
| 700 | **TRAFFIC ENGINEERING** | | | | |
| | PAVEMENT MARKING | L.FT. | 160 | $ 2.00 | $ 400 |
| | TRANSVERSE PAVEMENT MARKING | EACH | 2 | $ 500.00 | $ 1,000 |
| | SIGNING | MILE | - | - | - |
| | CANTILEVERED FLASHING-LIGHT SIGNALS | EACH | - | - | - |
| | SUPPLEMENTAL FLASHING-LIGHT SIGNALS | EACH | 3 | $ 10,000.00 | $ 30,000 |
| | WAYSIDE HORN | EACH | - | - | - |
| | FOUR-QUADRANT GATE ARMS | EACH | - | - | - |
| | BARRIER GATE ARM | EACH | - | - | - |
| | PEDESTRIAN GATE ARM | EACH | - | - | - |
| | PEDESTRIAN SWING GATE | EACH | - | - | - |
| | VEHICLE PRESENCE DETECTION SYSTEM | EACH | - | - | - |
| | TRAFFIC SIGNAL ADVANCE PREEMPTION | EACH | - | - | - |
| | TRAFFIC SIGNAL | EACH | - | - | - |
| | FLAGGING SERVICES (RAILROAD) | DAY | 7 | $ 1,750.00 | $ 12,250 |
| | FLAGGING SERVICES (CONTRACTOR) | DAY | 7 | $ 1,750.00 | $ 12,250 |
| | LIGHTING | EACH | 2 | $ 2,500.00 | $ 5,000 |
| | MISCELLANEOUS ITEMS (BLANK-OUT SIGNS) | L.SUM | 1 | $ 20,000.00 | $ 20,000 |
| | **TOTAL ITEM 700** | | | | $ 81,000 |
| 800 | **ROADSIDE DEVELOPMENT** | | | | |
| | LANDSCAPING AND TOPSOIL | SQ.YD. | - | - | - |
| | NEW UTILITIES | L.SUM | - | - | - |
| | UTILITY RELOCATION | L.SUM | - | - | - |
| | MISCELLANEOUS ITEMS | L.SUM | - | - | - |
| | **TOTAL ITEM 800** | | | | - |

# ARIZONA DEPARTMENT OF TRANSPORTATION
## CONSTRUCTION COST ESTIMATE SUMMARY

**CROSSING ID:** 025651J
**PROJECT NAME:** Greenway Rd, North of Grand Ave,

**AGENCY:** ADOT
**ESTIMATE LEVEL:** LEVEL 0
**DATE:** 1/12/2022

| ITEM | MAJOR ITEM DESCRIPTION | UNIT | QUANTITY | UNIT COST | TOTAL COST |
|---|---|---|---|---|---|
| 900 | **INCIDENTALS** | | | | |
| | CONCRETE CURB | L.FT. | - | - | - |
| | CONCRETE BARRIER | L.FT. | - | - | - |
| | CONCRETE CROSSING PANELS | T. FT. | - | - | - |
| | CONCRETE SIDEWALK | SQ.FT. | - | - | - |
| | MEDIAN PAVERS | SQ.YD. | - | - | - |
| | FENCE | L.FT. | - | - | - |
| | REMOVE/REPLACE TRACK | T. FT. | - | - | - |
| | MISCELLANEOUS ITEMS | L.SUM | - | - | - |
| | **TOTAL ITEM 900** | | | | - |
| | **SUBTOTAL A (ITEM SUBTOTAL)** | | | | **$ 81,000** |
| PW | **PROJECT WIDE** | | | | |
| | TRAFFIC CONTROL (8% OF SUBTOTAL A) | | | 8% | $ 6,500 |
| | DUST PALLIATIVE (0% OF SUBTOTAL A)(INCLUDED IN FURNISH WATER) | | | 0% | $ 0 |
| | QUALITY CONTROL (1% OF SUBTOTAL A) | | | 1% | $ 900 |
| | CONSTRUCTION SURVEYING (2% OF SUBTOTAL A) | | | 2% | $ 1,700 |
| | EROSION CONTROL (1% OF SUBTOTAL A) | | | 1% | $ 900 |
| | MOBILIZATION (10% OF SUBTOTAL A) | | | 10% | $ 8,100 |
| | UNIDENTIFIED ITEMS (15% OF SUBTOTAL A) | | | 15% | $ 12,200 |
| | **SUBTOTAL B (SUBTOTAL A + PROJECT WIDE)** | | | | **$ 111,300** |
| OTHER PROJ | **OTHER PROJECT COSTS** | | | | |
| | DPS TRAFFIC CONTROL (0% OF SUBTOTAL A) | | | 0% | $ 0 |
| | JOINT PROJECT AGREEMENT ITEMS (0% OF SUBTOTAL A) | | | 0% | $ 0 |
| | CONTRACTOR INCENTIVES (0% OF SUBTOTAL A) | | | 0% | $ 0 |
| | ENVIRONMENTAL MITIGATION (0.5% OF SUBTOTAL A) | | | 1% | $ 500 |
| | **BASE YEAR CONSTRUCTION COST (EXCLUDING UTILITIES & R/W)** | | | | **$ 111,800** |
| BELOW | **BELOW THE LINE ITEMS** | | | | |
| | POST DESIGN SERVICES (1% OF BASE YEAR CONSTRUCTION COST) | | | 1% | $ 1,200 |
| | CONSTRUCTION CONTINGENCIES (5% OF BASE YEAR CONSTRUCTION COST) | | | 5% | $ 5,600 |
| | CONSTRUCTION ENGINEERING (14% OF BASE YEAR CONSTRUCTION COST) | | | 14% | $ 15,700 |
| | **SUBTOTAL BASE YEAR CONSTRUCTION** | | | | **$ 134,300** |
| | INDIRECT COST ALLOCATION (10.5% OF BASE YEAR CONSTRUCTION) | | | 10.5% | $ 11,800 |
| | **BASE YEAR DEPARTMENT CONSTRUCTION COST (EXCLUDING UTILITIES & R/W)** | | | | **$ 146,100** |
| | | | | | |
| DES | **PREDESIGN AND FINAL DESIGN** | | | | |
| | PREDESIGN/NEPA/PI SERVICES (10% OF BASE YEAR CONSTRUCTION COST) | | | 10% | $ 11,200 |
| | INDIRECT COST ALLOCATION (10.5% OF ALL PREDESIGN COSTS) | | | 10.5% | $ 1,200 |
| | **SUBTOTAL PREDESIGN** | | | | **$ 12,400** |
| | FINAL DESIGN SERVICES (8% OF BASE YEAR CONSTRUCTION COST) | | | 8% | $ 9,000 |
| | INDIRECT COST ALLOCATION (10.5% OF ALL FINAL DESIGN COSTS) | | | 10.5% | $ 1,000 |
| | **SUBTOTAL FINAL DESIGN** | | | | **$ 10,000** |
| | **TOTAL ESTIMATED DESIGN COST** | | | | **$22,400** |
| | | | | | |
| UTIL | **UTILITY RELOCATION** | | | | |
| | UTILITIES (NEW FACILITIES/RELOCATIONS) | | | 14% | $ 20,500 |
| | INDIRECT COST ALLOCATION (10.5% OF ALL UTILITY COSTS) | | | 10.5% | $ 2,200 |
| | **TOTAL ESTIMATED UTILITY COST** | | | | **$22,700** |
| | | | | | |
| R/W | **RIGHT-OF-WAY** | | | | |
| | RIGHT-OF-WAY | $250,000 | ACR | 0.00 | $ 0 |
| | INDIRECT COST ALLOCATION (10.5% OF ALL RIGHT-OF-WAY COSTS) | | | 10.5% | $ 0 |
| | **TOTAL ESTIMATED RIGHT-OF-WAY COSTS** | | | | **$0** |
| | **TOTAL ESTIMATED PROJECT COST** | | | | **$191,200** |
| | **TOTAL ESTIMATED PROJECT COST (USE)** | | | | **$200,000** |

**ARIZONA DEPARTMENT OF TRANSPORTATION**
**CONSTRUCTION COST ESTIMATE SUMMARY**

**CROSSING ID:** 741100A
**PROJECT** Massingale Rd, East of I-10 Frontage Rd, Tucson

**AGENCY:** ADOT
**ESTIMATE LEVEL:** LEVEL 0
**DATE:** 1/12/2022

**PROJECT DETAILS**

Potential improvements include:

1. Crossing closure.

| ITEM | MAJOR ITEM DESCRIPTION | UNIT | QUANTITY | UNIT COST | TOTAL COST |
|---|---|---|---|---|---|
| **200** | **REMOVALS** | | | | |
| | REMOVAL OF PAVEMENT | SQ.YD. | - | - | - |
| | REMOVAL OF TREES | EACH | - | - | - |
| | REMOVAL OF SIGNS | EACH | - | - | - |
| | REMOVAL OF SIGNALS | EACH | - | - | - |
| | REMOVAL OF DRIVEWAYS | EACH | - | - | - |
| | MISCELLANEOUS ITEMS (CROSSING CLOSURE) | L.SUM | 1 | $ 30,000.00 | $ 30,000 |
| | **TOTAL ITEM 200** | | | | $ 30,000 |
| **300 & 400** | **BASE AND SURFACE TREATMENT** | | | | |
| | CONCRETE PAVEMENT | SQ.YD. | - | - | - |
| | ASPHALT PAVEMENT | SQ.YD. | - | - | - |
| | MISCELLANEOUS ITEMS | L.SUM | - | - | - |
| | **TOTAL ITEM 300 & 400** | | | | - |
| **500** | **DRAINAGE** | | | | |
| | PIPE CULVERT | L.FT. | - | - | - |
| | DRAINAGE STRUCTURE | EACH | - | - | - |
| | MISCELLANEOUS ITEMS | L.SUM | - | - | - |
| | **TOTAL ITEM 500** | | | | - |
| **600** | **STRUCTURES** | | | | |
| | RAILROAD OVERPASS | SQ. FT. | - | - | - |
| | PEDESTRIAN BRIDGE | SQ. FT. | - | - | - |
| | MISCELLANEOUS ITEMS | L.SUM | - | - | - |
| | **TOTAL ITEM 600** | | | | - |
| **700** | **TRAFFIC ENGINEERING** | | | | |
| | PAVEMENT MARKING | L.FT. | - | - | - |
| | TRANSVERSE PAVEMENT MARKING | EACH | - | - | - |
| | SIGNING | MILE | - | - | - |
| | CANTILEVERED FLASHING-LIGHT SIGNALS | EACH | - | - | - |
| | SUPPLEMENTAL FLASHING-LIGHT SIGNALS | EACH | - | - | - |
| | WAYSIDE HORN | EACH | - | - | - |
| | FOUR-QUADRANT GATE ARMS | EACH | - | - | - |
| | BARRIER GATE ARM | EACH | - | - | - |
| | PEDESTRIAN GATE ARM | EACH | - | - | - |
| | PEDESTRIAN SWING GATE | EACH | - | - | - |
| | VEHICLE PRESENCE DETECTION SYSTEM | EACH | - | - | - |
| | TRAFFIC SIGNAL ADVANCE PREEMPTION | EACH | - | - | - |
| | TRAFFIC SIGNAL | EACH | - | - | - |
| | FLAGGING SERVICES (RAILROAD) | DAY | - | - | - |
| | FLAGGING SERVICES (CONTRACTOR) | DAY | - | - | - |
| | LIGHTING | EACH | - | - | - |
| | MISCELLANEOUS ITEMS | L.SUM | - | - | - |
| | **TOTAL ITEM 700** | | | | - |
| **800** | **ROADSIDE DEVELOPMENT** | | | | |
| | LANDSCAPING AND TOPSOIL | SQ.YD. | - | - | - |
| | NEW UTILITIES | L.SUM | - | - | - |
| | UTILITY RELOCATION (12kv POLE) | L.SUM | 1 | - | - |
| | MISCELLANEOUS ITEMS | L.SUM | - | - | - |
| | **TOTAL ITEM 800** | | | | - |

# ARIZONA DEPARTMENT OF TRANSPORTATION
## CONSTRUCTION COST ESTIMATE SUMMARY

**CROSSING ID:** 741100A
**PROJECT NAME:** Massingale Rd, East of I-10 Frontage Rd,

**AGENCY:** ADOT
**ESTIMATE LEVEL:** LEVEL 0
**DATE:** 1/12/2022

| ITEM | MAJOR ITEM DESCRIPTION | UNIT | QUANTITY | UNIT COST | TOTAL COST |
|---|---|---|---|---|---|
| 900 | **INCIDENTALS** | | | | |
| | CONCRETE CURB | L.FT. | - | - | - |
| | CONCRETE BARRIER | L.FT. | - | - | - |
| | CONCRETE CROSSING PANELS | T. FT. | - | - | - |
| | CONCRETE SIDEWALK | SQ.FT. | - | - | - |
| | MEDIAN PAVERS | SQ.YD. | - | - | - |
| | FENCE | L.FT. | - | - | - |
| | REMOVE/REPLACE TRACK | T. FT. | - | - | - |
| | MISCELLANEOUS ITEMS | L.SUM | - | - | - |
| | **TOTAL ITEM 900** | | | | - |
| | **SUBTOTAL A (ITEM SUBTOTAL)** | | | | **$ 30,000** |
| PW | **PROJECT WIDE** | | | | |
| | TRAFFIC CONTROL (8% OF SUBTOTAL A) | | | 8% | $ 2,400 |
| | DUST PALLIATIVE (0% OF SUBTOTAL A)(INCLUDED IN FURNISH WATER) | | | 0% | $ 0 |
| | QUALITY CONTROL (1% OF SUBTOTAL A) | | | 1% | $ 300 |
| | CONSTRUCTION SURVEYING (2% OF SUBTOTAL A) | | | 2% | $ 600 |
| | EROSION CONTROL (1% OF SUBTOTAL A) | | | 1% | $ 300 |
| | MOBILIZATION (10% OF SUBTOTAL A) | | | 10% | $ 3,000 |
| | UNIDENTIFIED ITEMS (15% OF SUBTOTAL A) | | | 15% | $ 4,500 |
| | **SUBTOTAL B (SUBTOTAL A + PROJECT WIDE)** | | | | **$ 41,100** |
| OTHER PROJ | **OTHER PROJECT COSTS** | | | | |
| | DPS TRAFFIC CONTROL (0% OF SUBTOTAL A) | | | 0% | $ 0 |
| | JOINT PROJECT AGREEMENT ITEMS (0% OF SUBTOTAL A) | | | 0% | $ 0 |
| | CONTRACTOR INCENTIVES (0% OF SUBTOTAL A) | | | 0% | $ 0 |
| | ENVIRONMENTAL MITIGATION (0.5% OF SUBTOTAL A) | | | 1% | $ 200 |
| | **BASE YEAR CONSTRUCTION COST (EXCLUDING UTILITIES & R/W)** | | | | **$ 41,300** |
| BELOW | **BELOW THE LINE ITEMS** | | | | |
| | POST DESIGN SERVICES (1% OF BASE YEAR CONSTRUCTION COST) | | | 1% | $ 500 |
| | CONSTRUCTION CONTINGENCIES (5% OF BASE YEAR CONSTRUCTION COST) | | | 5% | $ 2,100 |
| | CONSTRUCTION ENGINEERING (14% OF BASE YEAR CONSTRUCTION COST) | | | 14% | $ 5,800 |
| | **SUBTOTAL BASE YEAR CONSTRUCTION** | | | | **$ 49,700** |
| | INDIRECT COST ALLOCATION (10.5% OF BASE YEAR CONSTRUCTION) | | | 10.5% | $ 4,400 |
| | **BASE YEAR DEPARTMENT CONSTRUCTION COST (EXCLUDING UTILITIES & R/W)** | | | | **$ 54,100** |
| | | | | | |
| DES | **PREDESIGN AND FINAL DESIGN** | | | | |
| | PREDESIGN/NEPA/PI SERVICES (10% OF BASE YEAR CONSTRUCTION COST) | | | 10% | $ 4,200 |
| | INDIRECT COST ALLOCATION (10.5% OF ALL PREDESIGN COSTS) | | | 10.5% | $ 500 |
| | **SUBTOTAL PREDESIGN** | | | | **$ 4,700** |
| | FINAL DESIGN SERVICES (8% OF BASE YEAR CONSTRUCTION COST) | | | 8% | $ 3,400 |
| | INDIRECT COST ALLOCATION (10.5% OF ALL FINAL DESIGN COSTS) | | | 10.5% | $ 400 |
| | **SUBTOTAL FINAL DESIGN** | | | | **$ 3,800** |
| | **TOTAL ESTIMATED DESIGN COST** | | | | **$8,500** |
| | | | | | |
| UTIL | **UTILITY RELOCATION** | | | | |
| | UTILITIES (NEW FACILITIES/RELOCATIONS) | | | 14% | $ 7,600 |
| | INDIRECT COST ALLOCATION (10.5% OF ALL UTILITY COSTS) | | | 10.5% | $ 800 |
| | **TOTAL ESTIMATED UTILITY COST** | | | | **$8,400** |
| | | | | | |
| R/W | **RIGHT-OF-WAY** | | | | |
| | RIGHT-OF-WAY | $250,000 | ACR | 0.00 | $ 0 |
| | INDIRECT COST ALLOCATION (10.5% OF ALL RIGHT-OF-WAY COSTS) | | | 10.5% | $ 0 |
| | **TOTAL ESTIMATED RIGHT-OF-WAY COSTS** | | | | **$0** |
| | **TOTAL ESTIMATED PROJECT COST** | | | | **$71,000** |
| | **TOTAL ESTIMATED PROJECT COST (USE)** | | | | **$80,000** |

**ARIZONA DEPARTMENT OF TRANSPORTATION**
**CONSTRUCTION COST ESTIMATE SUMMARY**

**CROSSING ID:** 741560C
**PROJECT** University Dr, West of Ash Ave, Tempe

**AGENCY:** ADOT
**ESTIMATE LEVEL:** LEVEL 0
**DATE:** 1/12/2022

**PROJECT DETAILS**

Potential improvements include:

1. Automatic pedestrian gates with barriers/fencing.

| ITEM | MAJOR ITEM DESCRIPTION | UNIT | QUANTITY | UNIT COST | TOTAL COST |
|---|---|---|---|---|---|
| **200** | **REMOVALS** | | | | |
| | REMOVAL OF PAVEMENT | SQ.YD. | 134 | $ 20.00 | $ 2,700 |
| | REMOVAL OF TREES | EACH | - | - | - |
| | REMOVAL OF SIGNS | EACH | - | - | - |
| | REMOVAL OF SIGNALS | EACH | - | - | - |
| | REMOVAL OF DRIVEWAYS | EACH | - | - | - |
| | MISCELLANEOUS ITEMS | L.SUM | - | - | - |
| | **TOTAL ITEM 200** | | | | $ 3,000 |
| **300 & 400** | **BASE AND SURFACE TREATMENT** | | | | |
| | CONCRETE PAVEMENT | SQ.YD. | - | - | - |
| | ASPHALT PAVEMENT | SQ.YD. | - | - | - |
| | MISCELLANEOUS ITEMS | L.SUM | - | - | - |
| | **TOTAL ITEM 300 & 400** | | | | - |
| **500** | **DRAINAGE** | | | | |
| | PIPE CULVERT | L.FT. | - | - | - |
| | DRAINAGE STRUCTURE | EACH | - | - | - |
| | MISCELLANEOUS ITEMS | L.SUM | - | - | - |
| | **TOTAL ITEM 500** | | | | - |
| **600** | **STRUCTURES** | | | | |
| | RAILROAD OVERPASS | SQ. FT. | - | - | - |
| | PEDESTRIAN BRIDGE | SQ. FT. | - | - | - |
| | MISCELLANEOUS ITEMS | L.SUM | - | - | - |
| | **TOTAL ITEM 600** | | | | - |
| **700** | **TRAFFIC ENGINEERING** | | | | |
| | PAVEMENT MARKING | L.FT. | - | - | - |
| | TRANSVERSE PAVEMENT MARKING | EACH | - | - | - |
| | SIGNING | MILE | - | - | - |
| | CANTILEVERED FLASHING-LIGHT SIGNALS | EACH | - | - | - |
| | SUPPLEMENTAL FLASHING-LIGHT SIGNALS | EACH | - | - | - |
| | WAYSIDE HORN | EACH | - | - | - |
| | FOUR-QUADRANT GATE ARMS | EACH | - | - | - |
| | BARRIER GATE ARM | EACH | - | - | - |
| | PEDESTRIAN GATE ARM | EACH | 4 | $ 100,000.00 | $ 400,000 |
| | PEDESTRIAN SWING GATE | EACH | - | - | - |
| | VEHICLE PRESENCE DETECTION SYSTEM | EACH | - | - | - |
| | TRAFFIC SIGNAL ADVANCE PREEMPTION | EACH | - | - | - |
| | TRAFFIC SIGNAL | EACH | - | - | - |
| | FLAGGING SERVICES (RAILROAD) | DAY | - | - | - |
| | FLAGGING SERVICES (CONTRACTOR) | DAY | - | - | - |
| | LIGHTING | EACH | - | - | - |
| | MISCELLANEOUS ITEMS | L.SUM | - | - | - |
| | **TOTAL ITEM 700** | | | | $ 400,000 |
| **800** | **ROADSIDE DEVELOPMENT** | | | | |
| | LANDSCAPING AND TOPSOIL | SQ.YD. | - | - | - |
| | NEW UTILITIES | L.SUM | - | - | - |
| | UTILITY RELOCATION | L.SUM | - | - | - |
| | MISCELLANEOUS ITEMS | L.SUM | - | - | - |
| | **TOTAL ITEM 800** | | | | - |

# ARIZONA DEPARTMENT OF TRANSPORTATION
## CONSTRUCTION COST ESTIMATE SUMMARY

**CROSSING ID:** 741560C
**PROJECT NAME:** University Dr, West of Ash Ave, Tempe

**AGENCY:** ADOT
**ESTIMATE LEVEL:** LEVEL 0
**DATE:** 1/12/2022

| ITEM | MAJOR ITEM DESCRIPTION | UNIT | QUANTITY | UNIT COST | TOTAL COST |
|---|---|---|---|---|---|
| 900 | **INCIDENTALS** | | | | |
| | CONCRETE CURB | L.FT. | - | - | - |
| | CONCRETE BARRIER | L.FT. | - | - | - |
| | CONCRETE CROSSING PANELS | T. FT. | - | - | - |
| | CONCRETE SIDEWALK | SQ.FT. | 924 | $ 50.00 | $ 46,200 |
| | MEDIAN PAVERS | SQ.YD. | - | - | - |
| | FENCE | L.FT. | 320 | $ 15.00 | $ 4,800 |
| | REMOVE/REPLACE TRACK | T. FT. | - | - | - |
| | MISCELLANEOUS ITEMS | L.SUM | - | - | - |
| | **TOTAL ITEM 900** | | | | $ 51,000 |
| | **SUBTOTAL A (ITEM SUBTOTAL)** | | | | **$ 454,000** |
| PW | **PROJECT WIDE** | | | | |
| | TRAFFIC CONTROL (8% OF SUBTOTAL A) | | | 8% | $ 36,400 |
| | DUST PALLIATIVE (0% OF SUBTOTAL A)(INCLUDED IN FURNISH WATER) | | | 0% | $ 0 |
| | QUALITY CONTROL (1% OF SUBTOTAL A) | | | 1% | $ 4,600 |
| | CONSTRUCTION SURVEYING (2% OF SUBTOTAL A) | | | 2% | $ 9,100 |
| | EROSION CONTROL (1% OF SUBTOTAL A) | | | 1% | $ 4,600 |
| | MOBILIZATION (10% OF SUBTOTAL A) | | | 10% | $ 45,400 |
| | UNIDENTIFIED ITEMS (15% OF SUBTOTAL A) | | | 15% | $ 68,100 |
| | **SUBTOTAL B (SUBTOTAL A + PROJECT WIDE)** | | | | **$ 622,200** |
| OTHER PROJ | **OTHER PROJECT COSTS** | | | | |
| | DPS TRAFFIC CONTROL (0% OF SUBTOTAL A) | | | 0% | $ 0 |
| | JOINT PROJECT AGREEMENT ITEMS (0% OF SUBTOTAL A) | | | 0% | $ 0 |
| | CONTRACTOR INCENTIVES (0% OF SUBTOTAL A) | | | 0% | $ 0 |
| | ENVIRONMENTAL MITIGATION (0.5% OF SUBTOTAL A) | | | 1% | $ 2,300 |
| | **BASE YEAR CONSTRUCTION COST (EXCLUDING UTILITIES & R/W)** | | | | **$ 624,500** |
| BELOW | **BELOW THE LINE ITEMS** | | | | |
| | POST DESIGN SERVICES (1% OF BASE YEAR CONSTRUCTION COST) | | | 1% | $ 6,300 |
| | CONSTRUCTION CONTINGENCIES (5% OF BASE YEAR CONSTRUCTION COST) | | | 5% | $ 31,300 |
| | CONSTRUCTION ENGINEERING (14% OF BASE YEAR CONSTRUCTION COST) | | | 14% | $ 87,500 |
| | **SUBTOTAL BASE YEAR CONSTRUCTION** | | | | **$ 749,600** |
| | INDIRECT COST ALLOCATION (10.5% OF BASE YEAR CONSTRUCTION) | | | 10.5% | $ 65,600 |
| | **BASE YEAR DEPARTMENT CONSTRUCTION COST (EXCLUDING UTILITIES & R/W)** | | | | **$ 815,200** |
| DES | **PREDESIGN AND FINAL DESIGN** | | | | |
| | PREDESIGN/NEPA/PI SERVICES (10% OF BASE YEAR CONSTRUCTION COST) | | | 10% | $ 62,300 |
| | INDIRECT COST ALLOCATION (10.5% OF ALL PREDESIGN COSTS) | | | 10.5% | $ 6,600 |
| | **SUBTOTAL PREDESIGN** | | | | **$ 68,900** |
| | FINAL DESIGN SERVICES (8% OF BASE YEAR CONSTRUCTION COST) | | | 8% | $ 50,000 |
| | INDIRECT COST ALLOCATION (10.5% OF ALL FINAL DESIGN COSTS) | | | 10.5% | $ 5,300 |
| | **SUBTOTAL FINAL DESIGN** | | | | **$ 55,300** |
| | **TOTAL ESTIMATED DESIGN COST** | | | | **$124,200** |
| UTIL | **UTILITY RELOCATION** | | | | |
| | UTILITIES (NEW FACILITIES/RELOCATIONS) | | | 14% | $ 114,200 |
| | INDIRECT COST ALLOCATION (10.5% OF ALL UTILITY COSTS) | | | 10.5% | $ 12,000 |
| | **TOTAL ESTIMATED UTILITY COST** | | | | **$126,200** |
| R/W | **RIGHT-OF-WAY** | | | | |
| | RIGHT-OF-WAY | $250,000 | ACR | 0.00 | $ 0 |
| | INDIRECT COST ALLOCATION (10.5% OF ALL RIGHT-OF-WAY COSTS) | | | 10.5% | $ 0 |
| | **TOTAL ESTIMATED RIGHT-OF-WAY COSTS** | | | | **$0** |
| | **TOTAL ESTIMATED PROJECT COST** | | | | **$1,065,600** |
| | **TOTAL ESTIMATED PROJECT COST (USE)** | | | | **$1,070,000** |

**ARIZONA DEPARTMENT OF TRANSPORTATION**
**CONSTRUCTION COST ESTIMATE SUMMARY**

**CROSSING ID:** 741708G
**PROJECT** Main St, South of Casa Grande-Picacho Hwy, Eloy

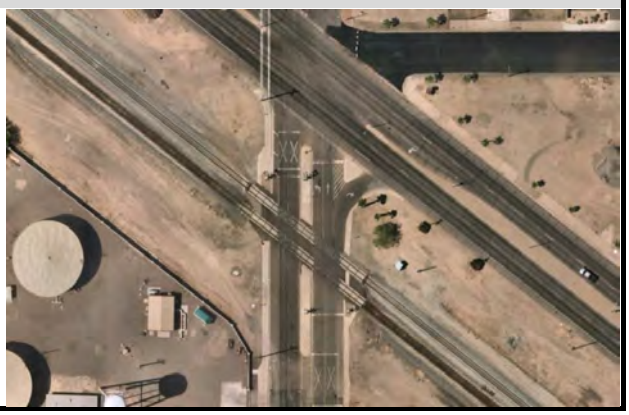
**AGENCY:** ADOT
**ESTIMATE LEVEL:** LEVEL 0
**DATE:** 1/12/2022

**PROJECT DETAILS**

Potential improvements include:

1. Bidirectional pedestrian gates and flashers with barriers/fencing

2. Pedestrian warning surface and signage (both directions).



| ITEM | MAJOR ITEM DESCRIPTION | UNIT | QUANTITY | UNIT COST | TOTAL COST |
|---|---|---|---|---|---|
| 200 | **REMOVALS** | | | | |
| | REMOVAL OF PAVEMENT | SQ.YD. | - | - | - |
| | REMOVAL OF TREES | EACH | - | - | - |
| | REMOVAL OF SIGNS | EACH | - | - | - |
| | REMOVAL OF SIGNALS | EACH | - | - | - |
| | REMOVAL OF DRIVEWAYS | EACH | - | - | - |
| | MISCELLANEOUS ITEMS | L.SUM | - | - | - |
| | **TOTAL ITEM 200** | | | | - |
| 300 & 400 | **BASE AND SURFACE TREATMENT** | | | | |
| | CONCRETE PAVEMENT | SQ.YD. | - | - | - |
| | ASPHALT PAVEMENT | SQ.YD. | - | - | - |
| | MISCELLANEOUS ITEMS | L.SUM | - | - | - |
| | **TOTAL ITEM 300 & 400** | | | | - |
| 500 | **DRAINAGE** | | | | |
| | PIPE CULVERT | L.FT. | - | - | - |
| | DRAINAGE STRUCTURE | EACH | - | - | - |
| | MISCELLANEOUS ITEMS | L.SUM | - | - | - |
| | **TOTAL ITEM 500** | | | | - |
| 600 | **STRUCTURES** | | | | |
| | RAILROAD OVERPASS | SQ. FT. | - | - | - |
| | PEDESTRIAN BRIDGE | SQ. FT. | - | - | - |
| | MISCELLANEOUS ITEMS | L.SUM | - | - | - |
| | **TOTAL ITEM 600** | | | | - |
| 700 | **TRAFFIC ENGINEERING** | | | | |
| | PAVEMENT MARKING | L.FT. | - | - | - |
| | TRANSVERSE PAVEMENT MARKING | EACH | - | - | - |
| | SIGNING | MILE | .50 | $ 12,000.00 | $ 6,000 |
| | CANTILEVERED FLASHING-LIGHT SIGNALS | EACH | - | - | - |
| | SUPPLEMENTAL FLASHING-LIGHT SIGNALS | EACH | 4 | $ 10,000.00 | $ 40,000 |
| | WAYSIDE HORN | EACH | - | - | - |
| | FOUR-QUADRANT GATE ARMS | EACH | - | - | - |
| | BARRIER GATE ARM | EACH | - | - | - |
| | PEDESTRIAN GATE ARM | EACH | 4 | $ 100,000.00 | $ 400,000 |
| | PEDESTRIAN SWING GATE | EACH | - | - | - |
| | VEHICLE PRESENCE DETECTION SYSTEM | EACH | - | - | - |
| | TRAFFIC SIGNAL ADVANCE PREEMPTION | EACH | - | - | - |
| | TRAFFIC SIGNAL | EACH | - | - | - |
| | FLAGGING SERVICES (RAILROAD) | DAY | - | - | - |
| | FLAGGING SERVICES (CONTRACTOR) | DAY | - | - | - |
| | LIGHTING | EACH | - | - | - |
| | MISCELLANEOUS ITEMS | L.SUM | - | - | - |
| | **TOTAL ITEM 700** | | | | $ 446,000 |
| 800 | **ROADSIDE DEVELOPMENT** | | | | |
| | LANDSCAPING AND TOPSOIL | SQ.YD. | - | - | - |
| | NEW UTILITIES | L.SUM | - | - | - |
| | UTILITY RELOCATION | L.SUM | - | - | - |
| | MISCELLANEOUS ITEMS | L.SUM | - | - | - |
| | **TOTAL ITEM 800** | | | | - |

# ARIZONA DEPARTMENT OF TRANSPORTATION
## CONSTRUCTION COST ESTIMATE SUMMARY

**CROSSING ID:** 741708G
**PROJECT NAME:** Main St, South of Casa Grande-Picacho

**AGENCY:** ADOT
**ESTIMATE LEVEL:** LEVEL 0
**DATE:** 1/12/2022

| ITEM | MAJOR ITEM DESCRIPTION | UNIT | QUANTITY | UNIT COST | TOTAL COST |
|---|---|---|---|---|---|
| 900 | **INCIDENTALS** | | | | |
| | CONCRETE CURB | L.FT. | - | - | - |
| | CONCRETE BARRIER | L.FT. | - | - | - |
| | CONCRETE CROSSING PANELS | T. FT. | - | - | - |
| | CONCRETE SIDEWALK | SQ.FT. | - | - | - |
| | MEDIAN PAVERS | SQ.YD. | - | - | - |
| | FENCE | L.FT. | 400 | $ 15.00 | $ 6,000 |
| | REMOVE/REPLACE TRACK | T. FT. | - | - | - |
| | MISCELLANEOUS ITEMS (DETECTABLE WARNING | L.SUM | 1 | $ 12,800.00 | $ 12,800 |
| | **TOTAL ITEM 900** | | | | $ 19,000 |
| | **SUBTOTAL A (ITEM SUBTOTAL)** | | | | **$ 465,000** |
| PW | **PROJECT WIDE** | | | | |
| | TRAFFIC CONTROL (8% OF SUBTOTAL A) | | | 8% | $ 37,200 |
| | DUST PALLIATIVE (0% OF SUBTOTAL A)(INCLUDED IN FURNISH WATER) | | | 0% | $ 0 |
| | QUALITY CONTROL (1% OF SUBTOTAL A) | | | 1% | $ 4,700 |
| | CONSTRUCTION SURVEYING (2% OF SUBTOTAL A) | | | 2% | $ 9,300 |
| | EROSION CONTROL (1% OF SUBTOTAL A) | | | 1% | $ 4,700 |
| | MOBILIZATION (10% OF SUBTOTAL A) | | | 10% | $ 46,500 |
| | UNIDENTIFIED ITEMS (15% OF SUBTOTAL A) | | | 15% | $ 69,800 |
| | **SUBTOTAL B (SUBTOTAL A + PROJECT WIDE)** | | | | **$ 637,200** |
| OTHER PROJ | **OTHER PROJECT COSTS** | | | | |
| | DPS TRAFFIC CONTROL (0% OF SUBTOTAL A) | | | 0% | $ 0 |
| | JOINT PROJECT AGREEMENT ITEMS (0% OF SUBTOTAL A) | | | 0% | $ 0 |
| | CONTRACTOR INCENTIVES (0% OF SUBTOTAL A) | | | 0% | $ 0 |
| | ENVIRONMENTAL MITIGATION (0.5% OF SUBTOTAL A) | | | 1% | $ 2,400 |
| | **BASE YEAR CONSTRUCTION COST (EXCLUDING UTILITIES & R/W)** | | | | **$ 639,600** |
| BELOW | **BELOW THE LINE ITEMS** | | | | |
| | POST DESIGN SERVICES (1% OF BASE YEAR CONSTRUCTION COST) | | | 1% | $ 6,400 |
| | CONSTRUCTION CONTINGENCIES (5% OF BASE YEAR CONSTRUCTION COST) | | | 5% | $ 32,000 |
| | CONSTRUCTION ENGINEERING (14% OF BASE YEAR CONSTRUCTION COST) | | | 14% | $ 89,600 |
| | **SUBTOTAL BASE YEAR CONSTRUCTION** | | | | **$ 767,600** |
| | INDIRECT COST ALLOCATION (10.5% OF BASE YEAR CONSTRUCTION) | | | 10.5% | $ 67,200 |
| | **BASE YEAR DEPARTMENT CONSTRUCTION COST (EXCLUDING UTILITIES & R/W)** | | | | **$ 834,800** |
| | | | | | |
| DES | **PREDESIGN AND FINAL DESIGN** | | | | |
| | PREDESIGN/NEPA/PI SERVICES (10% OF BASE YEAR CONSTRUCTION COST) | | | 10% | $ 63,800 |
| | INDIRECT COST ALLOCATION (10.5% OF ALL PREDESIGN COSTS) | | | 10.5% | $ 6,700 |
| | **SUBTOTAL PREDESIGN** | | | | **$ 70,500** |
| | FINAL DESIGN SERVICES (8% OF BASE YEAR CONSTRUCTION COST) | | | 8% | $ 51,200 |
| | INDIRECT COST ALLOCATION (10.5% OF ALL FINAL DESIGN COSTS) | | | 10.5% | $ 5,400 |
| | **SUBTOTAL FINAL DESIGN** | | | | **$ 56,600** |
| | **TOTAL ESTIMATED DESIGN COST** | | | | **$127,100** |
| | | | | | |
| UTIL | **UTILITY RELOCATION** | | | | |
| | UTILITIES (NEW FACILITIES/RELOCATIONS) | | | 14% | $ 116,900 |
| | INDIRECT COST ALLOCATION (10.5% OF ALL UTILITY COSTS) | | | 10.5% | $ 12,300 |
| | **TOTAL ESTIMATED UTILITY COST** | | | | **$129,200** |
| | | | | | |
| R/W | **RIGHT-OF-WAY** | | | | |
| | RIGHT-OF-WAY | $250,000 | ACR | 0.00 | $ 0 |
| | INDIRECT COST ALLOCATION (10.5% OF ALL RIGHT-OF-WAY COSTS) | | | 10.5% | $ 0 |
| | **TOTAL ESTIMATED RIGHT-OF-WAY COSTS** | | | | **$0** |
| | **TOTAL ESTIMATED PROJECT COST** | | | | **$1,091,100** |
| | **TOTAL ESTIMATED PROJECT COST (USE)** | | | | **$1,100,000** |

**ARIZONA DEPARTMENT OF TRANSPORTATION**
**CONSTRUCTION COST ESTIMATE SUMMARY**

**CROSSING ID:** 741814P
**PROJECT** McQueen Rd, South of Baseline Rd, Gilbert

**AGENCY:** ADOT
**ESTIMATE LEVEL:** LEVEL 0
**DATE:** 1/12/2022

**PROJECT DETAILS**

Potential improvements include:

1. Gate strike signage to discourage drivers from trying to beat the gates.
2. Pedestrian signage and tactile warning surface.
3. Realign sidewalk to avoid gate arm counterweight and to cross tracks perpendicularly.
4. Add pedestrian fencing.

| ITEM | MAJOR ITEM DESCRIPTION | UNIT | QUANTITY | UNIT COST | TOTAL COST |
|---|---|---|---|---|---|
| **200** | **REMOVALS** | | | | |
| | REMOVAL OF PAVEMENT | SQ.YD. | 134 | $ 20.00 | $ 2,700 |
| | REMOVAL OF TREES | EACH | - | - | - |
| | REMOVAL OF SIGNS | EACH | - | - | - |
| | REMOVAL OF SIGNALS | EACH | - | - | - |
| | REMOVAL OF DRIVEWAYS | EACH | - | - | - |
| | MISCELLANEOUS ITEMS | L.SUM | - | - | - |
| | **TOTAL ITEM 200** | | | | $ 3,000 |
| **300 & 400** | **BASE AND SURFACE TREATMENT** | | | | |
| | CONCRETE PAVEMENT | SQ.YD. | - | - | - |
| | ASPHALT PAVEMENT | SQ.YD. | - | - | - |
| | MISCELLANEOUS ITEMS | L.SUM | - | - | - |
| | **TOTAL ITEM 300 & 400** | | | | - |
| **500** | **DRAINAGE** | | | | |
| | PIPE CULVERT | L.FT. | - | - | - |
| | DRAINAGE STRUCTURE | EACH | - | - | - |
| | MISCELLANEOUS ITEMS | L.SUM | - | - | - |
| | **TOTAL ITEM 500** | | | | - |
| **600** | **STRUCTURES** | | | | |
| | RAILROAD OVERPASS | SQ. FT. | - | - | - |
| | PEDESTRIAN BRIDGE | SQ. FT. | - | - | - |
| | MISCELLANEOUS ITEMS | L.SUM | - | - | - |
| | **TOTAL ITEM 600** | | | | - |
| **700** | **TRAFFIC ENGINEERING** | | | | |
| | PAVEMENT MARKING | L.FT. | - | - | - |
| | TRANSVERSE PAVEMENT MARKING | EACH | - | - | - |
| | SIGNING | MILE | 1.00 | $ 12,000.00 | $ 12,000 |
| | CANTILEVERED FLASHING-LIGHT SIGNALS | EACH | - | - | - |
| | SUPPLEMENTAL FLASHING-LIGHT SIGNALS | EACH | - | - | - |
| | WAYSIDE HORN | EACH | - | - | - |
| | FOUR-QUADRANT GATE ARMS | EACH | - | - | - |
| | BARRIER GATE ARM | EACH | - | - | - |
| | PEDESTRIAN GATE ARM | EACH | - | - | - |
| | PEDESTRIAN SWING GATE | EACH | - | - | - |
| | VEHICLE PRESENCE DETECTION SYSTEM | EACH | - | - | - |
| | TRAFFIC SIGNAL ADVANCE PREEMPTION | EACH | - | - | - |
| | TRAFFIC SIGNAL | EACH | - | - | - |
| | FLAGGING SERVICES (RAILROAD) | DAY | - | - | - |
| | FLAGGING SERVICES (CONTRACTOR) | DAY | - | - | - |
| | LIGHTING | EACH | - | - | - |
| | MISCELLANEOUS ITEMS | L.SUM | - | - | - |
| | **TOTAL ITEM 700** | | | | $ 12,000 |
| **800** | **ROADSIDE DEVELOPMENT** | | | | |
| | LANDSCAPING AND TOPSOIL | SQ.YD. | - | - | - |
| | NEW UTILITIES | L.SUM | - | - | - |
| | UTILITY RELOCATION | L.SUM | - | - | - |
| | MISCELLANEOUS ITEMS | L.SUM | - | - | - |
| | **TOTAL ITEM 800** | | | | - |

# ARIZONA DEPARTMENT OF TRANSPORTATION
## CONSTRUCTION COST ESTIMATE SUMMARY

**CROSSING ID:** 741814P
**PROJECT NAME:** McQueen Rd, South of Baseline Rd,

**AGENCY:** ADOT
**ESTIMATE LEVEL:** LEVEL 0
**DATE:** 1/12/2022

| ITEM | MAJOR ITEM DESCRIPTION | UNIT | QUANTITY | UNIT COST | TOTAL COST |
|---|---|---|---|---|---|
| 900 | **INCIDENTALS** | | | | |
| | CONCRETE CURB | L.FT. | - | - | - |
| | CONCRETE BARRIER | L.FT. | - | - | - |
| | CONCRETE CROSSING PANELS | T. FT. | 16 | $ 2,200.00 | $ 35,200 |
| | CONCRETE SIDEWALK | SQ.FT. | 1,440 | $ 50.00 | $ 72,000 |
| | MEDIAN PAVERS | SQ.YD. | - | - | - |
| | FENCE | L.FT. | 240 | $ 15.00 | $ 3,600 |
| | REMOVE/REPLACE TRACK | T. FT. | - | - | - |
| | MISCELLANEOUS ITEMS (TRUNCATED DOMES) | L.SUM | 1 | $ 2,000.00 | $ 2,000 |
| | **TOTAL ITEM 900** | | | | $ 113,000 |
| | **SUBTOTAL A (ITEM SUBTOTAL)** | | | | **$ 128,000** |
| PW | **PROJECT WIDE** | | | | |
| | TRAFFIC CONTROL (8% OF SUBTOTAL A) | | | 8% | $ 10,300 |
| | DUST PALLIATIVE (0% OF SUBTOTAL A)(INCLUDED IN FURNISH WATER) | | | 0% | $ 0 |
| | QUALITY CONTROL (1% OF SUBTOTAL A) | | | 1% | $ 1,300 |
| | CONSTRUCTION SURVEYING (2% OF SUBTOTAL A) | | | 2% | $ 2,600 |
| | EROSION CONTROL (1% OF SUBTOTAL A) | | | 1% | $ 1,300 |
| | MOBILIZATION (10% OF SUBTOTAL A) | | | 10% | $ 12,800 |
| | UNIDENTIFIED ITEMS (15% OF SUBTOTAL A) | | | 15% | $ 19,200 |
| | **SUBTOTAL B (SUBTOTAL A + PROJECT WIDE)** | | | | **$ 175,500** |
| OTHER PROJ | **OTHER PROJECT COSTS** | | | | |
| | DPS TRAFFIC CONTROL (0% OF SUBTOTAL A) | | | 0% | $ 0 |
| | JOINT PROJECT AGREEMENT ITEMS (0% OF SUBTOTAL A) | | | 0% | $ 0 |
| | CONTRACTOR INCENTIVES (0% OF SUBTOTAL A) | | | 0% | $ 0 |
| | ENVIRONMENTAL MITIGATION (0.5% OF SUBTOTAL A) | | | 1% | $ 700 |
| | **BASE YEAR CONSTRUCTION COST (EXCLUDING UTILITIES & R/W)** | | | | **$ 176,200** |
| BELOW | **BELOW THE LINE ITEMS** | | | | |
| | POST DESIGN SERVICES (1% OF BASE YEAR CONSTRUCTION COST) | | | 1% | $ 1,800 |
| | CONSTRUCTION CONTINGENCIES (5% OF BASE YEAR CONSTRUCTION COST) | | | 5% | $ 8,900 |
| | CONSTRUCTION ENGINEERING (14% OF BASE YEAR CONSTRUCTION COST) | | | 14% | $ 24,700 |
| | **SUBTOTAL BASE YEAR CONSTRUCTION** | | | | **$ 211,600** |
| | INDIRECT COST ALLOCATION (10.5% OF BASE YEAR CONSTRUCTION) | | | 10.5% | $ 18,600 |
| | **BASE YEAR DEPARTMENT CONSTRUCTION COST (EXCLUDING UTILITIES & R/W)** | | | | **$ 230,200** |
| | | | | | |
| DES | **PREDESIGN AND FINAL DESIGN** | | | | |
| | PREDESIGN/NEPA/PI SERVICES (10% OF BASE YEAR CONSTRUCTION COST) | | | 10% | $ 17,600 |
| | INDIRECT COST ALLOCATION (10.5% OF ALL PREDESIGN COSTS) | | | 10.5% | $ 1,900 |
| | **SUBTOTAL PREDESIGN** | | | | **$ 19,500** |
| | FINAL DESIGN SERVICES (8% OF BASE YEAR CONSTRUCTION COST) | | | 8% | $ 14,100 |
| | INDIRECT COST ALLOCATION (10.5% OF ALL FINAL DESIGN COSTS) | | | 10.5% | $ 1,500 |
| | **SUBTOTAL FINAL DESIGN** | | | | **$ 15,600** |
| | **TOTAL ESTIMATED DESIGN COST** | | | | **$35,100** |
| | | | | | |
| UTIL | **UTILITY RELOCATION** | | | | |
| | UTILITIES (NEW FACILITIES/RELOCATIONS) | | | 14% | $ 32,300 |
| | INDIRECT COST ALLOCATION (10.5% OF ALL UTILITY COSTS) | | | 10.5% | $ 3,400 |
| | **TOTAL ESTIMATED UTILITY COST** | | | | **$35,700** |
| | | | | | |
| R/W | **RIGHT-OF-WAY** | | | | |
| | RIGHT-OF-WAY | $250,000 | ACR | 0.00 | $ 0 |
| | INDIRECT COST ALLOCATION (10.5% OF ALL RIGHT-OF-WAY COSTS) | | | 10.5% | $ 0 |
| | **TOTAL ESTIMATED RIGHT-OF-WAY COSTS** | | | | **$0** |
| | **TOTAL ESTIMATED PROJECT COST** | | | | **$301,000** |
| | **TOTAL ESTIMATED PROJECT COST (USE)** | | | | **$310,000** |

**ARIZONA DEPARTMENT OF TRANSPORTATION**
**CONSTRUCTION COST ESTIMATE SUMMARY**

**CROSSING ID:** 741825C
**PROJECT** Val Vista Dr, South of Warner Rd, Gilbert

**AGENCY:** ADOT
**ESTIMATE LEVEL:** LEVEL 0
**DATE:** 1/12/2022

**PROJECT DETAILS**

Potential improvements include:

1. Pedestrian signage and tactile warning surface.
2. Realign sidewalk to cross tracks perpendicularly.
3. Add flashers on new pole that are oriented towards pedestrians.

| ITEM | MAJOR ITEM DESCRIPTION | UNIT | QUANTITY | UNIT COST | TOTAL COST |
|---|---|---|---|---|---|
| 200 | **REMOVALS** | | | | |
| | REMOVAL OF PAVEMENT | SQ.YD. | 134 | $ 20.00 | $ 2,700 |
| | REMOVAL OF TREES | EACH | - | - | - |
| | REMOVAL OF SIGNS | EACH | - | - | - |
| | REMOVAL OF SIGNALS | EACH | - | - | - |
| | REMOVAL OF DRIVEWAYS | EACH | - | - | - |
| | MISCELLANEOUS ITEMS | L.SUM | - | - | - |
| | **TOTAL ITEM 200** | | | | $ 3,000 |
| 300 & 400 | **BASE AND SURFACE TREATMENT** | | | | |
| | CONCRETE PAVEMENT | SQ.YD. | - | - | - |
| | ASPHALT PAVEMENT | SQ.YD. | - | - | - |
| | MISCELLANEOUS ITEMS | L.SUM | - | - | - |
| | **TOTAL ITEM 300 & 400** | | | | - |
| 500 | **DRAINAGE** | | | | |
| | PIPE CULVERT | L.FT. | - | - | - |
| | DRAINAGE STRUCTURE | EACH | - | - | - |
| | MISCELLANEOUS ITEMS | L.SUM | - | - | - |
| | **TOTAL ITEM 500** | | | | - |
| 600 | **STRUCTURES** | | | | |
| | RAILROAD OVERPASS | SQ. FT. | - | - | - |
| | PEDESTRIAN BRIDGE | SQ. FT. | - | - | - |
| | MISCELLANEOUS ITEMS | L.SUM | - | - | - |
| | **TOTAL ITEM 600** | | | | - |
| 700 | **TRAFFIC ENGINEERING** | | | | |
| | PAVEMENT MARKING | L.FT. | - | - | - |
| | TRANSVERSE PAVEMENT MARKING | EACH | - | - | - |
| | SIGNING | MILE | .50 | $ 12,000.00 | $ 6,000 |
| | CANTILEVERED FLASHING-LIGHT SIGNALS | EACH | - | - | - |
| | SUPPLEMENTAL FLASHING-LIGHT SIGNALS | EACH | 2 | $ 10,000.00 | $ 20,000 |
| | WAYSIDE HORN | EACH | - | - | - |
| | FOUR-QUADRANT GATE ARMS | EACH | - | - | - |
| | BARRIER GATE ARM | EACH | - | - | - |
| | PEDESTRIAN GATE ARM | EACH | - | - | - |
| | PEDESTRIAN SWING GATE | EACH | - | - | - |
| | VEHICLE PRESENCE DETECTION SYSTEM | EACH | - | - | - |
| | TRAFFIC SIGNAL ADVANCE PREEMPTION | EACH | - | - | - |
| | TRAFFIC SIGNAL | EACH | - | - | - |
| | FLAGGING SERVICES (RAILROAD) | DAY | - | - | - |
| | FLAGGING SERVICES (CONTRACTOR) | DAY | - | - | - |
| | LIGHTING | EACH | - | - | - |
| | MISCELLANEOUS ITEMS | L.SUM | - | - | - |
| | **TOTAL ITEM 700** | | | | $ 26,000 |
| 800 | **ROADSIDE DEVELOPMENT** | | | | |
| | LANDSCAPING AND TOPSOIL | SQ.YD. | - | - | - |
| | NEW UTILITIES | L.SUM | - | - | - |
| | UTILITY RELOCATION | L.SUM | - | - | - |
| | MISCELLANEOUS ITEMS | L.SUM | - | - | - |
| | **TOTAL ITEM 800** | | | | - |

# ARIZONA DEPARTMENT OF TRANSPORTATION
## CONSTRUCTION COST ESTIMATE SUMMARY

**CROSSING ID:** 741825C
**PROJECT NAME:** Val Vista Dr, South of Warner Rd, Gilbert

**AGENCY:** ADOT
**ESTIMATE LEVEL:** LEVEL 0
**DATE:** 1/12/2022

| ITEM | MAJOR ITEM DESCRIPTION | UNIT | QUANTITY | UNIT COST | TOTAL COST |
|---|---|---|---|---|---|
| **900** | **INCIDENTALS** | | | | |
| | CONCRETE CURB | L.FT. | - | - | - |
| | CONCRETE BARRIER | L.FT. | - | - | - |
| | CONCRETE CROSSING PANELS | T. FT. | 16 | $ 2,200.00 | $ 35,200 |
| | CONCRETE SIDEWALK | SQ.FT. | 1,440 | $ 50.00 | $ 72,000 |
| | MEDIAN PAVERS | SQ.YD. | - | - | - |
| | FENCE | L.FT. | - | - | - |
| | REMOVE/REPLACE TRACK | T. FT. | - | - | - |
| | MISCELLANEOUS ITEMS (TRUNCATED DOMES) | L.SUM | 1 | $ 2,000.00 | $ 2,000 |
| | **TOTAL ITEM 900** | | | | $ 110,000 |
| | **SUBTOTAL A (ITEM SUBTOTAL)** | | | | **$ 139,000** |
| **PW** | **PROJECT WIDE** | | | | |
| | TRAFFIC CONTROL (8% OF SUBTOTAL A) | | | 8% | $ 11,200 |
| | DUST PALLIATIVE (0% OF SUBTOTAL A)(INCLUDED IN FURNISH WATER) | | | 0% | $ 0 |
| | QUALITY CONTROL (1% OF SUBTOTAL A) | | | 1% | $ 1,400 |
| | CONSTRUCTION SURVEYING (2% OF SUBTOTAL A) | | | 2% | $ 2,800 |
| | EROSION CONTROL (1% OF SUBTOTAL A) | | | 1% | $ 1,400 |
| | MOBILIZATION (10% OF SUBTOTAL A) | | | 10% | $ 13,900 |
| | UNIDENTIFIED ITEMS (15% OF SUBTOTAL A) | | | 15% | $ 20,900 |
| | **SUBTOTAL B (SUBTOTAL A + PROJECT WIDE)** | | | | **$ 190,600** |
| **OTHER PROJ** | **OTHER PROJECT COSTS** | | | | |
| | DPS TRAFFIC CONTROL (0% OF SUBTOTAL A) | | | 0% | $ 0 |
| | JOINT PROJECT AGREEMENT ITEMS (0% OF SUBTOTAL A) | | | 0% | $ 0 |
| | CONTRACTOR INCENTIVES (0% OF SUBTOTAL A) | | | 0% | $ 0 |
| | ENVIRONMENTAL MITIGATION (0.5% OF SUBTOTAL A) | | | 1% | $ 700 |
| | **BASE YEAR CONSTRUCTION COST (EXCLUDING UTILITIES & R/W)** | | | | **$ 191,300** |
| **BELOW** | **BELOW THE LINE ITEMS** | | | | |
| | POST DESIGN SERVICES (1% OF BASE YEAR CONSTRUCTION COST) | | | 1% | $ 2,000 |
| | CONSTRUCTION CONTINGENCIES (5% OF BASE YEAR CONSTRUCTION COST) | | | 5% | $ 9,600 |
| | CONSTRUCTION ENGINEERING (14% OF BASE YEAR CONSTRUCTION COST) | | | 14% | $ 26,800 |
| | **SUBTOTAL BASE YEAR CONSTRUCTION** | | | | **$ 229,700** |
| | INDIRECT COST ALLOCATION (10.5% OF BASE YEAR CONSTRUCTION) | | | 10.5% | $ 20,100 |
| | **BASE YEAR DEPARTMENT CONSTRUCTION COST (EXCLUDING UTILITIES & R/W)** | | | | **$ 249,800** |
| | | | | | |
| **DES** | **PREDESIGN AND FINAL DESIGN** | | | | |
| | PREDESIGN/NEPA/PI SERVICES (10% OF BASE YEAR CONSTRUCTION COST) | | | 10% | $ 19,100 |
| | INDIRECT COST ALLOCATION (10.5% OF ALL PREDESIGN COSTS) | | | 10.5% | $ 2,100 |
| | **SUBTOTAL PREDESIGN** | | | | **$ 21,200** |
| | FINAL DESIGN SERVICES (8% OF BASE YEAR CONSTRUCTION COST) | | | 8% | $ 15,400 |
| | INDIRECT COST ALLOCATION (10.5% OF ALL FINAL DESIGN COSTS) | | | 10.5% | $ 1,700 |
| | **SUBTOTAL FINAL DESIGN** | | | | **$ 17,100** |
| | **TOTAL ESTIMATED DESIGN COST** | | | | **$38,300** |
| | | | | | |
| **UTIL** | **UTILITY RELOCATION** | | | | |
| | UTILITIES (NEW FACILITIES/RELOCATIONS) | | | 14% | $ 35,000 |
| | INDIRECT COST ALLOCATION (10.5% OF ALL UTILITY COSTS) | | | 10.5% | $ 3,700 |
| | **TOTAL ESTIMATED UTILITY COST** | | | | **$38,700** |
| | | | | | |
| **R/W** | **RIGHT-OF-WAY** | | | | |
| | RIGHT-OF-WAY | $250,000 | ACR | 0.00 | $ 0 |
| | INDIRECT COST ALLOCATION (10.5% OF ALL RIGHT-OF-WAY COSTS) | | | 10.5% | $ 0 |
| | **TOTAL ESTIMATED RIGHT-OF-WAY COSTS** | | | | **$0** |
| | **TOTAL ESTIMATED PROJECT COST** | | | | **$326,800** |
| | **TOTAL ESTIMATED PROJECT COST (USE)** | | | | **$330,000** |