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Fort Defiance Industrial Area Traffic Circulation Study

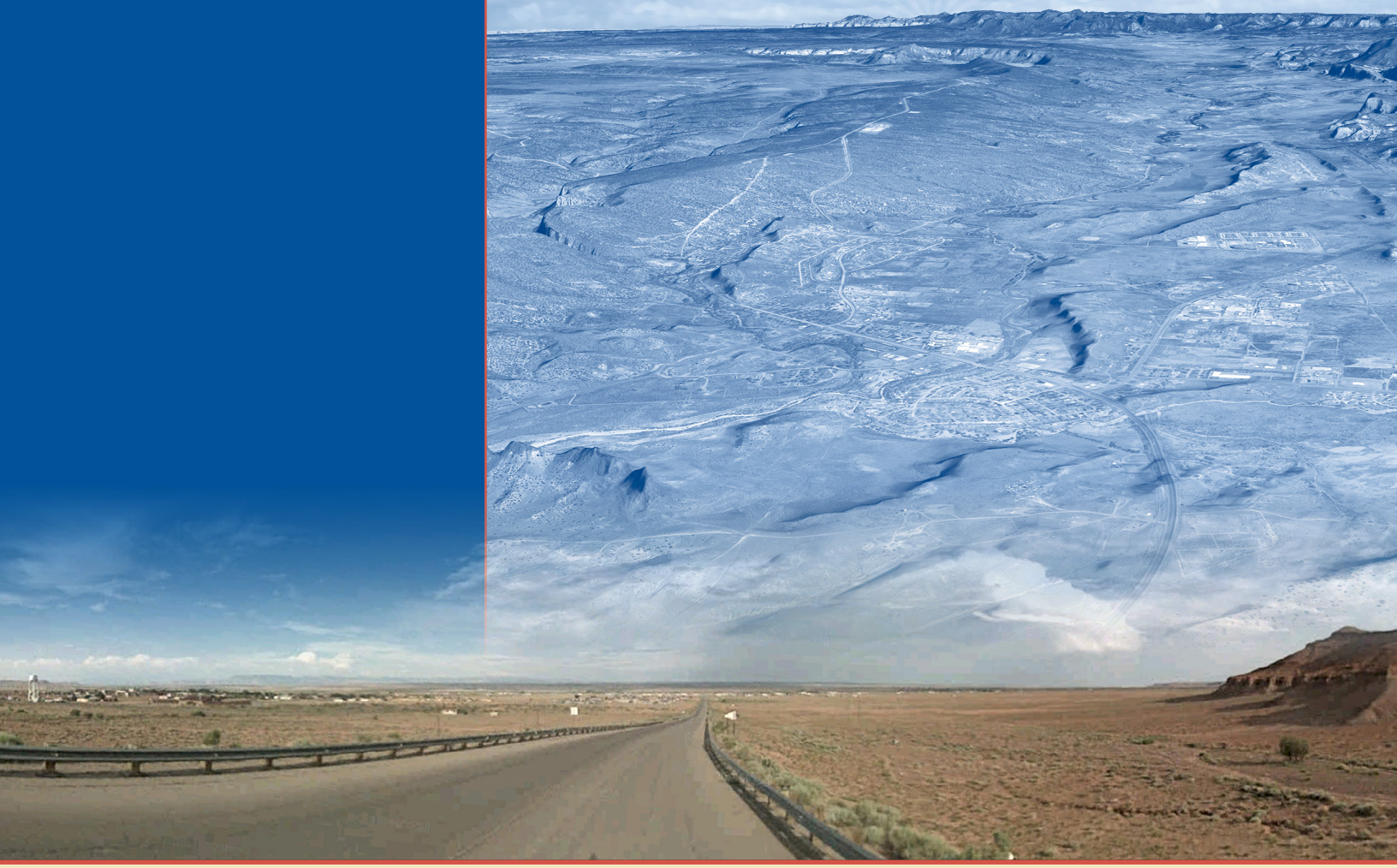
Task Assignment MPD 029-13

Final Report

March 14, 2014

ADOT

Arizona Department of Transportation



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RESOLUTION OF THE FORT DEFIANCE CHAPTER

Supporting and Approving the Fort Defiance Industrial Area Traffic Circulation Study: MPD 029-13 Completed by Jacobs Engineering Group Inc. under the Planning Assistance for Rural Areas (PARA) Program Sponsored by the Arizona Department of Transportation (ADOT) Multimodal Planning Division.

WHEREAS:

1. The Fort Defiance Community Chapter is a duly called chapter of the Navajo Nation pursuant to the Navajo Nation Code, Title II, Sections 4001 and 4006. Therefore it is authorized to address and take action on the needs and concerns of its people, and
2. The Fort Defiance Chapter has a vision of economic growth supported by commercial activity in a home to numerous governmental, social and educational facilities, including various residential subdivisions, and
3. Within the study area there are five (5) major roads that intersect and each has numerous safety deficiencies that become extremely hazardous to all modes of transportation, and
4. The traffic study is within the jurisdiction of the Bureau of Indian Affairs Right-of-Way whose regulations require and approved study prior to any improvements within their jurisdiction, and
5. Apache County District II served as the Local Public Agency in submitting the grant application to Arizona Department of Transportation Multimodal Planning Division on behalf of the Fort Defiance Community, and
6. The study analyzed and addressed planning of a broad range of multimodal transportation needs to promote safety and mobility, enhance economic vitality and improve community livability also future economic development, and
7. The study will become a major component in the pursuit of competitive funding to various entities detailing justification in the form of statistics for the various improvements.

NOW, THEREFORE, BE IT RESOLVED THAT,

The Fort Defiance Community Chapter Hereby Supports and Approves the Fort Defiance Industrial Area Traffic Circulation Study: MPD 029-13 completed by Jacobs Engineering Group Inc. under the Planning Assistance for Rural Areas (PARA) Program as sponsored by the Arizona Department of Transportation (ADOT) Multimodal Planning Division.

CERTIFICATION

I, hereby certify that the foregoing resolutions was considered at a duly called meeting of the Fort Defiance, Navajo Nation, Arizona at which a quorum was present at the same was passed with a vote of _63_ in favor, _0___ opposed, and _1___ abstained on this 9th day of March, 2014.

Motion by: ___Katherine Arviso_____ Second by: __Eva Platero_____

Zondra Bitsuie, Fort Defiance Chapter President

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1. INTRODUCTION

The Arizona Department of Transportation (ADOT), in cooperation with Apache County District II and the Fort Defiance Chapter of the Navajo Nation, analyzed the traffic circulation conditions of Navajo Routes 7, 12, 54, 110, and 112 within the Fort Defiance Industrial Area which is designated as a major growth area on the Navajo Nation. The study was funded by the Federal Highway Administration's (FHWA) State Planning and Research Program and administered through ADOT's Multimodal Planning Division's Planning Assistance for Rural Areas (PARA) program.

> The primary goal of this study was to develop a transportation improvement plan that promotes safety and mobility, enhances economic vitality, improves community livability, encourages environmental and cultural sensitivity, and supports current and planned economic development.

While the study focuses mainly on Navajo Routes 7, 12, 54, 110, and 112, other key local streets were analyzed to optimize traffic circulation performance. This study recommends phased improvement projects to address the most critical transportation needs of the study roadways in the Fort Defiance study area. Study findings will also be used to update the Navajo Nation's Road Inventory Field Data System (RIFDS) and Tribal Transportation Improvement Program (TTIP) over the next 5-, 10-, and 20-year planning horizon periods.

Technical Advisory Committee

The study was guided by a Technical Advisory Committee (TAC). The role of the TAC has been to provide technical guidance, support, advice, suggestions, recommendations, and to perform document reviews throughout the study process. TAC members included representatives from:

- Fort Defiance Chapter
- Apache County District II
- Bureau of Indian Affairs (BIA) Division of Transportation – Fort Defiance Agency
- Navajo Division of Transportation (NDOT) – Technical and Planning Departments
- Navajo Division of Economic Development
- Navajo Transit System
- Navajo Nation Department of Emergency Medical Services
- Navajo Nation Forestry
- Navajo Nation Department of Public Safety
- Navajo Nation Fire Department
- Window Rock Unified School District
- Navajo Housing Authority
- Navajo Nation Department of Agriculture
- Indian Health Service – Office of Environmental Health and Engineering
- Indian Health Service – Fort Defiance Indian Medical Center
- Northern Arizona Council of Governments
- Navajo Tribal Utility Authority (NTUA)
- Indian Affiliates, Inc
- Navajo Power LLC
- OUR Tse Ho Tso
- ADOT Multimodal Planning Division
- ADOT Environmental Planning Group
- ADOT Communications

Stakeholders

To develop a thorough understanding of the issues, deficiencies, and needs, the study team identified and interviewed a core group of stakeholders on May 23, 2013. The stakeholders included representatives from all major Navajo Nation departments, Fort Defiance Chapter, Apache County District II, BIA, Fort Defiance Agency, Navajo DOT, and NACOG. A second set of stakeholder interviews was conducted on October 16, 2013 to garner input on potential improvement recommendations. At both meetings, a questionnaire was distributed to each stakeholder and was followed up with an open discussion. Chapter 6 includes a detailed summary of the stakeholder outreach process.

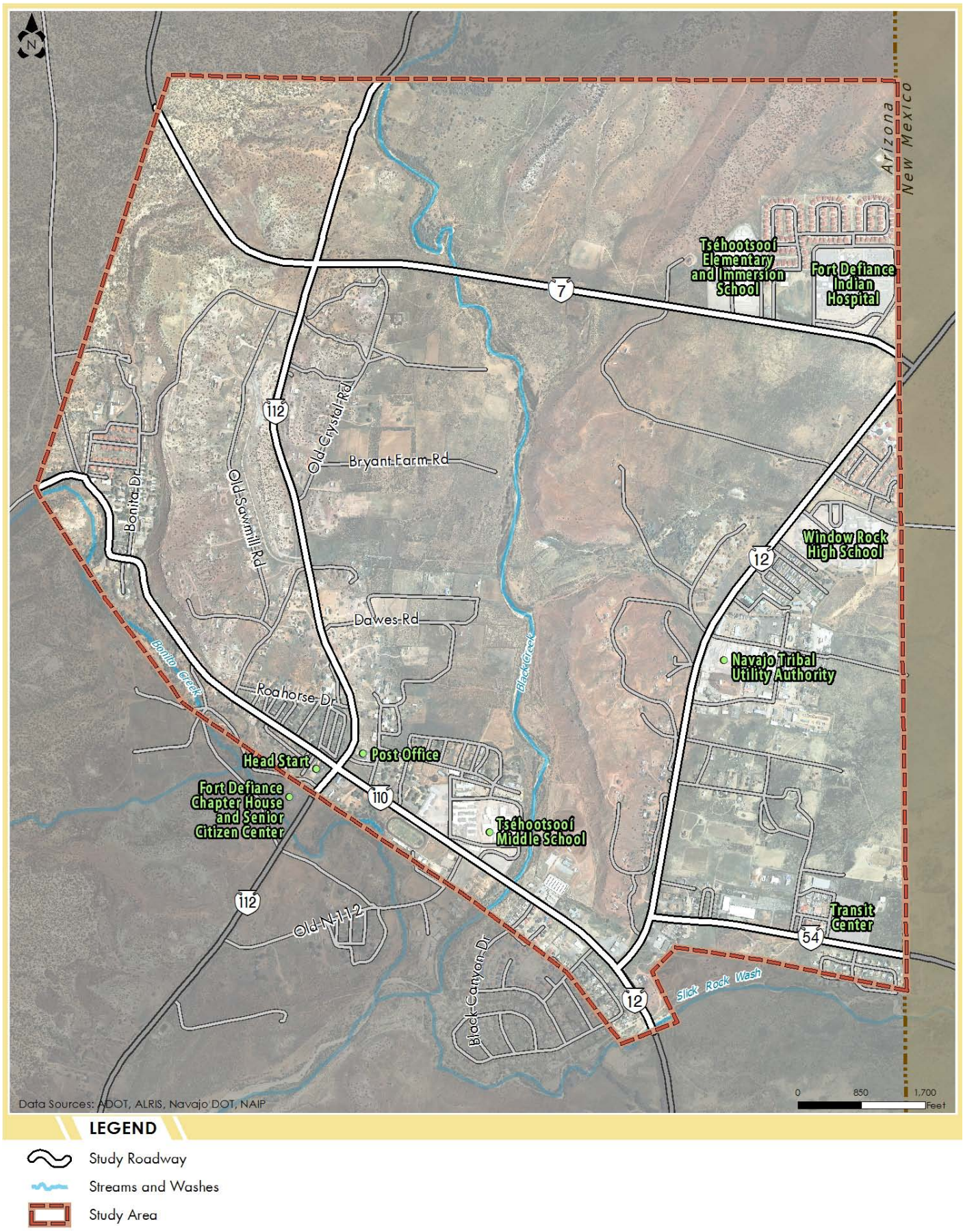
STUDY AREA OVERVIEW

Originally established in 1851 as a military post, today, Fort Defiance is home to approximately 3,600 residents (Census 2010) and serves as a major center for education, health, Federal and Tribal government operations, industrial enterprises, and agriculture. While the study area has experienced a significant population increase, unemployment within the community has also increased. Fort Defiance is designated as one of the Navajo Nation's Growth Centers and several housing, commercial, and industrial developments are planned within the community.

This study focused on major paved roadways within the Fort Defiance study area, including Navajo Routes N7, N12, N54, N110, and N112. These major routes serve local, commuter, and industrial traffic accessing residential, commercial, and industrial areas within the community. Commuter traffic to Window Rock, the Fort Defiance Industrial Area, and Fort Defiance Indian Hospital accounts for a significant amount of daily traffic on the study roadways. In addition, walking is a primary mode of transportation that is preferred by many community residents.

Figure 1.1 provides an illustration of the Fort Defiance Industrial Area and study roadways.

Figure 1.1. Study Area



PURPOSE AND NEED

The *Fort Defiance Industrial Area Traffic Circulation Study* was initiated to develop a planning strategy to improve the mobility and safety within the Fort Defiance Industrial Area. The need for this study stemmed directly from the desire of the Fort Defiance Chapter and Apache County District II to increase economic vitality, improve community livability, and enhance transportation conditions along the Area's major transportation routes. The project purpose is demonstrated with the following statement of need:

- **Address Safety and Operational Needs.** The current roadway network needs to be evaluated to identify solutions to improve safety and mobility, optimize traffic operations, and enhance overall streetscaping. Key issues that need to be addressed include:
    - Existing roadway and intersection design is not optimal, as commuter and truck traffic often causes congestion and unsafe conditions.
    - Roadways need to be upgraded to meet BIA design standards.
    - Roadways lack shoulders which limit vehicles from pulling over or yielding to emergency vehicles.
    - Vehicles travel at high speeds, particularly in school zones, causing unsafe driving and walking conditions.
    - The area has limited pedestrian walkways, crosswalks, and bicycle facilities.
- **Accommodate Planned Land Use and Future Growth.** Designated as one of the Navajo Nation's growth centers and industrial park areas, significant economic development activities will greatly increase truck and commuter congestion along study roadways and will require updated facilities to accommodate traffic and to promote multimodal transportation.
- **Provide Bicycle, Pedestrian, and Trail Connections Between Activity Centers.** Sidewalks and bike paths are limited and unsafe within numerous locations of the study area. Improvements are necessary to provide continuous and safe connections between business and activity centers for residents and for recreational purposes.
- **Promote Economic Growth and Community Livability while Maintaining the Area's Character.** A plan for transportation investments that encourages economic growth needs to be developed along the study roadways where local business can thrive while maintaining the rural and historic nature of the Fort Defiance growth area. Transportation investments that provide transportation choices and connections at the local and regional level can strengthen local businesses, spur business growth and job creation, encourage activity among residents, and promote tourism.

The primary purpose for this study was to develop a comprehensive, transportation long-range plan that can provide guidance to the Fort Defiance Chapter, Navajo Nation, and Apache County District II when making future land use and multimodal transportation decisions. Recommendations in this study will enable the Navajo Nation and the County to facilitate safer and more efficient infrastructure for the traveling public and guide the development along the study roadways.

GOALS AND OBJECTIVES

At the first kick-off meeting with the Technical Advisory Committee (TAC), a visioning exercise was conducted to discuss the study area issues, community values, and study expectations. The process resulted in the following objectives for the study:

- Identify projects to preserve existing transportation infrastructure
    - Identify roads in need of pavement preservation
    - Address structural and functional deficiencies of bridges
    - Perform traffic analysis and recommend operational improvements for existing critical intersections
    - Identify safety improvements for intersections and roadways that have high crashes
- Identify improvements to enhance traffic circulation
- Develop standards for roadway cross-sections
- Identify pedestrian, bicycle, and transit needs
- Identify low-cost improvements
- Group projects when possible to reduce costs
- Enhance connectivity between transportation modes – vehicles, transit, pedestrian, bicycle
- Prepare an Implementation Plan
    - Identify funding sources and strategies
    - Develop a System Maintenance Plan
- Communicate with the TAC, stakeholders, public, Navajo Nation, and the Fort Defiance Chapter at appropriate intervals to present results and obtain feedback

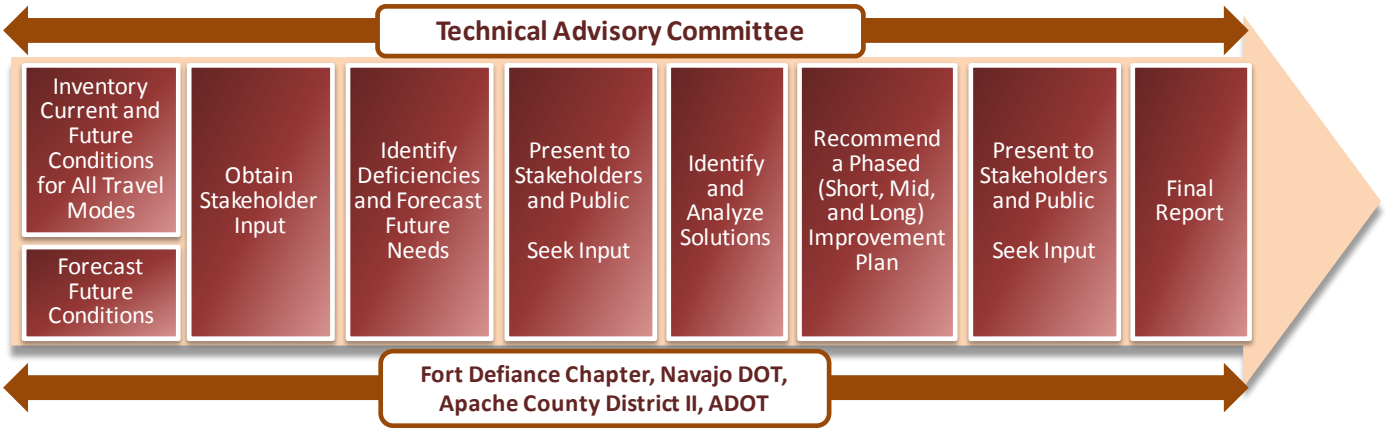
STUDY PROCESS

Development of a transportation plan consists of a comprehensive six phase process: data collection, analysis of existing and future conditions, stakeholder involvement, and analysis of improvement scenarios, recommendations, and public outreach. Throughout the process, the study team maintained consistent contact with the TAC and stakeholders and conducted extensive public outreach efforts. Figure 1.2 illustrates the process utilized for this study.

Working Paper 1: Existing and Future Conditions inventoried and analyzed the existing and future conditions in the study area, including existing transportation system deficiencies, issues, and needs. The First Public Open House was conducted on August 7, 2013 to present existing and projected transportation conditions and issues.

Working Paper 2: Draft Transportation Improvement Plan evaluated and identified improvement projects that addressed the needs and deficiencies identified in Working Paper 1. The Second Public Open House was conducted on January 8, 2014 to present the Draft Transportation Improvement Plan.

Figure 1.2. Study Process



TRIBAL TRANSPORTATION PROGRAM (TTP)

Jointly administered by the FHWA, BIA, and US Department of Transportation, the Tribal Transportation Program (TTP), which replaced the former Indian Reservation Roads (IRR) program, addresses the transportation needs of tribal governments by providing safe and adequate transportation and public road access to and within Indian reservations, Indian lands, and Alaska Native Village communities. Under the Moving Ahead for Progress in the 21st Century Act (P.L. 112-141), the program generally continues the IRR program, while adding a certain percentage of funds to tribal bridge and safety projects.

Under the TTP, the previous Indian Reservation Roads Inventory (IRRI) changed names to National Tribal Transportation Facility Inventory (NTTFI). The NTTFI is a comprehensive national inventory of tribal transportation facilities that are eligible for financial assistance under the TTP. In order to obtain proper funding, it is imperative that the NTTFI accurately reflects the conditions of the tribal roadways.

2. PREVIOUS STUDIES, REPORTS, AND PLANS

This chapter presents a review of studies, plans, and programs relevant to this study. Review of previous and current planning efforts often provides an insight into previously identified transportation issues and potential transportation improvements. This chapter also summarizes approved future transportation improvements within the study area.

ONGOING AND COMPLETED STUDIES

2012 St. Michaels-Window Rock-Fort Defiance Multimodal Long Range Transportation Study

The *2012 St. Michaels-Window Rock-Fort Defiance Multimodal Long Range Transportation Study* examined the current and future multimodal transportation conditions within the St. Michaels, Window Rock, and Fort Defiance corridor areas. The study utilized the BIA Road Inventory Field Data System (RIFDS) and a multitude of safety and transportation datasets to determine existing roadway conditions. Based on analysis of existing and future needs and deficiencies, the study developed a set of roadway, intersection, and multimodal improvement projects to enhance safety and mobility within the Fort Defiance Chapter. Within the Fort Defiance Industrial Area, the following improvement projects were recommended:

- Construct street lighting along N7, N12, N110, and N112
- Resurface the unpaved portion of N112, north of N7, to a paved road
- Widen N110 to a three lane roadway and resurface N110 from Paquotte Drive to 8th Street
- Pave Blue Canyon Drive, TR1456 to the Fire Department, TR1457 for access to the NTUA
- Reconstruct pavement along Black Creek Drive and Aspen Canyon Road
- Install solar speed monitors at the N12/N112 intersection
- Improve signing and pavement markings, upgrade signal display, provide a marked crosswalk, and install overhead pedestrian signal at the N12/N110 intersection
- At Window Rock High School, construct a right turn lane, install pedestrian crosswalks, and a HAWK Pedestrian Signal Beacon on N12
- Install a beacon signal and northbound right turn lane at the N12/TR1456 intersection for emergency access
- Construct northbound right turn lane at N12/TR1457 intersection
- Install traffic signals and advanced intersection warning signs at the N112/N110 intersection
- Construct sidewalks along N7, N12, N110, and N112 from east of Bonito Drive to Blue Canyon Road
- Construct shared-use paths along N112 and N12 south of N110
- Widen shoulders to accommodate bike lanes along N7, N54, and N112
- Develop a soft path equestrian trail along Black Creek

2004 Fort Defiance Community Land Use Plan

The *Fort Defiance Chapter Land Use Plan* was conducted as a means to establish a chapter wide vision for the future growth and sustainability of the area. The Plan was formed with an emphasis on addressing community participation, land suitability, infrastructure and land use, with the main focus of preserving the Chapter's natural beauty while improving the amenities and livability of its urbanized areas. Issues and development areas identified in the Plan included:

- Development of a mini-mall at the southwest corner of N12/N7 intersection, future residential growth by the Hooghan Project, and commercial and residential development along N112
- N12 corridor development as a major tourist corridor is in need of recreation facilities and retail sites
- Drainage issues to housing areas on the east slope of the Fort Defiance hills, west of Black Creek, along N110, and below grade commercial site southeast of N12/N54 intersection

Key recommendations included:

- Infill development at locations where additional development will not overburden existing infrastructure and road circulation will not be interrupted
- Establish growth boundaries around major development areas to promote community development and minimize sprawl
- Increase residential density to improve availability of public services
- Encourage commercial development immediately adjacent to major roadways
- Local shuttle service within the Chapter

2009 Navajo Nation Long Range Transportation Plan

The *2009 Navajo Nation Long Range Transportation Plan* identified the Navajo Nation's multimodal transportation needs for the next 20 years, in conjunction with development strategies for implementing improvements. The study was based on a comprehensive analysis of existing and future transportation needs throughout the Navajo Nation. The Fort Defiance area was identified in the study as a major growth center within the Nation. Recommended improvements in the Fort Defiance area included:

- Add a local transit circulator route between Fort Defiance and Window Rock
- Rehabilitate Slick Rock Creek and Upper Bonito Wash bridges
- Monitor the intersection of N112/N110 for future traffic controls
- Develop a street system that promotes travel continuity, new development, and pedestrian/bicycle mobility

2009 Navajo Transit System Five-Year Plan

The *Navajo Transit System Five-Year Plan* was a Nation-wide assessment of the current transit needs and service deficiencies of the Nation. The Transit Plan provides a roadmap for future transit services to better accommodate current users and for future ridership in the coming years. The study analyzed ridership characteristics within the Nation and found that the majority of riders were adults that utilized transit for employment purposes. Recommended improvements in the Fort Defiance area include:

- Open a Regional Transit Center in the Window Rock/Fort Defiance area
- Add local transit circulator service between Fort Defiance and Window Rock which would operate throughout the day

2009 Diné Tah "Among the People" Scenic Road Corridor Management Plan

The *Diné Tah "Among the People" Scenic Road Corridor Management Plan* (CMP) established a management plan along the Diné Tah Scenic Road (N12 from I-40 to Chinle) with the ultimate goal of being designated as a National Scenic Byway or All-American Road. The purpose of this study was to develop a comprehensive plan for the vision of the corridor to assist agencies, land owners, and the public in managing, developing, and conserving the roadway corridor. Recommended improvements include:

- Right-of-way fencing in areas with high occurrences of vehicle crashes with animals, as well as cattle guards and wildlife crossings
- Dedicated right turn deceleration lanes in urbanized areas
- Allow for volunteer services within roadway right-of-way to assist with roadway beautification
- Add pedestrian crossing, sidewalks, and bicycle paths in urban areas
- Install street lighting in locations with high accident rates to increase visibility and safety
- Develop signage guidelines
- Within urban areas, install landscape planting along the corridor

2006 Navajo Nation N12 Road Safety Audit

The *Navajo Nation N12 Road Safety Audit* was commissioned by the FHWA as a way to demonstrate the usefulness and effectiveness of Road Safety Audits to tribal road agencies. The audit investigated roadway geometry, collision summaries, and vehicle volumes to highlight various safety issues along the N12 corridor. Key elements identified in the study include:

- AADT along N12 between Window Rock and Fort Defiance ranges between 14,000 and 24,000 vehicles, with speed limits varying between 35 to 55 mph
- While the N12/N110 intersection in Fort Defiance has 40 percent less traffic than that of the N12/N100 intersection in Window Rock, the intersection has almost the same amount of vehicular crashes (59 crashes reported at N12/N110 intersection)
- Injury-causing crashes were more prevalent, and typically involved injuring more occupants, at the N12/N110 intersection in Fort Defiance than major intersections in Window Rock

- Safety issues identified at the N12/N110 intersection included:
    - The intersection configuration and conspicuousness may be limited, especially on the westbound approach
    - Horizontal and vertical curves on the westbound approach to the intersection limits driver's view of lanes, traffic control, and conflicting vehicles movements at driveways
    - Movements at driveways to the gas stations located northeast and northwest of the intersection may contribute to conflicts
    - A Jersey barrier that is located on the west side of the intersection presents a fixed-object hazard
    - Lane markings on the east exit leg are not clear
    - Jaywalking pedestrians may cause drivers to slow or stop unexpectedly
    - The intersection has a risk rating of "C"
- Recommended improvements to the intersection included:
    - Improve signing and pavements markings
    - Upgrade the signal display and remove the Jersey barrier on the west side of the intersection
    - Review opportunities for access management
    - Upgrade the east exit leg via improved pavement marking, access consolidation, or realignment of the right turn lane

2012 Comprehensive Community Assessment for Navajo Head Start

The *Comprehensive Community Assessment for Navajo Head Start* was conducted as part of a Head Start grant negotiation between the Navajo Nation and the Office of Head Start. The study included data collection and analysis of relevant information about the Nation's Head Start and Early Head Start service areas. The study identified 25 head start centers (five of which are now closed), with 73 staff, 361 enrolled children, and 22 classrooms in use in the Fort Defiance Chapter. In the Fort Defiance study area, the Fort Defiance EHS (infant and toddler) and the Fort Defiance Immersion School have a total of 30 enrolled children and eight staff.

PROGRAMMED AND SCOPED PROJECTS

The Intermodal Transportation Division at ADOT published the *Arizona State Transportation Improvement Program (STIP), Fiscal Years 2013-2017* that listed statewide transportation improvement projects. The STIP includes projects recommended by the Tribal Transportation Program's (TTP) Transportation Improvement Program (TIP) for all tribes in the western region including the Navajo Nation. No projects were listed in the 2013-2017 STIP for the study area.

The 2013 Navajo Nation Tribal Transportation Improvement Program (TTIP) did not include any specific roadway improvement projects for the study corridors within the Fort Defiance area.

3. LAND USE AND SOCIOECONOMIC CONDITIONS

This section summarizes current land use, existing socioeconomic conditions, environmental justice population review (Title VI), and future development and growth for the study area.

LAND OWNERSHIP

The entire study area is located within the Navajo Nation Reservation. Land within the Navajo Nation is primarily communally owned and administered by the Nation's government; however, customary land users may lease land for home sites, grazing, and other uses. Organizations such as the BIA, other federal agencies, churches and other religious organizations, and businesses, may also lease land.

LAND USE

Integrating land use into transportation planning is essential so communities can support "smart growth" processes and promote sustainable development. Sustainable development improves mobility, supports economic growth, and ensures the financial stability of the transportation system. This approach helps maintain the quality of living for the people and the quality of the community as a whole and also reduces the need for roadway expansion.

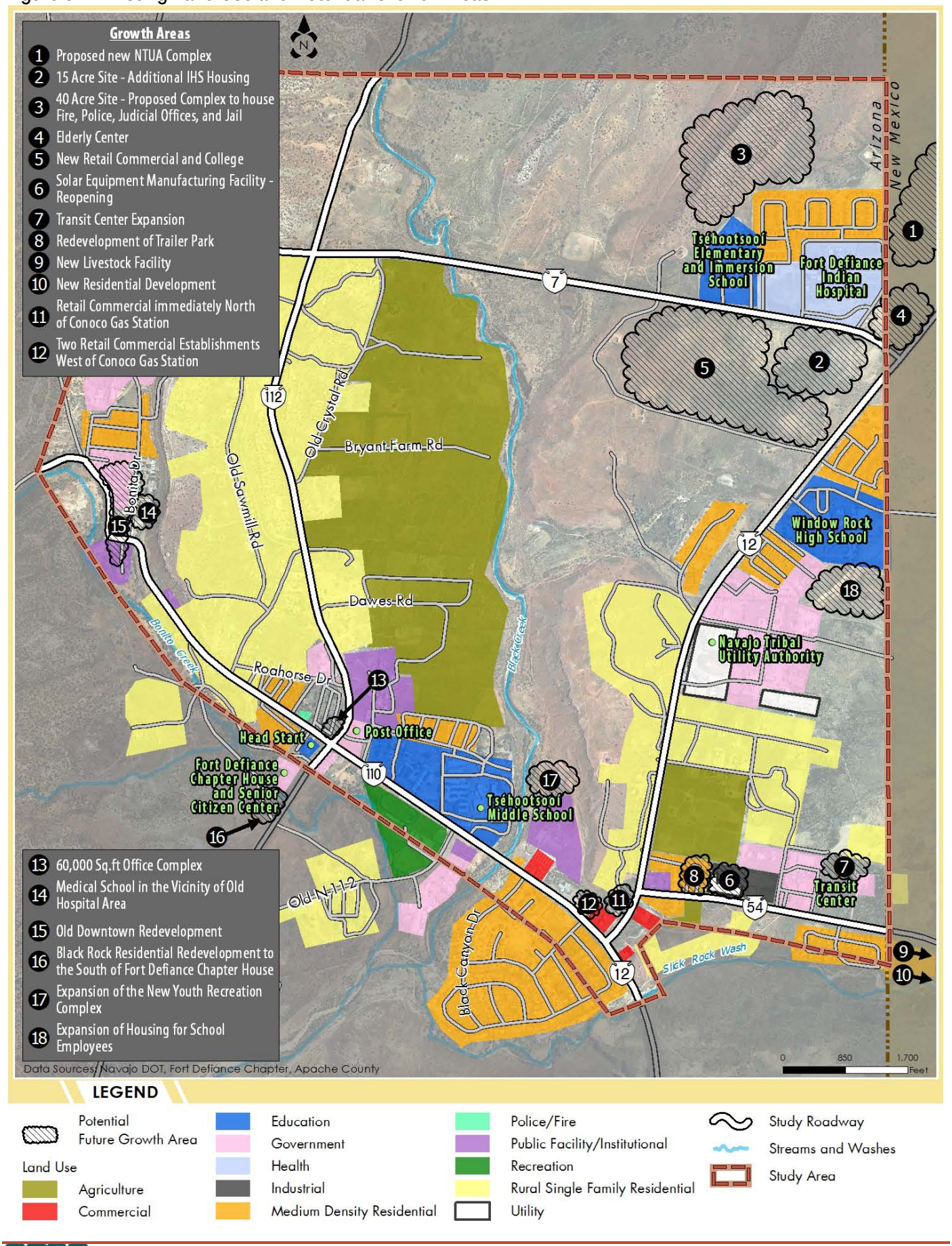
Existing land use data was compiled based on the *Fort Defiance Community Land Use Plan* and a comprehensive field review of the study area. Figure 3.1 illustrates existing land uses within the study area. As shown in Figure 3.1, land use types within the study area are:

- **Residential:** Approximately 28% of the study area is designated as residential land use. Within the study area, residential land use areas typically consist of medium density single family home housing communities, while rural single family residential areas are single family homes on larger lots. The largest residential development is the Rio Puerco Estates housing community located in the southwest corner of the N12/N110 intersection. Housing communities are also located along N12 near the Window Rock High School, N7 north of the hospital, along N112 on both sides, south side of N54, and to the west of N112/N110 intersection along N110.
- **Agriculture:** Agricultural land predominantly occupies the central portion of the study area between the Black Creek on the east and N112 on the west. Approximately 12% of the land is classified as agricultural.
- **Education:** The Fort Defiance area has one high school, one middle school, two elementary schools, and two head start schools. Window Rock High School is located along N12 between N110 and N7. Tséhootsooí Middle School is located along N110 and adjacent to the Post Office. Tséhootsooí Elementary and Immersion Schools are located along N7 and adjacent to the Fort Defiance Indian Hospital. These schools serve the communities of Fort Defiance, Window Rock, and St Michaels. Approximately 3% of the study area is classified for educational land use.
- **Government:** Fort Defiance is home to several federal, state, and tribal government offices, including the Post Office, Navajo Tribal Utility Authority (NTUA), Navajo Transit Service

(NTS), Apache County District II office, the Navajo Housing Authority, BIA field office, and the Fort Defiance Chapter House. Approximately 6% of the study area is classified as government land use.

- **Health**: The Fort Defiance Indian Hospital is a state of the art hospital opened in the year 2002 and employs about 850 staff. The hospital is located in the northwest corner of the N12/N7 intersection. This hospital serves residents from Fort Defiance and surrounding communities, including Window Rock and St. Michaels.
- **Commercial and Industrial:** Commercial and industrial services are primarily located along N12, N54, and N110. Approximately 2% of the study area is designated as commercial land use.
- **Public and Recreation Facilities:** Approximately 3% of the land is designated as public and recreational land use. Public and recreation facilities include the new basketball facility currently under construction adjacent to the Window Rock High School, Youth Recreation Center located north of N110 adjacent to Black Creek, and the sports complex located along N110.
- **Grazing:** Raising livestock is a primary occupation for many residents on the reservation. A large percentage of the land to the east of Black Creek and the area north of N7 and west of the Fort Defiance Indian Hospital are designated for grazing. The Navajo Nation enforces an open range policy; therefore, livestock can often be found along roadway shoulders and crossing major roads.

Figure 3.1. Existing Land Use and Potential Growth Areas



EXISTING SOCIOECONOMIC CONDITIONS

A review of existing population and employment was conducted to understand the demographic characteristics of the Fort Defiance community. As identified by the US Census Bureau, Table 3.1 summarizes the population and housing unit growth trends from 2000 to 2010 for the study area, Fort Defiance Census Designated Place (CDP), Apache County, and the State of Arizona. While the Fort Defiance CDP's total number of housing units and population has dramatically decreased, population and housing units have steadily increased within the study area. This increase in the number of housing units and total population in the study area can largely be attributed to the development of hospital employee housing north of the Fort Defiance Indian Hospital.

Table 3.1. Population and Housing Unit Growth Trends

Geographic Area	Population		Population Growth	Housing Units		Housing Units Growth
	2000	2010		2000	2010	
Fort Defiance Study Area	2,887	3,166	9.7%	990	1,208	22.0%
Fort Defiance CDP	4,061	3,624	-10.8%	1,321	1,250	-5.4%
Apache County	69,423	71,518	3.0%	31,621	32,514	2.8%
State of Arizona	5,130,632	6,392,017	24.6%	2,189,189	2,844,526	29.9%

Source: 2010 US Census, 2000 US Census

Figure 3.2 and Figure 3.3 illustrate the total population and occupied housing units per acre, respectively. As illustrated in the figures, areas with high population and occupied housing unit concentrations are located southwest of the N12/N110 intersection, west of the Tséhootsoí Middle School, along Bonita Drive, south of N54, north of Window Rock High School, and at the employee housing area for the Fort Defiance Indian Hospital. According to the 2010 US Census, nearly 11% of the study area's total population and occupied housing units are located at the Fort Defiance Indian Hospital. In addition, only 70% of all available housing units at the Fort Defiance Indian Hospital are occupied. While only partially located within the study area, the Rio Puerco Estates housing community in the southwest corner of the N12/N110 intersection contains approximately 733 persons and 135 occupied housing units.

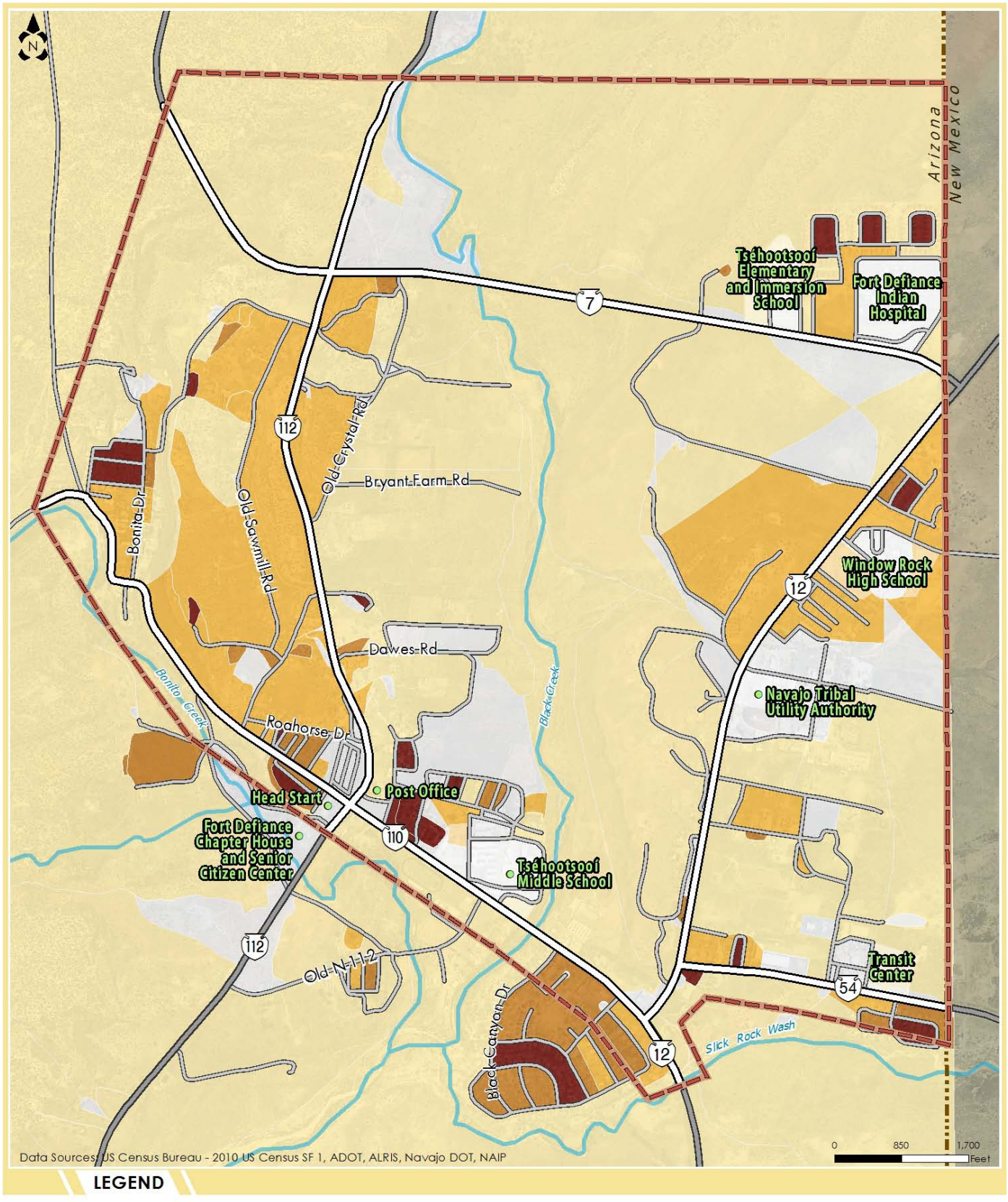
Employment Overview

As a sovereign Nation, the Navajo Nation is responsible for the economic development, financial solvency, and general welfare of its members. ReferenceUSA data was compiled to identify primary employment industries and current employment levels within the study area. Based on the ReferenceUSA database, there are approximately 3,784 employees within the Fort Defiance study area. The Fort Defiance Indian Hospital is cited as the largest employer within the community with 850 employees, while the NTUA has 500 employees. According to ReferenceUSA, the largest type of employers within the area is government offices, physicians and surgeons, schools, federal government contractors, and health practitioners.

Major Employer	Employees
Fort Defiance Indian Hospital	850
Navajo Tribal Utility Authority	500
Navajo Nation Water Department	146
Window Rock High School	80
Tséhootsoí Middle School	70
Tséhootsoí Primary Learning	56

Figure 3.2. Total Population per Acre

Figure 3.3. Total Occupied Housing Units per Acre



FUTURE DEVELOPMENT AND GROWTH TRENDS

Forecasting socioeconomic conditions allows us to anticipate changes in future travel demand and to envision potential solutions. Development of rational projections for population, housing units, and employment for each horizon year is vital to the process of forecasting realistic traffic volumes.

Stakeholder meetings were conducted with the Fort Defiance Chapter, Navajo Housing Authority, Navajo Nation Economic Development Department, Fort Defiance Regional Business Development Office (RBDO), Window Rock Unified School District, Navajo Transit System, and Apache County District II to discuss details about planned developments and potential timeframes for development. Table 3.2 presents potential future developments within the study area, while Figure 3.1 illustrates the locations of the planned developments. Historical growth trends and future developments data was then utilized to forecast future socioeconomic conditions for each horizon year. Table 3.3 summarizes the population, housing units, and employment for each horizon year.

Table 3.2. Potential Study Area Developments

#	Proposed Development	Location	Timeframe
1	Relocation of NTUA Facility	NW corner of N12/N7 intersection	2013 - 2018
2	IHS Housing - 15 acre site	SW corner of N12/N7 intersection	2013 - 2018
3	Complex for Fire, Police, Judicial offices, and Jail - 40 acre site	North of N7 and adjacent to Fort Defiance Indian Hospital	2018 - 2033
4	Elderly Center	NW corner of N12/N7 intersection	2018 - 2023
5	Retail Commercial and College	South of N7	2013 - 2018
6	Reopening Solar Equipment Manufacturing Facility	North of N54	2013 - 2018
7	Transit Center Expansion	North of N54	2013 - 2018
8	Redevelopment of Trailer Park	North of N54	2018 - 2023
9	Livestock Facility	Along N54 - east of the study boundary	2018 - 2023
10	Residential Development	Along N54 - east of the study boundary	2018 - 2023
11	Retail Commercial	Immediately North of Conoco Gas Station	2013 - 2018
12	Two Retail Commercial Establishments	West of Conoco Gas Station	2013 - 2018
13	Office Complex - 60,000 SQ. FT	NW corner of N112/N110 intersection	2013 - 2023
14	Medical School	Old Hospital area	2013 - 2018
15	Old Downtown Redevelopment	Old Hospital area	2018 - 2023
16	Black Rock Residential Redevelopment	South of Fort Defiance Chapter House	2023 - 2033
17	Expansion of the New Youth Recreation Complex	North of N110	2013 - 2018
18	Expansion of Housing for School Employees	East of N12 and adjacent to Window Rock High School	2018 - 2023
19	Window Rock High School Sports Stadium	East of N12 and adjacent to Window Rock High School	2013 - 2018

Table 3.3 Future Population, Housing Units, and Employment

Socioeconomic Variable	2000	2010	2013	2018	2023	2033
Population	2,887	3,166	3,250	3,389	3,529	3,808
Housing Units	990	1,208	1,273	1,318	1,383	1,423
Employment	---	---	2,002	2,267	2,555	2,767

4. EXISTING AND FUTURE TRANSPORTATION CONDITIONS

This section inventories essential elements of the existing transportation system and documents the status/condition of each element. Major elements inventoried include roadway characteristics, traffic conditions, crash history, future traffic conditions, and other modes of transportation in the study area.

EXISTING ROADWAY CHARACTERISTICS

The study area consists of five major roadways:

- **N7:** East-west regional roadway connecting Fort Defiance and Chinle
- **N12:** Major north-south regional roadway linking Interstate 40 near the border of Arizona/New Mexico, Window Rock, Fort Defiance, Canyon De Chelly and ultimately merging with US 191
- **N54:** Regional connector between Fort Defiance and SR 264 in New Mexico
- **N110:** Local east-west roadway that provides access to community facilities and regional corridors
- **N112:** Major north-south corridor linking Fort Defiance to St. Michaels

Functional Classification

Functional Classification is the grouping of streets and highways by the character of service they intend to provide. Defining a street's functional classification, serves as a basis for establishing speed limits, design standards, and access controls. BIA and the Navajo Nation owned and maintained roadways have specific guidelines for the functional classification of roadways. Within the study area, all roadways are classified by the BIA as Rural Minor Arterial (class 2) roadways with the exception of a small portion of N112 north of N7 which is classified as a Rural Major Collector (class 4). Table 4.1 lists the BIA functional classification types and definitions.

Table 4.1. BIA Functional Classification Definition

Class	Description
1	Major arterial roads providing an integrated network with characteristics for serving traffic between large population centers, generally without stub connections and having average daily traffic volumes of 10,000 vehicles per day or more with more than two lanes of traffic.
2	Rural minor arterial roads providing an integrated network having the characteristics for serving traffic between large population centers, generally without stub connections. May also link smaller towns and communities to major resort areas that attract travel over long distances and generally provide for relatively high overall travel speeds with minimum interference to through traffic movement. Generally provide for at least inter-county or inter-state service and are spaced at intervals consistent with population density. This class of road will have less than 10,000 vehicles per day.
3	Streets located within communities serving residential areas.
4	Rural major collector road is collector to rural local roads.

Table 4.1. BIA Functional Classification Definition (Continued)

Class	Description
5	Rural local road that is either a section line and/or stub type roads, make connections within the grid of the TTP system. This class of road may serve areas around villages, into farming areas, to schools, tourist attractions, or various small enterprises. Also included are roads and motorized trails for administration of forests, grazing, mining, oil, recreation, or other use purposes.
6	City minor arterial streets that are located within communities, and serve as access to major arterials.
7	City collector streets that are located within communities and serve as collectors to the city local streets.
8	This class encompasses all non-road projects such as paths, trails, walkways, or other designated types of routes for public use by foot traffic, bicycles, trail bikes, snowmobiles, all terrain vehicles, or other uses to provide for the general access of non-vehicular traffic.
9	This classification encompasses other transportation facilities such as public parking facilities adjacent to TTP routes and scenic byways, rest areas, and other scenic pullouts, ferry boat terminals, and transit terminals.
10	This classification encompasses airstrips that are within the boundaries of the TTP system grid and are open to the public. These airstrips are included for inventory and maintenance purposes only.
11	This classification indicates an overlapping or previously inventoried section or sections of a route and is used to indicate that it is not to be used for accumulating needs data. This class is used for reporting and identification purposes only.

Source: Bureau of Indian Affairs

Number of Lanes and Right-of-Way

Based on NTTFI data and observations made during the field review, Figure 4.1 illustrates the number of lanes for major roadways in the study area. The major corridors of N12 (between N110 and N7) and N110 (between N12 and N112) consist of four lanes with a center turn lane, while all other major roadways are two lanes. According to the NTTFI data, right-of-way (ROW) widths along the study corridors range between 100 to 200 feet.

Roadway Surface

The NTTFI inventory categorizes the study corridors as one of the following surface types:

- Bituminous material less than 2" thick (including chip seal over asphalt penetration).
- Bituminous material 2" thick or more.

All study roadways are paved; however, several segments have poor pavement condition according to the NTTFI. The following segments have poor pavement conditions:

- N112: N110 to north end of the study boundary
- N7: Black Creek bridge to the west end of the study boundary
- N110: N12 to N112

Posted Speed Limits

Speed limits on study roadways range between 15 to 35 MPH. School zones along N7, N12, and N110 have a designated speed limit of 15MPH to enhance safety at school locations. Figure 4.1 illustrates the posted speed limits and locations of school zones within the study area.

Several stakeholders cited that the actual travel speeds are much higher than the posted speed limits and that some form of enforcement is required to improve safety. Traffic and speed counts were conducted in May 2013 as part of this study process. The traffic count data obtained validates the stakeholders' claims that actual travel speeds are much higher than the posted speed limits. Figure 4.2 illustrates the posted speed limits versus the actual travel speeds.

Traffic Control

The usage of traffic control devices is the primary method of ensuring orderly traffic flow at intersections and along roadway networks. Figure 4.3 illustrates installed traffic control devices within the study area as well as regulatory, warning, and informational signs. As shown in the figure, traffic signals are located at the intersections of N12/N110, N12/N54, and N12/N7. Pedestrian crossing signs are located at the intersections of N12/N110, N12/N54, and N112/N110 as well as along N110 near Bonita Drive.

Shoulder Conditions

Roadside shoulders are an important safety feature that may also be utilized for future bicycle lanes, new sidewalks, or extended sidewalks/buffers. According to the *Arizona Statewide Bicycle Pedestrian Plan*, bike lanes should be four feet in width to safely accommodate bicyclists. Based on the NTTFI data, areas with less than four feet of shoulders include:

- N7 (Black Creek Bridge to N112 Intersection): 3 FT paved shoulders
- N12 (N110 Intersection to Window Rock High School): 2 FT paved shoulders
- N110 (N112 Intersection to Subdivision): 2 FT curbed shoulders
- N110 (Old Red Lake Road to Bonito Drive): No shoulders

The NTTFI also inventories shoulder conditions. Based on the latest NTTFI, several locations within the study area have shoulders that are in critical condition and need to be reconstructed for the safety of users and the protection of traffic lanes. Areas with shoulders in critical conditions include:

- N7 (Tséhootsooí Elementary School to N112 intersection)
- N110 (Old Red Lake Road to Bonito Drive)
- N112 (North of N7)

Based on the comprehensive field review, study team members also noted that shoulder striping had faded and was not clearly visible.

Fencing and Cattle Guards

Fencing and cattle guards are used as roadway safety devices to prevent livestock from crossing roadways. Due to the Nation's open grazing policies, the addition of fencing and cattle guards may

prevent vehicular crashes with livestock. Figure 4.4 illustrates the location of cattle guards and fencing conditions as observed by study team members during the field review.

Drainage

For each roadway segment, the NTTFI describes the condition of drainage structure, ditches, dikes, etc. According to the NTTFI, road segments with severe drainage problems include:

- N110 - Sections 150, 160, 165, 170, and 180
- N110 - Sections 10, 30, 40, and 50
- N112 - Sections 35, 50, 60, 63, 66, and 70

Roadway Deficiency Information

The NTTFI collects information on a number of roadway deficiency categories, including passing sight distances, number of deficient curves, and stopping restrictions.

Passing Sight Conditions

This category represents the percent (by length) of the roadway segment that meets the passing sight distance requirements set by the BIA. Within the study area, all roadway segments were characterized as having 90-100% of the section meeting or exceeding requirements.

Number of Deficient Curves

The number of deficient curves category represents the number of curves within a given roadway segment with a degree of curvature sharper than the allowable design standards set forth by the BIA. According to the NTTFI, N112 north of N7 is the only road segment to have deficient curves. Within the N112 section 70 segment, there are two separate curves the do not meet the allowed degree of curvature set forth by the BIA roadway design standards.

Number of Stopping Restrictions

For each roadway segment, the number of stopping restrictions represents the number of instances where stopping sight distances are less than the minimums defined by the BIA roadway design standards. Within the study area, the following road segments were identified in the NTTFI as having less than the minimum stopping distance:

- N110 - Section 110: five stopping restrictions
- N112 - Section 70: two stopping restrictions

Bridge Conditions

The NTTFI includes bridge condition information based on structure inventory and appraisal. Bridge N665, located on N12 south of the N12/N110 intersection, is classified in the NTTFI as being eligible for replacement. According to the National Bridge Inventory, this bridge has a sufficiency rating of 70.8 and is deemed structurally deficient. The NTTFI lists all other bridges within the study area as being in excellent condition with no construction needed. Pedestrian access, however, is not currently available on the N7 bridge located east of N7/N112 intersection and the bridge located on N12 located south of the N12/N110 intersection. These bridges restrict pedestrian mobility and cause pedestrians to enter the travel lanes to cross the bridge.

Figure 4.1. Number of Lanes and Posted Speed Limits

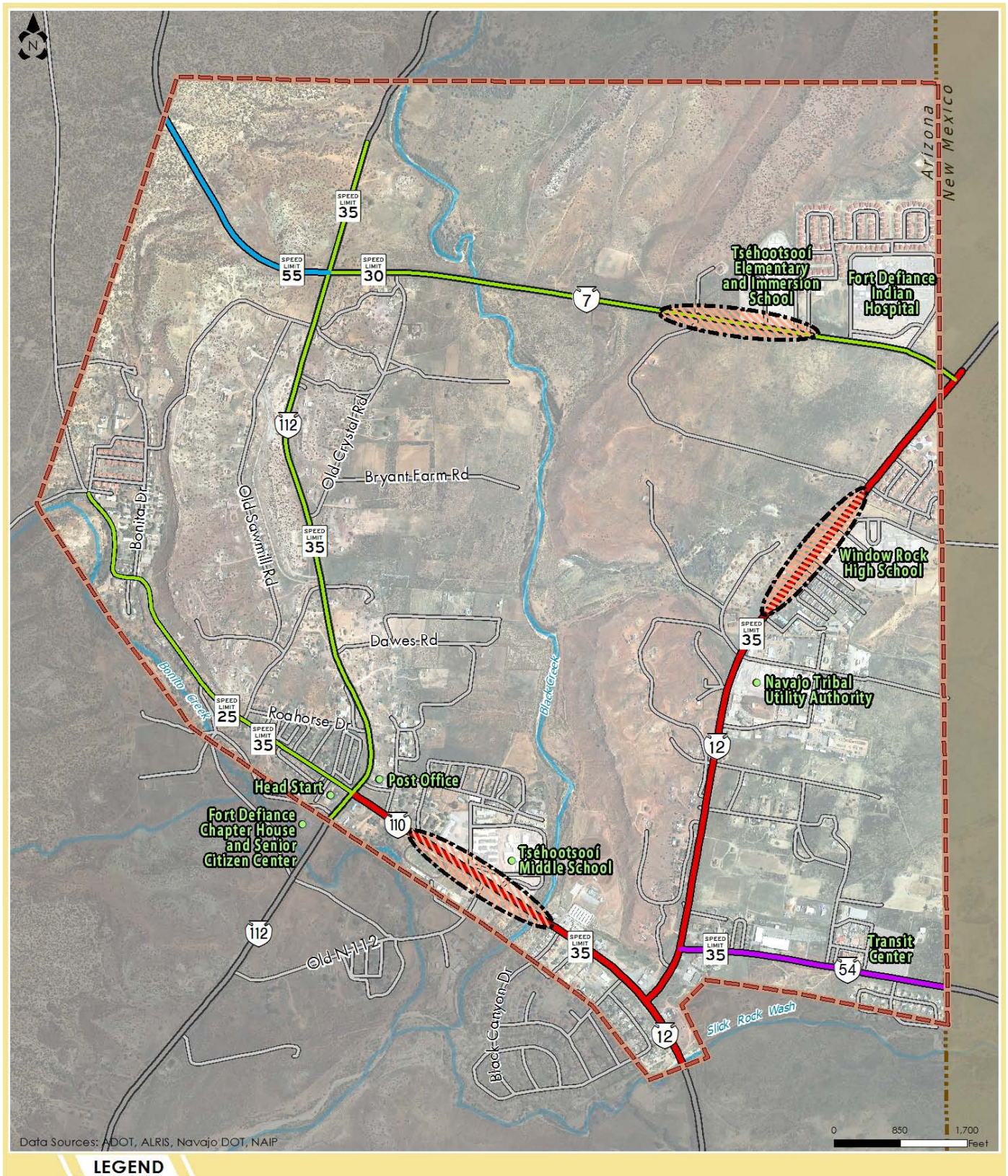


Figure 4.2. Speed Limits Versus Actual Travel Speeds

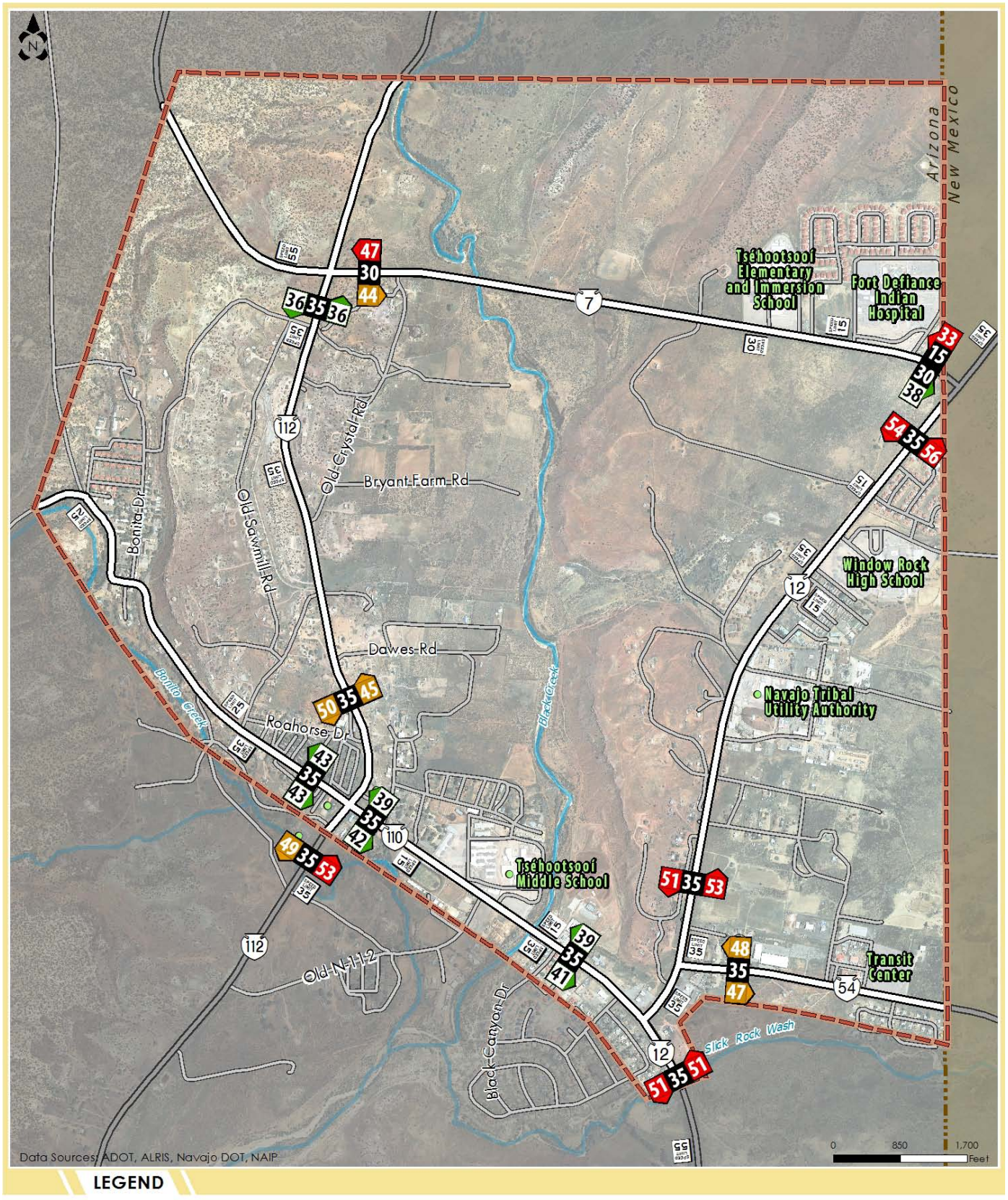


Figure 4.3. Traffic Control Devices and Signage

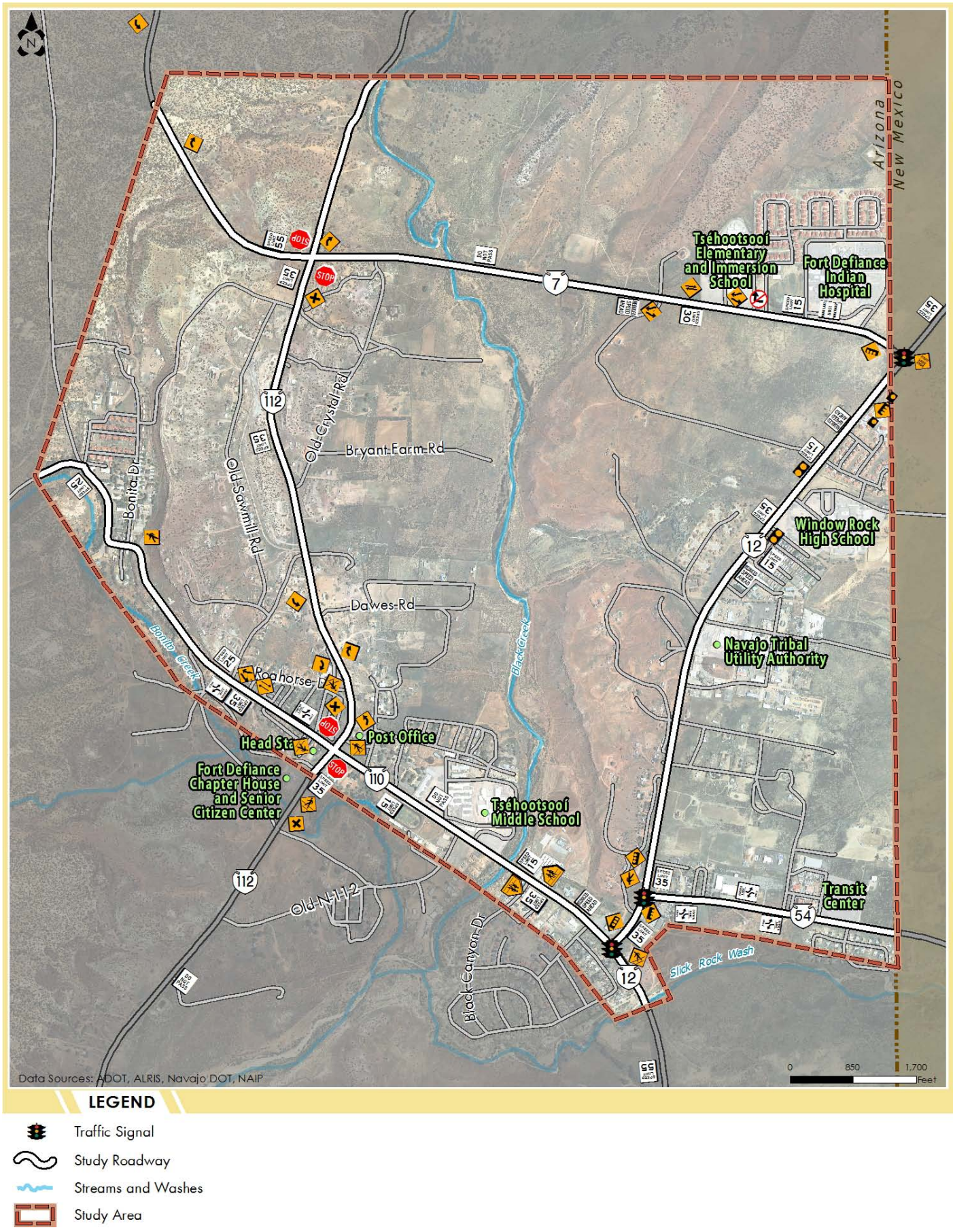
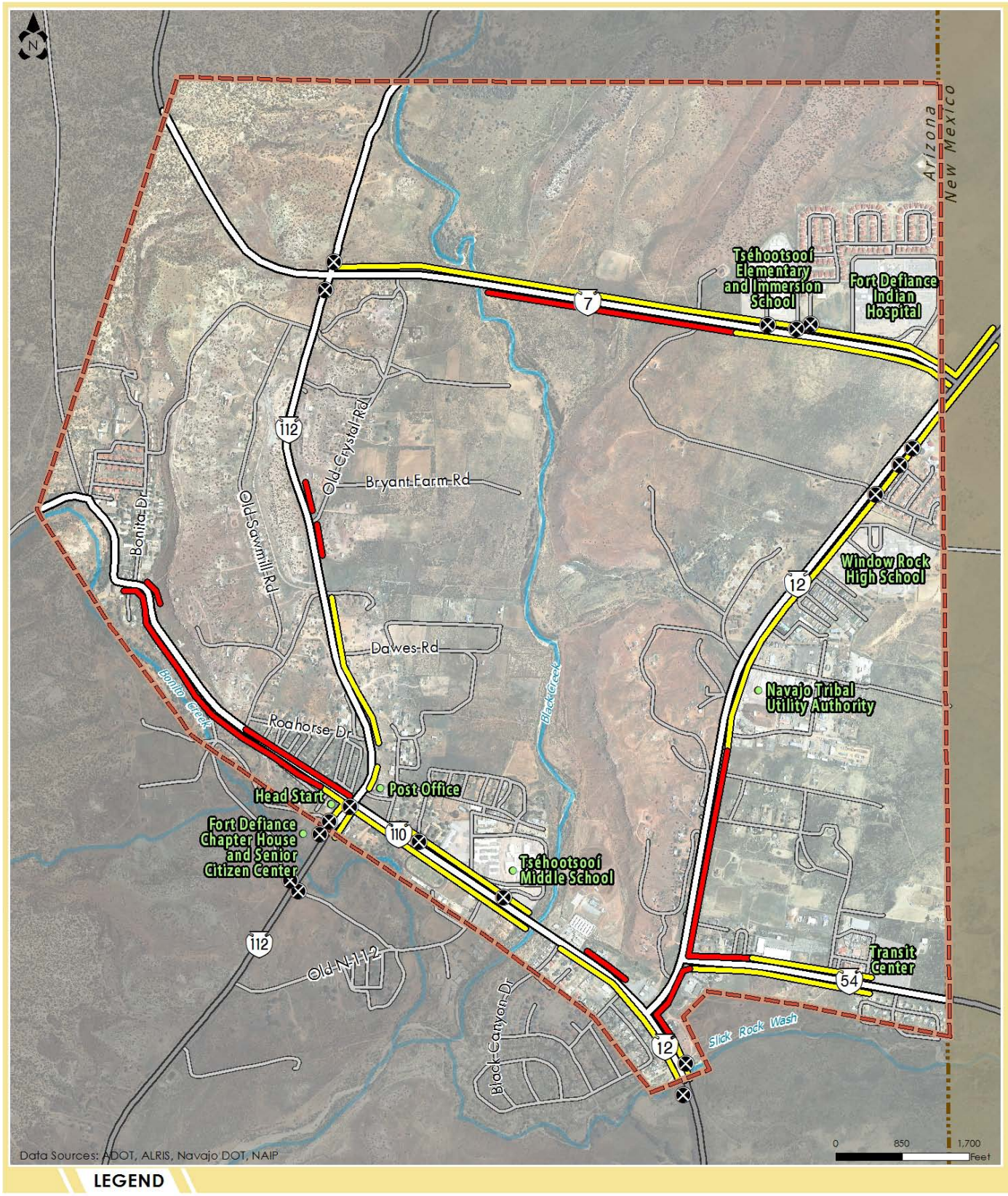


Figure 4.4. Fencing and Cattle Guard Conditions



EXISTING TRAFFIC CONDITIONS

Traffic and turning movement counts were conducted in May 2013 as part of the study process. Daily traffic counts were collected at 12 locations along the study roadways as well as turn movement counts for the AM/PM peak two-hour periods for the critical intersections. The traffic counts also provided vehicle classification distribution and average travel speeds at each location. This data was compared against Navajo DOT's traffic counts for validation purposes. In most locations, travel patterns gathered in the traffic count data matched with that of Navajo DOT traffic volumes. Figure 4.5 displays the existing daily traffic volumes. Key observations noted in the Figure include:

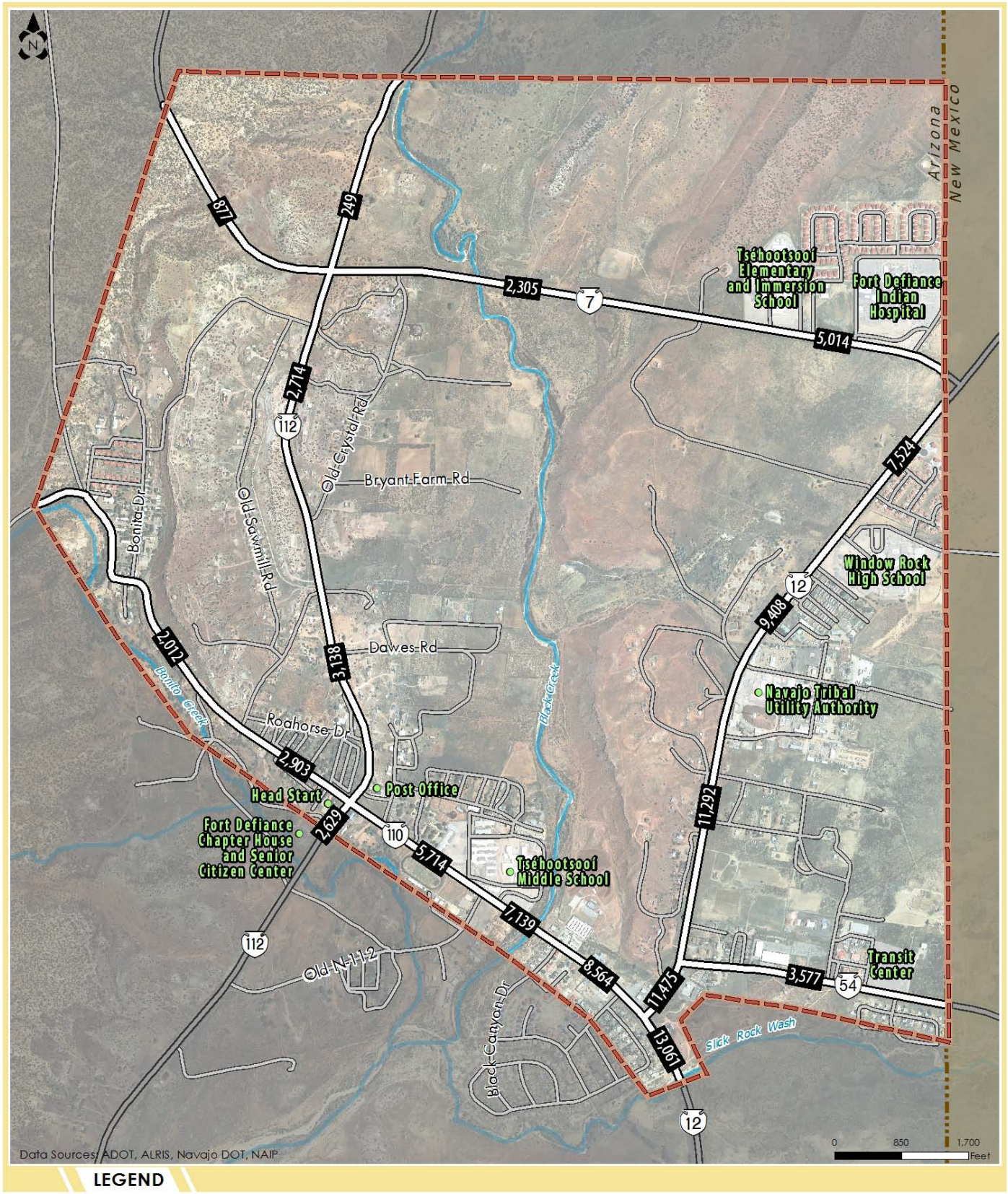
- N12, between the intersection at N110 and the eastern study boundary, has the highest amount of traffic, with approximately 13,000 vehicles daily.
- N12, between the intersections of N12/N110 and N12/N7, ranges between 7,500 and 11,500 vehicles daily. Major activity centers such as the NTUA, Window Rock High School, Fort Defiance Indian Hospital, and the elementary schools are accessed by using N12.
- N110, between the intersections of N12/N110 and N110/N112, ranges between 5,700 and 8.500 vehicles daily. This corridor provides access to activity centers such as the Post Office, middle school, youth center, residential developments, and other small businesses.

Level of Service

Traffic congestion levels of study roadways were estimated using traffic count data. The degree of traffic congestion is commonly expressed in terms of Level of Service (LOS). LOS is a measurement of traffic congestion conditions defined by the Transportation Research Board's (TRB) Highway Capacity Manual (HCM). For a planning level analysis, the roadway LOS is determined based on the ratio of traffic volume on the road to capacity of the road. Capacity of the road is a function of the number of lanes, functional classification, speed, and roadway geometrics and provides thresholds for the maximum number of cars allowed to travel on a lane for the peak or daily conditions. Each level of service is given a letter grade based on its level of congestion, ranging from "A" through "F", with LOS A representing free flowing traffic conditions where vehicles experience minimal delays and LOS F representing failing conditions where vehicles experience long delays. Figure 4.6 is an illustration of the LOS types. Road segment LOS is characterized by the HCM as follows:

- **LOS A:** Best, free flow operations (on uninterrupted flow facilities) and very low delay (on interrupted flow facilities). Freedom to select desired speeds and to maneuver within traffic is extremely high.
- **LOS B:** Flow is stable, but presence of other users is noticeable. Freedom to select desired speeds is relatively unaffected, but there is a slight decline in the freedom to maneuver within traffic.

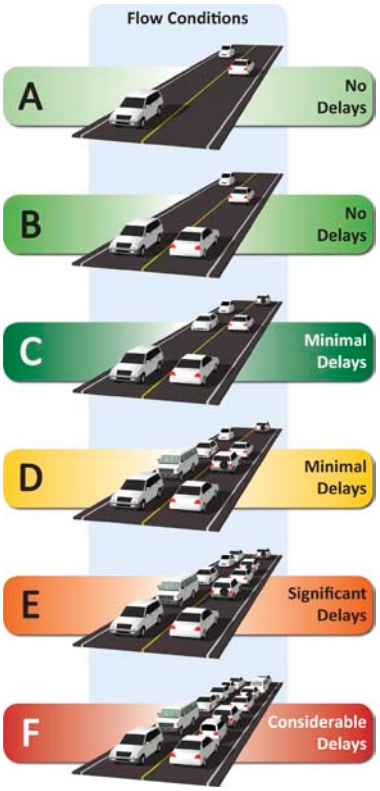
Figure 4.5. Existing Average Daily Traffic Volumes



- **LOS C:** Flow is stable, but the operation of users is becoming affected by the presence of other users. Maneuvering within traffic requires substantial vigilance on the part of the user.
- **LOS D:** High density but stable flow. Speed and freedom to maneuver are severely restricted. The driver is experiencing a generally poor level of comfort and convenience.
- **LOS E:** Flow is at or near capacity. All speeds are reduced to a low, but relatively uniform value. Freedom to maneuver within traffic is extremely difficult. Comfort and convenience levels are extremely poor.
- **LOS F:** Worse, facility has failed, or a breakdown has occurred.

In general for rural areas, LOS A and B represent no congestion, LOS C and D represent moderate congestion, and LOS E and F represent severe congestion.

FIGURE 4.6 Level of Service



Current Roadway Level of Service

Figure 4.7 displays the existing LOS for the study roadways. Currently, all study roadways operate at LOS A and B, except for the following:

LOS C:

- N 54: N12 to the eastern study boundary
- N7: N12 to the elementary school

Current Intersection Level of Service

Utilizing the turning movement count data, LOS conditions were estimated for major intersections within the study area. Figure 4.8 displays the current lane configuration and traffic control type at each intersection and Figure 4.9 displays the turn movement volumes. Figure 4.10 displays the overall intersection LOS, and the LOS at each turn movement for each leg/approach for each intersection. Table 4.2 summarizes the intersection LOS analysis.

Figure 4.7. Existing Level of Service

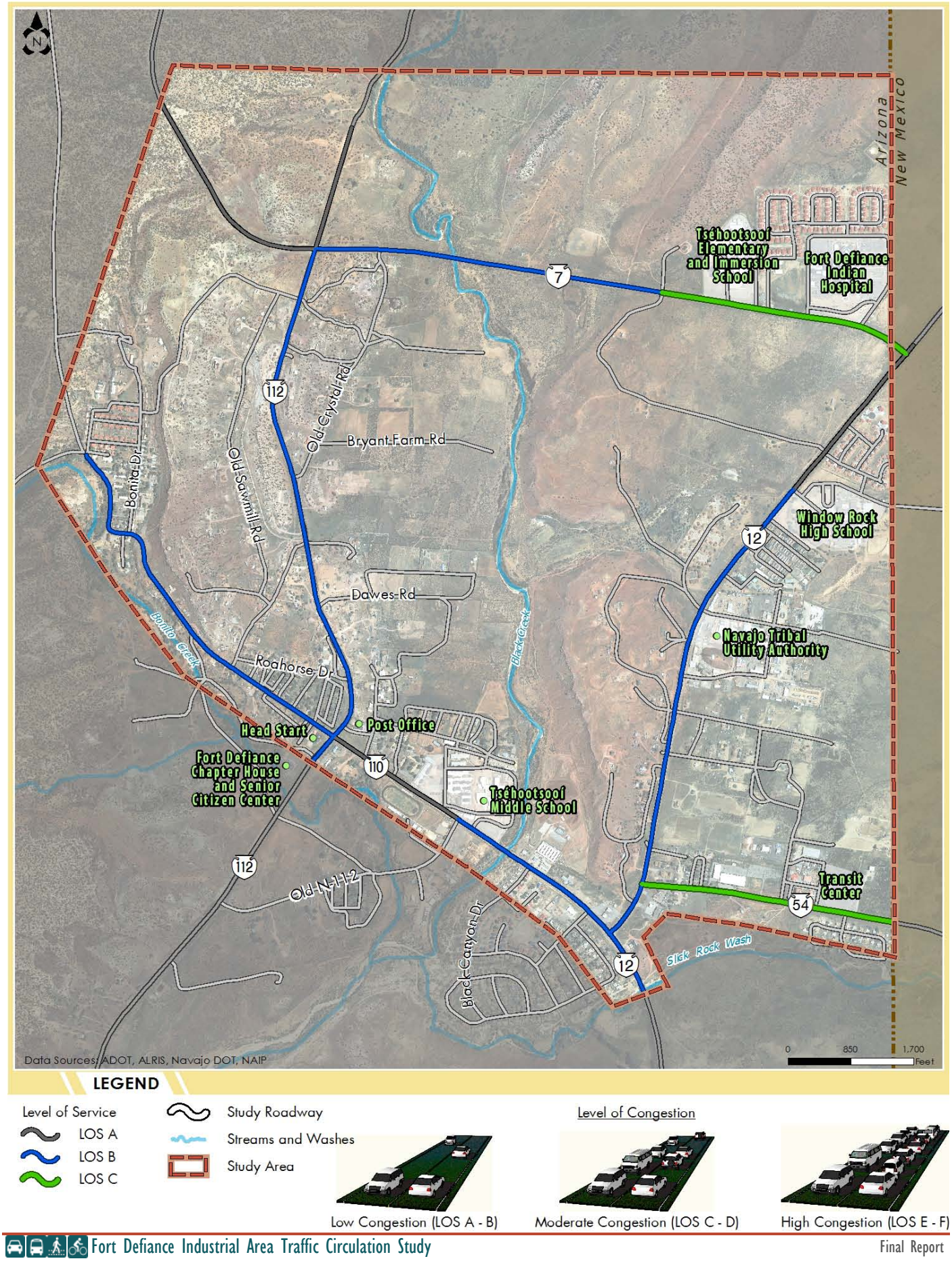


Figure 4.8. Existing Intersection Lane Configuration

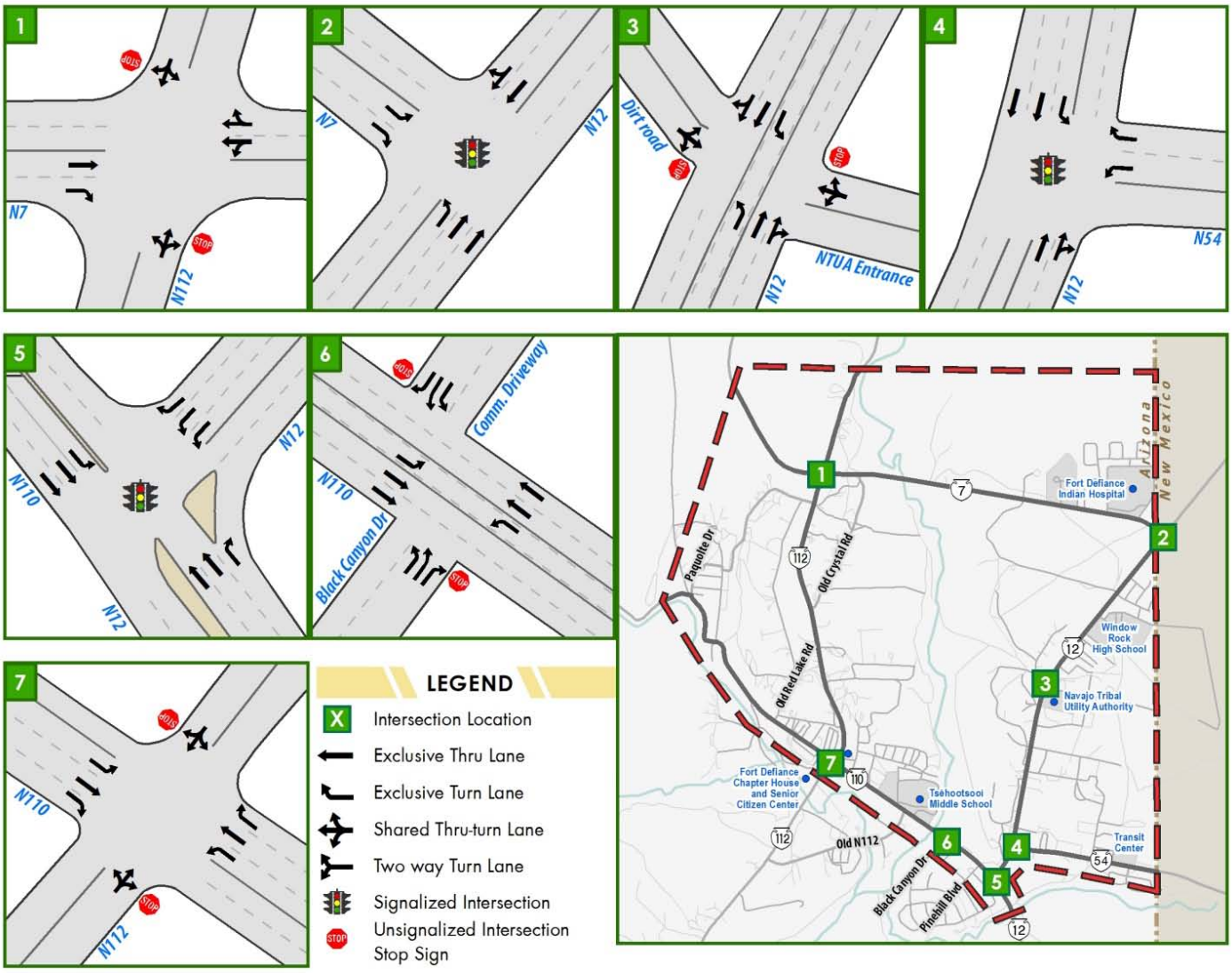


Figure 4.9. Existing Intersection Turning Movement Volumes

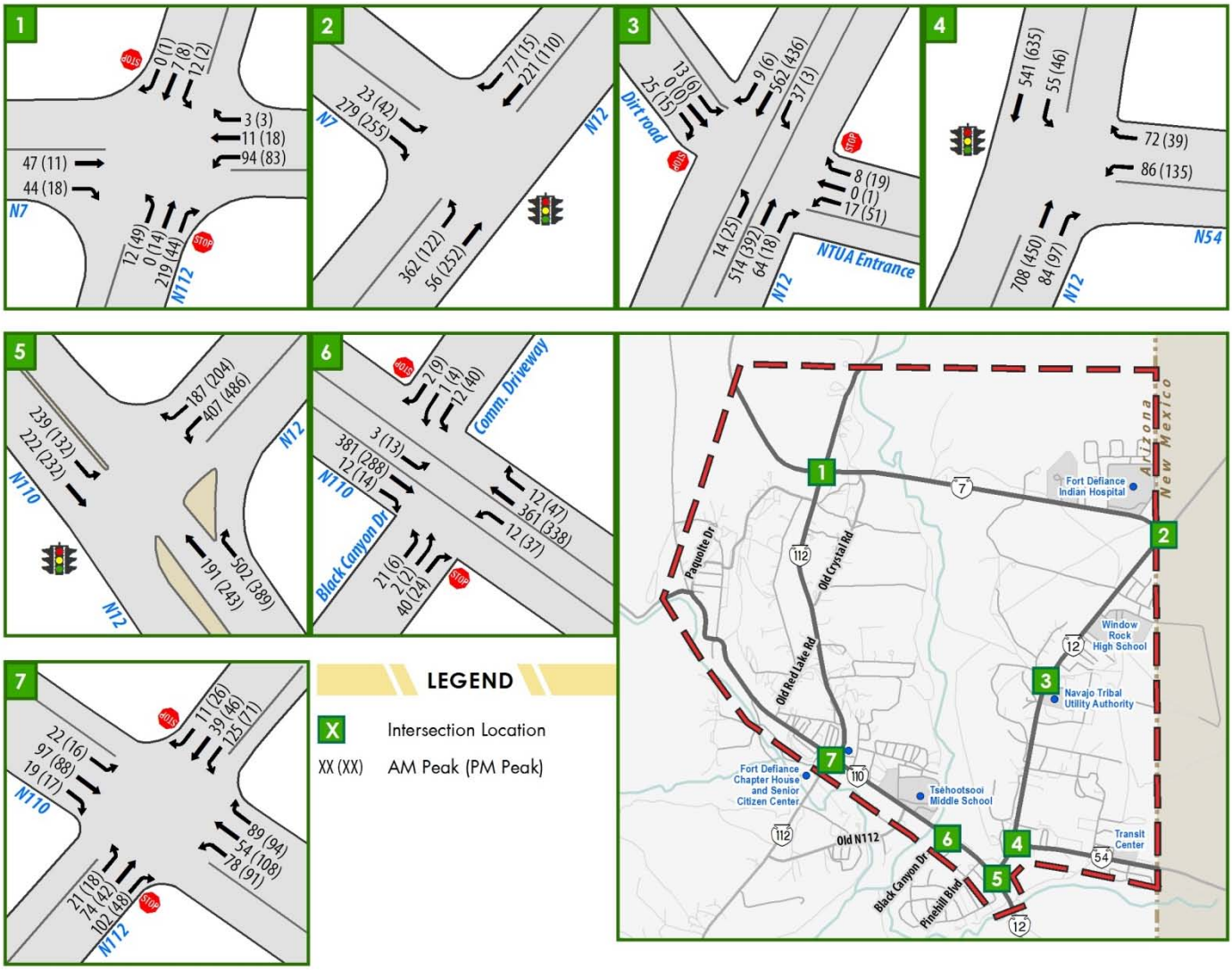


Figure 4.10. Existing Intersection Level of Service

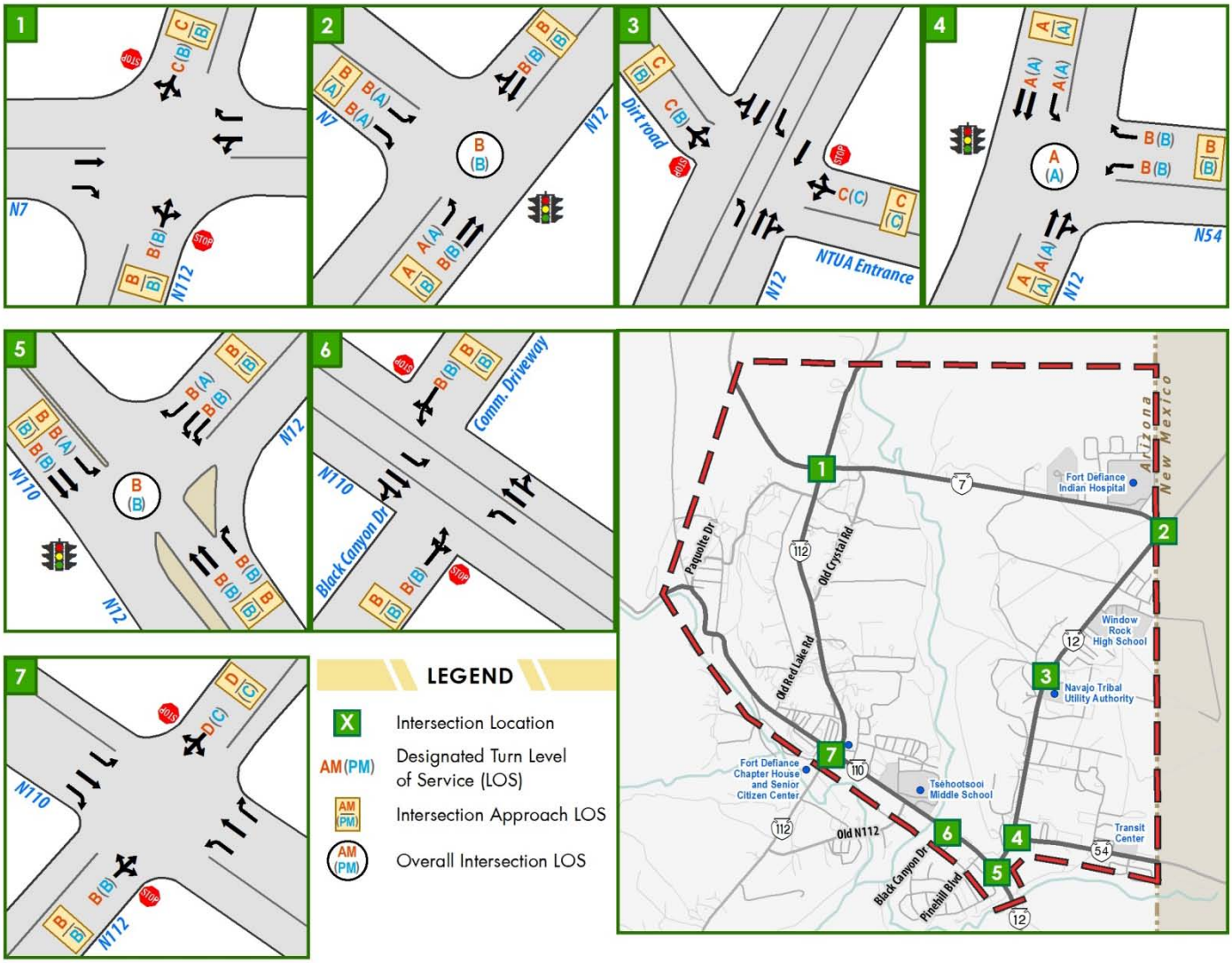


Table 4.2. Existing Intersection Level of Service Summary

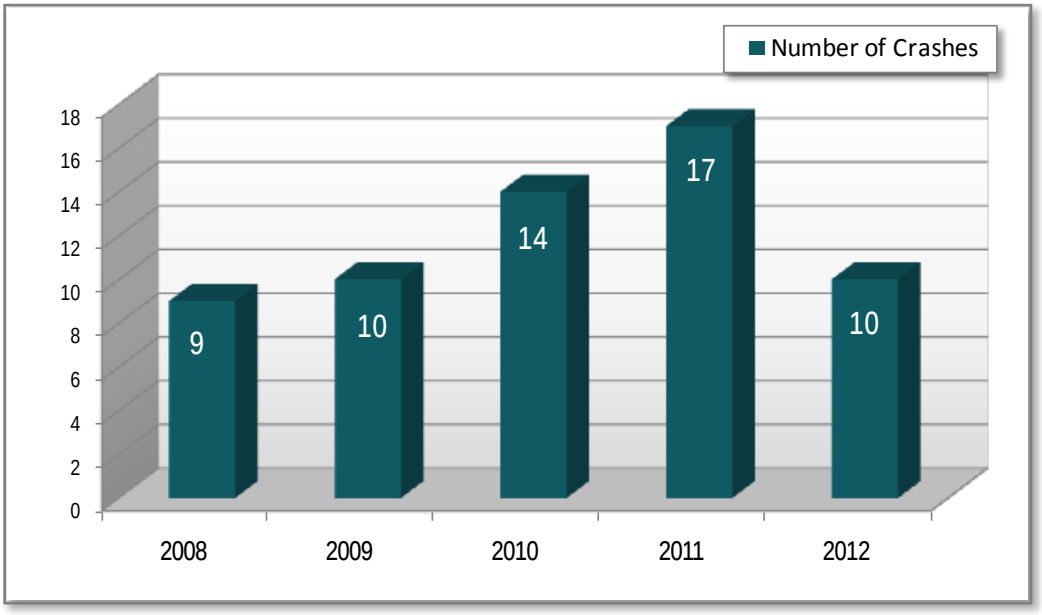
Intersection	Level of Service
N112/N7	AM • Southbound approach is LOS C • All other approaches operate at LOS B or better PM • All approaches operate at LOS B or better
N12/N7	AM • All approaches operate at LOS B or better PM • All approaches operate at LOS B or better
N12/NTUA Entrance	AM • Eastbound approach is LOS C • Westbound approach is LOS C • All other approaches operate at LOS B or better PM • Westbound approach is LOS C • All approaches operate at LOS B or better
N12/N54	AM • All approaches operate at LOS B or better PM • All approaches operate at LOS B or better
N12/N110	AM • All approaches operate at LOS B or better PM • All approaches operate at LOS B or better
Black Canyon Drive/ N110	AM • All approaches operate at LOS B or better PM • All approaches operate at LOS B or better
N112/N110	AM • Southbound approach is LOS D • All other approaches operate at LOS B or better PM • Southbound approach is LOS C • All other approaches operate at LOS B or better

CRASH DATA ANALYSIS

Crash analysis was conducted for the study corridors to identify trends, patterns, predominant crash reasons, and high crash rate intersections and corridors. The purpose of the crash analysis was to discover safety hazard locations that need to be addressed to improve area safety.

Motor vehicle crash data was obtained from Navajo DOT for crashes occurring between January 1999 and December 2012. During this 13 year period a total of 222 incidents occurred along the study roadways, of which 27% or 60 total crashes occurred during the last five years (2008 - 2012). As illustrated in Figure 4.11, the total number of crashes along the study corridors steadily increased between 2008 and 2011. In 2012, however, the total number of crashes sharply declined.

Figure 4.11. Crash Trends from January 2008 to December 2012



Source: Navajo Department Of Transportation, January 2008 - December 2012

Figure 4.12 illustrates the locations of crashes within the study area, as well as crashes that resulted in injuries or fatalities, and Figure 4.13 presents the overall crash density as well as the location of major crash causes. Based on review of the each crash characteristic and location, the following trends were identified for crashes recorded between January 2008 and December 2012.

Crash Location by Road: Identifying crash locations and the type of crashes for each corridor aids in identifying deficiencies and developing improvement scenarios to improve safety. Table 4.3 provides a summary of the number of crashes, crash rates, and the number of injury crashes along the study corridors and at key intersections. As shown in the table, nearly 25% of all crashes occurred at the intersections of N112/N110 and N12/N110. The study corridors of N110, from the N12 Intersection to the Tséhootsooí Middle School, and N112, between the Southern Study Boundary to Old Crystal Road, had the highest total number of crashes with 12 and 11 total crashes, respectively.

Table 4.3. Crash Locations, Severity, and Crash Rate (2008 - 2012)

Location		Number of Crashes	Percent of All Crashes	Road Length (Miles)	Crash Rate	Number of Injury Crashes (Percent)	Number of Fatalities
Intersections							
N112/N110		8	13.30%	-	0.61	3 (38%)	0
N112/N7		1	1.70%	-	0.18	0	0
N12/N10		7	11.70%	-	0.23	1 (14%)	0
N12/N54		6	10.00%	-	0.25	3 (50%)	0
N12/N7		4	6.70%	-	0.22	2 (50%)	0
Corridors							
N7	N12 Intersection to Tséhootsooí Elementary School	4	6.70%	0.41	1.07	2(50%)	0
	Tséhootsooí Elementary School to N112 Intersection	2	3.30%	1.14	0.42	0	1
	N112 Intersection to Western Study Boundary	2	3.30%	0.61	2.05	1 (50%)	0
N12	Southern Study Boundary to N110 Intersection	7	11.70%	0.18	1.63	0	0
	N110 Intersection to N54 Intersection	6	10.00%	0.16	1.79	2 (33%)	0
	N54 Intersection to Window Rock High School	9	15.00%	1.12	0.39	5 (55%)	0
	Window Rock High School to N7 Intersection	3	5.00%	0.47	0.46	0	1
N54	Eastern Study Boundary to N12 Intersection	0	-	0.66	0.00	0	0
N112	Southern Study Boundary to Old Crystal Road	11	18.30%	0.81	2.37	4 (36%)	1
	Old Crystal Road to N7 Intersection	1	1.70%	0.62	0.33	0	0
	N7 Intersection to Northern Study Boundary	0	-	0.5	0.00	0	0
N110	N12 Intersection to Tséhootsooí Middle School	12	20.00%	0.54	1.42	5 (42%)	0
	Tséhootsooí Middle School to N112 Intersection	2	3.30%	0.34	0.56	0	0
	N112 Intersection to Western Study Boundary	1	1.70%	1.17	0.23	1 (100%)	0

Source: Navajo Department Of Transportation, January 2008 - December 2012

Intersection Crash Rates are expressed as crashes per million vehicles entering the intersection

Segment Crash Rates are expressed as crashed per million vehicle miles traveled

Figure 4.12. Crash Location and Crash Severity

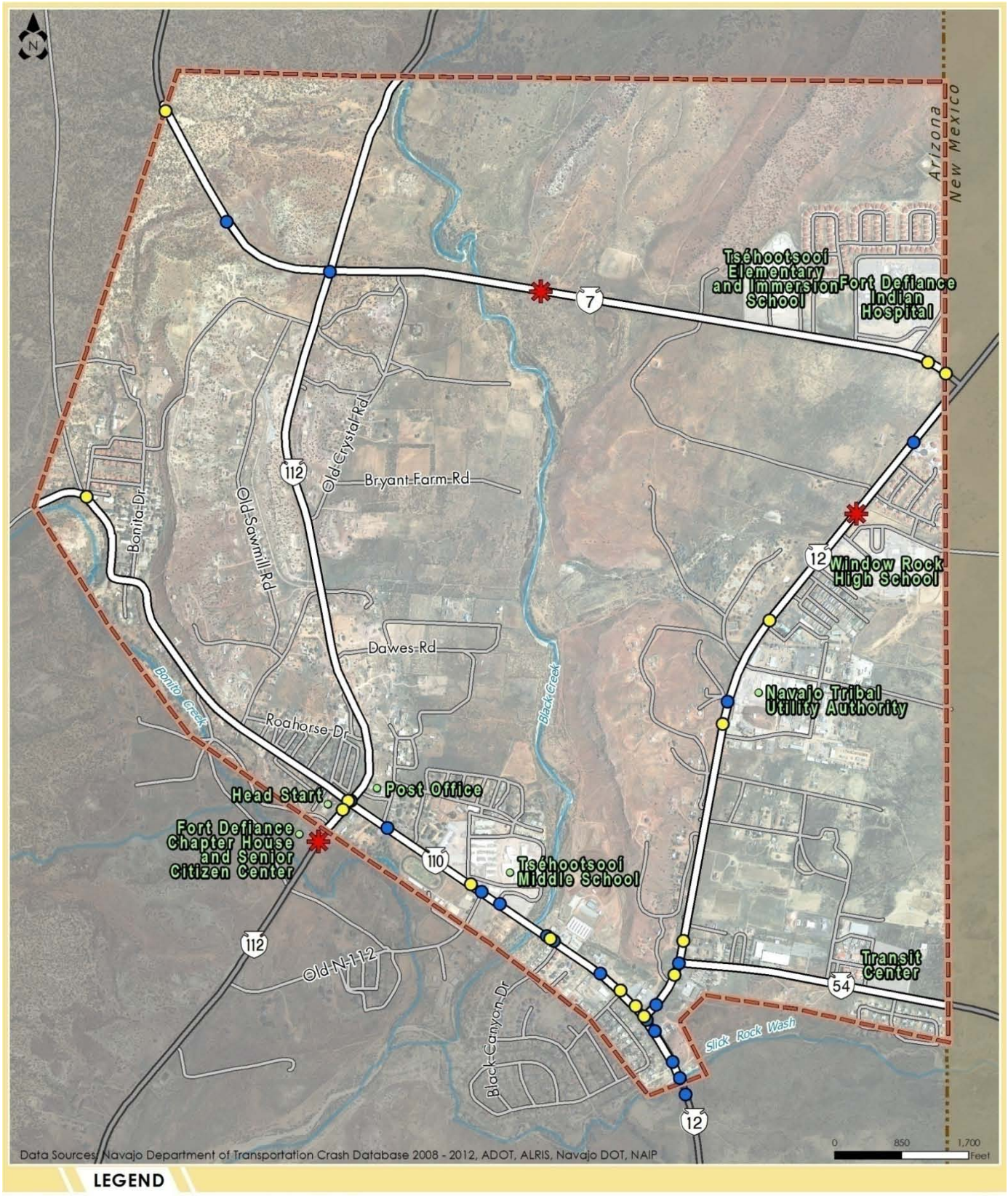
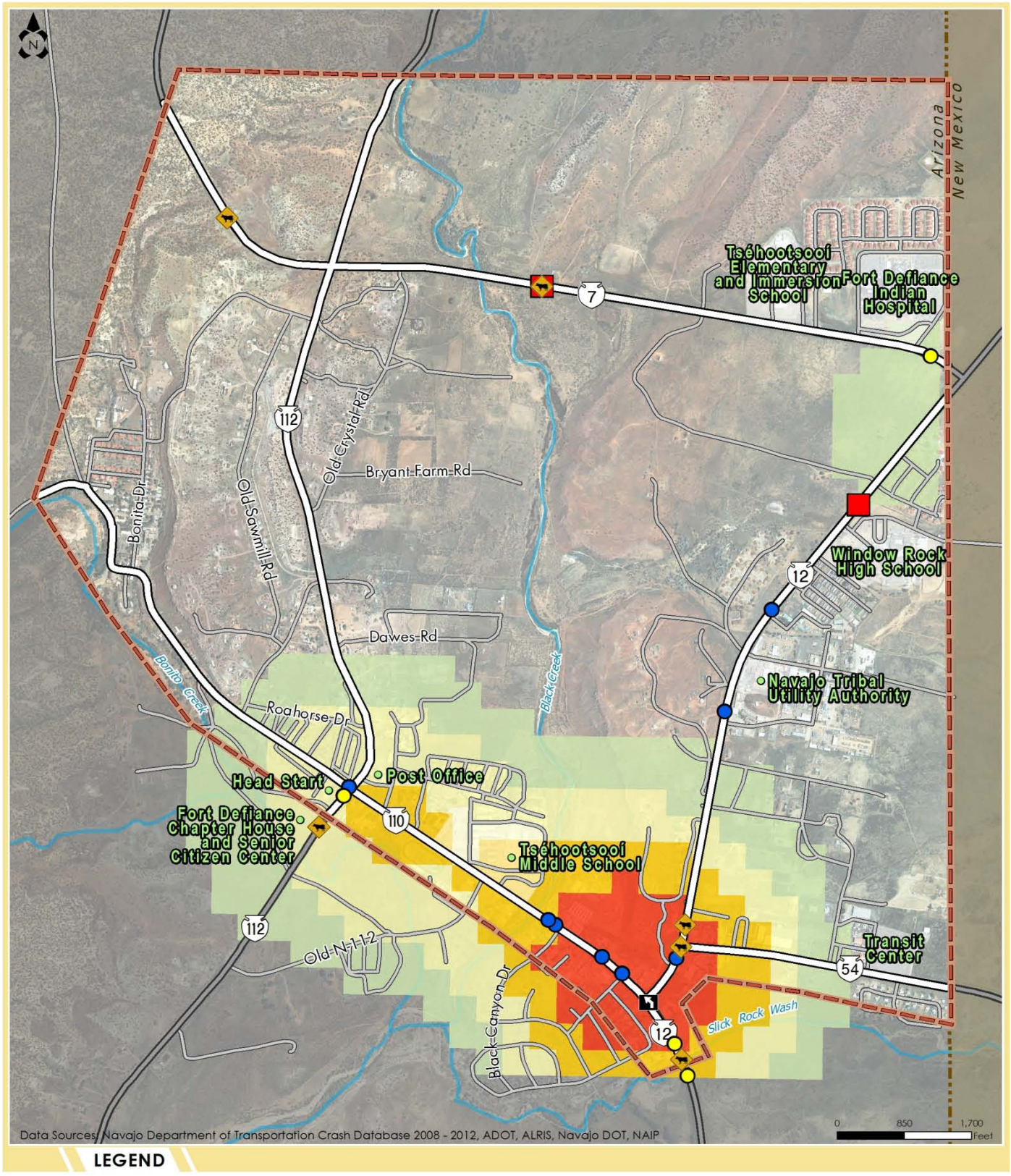


Figure 4.13. Crash Density and Major Cause of Crash

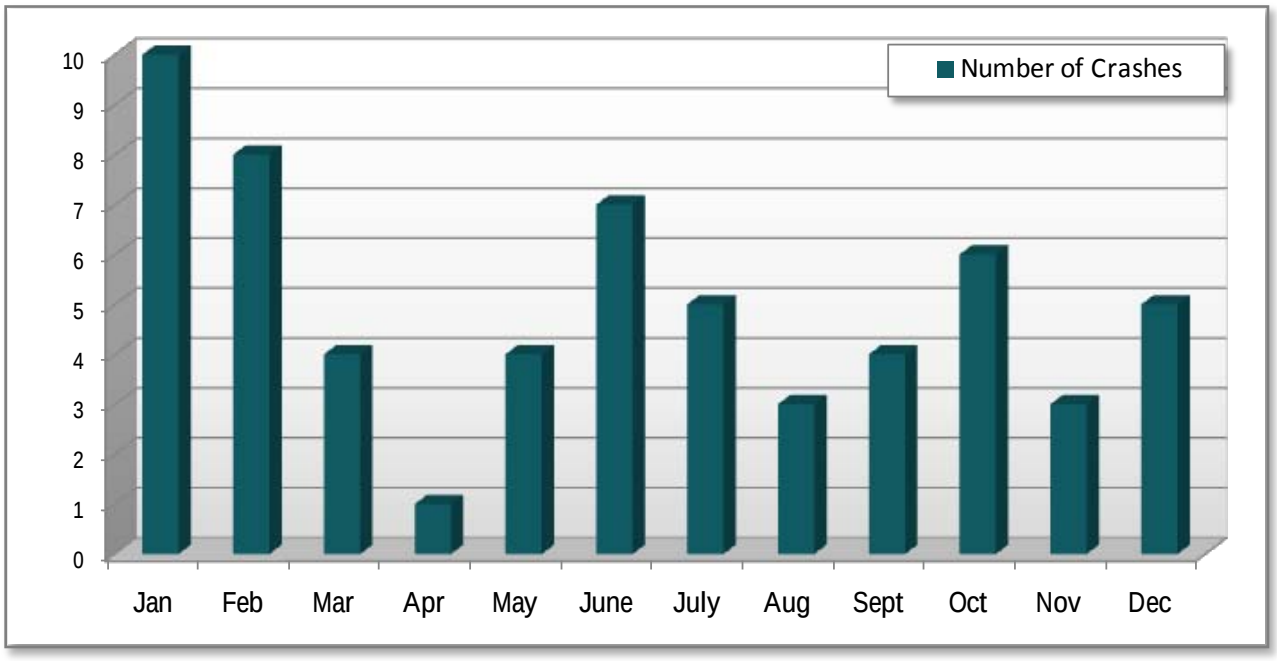


Crash Rates: Crash rates were estimated along the study corridors and key intersections. Crash rates for the roadway segments are expressed in terms of crashes per million vehicle miles traveled and crash rates for intersections are expressed in terms of crashes per million vehicles entering the intersection. Crash rate is a function of the number of vehicles utilizing a roadway or entering an intersection; therefore, a higher total number of crashes does not always result in a higher crash rate. The crash rate for the N112/N110 Intersection is more than double that of any other intersection in the study area. N112, between the southern study boundary and Old Crystal Road, experiences the highest crash rate in the study area.

Injury Severity: 20 of 60 crashes, or 33% of all crashes, resulted in an injury along study roadways. Of all crashes at intersections, 30% resulted in an injury. Additionally, since 2008 a total of three fatal crashes occurred within the study area. Figure 4.12 provides an illustration of the location of crashes that resulted in a fatality. Pedestrians were involved in two of the three fatal crashes. Under the influence of alcohol was cited as the primary cause in each of these fatal crashes.

Road and Weather Conditions: The majority of the crashes were cited as occurring during a clear day with dry roadway conditions. 13% of all crashes were cited as occurring on snow, slush, or ice covered roadways. Winter weather conditions may be a significant factor in the high number of crashes occurring during the winter months, as shown in Figure 4.14 approximately 38% of all crashes took place between December and February.

Figure 4.14. Crash Trends by Month (January 2008 to December 2012)



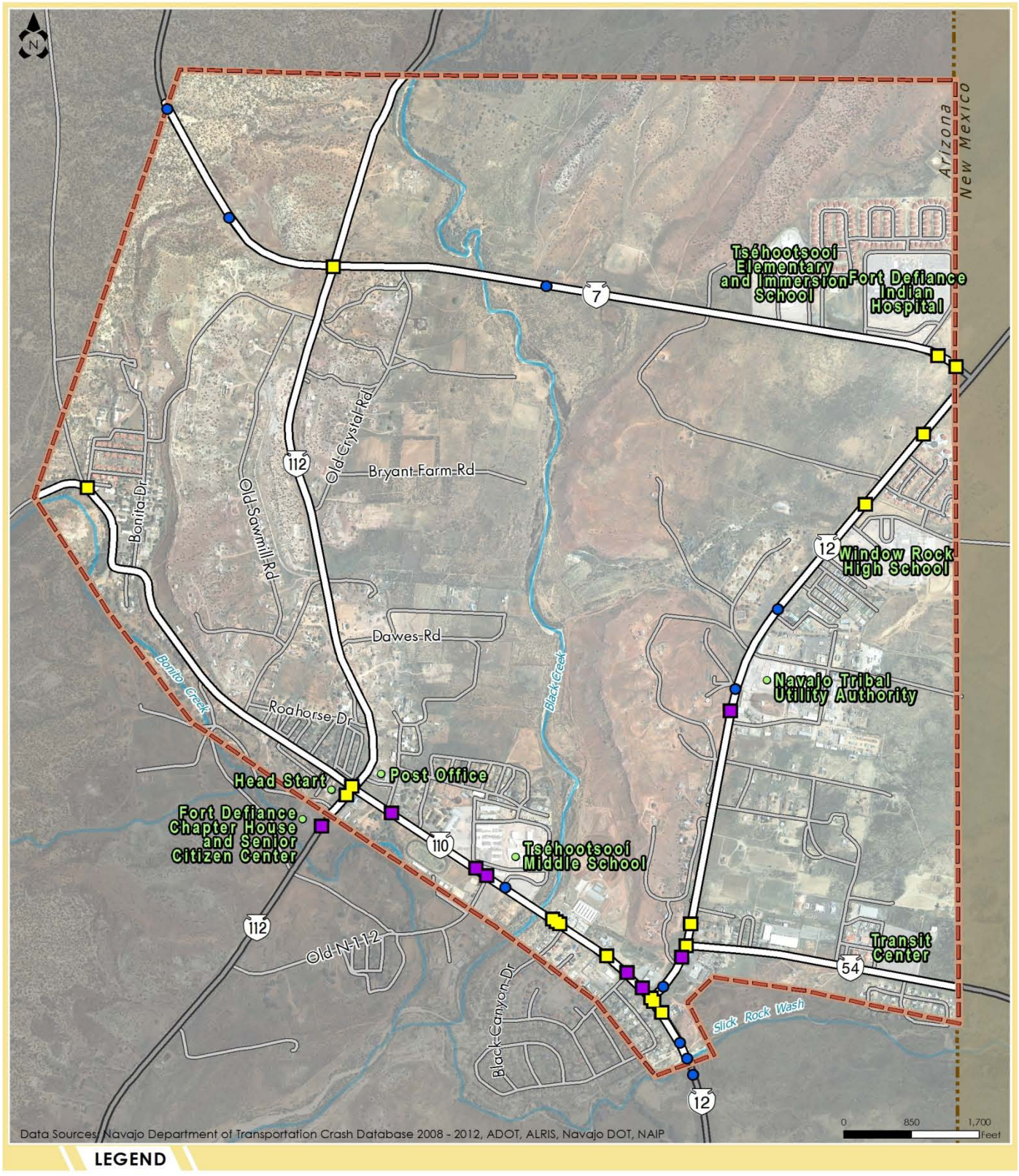
Source: Navajo Department Of Transportation, January 2008 - December 2012

Crash Causes: The leading causes for crashes in the study area were cited as "failure to yield ROW" (23%), "driver inattention" (20%), and "animal on road" (10%). Speeding was cited as the cause for approximately 6% of all crashes within the study area. N12, between the southern study boundary to the N110 intersection, had the highest total number of crashes that resulted from speeding.

Pedestrian and bicyclists: In total, there were two pedestrian involved crashes (3% of all crashes) within the study area; both of which resulted in a fatality. Figure 4.13 illustrates the locations of these pedestrian involved crashes. As shown in the Figure, one pedestrian related crash occurred near the Window Rock High School on N12 and one along N7. No bicyclist involved crashes were recorded.

Intersection Relation: Over 63% of all crashes that occurred within the study area were identified as intersection related, while an additional 17% of all crashes were cited as being related to access points to developments. Figure 4.15 illustrates the location of crashes by their relationship with intersection and business access points. As shown in the figure, outside of the major intersections, the N110 corridor between the N12 and N112 has the highest number of intersection and development strip access related crashes. This high concentration of intersection and development strip access related crashes along N110 indicated the need for safety and access management enhancements along the corridor.

Figure 4.15. Crash Location by Intersection Relation



FUTURE TRAFFIC CONDITIONS

The primary purpose of forecasting traffic volumes was to estimate the additional travel demand added to existing roadways and to forecast congestion levels due to projected growth in population and employment. In addition, this analysis provided valuable insight into potential transportation solutions.

Future traffic forecasts were estimated using a two step process.

- Step 1: NTTFI recommended 2% linear growth rate per year was applied to existing traffic volumes to forecast preliminary traffic volumes for Years 2018, 2023, and 2033.
- Step 2: Additional traffic generated by planned future developments, shown in Figure 3.3, was estimated utilizing *Institute of Transportation Engineers (ITE) Trip Generation Manual* methods. Traffic volumes estimated in Step 1 were then adjusted to account for this additional traffic.

Working Paper 1 presented future traffic conditions *if no roadway improvements are made* (No-Build). Projected No-Build traffic conditions serve a baseline to determine if roadway improvements alleviate congestion. The section below presents projected traffic conditions if the following improvements are made:

- N112/N7 Intersection is restriped to include turn lanes on N112 and N7;
- N112/N110 Intersection is upgraded to a signalized intersection and turn lanes are added on N112; and
- Turn lanes are added from the NTUA onto N12.

Projected 2018 Traffic Conditions

Projected 2018 Roadway Level of Service

Figure 4.16 displays the projected 2018 daily traffic volumes and Figure 4.17 illustrates the LOS for the roadway network with projected 2018 traffic volumes. Traffic volumes and LOS results in this section represent average annual daily traffic conditions. All study roadways operate at a LOS A and B, except for the following:

LOS C:

- N7: N12 to west of the Tséhootsooí Elementary School
- N 54: N12 to the eastern study boundary

Projected 2018 Intersection Level of Service

Based on the projected 2018 daily traffic volumes, intersection turn movement volumes were estimated using *NCHRP Report 255* methods. Intersection improvements such as additional turn lanes and traffic signals were identified to accommodate 2018 traffic conditions. Figure 4.18 displays the enhanced 2018 lane configuration; Figure 4.19 displays the projected 2018 turn movement volumes; and Figure 4.20 displays the overall intersection LOS, and the LOS at each turn movement for each leg/approach for each intersection. Table 4.4 summarizes the intersection LOS analysis.

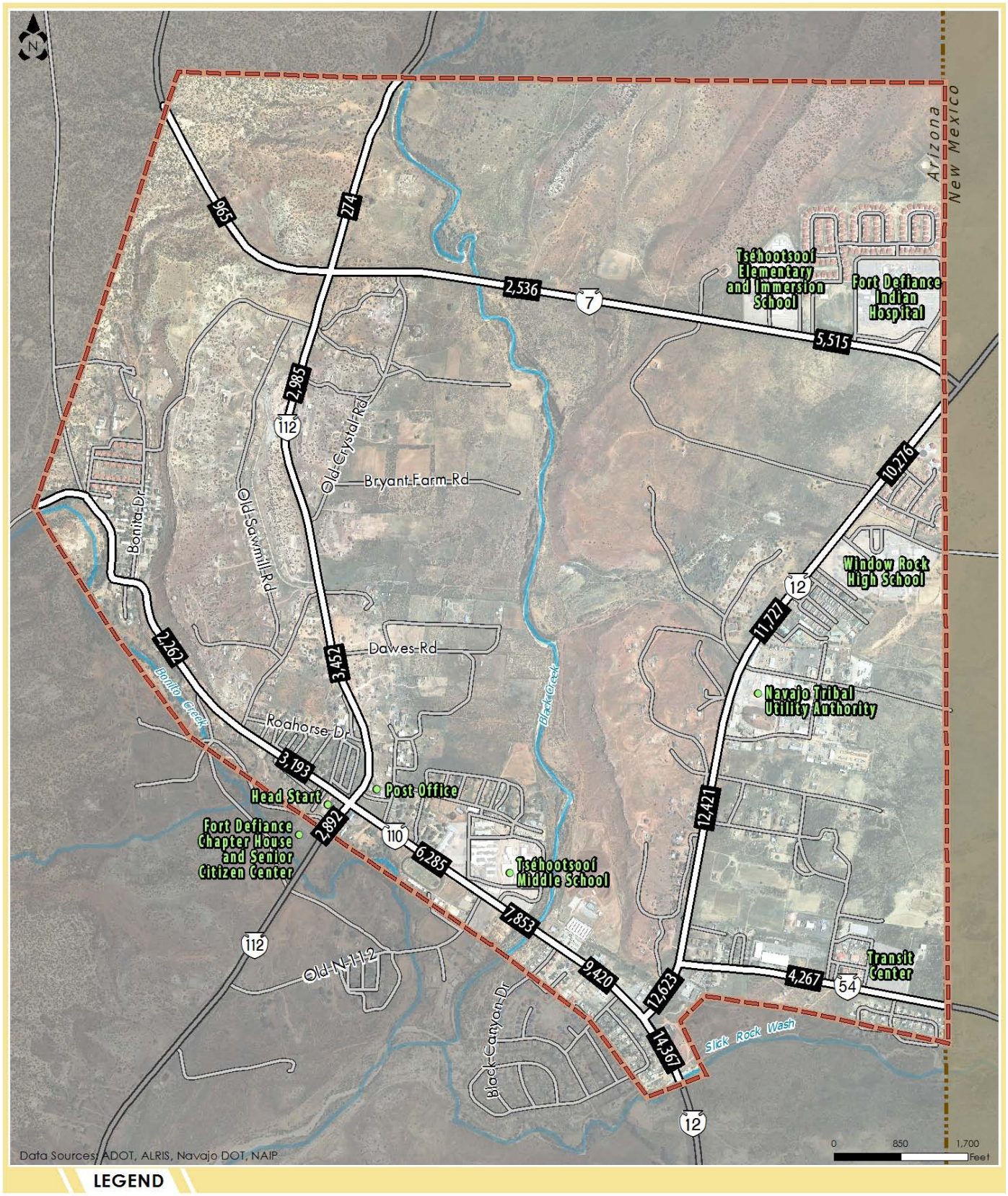
Table 4.4. 2018 Intersection Level of Service Summary

Intersection	Level of Service
N112/N7	AM • Southbound approach is LOS C • All other approaches operate at LOS B or better • Southbound and Northbound left turn movement is LOS C • All other turn movements operate at LOS B or better PM • All approaches operate at LOS B or better • Southbound and Northbound left turn movement is LOS C • All other turn movements operate at LOS B or better
N12/N7	AM • All approaches and turn movements operate at LOS B or better PM • All approaches and turn movements operate at LOS B or better
N12/NTUA Entrance	AM • Eastbound approach is LOS D • All other approaches operate at LOS B or better • Eastbound thru and left turn movements are LOS D • All other turn movements operate at LOS B or better PM • Eastbound approach is LOS C • All other approaches operate at LOS B or better • Eastbound thru and left turn movements are LOS C • All other turn movements operate at LOS B or better
N12/N54	AM • All approaches operate at LOS B or better • All turn movements operate at LOS B or better PM • All approaches operate at LOS B or better • All turn movements operate at LOS B or better
N12/N110	AM • Eastbound approach is LOS C • All other approaches operate at LOS B or better • Eastbound left turn movement is LOS C • All other turn movements operate at LOS B or better PM • All approaches operate at LOS B or better • All turn movements operate at LOS B or better

Table 4.4. 2018 Intersection Level of Service Summary (Continued)

Intersection	Level of Service
Black Canyon Drive/ N110	AM • Southbound approach is LOS C • Northbound approach is LOS C • Southbound turn movements are LOS C • Northbound turn movements are LOSC PM • Southbound approach is LOS C • All other approaches are LOS B or better • Southbound turn movements are LOS C • All other turn movements are LOS B or better
N112/N110	AM • All approaches operate at LOS A • All turn movements operate at LOS A PM • All approaches operate at LOS A • All turn movements operate at LOS A

Figure 4.16. 2018 Projected Average Daily Traffic Volumes



LEGEND

- X,XXX — Existing Average Daily Traffic
- Study Roadway
- Streams and Washes
- Study Area

Figure 4.17. 2018 Level of Service

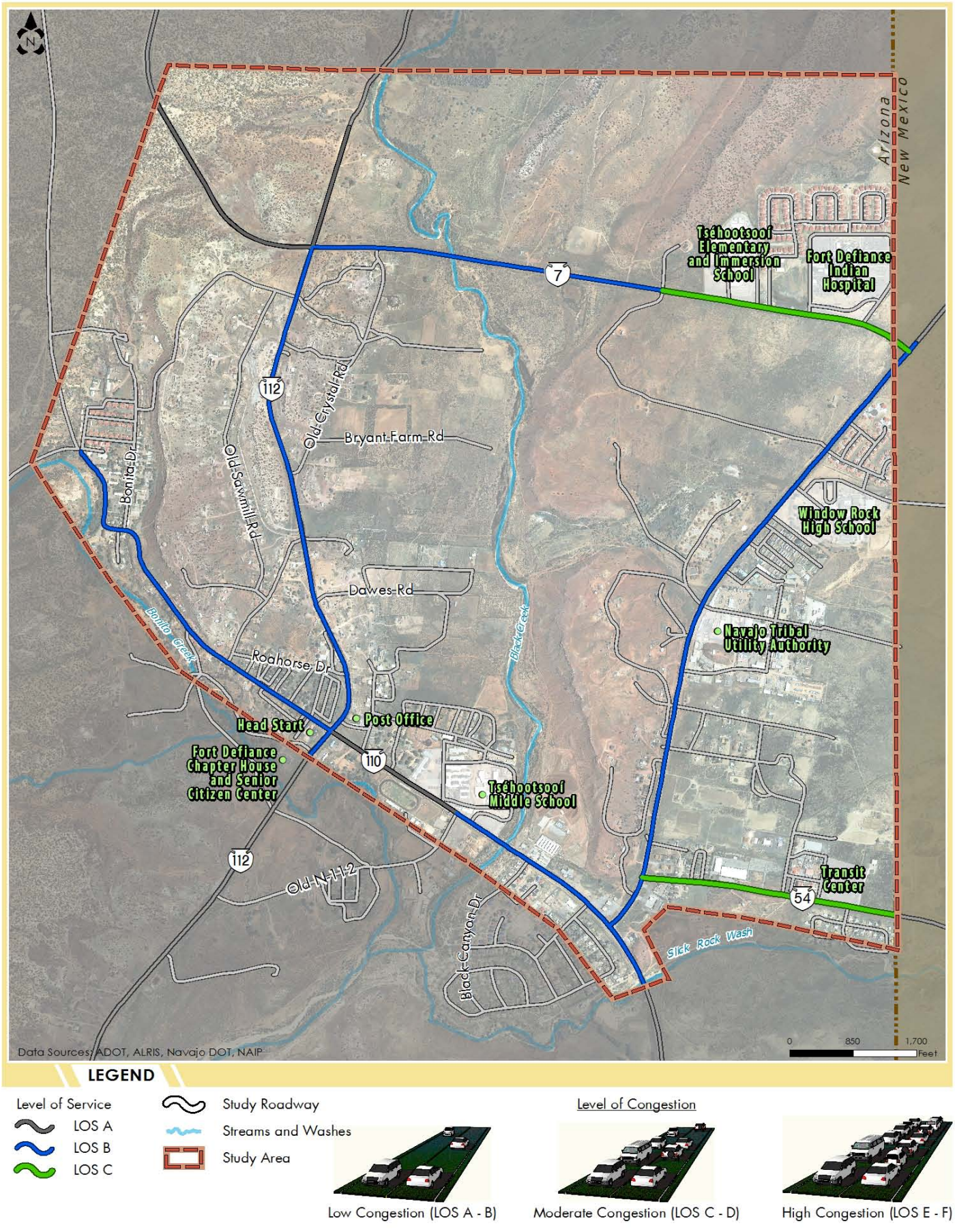


Figure 4.18. 2018 Intersection Lane Configuration

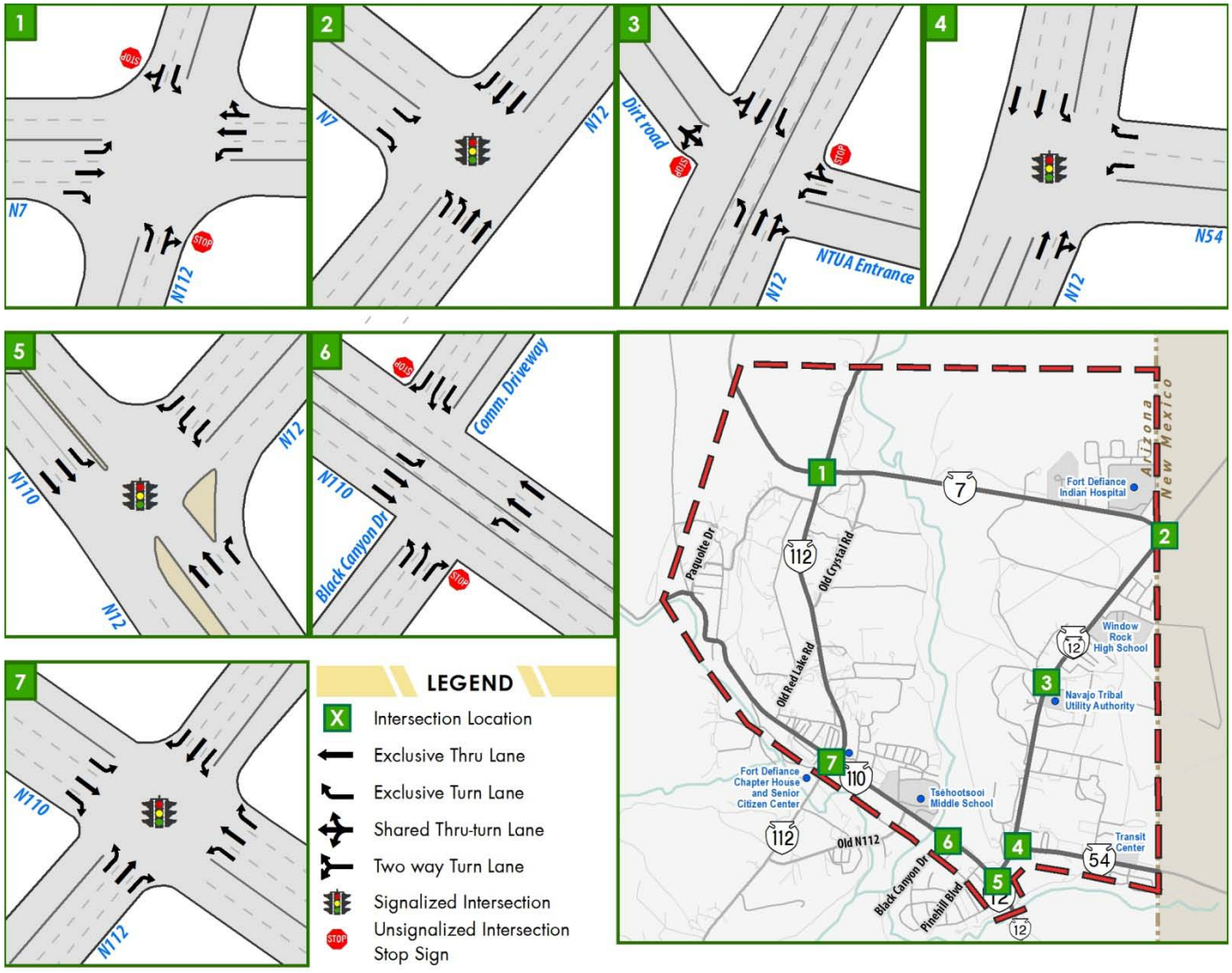


Figure 4.19. 2018 Intersection Turning Movement Volumes

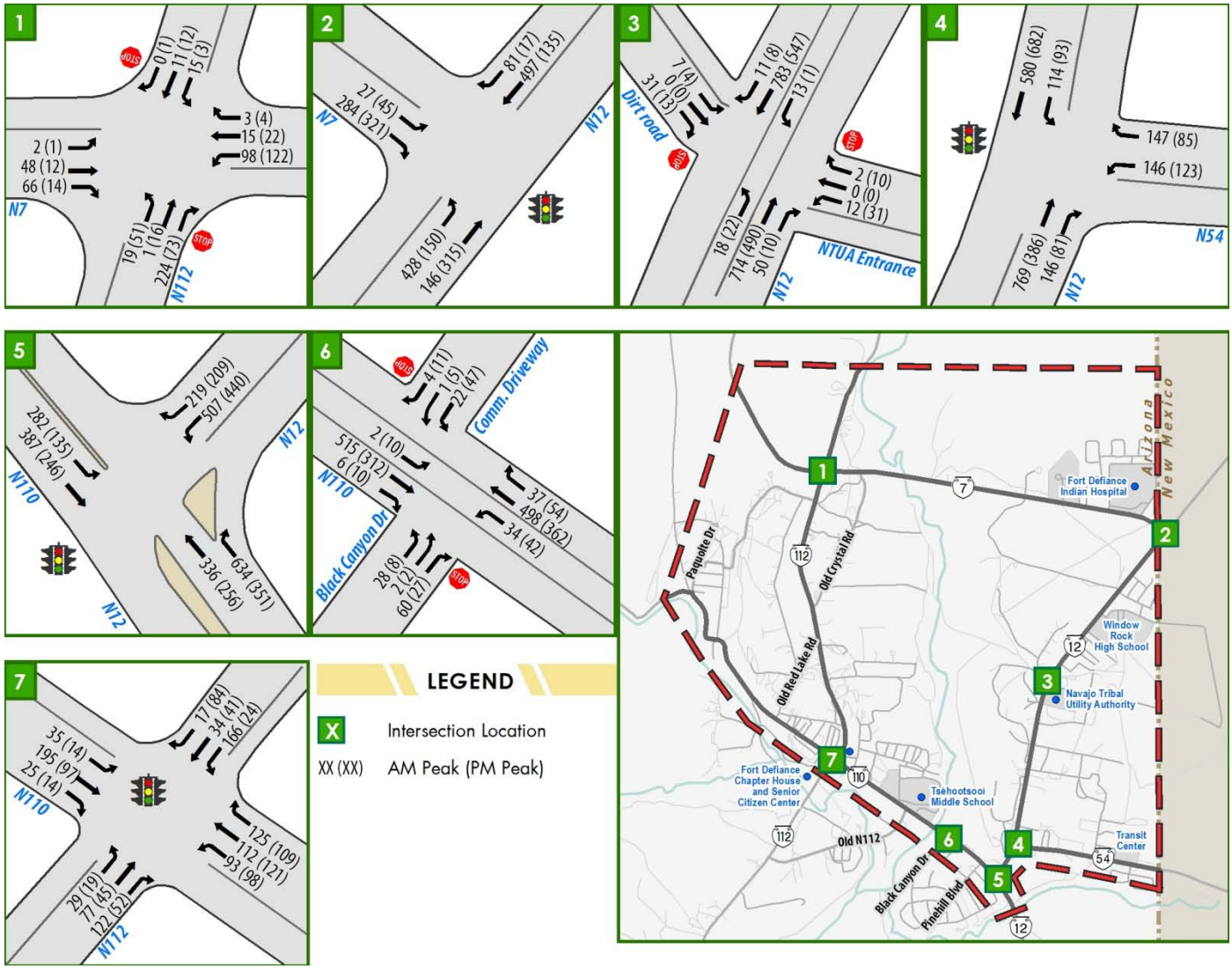
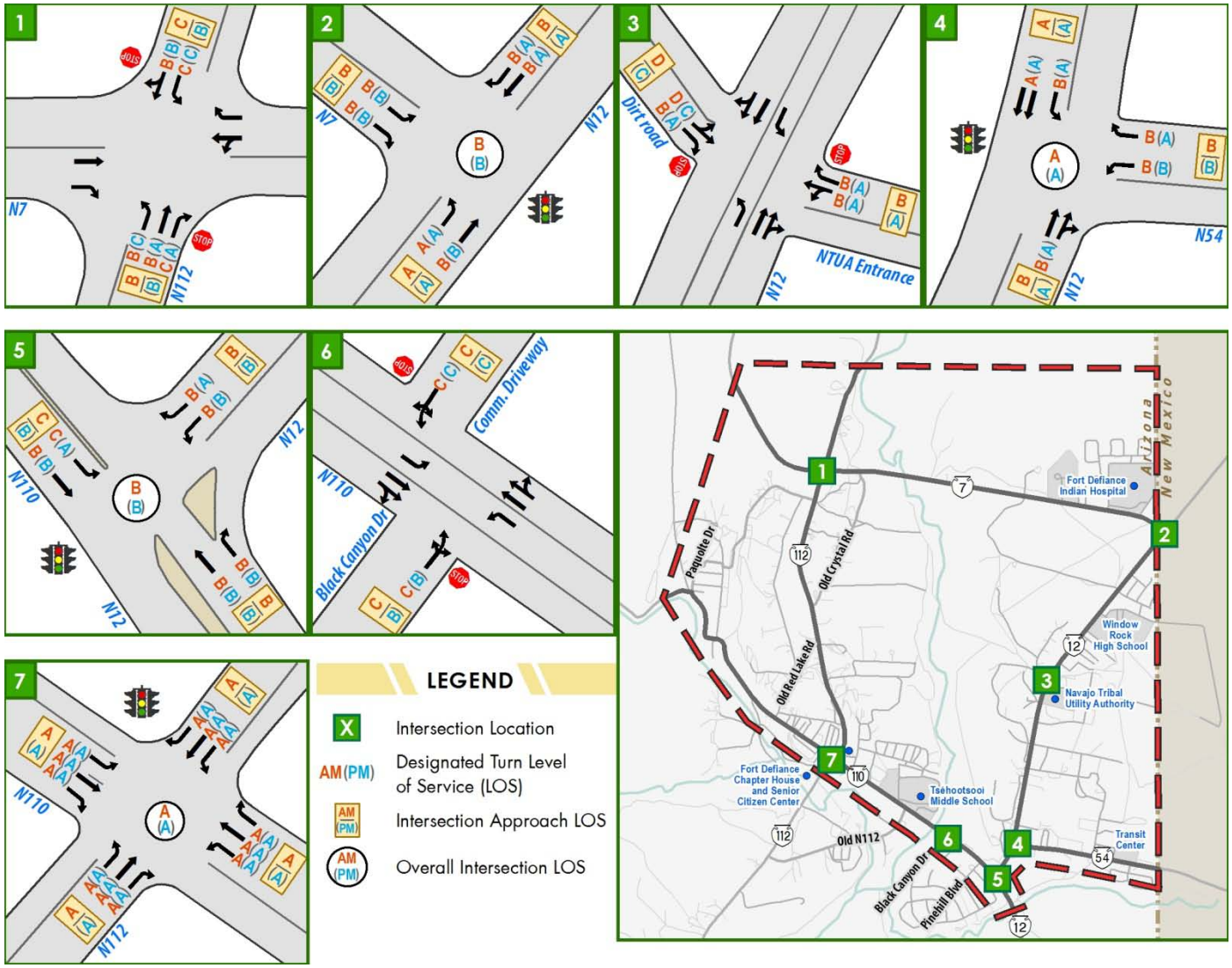


Figure 4.20. 2018 Intersection Level of Service



Projected 2023 Traffic Conditions

Projected 2023 Roadway Level of Service

Figure 4.21 displays the projected 2023 daily traffic volumes and Figure 4.22 illustrates the LOS for the roadway network with projected 2023 traffic volumes. Traffic volumes and LOS results in this section represent average annual daily traffic conditions. All study roadways operate at a LOS A and B, except for the following:

LOS C:

- N7: N12 to west of the Tséhootsooí Elementary School
- N 54: N12 to the eastern study boundary
- N12: Southern study boundary to N110
- N110: N112 to Old Red Lake Road
- N112: N110 to Old Crystal Road

Projected 2023 Intersection Level of Service

Based on the projected 2023 daily traffic volumes, intersection turn movement volumes were estimated using *NCHRP Report 255* methods. Intersection improvements such as additional turn lanes and traffic signals were identified to accommodate 2023 traffic conditions. Figure 4.23 illustrates the 2023 lane configuration; Figure 4.24 displays the projected 2023 turn movement volumes; and Figure 4.25 displays the overall intersection LOS, and the LOS at each turn movement for each leg/approach for each intersection. Table 4.5 summarizes the intersection LOS analysis.

Projected 2033 Traffic Conditions

Projected 2033 Roadway Level of Service

Figure 4.26 displays the projected 2033 daily traffic volumes and Figure 4.27 illustrates the LOS for the roadway network with projected 2033 traffic volumes. Traffic volumes and LOS results in this section represent average annual daily traffic conditions. All study roadways operate at a LOS A and B, except for the following:

LOS C:

- N7: N12 to west of the Tséhootsooí Elementary School
- N 54: N12 to the eastern study boundary
- N12: Southern study boundary to N110
- N110: N112 to Old Red Lake Road
- N112: N110 to Old Crystal Road

Projected 2033 Intersection Level of Service

Based on the projected 2033 daily traffic volumes, intersection turn movement volumes were estimated using *NCHRP Report 255* methods. Intersection improvements such as additional turn lanes and traffic signals were identified to accommodate 2033 traffic conditions. Figure 4.28 illustrates the 2033 lane configuration; Figure 4.29 displays the projected 2033 turn movement

volumes; and Figure 4.30 displays the overall intersection LOS, and the LOS at each turn movement for each leg/approach for each intersection. Table 4.6 summarizes the intersection LOS analysis.

Table 4.5. 2023 Intersection Level of Service Summary

Intersection	Level of Service
N112/N7	AM • Southbound approach is LOS D • All other approaches operate at LOS B or better • Southbound left turn movement is LOS B • All other turn movements operate at LOS B or better PM • Southbound approach is LOS C • All other approaches operate at LOS B or better • All southbound turn movements are LOS C • Northbound left turn movement is LOS C • Northbound thru movement is LOS C • All other turn movements are LOS A
N12/N7	AM • All approaches operate at LOS B or better • All turn movements operate at LOS B or better PM • All approaches operate at LOS B or better • All turn movements operate at LOS B or better
N12/NTUA Entrance	AM • Eastbound approach is LOS D • All other approaches are LOS B or better • Eastbound thru and left turn movements are LOS D • All other turn movements are LOS B or better PM • Eastbound approach is LOS C • All other approaches operate at LOS B or better • Eastbound thru and left turn movements are LOS C • All other turn movements are LOS B or better
N12/N54	AM • All approaches operate at LOS B or better • All turn movements operate at LOS B or better PM • All approaches operate at LOS B or better • All turn movements operate at LOS B or better
N12/N110	AM • Southbound approach is LOS C • All other approaches are LOS B or better • Southbound left turn movement is LOS C • Eastbound left turn movement is LOS C • All other turn movements are LOS B or better PM • All approaches operate at LOS B or better • All turn movements operate at LOS B or better

Table 4.5. 2023 Intersection Level of Service Summary (Continued)

Intersection	Level of Service
Black Canyon Drive/ N110	AM • Northbound approach is LOS C • Southbound approach is LOS C • All Southbound turn movements are LOS C • All Northbound turn movements are LOS C PM • Southbound approach is LOS C • All other approaches operate at LOS B or better • All Southbound turn movements are LOS C • All other turn movements are LOS B or better
N112/N110	AM • All approaches operate at LOS B or better • All turn movements operate at LOS B or better PM • All approaches operate at LOS B or better • All turn movements operate at LOS B or better

Table 4.6. 2033 Intersection Level of Service Summary

Intersection	Level of Service
N112/N7	AM • Southbound approach is LOS C • All other approaches are LOS B or better • Southbound left turn movement is LOS F • Northbound left turn movement is LOS C • All other turn movements are LOS B or better PM • Southbound approach is LOS C • Northbound approach is LOS C • Southbound left turn movement is LOS D • Southbound thru and left turn movements are LOS C • Northbound left turn movement is LOS D • Northbound thru movement is LOS C • All other turn movements are LOS B or better
N12/N7	AM • Eastbound approach is LOS C • All other approaches are LOS B or better • Eastbound right turn movement is LOS C • Southbound thru movement is LOS C • All other turn movements are LOS B or better PM • All approaches operate at LOS B or better • All turn movements operate at LOS B or better
N12/NTUA Entrance	AM • Eastbound approach is LOS E • Westbound approach is LOS E • Eastbound thru and left turn movements are LOS E • Eastbound right turn movement is LOS C • Westbound right turn movement is LOS C • Westbound thru and left turn movements are LOS E

Table 4.6. 2033 Intersection Level of Service Summary (Continued)

Intersection	Level of Service
N12/NTUA Entrance	PM • Westbound approach is LOS C • All other approaches are LOS B or better • Westbound right turn movement is LOS C • Westbound thru and left turn movement is LOS C • Eastbound thru and left turn movement is LOS C • All other turn movements are LOS B or better
N12/N54	AM • Westbound approach is LOS C • Northbound approach is LOS C • All other approaches are LOS B or better • Westbound right turn movement is LOS C • Westbound left turn movement is LOS D • Northbound thru movement is LOS C • Northbound thru and left turn movements are LOS C • Southbound left turn movement is LOS C • All other turn movements are LOS B or better PM • All approaches operate at LOS B or better • All turn movements operate at LOS B or better
N12/N110	AM • Eastbound approach is LOS C • Southbound approach is LOS C • All other approaches are LOS B or better • Eastbound left turn movement is LOS C • Eastbound right turn movement is LOS C • Southbound left turn movement is LOS C • Westbound thru movement is LOS C • All other turn movements are LOS B or better PM • All approaches operate at LOS B or better • All turn movements operate at LOS B or better
Black Canyon Drive/ N110	AM • Northbound approach is LOS C • Southbound approach is LOS C • All Southbound turn movements are LOS C • All Northbound turn movements are LOS C PM • Southbound approach is LOS C • All other approaches are LOS B or better • All Southbound turn movements are LOS C • All other turn movements operate at LOS B or better
N112/N110	AM • All approaches operate at LOS B or better • All turn movements operate at LOS B or better PM • All approaches operate at LOS B or better • All turn movements operate at LOS B or better

Figure 4.21. 2023 Projected Average Daily Traffic Volumes

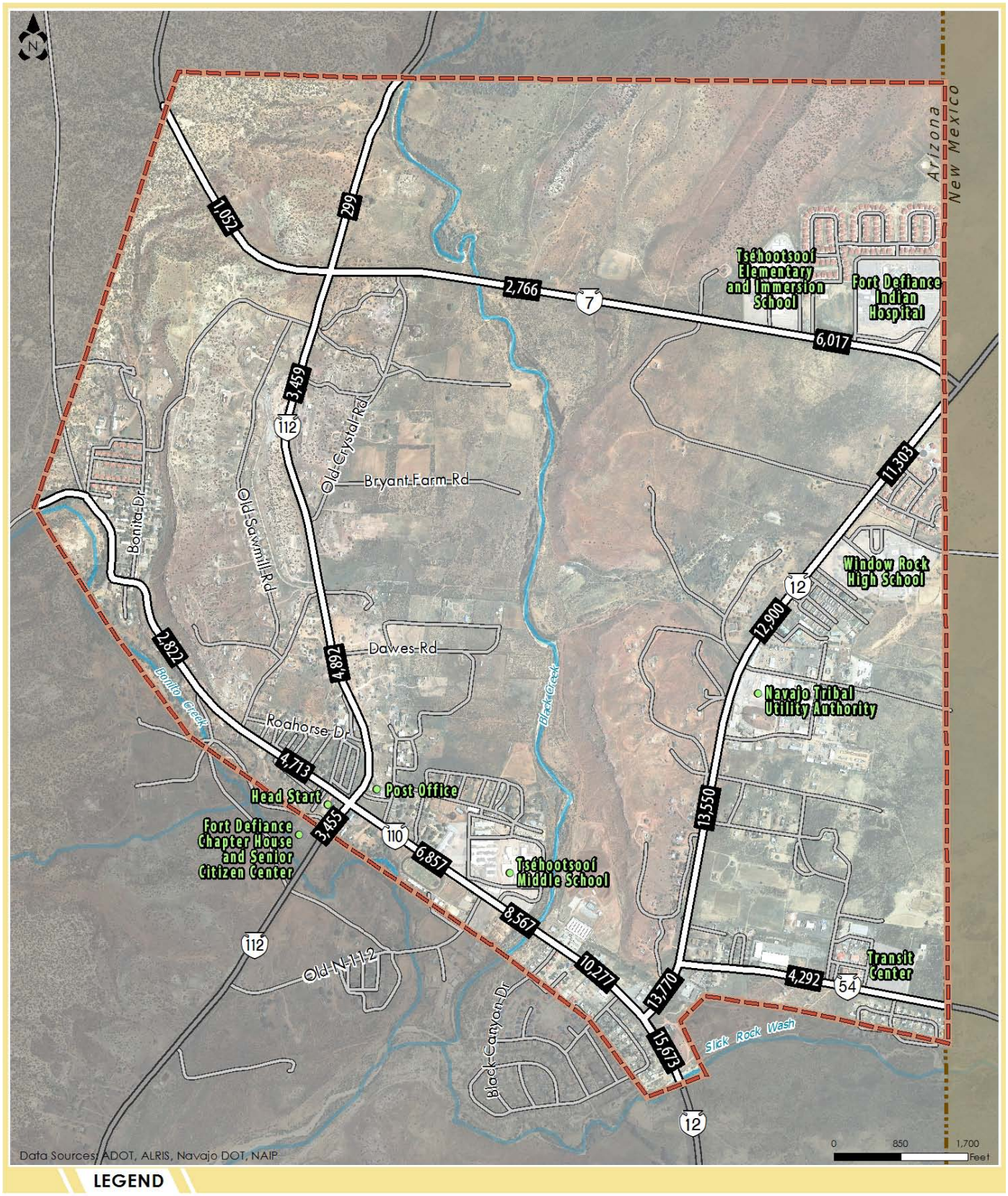


Figure 4.22. 2023 Level of Service

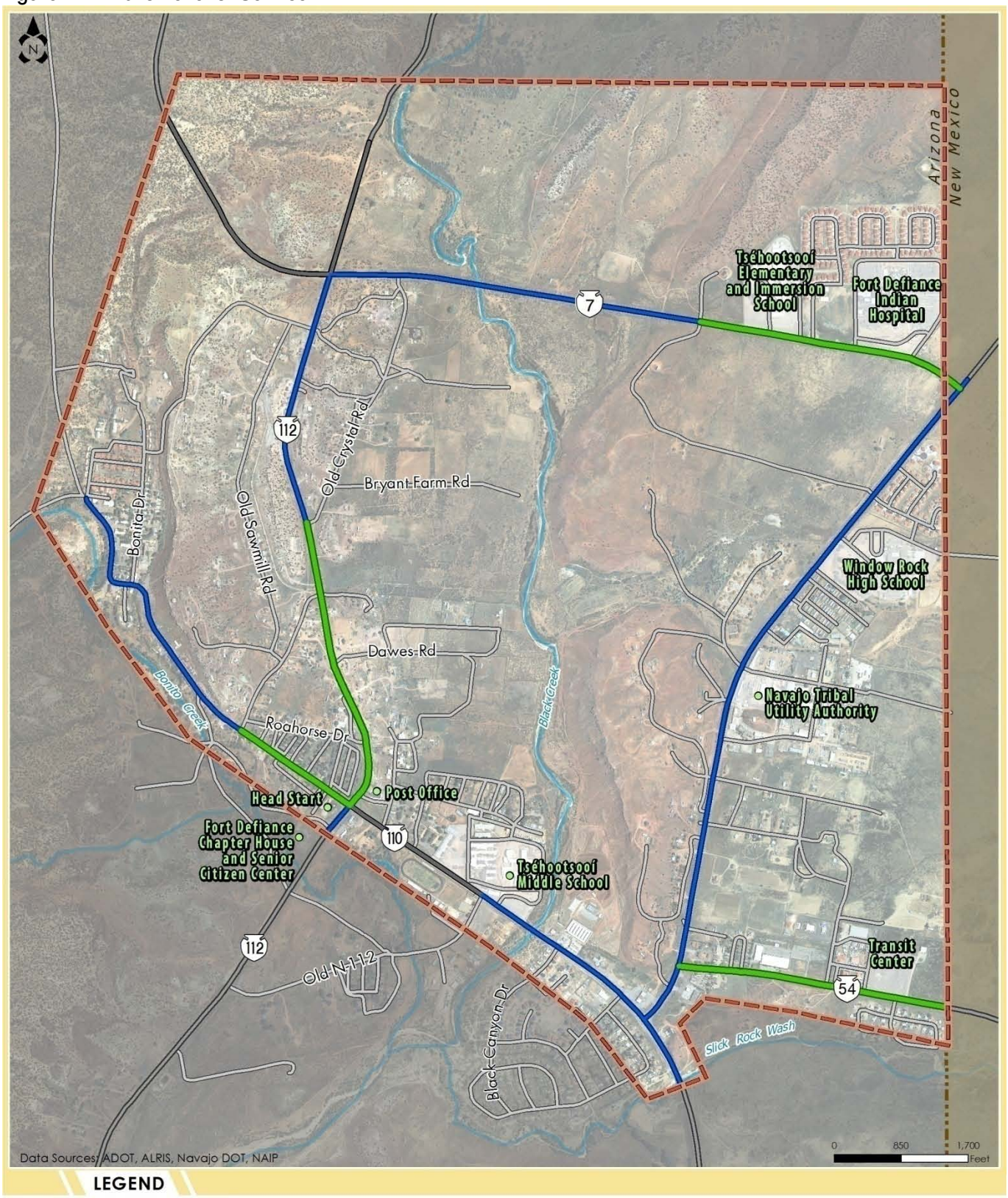


Figure 4.23. 2023 Intersection Lane Configuration

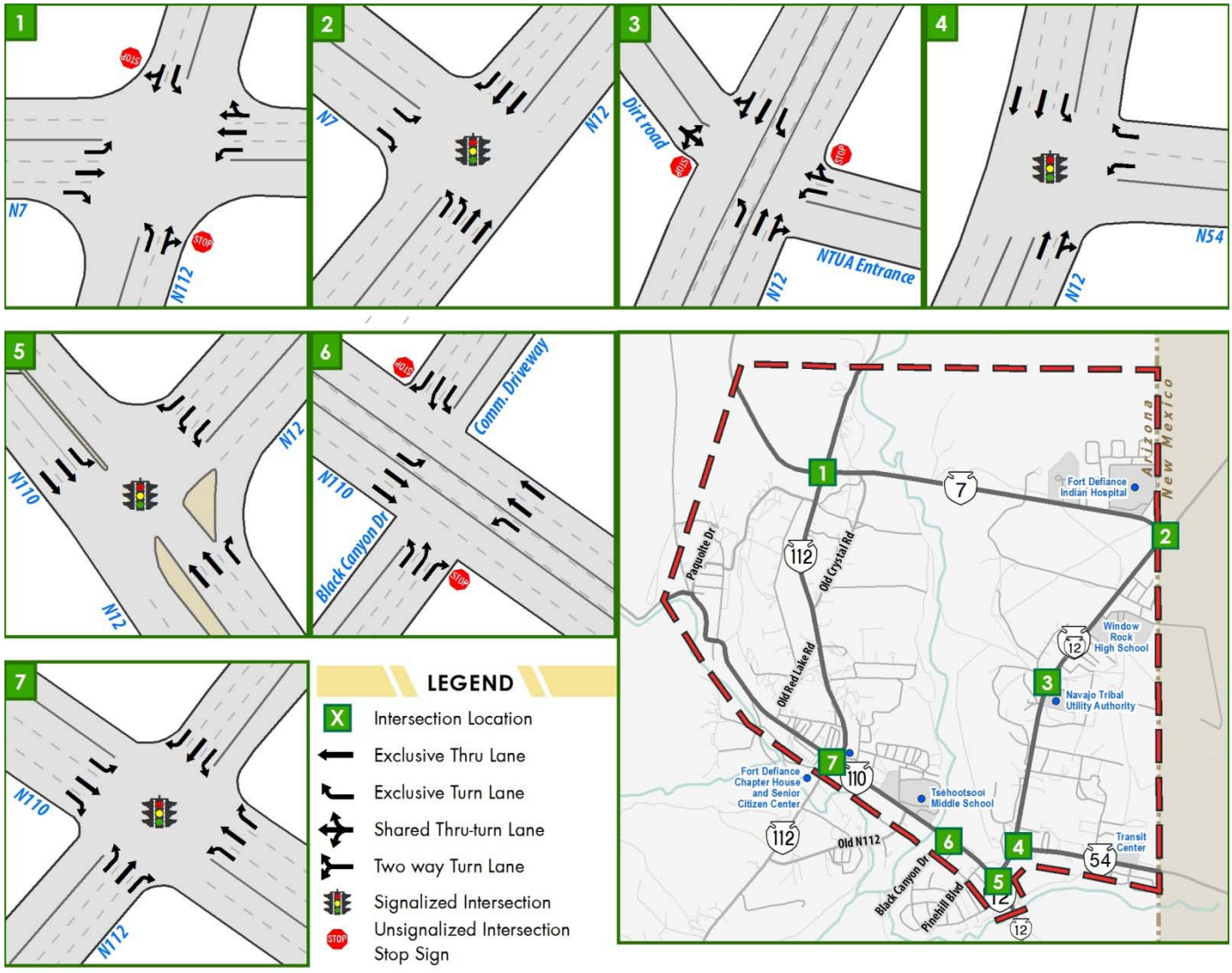


Figure 4.24. 2023 Intersection Turning Movement Volumes

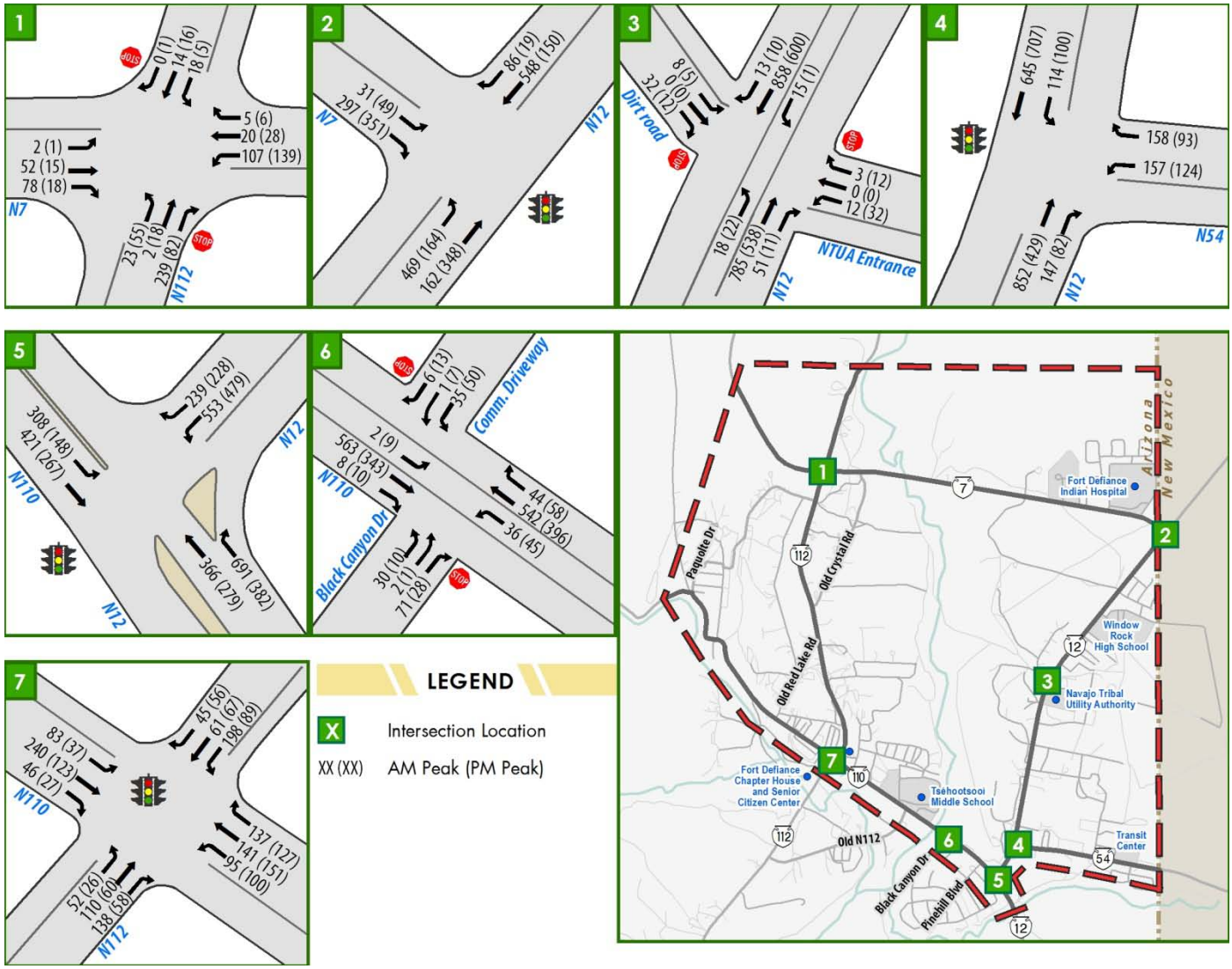


Figure 4.25. 2023 Intersection Level of Service

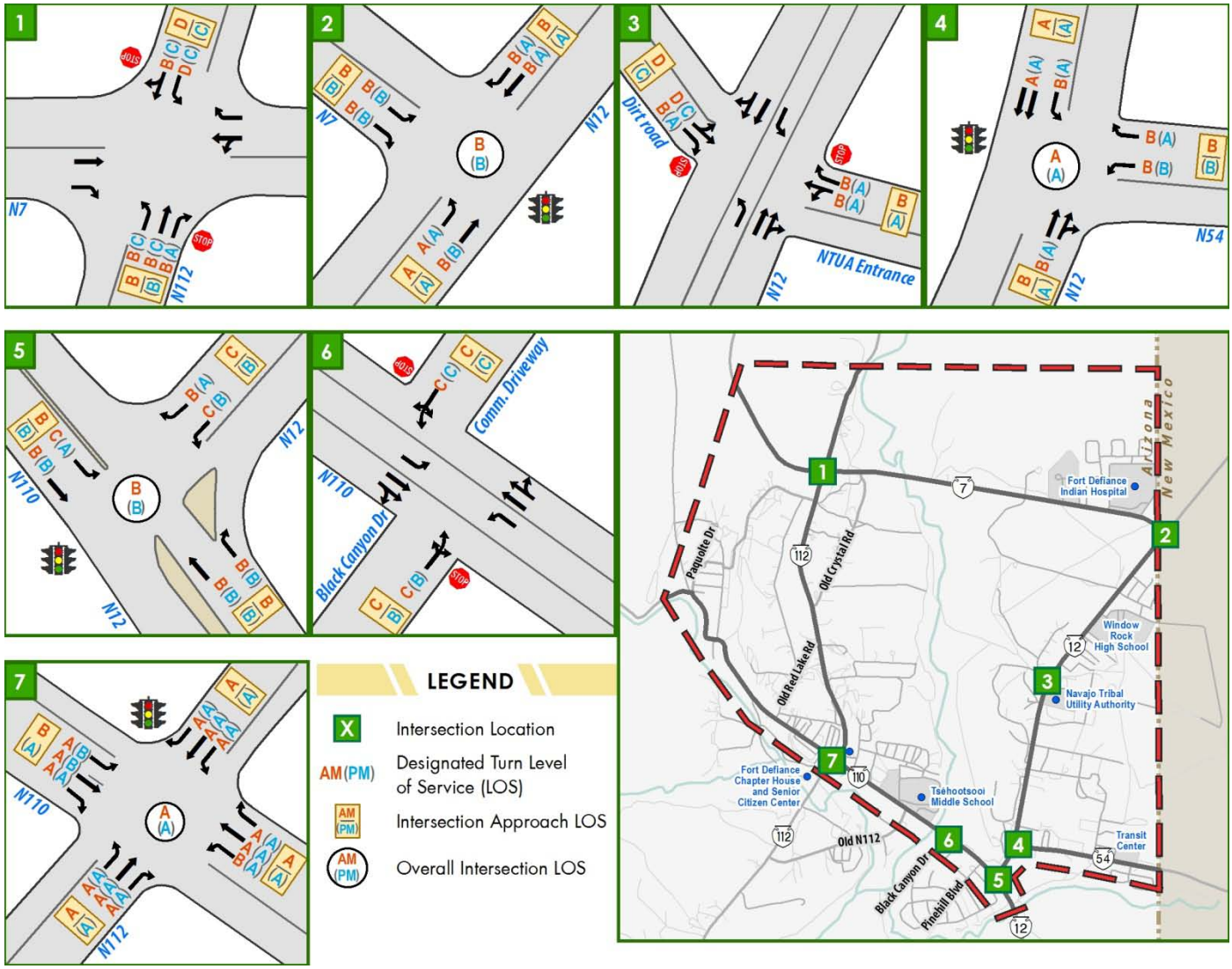


Figure 4.26. 2033 Projected Average Daily Traffic Volumes

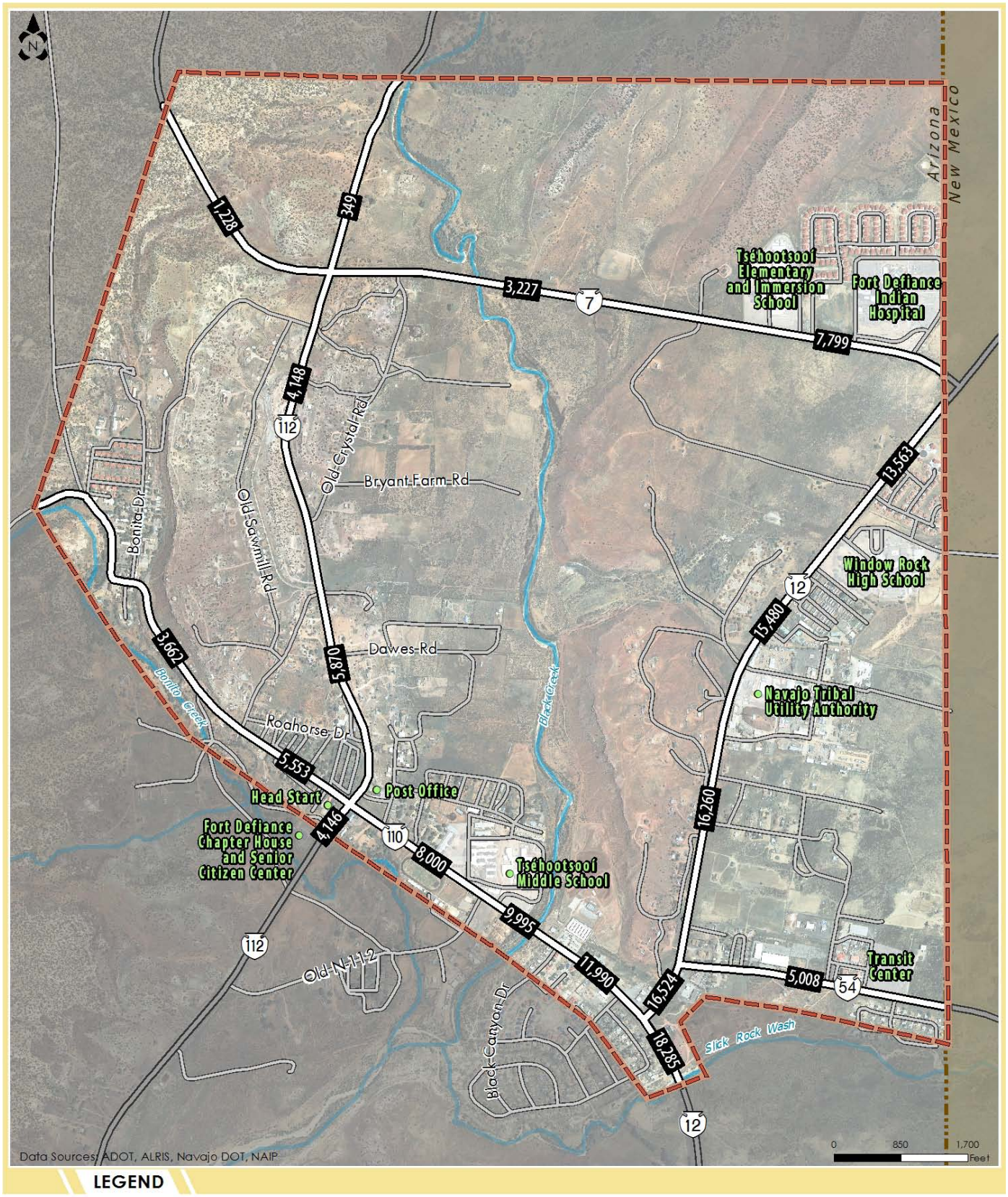


Figure 4.27. 2033 Level of Service

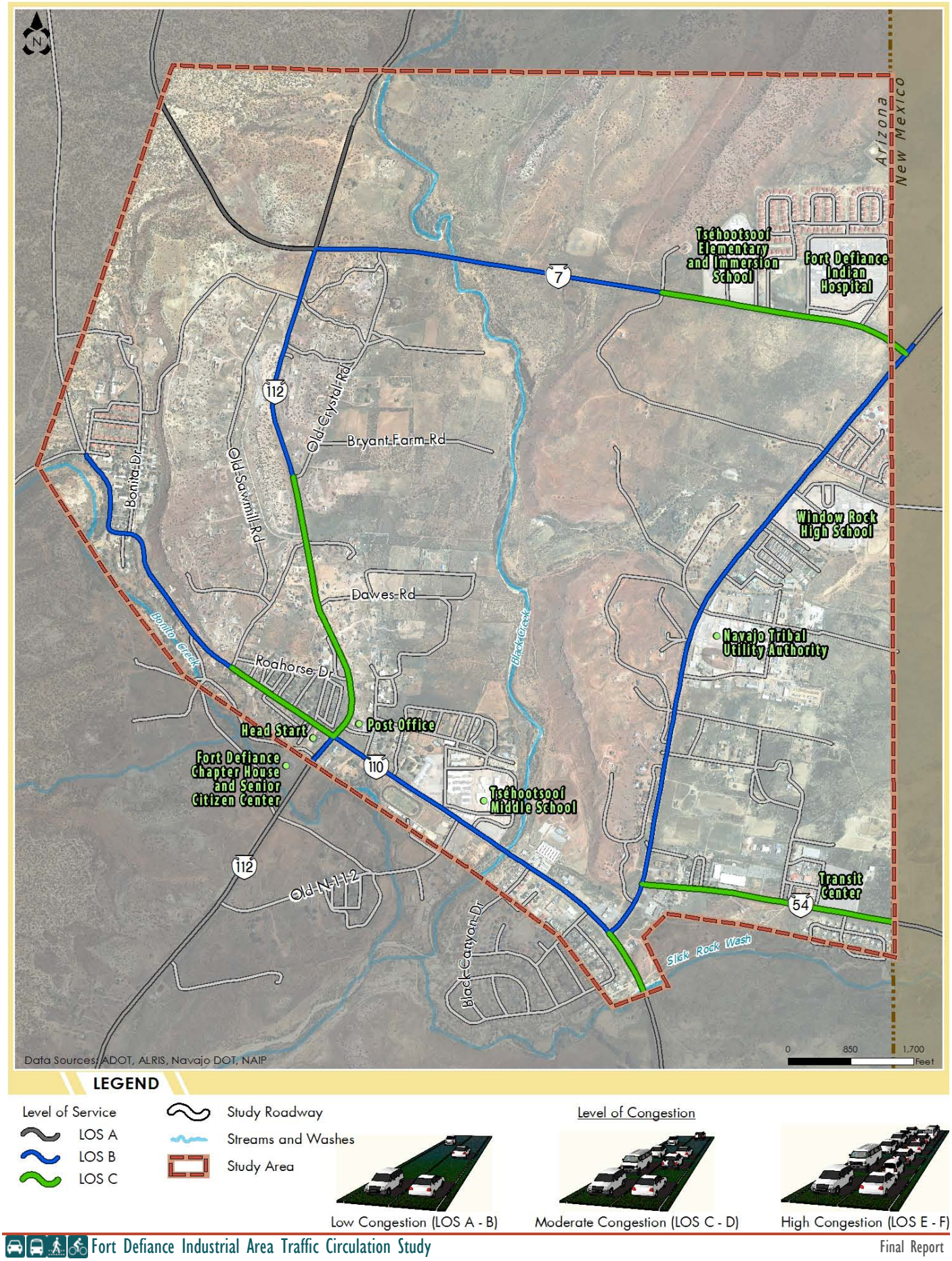


Figure 4.28. 2033 Intersection Lane Configuration

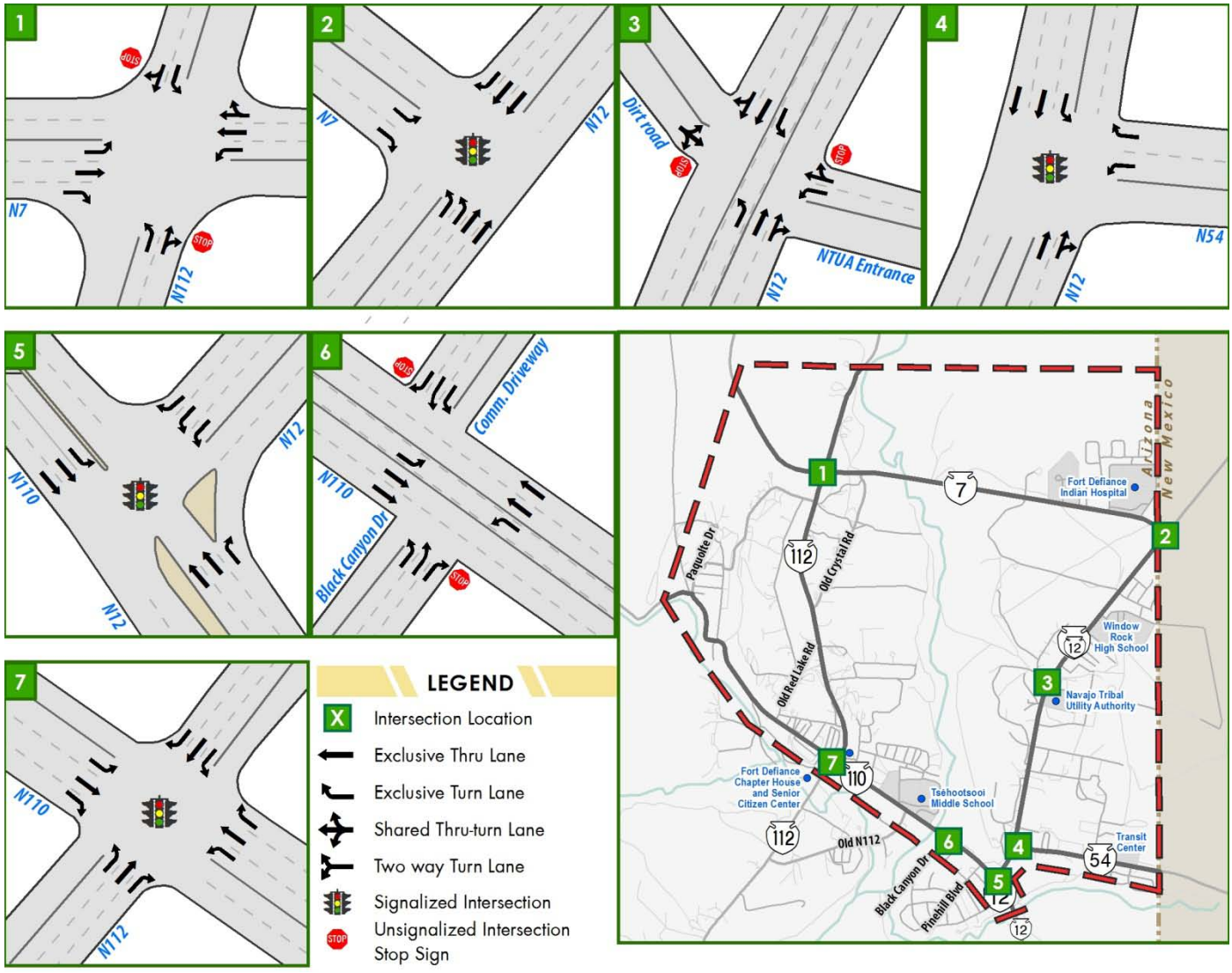


Figure 4.29. 2033 Intersection Turning Movement Volumes

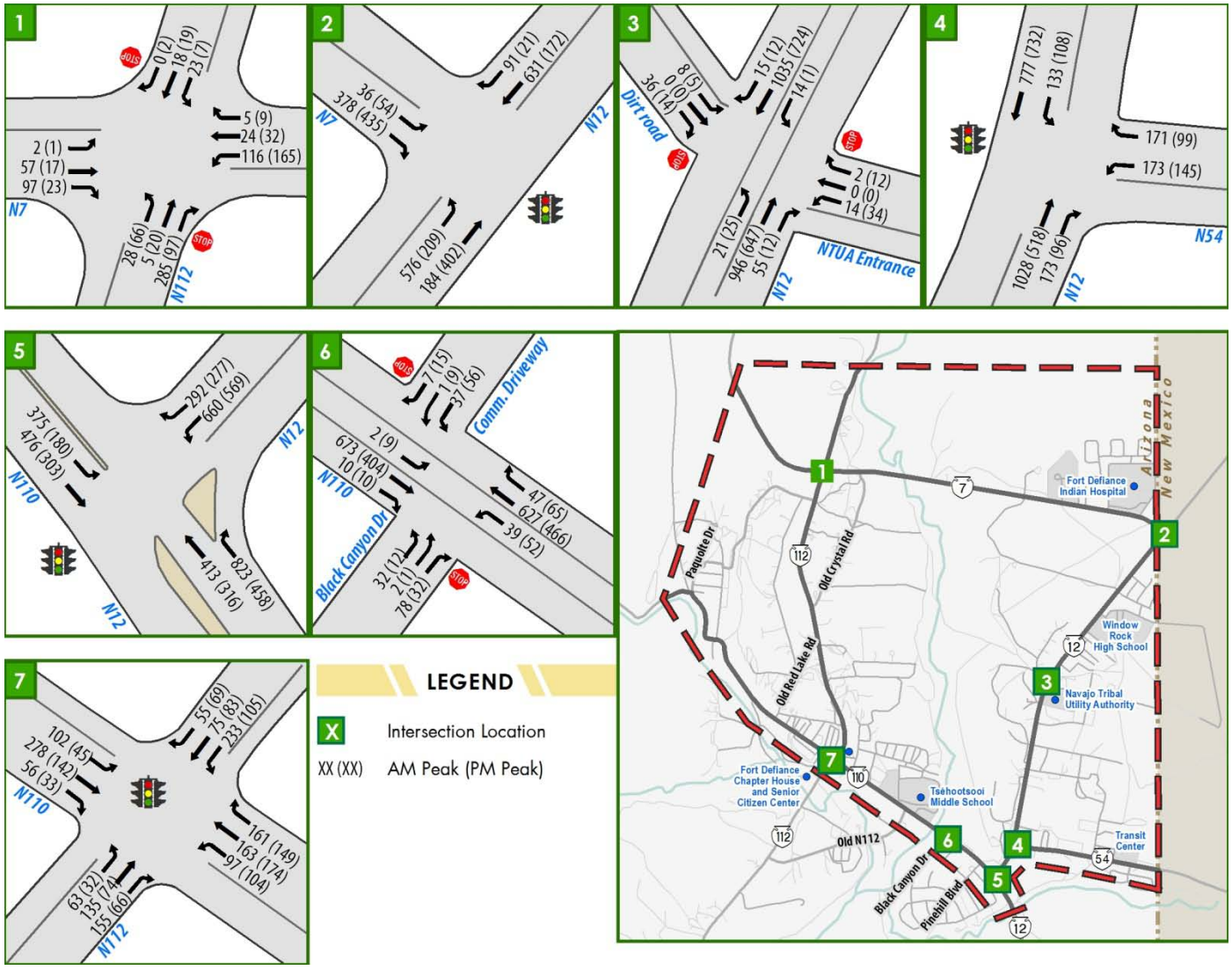
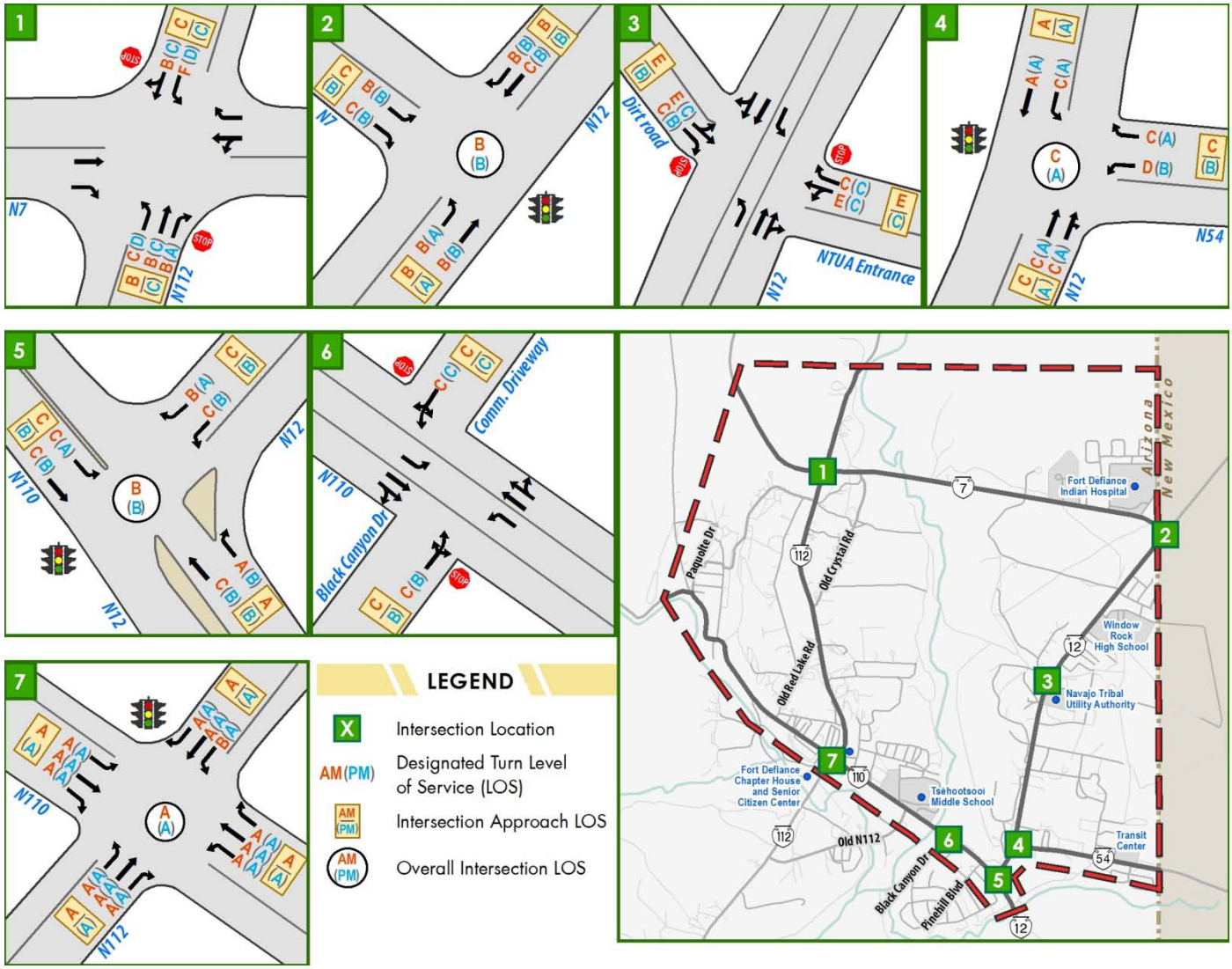


Figure 4.30. 2033 Intersection Level of Service



OTHER MODES OF TRANSPORTATION

Existing Pedestrian and Bicycle Facilities

Alternative modes of transportation are an important aspect of the multimodal transportation network as they provide mobility for those not able to operate without access to a vehicle. Figure 4.31 illustrates the existing sidewalks and pedestrian facilities in Fort Defiance. During the field review, pedestrian and bicycle use of the roadways was frequently witnessed.

Sidewalks are currently present along portions of N12, N54, and N110; however, during the field review many pedestrians were observed using the roadway shoulder in places where sidewalks do not exist. A pedestrian overpass is available near Tséhootsooí Middle School to allow pedestrians to safely cross N110. The overpass is typically used by students attending the school and sports center. Currently there are no bicycle lanes within the study area, and pedestrian trails are created by frequent traffic in locations where sidewalks do not exist. In general crosswalks are poorly striped and too wide to cross in a safe manner, and most sidewalks are in poor condition.

Existing Transit Facilities

Navajo Transit Services (NTS) currently provides transit services within, to, and from the Fort Defiance study area. NTS provides fixed-route transit services to 41 Navajo Chapters. The NTS Transit Center, located along N54, serves as a central hub for the Nation's bus fleet. Additionally, the NTS Transit Center houses areas for administration, office and clerical, vehicle repair, storage and fueling.

The following routes are provided by the NTS:

- Route 1: Tuba City to Fort Defiance and return
- Route 2: Steamboat to Window Rock and return
- Route 3: Kayenta to Fort Defiance and return
- Route 4: Crownpoint, NM to Fort Defiance and return
- Route 5: Gallup, NM to Fort Defiance and return
- Route 6: Crystal, NM to Gallup, NM and return
- Route 7: Shiprock, NM to Fort Defiance and return
- Route 9: Dikon to Fort Defiance and return
- Route 13: Fort Defiance to Crownpoint, NM and Gallup, NM and return
- Route 14: Shiprock, NM to Fort Defiance and return
- Route 15: Sanders to Window Rock and Gallup, NM and return

Table 4.7 provides an overview of the existing NTS transit routes that service the study area, as well as the approximate departure time from study area bus stop locations. Figure 4.32 provides an overview of transit stop locations within the study area that service existing NTS routes.

Figure 4.31. Existing Pedestrian Facilities

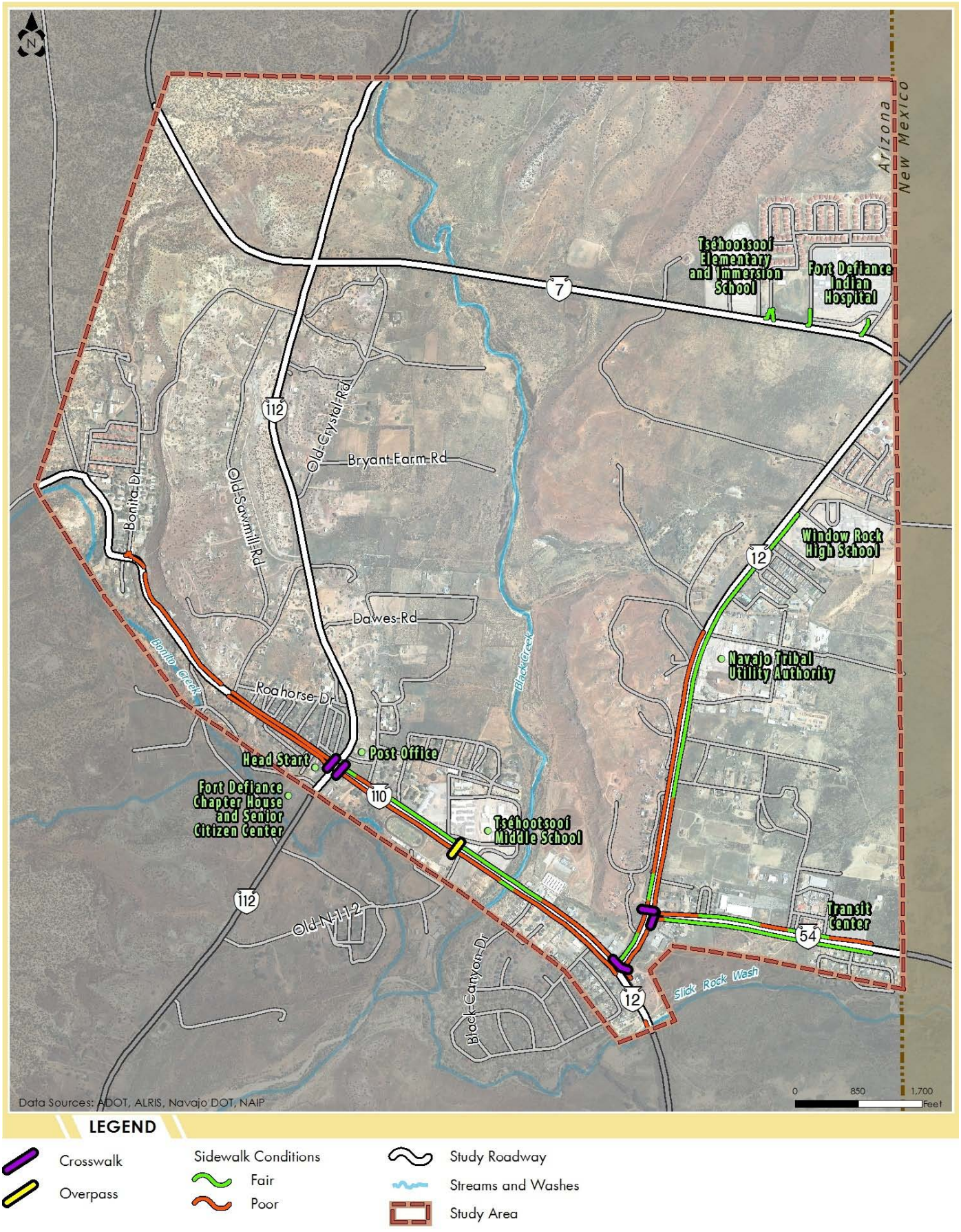


Figure 4.32. Existing Transit Facilities

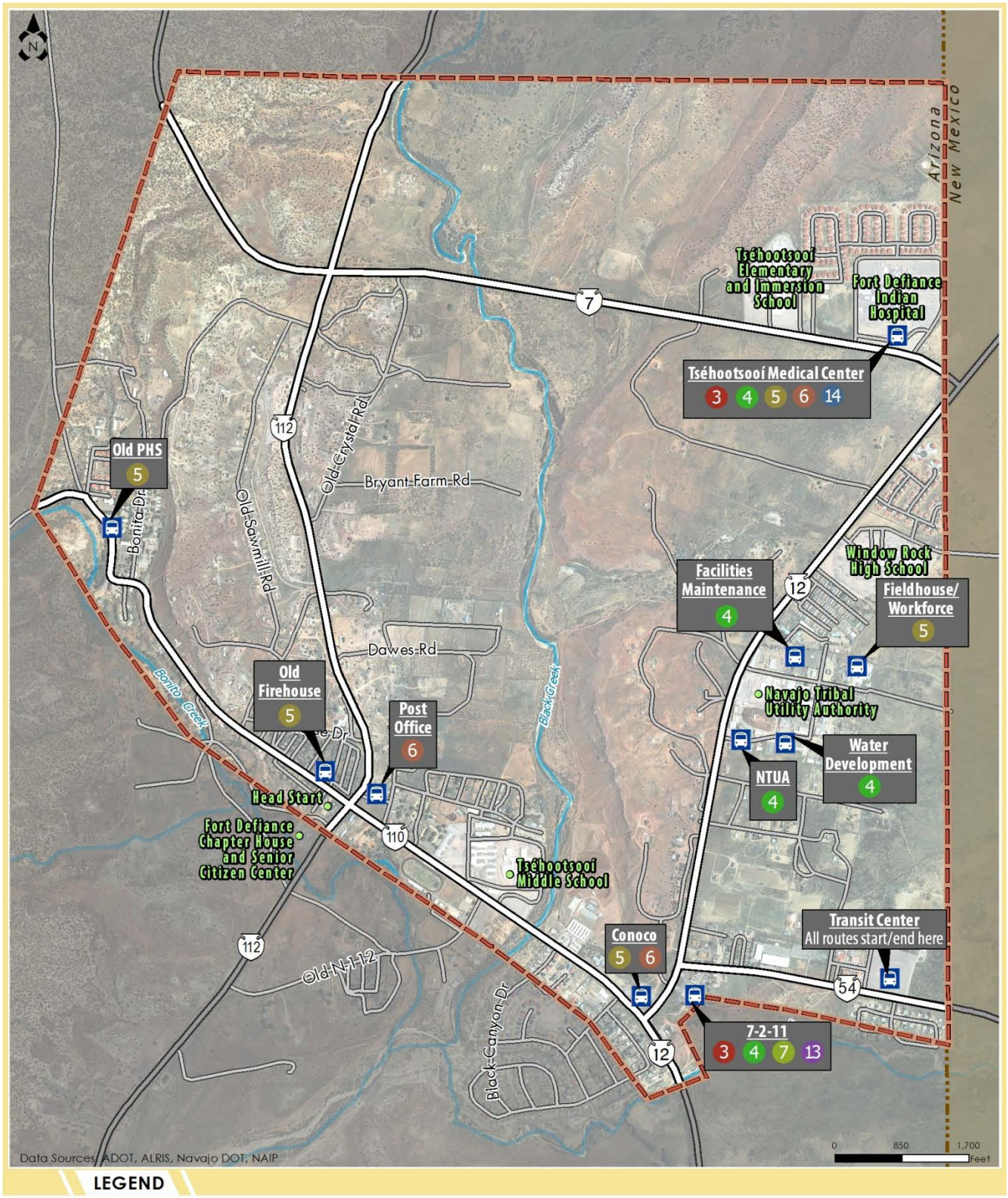


Table 4.7. NTS Transit Routes

Route	From/To	Location	Time	2nd	3rd	4th
Rt 1 - Tuba City	Tuba City/Fort Defiance	NTS Shop	10:00 AM			
	Fort Defiance/Tuba City	NTS Shop	2:50 PM			
Rt 2 - Steamboat	Steamboat/Fort Defiance	NTS Shop	8:12 AM			
	Fort Defiance/Steamboat	NTS Shop	4:50 PM			
Rt 3 - Kayenta	Kayenta/Fort Defiance	Tsehootsooi Medical Center	9:20 AM			
		7-2-11 Store	9:25 AM			
		NTS Shop	10:00 AM			
	Fort Defiance/Kayenta	NTS Shop	2:45 PM			
		7-2-11 Store	3:25 PM			
		Tsehootsooi Medical Center	3:30 PM			
Rt 4 - Crownpoint	Crownpoint/Fort Defiance	7-2-11 Store	7:50 AM			
		NTUA	7:55 AM			
		Water Development	7:58 AM			
		Facilities Maintenance	8:00 PM			
		Tsehootsooi Medical Center	8:05 PM			
		NTS Shop	8:15 PM			
	Fort Defiance/Crownpoint	NTS Shop	4:55 PM			
		7-2-11 Store	4:50 PM			
		Tsehootsooi Medical Center	5:00 PM			
		NTUA	5:05 PM			
		Water Development	5:08 PM			
		Facilities Maintenance	5:10 PM			
Rt 5 - Gallup	Fort Defiance/Gallup	NTS Shop	5:30 AM	9:15 AM	12:25 PM	5:00 PM
		New PHS		9:25 AM	12:30 PM	
		Conoco	5:35 AM	9:35 AM	12:35 PM	5:05 PM
		Road Stop (Old Firehouse)			12:45 PM	5:08 PM
		Old PHS		9:40 AM	12:48 PM	5:12 PM
		Workforce/Fieldhouse		9:50 AM	12:53 PM	5:30 PM
	Gallup/Fort Defiance	Road Stop (Old Firehouse)	7:48 AM		3:18 PM	
		Old PHS	7:50 AM		3:20 PM	
		H/S Fieldhouse/Workforce	7:55 AM		3:25 PM	7:48 PM
		Conoco	8:00 AM		3:30 PM	7:50 PM
		New PHS				
		NTS Shop	8:05 AM	12:14 PM	3:35 PM	7:55 PM
Rt 6 - Crystal	Crystal/Fort Defiance	I.H.S.	7:15 AM			
		Conoco	7:20 AM			
		Post Office	7:25 AM			
		Fieldhouse	7:30 AM			
		NTS Shop	9:15 AM			
	Fort Defiance/Crystal	NTS Shop	3:00 PM			
		Conoco	3:05 PM			
		Conoco	5:35 PM			
		Post Office	5:40 PM			
		Fieldhouse	5:43 PM			
		I.H.S.	5:50 PM			

Table 4.7. NTS Transit Routes (Continued)

Route	From/To	Location	Time	2nd	3rd	4th
Rt 7 - Newcomb/Ft. Defiance	Newcomb/Fort Defiance	7-2-11 Store	10:03 AM			
		NTS Shop	10:05 AM			
	Fort Defiance/Newcomb	NTS Shop	2:05 PM			
		7-2-11 Store	2:10 PM			
Rt 9 - Dilkon	Dilkon/Fort Defiance	NTS Shop	8:12 AM			
	Fort Defiance/Dilkon	NTS Shop	4:40 PM			
Rt 13 - Crownpoint/Gallup	Fort Defiance/Crownpoint-Gallup	NTS Shop	6:00 AM			
		7-2-11 Store	6:05 AM			
		NTS Shop	10:20 AM			
	Crownpoint-Gallup/Fort Defiance	NTS Shop	2:45 PM			
		7-2-11 Store	6:48 PM			
		NTS Shop	6:50 PM			
Rt 14 - Shiprock/Ft. Defiance	Shiprock/Fort Defiance	PHS Hospital	7:50 AM			
		NTS Shop	8:00 AM			
	Fort Defiance/Shiprock	NTS Shop	4:50 PM			
		NHA	4:55 PM			
		PHS Hospital	5:05 PM			
Rt 15 - Sanders/Window	Sanders/Fort Defiance	NTS Shop	9:30 AM			
	Fort Defiance/Sanders	NTS Shop	4:50 PM			

Source: Navajo Transit System

TRANSPORTATION ISSUES, DEFICIENCIES, AND NEEDS SUMMARY

Based on the inventory and analysis of existing conditions, transportation system deficiencies and issues were identified. These issues and deficiencies formed the basis for the development of the transportation improvement plan. Figure 4.33 is a summary of the major roadway issues in the study area and Figure 4.34 is a summary of issues for the transit, pedestrian, and bicycle modes.

Figure 4.33. Roadway Issues and Needs Summary

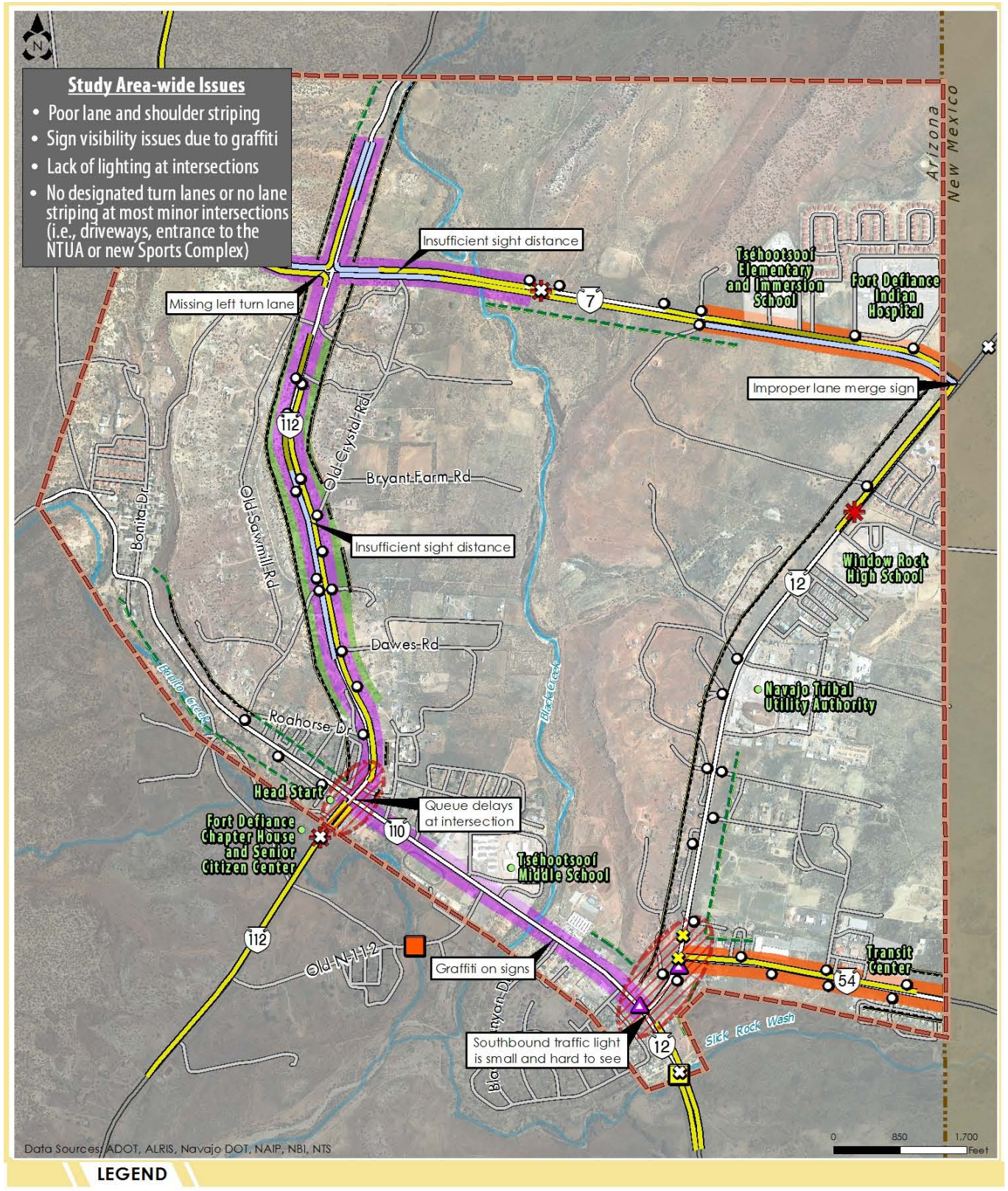
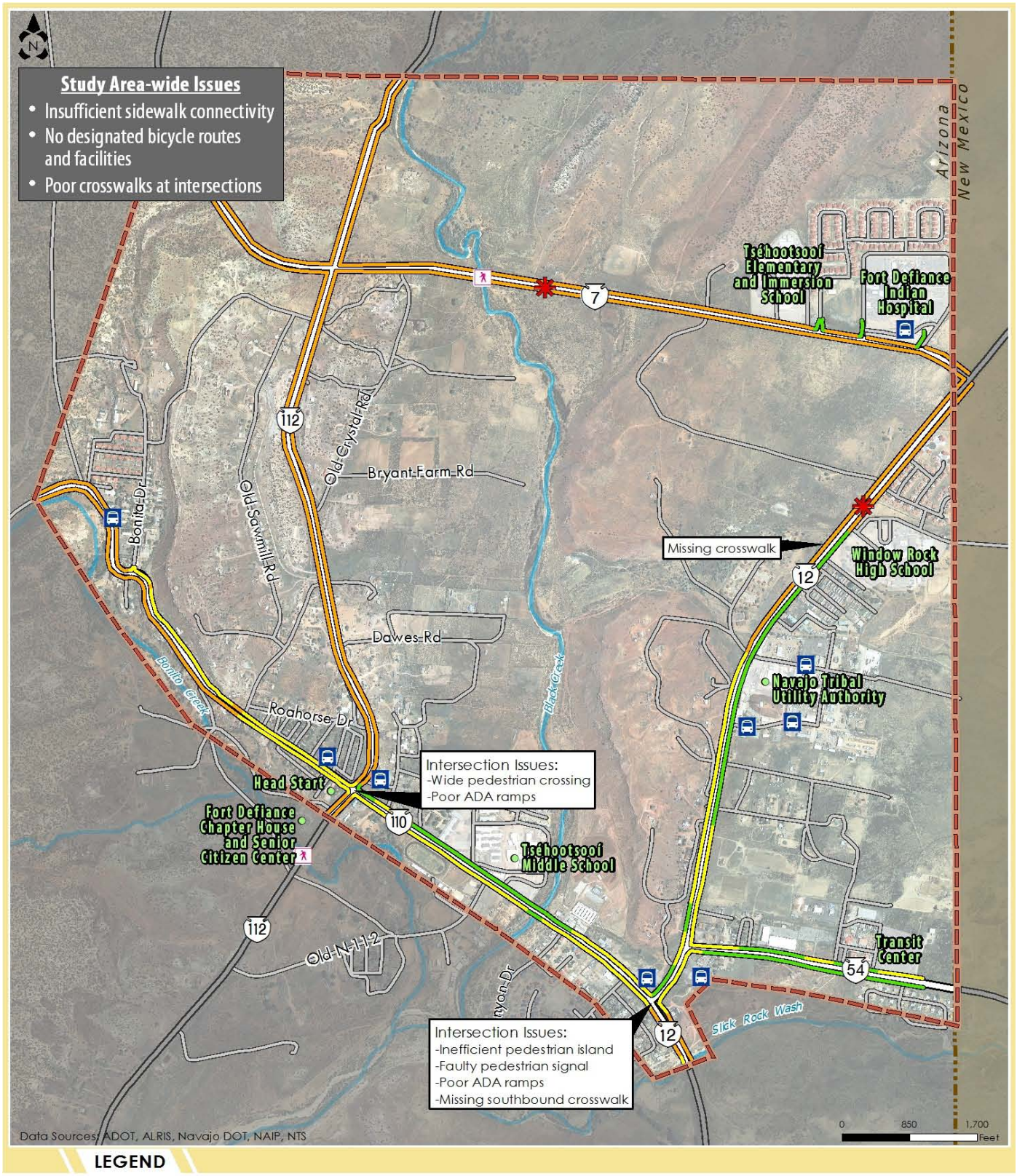


Figure 4.34. Pedestrian, Bicycle, and Transit Summary of Issues and Needs



5. EVALUATION OF IMPROVEMENTS

This chapter presents the initial improvement concepts and the criteria used for evaluating recommendations for the Fort Defiance study area. Initial concepts were developed based on deficiencies and needs identified in the existing conditions analysis; future land use, socioeconomic, and traffic conditions; and the goals and objectives established by the study team and the TAC at the onset of the study.

EVALUATION CRITERIA

Transportation system deficiency analysis and input from the public, stakeholders, and the TAC resulted in a comprehensive list of existing and future transportation issues and needs for the Fort Defiance community. Table 5.1 summarizes the criteria utilized used in evaluating potential transportation improvement options.

Table 5.1 Evaluation Criteria

Evaluation Criteria	Objectives
Deficiencies and Needs	• Mitigate existing deficiencies • Support future needs
Safety and Security	• Reduce vehicle, pedestrian, and bicycle collisions • Improve access for emergency services
Economic Development Opportunity	• Promote economic growth • Compatible with existing and planned development
Transportation Choices	• Support transit, pedestrian, and bicycle modes
Congestion/Level of Service	• Reduce congestion, bottlenecks and travel times for all modes • Support future traffic demand
Mobility and Access	• Improve linkages between vehicular, transit, pedestrian, and bicycle modes • Facilitate efficient regional mobility • Maintain travel reliability
Environmental Impacts	• Protect and enhance natural, historical, and cultural environment by minimizing potential adverse impacts
Infrastructure Preservation/Maintenance	• Preserve and maintain existing transportation infrastructure
Cost Efficiency and Implementation Feasibility	• Minimize capital cost of improvements, including preservation of right-of-way (ROW) • Reduce ROW impacts • Implementable and Flexible

ROADWAY IMPROVEMENT OPTIONS

Based on the traffic analysis, summarized in Chapter 4, no roadway capacity improvements need to be made to accommodate future traffic demand. In order to enhance safety and to conform to BIA standards, the following safety and roadway improvements were evaluated:

- Street cross-section enhancements;
- Street lighting; and
- Traffic calming measures at school zones and entryways to the study area.

The following section presents a summary of the different safety enhancements evaluated to identify the most effective improvements for the Fort Defiance study area.

Street Cross-Sections

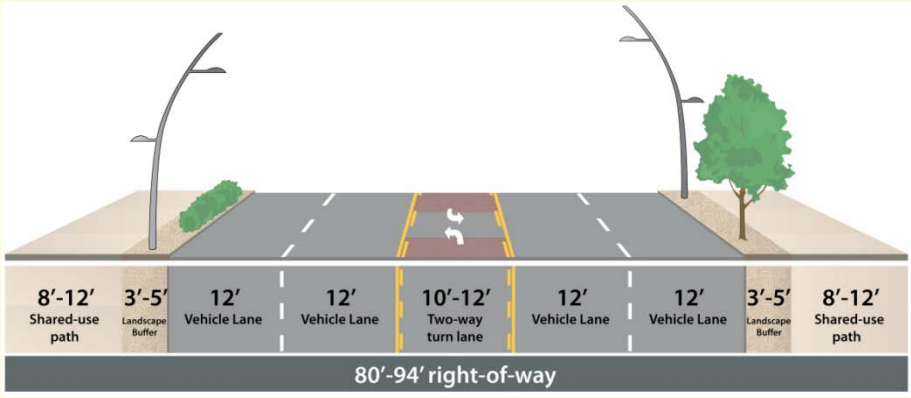
Roadway cross-sections provide the framework for designing and improving community roadways. A road's cross-section is based on several factors, including: existing and future traffic volumes, type of traffic that utilizes the facility; functional classification; level of pedestrian, bicycle, and transit activity; surrounding land use; right-of-way (ROW) availability; and proposed development surrounding the corridor. To accommodate multiple transportation modes, many communities are utilizing "Complete Street" initiatives to develop cross-sections to enhance the safety along roadways.

According to the National Complete Streets Coalition, typical elements that make up a complete street include sidewalks, bicycle lanes (or paved shoulders), shared-use paths, designated bus lanes, safe and accessible transit stops, and safe pedestrian crossings. Based on input from the TAC, stakeholders, and the public; cross-section concepts were developed for the study roadways that incorporate complete street elements while maintaining the rural, historical character of the community.

Table 5.2 summarizes cross-sections evaluated for the Fort Defiance study area roadways.

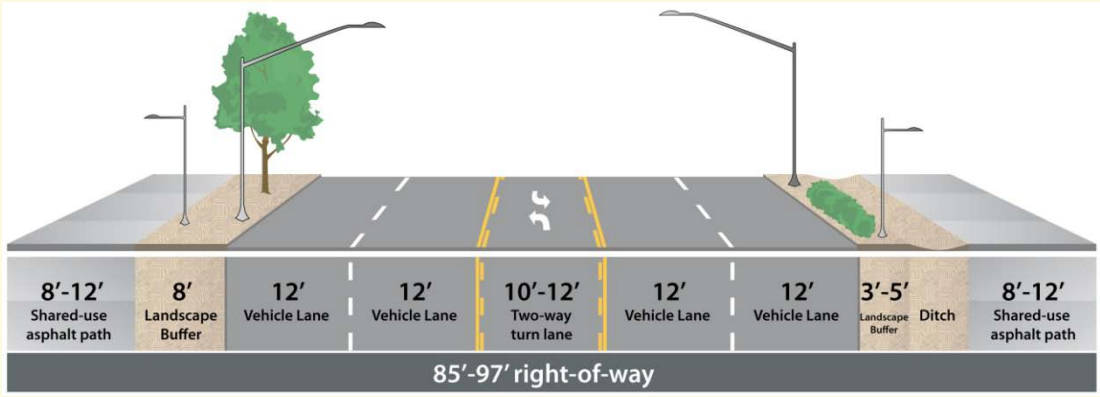
Table 5.2. Cross-Section Options

Option 1: Rural Arterial - Commercial Corridor



Applicable Roadways:	• N110: N12 to N112	• N12: Southern study boundary to N54
Roadway Context:	• Experiences high traffic volumes • Restricted ROW Conditions	• Serves regional and local traffic • Located in fully developed area
Number of Lanes & Median:	• Two 12 FT lanes in both directions	• 10 - 12 FT two-way center turn lane
Right-of-Way Width:	80 - 94 FT	
Street Elements:	• 3 - 5 FT landscape buffer on both sides of road • Street lighting	• Bus bays where applicable • Pedestrian crosswalks at appropriate intervals
Pedestrian/ Bike Facilities:	8 - 12 FT concrete shared use path in both directions	

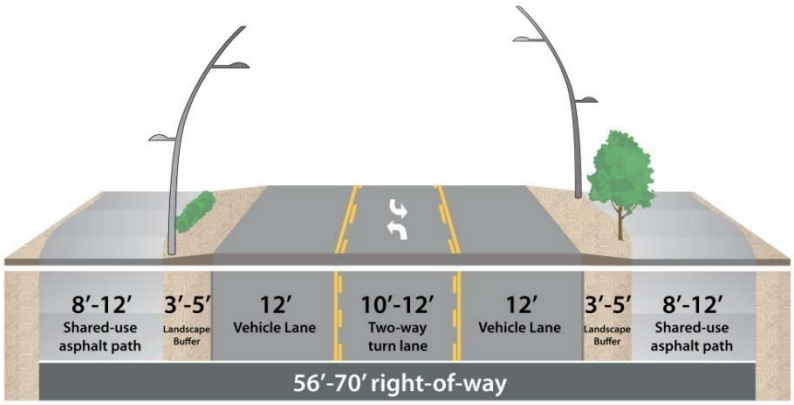
Option 2: Rural Arterial - Partially Developed Corridor



Applicable Roadways:	• N12: N54 to N7	
Roadway Context:	• Experiences high traffic volumes • Additional ROW available	• Serves regional and local traffic • Located in partially developed area
Number of Lanes & Median:	• Two 12 FT lanes in both directions	• 10 - 12 FT two-way center turn lane
Right-of-Way Width:	85 - 97 FT	
Street Elements:	• Landscape buffer on both sides of road • Ditch for drainage • Street lighting	• Bus bays where applicable • Pedestrian crosswalks at appropriate intervals
Pedestrian/ Bike Facilities:	8-12 FT asphalt/concrete shared use path in both directions	

Table 5.2. Cross-Section Options (Continued)

Option 3: Rural Collector - Partially Developed Corridor

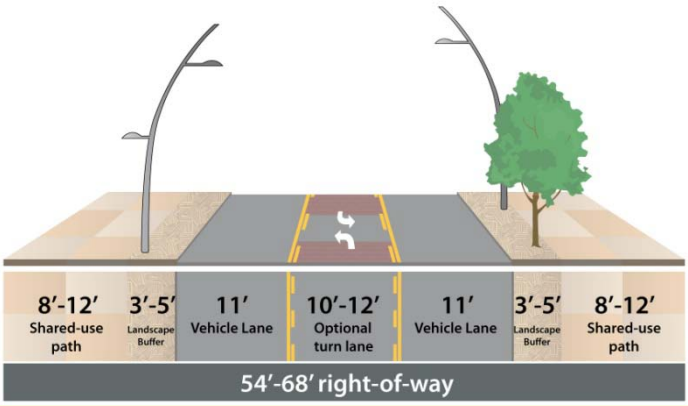


Applicable Roadways:	• N112: Southern study boundary to Old Crystal Rd	• N7: N12 to Tséhootsooí Elementary School • N54: N12 to Eastern study boundary
Roadway Context:	• Experiences medium to high traffic volume	• Serves regional and local traffic • Located in partially developed area
Number of Lanes & Median:	• One 12 FT lane in both directions	• 10 - 12 FT two-way center turn lane
Right-of-Way Width:	56 - 70 FT	
Street Elements:	• 3 - 5 FT landscape buffer on both sides of road • Street lighting	• Bus bays where applicable • Pedestrian crosswalks at appropriate intervals
Pedestrian/ Bike Facilities:	8 - 12 FT asphalt shared use path in both directions	

Option 4: Rural Collector - Rural Area Corridor

Applicable Roadways:	• N112: Old Crystal Rd to Northern study boundary	• N7: Tséhootsooí Elementary School to Western study boundary
Roadway Context:	• Experiences low/med traffic volumes	• Located in rural area and serves local traffic
Number of Lanes & Median:	• One 12 FT lane in both directions	• No center turn lane/median
Right-of-Way Width:	46 - 58 FT	
Street Elements:	• 3 - 5 FT landscape buffer on both sides • Street lighting	• Bus bays where applicable
Pedestrian/ Bike Facilities:	8-12 FT asphalt shared use path in both directions	

Table 5.2. Cross-Section Options (Continued)

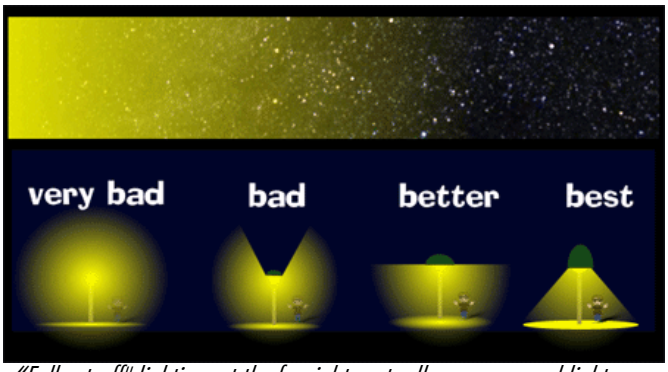
Option 5: Rural Collector - Old Town / Main Street Corridor		
		
Applicable Roadways:	• N110: N112 to Western study boundary	
Roadway Context:	• Experiences low to medium traffic volumes • Located in Old town / Downtown / Main Street area • Serves local traffic	
Number of Lanes & Median:	• One 12 FT lane in both directions	• Optional 10 - 12 FT two-way center turn lane
Right-of-Way Width:	54 - 68 FT	
Street Elements:	• 3 - 5 FT landscape buffer on both sides of road • Street lighting	• Bus bays where applicable • Pedestrian crosswalks at appropriate intervals
Pedestrian/Bike Facilities:	8-12 FT concrete sidewalk in both directions	

Lighting

Street and pedestrian lighting is intended to create a safe, nighttime environment by increasing visibility between pedestrians, motorists, and their surroundings. For motor vehicles, installing street lighting improves driver's visibility and in turn can reduce the risk of traffic accidents and the severity of crashes. Good outdoor lighting can also create and encourage a pedestrian friendly environment by providing extended hours of light to utilize pedestrian facilities. Aesthetically, street light poles and fixtures can also create a defining visual characteristic to enhance a community's character.

If not properly designed and installed, however, light pollution caused by street and pedestrian lighting can increase glare for drivers and reduce sky visibility. Fort Defiance's dark skies are more than an aesthetic value; it is part of the rural experience that preserves the rural and cultural character of the community. Founded in 1988, the International Dark-Sky Association (IDA) offers guidelines for regulating lighting that "minimizes the degradation of the nighttime visual environment and night sky, as well as minimizes glare caused by excessive or unnecessary outdoor lighting" while still providing outdoor lighting for nighttime safety, security, and enjoyment.

Communities are increasingly adopting "dark sky friendly" lighting regulations requiring the use of "full cut-off" lighting for commercial and roadway lighting. Dark sky lighting guidelines serve as the foundation for preserving naturally dark sky conditions of the Fort Defiance study area and for mitigating to the extent possible the effects of the development's outdoor artificial lighting on the natural and cultural environment. The easiest way to accommodate guidelines provided by the IDA is too install "full cut-off" lighting fixtures, which prevent light from escaping above the horizon line of the light fixture. Full cut-off fixtures do not allow upward light emission and illuminates no more than 10% of its light at a high angle, which in turn reduces glare for motorists, energy consumption, and sky glow. Table 5.3 provides examples of different lighting improvement options.



"Full cut-off" lighting, at the far rightmost, allows no upward light emission and reduces glare.

Table 5.3. Lighting Options

Potential Lighting Structure	Advantages/Disadvantages	Lighting Example
Standard Metal Street Light	• Standard energy use • High maintenance costs • Not dark skies friendly	
Solar Powered Fixture	• Solar powered • Reduces maintenance costs • Dark skies friendly	
LED Fixture	• LED lighting • Long lasting • Moderate maintenance costs • Dark skies friendly	

Traffic Calming Measures

As identified in Working Paper 1, travel speeds through the study area are generally much greater than actual posted speed limits. Traffic calming measures are often utilized to improve safety by encouraging motorists to reduce traveling speeds. Traffic calming is a self-enforcing traffic management approach that forces motorists to alter their speed or direction of travel. Research has found that installing traffic calming devices not only reduces automobile speeds but also the number and severity of crashes. Traffic calming devices can range from options that require no physical roadway modifications to major roadway alterations, such as roadway closures. Table 5.4 provides a summary of potential roadway enhancements that can be utilized in the Fort Defiance study area to reduce traveling speeds.

Table 5.4. Traffic Calming Options

Traffic Calming Device	Description	Advantages	Considerations
In-Road/On-Road Rumble Strips 	Grooves or raised markers placed in/on the roadway surface that transmits sound and vibration to alert drivers to changing conditions.	• Low installation costs • Do not require any additional ROW	• Noise and vibration created by the rumble strips may affect the adjacent residences • Can interfere with snow plow operations
Speed Limit Pavement Markings 	Highly visible in-pavement markings, which are also visible at night, alerting drivers of speed limit.	• Inexpensive installation costs • Can be quickly installed	• Easily wears off and requires regular maintenance • Not visible on snow covered roads
Speed Hump 	Raised pavement section which requires motorists to drive at a reduced speed over an undulation	• Speed reduction • Relatively inexpensive installation costs	• Increased roadway noise • Increased maintenance costs • Requires highly visible warning signage • May slow emergency vehicle response times • Can interfere with snow plow operations
Speed Table 	Longer raised speed hump with a flat section in the middle and ramps on the ends. Sometimes constructed with brick or other textured materials on the flat section	• Speed reduction • Relatively inexpensive installation costs	• Increased roadway noise • Increased maintenance costs • Requires highly visible warning signage • May slow emergency vehicle response times • Can interfere with snow plow operations

Table 5.4. Traffic Calming Options (Continued)

Traffic Calming Device	Description	Advantages	Considerations
Traffic Islands and Medians 	Concrete or landscaped islands typically located down the center of a roadway or at a roadway entrance.	• Provides a mid-block pedestrian refuge • Can improve the aesthetics of a roadway	• May restrict access to driveways in one direction
Double Chicane 	Series of alternating curb extensions or islands that narrow the roadway and require vehicles to follow an S-shaped path. Appropriate for midblock locations.	• Easily negotiable by large vehicles • Can improve the aesthetics of a roadway	• Curb realignment and landscaping can be costly • Concrete chicanes complicate street maintenance and drainage • May require additional ROW to construct
Roundabout or Traffic Circle 	Roundabouts require traffic to circulate counterclockwise around a center island at an intersection. Traffic circles are small islands placed in intersections, in which vehicles must slow down in order to navigate the circle.	• Roundabout can moderate traffic speeds on arterial roadways • Less expensive than operating a traffic signal • Provides landscaping opportunities	• May require additional ROW to construct • Emergency vehicles and large trucks may have difficulty navigating
HAWK Pedestrian Beacon 	Pushbutton-activated, signalized, mid-block pedestrian crossing signal. The pedestrian hybrid beacon is used to warn and control traffic to assist pedestrians in crossing a street at a marked crosswalk.	• Provides a 'red' condition which requires vehicles to stop for pedestrians • Improves visibility of crossing and pedestrians	• High installation and maintenance costs

INTERSECTION IMPROVEMENT OPTIONS

To address the existing deficiencies, future needs, and to enhance safety and mobility, preliminary improvement concepts were developed for the N12/N110 and N112/N110 intersections. The following section presents a summary of these preliminary improvement concepts.

N12/N110 Intersection - Option 1: Signalized Intersection

As illustrated in the figure on the right, in Concept 1:

- Traffic signal heads are upgraded to improve visibility
- Raised medians are reconstructed
- Crosswalks are incorporated on all legs of the intersection
- Signal equipment is upgraded to include walk push buttons
- Signage and pavement markings are improved
- Pedestrian and bicycle facilities are located throughout
- Reconstructs ramps to meet ADA compliance

Advantages

- Low cost of implementation
- No additional ROW required
- No additional learning curve for drivers

Disadvantages

- High maintenance costs
- Additional turn lanes may be required to accommodate future traffic volume increase
- May not reduce speeding, which is currently one of the issues

N12/N110 Intersection - Option 2: Roundabout

As illustrated in the figure on the right, in Concept 2:

- Intersection is converted to a two-lane roundabout
- Raised medians at the roundabout provide pedestrian crossing access
- Pedestrian and bicycle facilities are located throughout
- Incorporates ADA compliant ramps and street lighting

Advantages

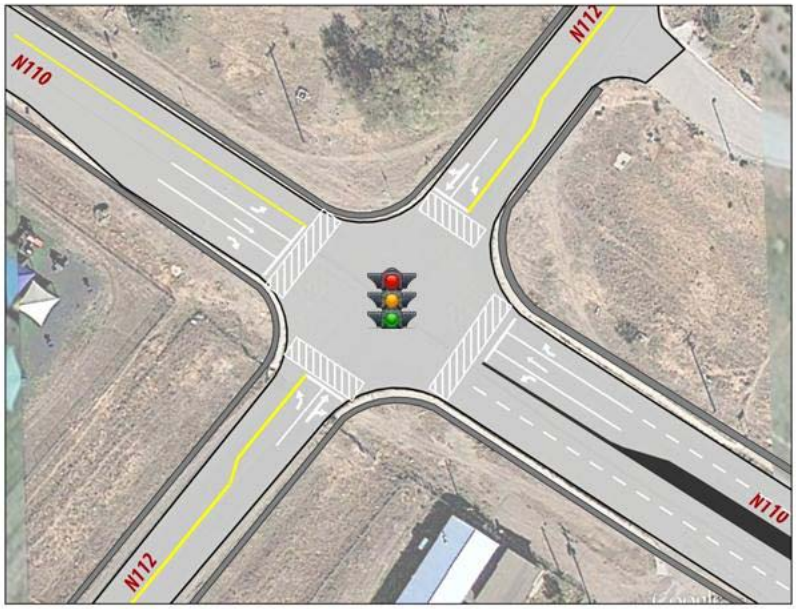
- Potential reduction in injury and fatal type crashes
- Forces drivers to slow down as they approach the intersection
- Lesser delays and backups at the intersection
- Improves aesthetic appearance of the area

Disadvantages

- Will require additional ROW
- Close proximity of N12/N54 intersection could cause queuing issues at this intersection, especially during peak periods
- Two-lane roundabout could be confusing for drivers, especially tourists
- High implementation costs

N112/N110 Intersection - Option 1: Signalized Intersection

As illustrated in the figure on the right, in Option 1:



- Intersection is converted to a four-way, signalized intersection
- Exclusive left-turn lanes installed on N112
- Raised median installed on N110 east of intersection
- Pedestrian and bicycle facilities are located throughout
- Incorporates ADA compliant ramps and street lighting

Advantages

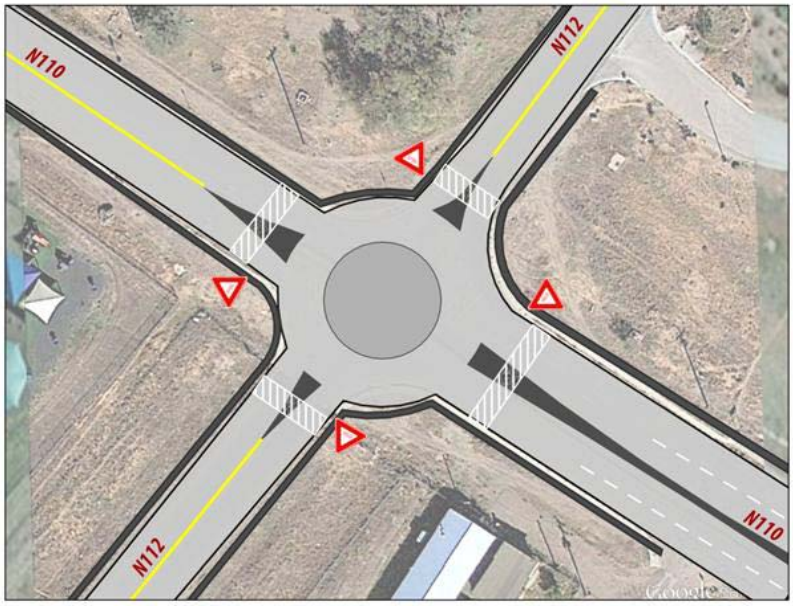
- Improves circulation
- Provides motorists turning left off of N112 and exclusive turn lane, reducing queuing
- Less confusing to motorists, especially tourists, traveling through the intersection.
- Lower implementation costs
- No additional ROW is required

Disadvantages

- High maintenance costs
- May not reduce speeding, which is currently one of the issues

N112/N110 Intersection - Option 2: Roundabout

As illustrated in the figure on the right, in Concept 2:



- Intersection is converted to a one-lane roundabout
- Raised medians at the roundabout provide pedestrian crossing access
- Pedestrian and bicycle facilities are located throughout
- Incorporates ADA compliant ramps and street lighting

Advantages

- Improves circulation
- Opportunities for new sidewalks, bike lanes, and landscaping
- Improves safety for turning movements
- Potential reduction in injury and fatal type crashes
- Forces drivers to slow down as they approach the intersection
- Lesser delays and backups at the intersection
- Improves aesthetic appearance of the area

Disadvantages

- May be confusing to motorists, especially tourists
- May need to acquire additional ROW
- High implementation costs

OTHER MODES OF TRANSPORTATION OPTIONS

Pedestrian and Bicycle Facilities Options

Alternative modes of transportation such as sidewalks, bike paths/routes, and trails (including equestrian) are an important aspect of the multimodal transportation network as they provide mobility for those not able to operate or without access to a vehicle and also for recreational purpose. At the onset of the study, Community members, stakeholders, and the TAC all expressed interest in enhancing existing pedestrian facilities to allow pedestrians to safely walk between residential areas and activity centers. Developing a community-wide pedestrian and bicycle network can lead to many benefits, including:

- Lowering traffic congestion by reducing dependence on automobiles;
- Enhancing residents quality of life through promoting healthier lifestyles;
- Expanding tourism opportunities and enhancing local economy;
- Providing mobility for those without a vehicle or are unable to drive; and
- Improving community aesthetics while preserving the natural environment.

Table 5.5 provides an overview of potential pedestrian and bicycle facilities that could enhance Fort Defiance's existing pedestrian network.

Table 5.5. Pedestrian Facility Options

Pedestrian Facility	Considerations	Illustration
Asphalt shared-use-path offset from roadway	• Can be utilized by multiple modes, including bicyclists, in-line skaters, wheelchair users, etc. • Minimizes potential crossing conflicts with motor vehicles • Provides opportunity to enhance streetscaping	
Bike Lane striped on roadway; Sidewalk offset from roadway	• Pedestrians have safe buffer zone between motor vehicles • Pavement striping maintenance is critical so bicyclists and motorist are able to identify lane	

Table 5.5. Pedestrian Facility Options (Continued)

Pedestrian Facility	Considerations	Illustration
Separate sidewalk and bike lane offset from roadway	• Offset sidewalk provides a safe buffer zone between motor vehicles • Separated bike lanes provides bicyclists with a buffer zone from motor vehicles • Increased installation and maintenance costs	
Sidewalk Only – offset from roadway (when ROW is restricted)	• Pedestrians have safe buffer zone between motor vehicles • Provides opportunity to enhance streetscaping	

Transit Facility Options

Successful transit systems open economic opportunities for local residents and businesses, enable residents without access to a transportation mode, link neighboring destinations, and generally enhance the quality of life of residents and the economic vitality of rural communities. Transit systems are comprised of the transit routes as well as the facilities that service the transit route and riders. Since the overall design of a transit stop affects operations and system efficiency, it is imperative that the design of a transit facility balance safe and convenient access with functionality. Factors to consider when identifying the location of a transit stop include operational issues, such as potential conflicts with motor vehicles; passenger accessibility; safety conditions; and ridership potential.

The Navajo Transit System (NTS) currently provides transit services within, to, and from the Fort Defiance study area. At present, the NTS provides services from ten separate locations; however, the transit stops lack proper amenities.

Table 5.6 provides an overview of potential transit facilities that could enhance Fort Defiance's existing transit network.

Table 5.6. Transit Facility Options

Pedestrian Facility	Considerations	Illustration
Curb-side bus stop	• Minimum requirements of a bus stop are a sign and a clear, firm, and stable slip-resistant surface for boarding and alighting • Limited or no driveways should be located near the stop • Needs adequate curb space for the bus to pull out	
Bus pullout	• Reduces disruption of traffic along the roadway and increases passenger safety • More expensive and are often more difficult to locate than curb-side bus stops	
Bus shelters	• Provides a safe area of protection for passengers • Must meet ADA requirements • Shelters that only include a roof, no walls, provide little protection from the wind but are easier to maintain • Metal structures anchored to foundations can be relocated as needed (image on right)	
Benches	• Provides a comfortable resting area for waiting passengers • Must meet ADA requirements • Provides opportunity to generate income through advertising	

Table 5.6. Transit Facility Options (Continued)

Pedestrian Facility	Considerations	Illustration
Signage	• Provides passengers with important operation information, such as route schedules • Should not obstruct other street signs	
Lighting	• Improves the safety for drivers, pedestrians, bicyclists, and transit passengers • Solar powered lighting can be installed to reduce costs • One lighting fixture should be incorporated on both sides of a bus stop	
Safe pedestrian paths	• Allow transit riders to walk safely to the transit stop • Sidewalks should be ADA-accessible	

PRIORITIZATION OF IMPROVEMENT OPTIONS

The study roadway system was divided into roadway segments and potential multimodal transportation improvement options were identified for each segment. Potential improvements were evaluated and prioritized to determine the projects/improvements that best serve the needs of the Fort Defiance study area, Navajo Nation, and Apache County District II. Working Paper 2 provides a detailed overview of the criteria utilized to quantify the benefits of each improvement option. Based on the results of the evaluation, projects were prioritized into short-, mid-, and long-term implementation phases. Planning level cost estimates were also developed based on typical per-mile/foot construction costs in 2013.

6. STAKEHOLDER AND PUBLIC INPUT

Public involvement and stakeholder outreach is essential to the broad acceptance and successful implementation of any transportation improvement plan. The goal of community outreach is to educate stakeholders and the public about the study, provide opportunities for input, and to create a process to build consensus in support of the study recommendations. For this study, Phase I of the outreach focused on current transportation issues, problem areas, and needs; and Phase II focused on recommended improvements for the problem areas identified in the first phase. This chapter presents stakeholder and public outreach efforts conducted during both phases.

PHASE I - STAKEHOLDER OUTREACH

To develop a thorough understanding of the issues, deficiencies, and needs, the study team identified and interviewed a core group of stakeholders. The stakeholders included representatives from all major Navajo Nation departments, Fort Defiance Chapter, Apache County District II, BIA, Fort Defiance Agency, Navajo DOT, and NACOG. The first set of stakeholder interviews were conducted on May 23, 2013. A questionnaire was distributed to each stakeholder at the meeting and was followed up with an open discussion. *Phase 1 Stakeholder Outreach Summary Report* is included in Appendix A.

Key comments received during the meetings included:

- Lacking of lighting along roadways is a major concern for community members.
- Traffic in the month of August is more than the typical yearly average.
- Vegetation along roadways needs to be removed.
- There are two bridges along the study roadways. Both bridges are eligible for replacement. The bridge on N7 does not include a walkway for pedestrians which is potentially unsafe.
- The (N12) RSA that was completed recommends roundabouts or traffic signals at all critical intersections.
- Coordinate with NTUA about roadway and utility issues.
- Pedestrian and bicycle facilities are needed throughout the study roads. N12, N110 should be a priority.
- Exclusive turning lanes are needed for the NTUA driveway intersection and other major cross streets.
- Emergency pullouts are needed especially on two lane roads.
- Striping is completely faded and needs to be addressed. Because of limited funding, BIA is focused on unpaved roads and unable to perform regular maintenance on existing paved roads including striping the roads.
- Speeding is a major concern on all roads. Enforcement has to be considered.
- Sidewalks and lighting are needed at school zones.

- N12/N54 intersection is congested in peak hours and around noon time.
- Drainage issues exist at N12/N110 intersection.
- Pedestrian crossing is needed along N110 in the vicinity of the Youth Center.
- N110/N112 intersection needs to be signalized. Very unsafe.
- Signage needs to be replaced because of reflectivity concerns. Guard rails should also be made reflective.
- N7 west of N7/N112 is in really bad condition and is difficult to drive during winter conditions.
- Pedestrian crossings are needed at school zones, IHS, and NTUA intersections.
- Lighting needs to be added at intersections - N12/N110, N7/N112, N12/N7, N112/N110.
- Special events generate significantly high traffic volumes - Graduation, Annual Fair.
- Bus shelters are needed at bus stops.
- NTUA has plans to relocate to a new facility to be built in the vicinity of the IHS hospital. The new building is expected to be completed by 2015. The existing NTUA campus will still be used at lower staffing levels.
- Street naming should be addressed.
- NTUA will provide a GIS data of utilities.
- NTUA Driveway/N12 intersection is congested in mornings and evenings. Especially when utility bills are due. Intersection also has sight distance issues.
- Need pedestrian crossing on N12 between N110 and N54.
- Elderly homes facility is planned at the northwest corner of N7/N12.
- No shoulder on N110 results in vehicles stopping on the road during emergencies.
- Speed limits need to be reviewed and enforced.
- At N12/N110 intersection, accessing the Conoco gas station is an issue by traffic coming from Window Rock.
- Several proposed new commercial, industrial, and residential developments within the study area were identified.

PHASE I – PUBLIC OUTREACH

Public involvement is the process of involving the public throughout the transportation planning process through meaningful communication with interested citizens. To ensure that transportation decisions reflect the public's best interests, public involvement is a critical component of the transportation planning process. To engage the public, the study work plan includes two public

meetings to inform, discuss, and to seek input. Also, a project website was developed and hosted by ADOT to enable citizens to access study documents and submit comments or questions.

The Navajo Nation Fort Defiance Chapter, Apache County District II, ADOT, and the study team hosted the first of two public meetings on August 7, 2013 at the Fort Defiance Chapter House. The goal of the meeting was to inform the public of the project's goals and objectives, discuss the deficiencies and needs of the study area, and elicit input on the public's "vision" for the future of Fort Defiance. In total, there were 12 participants at the meeting, not including study team members.

The meeting commenced with a brief presentation of the study goals and objectives, summary of existing conditions, and key issues identified by the study team. Large boards were also displayed to further communicate information and to generate conversation between the public and study team members. The board displays included: study overview, map of current transportation issues as identified by the study team, and a map of study area in which community members can mark areas in need of multimodal improvements. Comment forms were also provided to each meeting attendee. Phase 1 Public Outreach Summary Report is included in Appendix B.

Key comments received during the meeting included:

- Due to major growth in the area, enhancements need to be made to the existing roadway network to accommodate future traffic congestion.
- Concerns on how the new sports facility will impact traffic flow.
- The addition of turning lanes and traffic signals at major activity centers, such as the Fort Defiance Indian Hospital and NTUA, needs to be evaluated.
- Walking is a major mode of transportation and proper facilities need to be developed to accommodate pedestrians.
- The specific goals of this study should focus on creating a safe environment for all travel modes and livestock, maintenance of existing roadway system, and improving pedestrian facilities.
- Major transportation issues that the community currently faces include:
    - High travel speeds, livestock and domestic animals on roadways, lack of street lighting, and poor pavement striping creates unsafe driving conditions;
    - Community lacks safe pedestrian walkways, crosswalks, and proper bus stops;
    - Traffic lights and traffic signs need to be improved and replaced if damaged; and
    - Roadside vegetation need to be cleared to allow water to properly drain, visibility is improved, and to discourage livestock from grazing next to the roadway.
- Desired improvements on study roadways include:
    - Maintenance of existing roadway system, including: surface treatment, pavement reconstruction, and pavement restriping;
    - Install traffic calming measures or enforce traffic laws, particularly in school zones and along major routes;

- Incorporate street lighting to improve nighttime visibility;
- Provide pedestrian and bicycle access to schools, the hospital, the Post Office, and the NTUA; and
- Install safe pedestrian pathways, crosswalks, and wellness trails to increase mobility and to promote exercise.

- Develop a public and traffic safety community awareness and education program that promotes safety in school zones and along study roadways may help to reduce high traffic speeds and foster a safer community.

PHASE II – STAKEHOLDER OUTREACH

The Navajo Nation Fort Defiance Chapter, Apache County District II, ADOT, and the study team hosted a second round of five meetings for stakeholders to learn about the study goals, issues and concerns, obtain input on improvements scenarios and to discuss the long-term "vision" of the Fort Defiance study area. The meetings were held on October 16, 2013 at the Apache County District II office. A questionnaire was also provided to each stakeholder. *Phase 2 Stakeholder Outreach Summary Report* is included in Appendix C.

Key comments received during the meetings included:

- Majority of the attendees preferred a roundabout at the N112/N110 intersection instead of a traffic signal. Attendees felt that the single lane roundabout would enhance the aesthetic appeal and blend well with the Chapter's idea of redeveloping the N110 roadway to a more tourist friendly corridor.
- Improvements to the current traffic signal at N12/N110 were preferred over the roundabout option. Improvements included upgrading signal equipment, restriping, reconstruction of channel islands and raised medians, adding sidewalks and crosswalks.
- "Dark Skies" friendly LED lighting was preferred over solar lighting.
- At school zones, a Double Chicane with a High-intensity Activated crossWalK (HAWK) pedestrian beacon or HAWK system was preferred to mitigate speeding issues. Low cost options such as rumble strips, speed tables, and on-street pavement markings, were recommended for the short-term. These options are hard to maintain because of winter weather conditions.
- Proposed fencing and cattle guard improvements were endorsed. However, the stakeholders cautioned that the Study Team should coordinate with the Navajo Department of Agriculture to address grazing concerns.
- Removal of roadside vegetation, restriping of roads, pavement maintenance were also strongly supported.
- Proposed bicycle and pedestrian improvements were strongly endorsed. Stakeholders particularly liked the idea of separated multiuse/shared pedestrian and bicycle paths.
- The street cross-section options for each study route were received very well.
- The Navajo Transit System is exploring the option of adding a bus stop at the Window Rock High School based on multiple requests.

- An internal transit circulator route is not needed at this time.
- Bus stops with shelters and possibly pull outs would be preferred. The Navajo Transit System purchased the equipment to install shelters and is planning to install them in the short term.
- School District representative agreed with the proposed traffic calming measures.
- A secondary access to the new Window Rock High School Sports Stadium facility may be addressed as part of this study.
- Proposed trail locations were supported.

PHASE II – PUBLIC OUTREACH

The second public meeting was hosted on January 8, 2014 at the Fort Defiance Chapter House. The goal of the meeting was to inform the public of the draft transportation improvement plan and seek input. In total, there were 36 participants at the meeting, not including study team members.

The meeting commenced with a brief presentation of the study goals and objectives and key elements of the draft transportation improvement plan. Large boards were also displayed to further communicate information and to generate conversation between the public and study team members. Comment forms were also provided to each meeting attendee. Phase 2 Public Outreach Summary Report is included in Appendix D.

Key comments received during the meeting included:

- A bus top needs to be located near the N7/N112 intersection due to it being congested at times. This would be for school buses only and for the safety of students. This should be part of the first phase. Also, near the old hospital and N7, people walk in that area and improvements are needed there.
- There needs to be a walking trail between N112 and N12 along the creek. A lot of students walk to Window Rock High School.
- The study needs to adequately address needs from a business perspective, in particular accesses to businesses in the Fort Defiance area.
- The study should consider photo enforcement as another method for addressing speeding in the Fort Defiance area.
- The Navajo Forestry Department wants to ensure that environmental issues are adequately addressed in the study final report.
- Apache County Supervisor White asked how the funding task would be covered.

  Response: There will be a plan for implementation section in the final report that identifies funding resources and that projects can be cross referenced with potential sources that the Chapter and County can pursue for implementation of the recommended priority projects.

7. AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONCERNS

Inventory of the physical, natural, and cultural environment is an important component of the transportation planning process. When environmental conditions and concerns are reviewed in the early stages of the transportation planning process, transportation solutions can be developed to avoid or lessen the negative impacts on the natural environment. This chapter presents a review of environmental conditions within the study area.

TOPOGRAPHY AND GEOLOGY

Located in a valley west of the Chuska Mountain and east of the Defiance Plateau, the Fort Defiance study area sits at the elevation of approximately 6,800 feet. The study area is comprised of geological types that include Chinle Formation (TrC) and Shinarump Conglomerate Member (TrCS). According to the Arizona Geological Survey (AZGS), TrC consists of colorful mudstone, such as in the Painted Desert, and less abundant lenses of sandstone conglomerate, deposited by large river systems. This unit typically is eroded into badlands topography and contains clays that are prone to shrink and swell. TrCS is a basal conglomerate and pebbly sandstone of Chinle Formation which is relatively more resistant to erosion.

Recommendations for Further Analysis

A geotechnical evaluation of soils will need to be conducted during the design phase of project implementation to determine pavement, slope protection, and structural needs. An analysis of drainage needs will also need to be performed during the Design Concept Report/Environmental Assessment (DCR/EA) phase.

VEGETATION

The Fort Defiance study area contains Great Basin Desert Scrub, Great Basin Conifer Woodland, and Plains and Great Basin Grassland vegetation communities. Great Basin Desert Scrub is dominated by the presence of sagebrush, blackbrush, shadescale and grasses. Great Basin Conifer Woodland vegetation is mainly comprised of medium sized conifers, the pinyon pine and juniper. Plains and Great Basin Grasslands are primarily composed of mixed or short-grass communities.

No formal inventory of native plants was conducted; however, native plants may occur within the study area. Native plants include the Navajo Mountain phlox, Navajo sedge, a variety of cacti, and numerous tree species. The Navajo Natural Heritage Program (NNHP) maintains a comprehensive database of rare and protected plants on the Navajo Nation. According to the NNHP, there are 63 sensitive plant species within the Navajo Nation, of which 19 are classified as endangered.

Recommendations for Further Analysis

Any improvements to study area roadways have the potential to affect native plants. During the design phase, a detailed review will need to be conducted by the NNHP to identify impacts on protected plant species. Consideration during the design phase should be given to protecting native vegetation.

BIOLOGY

The Arizona Game and Fish Department (AGFD) Heritage Data Management System (HDMS) was accessed to determine special state species and threatened, endangered, and candidate species in the vicinity of the study area. Utilizing the HDMS online retrieval system for approximately 3.0 miles around the study area, no species were identified as special, threatened, or endangered. This preliminary review was conducted to identify potential impacts to biological resources. For the Navajo Nation, the NNHP collects, manages, and disseminates rare, threatened, and endangered species information for land-use planning to promote conservation.

Wildlife movement through the study area depends on the availability of preferred habitat, foraging range, migration, and dispersal patterns. Often, resident wildlife species find that altered habitat and developed areas present a barrier to movement. The Arizona Wildlife Linkages Workgroup (AWLW), a collaborative effort between ADOT and eight public and nonprofit organizations identified large blocks of protected habitat, potential wildlife movement corridors, and factors that may disrupt these linkage zones. The AWLW developed the Arizona Wildlife Linkages Assessment, which identified wildlife habitat blocks and linkage zones that allow land managers and transportation planners to integrate wildlife needs into developments and land use plans. Wildlife linkage zones are areas of wildlife movement between habitat blocks. The northern portion of the Fort Defiance study area falls within the Chuska Mountains – New Mexico linkage zone, an AWLW-designated, non-high priority wildlife linkage zone. Wildlife linkage zones are areas of wildlife movement between wildlife habitat blocks. Wildlife habitat blocks are defined as large, contiguous areas of natural woodland with little or no human disturbance and are essential for maintaining a diverse and healthy population of wildlife. The study area falls completely within an AWLW designated wildlife habitat block. Figure 7.1 illustrates the location of wildlife linkage zones in the study area.

Recommendations for Further Analysis

Any improvements in the study area may have the potential to affect plants and wildlife within the study area. During the design and environmental overview phase of project implementation, a detailed biological analysis will need to be conducted to determine the specific presence/absence of projected species and potential mitigation measures by the NNHP. Wildlife corridors are identified based on currently available data; additional corridors or linkages may exist. During the design process, coordination will need to occur with the AZGFD, the USFWS, and the Arizona Wildlife Linkages Workgroup to incorporate elements to protect wildlife from roadway traffic and to allow for the safe wildlife movement across the study area. On-going communication is also recommended between the Fort Defiance Chapter, Navajo Nation, AGFD, USFWS, and Apache County District II to coordinate mitigation measures to protect all environmentally sensitive species in the area during the construction phase.

HYDROLOGY

The major hydrological features within Fort Defiance include Black Creek, which runs north-south through the study area, and Bonito Creek, which runs along the southwestern portion of the study area. The U.S. Army Corps of Engineers (Corps) is authorized by Congress to provide flood protection, environmental stewardship, and civil works construction on the Navajo Nation. Although flooding often occurs on the Navajo Nation, no federally sponsored flood control projects using the authority granted to the Corps have been constructed. Within the study area, the *Fort Defiance Chapter Land Use Plan* identified floodplains along Black Creek and Hickman Wash. According to the Plan, significant flooding may occur along Hickman Wash due to the runoff from the Chuska Mountains.

The United States Fish & Wildlife's National Wetlands Inventory indicates that freshwater forested/shrub wetlands may border Bonito Creek and Black Creek within the study area. Along portions of both Bonito Creek and Black Creek, freshwater forested/shrub wetlands are located within the study area. Wetlands are defined by the Environmental Protection Agency (EPA) as lands where saturation with water is the dominant factor determining the nature of soil development and the types of plant and animal communities living in the soil and on its surface. Wetlands typically are areas where water covers the soil or is present at/near the surface of the soil year-round or during varying periods throughout the year. Freshwater forested/shrub wetlands are dominated by relatively small wooded vegetation and are one of the most common wetlands in the United States.

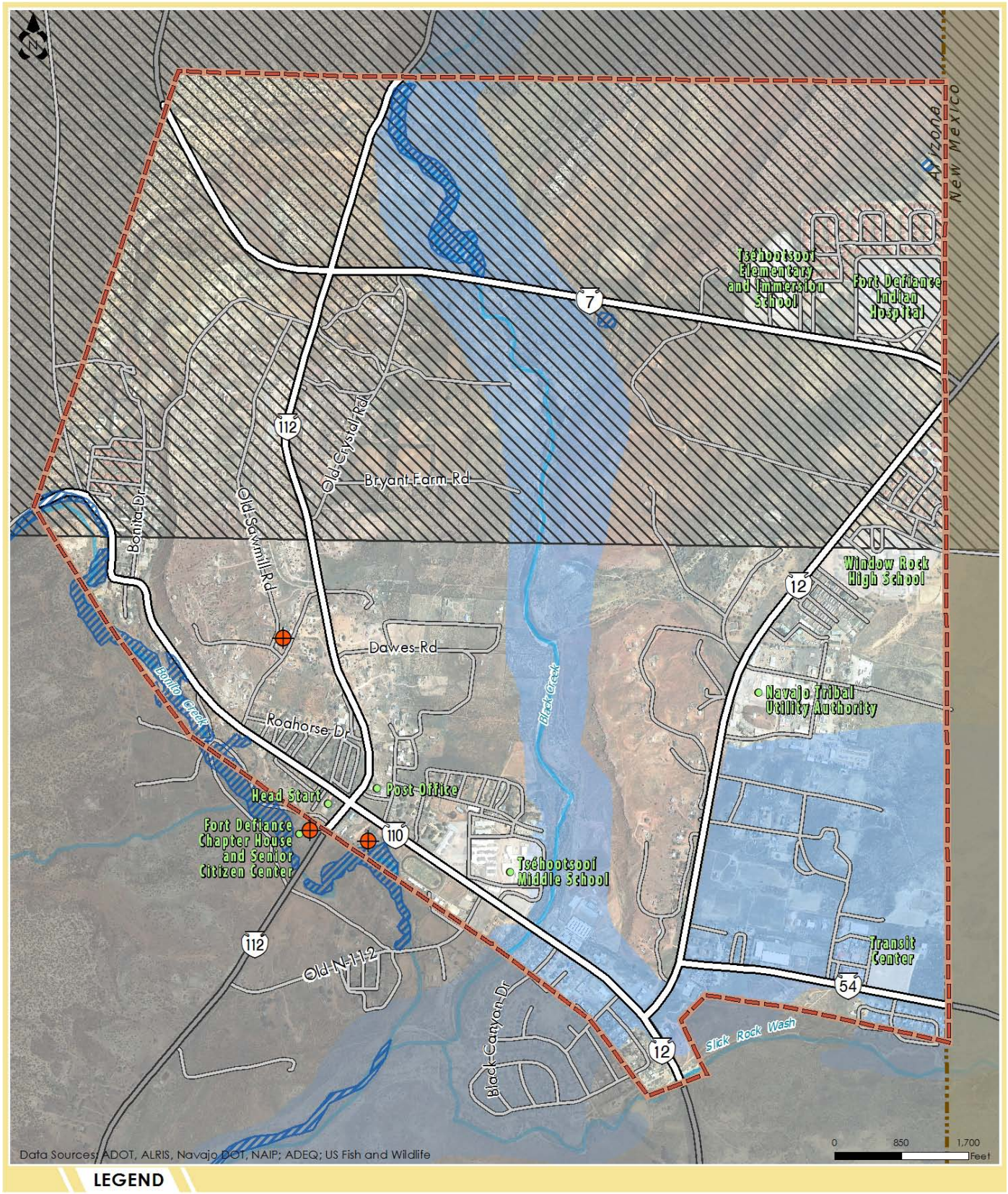
Wells

The *Fort Defiance Chapter Land Use Plan* identified three wells within the study area. The wells are located along Bonito Creek and Old Sawmill Road. Figure 7.1 illustrates the location of hydrologic features and floodplains in the study area.

Recommendations for Further Analysis

Floodplains along Black Creek and Hickman Wash may impact transportation movements to and around study roadways. Impacts to floodplains from roadway construction need to be considered to reduce or eliminate induced increases to flood event water surface elevations. A drainage analysis will also need to be conducted during the design phase to determine the degree of impacts on the area's hydrological features and floodplains and to identify potential mitigation measures. During the design process, coordination will need to occur with the USFWS and EPA to identify and to incorporate elements that protect wetlands in and around the study area. Furthermore, landscaping considerations should be given to incorporate low water use desert or desert adaptable planting that is consistent with EPA guidelines.

Figure 7.1. Wildlife Corridors and Hydrological Features



PRIME AND UNIQUE FARMLANDS

The Fort Defiance study area is located in the Natural Resources Conservation Service's (NRCS) Soil Survey Geographic (SSURGO) Database soil survey area AZ 715. According to the NRCS survey, the study area contains no soils that support prime or unique farmlands or farmlands of statewide or local importance.

Recommendations for Further Analysis

Coordination between the Fort Defiance Chapter, the Navajo Nation, Apache County District II, USDA, and the USFS is needed to identify areas of potential or prime unique farmlands. If soil types in the area are considered prime or unique as identified on the USDA prime and unique farmlands soils list, analysis needs to be conducted to determine whether water delivery irrigation systems associated with the farmlands are adversely affected by the recommended improvements.

NOISE IMPACTS

Maintaining acceptable noise levels to preserve the character of open spaces, residential quiet zones, and recreational facilities should be considered when selecting a potential transportation improvement project. Schools, hospitals, residential development, and community uses requiring low noise levels are included in the list of potential noise-sensitive receptors.

There are numerous existing noise-sensitive receptors within the study area, including schools, the Fort Defiance Indian Hospital, community centers, and residential and housing communities. Potential future noise-sensitive receptors include IHS housing, new residential development, existing housing redevelopment, and the potential new elderly center northwest of the N12/N7 intersection. Other than the major paved roadways, potential noise generators within the study area include the NTUA facility and the Transit Center. Future noise impacts may occur as a result of industrial and commercial development and the relocation of the NTUA.

Recommendations for Further Analysis

A detailed noise analysis study would need to be conducted to identify if potential noise levels exceed FHWA noise thresholds. During the DCR/EA phase of the project, noise-sensitive receivers should be modeled using the FHWA's approved Traffic Noise Model version 2.5 (TNM2.5) and validated against field measurements. Traffic noise impacts may occur as a result of future development; therefore, noise abatement measures should be assessed for all affected noise-sensitive receivers. Coordination will need to occur between the Fort Defiance Chapter, Navajo Nation, and Apache County District II to ensure that development complies with ordinances and noise policies.

AIR QUALITY

Based on data provided by the Arizona Department of Environmental Quality (ADEQ), air quality in the study area meets the National Ambient Air Quality Standards (NAAQS) set forth by the Clean Air Act (CAA) for criteria pollutants carbon monoxide (CO), nitrogen dioxide (NO^2), ozone,

particulate matter less than or equal to 2.5 microns or 10 microns (PM2.5 and PM10, respectively), and sulfur dioxide (SO^2).

Recommendations for Further Analysis

Initially, a qualitative evaluation should be conducted to assess air quality impacts. Measures should be taken to ensure that improvements made do not negatively impact the air quality of the region. During the project implementation phase, proposed improvements along roadway corridors will require a detailed evaluation to identify the impacts with respect to the increase and decrease in criteria pollutants and mobile source air toxins. Coordination will need to occur between ADEQ, Fort Defiance Chapter, the Navajo Nation, and Apache County District II to ensure that any proposed improvements comply with EPA ordinances and policies for air quality.

UTILITIES

The NTUA provides the Fort Defiance study area with a full range of utilities including electricity, water, wastewater, and natural gas. Navajo Sanitation also provides residential and commercial trash removal within the Fort Defiance Chapter. Telephone service is provided by Navajo Communications Company, Inc., and cellular telephone service is available through private cellular companies.

Recommendations for Further Analysis

Any improvements along the study roadways would involve multiple utilities. During the project pre-design and DCR/EA phase, additional investigations need to be made concerning the degree of impacts and to see if any relocation or service interruptions would need to be made. Coordination between the utility companies and the Fort Defiance Chapter is imperative during the pre-design and design phase of project implementation.

HAZARDOUS MATERIALS

A regulatory database review of federal and state hazardous material databases was evaluated to identify the presence of hazardous materials in the study area. Through this evaluation it was found that no leaking underground storage tanks, Superfund sites, solid waste landfills, or hazardous waste treatment, storage, and disposal facilities (TSDFs) are located within the study area.

Recommendations for Further Analysis

A detailed evaluation based on ROW needs should occur during the DCR/EA phase of project development. A corridor-level Preliminary Initial Site Assessment (PISA) will need to be conducted during the project design phase to identify issues and constraints related to hazardous sites in the area immediately adjacent to the corridor.

VISUAL RESOURCES

The visual character of the study area varies between open, grazing land to developed residential, commercial, and industrial areas. The State of Arizona designated route N12, Diné Tah "Among the People", from I-40 to Chinle as a Scenic Road due to its historic significance and scenic vistas.

As defined by ADOT, scenic roadways offer memorable visual impression, are free of visual encroachment, and form a harmonious composite of visual patterns. The *2009 Diné Tah "Among the People" Scenic Road Corridor Management Plan* was developed to guide the management, development, and conservation along the roadway corridor for possible designation as a National or All-American Road.

No other land-managing agencies with visual impact requirements (e.g., National Park Service, U.S. Forest Service, and Bureau of Land Management) own or have jurisdiction over land in the study area.

Recommendations for Further Analysis

The proposed improvements are consistent in scope and scale with the current facility, adjacent land use, and the visual character of the Community. Vegetation removal and aesthetic treatment/landscaping should coordinate with the vision of the Community and follow ordinances set forth by the Navajo Nation, Apache County District II, and the Fort Defiance Chapter. Where applicable, design consideration should be given to provide for vistas from the roadway and to incorporate cohesive planting design that allows for views of the surrounding landscape. Coordination should also occur between the Navajo Nation, communities along the Diné Tah "Among the People" scenic route, the Fort Defiance Chapter, and ADOT to develop a comprehensive signage system, landscaping standards, and corridor maintenance plan that promotes economic vitality while protecting scenic vistas.

CULTURAL RESOURCES

Cultural resources are properties that reflect the heritage of local communities, states, and nations. Properties judged to be significant and to retain sufficient integrity to convey that significance are termed "historic properties" and are afforded certain protection in accordance with state and federal legislation. The National Historic Preservation Act (NHPA) of 1966, as amended, defines historic properties as any prehistoric or historic sites, buildings, structures, districts (including landscapes) and objects included in, or eligible for inclusion in, the National Register of Historic Places (NRHP). Traditional cultural properties having heritage value for contemporary communities (often, but not necessarily, Native American groups) also can be determined eligible for, and listed in, the NRHP because of their association with historic cultural practices or beliefs that are important in maintaining the cultural identities of such communities.

Section 106 of the NHPA requires federal agencies to consider the potential effects of their undertakings on historic properties. Effects can be direct and result in physical alteration to the property, or indirect, as when the characteristics that qualify the property for NRHP listing are altered as a result of visual, auditory, or atmospheric intrusions. To be considered eligible for listing in the NRHP, a property must retain integrity of location, design, setting, materials, workmanship, feeling, and association and must also meet at least one of the following criteria:

- Criterion A - Associated with events that have made a significant contribution to the broad patterns of our history; or
- Criterion B - Associated with the lives of persons significant in our past; or

- Criterion C - Embodies the distinctive characteristics of a type, period, or method of construction or that represent the work of a master, or that possess high artistic values, or that represent a significant distinguishable entity whose components may lack individual distinction; or
- Criterion D - Has yielded, or may be likely to yield, information important in prehistory or history

For this study, archival research and record searches were conducted at the Navajo Nation Historic Preservation Department (NNHPD). The NNHPD, which operates under the authority of the Navajo Nation Cultural Resources Protection Act (NN-CRPA), participates as the Tribal Historic Preservation Office in the federal Section 106 review process (described above) on behalf of the Navajo Nation and advises federal, state, and tribal agencies and project sponsors on protection and management of cultural resources in a manner that reflects the unique preservation concerns of the Navajo Nation. In addition to the NN-CRPA, any projects occurring on Navajo Nation lands require compliance with the following:

- Archaeological Resources Protection Act (ARPA), and
- American Indian Religious Freedom Act (AIRFA).

ARPA of 1979 (43 CRR § 6) has two fundamental purposes:

- To protect irreplaceable archaeological resources on public and Indian lands from unauthorized excavation, removal, damage, alteration, or defacement, and
- To increase communication and exchange of information among governmental authorities, the professional archaeological community, and private individuals having collections of archaeological resources and data that were obtained prior to the enactment of this Act.

ARPA regulations define an archaeological resource as "…any material remains of human life or activities which are at least 100 years of age, and which are of archaeological interest." These qualities must be assessed to determine whether a resource merits the protection provided for under this Act. AIRFA of 1978 (Public Law 95-341) was passed by Congress to protect and preserve for American Indians their inherent right of freedom to believe, express, and exercise their traditional religions, including but not limited to access to sites, use and possession of sacred objects, and the freedom to worship through ceremonies and traditional rites. Thus, any site or place (prehistoric or historic) having religious, ceremonial, or sacred aspects or components needs to be evaluated within the context of this law.

The NNHPD records search identified approximately 90 prior cultural resources projects and nine previously recorded cultural resource sites in a search area within the general vicinity of Fort Defiance that included segments of N7, N12, N54, N110, and N112. Table 7.1 lists the number of cultural resource projects identified for each route segment and Table 7.2 lists the previously recorded cultural resource sites. NRHP eligibility recommendations for the previously recorded cultural resources sites are unknown at this point in the study.

Table 7.1. Number of Cultural Resources Projects by Route Segment

Route	Segment	No. of Assessments
N7	N12 Intersection to Tséhootsooí Elementary School	7
	Tséhootsooí Elementary School to N112 Intersection	8
	N112 Intersection to Western Study Boundary	4
N112	Southern Study Boundary to Old Crystal Road	16
	Old Crystal Road to N7 Intersection	12
	N7 Intersection to Northern Study Boundary	2
N110	N12 Intersection to Tséhootsooí Middle School	5
	Tséhootsooí Middle School to N112 Intersection	4
	N112 Intersection to Western Study Boundary	12
N12	Southern Study Boundary to N110 Intersection	1
	N110 Intersection to N54 Intersection	0
	N54 Intersection to Window Rock High School	9
	Window Rock High School to N7 Intersection	8
N54	Eastern Study Boundary to N12 Intersection	5

Source: Navajo Nation Historic Preservation Department

Table 7.2. List of Cultural Resources Sites by Route Segment

Site ID	Comments
AZ-P-9-6	Artifact Scatter (AD 1000-1150)
AZ-P-9-7	Lithic Scatter (no date)
AZ-P-9-20	
AZ-P-9-15	Rubble Area, Soil Stain, Artifacts (AD 900-1100)
AZ-P-24-30	
AZ-P-24-31	
AZ-P-24-32	
AZ-P-24-37	Site is close to N54
AZ-P-24-29	

Source: Navajo Nation Historic Preservation Department

Recommendations for Further Analysis

As project planning progresses, additional cultural resources research and inventory will be required to identify impacts on cultural resources. Efforts to obtain specific eligibility criteria and to arrive at definitive eligibility assessments, including assessing whether the portions of eligible properties subject to potential effects are contributing or non-contributing, also is required. It is

probable that an agreement document (a memorandum of agreement or a programmatic agreement) will be developed to demonstrate Section 106 compliance. When a preferred alternative is defined, the lead agency would need to determine what effect construction of that alternative will have on historic properties. The three possible effect determinations are "no historic properties affected," "no adverse effect," and "adverse effect."

Historic properties on or near the preferred alternative are not always subject to adverse effect. Various strategies can be employed to completely avoid effects or to ensure that effects are minimized and therefore not adverse. If it is determined that historic properties would be adversely affected, it would be necessary to identify mitigation measures to ameliorate those effects to the extent possible. Such measures can include data recovery of archaeological sites and documentation of historic buildings and structures. If adverse effects to cultural resources valued for in-place preservation (typically those determined eligible under Criteria A, B, or C) cannot be avoided, a Section 4(f) alternatives evaluation would be required to explore the potential for a prudent and feasible alternative that would not result in a Section 4(f) use.

When project alternatives and an area of potential effects (APE) have been identified, impacts on historic properties would need to be evaluated. In addition, it would be necessary to conduct cultural resource surveys, according to current Arizona State Museum guidelines, for all portions of the APE that have not been previously surveyed or that were surveyed 10 years or more prior.

SECTION 4(F) AND SECTION 6(F) RESOURCES

Section 4(f) of the US Department of Transportation Act of 1966 and the Section 6(f) of the Land and Water Conservation Fund (LWCF) Act are intended to protect the nation's recreational resources from significant transportation-related impacts. Section 6(f) is a component of the LWCF Act of 1965 that protects recreational properties acquired or developed with LWCF Act funds that could be affected by transportation projects. No Section 6(f) properties have been identified in the Fort Defiance study area.

Section 4(f) stipulates that the FHWA and other DOT agencies cannot approve the use of land from publicly owned parks, recreational areas, wildlife and waterfowl refuges, or public and private historical sites unless there is no feasible alternative or the projects include all possible planning to minimize harm to the property. The "use" of Section 4(f) is defined in CFR Title 23, Part 771.135(p) as:

- When property is permanently incorporated into a transportation facility;
- When there is a temporary occupancy of land that is adverse in terms of the statute's preservation purpose; or
- When there is a constructive use of a Section 4(f) property. A constructive use of Section 4(f) resource occurs when the proximity impacts of a proposed project adjacent or nearby a Section 4(f) property results in a substantial impairment to the property's activities or features that qualify a resource for protection under Section 4(f).

A historic site is considered a Section 4(f) property if it is eligible for the National Register of Historic Places (NRHP) under Criterion A, B, or C if the site is associated with events that have made a

significant contribution to the broad patterns of our history, associated with the lives of persons significant in our past, or embodies the distinctive characteristics of a type, period, or method of construction, or that represents the work of a significant distinguishable entity whose components may lack individual distinction.

Potential Section 4(f) properties within the study area include the Youth Recreation Center, owned and operated by the Navajo Nation, located north of N110. The Youth Recreation Center includes the Boys and Girls Club of the Diné Nation, teen outreach center, and an outdoor skate park. In addition, the Youth Recreation Center is planned to expand to include a new multi-purpose building.

Future potential Section 4(f) properties also include the sports complex constructed near the Window Rock High School.

Recommendations for Further Analysis

Additional analysis needs to be conducted into resources eligible for protection under Section 6(f) and Section 4(f) to evaluate potential impacts of the proposed improvements on these resources. A Section 4(f) evaluation report should be conducted that documents coordination efforts between agencies and local communities; attempts to avoid the resources, direct or constructive use impacts; and measures to minimize harm and impacts from temporary occupancy (if needed). During the DCR/EA phase, Section 4(f) properties need to be analyzed for measures to minimize harm on planned recreational facilities in proximity to the project area, if warranted.

ENVIRONMENTAL JUSTICE REVIEW (TITLE VI)

Title VI of the Civil Rights Act of 1964 and related statutes ensure that individuals are not excluded from participation in, denied the benefit of, or subjected to discrimination under any program or activity receiving federal financial assistance on the basis of race, color, national origin, age, sex, and disability. Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations,* dictates that programs, policies, and activities identify and address, as appropriate, disproportionately high adverse human health and environmental effects on minority and low-income populations. Protected populations considered in this analysis include: minority, elderly, low-income, and disabled populations. Detailed analysis of the environmental justice conditions along the study corridor can be found in *Working Paper 1: Existing and Future Conditions*. Key findings noted in Working Paper 1 include:

- *Age 65 and Older* - Concentrations of elderly populations are scattered throughout the study area. The highest total number of elderly persons reside within the Rio Puerco Estates housing community, located on the southwest corner of N12/N110 intersection. Several Census Blocks along N112, N110, and N54 also have high concentrations of age 65 and older populations.
- *Minority Population* - According to the 2010 Census, approximately 93% of the total population within the study area are minorities. The high percentage of minority population is due to the study area being located within the Navajo Nation.

- *Female Head of Households* -The highest concentrations of this population group occurs along Bonita Drive, adjacent to N110, N112, the Window Rock High School, and in the Rio Puerco Estates housing community
- *Below Poverty Population* - According to the 2007-2011 ACS approximately 34% of the study area's population is considered to be below the poverty level.
- *Disabled Population* - According to the 2000 U.S. Census, 11% of the total population within the study area are disabled.

Multimodal transportation improvements would provide numerous positive impacts to environmental justice populations in the study area. Enhanced streetscaping that provides bicycle and pedestrian facilities would increase protected population's ease of access to local activity centers, places of employment, medical services, and community facilities. Additionally, incorporating transit services and bus bays will give protected populations even greater accessibility to local and regional attractions, as well as employment centers.

In Chapter 8, Table 8.5 provides a detailed overview of potential impacts and benefits of recommended improvements on Title VI populations.

Recommendations for Further Analysis

The potential positive and negative effects on the protected populations should be discussed in the environmental analysis of the design phase. The environmental justice data will also need to be updated as data becomes available; coordination with Navajo Nation environmental planners will determine the appropriate data source for the most accurate environmental justice review. Guidance on the Environmental Justice data updates can be provided by the ADOT Multimodal Planning Division, as needed. Consideration should be given during the construction phase of project implementation on the impacts to minority-owned businesses, the mobility needs of the protected populations, and on residential parcels of protected populations. In addition, on-going outreach efforts need to be made to include meaningful participation by all residents, including low-income, disabled, below poverty and minority populations, throughout project development.

8. PLAN FOR IMPROVEMENTS

This section presents the plan for improvements for the Fort Defiance Industrial Area for the short-, mid-, and long-term planning horizons. This transportation plan is the result of the deficiency analysis from Working Paper 1, Stakeholder Meetings 1 input, Public Meeting 1 Input, Working Paper 2, Stakeholder Meetings 2 input, and Public Meeting 2 input. It is a multimodal plan that includes roadway, transit, pedestrian, bicycle, and trails improvements.

ROADWAY IMPROVEMENT RECOMMENDATIONS

The improvements identified in this section were subject to review and comment by agency stakeholders and the general public. Input received on the improvement recommendations resulted in further refinement of the improvement plan content.

Short-Term (2018) Improvements

Short-term phase projects are recommended to be completed as the study area reaches year 2018. Table 8.1 presents a comprehensive list of the transportation recommendations for this phase, as well as the project number, location, description, estimated costs, and potential funding sources for each project. Each project is assigned a unique project number that can be used to track project progress. Planning level cost estimates were developed based on typical per-mile/foot construction costs in 2013. Unless otherwise noted, the recommended projects are not yet funded. Chapter 10 of this report outlines detailed funding source information and guidelines. *Estimated costs for each project are expressed in 2013 dollars and do not include materials or labor. Actual costs for projects could vary at the time of implementation; therefore, a detailed analysis should be performed on a case-by-case basis to determine actual costs.*

Table 8.1. Short-Term Recommendations

ID	Project Location and Description	Cost
ST-1	N7: N12 Intersection to Tséhootsooí Elementary School Upgrade corridor to improve roadway and pedestrian safety conditions • Roadway Striping (0.41 mi) • Pavement Preservation – Minor Rehabilitation (Chip Seal) (0.41 mi) • Install Lighting • Add 8" Wide, Unpaved Shoulders • Add 4" Wide Landscape Buffer • Install Cattle Guards (2) • Construct Asphalt Share Use Path – Westbound (0.41 mi)	$173,650
ST -2	N7: Tséhootsooí Elementary School to N112 Intersection Upgrade corridor to improve roadway and pedestrian safety conditions • Roadway Striping (1.14 mi) • Pavement Preservation – Structural Overlay (1.14 mi) • Replace Signage • Install Lighting • Add 8" Wide, Unpaved Shoulders • Add 4" Wide Landscape Buffer • Repair Fencing (0.60 mi) • Install Cattle Guards (2)	$904,660

Table 8.1. Short-Term Roadway Recommendations (Continued)

ID	Project Location and Description	Cost
ST -3	N7: N112 Intersection to Western Study Boundary Upgrade corridor to improve roadway safety conditions • Roadway Striping (0.61 mi) • Pavement Preservation – Structural Overlay • Add 8" Wide, Unpaved Shoulders	$405,650
ST-4	N12: Southern Study Boundary to N110 Intersection Upgrade corridor to improve roadway and pedestrian safety conditions • Roadway Striping (0.18 mi) • Pavement Preservation – Minor Rehabilitation (Chip Seal) (0.18 mi) • Install Lighting • Add 4" Wide Landscape Buffer • Repair Fencing (0.18 mi) • Construct Concrete Shared Use Path – Northbound • Construct Concrete Shared Use Path – Southbound	$140,000
ST -5	N12: N110 Intersection to N54 Intersection Upgrade corridor to improve roadway and pedestrian safety conditions • Roadway Striping (0.16 mi) • Remove Roadside Vegetation • Pavement Preservation – Minor Rehabilitation (Chip Seal) (0.16 mi) • Replace Signage • Install Lighting • Add 4" Wide Landscape Buffer • Repair Fencing (0.14 mi) • Install Cattle Guards (2) • Construct Concrete Shared Use Path – Northbound • Construct Concrete Shared Use Path – Southbound	$134,560
ST -6	N12: N54 Intersection to Window Rock High School Upgrade corridor to improve roadway and pedestrian safety conditions • Roadway Striping (1.12 mi) • Remove Roadside Vegetation • Pavement Preservation – Minor Rehabilitation (Chip Seal) (1.12 mi) • Replace Signage • Install Lighting • Add 4" Wide Landscape Buffer • Repair Fencing (0.51 mi) • Install New Fencing (0.61 mi) • Install Cattle Guards (7) • Construct Extra-Wide Asphalt Shared Use Path – Northbound	$494,220

Table 8.1. Short-Term Roadway Recommendations (Continued)

ID	Project Location and Description	Cost
ST -7	N12: Window Rock High School to N7 Intersection Upgrade corridor to improve roadway and pedestrian safety conditions • Roadway Striping (0.47 mi) • Remove Roadside Vegetation • Pavement Preservation – Minor Rehabilitation (Chip Seal) (0.47 mi) • Install Lighting • Add 4" Wide Landscape Buffer • Install Cattle Guard (1) • Install New Fencing (0.47 mi) • Construct Extra-Wide Asphalt Shared Use Path – Northbound	$195,690
ST -8	N54: Eastern Study Boundary to N12 Intersection Upgrade corridor to improve roadway and pedestrian safety conditions • Roadway Striping (0.66 mi) • Pavement Preservation – Minor Rehabilitation (Chip Seal) (0.66 mi) • Install Lighting • Add 4" Wide Landscape Buffer • Install New Fencing (0.40 mi) • Install Cattle Guards (6)	$136,300
ST -9	N110: N12 Intersection to Tséhootsooí Middle School Upgrade corridor to improve roadway and pedestrian safety conditions • Roadway Striping (0.54 mi) • Pavement Preservation – Structural Overlay (0.54 mi) • Replace Signage • Install Lighting • Add 4" Wide Landscape Buffer • Construct Concrete Shared Use Path – Westbound • Construct Concrete Shared Use Path – Eastbound	$803,360
ST -10	N110: Tséhootsooí Middle School to N112 Intersection Upgrade corridor to improve roadway and pedestrian safety conditions • Roadway Striping (0.34 mi) • Pavement Preservation – Structural Overlay (0. 34 mi) • Replace Signage • Install Lighting • Add 4" Wide Landscape Buffer • Construct Concrete Shared Use Path – Westbound • Construct Concrete Shared Use Path – Eastbound	$506,060

Table 8.1. Short-Term Roadway Recommendations (Continued)

ID	Project Location and Description	Cost
ST -11	N110: N112 Intersection to Western Study Boundary Upgrade corridor to improve roadway and pedestrian safety conditions • Roadway Striping (1.17 mi) • Pavement Preservation – Minor Rehabilitation (Chip Seal) (1.17 mi) • Install Lighting • Add 4" Wide Landscape Buffer • Add Unpaved Shoulders • Repair Existing Fencing (1.08 mi)	$275,650
ST -12	N112: Southern Study Boundary to Old Crystal Road Upgrade corridor to improve roadway and pedestrian safety conditions • Roadway Striping (0.81 mi) • Remove Roadside Vegetation • Replace Signage • Pavement Preservation – Structural Overlay (0.81 mi) • Install Lighting • Add 4" Wide Landscape Buffer • Add Unpaved Shoulders • Install New Fencing (0.91 mi) • Install Cattle Guards (7) • Construct Narrow Asphalt Shared Use Path – Southbound	$824,760
ST -13	N112: Old Crystal Road to N7 Intersection Upgrade corridor to improve roadway and pedestrian safety conditions • Roadway Striping (0.62 mi) • Remove Roadside Vegetation • Replace Signage • Pavement Preservation – Structural Overlay (0.62 mi) • Install Lighting • Add 4" Wide Landscape Buffer • Add Unpaved Shoulders • Install New Fencing (1.2 mi) • Install Cattle Guards (9) • Construct Narrow Asphalt Share Use Path – Southbound	$676,240
ST -14	N112: N7 Intersection to Northern Study Boundary Restripe roadway to improve roadway safety conditions	$1,750
ST -15	N112/N7 Intersection Upgrade intersection to include: • Pavement Restriping of Travel Lanes and to Include Pedestrian Crosswalks • Add Turn Lanes on N112 - Northbound and Southbound • Add Left Turn Lane on N7 - Westbound	$5,000

Table 8.1. Short-Term Roadway Recommendations (Continued)

ID	Project Location and Description	Cost
ST -16	N12/N110 Intersection Repair cross slope to improve drainage; remove barrier along intersection; and upgrade intersection to include: *Option 1 (No Roundabout):* Upgrade traffic signal; install raised medians on N12 and N110; reconfigure pedestrian island; construct shared use path; install pedestrian crosswalks and pedestrian crossing signals; convert entrance to Conoco Gas Station to a right-in only; pavement restriping to include exclusive turn lanes. *Option 2 (Roundabout):* Reconfigure intersection to include a roundabout; pedestrian crosswalks and sidewalks incorporated into design	Option1: $600,000 Option 2: $1,050,000
ST -17	N112/N110 Intersection Repair cross slope to improve drainage and upgrade intersection to include: *Option 1 (No Roundabout):* Restripe the intersection to include turn-lanes on N112; install traffic signal; pedestrian crosswalks and sidewalks incorporated into design *Option 2 (Roundabout):* Reconfigure intersection to include a roundabout; pedestrian crosswalks and sidewalks incorporated into design	Option1: $600,000 Option 2: $1,050,000
ST -18	Black Canyon Drive/N110 Intersection Widen Cross-street to Add Turn Lanes and Cross-walks	$300,000
ST -19	NTUA/N12 Intersection Widen Cross-street to Add Turn Lanes and Cross-walks	$300,000
ST -20	Tséhootsooí Middle School/N110 Intersection Upgrade intersection to include traffic calming measure: *Option 1:* Chicane raised medians. Enhancement to the chicane will need to be made in the mid-term phase to include the HAWK pedestrian beacon *Option 2:* Install flashing speed signs *Option 3:* Install rumble strips *Option 4:* Install speed limit pavement markings *Option 5:* Install speed hump or speed table	Option 1: $100,000 Option 2: $80,000 Option 3: $4,500 Option 4: $1,500 Option 5: $10,000
ST -21	Window Rock High School/N12 Intersection Upgrade intersection to include traffic calming measure: *Option 1:* Chicane raised medians. Enhancement to the chicane will need to be made in the mid-term phase to include the HAWK pedestrian beacon *Option 2:* Install flashing speed signs *Option 3:* Install rumble strips *Option 4:* Install speed limit pavement markings *Option 5:* Install speed hump or speed table	Option 1: $100,000 Option 2: $80,000 Option 3: $4,500 Option 4: $1,500 Option 5: $10,000

Table 8.1. Short-Term Roadway Recommendations (Continued)

ID	Project Location and Description	Cost
ST -22	Tséhootsooí Elementary School/N7 Intersection Upgrade intersection to include traffic calming measure: *Option 1:* Chicane raised medians. Enhancement to the chicane will need to be made in the mid-term phase to include the HAWK pedestrian beacon *Option 2:* Install flashing speed signs *Option 3:* Install rumble strips *Option 4:* Install speed limit pavement markings *Option 5:* Install speed hump or speed table	Option 1: $100,000 Option 2: $80,000 Option 3: $4,500 Option 4: $1,500 Option 5: $10,000
ST -23	Entrance to Town - Southbound N12 Upgrade roadway to include traffic calming measures: *Option 1:* Install flashing speed signs *Option 2* Install rumble strips *Option 3:* Install speed limit pavement markings *Option 4:* Install speed hump or speed table	Option 1: $80,000 Option 2: $4,500 Option 3: $1,500 Option 4: $10,000
ST -24	Entrance to Town - Northbound N12 Upgrade roadway to include traffic calming measures: *Option 1:* Install flashing speed signs *Option 2* Install rumble strips *Option 3:* Install speed limit pavement markings *Option 4:* Install speed hump or speed table	Option 1: $80,000 Option 2: $4,500 Option 3: $1,500 Option 4: $10,000
ST -25	Entrance to Town - Northbound N112 Upgrade roadway to include traffic calming measures: *Option 1:* Install flashing speed signs *Option 2* Install rumble strips *Option 3:* Install speed limit pavement markings *Option 4:* Install speed hump or speed table	Option 1: $80,000 Option 2: $4,500 Option 3: $1,500 Option 4: $10,000
ST -26	Entrance to Window Rock High School Sports Stadium Create alternative route entering/exiting the Stadium: *Option 1a: Extend Window Rock High School Road south for 0.14 miles to entrance currently in construction* *Option 1b: Extend Window Rock High School Road south for 0.25 miles* *Option 2: Extend Industrial Area roadway to the Stadium (0.23 miles)*	Option 1a: $126,000 Option 1b: $225,000 Option 2: $207,000

Project Descriptions for Short-Term Improvements

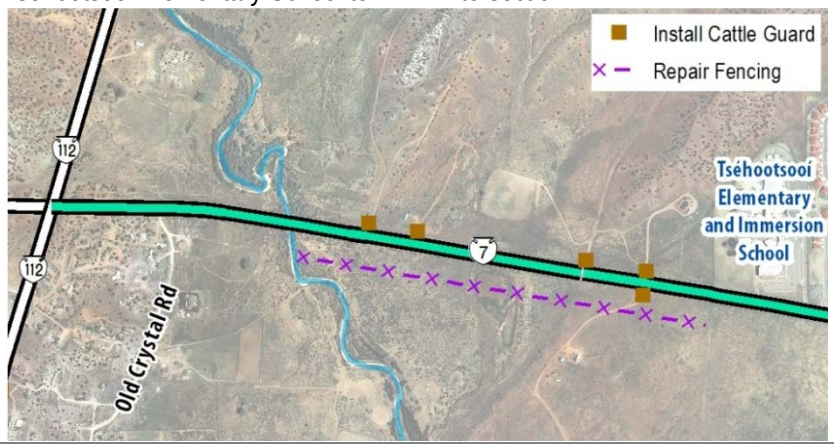
The following section presents specific improvement project information for projects identified for implementation during the short-term phase. Each project is profiled for ease of reference to pertinent information that may enable decision makers and funding agencies to quickly understand the need for their implementation.

Project #ST-1. N7: N12 Intersection to Tséhootsooí Elementary School	
Route Name:	N7
Section Number:	155, 150
Project Location:	N12 Intersection to Tséhootsooí Elementary School 
Project Mileage:	0.41 miles
Existing Conditions:	• Number of Lanes: One lane in each direction, each lane approximately 12 FT wide • Functional Classification: Rural Minor Arterial • Speed Limit: 30 MPH; 15 MPH school zone approaching Tséhootsooí Elementary School
Existing and Future Developments Served:	• Education and Health land use types are located along the northern portion of the corridor • Future NTUA complex, elderly center, government buildings along the northern portion; retail and IHS housing along southern portion
Existing and Projected Traffic Conditions:	• Existing ADT: 5,014 Existing LOS: C • 2018 ADT: 5,515 2018 LOS: C *Average Daily Traffic (ADT) refers to a roadway's total traffic volume during a 24-hour period. Level of Service (LOS) is measurement of traffic congestion. LOS is expressed using letters "A" through "F" , with LOS A representing free flow conditions and LOS F representing failed conditions.*

Project Description:

Improvement	Cost Estimate	Purpose/Benefit
Roadway Striping (0.41 mi)	$2,050	Improve lane visibility; Enhance safety
Pavement Preservation – Minor Rehabilitation (0.41 mi)	$20,500	Extend pavement life; Improve driver experience
Install Lighting	$20,500	Improve night time visibility and safety
Add 8" Wide Shoulders	$24,600	Provide safe area for vehicles to pull over
Add 4" Wide Landscape Buffer	$12,000	Increase pedestrian safety; Improve aesthetics
Install Cattle Guards (2)	$12,000	Restrict livestock from entering right-of-way
Construct Asphalt Share Use Path – WB (0.41 mi)	$82,000	Pedestrian/Bicyclist mobility

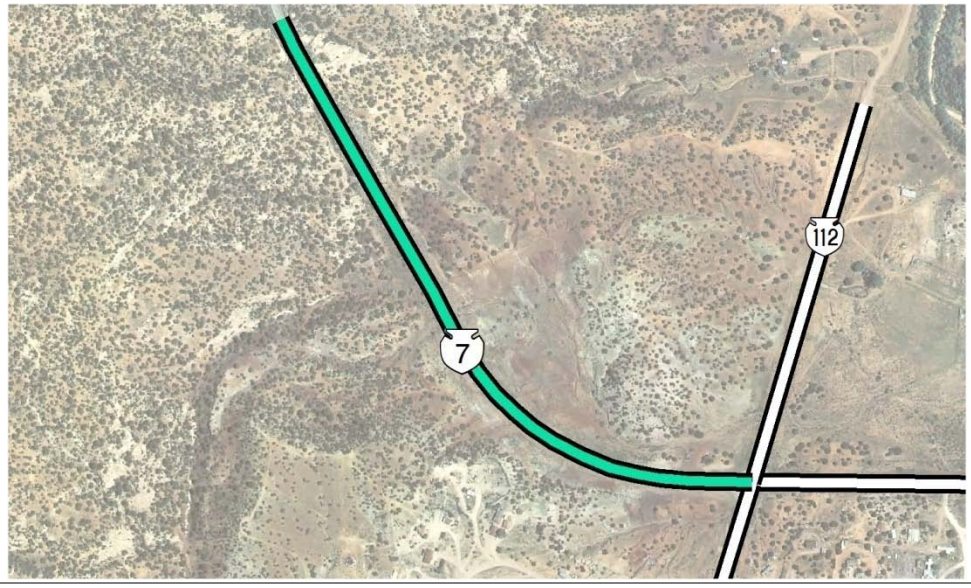
Environmental Overview:	Corridor is partially developed; therefore environmental impacts are minimal. Consideration should be given to impacts on biological and cultural resources, utilities, and noise receptors.
Issues Addressed:	Roadway safety concerns; pedestrian/bicyclist mobility; emergency vehicle access; and pavement preservation
Project Benefits:	Improved motor vehicle, pedestrian, bicyclist safety conditions; pedestrian/bicyclist access to N12; enhanced night time driving conditions; and improved pavement conditions
Funding Sources:	Tribal Transportation Program (TTP); Surface Transportation Program (STP); Federal Lands Transportation Program (FLTP)); Transportation Alternative Program (TAP); TAP - Safe Routes to School; Highway Safety Improvement Program (HSIP)

Project #ST-2. N7: Tséhootsooí Elementary School to N112 Intersection	
Route Name:	N7
Section Number:	146, 140, 130, 120
Project Location:	Tséhootsooí Elementary School to N112 Intersection 
Project Mileage:	1.14 miles
Existing Conditions:	• Number of Lanes: One lane in each direction, each lane approximately 12 FT wide • Functional Classification: Rural Minor Arterial • Speed Limit: 30 MPH; 15 MPH school zone approaching Tséhootsooí Elementary School
Existing and Future Developments Served:	• South of N7 is classified as agriculture, rural single family residential land use. North side of N7 is designated as grazing • Future retail and college along the south side; Government buildings north of Tséhootsooí Elementary School
Existing and Projected Traffic Conditions:	• Existing ADT: 2,305 Existing LOS: B • 2018 ADT: 2,536 2018 LOS: B *Average Daily Traffic (ADT) refers to a roadway's total traffic volume during a 24-hour period. Level of Service (LOS) is measurement of traffic congestion. LOS is expressed using letters "A" through "F" , with LOS A representing free flow conditions and LOS F representing failed conditions.*

Project Description:

Improvement	Cost Estimate	Purpose/Benefit
Roadway Striping (1.14 mi)	$5,700	Improve lane visibility; Enhance safety
Pavement Preservation – Structural Overlay (1.14 mi)	$684,000	Extend pavement life; Improve driver experience
Replace Signage	$4,560	Increase driver awareness and safety
Install Lighting	$57,000	Improve night time visibility and safety
Add 8" Wide Shoulders	$68,400	Provide safe area for vehicles to pull over
Add 4" Wide Landscape Buffer	$33,000	Increase pedestrian safety; Improve aesthetics
Repair Fencing (0.60 mi)	$27,000	Restrict livestock from entering right-of-way
Install Cattle Guards (5)	$25,000	Restrict livestock from entering right-of-way

Environmental Overview:	May have impacts to wetlands and biological resources in area. Consideration should be given to impacts on cultural resources.
Issues Addressed:	Roadway safety concerns; emergency vehicle access; and pavement preservation
Project Benefits:	Increased roadway safety; enhanced night time driving conditions; and improved pavement conditions
Funding Sources:	Tribal Transportation Program (TTP); Federal Lands Transportation Program (FLTP); Transportation Alternative Program (TAP); Highway Safety Improvement Program (HSIP)

Project #ST-3. N7: N112 Intersection to Western Study Boundary	
Route Name:	N7
Section Number:	115
Project Location:	N112 Intersection to Western Study Boundary 
Project Mileage:	0.61 miles
Existing Conditions:	• Number of Lanes: One lane eastbound, two lanes westbound; each lane approximately 12 FT wide • Functional Classification: Rural Minor Arterial • Speed Limit: 55 MPH
Existing and Future Developments Served:	• South of N7 is classified as agriculture, rural single family residential land use. North side of N7 is designated as grazing
Existing and Projected Traffic Conditions:	• Existing ADT: 877 Existing LOS: A • 2018 ADT: 965 2018 LOS: A *Average Daily Traffic (ADT) refers to a roadway's total traffic volume during a 24-hour period. Level of Service (LOS) is measurement of traffic congestion. LOS is expressed using letters "A" through "F" , with LOS A representing free flow conditions and LOS F representing failed conditions.*

Project Description:		
Improvement	Cost Estimate	Purpose/Benefit
Roadway Striping (0.61 mi)	$ 3,050	Improve lane visibility; Enhance safety
Pavement Preservation – Structural Overlay	$366,000	Extend pavement life; Improve driver experience
Add 8" Wide Shoulders	$36,600	Provide safe area for vehicles to pull over

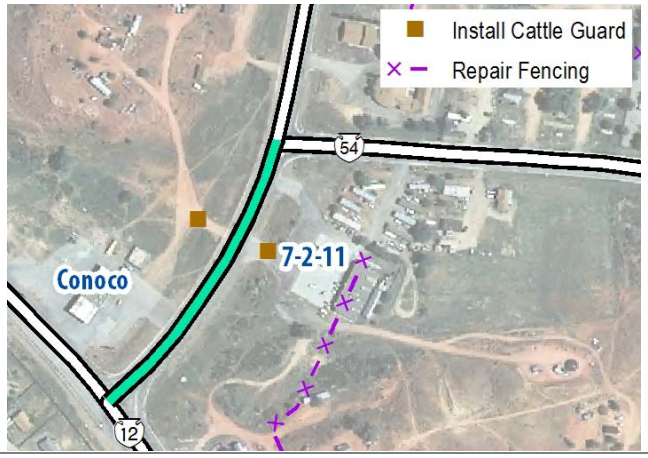
Environmental Overview:	May have impacts to wetlands and biological resources in area. Consideration should be given to impacts on cultural resources.
Issues Addressed:	Roadway safety concerns; emergency vehicle access; and pavement preservation
Project Benefits:	Improved roadway safety conditions and improved pavement conditions
Funding Sources:	Tribal Transportation Program (TTP); Federal Lands Transportation Program (FLTP); Highway Safety Improvement Program (HSIP)

Project #ST-4. N12: Southern Study Boundary to N110 Intersection	
Route Name:	N12
Section Number:	140, 150
Project Location:	Southern Study Boundary to N110 Intersection 
Project Mileage:	0.18 miles
Existing Conditions:	• Number of Lanes: Two lanes in each direction with center turn lane, each lane approximately 12-14 FT wide • Functional Classification: Section 140: Major Arterial Section 150: Rural Minor Arterial • Speed Limit: 35 MPH
Existing and Future Developments Served:	• The western portion of N12 is designated as residential, while the eastern portion of the corridor is designated commercial.
Existing and Projected Traffic Conditions:	• Existing ADT: 13,061 Existing LOS: B • 2018 ADT: 14,367 2018 LOS: B *Average Daily Traffic (ADT) refers to a roadway's total traffic volume during a 24-hour period. Level of Service (LOS) is measurement of traffic congestion. LOS is expressed using letters "A" through "F" , with LOS A representing free flow conditions and LOS F representing failed conditions.*

Project Description:

Improvement	Cost Estimate	Purpose/Benefit
Roadway Striping (0.18 mi)	$900	Improve lane visibility; Enhance safety
Pavement Preservation – Minor Rehabilitation (0.18 mi)	$9,000	Extend pavement life; Improve driver experience
Install Lighting	$9,000	Improve night time visibility and safety
Add 4" Wide Landscape Buffer	$5,000	Increase pedestrian safety; Improve aesthetics
Repair Fencing (0.18 mi)	$8,100	Restrict livestock from entering right-of-way
Construct Concrete Shared Use Path – Northbound	$54,000	Pedestrian/ Bicyclist mobility
Construct Concrete Shared Use Path – Southbound	$54,000	Pedestrian/ Bicyclist mobility

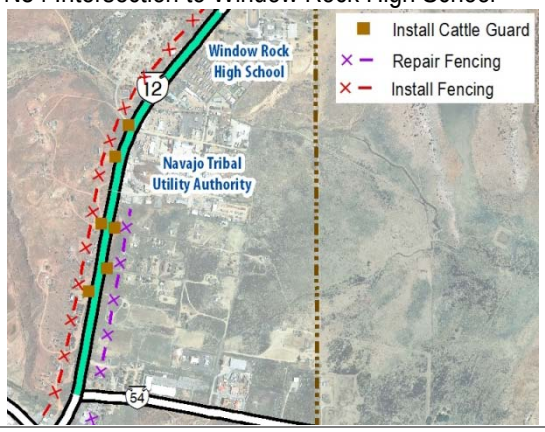
Environmental Overview:	Corridor is developed; therefore environmental impacts are minimal. Consideration should be given to impacts on flood event water surface elevations, cultural resources, utilities, and sensitive noise receptors.
Issues Addressed:	Roadway safety concerns; pedestrian/bicyclist mobility; emergency vehicle access; and pavement preservation
Project Benefits:	Improved motor vehicle, pedestrian, bicyclist safety conditions; pedestrian/bicyclist access to activity centers; enhanced night time driving conditions; and improved pavement conditions
Funding Sources:	Tribal Transportation Program (TTP); Surface Transportation Program (STP); Federal Lands Transportation Program (FLTP); Transportation Alternative Program (TAP); Highway Safety Improvement Program (HSIP); Tribal Safety Program

Project #ST-5. N12: N110 Intersection to N54 Intersection	
Route Name:	N12
Section Number:	150
Project Location:	N110 Intersection to N54 Intersection 
Project Mileage:	0.16 miles
Existing Conditions:	• Number of Lanes: Two lanes in each direction with center turn lane • Functional Classification: Rural Minor Arterial • Speed Limit: 35 MPH
Existing and Future Developments Served:	• Primarily designated as commercial, since the Conoco and the 7 to 11 gas stations are located in this corridor • Future retail immediately north of Conoco Gas Station
Existing and Projected Traffic Conditions:	• Existing ADT: 11,475 Existing LOS: B • 2018 ADT: 12,623 2018 LOS: B *Average Daily Traffic (ADT) refers to a roadway's total traffic volume during a 24-hour period. Level of Service (LOS) is measurement of traffic congestion. LOS is expressed using letters "A" through "F" , with LOS A representing free flow conditions and LOS F representing failed conditions.*

Project Description:

Improvement	Cost Estimate	Purpose/Benefit
Roadway Striping (0.16 mi)	$800	Improve lane visibility; Enhance safety
Remove Roadside Vegetation	$320	Improve driver visibility, drainage, and safety
Pavement Preservation – Minor Rehabilitation (0.16 mi)	$8,000	Extend pavement life; Improve driver experience
Replace Signage	$640	Increase driver awareness and safety
Install Lighting	$8,000	Improve night time visibility and safety
Add 4" Wide Landscape Buffer	$4,500	Increase pedestrian safety; Improve aesthetics
Repair Fencing (0.14 mi)	$6,300	Restrict livestock from entering right-of-way
Install Cattle Guards (2)	$10,000	Restrict livestock from entering right-of-way
Construct Concrete Shared Use Path – NB (0.16 mi)	$48,000	Pedestrian/Bicyclist mobility
Construct Concrete Shared Use Path – SB (0.16 mi)	$48,000	Pedestrian/Bicyclist mobility

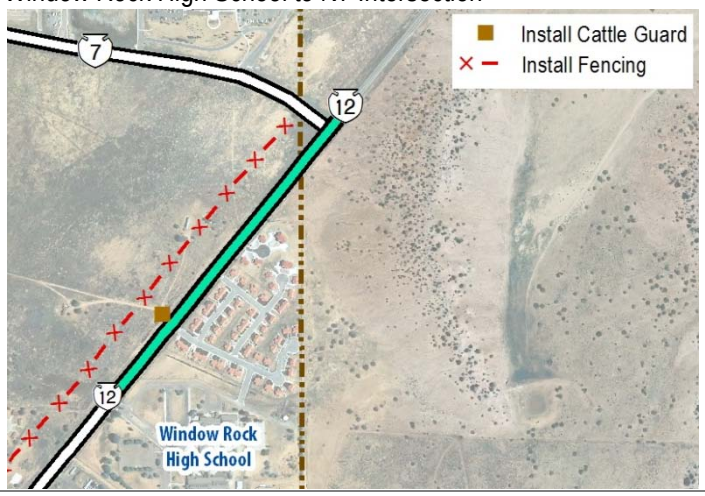
Environmental Overview:	Corridor is developed; therefore environmental impacts are minimal. Consideration should be given to impacts on flood event water surface elevations, utilities, and noise receptors.
Issues Addressed:	Roadway safety concerns; pedestrian/bicyclist mobility; emergency vehicle access; and pavement preservation
Project Benefits:	Increased motor vehicle, pedestrian, bicyclist safety conditions; pedestrian/bicyclist access to activity centers; enhanced night time driving conditions; and improved pavement conditions
Funding Sources:	Tribal Transportation Program (TTP); Surface Transportation Program (STP); Federal Lands Transportation Program (FLTP); Transportation Alternative Program (TAP); Highway Safety Improvement Program (HSIP)

Project #ST-6. N12: N54 Intersection to Window Rock High School	
Route Name:	N12
Section Number:	160, 165
Project Location:	N54 Intersection to Window Rock High School 
Project Mileage:	1.12 miles
Existing Conditions:	• Number of Lanes: Two lanes in each direction with center turn lane, each lane approximately 12-14 FT wide • Functional Classification: Rural Minor Arterial • Speed Limit: 35 MPH; 15 MPH school zone approaching Window Rock High School
Existing and Future Developments Served:	• Land use designations along the corridor include single family residential, agriculture, residential, religion, utility, and government • Future expansion of housing for school employees southeast of Window Rock High School
Existing and Projected Traffic Conditions:	• Existing ADT: 11,292 Existing LOS: B • 2018 ADT: 12,421 2018 LOS: B *Average Daily Traffic (ADT) refers to a roadway's total traffic volume during a 24-hour period. Level of Service (LOS) is measurement of traffic congestion. LOS is expressed using letters "A" through "F" , with LOS A representing free flow conditions and LOS F representing failed conditions.*

Project Description:

Improvement	Cost Estimate	Purpose/Benefit
Roadway Striping (1.12 mi)	$5,600	Improve lane visibility; Enhance safety
Remove Roadside Vegetation (1.12 mi)	$2,240	Improve driver visibility, drainage, and safety
Pavement Preservation – Minor Rehabilitation (1.12 mi)	$56,000	Extend pavement life; Improve driver experience
Replace Signage	$4,480	Increase driver awareness and safety
Install Lighting	$56,000	Improve night time visibility and safety
Add 4" Wide Landscape Buffer	$32,500	Increase pedestrian safety; Improve aesthetics
Repair Fencing (0.51 mi)	$22,950	Restrict livestock from entering right-of-way
Install New Fencing (1.12 mi)	$27,450	Restrict livestock from entering right-of-way
Install Cattle Guards (7)	$35,000	Restrict livestock from entering right-of-way
Construct Extra-Wide Asphalt Shared Use Path – NB	$252,000	Pedestrian/Bicyclist mobility

Environmental Overview:	Corridor is developed; therefore environmental impacts are minimal. Consideration should be given to impacts on cultural resources, utilities, and noise receptors.
Issues Addressed:	Roadway safety concerns; pedestrian/bicyclist mobility; emergency vehicle access; and pavement preservation
Project Benefits:	Improved motor vehicle, pedestrian, bicyclist safety conditions; pedestrian/bicyclist access to activity centers; enhanced night time driving conditions; and improved pavement conditions
Funding Sources:	Tribal Transportation Program (TTP); Surface Transportation Program (STP); Federal Lands Transportation Program (FLTP); Transportation Alternative Program (TAP);TAP -Safe Routes to School; Highway Safety Improvement Program (HSIP)

Project #ST-7. N12: Window Rock High School to N7 Intersection	
Route Name:	N12
Section Number:	170, 180
Project Location:	Window Rock High School to N7 Intersection 
Project Mileage:	0.47 miles
Existing Conditions:	• Number of Lanes: Two lanes in each direction with center turn lane • Functional Classification: Rural Minor Arterial • Speed Limit: 35 MPH; 15 MPH school zone approaching Window Rock High School
Existing and Future Developments Served:	• Eastern side of corridor is designated as residential and education, while the western portion is designated as grazing • Future retail and college as well as additional IHS housing in northwestern portion
Existing and Projected Traffic Conditions:	• Existing ADT: 7,524 Existing LOS: A • 2018 ADT: 10,276 2018 LOS: B *Average Daily Traffic (ADT) refers to a roadway's total traffic volume during a 24-hour period. Level of Service (LOS) is measurement of traffic congestion. LOS is expressed using letters "A" through "F" , with LOS A representing free flow conditions and LOS F representing failed conditions.*

Project Description:		
Improvement	Cost Estimate	Purpose/Benefit
Roadway Striping (0.47 mi)	$2,350	Improve lane visibility; Enhance safety
Remove Roadside Vegetation	$940	Improve driver visibility, drainage, and safety
Pavement Preservation – Minor Rehabilitation (0.47 mi)	$23,500	Extend pavement life; Improve driver experience
Install Lighting	$23,500	Improve night time visibility and safety
Add 4" Wide Landscape Buffer	$13,500	Increase pedestrian safety; Improve aesthetics
Install New Fencing (0.47 mi)	$21,150	Restrict livestock from entering right-of-way
Install Cattle Guards (1)	$5,000	Restrict livestock from entering right-of-way
Construct Extra-Wide Asphalt Shared Use Path – NB	$105,750	Pedestrian/Bicyclist mobility

Environmental Overview:	Corridor is partially developed; therefore environmental impacts are minimal. Consideration should be given to impacts on cultural resources, utilities, and sensitive noise receptors.
Issues Addressed:	Roadway safety concerns; pedestrian/bicyclist mobility; emergency vehicle access; and pavement preservation
Project Benefits:	Improved motor vehicle, pedestrian, bicyclist safety conditions; pedestrian/bicyclist access to activity centers; enhanced night time driving conditions; and improved pavement conditions
Funding Sources:	Tribal Transportation Program (TTP); Surface Transportation Program (STP); Federal Lands Transportation Program (FLTP); Transportation Alternative Program (TAP);TAP -Safe Routes to School; Highway Safety Improvement Program (HSIP)

Project #ST-8. N54: Eastern Study Boundary to N12 Intersection	
Route Name:	N54
Section Number:	90
Project Location:	Eastern Study Boundary to N12 Intersection 
Project Mileage:	0.66 miles
Existing Conditions:	• Number of Lanes: One lane in each direction, each lane approximately 12 FT wide • Functional Classification: Rural Minor Arterial • Speed Limit: 35 MPH
Existing and Future Developments Served:	• Land use designations along the corridor include religion, residential, utility, industrial, government, and rural single family residential • Future redeveloped trailer park, solar equipment manufacturing facility, and transit center expansion along northern portion of roadway
Existing and Projected Traffic Conditions:	• Existing ADT: 3,577 Existing LOS: C • 2018 ADT: 4,267 2018 LOS: C *Average Daily Traffic (ADT) refers to a roadway's total traffic volume during a 24-hour period. Level of Service (LOS) is measurement of traffic congestion. LOS is expressed using letters "A" through "F" , with LOS A representing free flow conditions and LOS F representing failed conditions.*

Project Description:		
Improvement	Cost Estimate	Purpose/Benefit
Roadway Striping (0.66 mi)	$3,300	Improve lane visibility; Enhance safety
Pavement Preservation – Minor Rehabilitation (0.66 mi)	$33,000	Extend pavement life; Improve driver experience
Install Lighting	$33,000	Improve night time visibility and safety
Add 4" Wide Landscape Buffer	$19,000	Increase pedestrian safety; Improve aesthetics
Install New Fencing (0.40 mi)	$18,000	Restrict livestock from entering right-of-way
Install Cattle Guards (6)	$30,000	Restrict livestock from entering right-of-way

Environmental Overview:	Corridor is developed; therefore environmental impacts are minimal. Consideration should be given to impacts on flood event water surface elevations, cultural resources, utilities, and sensitive noise receptors.
Issues Addressed:	Roadway safety concerns; emergency vehicle access; and pavement preservation
Project Benefits:	Improved roadway safety conditions; enhanced night time driving conditions; and improved pavement conditions
Funding Sources:	Tribal Transportation Program (TTP); Surface Transportation Program (STP); Federal Lands Transportation Program (FLTP); Transportation Alternative Program (TAP); Highway Safety Improvement Program (HSIP)

Project #ST-9. N110: N12 Intersection to Tséhootsooí Middle School	
Route Name:	N110
Section Number:	10, 20, 30
Project Location:	N12 Intersection to Tséhootsooí Middle School 
Project Mileage:	0.54 miles
Existing Conditions:	• Number of Lanes: Two lanes in each direction with a center turn lane, each lane approximately 12-14 FT wide • Functional Classification: Rural Minor Arterial • Speed Limit: 35 MPH; 15 MPH school zone approaching Tséhootsooí Middle School
Existing and Future Developments Served:	• The southern portion of N110 is designated residential and religion, while commercial and grazing land use designations are located along the northern portion of the corridor • Potential for future retail establishments west of Conoco Gas Station and expansion of New Youth Recreation Complex
Existing and Projected Traffic Conditions:	• Existing ADT: 8,564 Existing LOS: B • 2018 ADT: 9,420 2018 LOS: B *Average Daily Traffic (ADT) refers to a roadway's total traffic volume during a 24-hour period. Level of Service (LOS) is measurement of traffic congestion. LOS is expressed using letters "A" through "F" , with LOS A representing free flow conditions and LOS F representing failed conditions.*

Project Description:

Improvement	Cost Estimate	Purpose/Benefit
Roadway Striping (0.54 mi)	$2,700	Improve lane visibility; Enhance safety
Pavement Preservation – Structural Overlay (0.54 mi)	$432,000	Extend pavement life; Improve driver experience
Replace Signage	$2,160	Increase driver awareness and safety
Install Lighting	$27,000	Improve night time visibility and safety
Add 4" Wide Landscape Buffer	$15,500	Increase pedestrian safety; Improve aesthetics
Construct Concrete Shared Use Path – WB (0.54 mi)	$162,000	Pedestrian/Bicyclist mobility
Construct Concrete Shared Use Path – EB (0.54 mi)	$162,000	Pedestrian/Bicyclist mobility

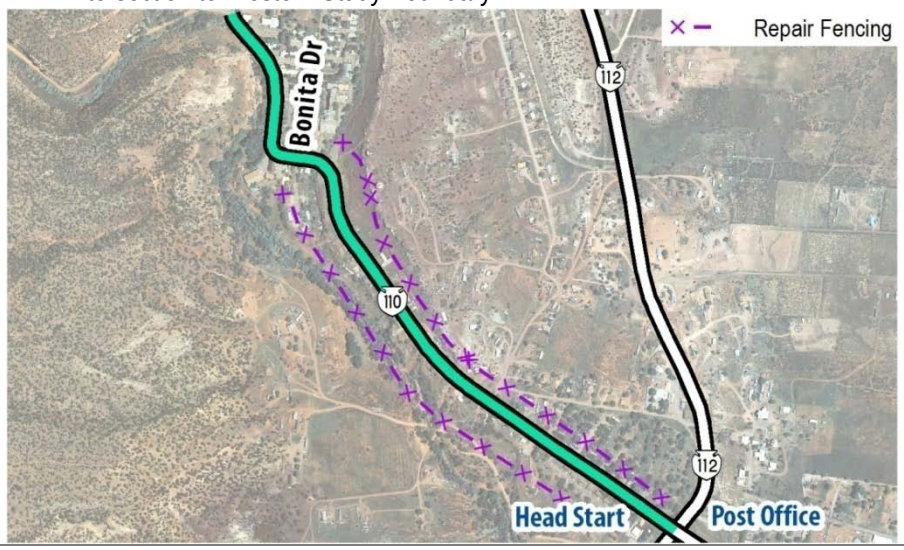
Environmental Overview:	Corridor is developed; therefore environmental impacts are minimal. Consideration should be given to impacts on flood event water surface elevations, cultural resources, utilities, and sensitive noise receptors.
Issues Addressed:	Roadway safety concerns; pedestrian/bicyclist mobility; emergency vehicle access; and pavement preservation
Project Benefits:	Improved motor vehicle, pedestrian, bicyclist safety conditions; pedestrian/bicyclist access to activity centers; enhanced night time driving conditions; and improved pavement conditions
Funding Sources:	Tribal Transportation Program (TTP); Surface Transportation Program (STP); Federal Lands Transportation Program (FLTP); Transportation Alternative Program (TAP);TAP -Safe Routes to School; Highway Safety Improvement Program (HSIP)

Project #ST-10. N110: Tséhootsooí Middle School to N112 Intersection	
Route Name:	N110
Section Number:	35
Project Location:	Tséhootsooí Middle School to N112 Intersection 
Project Mileage:	0.34 miles
Existing Conditions:	• Number of Lanes: Two lanes in each direction with a center turn lane, each lane approximately 12-14 FT wide • Functional Classification: Rural Minor Arterial • Speed Limit: 35 MPH; 15 MPH school zone approaching Tséhootsooí Middle School
Existing and Future Developments Served:	• Land use designations along this corridor include recreation, government, and education
Existing and Projected Traffic Conditions:	• Existing ADT: 5,714 Existing LOS: A • 2018 ADT: 6,285 2018 LOS: A *Average Daily Traffic (ADT) refers to a roadway's total traffic volume during a 24-hour period. Level of Service (LOS) is measurement of traffic congestion. LOS is expressed using letters "A" through "F" , with LOS A representing free flow conditions and LOS F representing failed conditions.*

Project Description:

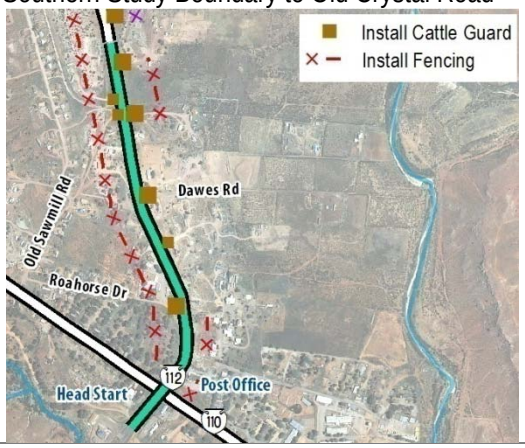
Improvement	Cost Estimate	Purpose/Benefit
Roadway Striping (0.34 mi)	$1,700	Improve lane visibility; Enhance safety
Pavement Preservation – Structural Overlay (0.34 mi)	$272,000	Extend pavement life; Improve driver experience
Replace Signage	$1,360	Increase driver awareness and safety
Install Lighting	$17,000	Improve night time visibility and safety
Add 4" Wide Landscape Buffer	$10,000	Increase pedestrian safety; Improve aesthetics
Construct Concrete Shared Use Path – WB (0.34 mi)	$102,000	Pedestrian/Bicyclist mobility
Construct Concrete Shared Use Path – EB (0.34 mi)	$102,000	Pedestrian/Bicyclist mobility

Environmental Overview:	Corridor is developed; therefore environmental impacts are minimal. Consideration should be given to impacts on cultural resources, utilities, and sensitive noise receptors.
Issues Addressed:	Roadway safety concerns; pedestrian/bicyclist mobility; emergency vehicle access; and pavement preservation
Project Benefits:	Improved motor vehicle, pedestrian, bicyclist safety conditions; pedestrian/bicyclist access to activity centers; enhanced night time driving conditions; and improved pavement conditions
Funding Sources:	Tribal Transportation Program (TTP); Surface Transportation Program (STP); Federal Lands Transportation Program (FLTP); Transportation Alternative Program (TAP);TAP -Safe Routes to School; Highway Safety Improvement Program (HSIP)

Project #ST-11. N110: N112 Intersection to Western Study Boundary	
Route Name:	N110
Section Number:	40, 43, 46, 50, 55
Project Location:	N112 Intersection to Western Study Boundary 
Project Mileage:	1.17 miles
Existing Conditions:	• Number of Lanes: Two lanes in each direction with a center turn lane, each lane approximately 12-14 FT wide • Functional Classification: Rural Minor Arterial • Speed Limit: 35 MPH
Existing and Future Developments Served:	• Land use designations include police/fire, medium density residential, rural single family residential, public facility/institutional, and government • Future office complex at northwest corner of N110/N112, Old Downtown redevelopment, and medical school in the vicinity of old hospital area
Existing and Projected Traffic Conditions:	• Existing ADT: 2,903 Existing LOS: B • 2018 ADT: 3,193 2018 LOS: B *Average Daily Traffic (ADT) refers to a roadway's total traffic volume during a 24-hour period. Level of Service (LOS) is measurement of traffic congestion. LOS is expressed using letters "A" through "F" , with LOS A representing free flow conditions and LOS F representing failed conditions.*

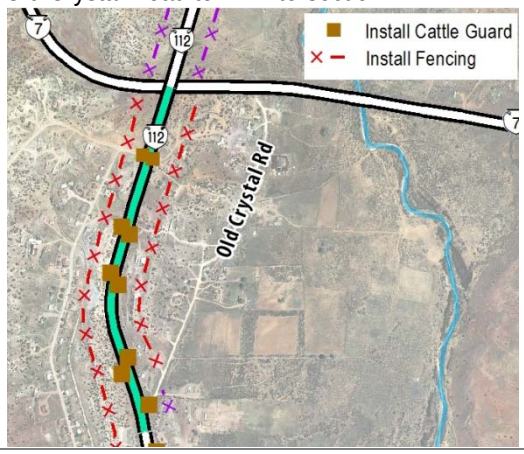
Project Description:		
Improvement	Cost Estimate	Purpose/Benefit
Roadway Striping (1.17 mi)	$5,850	Improve lane visibility; Enhance safety
Pavement Preservation – Minor Rehabilitation (1.17 mi)	$58,500	Extend pavement life; Improve driver experience
Install Lighting	$58,500	Improve night time visibility and safety
Add 4' Wide Landscape Buffer	$34,000	Increase pedestrian safety; Improve aesthetics
Add Shoulders	$70,200	Provide safe area for vehicles to pull over
Repair Existing Fencing (1.08 mi)	$48,600	Restrict livestock from entering right-of-way

Environmental Overview:	Corridor is developed; therefore environmental impacts are minimal. Consideration should be given to impacts on cultural resources, utilities, and sensitive noise receptors.
Issues Addressed:	Roadway safety concerns; emergency vehicle access; and pavement preservation
Project Benefits:	Improved roadway safety conditions; enhanced night time driving conditions; and improved pavement conditions
Funding Sources:	Tribal Transportation Program (TTP); Federal Lands Transportation Program (FLTP); Transportation Alternative Program (TAP); Highway Safety Improvement Program (HSIP)

Project #ST-12. N112: Southern Study Boundary to Old Crystal Road	
Route Name:	N112
Section Number:	50
Project Location:	Southern Study Boundary to Old Crystal Road 
Project Mileage:	0.81 miles
Existing Conditions:	• Number of Lanes: One lane in each, each lane approximately 12 FT wide • Functional Classification: Rural Minor Arterial • Speed Limit: 35 MPH
Existing and Future Developments Served:	• Land use designations include government, public facility/institutional, rural single family residential, and agriculture. Future residential redevelopment south of Forth Defiance Chapter House as well as office complex at the northwest corner of N112/N110
Existing and Projected Traffic Conditions:	• Existing ADT: 3,138 Existing LOS: B • 2018 ADT: 3,452 2018 LOS: B *Average Daily Traffic (ADT) refers to a roadway's total traffic volume during a 24-hour period. Level of Service (LOS) is measurement of traffic congestion. LOS is expressed using letters "A" through "F" , with LOS A representing free flow conditions and LOS F representing failed conditions.*

Project Description:		
Improvement	Cost Estimate	Purpose/Benefit
Roadway Striping (0.81 mi)	$4,050	Improve lane visibility; Enhance safety
Remove Roadside Vegetation	$1,620	Improve driver visibility, drainage, and safety
Replace Signage	$3,240	Increase driver awareness and safety
Pavement Preservation – Structural Overlay (0.81 mi)	$486,000	Extend pavement life; Improve driver experience
Install Lighting	$40,500	Improve night time visibility and safety
Add 4" Wide Landscape Buffer	$23,500	Increase pedestrian safety; Improve aesthetics
Add Shoulder	$48,600	Provide safe area for vehicles to pull over
Install New Fencing (0.91 mi)	$36,450	Restrict livestock from entering right-of-way
Install Cattle Guards (7)	$35,000	Restrict livestock from entering right-of-way
Construct Narrow Asphalt Shared Use Path – SB	$145,800	Pedestrian/Bicyclist mobility

Environmental Overview:	Corridor is developed; therefore environmental impacts are minimal. Consideration should be given to impacts on cultural resources, utilities, and noise receptors.
Issues Addressed:	Roadway safety concerns; pedestrian/bicyclist mobility; emergency vehicle access; and pavement preservation
Project Benefits:	Improved motor vehicle, pedestrian, bicyclist safety conditions; pedestrian/bicyclist access to activity centers; enhanced night time driving conditions; and improved pavement conditions
Funding Sources:	Tribal Transportation Program (TTP); Surface Transportation Program (STP); Federal Lands Transportation Program (FLTP); Transportation Alternative Program (TAP); Highway Safety Improvement Program (HSIP)

Project #ST-13. N112: Old Crystal Road to N7 Intersection	
Route Name:	N112
Section Number:	60, 63, 66
Project Location:	Old Crystal Road to N7 Intersection 
Project Mileage:	0.62 miles
Existing Conditions:	• Number of Lanes: One lane in each direction, each lane approximately 12 FT wide • Functional Classification: Rural Minor Arterial • Speed Limit: 35 MPH
Existing and Future Developments Served:	• The corridor is bounded by rural single family residential land use. • No developments are currently planned
Existing and Projected Traffic Conditions:	• Existing ADT: 2,714 Existing LOS: B • 2018 ADT: 2,985 2018 LOS: B *Average Daily Traffic (ADT) refers to a roadway's total traffic volume during a 24-hour period. Level of Service (LOS) is measurement of traffic congestion. LOS is expressed using letters "A" through "F" , with LOS A representing free flow conditions and LOS F representing failed conditions.*

Project Description:

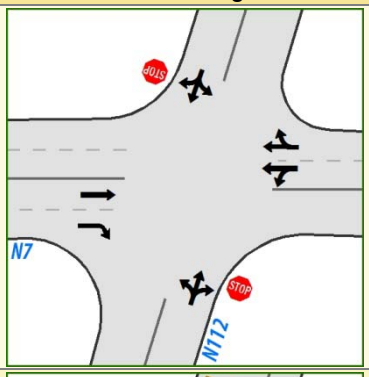
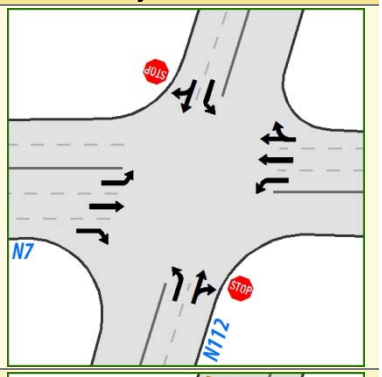
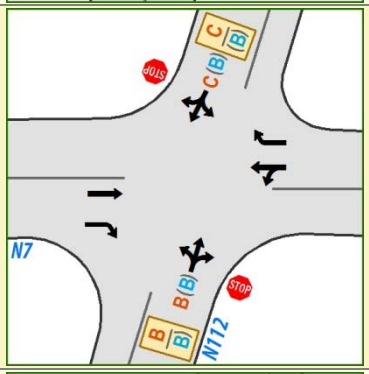
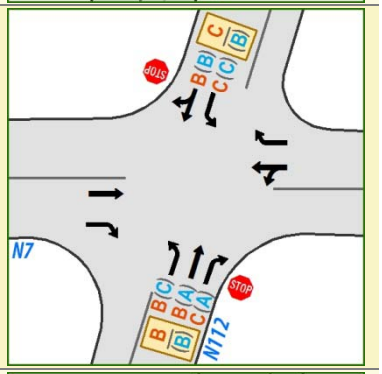
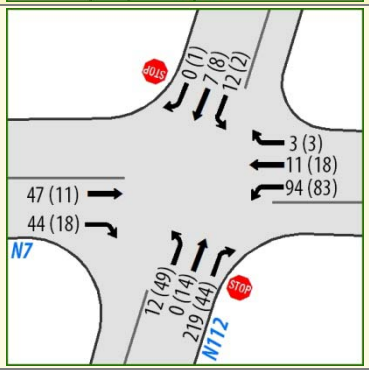
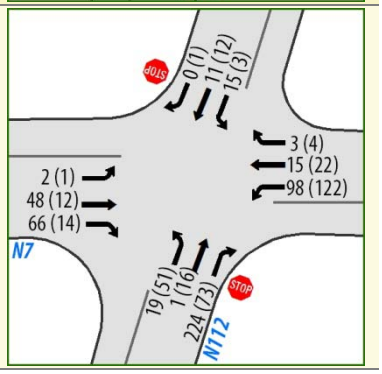
Improvement	Cost Estimate	Purpose/Benefit
Roadway Striping (0.62 mi)	$3,100	Improve lane visibility; Enhance safety
Remove Roadside Vegetation	$1,860	Improve driver visibility, drainage, and safety
Replace Signage	$2,480	Increase driver awareness and safety
Pavement Preservation – Structural Overlay (0.62 mi)	$372,000	Extend pavement life; Improve driver experience
Install Lighting	$31,000	Improve night time visibility and safety
Add 4" Wide Landscape Buffer	$18,000	Increase pedestrian safety; Improve aesthetics
Add Shoulders	$37,200	Provide safe area for vehicles to pull over
Install New Fencing (1.2 mi)	$54,000	Restrict livestock from entering right-of-way
Install Cattle Guards (9)	$45,000	Restrict livestock from entering right-of-way
Construct Narrow Asphalt Share Use Path – SB (0.62 mi)	$111,600	Pedestrian/Bicyclist mobility

Environmental Overview:	Corridor is developed; therefore environmental impacts are minimal. Consideration should be given to impacts on cultural resources, utilities, and noise receptors.
Issues Addressed:	Roadway safety concerns; pedestrian/bicyclist mobility; emergency vehicle access; and pavement preservation
Project Benefits:	Improved motor vehicle, pedestrian, bicyclist safety conditions; pedestrian/bicyclist access to activity centers; enhanced night time driving conditions; and improved pavement conditions
Funding Sources:	Tribal Transportation Program (TTP); Surface Transportation Program (STP); Federal Lands Transportation Program (FLTP); Transportation Alternative Program (TAP); Highway Safety Improvement Program (HSIP)

Project #ST-14. N112: N7 Intersection to Northern Study Boundary	
Route Name:	N112
Section Number:	70
Project Location:	N7 Intersection to Northern Study Boundary 
Project Mileage:	0.35 miles
Existing Conditions:	• Number of Lanes: One lane in each, each lane approximately 12 FT wide • Functional Classification: Rural Major Collector • Speed Limit: 35 MPH
Existing and Future Developments Served:	• Surrounding land use is designated for grazing • No developments are currently planned
Existing and Projected Traffic Conditions:	• Existing ADT: 169 Existing LOS: A • 2018 ADT: 186 2018 LOS: A *Average Daily Traffic (ADT) refers to a roadway's total traffic volume during a 24-hour period. Level of Service (LOS) is measurement of traffic congestion. LOS is expressed using letters "A" through "F" , with LOS A representing free flow conditions and LOS F representing failed conditions.*

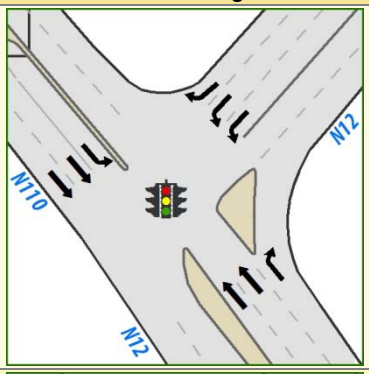
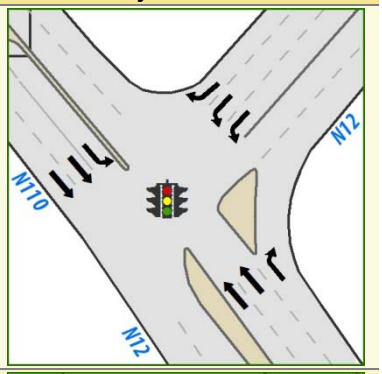
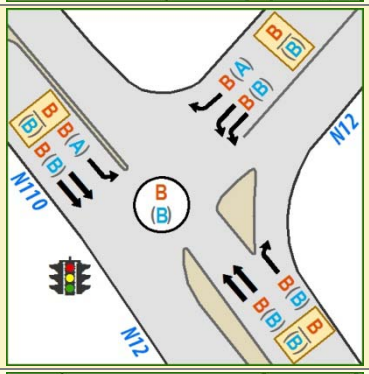
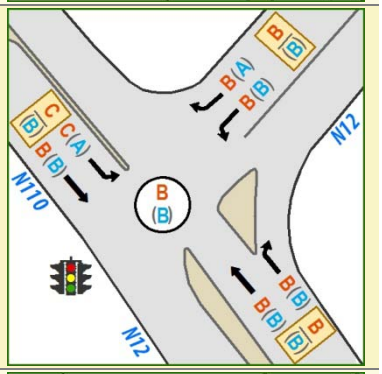
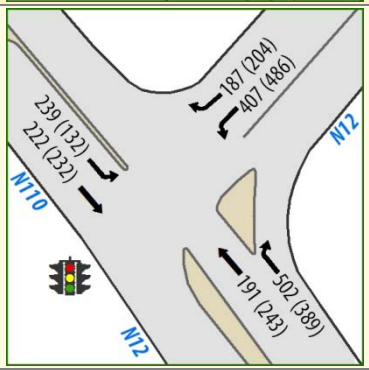
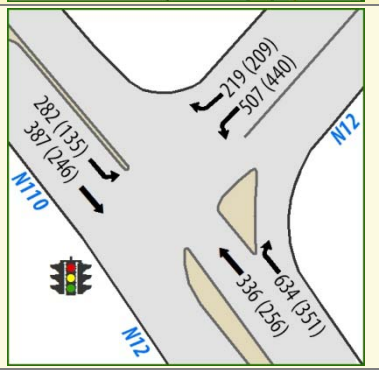
Project Description:		
Improvement	Cost Estimate	Purpose/Benefit
Roadway Striping (0.35 mi)	$1,750	Improve lane visibility; Enhance safety

Environmental Overview:	May have impacts to wetlands and biological resources in area. Consideration should be given to impacts on cultural resources.
Issues Addressed:	Roadway safety concerns
Project Benefits:	Improved roadway safety conditions
Funding Sources:	Tribal Transportation Program (TTP); Federal Lands Transportation Program (FLTP)

Project #ST-15. N112/N7 Intersection			
Intersection Name:	N112/N7		
BIA Route/Section Number:	N112: 66,70 N7:120,115		
Project Location:			
Existing and Projected Conditions:		Existing	Projected 2018
	Lane Configuration		
	Level of Service		
	Volumes		

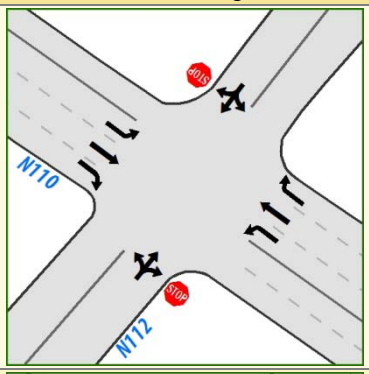
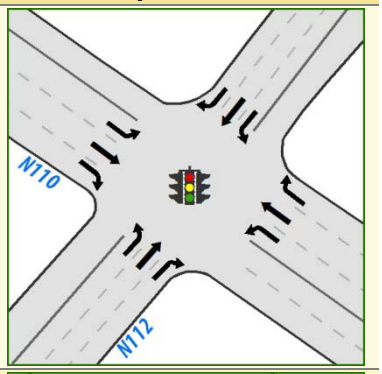
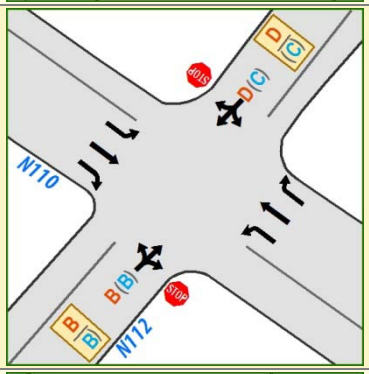
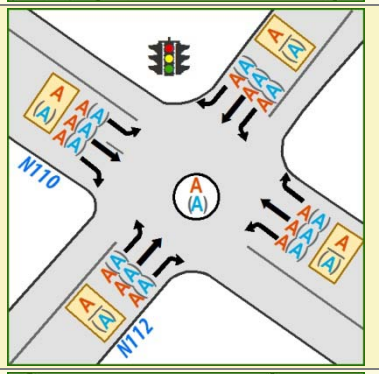
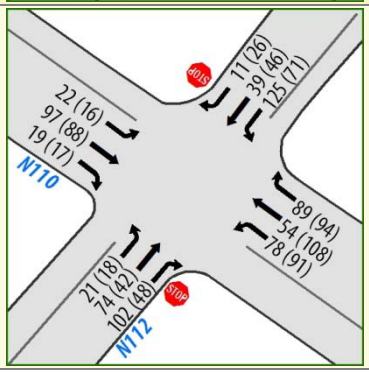
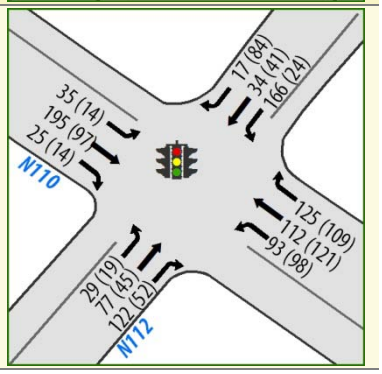
Project #ST-15. N112/N7 Intersection (Continued)		
Project Description:		
Improvement	Cost Estimate	Purpose/Benefit
Pavement Restriping of Travel Lanes and to Include Pedestrian Crosswalks	$5,000	Improve roadway and pedestrian safety conditions; Improve intersection traffic operations and safety conditions
Add Turn Lanes on N112 - Northbound and Southbound		
Add Left Turn Lane on N7 - Westbound		

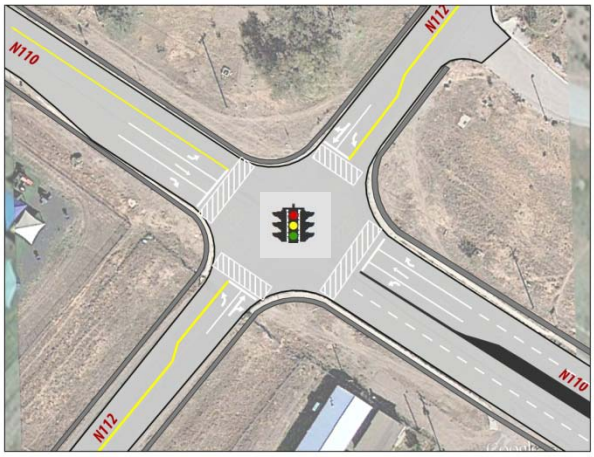
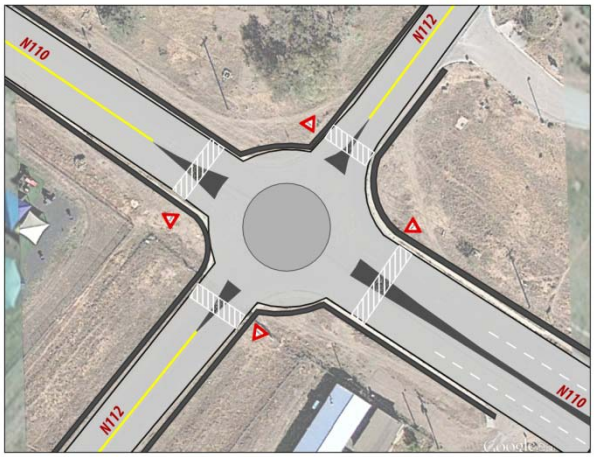
Environmental Overview:	Improvements do not need additional right-of-way; therefore environmental impacts will be limited. Consideration should be given to impacts on wetlands, biological resources, and cultural resources.
Issues Addressed:	Intersection traffic operations; pedestrian safety; and intersection safety conditions
Project Benefits:	Increased roadway and pedestrian safety conditions; enhanced night time driving conditions; and increased pedestrian mobility
Funding Sources:	Tribal Transportation Program (TTP); Federal Lands Transportation Program (FLTP); Transportation Alternative Program (TAP); Highway Safety Improvement Program (HSIP); Tribal Safety Program

Project #ST-16. N12/N110 Intersection			
Intersection Name:	N12/N110		
BIA Route/Section Number:	N112: 50,60 N110: 35,40		
Project Location:			
Existing and Projected Conditions:		Existing	Projected 2018
	Lane Configuration		
	Level of Service		
	Volumes		

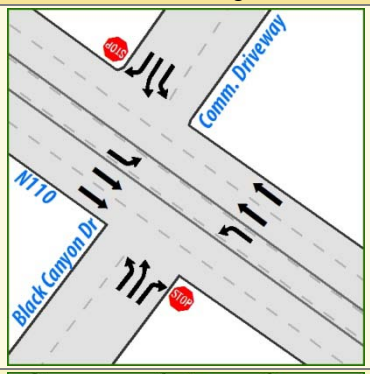
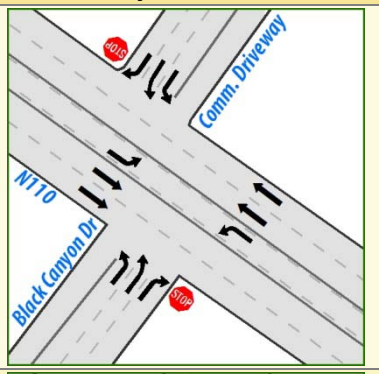
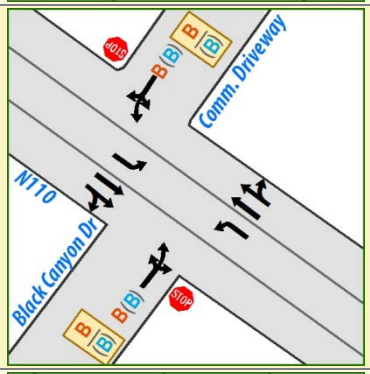
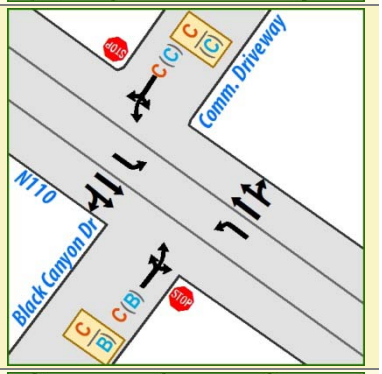
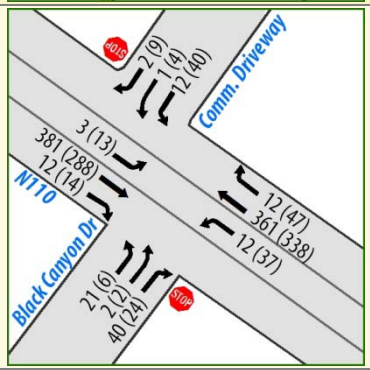
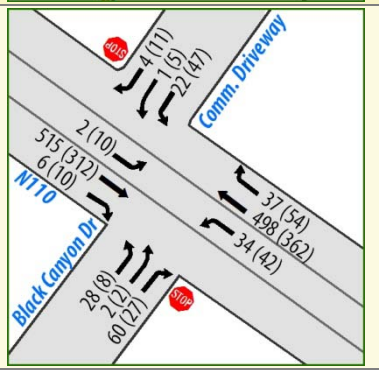
Project #ST-16. N12/N110 Intersection (Continued)		
Project Description:		
Improvement	Cost Estimate	Purpose/Benefit
Repair Cross Slope to Improve Drainage	$250,000	Improves drainage
Option 1 (No Roundabout): Upgrade traffic signal; install raised medians on N12 and N110; remove jersey barrier; reconfigure pedestrian island; construct shared use path; install pedestrian crosswalks and pedestrian crossing signals; convert entrance to Conoco Gas Station to a right-in only; pavement restriping to include exclusive turn lanes 	$350,000	Enhances traffic operations; improves safety conditions; reduces turning movement conflict locations; provides safe pedestrian and bicyclist pathways and crosswalks
Option 2 (Roundabout): Reconfigure intersection to include a roundabout; ; remove jersey barrier; pedestrian crosswalks and sidewalks incorporated into design 	$800,000	Enhances traffic operations; improves safety conditions; reduces turning movement conflict locations; provides safe pedestrian and bicyclist pathways and crosswalks

Environmental Overview:	Corridor is developed; therefore environmental impacts are minimal. Consideration should be given to impacts on flood event water surface elevations, cultural resources, utilities, and sensitive noise receptors.
Issues Addressed:	Intersection traffic operations; turning movement conflicts at intersection and into Conoco Gas Station; pedestrian and bicyclist mobility and access; and intersection safety conditions
Project Benefits:	Increased roadway and pedestrian safety conditions; traffic operations enhanced; and increased pedestrian and bicyclist mobility
Funding Sources:	Tribal Transportation Program (TTP); Federal Lands Transportation Program (FLTP); Transportation Alternative Program (TAP); Highway Safety Improvement Program (HSIP); Tribal Safety Program

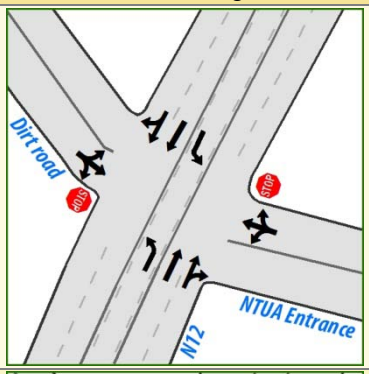
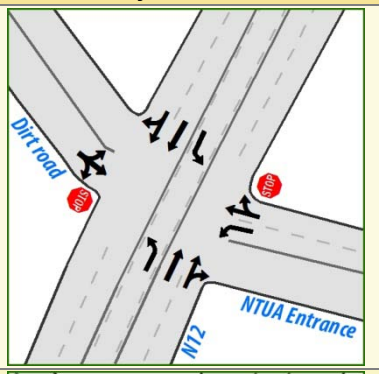
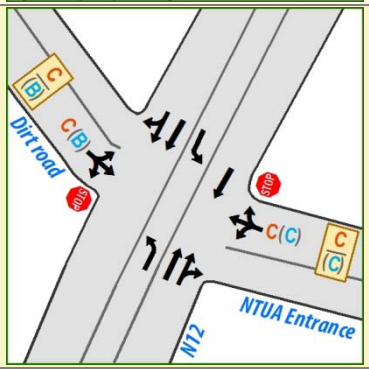
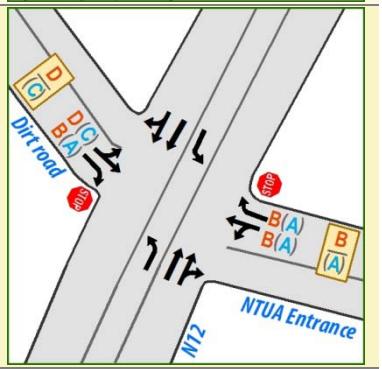
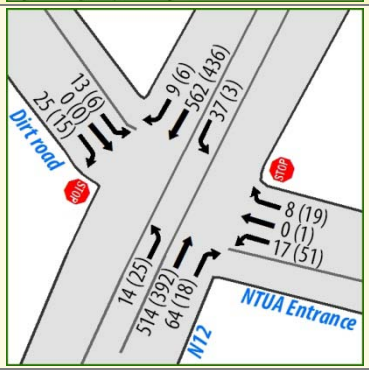
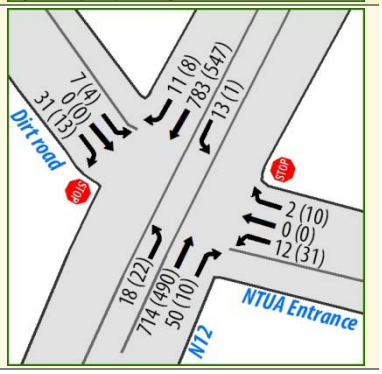
Project #ST-17. N112/N110 Intersection			
Intersection Name:	N112/N110		
BIA Route/Section Number:	N112: 50,60 N110: 35,40		
Project Location:			
Existing and Projected Conditions:		Existing	Projected 2018
	Lane Configuration		
	Level of Service		
	Volumes		

Project #ST-17. N112/N110 Intersection (Continued)		
Project Description:		
Improvement	Cost Estimate	Benefit
Repair Cross Slope to Improve Drainage	$250,000	Improves drainage
Option 1 (No Roundabout): Restripe the intersection to include turn-lanes on N112; install traffic signal; pedestrian crosswalks and sidewalks incorporated into design 	$350,000	Enhances traffic operations; improves safety conditions; provides motorist turning onto N110 exclusive left-turn lanes; provides safe pedestrian and bicyclist pathways and crosswalks
Option 2 (Roundabout): Reconfigure intersection to include a roundabout; pedestrian crosswalks and sidewalks incorporated into design 	$800,000	Enhances traffic operations; improves safety conditions; reduces turning movement conflict locations; provides safe pedestrian and bicyclist pathways and crosswalks

Environmental Overview:	Corridor is developed; therefore environmental impacts are minimal. Consideration should be given to impacts on flood event water surface elevations, cultural resources, utilities, and sensitive noise receptors.
Issues Addressed:	Intersection traffic operations; turning movement conflicts at intersection; pedestrian and bicyclist mobility and access; and intersection safety conditions
Project Benefits:	Increased roadway and pedestrian safety conditions; traffic operations enhanced; and increased pedestrian and bicyclist mobility and access
Funding Sources:	Tribal Transportation Program (TTP); Federal Lands Transportation Program (FLTP); Transportation Alternative Program (TAP); Highway Safety Improvement Program (HSIP); Tribal Safety Program

Project #ST-18. Black Canyon Drive/N110 Intersection			
Intersection Name:	Black Canyon Drive/N110		
BIA Route/Section Number:	N110: 10		
Project Location:			
Existing and Projected Conditions:		Existing	Projected 2018
	Lane Configuration		
	Level of Service		
	Volumes		

Project #ST-18. Black Canyon Drive/N110 Intersection (Continued)			
Project Description:			
Improvement		Cost Estimate	Benefit
Widen Cross-Street to Add Turn lanes and Cross-walks		$300,000	Enhances traffic operations; improves safety conditions; reduces turning movement conflict locations; provides safe pedestrian and bicyclist crosswalks
Environmental Overview:	No additional right-of-way is needed; therefore environmental impacts are minimal. Consideration should be given to impacts on flood event water surface elevations, cultural resources, utilities, and sensitive noise receptors.		
Issues Addressed:	Turning movement conflicts at intersection; pedestrian and bicyclist mobility and access; and overall safety conditions		
Project Benefits:	Increased roadway and pedestrian safety conditions; traffic operations enhanced; and increased pedestrian and bicyclist mobility and access		
Funding Sources:	Tribal Transportation Program (TTP); Federal Lands Transportation Program (FLTP); Transportation Alternative Program (TAP); Highway Safety Improvement Program (HSIP); Tribal Safety Program		

Project #ST-19. NTUA/N12 Intersection			
Intersection Name:	NTUA/N12 Intersection		
BIA Route/Section Number:	N12: 165		
Project Location:			
Existing and Projected Conditions:		Existing	Projected 2018
	Lane Configuration		
	Level of Service		
	Volumes		

Project #ST-19. NTUA/N12 Intersection (Continued)		
Project Description:		
Improvement	Cost Estimate	Benefit
Widen Cross-Street to Add Turn lanes and Cross-walks	$300,000	Enhances traffic operations; improves safety conditions; reduces turning movement conflict locations; provides safe pedestrian and bicyclist crosswalks

Environmental Overview:	No additional right-of-way is needed; therefore environmental impacts are minimal. Consideration should be given to impacts on cultural resources, utilities, and noise receptors.
Issues Addressed:	Turning movement conflicts at intersection; pedestrian and bicyclist mobility and access; and overall safety conditions
Project Benefits:	Increased roadway and pedestrian safety conditions; traffic operations enhanced; and increased pedestrian and bicyclist mobility and access
Funding Sources:	Tribal Transportation Program (TTP); Federal Lands Transportation Program (FLTP); Transportation Alternative Program (TAP); Highway Safety Improvement Program (HSIP); Tribal Safety Program

Project #ST-20. Tséhootsooí Middle School/N110 Intersection	
Intersection Name:	Tséhootsooí Middle School/N110 Intersection
BIA Route/Section Number:	N12: 165
Project Location:	

Project Description:

Improvement	Cost Estimate	Purpose/Benefit
Option 1: Install Double Chicane raised medians. Enhancement to the chicane will need to be made in the mid-term phase to include the HAWK pedestrian beacon 	$100,000	Forces drivers to slow speeds
Option 2: Install Flashing Speed Signs to warn drivers of school zone speeds 	$80,000	Increase driver awareness of school zone

Project #ST--20. Tséhootsooí Middle School/N110 Intersection (Continued)		
Project Description:		
Improvement	Cost Estimate	Purpose/Benefit
Option 3: Install Rumble Strips to warn drivers of school zone speeds 	$4,000	Alerts drivers of changing speed conditions
Option 4: Install Speed Limit Pavement Markings on road to warn drivers of school zone speeds 	$1,500	Alerts drivers of changing speed conditions
Option 5: Install Speed Bump or Speed Table to warn drivers of school zone speeds 	$10,000	Alerts drivers of changing speed conditions

Environmental Overview:	Corridor is partially developed; therefore environmental impacts are minimal. Consideration should be given to impacts on cultural resources, utilities, and sensitive noise receptors.
Issues Addressed:	High travel speeds in school zones; pedestrian and bicyclist safety; pedestrian and bicyclist mobility and access; and overall safety conditions
Project Benefits:	Increased roadway and pedestrian safety conditions; enhanced traffic operations; and increased pedestrian and bicyclist mobility and access
Funding Sources:	Tribal Transportation Program (TTP); Tribal Safety Program; Federal Lands Transportation Program (FLTP); Highway Safety Improvement Program (HSIP); Section 402 State and Community Highway; TAP - Safe Routes to School

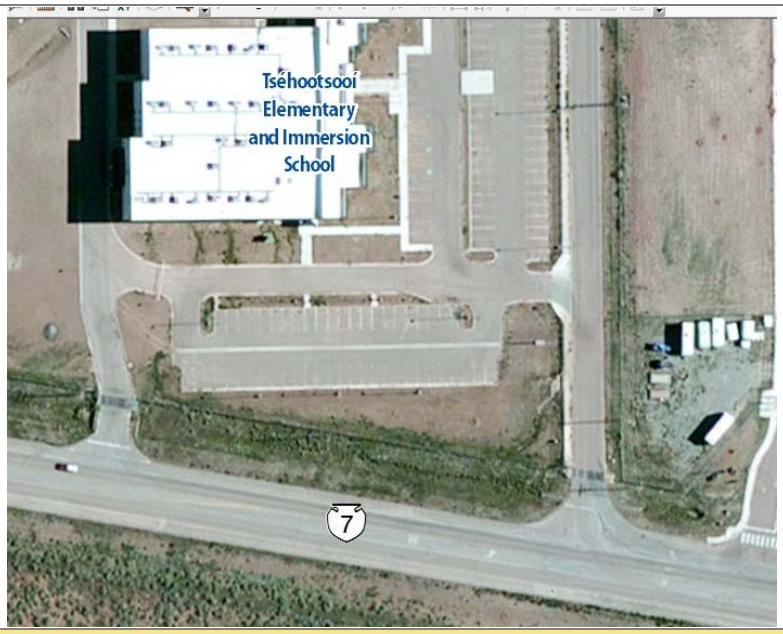
Project #ST-21. Window Rock High School/N12 Intersection	
Intersection Name:	Window Rock High School/N12 Intersection
BIA Route/Section Number:	N12: 170
Project Location:	Window Rock High School/N12 Intersection 

Project Description:

Improvement	Cost Estimate	Purpose/Benefit
Option 1: Install Double Chicane raised medians. Enhancement to the chicane will need to be made in the mid-term phase to include the HAWK pedestrian beacon 	$100,000	Forces drivers to slow speeds
Option 2: Install Flashing Speed Signs to warn drivers of school zone speeds 	$80,000	Increase driver awareness of school zone

Project #ST-21. Window Rock High School/N12 Intersection (Continued)		
Project Description:		
Improvement	Cost Estimate	Purpose/Benefit
Option 3: Install Rumble Strips to warn drivers of school zone speeds 	$4,000	Alerts drivers of changing speed conditions
Option 4: Install Speed Limit Pavement Markings on road to warn drivers of school zone speeds 	$1,500	Alerts drivers of changing speed conditions
Option 5: Install Speed Bump or Speed Table to warn drivers of school zone speeds 	$10,000	Alerts drivers of changing speed conditions

Environmental Overview:	Corridor is partially developed; therefore environmental impacts are minimal. Consideration should be given to impacts on cultural resources, utilities, and sensitive noise receptors.
Issues Addressed:	High travel speeds in school zones; turning movement conflicts; pedestrian and bicyclist safety; pedestrian and bicyclist mobility and access; and overall safety conditions
Project Benefits:	Increased roadway and pedestrian safety conditions; enhanced traffic operations; and increased pedestrian and bicyclist mobility and access
Funding Sources:	Tribal Transportation Program (TTP); Tribal Safety Program; Federal Lands Transportation Program (FLTP); Highway Safety Improvement Program (HSIP); Section 402 State and Community Highway; TAP - Safe Routes to School

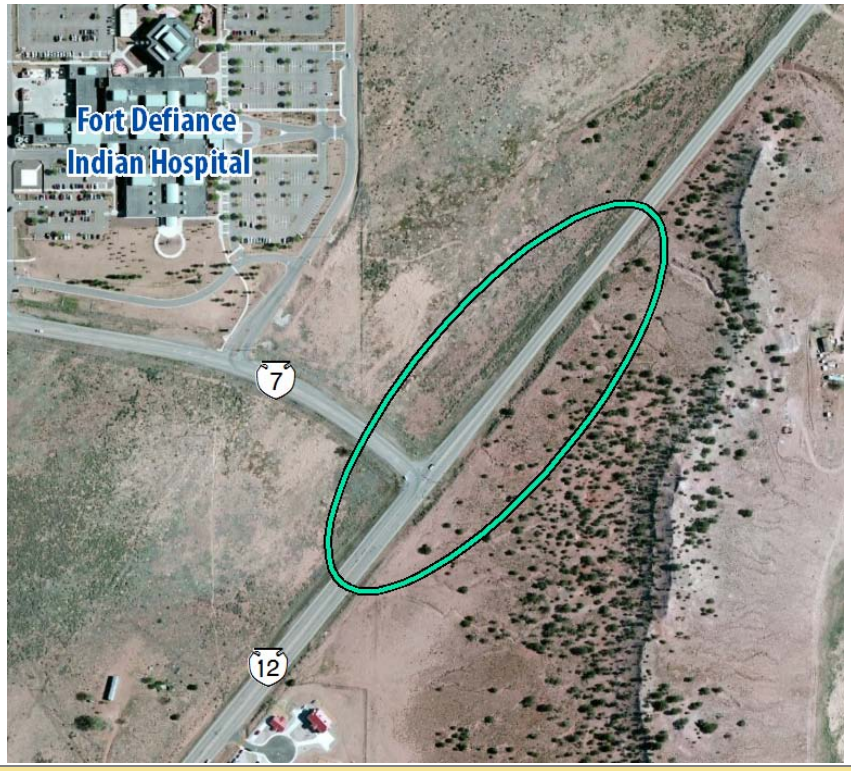
Project #ST-22. Tséhootsooí Elementary School/N7 Intersection	
Intersection Name:	Tséhootsooí Elementary School/N7 Intersection
BIA Route/Section Number:	N12: 150
Project Location:	

Project Description:

Improvement	Cost Estimate	Purpose/Benefit
Option 1: Install Double Chicane raised medians. Enhancement to the chicane will need to be made in the mid-term phase to include the HAWK pedestrian beacon 	$100,000	Forces drivers to slow speeds
Option 2: Install Flashing Speed Signs to warn drivers of school zone speeds 	$80,000	Increase driver awareness of school zone

Project #ST-22. Tséhootsooí Elementary School/N7 Intersection (Continued)		
Project Description:		
Improvement	Cost Estimate	Purpose/Benefit
Option 3: Install Rumble Strips to warn drivers of school zone speeds 	$4,000	Alerts drivers of changing speed conditions
Option 4: Install Speed Limit Pavement Markings on road to warn drivers of school zone speeds 	$1,500	Alerts drivers of changing speed conditions
Option 5: Install Speed Bump or Speed Table to warn drivers of school zone speeds 	$10,000	Alerts drivers of changing speed conditions

Environmental Overview:	Corridor is partially developed; therefore environmental impacts are minimal. Consideration should be given to impacts on cultural resources, utilities, and sensitive noise receptors.
Issues Addressed:	High travel speeds in school zones; pedestrian and bicyclist safety; pedestrian and bicyclist mobility and access; and overall safety conditions
Project Benefits:	Increased roadway and pedestrian safety conditions; enhanced traffic operations; and increased pedestrian and bicyclist mobility and access
Funding Sources:	Tribal Transportation Program (TTP); Tribal Safety Program; Federal Lands Transportation Program (FLTP); Highway Safety Improvement Program (HSIP); Section 402 State and Community Highway; TAP - Safe Routes to School

Project #ST-23. Entrance to Town - Southbound N12	
Route Name:	N12
Section Number:	N12: 180, 185
Project Location:	

Project Description:		
Improvement	Cost Estimate	Purpose/Benefit
Option 1: Install Flashing Speed Signs to warn drivers of reduced speed limit 	$80,000	Increase driver awareness of speed limit
Option 2: Install Rumble Strips to warn drivers of reduced speed limit 	$4,000	Alerts drivers of changing speed conditions

Project #ST-23. Entrance to Town - Southbound N12		
Project Description:		
Improvement	Cost Estimate	Purpose/Benefit
Option 3: Install Speed Limit Pavement Markings on road to warn drivers of reduced speed limit 	$1,500	Alerts drivers of changing speed conditions
Option 4: Install Speed Bump or Speed Table to warn drivers of reduced speeds 	$10,000	Alerts drivers of changing speed conditions

Environmental Overview:	Corridor is partially developed; therefore environmental impacts are minimal. Consideration should be given to impacts on cultural resources, utilities, and sensitive noise receptors.
Issues Addressed:	High travel speeds; pedestrian and bicyclist safety; pedestrian and bicyclist mobility and access; and overall safety conditions
Project Benefits:	Increased roadway and pedestrian safety conditions; traffic operations enhanced; and increased pedestrian and bicyclist mobility and access
Funding Sources:	Tribal Transportation Program (TTP); Tribal Safety Program; Federal Lands Transportation Program (FLTP); Highway Safety Improvement Program (HSIP); Section 402 State and Community Highway

Project #ST-24. Entrance to Town - Northbound N12	
Route Name:	N12
Section Number:	N12: 130, 150
Project Location:	

Project Description:

Improvement	Cost Estimate	Purpose/Benefit
Option 1: Install Flashing Speed Signs to warn drivers of reduced speed limit 	$80,000	Increase driver awareness of speed limit
Option 2: Install Rumble Strips to warn drivers of reduced speed limit 	$4,000	Alerts drivers of changing speed conditions

Project #ST-24. Entrance to Town - Northbound N12		
Project Description:		
Improvement	Cost Estimate	Purpose/Benefit
Option 3: Install Speed Limit Pavement Markings on road to warn drivers of reduced speed limit 	$1,500	Alerts drivers of changing speed conditions
Option 4: Install Speed Bump or Speed Table to warn drivers of reduced speeds 	$10,000	Alerts drivers of changing speed conditions

Environmental Overview:	Corridor is partially developed; therefore environmental impacts are minimal. Consideration should be given to impacts on cultural resources, utilities, and sensitive noise receptors.
Issues Addressed:	High travel speeds; pedestrian and bicyclist safety; pedestrian and bicyclist mobility and access; and overall safety conditions
Project Benefits:	Increased roadway and pedestrian safety conditions; enhanced traffic operations; and increased pedestrian and bicyclist mobility and access
Funding Sources:	Tribal Transportation Program (TTP); Tribal Safety Program; Federal Lands Transportation Program (FLTP); Highway Safety Improvement Program (HSIP); Section 402 State and Community Highway

Project #ST-25. Entrance to Town - Northbound N112	
Route Name:	N112
Section Number:	N112: 35,50
Project Location:	

Project Description:		
Improvement	Cost Estimate	Purpose/Benefit
Option 1: Install Flashing Speed Signs to warn drivers of reduced speed limit 	$80,000	Increase driver awareness of speed limit
Option 2: Install Rumble Strips to warn drivers of reduced speed limit 	$4,000	Alerts drivers of changing speed conditions

Project #ST-25. Entrance to Town - Northbound N112		
Project Description:		
Improvement	Cost Estimate	Purpose/Benefit
Option 3: Install Speed Limit Pavement Markings on road to warn drivers of reduced speed limit 	$1,500	Alerts drivers of changing speed conditions
Option 4: Install Speed Bump or Speed Table to warn drivers of reduced speeds 	$10,000	Alerts drivers of changing speed conditions

Environmental Overview:	Corridor is partially developed; therefore environmental impacts are minimal. Consideration should be given to impacts on cultural resources, utilities, and sensitive noise receptors.
Issues Addressed:	High travel speeds; pedestrian and bicyclist safety; pedestrian and bicyclist mobility and access; and overall safety conditions
Project Benefits:	Increased roadway and pedestrian safety conditions; enhanced traffic operations; and increased pedestrian and bicyclist mobility and access
Funding Sources:	Tribal Transportation Program (TTP); Tribal Safety Program; Federal Lands Transportation Program (FLTP); Highway Safety Improvement Program (HSIP); Section 402 State and Community Highway

Project #ST-26. Secondary Entrance to Window Rock High School Sports Stadium	
Route Name:	Local Tribal Roadway
Section Number:	Not Applicable
Project Location:	

Project Description:		
Improvement	Cost Estimate	Purpose/Benefit
Option 1a: Construct an alternate entrance/exit to the Stadium by extending Window Rock High School Road south for 0.14 miles to entrance currently in construction 	$126,000	Provides additional access to the Stadium; relieves congestion on N12

Project #ST-26. Entrance to Window Rock High School Sports Stadium(Continued)		
Project Description:		
Improvement	Cost Estimate	Purpose/Benefit
Option 1b: Construct an alternate entrance/exit to the Stadium by extending Window Rock High School Road to southern boundary 	$225,000	Provides additional access to the Stadium; relieves congestion on N12
Option 2: Construct an alternate entrance/exit to the Stadium by extending Industrial Area roadway to the Stadium 	$207,500	Provides additional access to the Stadium; relieves congestion on N12

Environmental Overview:	Area is current developed; therefore environmental impacts are minimal. Consideration should be given to impacts on cultural resources, utilities, and sensitive noise receptors.
Issues Addressed:	Traffic congestion on N12; alternative access routes to the Stadium; special event congestion and travel flow; and overall safety conditions
Project Benefits:	Additional entrance/exit points during special events; alternative routes; and traffic operations on N12 enhanced
Funding Sources:	Tribal Transportation Program (TTP); Tribal Safety Program; Federal Lands Transportation Program (FLTP); Indian Community Development Block Grant Program; Highway Safety Improvement Program (HSIP)

Mid-Term (2023) Improvements

Mid-term phase projects are recommended to be completed as the study area reaches year 2023. Table 8.2 presents a comprehensive list of the transportation recommendations for this phase, as well as the project number, location, description, estimated costs, and potential funding sources for each project. Each project is assigned a unique project number that can be used to track project progress. Planning level cost estimates were developed based on typical per-mile/foot construction costs in 2013. Unless otherwise noted, the recommended projects are not yet funded. Chapter 10 of this report outlines detailed funding source information and guidelines. *Estimated costs for each project are expressed in 2013 dollars and do not include materials or labor. Actual costs for projects could vary at the time of implementation; therefore, a detailed*

Table 8.2. Mid-Term Recommendations

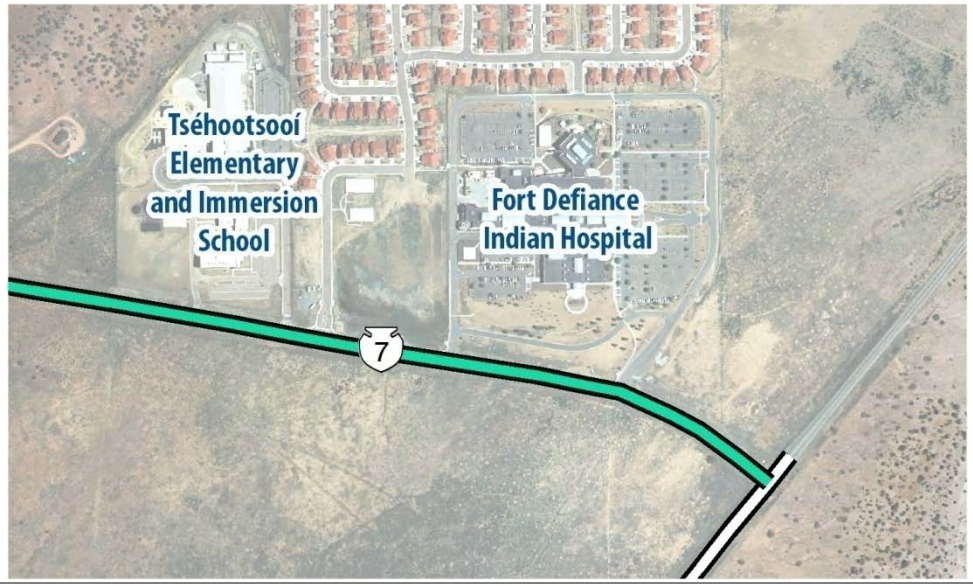
ID	Project Location and Description	Cost
MT-1	N7: N12 Intersection to Tséhootsooí Elementary School Upgrade corridor to provide safe access for pedestrians and bicyclists • Construct Narrow Asphalt Shared Use Path – Eastbound (0.41 mi)	$82,000
MT-2	N7: Tséhootsooí Elementary School to N112 Intersection Upgrade corridor to provide safe access for pedestrians and bicyclists • Construct Narrow Asphalt Shared Use Path – Eastbound (1.14 mi) • Replace Bridge: Add Pedestrian Walkway	$685,200
MT-3	N7: N112 Intersection to Western Study Boundary Upgrade corridor to improve roadway safety conditions • Repair Existing Fencing • Install Lighting • Add 4" Wide Landscape Buffer	$75,450
MT-4	N12: Southern Study Boundary to N110 Intersection Replace structurally deficient bridge	$480,000
MT-5	N12: N54 Intersection to Window Rock High School Upgrade corridor to provide safe access for pedestrians and bicyclists • Construct Extra-Wide Asphalt Shared Use Path – Southbound (1.12 mi)	$252,000
MT-6	N12: Window Rock High School to N7 Intersection Upgrade corridor to provide safe access for pedestrians and bicyclists • Construct Extra-Wide Asphalt Shared Use Path – Southbound (0.47 mi)	$105,750
MT-7	N110: N112 Intersection to Western Study Boundary Upgrade corridor to provide safe access for pedestrians and bicyclists • Construct Narrow Asphalt Shared Use Path – Westbound (1.17 mi)	$351,000
MT-8	N112: Southern Study Boundary to Old Crystal Road Upgrade corridor to provide safe access for pedestrians and bicyclists • Construct Narrow Asphalt Shared Use Path – Westbound (0.81 mi)	$145,800

Table 8.2. Mid-Term Roadway Recommendations (Continued)

ID	Project Location and Description	Cost
MT-9	N112: Old Crystal Road to N7 Intersection Upgrade corridor to provide safe access for pedestrians and bicyclists • Construct Narrow Asphalt Share Use Path – Northbound (0.62 mi)	$111,600
MT-10	N112: N7 Intersection to Northern Study Boundary Upgrade corridor to improve roadway safety conditions • Pavement Preservation – Structural Overlay (0.35 mi) • Install New Fencing • Install Cattle Guards (4) • Install Lighting • Add 4" Wide Landscape Buffer • Add Unpaved Shoulders	$313,150
MT -11	Tséhootsooí Middle School/N110 Intersection Upgrade chicane installed during the short-term phase o include a HAWK pedestrian beacon	$100,000
MT -12	Window Rock High School/N12 Intersection Upgrade chicane installed during the short-term phase o include a HAWK pedestrian beacon	$100,000
MT -13	Tséhootsooí Elementary School/N7 Intersection Upgrade chicane installed during the short-term phase o include a HAWK pedestrian beacon	$100,000
MT -14	Multi-Use Trail Construct a multi-use path to increase pedestrian and bicyclist mobility, encourage recreation activities; and to ultimately connect with neighboring communities • Develop multi-use trail from Black Creek from the Southern Study Boundary to Window Rock High School	$160,000

Project Descriptions for Mid-Term Improvements

The following section presents specific improvement project information for projects identified for implementation during the mid-term phase. Each project is profiled for ease of reference to pertinent information that may enable decision makers and funding agencies to quickly understand the need for their implementation.

Project #MT-1. N7: N12 Intersection to Tséhootsooí Elementary School	
Route Name:	N7
Section Number:	155, 150
Project Location:	N12 Intersection to Tséhootsooí Elementary School 
Project Mileage:	0.41 miles
Existing Conditions:	• Number of Lanes: One lane in each direction, each lane approximately 12 FT wide • Functional Classification: Rural Minor Arterial • Speed Limit: 30 MPH; 15 MPH school zone approaching Tséhootsooí Elementary School
Existing and Future Developments Served:	• Education and Health land use types are located along the northern portion of the corridor • Future NTUA complex, elderly center, government buildings along the northern portion; retail and IHS housing along southern portion
Existing and Projected Traffic Conditions:	• Existing ADT: 5,014 Existing LOS: C • 2018 ADT: 5,515 2018 LOS: C *Average Daily Traffic (ADT) refers to a roadway's total traffic volume during a 24-hour period. Level of Service (LOS) is measurement of traffic congestion. LOS is expressed using letters "A" through "F" , with LOS A representing free flow conditions and LOS F representing failed conditions.*

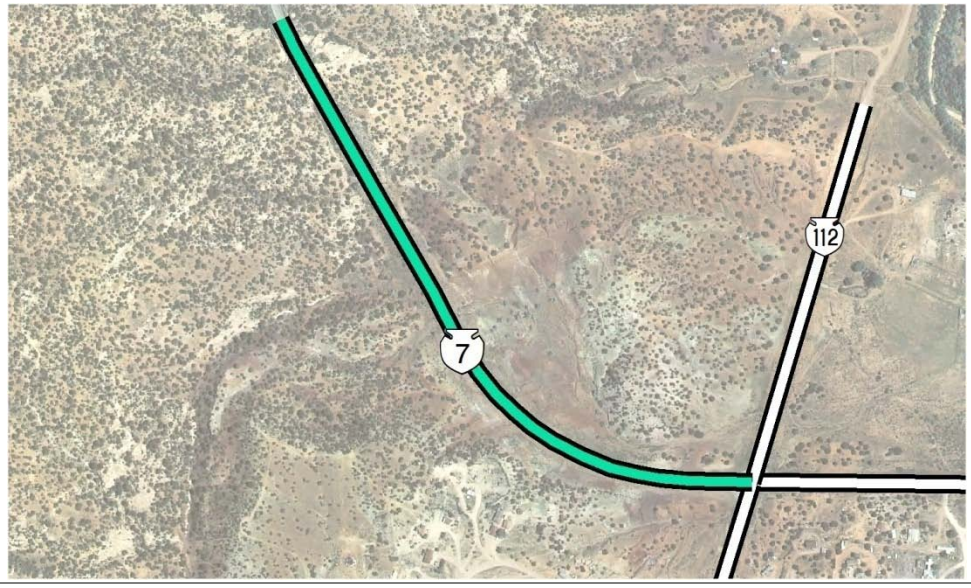
Project Description:		
Improvement	Cost Estimate	Purpose/Benefit
Construct Asphalt Share Use Path – Eastbound (0.41 mi)	$82,000	Pedestrian/Bicyclist mobility

Environmental Overview:	Corridor is partially developed; therefore environmental impacts are minimal. Consideration should be given to impacts on biological and cultural resources, utilities, and noise receptors.
Issues Addressed:	Pedestrian/bicyclist mobility
Project Benefits:	Increased pedestrian and bicyclist safety conditions; and pedestrian/bicyclist access to N12
Funding Sources:	Tribal Transportation Program (TTP); Surface Transportation Program (STP); Federal Lands Transportation Program (FLTP); Transportation Alternative Program (TAP); TAP - Safe Routes to School; Highway Safety Improvement Program (HSIP)

Project #MT-2. N7: Tséhootsooí Elementary School to N112 Intersection	
Route Name:	N7
Section Number:	146, 140, 130, 120
Project Location:	Tséhootsooí Elementary School to N112 Intersection 
Project Mileage:	1.14 miles
Existing Conditions:	• Number of Lanes: One lane in each direction, each lane approximately 12 FT wide • Functional Classification: Rural Minor Arterial • Speed Limit: 30 MPH; 15 MPH school zone approaching Tséhootsooí Elementary School
Existing and Future Developments Served:	• South of N7 is classified as agriculture, rural single family residential land use. North side of N7 is designated as grazing • Future retail and college along the south side; Government buildings north of Tséhootsooí Elementary School
Existing and Projected Traffic Conditions:	• Existing ADT: 2,305 Existing LOS: B • 2018 ADT: 2,536 2018 LOS: B *Average Daily Traffic (ADT) refers to a roadway's total traffic volume during a 24-hour period. Level of Service (LOS) is measurement of traffic congestion. LOS is expressed using letters "A" through "F" , with LOS A representing free flow conditions and LOS F representing failed conditions.*

Project Description:		
Improvement	Cost Estimate	Benefit
Construct Narrow Asphalt Shared Use Path – Westbound (0.60 mi)	$480,000	Pedestrian/Bicyclist mobility
Replace Bridge: Add Pedestrian Walkway	$205,200	Pedestrian/Bicyclist mobility

Environmental Overview:	May have impacts to wetlands and biological resources in area. Consideration should be given to impacts on cultural resources.
Issues Addressed:	Pedestrian/bicyclist mobility
Project Benefits:	Increased pedestrian and bicyclist safety conditions; and pedestrian/bicyclist access to N112
Funding Sources:	Tribal Transportation Program (TTP); Tribal Bridge Program; Surface Transportation Program (STP); Federal Lands Transportation Program (FLTP); Transportation Alternative Program (TAP); Highway Safety Improvement Program (HSIP)

Project #MT-3. N7: N112 Intersection to Western Study Boundary	
Route Name:	N7
Section Number:	115
Project Location:	N112 Intersection to Western Study Boundary 
Project Mileage:	0.61 miles
Existing Conditions:	• Number of Lanes: One lane eastbound, two lanes westbound; each lane approximately 12 FT wide • Functional Classification: Rural Minor Arterial • Speed Limit: 55 MPH
Existing and Future Developments Served:	• South of N7 is classified as agriculture, rural single family residential land use. North side of N7 is designated as grazing
Existing and Projected Traffic Conditions:	• Existing ADT: 877 Existing LOS: A • 2018 ADT: 965 2018 LOS: A *Average Daily Traffic (ADT) refers to a roadway's total traffic volume during a 24-hour period. Level of Service (LOS) is measurement of traffic congestion. LOS is expressed using letters "A" through "F" , with LOS A representing free flow conditions and LOS F representing failed conditions.*

Project Description:		
Improvement	Cost Estimate	Benefit
Repair Fencing (0.61 mi)	$27,450	Restrict livestock from entering right-of-way
Install Lighting	$30,500	Improve visibility and safety
Add 4" Wide Landscape Buffer	$17,500	Increase pedestrian safety; drainage

Environmental Overview:	May have impacts to wetlands and biological resources in area. Consideration should be given to impacts on cultural resources.
Issues Addressed:	Roadway safety conditions
Project Benefits:	Increased roadway safety condition and improved nighttime visibility
Funding Sources:	Tribal Transportation Program (TTP); Federal Lands Transportation Program (FLTP); Highway Safety Improvement Program (HSIP)

Project #MT-4. N12: Southern Study Boundary to N110 Intersection	
Route Name:	N12
Section Number:	140, 150
Project Location:	Southern Study Boundary to N110 Intersection 
Project Mileage:	0.18 miles
Existing Conditions:	• Number of Lanes: Two lanes in each direction with center turn lane, each lane approximately 12-14 FT wide • Functional Classification: Section 140: Major Arterial Section 150: Rural Minor Arterial • Speed Limit: 35 MPH
Existing and Future Developments Served:	• The western portion of N12 is designated as residential, while the eastern portion of the corridor is designated commercial.
Existing and Projected Traffic Conditions:	• Existing ADT: 13,061 Existing LOS: B • 2018 ADT: 14,367 2018 LOS: B *Average Daily Traffic (ADT) refers to a roadway's total traffic volume during a 24-hour period. Level of Service (LOS) is measurement of traffic congestion. LOS is expressed using letters "A" through "F" , with LOS A representing free flow conditions and LOS F representing failed conditions.*

Project Description:		
Improvement	Cost Estimate	Benefit
Bridge Replacement	$480,000	Structurally sufficient bridge

Environmental Overview:	Corridor is developed; therefore environmental impacts are minimal. Consideration should be given to impacts on flood event water surface elevations, cultural resources, utilities, and sensitive noise receptors.
Issues Addressed:	Safety conditions and structurally integrity of bridge
Project Benefits:	Increased safety conditions
Funding Sources:	Tribal Bridge Program

Project #MT-5. N12: N54 Intersection to Window Rock High School	
Route Name:	N12
Section Number:	160, 165
Project Location:	N54 Intersection to Window Rock High School 
Project Mileage:	1.12 miles
Existing Conditions:	• Number of Lanes: Two lanes in each direction with center turn lane, each lane approximately 12-14 FT wide • Functional Classification: Rural Minor Arterial • Speed Limit: 35 MPH; 15 MPH school zone approaching Window Rock High School
Existing and Future Developments Served:	• Land use designations along the corridor include single family residential, agriculture, residential, religion, utility, and government • Future expansion of housing for school employees southeast of Window Rock High School
Existing and Projected Traffic Conditions:	• Existing ADT: 11,292 Existing LOS: B • 2018 ADT: 12,421 2018 LOS: B *Average Daily Traffic (ADT) refers to a roadway's total traffic volume during a 24-hour period. Level of Service (LOS) is measurement of traffic congestion. LOS is expressed using letters "A" through "F" , with LOS A representing free flow conditions and LOS F representing failed conditions.*

Project Description:		
Improvement	Cost Estimate	Benefit
Construct Extra-Wide Asphalt Shared Use Path-Southbound (1.12 mi)	$252,000	Pedestrian/Bicyclist mobility

Environmental Overview:	Corridor is developed; therefore environmental impacts are minimal. Consideration should be given to impacts on cultural resources, utilities, and noise receptors..
Issues Addressed:	Pedestrian/bicyclist mobility
Project Benefits:	Increased pedestrian and bicyclist safety conditions and pedestrian/bicyclist access to activity centers
Funding Sources:	Tribal Transportation Program (TTP) ; Surface Transportation Program (STP) Federal Lands Transportation Program (FLTP); Highway Safety Improvement Program (HSIP); TAP- Safe Routes to School

Project #MT-6. N12: Window Rock High School to N7 Intersection	
Route Name:	N12
Section Number:	170, 180
Project Location:	Window Rock High School to N7 Intersection 
Project Mileage:	0.47 miles
Existing Conditions:	• Number of Lanes: Two lanes in each direction with center turn lane • Functional Classification: Rural Minor Arterial • Speed Limit: 35 MPH; 15 MPH school zone approaching Window Rock High School
Existing and Future Developments Served:	• Eastern side of corridor is designated as residential and education, while the western portion is designated as grazing • Future retail and college as well as additional IHS housing in northwestern portion
Existing and Projected Traffic Conditions:	• Existing ADT: 7,524 Existing LOS: A • 2018 ADT: 10,276 2018 LOS: B *Average Daily Traffic (ADT) refers to a roadway's total traffic volume during a 24-hour period. Level of Service (LOS) is measurement of traffic congestion. LOS is expressed using letters "A" through "F" , with LOS A representing free flow conditions and LOS F representing failed conditions.*

Project Description:		
Improvement	Cost Estimate	Benefit
Construct Extra-Wide Asphalt Shared Use Path- Southbound (0.47 mi)	$105,750	Pedestrian/Bicyclist mobility

Environmental Overview:	Corridor is partially developed; therefore environmental impacts are minimal. Consideration should be given to impacts on cultural resources, utilities, and sensitive noise receptors.
Issues Addressed:	Pedestrian/bicyclist mobility
Project Benefits:	Increased pedestrian and bicyclist safety conditions and pedestrian/bicyclist access to activity centers and residential areas
Funding Sources:	Tribal Transportation Program (TTP) ; Surface Transportation Program (STP) Federal Lands Transportation Program (FLTP); Highway Safety Improvement Program (HSIP); TAP- Safe Routes to School

Project #MT-7. N110: N112 Intersection to Western Study Boundary	
Route Name:	N110
Section Number:	40, 43, 46, 50, 55
Project Location:	N112 Intersection to Western Study Boundary 
Project Mileage:	1.17 miles
Existing Conditions:	• Number of Lanes: Two lanes in each direction with a center turn lane, each lane approximately 12-14 FT wide • Functional Classification: Rural Minor Arterial • Speed Limit: 35 MPH
Existing and Future Developments Served:	• Land use designations include police/fire, medium density residential, rural single family residential, public facility/institutional, and government • Future office complex at northwest corner of N110/N112, Old Downtown redevelopment, and medical school in the vicinity of old hospital area
Existing and Projected Traffic Conditions:	• Existing ADT: 2,903 Existing LOS: B • 2018 ADT: 3,193 2018 LOS: B *Average Daily Traffic (ADT) refers to a roadway's total traffic volume during a 24-hour period. Level of Service (LOS) is measurement of traffic congestion. LOS is expressed using letters "A" through "F" , with LOS A representing free flow conditions and LOS F representing failed conditions.*

Project Description:		
Improvement	Cost Estimate	Benefit
Construct Concrete Shared Use Path – Westbound (1.17 mi)	$351,000	Pedestrian/Bicyclist mobility

Environmental Overview:	Corridor is developed; therefore environmental impacts are minimal. Consideration should be given to impacts on cultural resources, utilities, and sensitive noise receptors.
Issues Addressed:	Pedestrian/bicyclist mobility
Project Benefits:	Increased pedestrian and bicyclist safety conditions; pedestrian/bicyclist access to activity centers and residential areas; downtown redevelopment
Funding Sources:	Tribal Transportation Program (TTP) ; Surface Transportation Program (STP) Federal Lands Transportation Program (FLTP); Highway Safety Improvement Program (HSIP)

Project #MT-8. N112: Southern Study Boundary to Old Crystal Road	
Route Name:	N112
Section Number:	50
Project Location:	Southern Study Boundary to Old Crystal Road 
Project Mileage:	0.81 miles
Existing Conditions:	• Number of Lanes: One lane in each, each lane approximately 12 FT wide • Functional Classification: Rural Minor Arterial • Speed Limit: 35 MPH
Existing and Future Developments Served:	• Land use designations include government, public facility/institutional, rural single family residential, and agriculture • Future residential redevelopment south of Forth Defiance Chapter House as well as office complex at the northwest corner of N112/N110
Existing and Projected Traffic Conditions:	• Existing ADT: 3,138 Existing LOS: B • 2018 ADT: 3,452 2018 LOS: B *Average Daily Traffic (ADT) refers to a roadway's total traffic volume during a 24-hour period. Level of Service (LOS) is measurement of traffic congestion. LOS is expressed using letters "A" through "F" , with LOS A representing free flow conditions and LOS F representing failed conditions.*

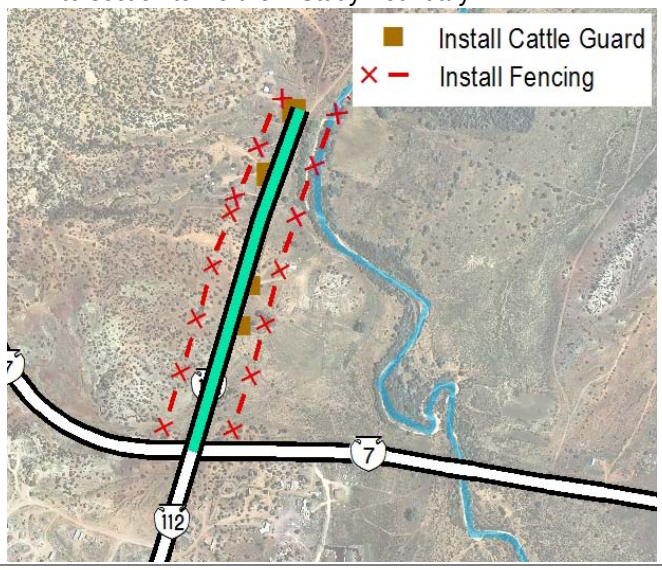
Project Description:		
Improvement	Cost Estimate	Benefit
Construct Narrow Asphalt Shared Use Path – Northbound (0.81 mi)	$145,800	Pedestrian/Bicyclist mobility

Environmental Overview:	Corridor is developed; therefore environmental impacts are minimal. Consideration should be given to impacts on cultural resources, utilities, and noise receptors.
Issues Addressed:	Pedestrian/bicyclist mobility
Project Benefits:	Increased pedestrian and bicyclist safety conditions and pedestrian/bicyclist access to activity centers and residential areas
Funding Sources:	Tribal Transportation Program (TTP) ; Surface Transportation Program (STP) Federal Lands Transportation Program (FLTP); Highway Safety Improvement Program (HSIP)

Project #MT-9. N112: Old Crystal Road to N7 Intersection	
Route Name:	N112
Section Number:	60, 63, 66
Project Location:	Old Crystal Road to N7 Intersection 
Project Mileage:	0.62 miles
Existing Conditions:	• Number of Lanes: One lane in each, each lane approximately 12 FT wide • Functional Classification: Rural Minor Arterial • Speed Limit: 35 MPH
Existing and Future Developments Served:	• The corridor is bounded by rural single family residential land use. • No developments are currently planned
Existing and Projected Traffic Conditions:	• Existing ADT: 2,714 Existing LOS: B • 2018 ADT: 2,985 2018 LOS: B *Average Daily Traffic (ADT) refers to a roadway's total traffic volume during a 24-hour period. Level of Service (LOS) is measurement of traffic congestion. LOS is expressed using letters "A" through "F" , with LOS A representing free flow conditions and LOS F representing failed conditions.*

Project Description:		
Improvement	Cost Estimate	Benefit
Construct Narrow Asphalt Share Use Path – Northbound (0.62 mi)	$111,600	Pedestrian/Bicyclist mobility

Environmental Overview:	Corridor is developed; therefore environmental impacts are minimal. Consideration should be given to impacts on cultural resources, utilities, and noise receptors.
Issues Addressed:	Pedestrian/bicyclist mobility
Project Benefits:	Increased pedestrian and bicyclist safety conditions and pedestrian/bicyclist access activity centers and residential areas
Funding Sources:	Tribal Transportation Program (TTP) ; Surface Transportation Program (STP) Federal Lands Transportation Program (FLTP); Highway Safety Improvement Program (HSIP)

Project #MT-10. N112: N7 Intersection to Northern Study Boundary	
Route Name:	N112
Section Number:	70
Project Location:	N7 Intersection to Northern Study Boundary 
Project Mileage:	0.50 miles
Existing Conditions:	• Number of Lanes: One lane in each, each lane approximately 12 FT wide • Functional Classification: Rural Major Collector • Speed Limit: 35 MPH
Existing and Future Developments Served:	• Surrounding land use is designated for grazing • No developments are currently planned
Existing and Projected Traffic Conditions:	• Existing ADT: 169 Existing LOS: A • 2018 ADT: 186 2018 LOS: A *Average Daily Traffic (ADT) refers to a roadway's total traffic volume during a 24-hour period. Level of Service (LOS) is measurement of traffic congestion. LOS is expressed using letters "A" through "F" , with LOS A representing free flow conditions and LOS F representing failed conditions.*

Project Description:		
Improvement	Cost Estimate	Benefit
Pavement Preservation – Structural Overlay (0.35 mi)	$210,000	Improve safety conditions
Install New Fencing	$34,650	Restrict livestock from entering right-of-way
Install Cattle Guards (4)	$20,000	Restrict livestock from entering right-of-way
Install Lighting	$17,500	Improve visibility and safety
Add 4" Wide Landscape Buffer	$10,000	Drainage
Add Shoulders	$21,000	Provide safe area for vehicles to pull over

Environmental Overview:	May have impacts to wetlands and biological resources in area. Consideration should be given to impacts on cultural resources.
Issues Addressed:	Roadway safety conditions; emergency vehicle access; and pavement conditions
Project Benefits:	Increased roadway safety condition and improved pavement conditions
Funding Sources:	Tribal Transportation Program (TTP); Federal Lands Transportation Program (FLTP); Transportation Alternative Program (TAP); Highway Safety Improvement Program (HSIP)

Project #MT-11. Tséhootsooí Middle School/N110 Intersection	
Intersection Name:	Tséhootsooí Middle School/N110 Intersection
BIA Route/Section Number:	N12: 165
Project Location:	

Project Description:

Improvement	Cost Estimate	Benefit
Upgrade chicane installed during the short-term phase o include a HAWK pedestrian beacon 	$100,000	Forces drivers to slow speeds

Environmental Overview:	No additional right-of-way is needed; therefore environmental impacts are minimal. Consideration should be given to impacts on cultural resources, utilities, and sensitive noise receptors.
Issues Addressed:	High travel speeds in school zones; pedestrian and bicyclist safety; pedestrian and bicyclist mobility and access; and overall safety conditions
Project Benefits:	Increased roadway and pedestrian safety conditions and increased pedestrian and bicyclist mobility and access

Project # MT-12. Window Rock High School/N12 Intersection	
Intersection Name:	Window Rock High School/N12 Intersection
BIA Route/Section Number:	N12: 170
Project Location:	Window Rock High School/N12 Intersection 

Project Description:

Improvement	Cost Estimate	Benefit
Upgrade chicane installed during the short-term phase o include a HAWK pedestrian beacon 	$100,000	Forces drivers to slow speeds

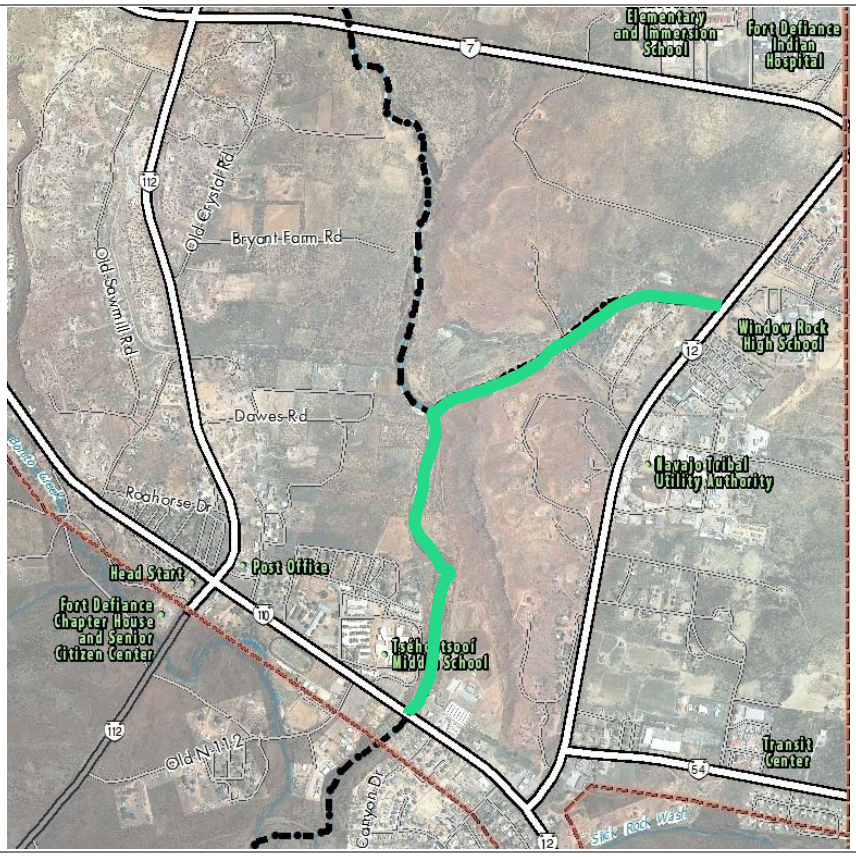
Environmental Overview:	No additional right-of-way is needed; therefore environmental impacts are minimal. Consideration should be given to impacts on cultural resources, utilities, and sensitive noise receptors.
Issues Addressed:	High travel speeds in school zones; pedestrian and bicyclist safety; pedestrian and bicyclist mobility and access; and overall safety conditions
Project Benefits:	Increased roadway and pedestrian safety conditions and increased pedestrian and bicyclist mobility and access
Funding Sources:	Tribal Transportation Program (TTP); Tribal Safety Program; Federal Lands Transportation Program (FLTP); Highway Safety Improvement Program (HSIP); Section 402 State and Community Highway; TAP - Safe Routes to School

Project # MT-13. Tséhootsooí Elementary School/N7 Intersection	
Intersection Name:	Tséhootsooí Elementary School/N7 Intersection
BIA Route/Section Number:	N12: 150
Project Location:	

Project Description:

Improvement	Cost Estimate	Benefit
Upgrade chicane installed during the short-term phase o include a HAWK pedestrian beacon 	$100,000	Forces drivers to slow speeds

Environmental Overview:	No additional right-of-way is needed; therefore environmental impacts are minimal. Consideration should be given to impacts on cultural resources, utilities, and sensitive noise receptors.
Issues Addressed:	High travel speeds in school zones; pedestrian and bicyclist safety; pedestrian and bicyclist mobility and access; and overall safety conditions
Project Benefits:	Increased roadway and pedestrian safety conditions and increased pedestrian and bicyclist mobility and access

Project #MT-14. Multi-Use Trail	
Route Name:	Not Applicable
Section Number:	Not Applicable
Project Location:	
Project Mileage:	~1.60 miles
Existing and Future Developments Served:	• Surrounding land use is designated for grazing • No developments are currently planned

Project Description: Construct a multi-use path to increase pedestrian and bicyclist mobility, encourage recreation activities; and to ultimately connect with neighboring communities

Improvement	Cost Estimate	Benefit
Develop multi-use trail from Black Creek from the Southern Study Boundary to Window Rock High School (~1.6 miles)	$160,000	Pedestrian/Bicyclist mobility and access

Environmental Overview:	May have impacts to wetlands, flood event water surface elevations, cultural resources , and biological resources in area.
Issues Addressed:	Lack of pedestrian, bicyclist, and trail recreational activity areas
Project Benefits:	Increase pedestrian and bicyclist mobility, encourage recreation activities; and to ultimately connect with neighboring communities
Funding Sources:	Surface Transportation Program (STP); Transportation Alternative Program (TAP); TAP = Recreation Trails Program (RTP)

Long-Term (2033) Improvements

Long-term phase projects are recommended to be completed as the study area reaches year 2033. Table 8.3 presents a comprehensive list of the transportation recommendations for this phase, as well as the project number, location, description, estimated costs, and potential funding sources for each project. Each project is assigned a unique project number that can be used to track project progress. Planning level cost estimates were developed based on typical per-mile/foot construction costs in 2013. Unless otherwise noted, the recommended projects are not yet funded. Chapter 10 of this report outlines detailed funding source information and guidelines. *Estimated costs for each project are expressed in 2013 dollars and do not include materials or labor. Actual costs for projects could vary at the time of implementation; therefore, a detailed*

Table 8.3. Long-Term Recommendations

ID	Project Location and Description	Cost
LT-1	N7: Tséhootsooí Elementary School to N112 Intersection Upgrade corridor to provide safe access for pedestrians and bicyclists • Construct Narrow Asphalt Shared Use Path – Eastbound (0.60 mi)	$205,200
LT-2	N7: N112 Intersection to Western Study Boundary Upgrade corridor to provide safe access for pedestrians and bicyclists • Construct Narrow Asphalt Shared Use Path – Eastbound (0.61 mi) • Construct Narrow Asphalt Shared Use Path – Westbound (0.61 mi)	$219,600
LT-3	N110: N112 Intersection to Western Study Boundary Upgrade corridor to provide safe access for pedestrians and bicyclists and improve roadway conditions • Pave 0.2 Miles of Unpaved Roadway • Construct Concrete Shared Use Path – Westbound (1.17 mi)	$468,000
LT-4	N112: N7 Intersection to Northern Study Boundary Upgrade corridor to provide safe access for pedestrians and bicyclists and improve roadway conditions • Construct Narrow Asphalt Shared Use Path – Eastbound (0.50 mi) • Construct Narrow Asphalt Shared Use Path – Westbound (0.50 mi) • Pave 0.15 Miles of Unpaved Roadway	$300,000
LT-5	Multi-Use Trail Construct a multi-use path to increase pedestrian and bicyclist mobility, encourage recreation activities; and to ultimately connect with neighboring communities • Develop multi-use trail along remaining portion of Black Creek within the Study Area	$250,000

Project Descriptions for Long-Term Improvements

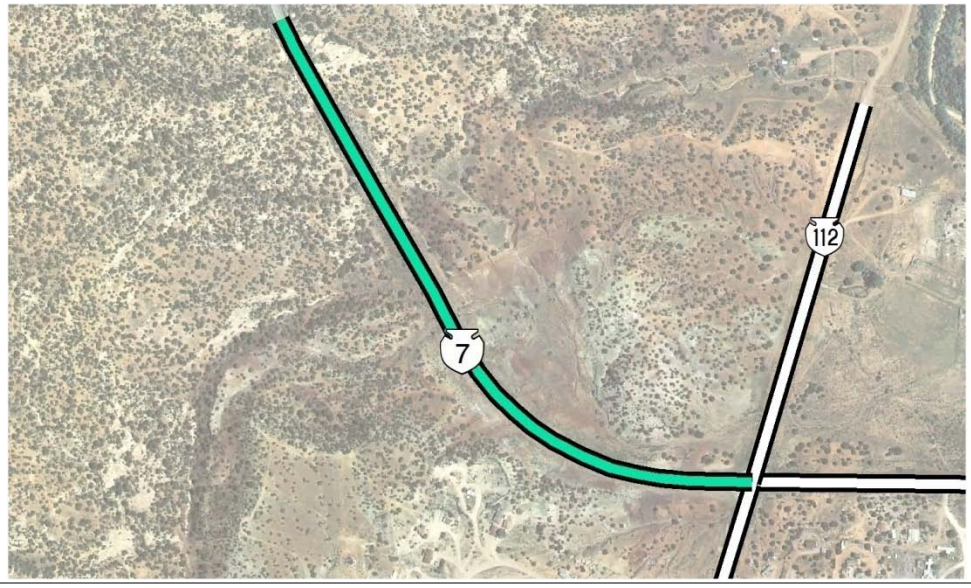
The following section presents specific improvement project information for projects identified for implementation during the long-term phase. Each project is profiled for ease of reference to pertinent information that may enable decision makers and funding agencies to quickly understand the need for their implementation.

Project #LT-1. N7: Tséhootsooí Elementary School to N112 Intersection	
Route Name:	N7
Section Number:	146, 140, 130, 120
Project Location:	Tséhootsooí Elementary School to N112 Intersection 
Project Mileage:	1.14 miles
Existing Conditions:	• Number of Lanes: One lane in each direction, each lane approximately 12 FT wide • Functional Classification: Rural Minor Arterial • Speed Limit: 30 MPH; 15 MPH school zone approaching Tséhootsooí Elementary School
Existing and Future Developments Served:	• South of N7 is classified as agriculture, rural single family residential land use. North side of N7 is designated as grazing • Future retail and college along the south side; Government buildings north of Tséhootsooí Elementary School
Existing and Projected Traffic Conditions:	• Existing ADT: 2,305 Existing LOS: B • 2018 ADT: 2,536 2018 LOS: B *Average Daily Traffic (ADT) refers to a roadway's total traffic volume during a 24-hour period. Level of Service (LOS) is measurement of traffic congestion. LOS is expressed using letters "A" through "F" , with LOS A representing free flow conditions and LOS F representing failed conditions.*

Project Description:

Improvement	Cost Estimate	Benefit
Construct Narrow Asphalt Shared Use Path – Eastbound (0.60 mi)	$120,000	Pedestrian/Bicyclist mobility

Environmental Overview:	May have impacts to wetlands and biological resources in area. Consideration should be given to impacts on cultural resources.
Issues Addressed:	Pedestrian/bicyclist mobility
Project Benefits:	Increased pedestrian and bicyclist safety conditions; and pedestrian/bicyclist access to N112
Funding Sources:	Tribal Transportation Program (TTP) ; Surface Transportation Program (STP) Federal Lands Transportation Program (FLTP); Highway Safety Improvement Program (HSIP)

Project #LT-2. N7: N112 Intersection to Western Study Boundary	
Route Name:	N7
Section Number:	115
Project Location:	N112 Intersection to Western Study Boundary 
Project Mileage:	0.61 miles
Existing Conditions:	• Number of Lanes: One lane eastbound, two lanes westbound; each lane approximately 12 FT wide • Functional Classification: Rural Minor Arterial • Speed Limit: 55 MPH
Existing and Future Developments Served:	• South of N7 is classified as agriculture, rural single family residential land use. North side of N7 is designated as grazing
Existing and Projected Traffic Conditions:	• Existing ADT: 877 Existing LOS: A • 2018 ADT: 965 2018 LOS: A *Average Daily Traffic (ADT) refers to a roadway's total traffic volume during a 24-hour period. Level of Service (LOS) is measurement of traffic congestion. LOS is expressed using letters "A" through "F" , with LOS A representing free flow conditions and LOS F representing failed conditions.*

Project Description:		
Improvement	Cost Estimate	Benefit
Construct Narrow Asphalt Shared Use Path – Eastbound (0.61 mi)	$150,000	Pedestrian/Bicyclist mobility
Construct Narrow Asphalt Shared Use Path – Westbound (0.61 mi)	$150,000	Pedestrian/Bicyclist mobility

Environmental Overview:	May have impacts to wetlands and biological resources in area. Consideration should be given to impacts on cultural resources.
Issues Addressed:	Pedestrian/bicyclist mobility
Project Benefits:	Increased pedestrian and bicyclist safety conditions and pedestrian/bicyclist access
Funding Sources:	Tribal Transportation Program (TTP) ; Surface Transportation Program (STP) Federal Lands Transportation Program (FLTP); Highway Safety Improvement Program (HSIP)

Project #LT-3. N110: N112 Intersection to Western Study Boundary	
Route Name:	N110
Section Number:	40, 43, 46, 50, 55
Project Location:	N112 Intersection to Western Study Boundary 
Project Mileage:	1.17 miles
Existing Conditions:	• Number of Lanes: Two lanes in each direction with a center turn lane, each lane approximately 12-14 FT wide • Functional Classification: Rural Minor Arterial • Speed Limit: 35 MPH
Existing and Future Developments Served:	• Land use designations include police/fire, medium density residential, rural single family residential, public facility/institutional, and government • Future office complex at northwest corner of N110/N112, Old Downtown redevelopment, and medical school in the vicinity of old hospital area
Existing and Projected Traffic Conditions:	• Existing ADT: 2,903 Existing LOS: B • 2018 ADT: 3,193 2018 LOS: B *Average Daily Traffic (ADT) refers to a roadway's total traffic volume during a 24-hour period. Level of Service (LOS) is measurement of traffic congestion. LOS is expressed using letters "A" through "F" , with LOS A representing free flow conditions and LOS F representing failed conditions.*

Project Description:

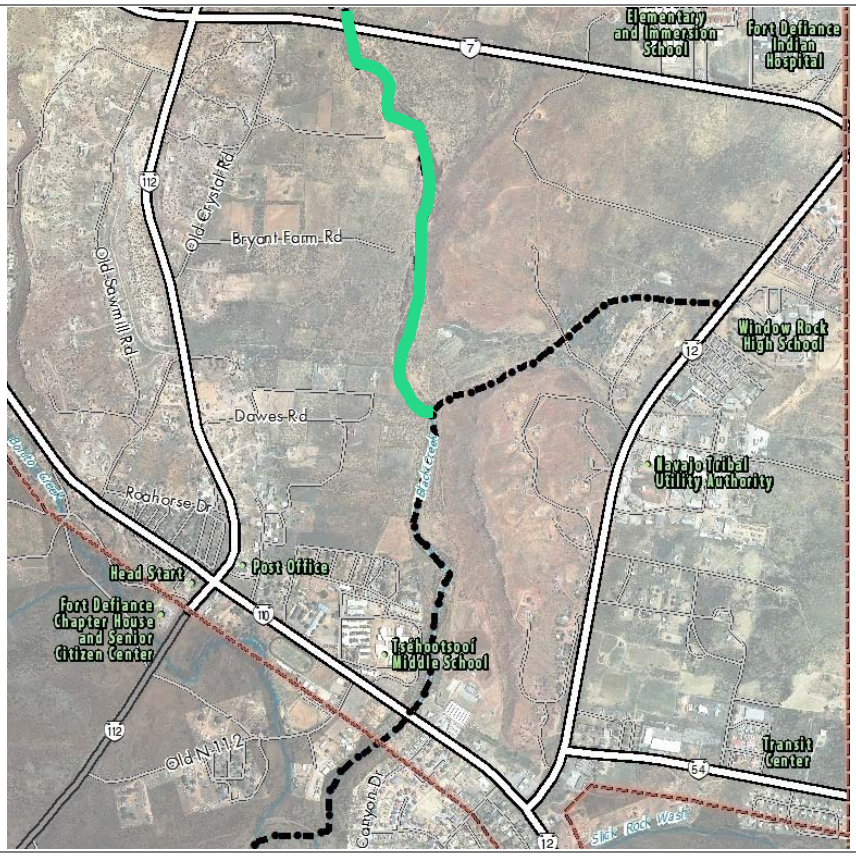
Improvement	Cost Estimate	Benefit
Pave 0.2 Miles of Unpaved Roadway	$180,000	Improved roadway conditions
Construct Concrete Shared Use Path – Westbound (1.17 mi)	$234,000	Pedestrian/Bicyclist mobility

Environmental Overview:	Corridor is developed; therefore environmental impacts are minimal. Consideration should be given to impacts on cultural resources, utilities, and sensitive noise receptors.
Issues Addressed:	Pedestrian/bicyclist mobility and unpaved roadway
Project Benefits:	Increased pedestrian and bicyclist safety conditions; pedestrian/bicyclist access to activity centers and residential areas; downtown redevelopment
Funding Sources:	Tribal Transportation Program (TTP) ; Surface Transportation Program (STP); Federal Lands Transportation Program (FLTP); Highway Safety Improvement Program (HSIP)

Project #LT-4. N112: N7 Intersection to Northern Study Boundary	
Route Name:	N112
Section Number:	70
Project Location:	N7 Intersection to Northern Study Boundary 
Project Mileage:	0.35 miles
Existing Conditions:	• Number of Lanes: One lane in each, each lane approximately 12 FT wide • Functional Classification: Rural Major Collector • Speed Limit: 35 MPH
Existing and Future Developments Served:	• Surrounding land use is designated for grazing • No developments are currently planned
Existing and Projected Traffic Conditions:	• Existing ADT: 169 Existing LOS: A • 2018 ADT: 186 2018 LOS: A *Average Daily Traffic (ADT) refers to a roadway's total traffic volume during a 24-hour period. Level of Service (LOS) is measurement of traffic congestion. LOS is expressed using letters "A" through "F" , with LOS A representing free flow conditions and LOS F representing failed conditions.*

Project Description:		
Improvement	Cost Estimate	Benefit
Construct Narrow Asphalt Shared Use Path – Eastbound (0.50 mi)	$100,000	Pedestrian/Bicyclist mobility
Construct Narrow Asphalt Shared Use Path – Westbound (0.50 mi)	$100,000	Pedestrian/Bicyclist mobility
Pave 0.15 Miles of Unpaved Roadway	$120,000	Improved roadway conditions

Environmental Overview:	May have impacts to wetlands and biological resources in area. Consideration should be given to impacts on cultural resources.
Issues Addressed:	Pedestrian/bicyclist mobility and unpaved roadway
Project Benefits:	Increased roadway and pedestrian/bicyclist conditions
Funding Sources:	Tribal Transportation Program (TTP) ; Surface Transportation Program (STP); Federal Lands Transportation Program (FLTP); Highway Safety Improvement Program (HSIP)

Project #LT-5. Multi-Use Trail	
Route Name:	Not Applicable
Section Number:	Not Applicable
Project Location:	
Project Mileage:	~2.5 miles
Existing and Future Developments Served:	• Surrounding land use is designated for grazing • No developments are currently planned

Project Description: Construct a multi-use path to increase pedestrian and bicyclist mobility, encourage recreation activities; and to ultimately connect with neighboring communities

Improvement	Cost Estimate	Benefit
Develop multi-use trail along remaining portion of Black Creek within the Study Area (~ 2.5 miles)	$250,000	Pedestrian/Bicyclist mobility and access

Environmental Overview:	May have impacts to wetlands, flood event water surface elevations, cultural resources , and biological resources in area.
Issues Addressed:	Lack of pedestrian, bicyclist, and trail recreational activity areas
Project Benefits:	Increase pedestrian and bicyclist mobility, encourage recreation activities; and to ultimately connect with neighboring communities
Funding Sources:	Surface Transportation Program (STP); Transportation Alternative Program (TAP); TAP = Recreation Trails Program (RTP)

PEDESTRIAN, BICYCLE, AND TRAIL FACILITY RECOMMENDATIONS

The Fort Defiance study area's existing sidewalks, bike lanes, and trails were reviewed in relation to:

- The location of activity centers such as schools, large retail establishments, libraries, hospitals, recreation activity centers,
- Proposed developments; and
- Existing roadway alignments.

Analyzing the study area's existing pedestrian and bicycle facilities helped to identify locations that would benefit from these amenities and that would be closely integrated with the area's roadway system. Figure 8.1 provides an illustration of recommended pedestrian, bicycle and trail facilities.

For detailed descriptions and maps of the short-, mid-, and long-term pedestrian and bicycle improvement recommendations please refer to the recommended improvement projects presented at the beginning of this chapter.

TRANSIT RECOMMENDATIONS

The identification of transit projects were based on input from the Navajo Transit System staff, the TAC, stakeholders, public input and a review of the Navajo Transit System Five-Year Plan and previous planning studies.

Short-Term (2018) Transit Recommendations

- Conduct a transit ridership survey to determine the need for local transit service and to identify potential new stop locations.
- If warranted by the transit ridership survey, redesign existing transit routes to add an additional transit stop at the Window Rock High School.
- Install shelters at bus stop locations to provide safety for waiting passengers and to encourage transit ridership.
- Per the 2009 *Navajo Transit System Five-Year Implementation Plan*, establish a circulator bus route between St. Michaels, Window Rock, and the Fort Defiance study area.

Mid-Term (2023) Transit Recommendations

- Establish a Local Circulator that operates daily between 8am – 5pm and connects government and activity centers within Fort Defiance.

Long-Term (2033) Transit Recommendations

- Install bus pullouts and advance signage at the pullouts to reduce delays and to lower the potential for rear-end collisions with motor vehicles. Table 8.4 provides a summary of existing transit stop locations in which the existing right-of-way and roadway conditions support the installation of bus pullouts.

Figure 8.1. Recommended Pedestrian and Trail Facilities

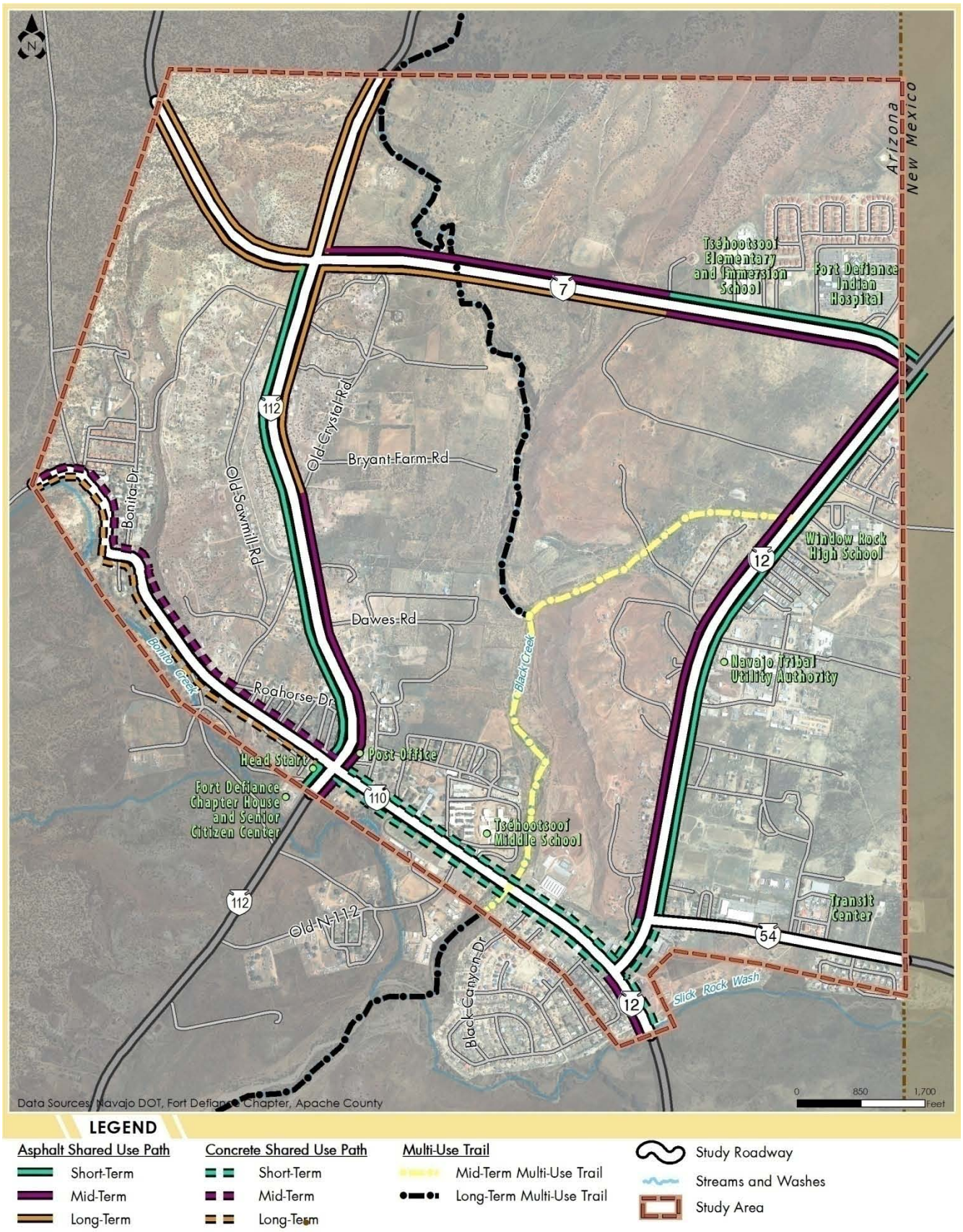


Table 8.4. Recommended Transit Stop Locations

Bus Stop	Considerations	Recommended Bus Location*
Conoco Gas Station	• 150 FT ROW, four-lane roadway • Intersection operations may be impacted by near-side or far-side bus stops • Existing driveways may cause conflicts for near-side, far-side, and bus pullouts	Bus pullout can be accommodated west of the Conoco Gas Station on N110.
7-2-11	• 150 FT ROW, four-lane roadway • Near-side and far-side bus stops may cause conflicts and visibility issues for motor vehicles	Bus pullout can be accommodated south of 7-2-11 on N12.
Transit Center	• Existing transit center provides ample space for buses to enter the facility and to pick-up passengers	Not applicable
NTUA	• Existing stop is located on small two-lane street	If warranted, an additional bus pullout can be accommodated on N12, south of the NTUA
Water Development	• Existing stop is located on small two-lane street	If warranted, an additional bus pullout can be accommodated on N12, south of the NTUA
Facilities Maintenance Building	• Existing stop is located on small two-lane street	If warranted, an additional bus pullout can be accommodated on N12, south of the NTUA
Fort Defiance Indian Hospital	• Existing stop is located at the entrance of the Fort Defiance Indian Hospital	A centralized bus pullout can be installed along N7 to service both the hospital and neighboring residential area
Old PHS Building	• 150 FT ROW, four-lane roadway • Existing roadway conditions limits bus' available space to turn around	Bus pullout cannot be accommodated at the stop
Old Firehouse Building	• 100 FT ROW, two-lane roadway	Bus pullout can be accommodated north of the firehouse building on N110
Post Office	• 100 FT ROW, two-lane roadway	Bus pullout can be accommodated north of the Post Office driveway on N112
Window Rock High School	• 200 FT ROW, four-lane roadway • Can provide a centralized bus stop for the school and adjacent residential areas	Bus pullout can be accommodated a north of the High School on N12

**Recommendations are based on existing ROW and roadway characteristics, a detailed site suitability study will need to be conducted to identify the exact location that can support a bus pullout or transit stop. Factors such as sidewalk and right-of-way space, topography, land use compatibility, safety, and operation should be considered during this analysis.*

TITLE VI IMPLICATIONS

To ensure that the recommended projects provide a fair distribution of benefits and burdens to all residents, an analysis of potential impacts on protected populations was conducted. Since the study is located within the Navajo Reservation, the entire study area has a high percentage of Title VI populations. It is anticipated, however, that recommended transportation improvement projects will only have negative impacts during construction periods. Ultimately, this plan's recommendations will provide protected populations with enhanced, safer multimodal transportation. Table 8.5 provides an overview of potential impacts and benefits of recommended improvements on Title VI population.

Throughout the course of the study, efforts were made to including meaningful participation by all residents through stakeholder and public outreach. A two-phase public involvement process including two public meetings in which protected populations were invited to voice their opinion on the needs of the community and comment on recommended improvements. As recommended projects are implemented, it is vital that on-going outreach efforts to protected populations continue. Furthermore, consideration should be given during project development and construction to minimize or mitigate adverse impacts to minority business owners, the mobility needs of the protected populations, and residential parcels of protected populations.

Table 8.5. Recommended Project Impacts and Advantages on Title VI Populations

Project Type	Project Number	Project Description	Impacted Populations	Disproportionate/ Adverse Impacts	Benefits of Recommended Improvement
Roadway Deficiencies	ST:1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13 MT: 3, 4, 10 LT: 3, 4	Pavement preservation, pavement rehabilitation, roadway striping, install shoulders, add landscape buffer; widen street, bridge replacement.	Minority, low-income, age 65 and older, and disabled populations.	Temporary constraints to access businesses, residential areas, and activity centers during construction. Increased noise during construction.	Improved overall safety and efficiency of roadway network. Improved road conditions and emergency response time. Improved pedestrian safety. Reduction in crashes and crash severity.
Roadside Safety Enhancements	ST:1, 2, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13 MT: 3, 10	Install cattle guards, repair fencing, remove vegetation.	Minority, low-income, age 65 and older, and disabled populations.	Temporary constraints and increased noise during construction.	Improved overall safety and efficiency of roadway network. Reduction in crashes and crash severity.
Intersection Traffic Control	ST: 14, 15, 16, 17, 18, 19	Install traffic signals, enhance existing traffic signal, add turn lanes, reconfigure intersection to roundabout.	Minority, low-income, age 65 and older, and disabled populations.	Temporary constraints and increased noise during construction.	Improved overall safety and efficiency of roadway network. Improved road conditions and emergency response time. Improved pedestrian safety. Reduction in crashes and crash severity. Relieve traffic congestion.
Pedestrian Mobility	ST:1, 4, 5, 6, 7, 9, 10, 12, 13, 18, 19 MT: 1, 2, 5, 6, 7, 8, 9 LT: 1, 2, 3, 4, 5	Install shared-use paths, sidewalks, pedestrian crosswalks, bike lanes, and multi-use trails.	Minority, low-income, age 65 and older, and disabled populations.	Temporary constraints and increased noise during construction.	Improved pedestrian, bicycle, and roadway safety. Promote safe mobility and exercise. Provide alternative means of transportation.
School Zone and Community Gateway Safety Improvements	ST: 20, 21, 22, 23, 24, 25, 26 MT: 11, 12, 13, 14	Install traffic calming devices such as chicane median, HAWK Pedestrian Beacon, and rumble strips.	Minority, low-income, age 65 and older, and disabled populations.	Temporary constraints and increased noise during construction.	Improved pedestrian, bicycle, and roadway safety. Reduction in crashes and crash severity.
Alternative Routes	ST: 26	Construct alternative route to access Window Rock High School Sports Stadium	Minority, low-income, age 65 and older, and disabled populations	Temporary constraints and increased noise during construction.	Relieve traffic congestion.
Transit		Install bus shelters, establish circulator bus routes, and install bus pullouts.	Minority, low-income, age 65 and older, and disabled populations.	Temporary constraints to access activity centers during construction. Increased traffic noise and traffic volume. Decreased air quality.	Improved local and regional transit connectivity. Provide alternative means of transportation. Improved pedestrian safety. Improved overall efficiency of roadway network. Relieve traffic congestion.

TRIBAL TRANSPORTATION PROGRAM UPDATE RECOMMENDATIONS

The National Tribal Transportation Facility Inventory (NTTFI) is a comprehensive national inventory of all tribal transportation facilities that are eligible for TTP funding by tribe, reservation, BIA agency and region, Congressional district, State, and county. This inventory is utilized as the basis to identify a tribe's transportation system, determine the transportation needs of a tribe, and serves as a basis for apportioning federal funds. The inventory includes specific facility information, such as classification, route/bridge number, current and projected traffic volumes, pavement conditions etc, and is utilized for the ongoing review of facility conditions. Detailed descriptions of the recommended updates to the NTTFI were documented and provided to the Fort Defiance Chapter, BIA, and ADOT.

In order to obtain funding and accurately report the status of the tribe's transportation system, the current NTTFI for the Fort Defiance Chapter was reviewed against field review conditions and GIS analysis to identify necessary corrections and updates.

Mileage Corrections

Utilizing GIS software, existing NTTFI routes and sections were analyzed to determine section mileage. Within the study area, the following two roadway sections need to be updated to reflect accurate conditions:

- Route 07, Section 140: Length decreased by 0.1 mile
- Route 07, Section 150: Length increased by 0.1 mile

Existing Traffic Volumes

Traffic counts were obtained as part of the Fort Defiance Industrial Area Traffic Circulation Study. One of the major criteria in determining the functional classification of a roadway is the number of vehicles that utilize the road every day. In order for appropriate decisions and improvement recommendations to be made, traffic count data was gathered in May 2013 at 12 locations along the study roadways. Existing ADT and ADT Year corrections to the NTTFI are made to the following roadways:

- Route 0110: Sections 010, 030, 035, 040, 043, 046, and 050
- Route 0112: Sections 050, 060, 063, 066, and 070
- Route 012: Sections 150, 160, 165, 170, and 180
- Route 07; Sections 115, 120, 140, and 150

Recommended New Route to the NTTFI

Based on analysis of current and future conditions, it is recommended that the following roadways be added to the inventory:

- The Window Rock High School Sports Stadium will generate increased vehicle and pedestrian traffic in the area. As the recommended Window Rock High School Sports Stadium roadways are developed, consideration should be given for the inclusion in the inventory. The Window Rock High School Sport Stadium is a major activity center in the community that will generate substantial vehicle and pedestrian traffic to the area. Inclusion to the NTTFI will ensure appropriate funding and the maintenance of the roadway.

9. ROADWAY MAINTENANCE PLAN

The Navajo Nation BIA Road System consists of existing and proposed public roads within the Navajo Reservation that meet the Tribal Transportation Program (formerly IRR) definition and for which the BIA Navajo Regional Office Division of Transportation (BIA-NRODOT) has or plans to obtain legal right-of-way. Within the BIA-NRODOT, the Navajo Nation Road Maintenance Program is responsible for the preservation, repair, and restoration of system roads to their original condition. In effort to establish a standard schedule for which road shall be maintained, the following Roadway Maintenance Plan provides an overview of standard maintenance activities and frequency for which maintenance should occur.

STUDY ROADWAY MAINTENANCE NEEDS

Paved roads require routine maintenance such as patching; crack sealing; snow plowing; guardrail, sign and delineator replacements; repair, and cleaning; fence and gate repair; roadside clean-up and mowing; and striping. As identified by the *BIA Road Maintenance Manual,* the following is the minimum acceptable level for paved road maintenance:

- Maintaining all roadways, shoulders, traffic signs, drainage structures, and pavement markings;
- Patching potholes and localized failures is necessary;
- Sealing cracks in the pavement; and
- Pavement sealing when deterioration is moderate, with small areas rated as severe.

Table 9.1 provides an overview of standard road maintenance activities per the *BIA Road Maintenance Manual* and *ADOT Performance Guidelines Manual*.

Table 9.1. Road Maintenance Activities

Maintenance Activity	Description and Purpose	Guidelines	Season
Replace Surface / Base	The removal and replacement of badly cracked and broken asphalt surface and deteriorated base with new material.	Material shall be removed a minimum depth of 4" and a minimum thickness of 2" asphaltic premix surface material should be used.	Spring or Fall
Patching Surface	Patch potholes, severe depressions, edge breakup, and breaks in roadway and shoulder surfaces using premix materials.	1.Potholes and localized failures are to be repaired as soon as scheduling permits, but no later than one week after notification, except when: a. The speed limit on the road is 35 MPH or less. The hole or localized failure is not over 2" deep as measured from the adjacent pavement. Repair work is within existing schedules. b. Sealing or resurfacing project is starting within the month. 2.Apply either temporary or permanent patches. Use permanent patching unless overlays or other general repairs are scheduled.	Can be performed year-round

Source: BIA Road Maintenance Manual; ADOT Performance Guidelines Manual

Table 9.1. Road Maintenance Activities (Continued)

Maintenance Activity	Description and Purpose	Guidelines	Season
Crack Sealing	Rout and/or clean 1/4" or greater expansion or working cracks and seal in AC or PCC pavements to prevent the passage of water through the surface crack into the pavement structure or sub-grade.	This should be done in cool weather when cracks are open (spring or fall). Not in inclement weather which would interfere with adherence of the asphalt.	Winter
Sand Seal Coat	Full-surface treatment on continuous sections of bituminous pavement with one application of liquid asphalt and cover material to seal and restore surface life, flexibility, and skid resistance. Sand seals enrich weathered pavements and fills fine cracks in the pavement surface.	This should be done when deterioration is moderate, with perhaps small areas rated as severe. Severe deterioration requires a decision of whether to return the road to gravel or repave; and may require a report on why deterioration was allowed to progress so far.	Spring or Fall
Chip Seal	Full-surface treatment on continuous sections of bituminous pavement with one application of liquid asphalt and cover material to seal and restore surface life, flexibility and skid resistance.	Section of surface to be treated must be large enough to utilize at least twenty-one tons of liquid asphalt spread by the supplier. This should be done when deterioration is moderate, with perhaps small areas rated as severe. Severe deterioration requires a decision of whether to return the road to gravel or repave; and may require a report on why deterioration was allowed to progress so far	Spring or Fall
Tight Blading	The application of premix with a blade to fill ruts and raveling in asphaltic pavement and/or ACFC finishing course. (1-1/2 inches deep or less)	Schedule seal coat at least one month after completion to allow to cure and to get additional traffic compaction. Should be coordinated with the District Traffic Engineer to avoid covering recently painted stripe and allow for restriping schedule.	Spring or Fall
Surface Blading and Reshaping	Grade unpaved roads, including frontage roads, to restore proper shape, smoothness and drainage. This activity includes forming or reforming of drainage gutters, removal of berms, and placement of cut material on the roadway.	Grading is best performed after rain or when surface materials are moist to insure proper compaction.	Spring or Fall

Source: BIA Road Maintenance Manual; ADOT Performance Guidelines Manual

Table 9.1. Road Maintenance Activities (Continued)

Maintenance Activity	Description and Purpose	Guidelines	Season
Soil Stabilization Unpaved Roads	Apply magnesium chloride soil stabilizers to promote compaction and dust control on dirt or gravel roads	Apply magnesium chloride at recommended rate for dust control or compaction on gravel or dirt roads, do not exceed 300 gallons per lane mile per day.	Can be performed year-round
Dust Control	Apply water to reinforce soil characteristics for dust control and maintenance of unpaved surfaces, stockpiles, etc.	Apply a sufficient amount of water to settle dust or form a crust	Can be performed year-round
Blade Unpaved Shoulders	Blade and reshape shoulders & drainage ditches including fill & cut sections, if necessary, to correct pavement drop-off, rutting of shoulders, build-up of shoulder material, and to restore a smooth, safe surface with proper drainage.	Grading is best performed when shoulder material is moist to insure maximum workability of material.	Can be performed year-round
Repair Shoulders	Add or remove material to shoulder and slope to eliminate pavement drop-off, rutted or eroded conditions.	Should be scheduled before rutting along the edge of the pavement effects the integrity of the roadway or when slope erosion, if left unrepaired, will deteriorate into major damage.	Spring or Fall
Reconstruction	When a roadway has reached the end of its life cycle and can no longer be rehabilitated, a new road must be constructed. All existing pavement will be removed and recycled for use as a new sub-base. The old sub-base will be regraded and compacted and a new hot-mix asphalt surface applied.	Material shall be removed a minimum depth of 4" and a minimum thickness of 2" asphaltic premix surface material should be used. The base shall be replaced when unstable.	Spring or Fall
Pavement Striping	Paint traffic lines which include center lines, lane lines, no passing stripes, gore stripes and edge stripes on roadways, frontage roads, all re-paved or sealed roadways and other pavement markings.	Striping should be scheduled to follow seal coats.	Spring or Fall
Asphalt Sidewalks and Shared-Use Paths	Repair pop-outs; potholes, buckled sidewalks, broken curbs, , sunken pavement, root infiltration.	Check drainage components for proper function; Identify and complete joint and crack sealing and patching; perform seal coating. If widespread subgrade issues are suspected, removal and replacement is the only option	Can be performed year-round

Source: BIA Road Maintenance Manual; ADOT Performance Guidelines Manual

Table 9.1. Road Maintenance Activities (Continued)

Maintenance Activity	Description and Purpose	Guidelines	Season
Concrete Sidewalk and Shared-Use Paths	Repair potholes, buckled sidewalks, broken curbs, crumbling concrete, sunken pavement.	Check drainage components for proper function, no pooling water; Identify and complete joint and crack sealing and patching. If widespread subgrade issues are suspected, removal and replacement is the only option	Can be performed year-round
Guardrail Replacement, Repair, and Cleaning	Replace and upgrade guardrail systems	Maintenance work is scheduled as required and as necessary to replace and upgrade guardrail system	Can be performed year-round
Cattle Guard Maintenance and Clean-Out	Replace, repair grills and/or clean cattle guards.	When damaged cattle guard becomes a traffic safety hazard or allows livestock to enter right-of-way, this activity should be treated as an emergency.	Can be performed year-round
Drainage Maintenance and Clean-Out	Clean inlet and outlet drainage ditches within right-of-way and drainage easements, including those for roadway dips. Clean catch basins, drop right-of-way and drainage easements, including those for roadway dips. Clean catch basins, drop inlets and down drains.	This work shall be performed on drainage installations, as required.	Can be performed year-round
Fencing and Gate Repair	Inspect, maintain, repair or replace all fencing and gates	Maintenance work is as necessary to replace and upgrade fence system, including installation and maintenance of gates.	Can be performed year-round
Sign Clean/ Wash/ Inspect	Inspect and clean to maintain unit at optimum designed efficiency.		Can be performed year-round
Sign Repair and Replacement	Repair and replace existing signs due to graffiti, accident, weather damage, or retroreflectivity	The BIA shall install and replace signs in accordance with the current edition of the MUTCD.	Can be performed year-round
Sweeping	Sweeping of the curbed and other portions of the roadway with a mechanical sweeper	Sweeping shall be accomplished when possible during times of low traffic volume and in accordance with the applicable route schedule.	Can be performed year-round

Source: BIA Road Maintenance Manual; ADOT Performance Guidelines Manual

Table 9.1. Road Maintenance Activities (Continued)

Maintenance Activity	Description and Purpose	Guidelines	Season
Roadside Mowing	Machine mow road edge on road shoulders to improve sight distance, control weeds, tree seedlings, eliminate snowdrift, reduce summer fire fuels and enhance view of hazard markers, guardrails and delineators.	Vegetation is not to be mowed unless average height of plants is greater than 17". In order to preserve perennial grasses needed for shoulder stability, do not mow lower than 4".	Can be performed year-round
Brush and Tree Removal	Trim shrubs and ground cover in landscaped areas to maintain sight distance, or to improve plant barrier density.	Various conditions and/or shrub varieties require pruning at different times during the year.	Can be performed year-round
Roadside Clean-up	Pick up and disposal of all litter within the right-of-way. Includes removal of all unsightly objects and items which could cause damage to roadside mowing equipment.	Work shall be accomplished as needed to preserve the aesthetic appearance of the highway and assure safety of roadside mowing equipment.	Can be performed year-round
Removal of Traffic Obstacles	During routine maintenance and roadway inspection, remove immediately all obstacles within the right-of-way that are potentially hazardous to roadway users.	Obstacles include fallen trees and posts, rocks, brush, trash, dead animals, unauthorized signs, etc.	Can be performed year-round
Winter Preparation	Conduct winter patrol of snow and ice areas of the road to determine the possible development of hazardous conditions requiring maintenance attention.	Winter storm patrol shall be used as weather forecasts and conditions warrant. Remove de-icer from equipment to prevent excessive corrosion.	Fall and Winter
Snow and Ice Control	Plow snow and/or apply de-icing agents to the roadway as conditions warrant	Plow and/or apply abrasives / de-icers to locations where needed. Abrasive material may be treated with de-icing agents.	Winter
Bridge Clean and Inspect	Inspect, clean, remove graffiti from, and otherwise maintain decks, joints, footings, abutments, wingwalls, superstructure, and rails	Scheduling shall become an emergency when conditions require immediate attention for public safety.	Can be performed year-round

Source: BIA Road Maintenance Manual; ADOT Performance Guidelines Manual

Within the Fort Defiance study area, all study roadways are classified as a Rural Minor Arterial (class 2) or a Rural Major Collector (class 4) roadway. The maintenance of these minor arterials and major collectors is a high priority since they serve traffic between population centers and carry high volumes of local traffic. To prioritize maintenance, a road classification system was developed based on a road's function, land use, and traffic conditions. This classification system, referred to as "Level of Development", serves as a guide for determining the type and timetable of maintenance activities within the Fort Defiance study area. Table 9.2 outlines LOD Classification System utilized in this study as well as corresponding study roadways.

Table 9.2. Level of Development

LOD	Roadway Context	Study Roadways
LOD 1	• Arterial roadway • Moderate to high traffic volumes • Regional and local traffic • Developed area • Major school bus route	• N12: Southern Study Boundary to Northern Study Boundary • N54: Eastern Study Boundary to N12 Intersection • N110: N12 Intersection to Western Study Boundary
LOD 2	• Arterial roadway • Moderate to low traffic volumes • Regional and local traffic • Partially developed area • School bus route	• N112: Southern Study Boundary to N7 Intersection • N7: N12 Intersection to N112 Intersection
LOD 3	• Arterial roadway • Low traffic volumes • Regional and local traffic • Rural area	• N7: N112 Intersection to Western Study Boundary • N112: N7 Intersection to Northern Study Boundary

For each LOD classified roadway, a specific maintenance schedule should be followed in order to maintain the safety of the traveling public. Figure 9.1; 9.2; and 9.3 illustrate the recommended maintenance schedule for roadways classified as LOD 1-3, respectively.

Figure 9.1. Maintenance Activities and Frequency - Level of Development 1

Maintenance Activity	Frequency	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
Crack Sealing	5 years		■					■					■					■			
Shoulder Maintenance	10 years							■										■			
Drainage Structure Clean-Out and Repair	2 years	■		■		■		■		■		■		■		■		■		■	
Guardrail Replacement, Repair, and Cleaning	2 years	■		■		■		■		■		■		■		■		■		■	
Fence, Cattleguard, and Gate Clean-Out and Repair	2 years	■		■		■		■		■		■		■		■		■		■	
Chip Sealing	7 years	■						■							■						
Sign Replacement	7 years	■						■							■						
Overlay	20 years	■										■									
Reconstruction	40 years																				
Surface Blading	N/A																				
Maintenance Performed Once a Year		×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×
Patching Surface	Should be performed in Spring or Fall																				
Surface Inspection	Can be performed year-round																				
Pavement Striping	Can be performed year-round																				
Drainage Structure Inspection	Can be performed year-round																				
Guardrail Inspection	Can be performed year-round																				
Fence, Cattleguard, and Gate Inspection	Can be performed year-round																				
Maintenance Performed Twice a Year		■■	■■	■■	■■	■■	■■	■■	■■	■■	■■	■■	■■	■■	■■	■■	■■	■■	■■	■■	■■
Surface Cleaning	Can be performed year-round																				
Roadside Cleanup	Can be performed year-round																				
Roadside Mowing	Can be performed year-round																				
Sign Inspection	Can be performed year-round																				
Brush and Tree Removal	Can be performed year-round																				

Figure 9.2. Maintenance Activities and Frequency - Level of Development 2

Maintenance Activity	Frequency	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
Crack Sealing	5 years		■					■					■					■			
Shoulder Maintenance	10 years							■										■			
Drainage Structure Clean-Out and Repair	2 years	■		■		■		■		■		■		■		■		■		■	
Guardrail Replacement, Repair, and Cleaning	2 years	■		■		■		■		■		■		■		■		■		■	
Fence, Cattleguard, and Gate Clean-Out and Repair	2 years	■		■		■		■		■		■		■		■		■		■	
Chip Sealing	7 years	■						■							■						
Sign Replacement	7 years	■						■							■						
Overlay	30 years	■																			
Reconstruction	40 years																				
Surface Blading	N/A																				
Maintenance Performed Once a Year		×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×
Patching Surface	Should be performed in Spring or Fall																				
Surface Inspection	Can be performed year-round																				
Pavement Striping	Can be performed year-round																				
Drainage Structure Inspection	Can be performed year-round																				
Guardrail Inspection	Can be performed year-round																				
Fence, Cattleguard, and Gate Inspection	Can be performed year-round																				
Surface Cleaning	Can be performed year-round																				
Roadside Cleanup	Can be performed year-round																				
Roadside Mowing	Can be performed year-round																				
Sign Inspection	Can be performed year-round																				
Brush and Tree Removal	Can be performed year-round																				

Figure 9.3. Maintenance Activities and Frequency - Level of Development 3

Maintenance Activity	Frequency	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
Crack Sealing	5 years		■					■					■					■			
Shoulder Maintenance	10 years							■										■			
Drainage Structure Clean-Out and Repair	3 years	■			■			■			■			■			■			■	
Guardrail Replacement, Repair, and Cleaning	3 years	■			■			■			■			■			■			■	
Fence, Cattleguard, and Gate Clean-Out and Repair	3 years	■			■			■			■			■			■			■	
Chip Sealing	7 years	■						■							■						
Sign Replacement	7 years	■						■							■						
Overlay	30 years	■																			
Reconstruction	30 years																				
Maintenance Performed Once a Year		×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×
Patching Surface	Should be performed in Spring or Fall																				
Surface Inspection	Can be performed year-round																				
Pavement Striping	Can be performed year-round																				
Drainage Structure Inspection	Can be performed year-round																				
Guardrail Inspection	Can be performed year-round																				
Fence, Cattleguard, and Gate Inspection	Can be performed year-round																				
Surface Cleaning	Can be performed year-round																				
Roadside Cleanup	Can be performed year-round																				
Roadside Mowing	Can be performed year-round																				
Sign Inspection	Can be performed year-round																				
Brush and Tree Removal	Can be performed year-round																				
Surface Blading	Where Needed, Once Every 6 Weeks																				

ROADWAY MAINTENANCE ESTIMATES

To assist Tribal and County staff to determine the costs of maintaining existing roadways, the following section provides general costs estimates. Table 9.3 outlines typical maintenance procedures and planning cost estimates for each. These costs estimates should be used for planning purposes and initial project budgeting only; during the design phase of a project engineering estimates should be developed. Cost estimates provided in this section do not include right-of-way acquisition or utility relocation costs.

Table 9.3. Road Maintenance Activities

Maintenance Item	Cost Per Installation	Cost Per Linear Unit	Cost Per Mile
Replace Surface / Base			$80,000
Patching Surface		$150 per sqft	$15,000
Crack Sealing			$30,000
Chip Seal		$0.416 x pavement width	$2,204 x pavement width
Surface Blading and Reshaping			$20,000
Dust Control			$125,000
Asphalt-Concrete Overlay (1 1/2")		$0.706 x pavement width + $1.69 x length	$3,768 x pavement width + $10,223
Asphalt Grinding		$0.476 x pavement width	$2,520 x pavement width
Repair Shoulders			$15,000 per lane mile to reshape. Additional $5,000 per mile to place millings
Pavement Striping - Continuous or Broken		$0.30	$1,600 per mile per lane
Pavement Markings	$420 Per Marking (Symbol or Word)		
Raised Pavement Markers (reflectors)	$6.25 each	$6.25	$825 per lane
Guardrail Replacement	$40 per linear foot; Additional $1,500 per end terminal		
Fencing - Chain Link (6-feet high)		$23.10	$122,000
Sign Replacement	$485 each installation		
Sidewalk (5-foot, one side only)		$16.38	$86,500
Bike Path (8-foot asphalt-concrete; separate from road)		$18.08	$95,500
Fencing - Chain Link (6-feet high)		$23.10	$122,000

10. TRANSPORTATION PLAN IMPLEMENTATION

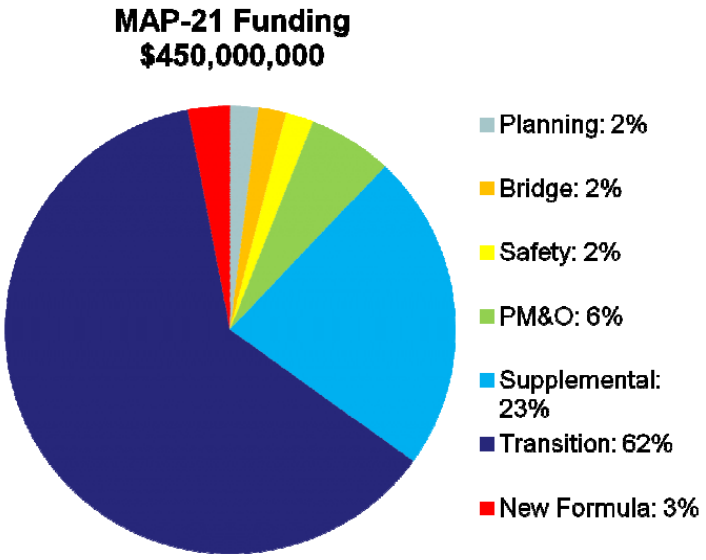
This section discusses available funding sources and implementation actions to help execute the Plan for Improvements.

FUNDING SOURCES

This section describes funding resources available for the types of projects recommended in Chapter 8. The successful implementation of the *Fort Defiance Industrial Area Traffic Circulation Study* is contingent upon the availability of funding for design and construction of the improvement projects. Primary funding sources for the area include Federal programs, BIA, ADOT, and other regional government agencies.

Passed in July 2012, the Moving Ahead for Progress in the 21st Century Act (MAP-21) reauthorized surface transportation programs through fiscal year 2014. The program was enacted to create a streamlined, performance-based, and multimodal program to address the many challenges facing the Nation's transportation system. MAP-21 authorizes Federal-aid highway programs for the next two-years while maintaining current spending levels by consolidating core highway programs of SAFETEA-LU.

Under MAP-21, the new Tribal Transportation Program (TTP) provides $450 million annually with the ultimate goal to provide safe and adequate transportation and public road access to and within Indian reservations and Indian lands. While generally following the existing Indian Reservation Roads program, the TTP also includes new standards that a certain percentage of funds should be allocated for tribal bridge and tribal safety projects. Funds through the TTP are allocated to Tribes utilizing a statutory formula based on tribal population, road mileage, and average tribal shares of SAFETEA-LU funding. In accordance with MAP-21, Tribes may utilize up to 25% of their TTP funds or $500,000, whichever is greater, for eligible and approved maintenance activities.



Included in MAP-21 is a new program called Tribal High Priority Projects Program (THPP). The THPP is a special funding pool that may be utilized for tribes or governmental subdivisions whose annual allocation is insufficient to complete its highest priority project; or for emergency/disasters on any TTP facilities. MAP-21 authorizes $30 million per year from the General Fund (subject to appropriation) for this new program.

In addition, MAP-21 gives FTA significant new authority to strengthen the safety of public transportation systems throughout the United States. The Act aims to align Federal funding to

progress towards the goals of restoring and replacing aged public transportation infrastructure, supporting development, and improving the efficiency of administering grant programs by consolidating and streamlining several programs. MAP-21 provides federal funding for public transit assistance through the Tribal Transit Program (TTP). The TTP is a set-aside from the Formula Grants for Rural Areas program and consists of a $25 million formula program and a $5 million discretionary grant program.

Navajo Nation Fuel Excise Tax Revenue is another funding source that could be used to fund some of the projects identified in the Plan for Improvements. Since 1999, the Fuel Excise Tax has been collected by the Office of Navajo Tax Commission and is making a positive impact on the Navajo Nation for community road projects. For gasoline, the FET is 18 cents and for diesel, it is 25 cents. Funding from the road fund is used for improvement projects such as parking lots, school bus routes, drainage crossings, access roads, road maintenance, grading, graveling, archaeological surveys, testing, mitigation, drainage studies, construction services, threatened and endangered species, airport maintenance, designs, plans, specifications, bidding, and contract services. This revenue source generates, on average, approximately $13 million each year. Projects completed with this funding are identified and included in the Navajo DOT Transportation Improvement Program (TIP).

Navajo DOT can also partner with Apache County District II to establish an IGA. If the county elects to enter into IGAs then some funds could be dedicated to specific projects through cooperative partnership.

Several counties in the state have instituted a ½ cent sales tax dedicated to transportation improvement projects. Counties have the ability to use these funds for planning, design and construction. The funds cannot be used to supplement staff salaries. Apache County could investigate the opportunity to institute this funding mechanism; however, it does require approval by the voters.

In addition to these Federal and local programs, there are a multitude of funding opportunities available through ADOT, regional government agencies, and private entities. Table 10.1 presents a comprehensive matrix of potential funding sources for roadway, safety, pedestrian and bicycle, and transit improvements that the Fort Defiance Chapter can apply for funding to implement the Plan for Improvements. The following resources also provide additional information related to funding sources.

Local Public Agency Projects Manual for Federal-aid Funded Projects

The ADOT Local Public Agency Projects Manual provides information and guidance to assist local public agencies (i.e., counties, cities, towns and tribal governments) with projects funded through the Federal Highway Administration's (FHWA) Federal-Aid Highway Program (FAHP), from planning to final acceptance. The manual outlines the ADOT and FHWA policies and procedures when developing, delivering, and administering transportation projects. The Manual is available at the following website link:

http://www.azdot.gov/business/programs-and-partnerships/LocalPublicAgency/lpa-projects-manual

Additionally, another available tool is the Federal-aid Essentials. It is web based and can be accessed at:

http://www.fhwa.dot.gov/federal-aidessentials/index.cfm

Arizona Tribal Transportation Website Funding Resources Links

The Arizona Tribal Transportation website is hosted by ADOT and is designed as a central location for state-tribal transportation related partnerships, projects, activities, groups, links, and other related information. The website contains a listing of transportation related funding resources which can be found at the following link:
http://www.aztribaltransportation.com/aztt/links.asp

PARTNERSHIPS

With the support of the ADOT Tribal Strategic Partnering Team, the Navajo Nation re-established a partnership between with the Navajo DOT, ADOT, BIA, FHWA, Hopi Tribe, Coconino County, Navajo County, and Apache County. The mission of the partnership is to foster and maintain working relationships in order to construct, operate, improve, and maintain a safe transportation system for the traveling public. The Navajo DOT Partnership Steering Committee identified the main goals of the partnership as focusing on aspects of the approval process, agreements, emergency response, training and education, funding resources, and route standards for the following subgoals:

- Subgoal#1: High Volume Routes/Region
- Subgoal#2: School Bus Routes/Region
- Subgoal#3: Low Volume Routes/Region
- Subgoal#4: Community Routes

As part of this partnership, a steering committee comprised of agency officials host meetings to discuss and plan for roadway improvement projects, emergency response, intergovernmental agreements, and to improve general communication and data sharing among agencies. Information generated on the above topics by this partnership could assist the Fort Defiance Chapter and Apache County District II with plan implementation. Access to the partnership information is available at the following link:
http://www.aztribaltransportation.com/NNP/index.asp.

In addition, the Fort Defiance Chapter and Apache County District II should work to build on the stakeholder partnership efforts initiated through this study planning process. It is recommended that project-specific partnerships be continued with the Navajo DOT, BIA Fort Defiance Agency and other agency stakeholders in order to garner support and available joint financial commitment to implement the study project recommendations. A guide on the basics of transportation partnering is available on the ADOT website at the following link: http://www.azdot.gov/business/programs-and-partnerships/partnering.

Table 10.1. Potential Funding Sources

Funding Program	Eligible Uses	Administering Agency	Program and Funding Details	Application Deadline	Contact Information
Roadway and Safety Projects					
Tribal Transportation Program (TTP)	TTP funds may be used by to pay the costs of the following activities: Transportation planning, research, maintenance*, engineering, rehabilitation, restoration, construction, and reconstruction of tribal transportation facilities; Operation and maintenance of transit programs and facilities that are located on, or provide access to, tribal land, or are administered by a tribal government	Federal Funds Allocated to BIA-DOT Navajo Regional Office on a formula basis	Funding formula is based on each tribe's total population and mileage. Improvement projects must be included in the Navajo Nation TIP.	Improvement projects must be submitted to FHWA by August	Margie Begay, Senior Planner Navajo Division of Transportation Southern Agency P.O. Box 4620 Window Rock, AZ 86515 Phone: 505-371-8312 Email: mbegay@navajodot.org
Tribal High Priority Projects (THPP)	Repair or reconstruction of eligible facilities in the national inventory of tribal transportation facilities. Funds may not be used for transportation planning; research; routine maintenance activities; structures and erosion protection; landscaping and irrigation systems; purchasing equipment; or condemnation of land for recreational trails.	Federal Funds Administered Through BIA-DOT Navajo Regional Office on a formula basis	Funds appropriated from the Federal General Fund, to remain available until September 30 of the third fiscal year after the year appropriated. An applicant may have only one application for assistance pending at any one time. Project funding is limited to a $1 million per application.		Margie Begay, Senior Planner Navajo Division of Transportation Southern Agency P.O. Box 4620 Window Rock, AZ 86515 Phone: 505-371-8312 Email: mbegay@navajodot.org
Tribal Transportation Planning Program	Transportation planning procedures for the TTP must be consistent with Statewide and Metropolitan planning processes.	Federal Funds Allocated to BIA-DOT Navajo Regional Office on a formula basis and distributed on a project by project basis	Funded by a set-aside of up to 2% from TTP funds. Funds are allocated directly to Tribe based on a formula, and distributed on a project by project basis.		Margie Begay, Senior Planner Navajo Division of Transportation Southern Agency P.O. Box 4620 Window Rock, AZ 86515 Phone: 505-371-8312 Email: mbegay@navajodot.org
Tribal Transportation Program Safety Funds (TTPSF)	MAP-21 established Tribal Safety funds by setting aside not more than 2 percent of the funds made available under the Tribal Transportation Program for each fiscal year. Eligible activities include: Tribal Safety Plans; Enforcement and EMS; Education Programs; Engineering Improvements; Data Collection; Data analysis and improvement; Road Safety Audits; and funding goals for each category	Federal Funds Allocated to BIA-DOT Navajo Regional Office on a formula basis	Projects Ranked by BIA, FHWA and Tribes. Funded by a set-aside of up to 2% from TTP funds. Maximum of $9,000,000 could be made available in each of FYs 2013 and 2014 for TTPSF.		Russell Garcia TTPSF Program Manager Federal Highway Administration 1200 New Jersey Avenue SE., Washington, DC 20590 Phone: (202) 366-9815 Email: russell.garcia@dot.gov

Source: FHWA, ADOT, Navajo Nation, USDOT, AmeriCorps, USDA, Arizona State Parks

Table 10.1. Potential Funding Sources (Continued)

Funding Program	Eligible Uses	Administering Agency	Program and Funding Details	Application Deadline	Contact Information
Tribal Bridge Program	Funds may be used for planning, design, engineering, preconstruction, construction, and inspection of a project to replace, rehabilitate, seismically retrofit, paint, or for anti-icing and deicing, or to implement any countermeasures (including multiple-pipe culverts) for eligible tribal transportation facility bridges. To be eligible, a bridge must have an opening of at least 20 feet, be classified as a tribal transportation facility, and be structurally deficient or functionally obsolete.	Federal Funds Allocated to BIA-DOT Navajo Regional Office on a formula basis	Funded by a set-aside of up to 2% from TTP funds.		Margie Begay, Senior Planner Navajo Division of Transportation Southern Agency P.O. Box 4620 Window Rock, AZ 86515 Phone: 505-371-8312 Email: mbegay@navajodot.org
Navajo Nation Fuel Excise Tax	The Navajo Nation administers a special fuel tax of 18 cents for gasoline and 25 cents for diesel. Revenue is utilizes for road improvement projects, such as: parking lots, school bus routes, drainage crossings, access roads, road maintenance, grading, graveling, and construction services	Office of Navajo Tax Commission	In 2013, FET collected over $13 million. From the revenue, approximately $4 million is distributed to Arizona yearly.		Office of the Navajo Tax Commission P.O. Box 1903 Window Rock, Arizona 86515 Phone: 928-871- 6681 Fax: 928-871- 7608 For general program information, visit: http://www.navajotax.org/
Surface Transportation Program (STP)	States and metropolitan regions may use these funds for highway, bridge, transit (including intercity bus terminals), and pedestrian and bicycle infrastructure projects. Eligible projects include, but are not limited to: • Construction, reconstruction, rehabilitation, resurfacing, restoration, preservation, or operational improvements for highways, bridges, and tunnels on any public roadway • Construction of new bridges and tunnels on a Federal-aid highway • Inspection and evaluation of bridges, tunnels and other highway assets as well as training for bridge and tunnel inspectors • Transit capital projects • Bicycle, pedestrian, and recreational trails • Environmental mitigation efforts	Federal Highway Administration Funds Administered Through ADOT and Planning Organizations	In general, STP projects may not be on local or rural minor collectors. Special rule allows States to use up to 15% of funds sub allocated for areas with a population of 5,000 or less on rural minor collectors. Project is scoped and request for funding submitted to NACOG.		Jason Kelly NACOG Transportation/Transit Planning 3130 Robert Rd. Ste. 1 Prescott Valley, AZ 86314 Phone: (928) 830-0127 Email: jkelly@nacog.org

Source: FHWA, ADOT, Navajo Nation, USDOT, AmeriCorps, USDA, Arizona State Parks

Table 10.1. Potential Funding Sources (Continued)

Funding Program	Eligible Uses	Administering Agency	Program and Funding Details	Application Deadline	Contact Information
Surface Transportation Program (STP) - Off-System Bridges	From the State's STP apportionment, States are required to obligate a portion of funds (not from suballocated amounts) for bridges not on Federal-aid highways (off-system bridges). Eligible projects include, but are not limited to: replacement, deicing, construction, inspection and evaluation of bridges	Federal Highway Administration Funds Administered through ADOT and Regional Planning Organizations	For projects to replace or rehabilitate deficient off-system bridges funded wholly by State/local sources, any amounts spent post-enactment that are in excess of 20% of project costs may be credited to the non-Federal share of eligible bridge projects in the State.	Project is scoped and request for funding submitted to NACOG. Project is scoped and request for funding submitted to Planning Organization.	Jason Kelly NACOG Transportation/Transit Planning 3130 Robert Rd. Ste. 1 Prescott Valley, AZ 86314 Phone: (928) 830-0127 Email: jkelly@nacog.org
Federal Lands Transportation Program (FLTP)	Eligible projects include, but are not limited to: • Program administration, transportation planning, research, preventive maintenance, engineering, rehabilitation, restoration, construction, and reconstruction of Federal lands transportation facilities • Operations and maintenance of transit facilities • Any transportation project eligible under title 23 of the United States Code that is within or adjacent to, or that provides access to Federal lands open to the public.	Funded by contract authority from the Highway Account of the Highway Trust Fund	On October 1 of each fiscal year, funds will be allocated among Federal Land Management Agency (FLMA) partners		Arizona Division Federal Highway Administration 4000 N. Central Avenue, Ste. 1500 Phoenix, Arizona 85012-3500 Phone: (602) 379-3646 Fax: (602) 382-8998 For general program information, visit: http://www.fhwa.dot.gov/map21/factsheets/fltp.cfm *or* http://www.fhwa.dot.gov/azdiv/
Federal Lands Access Program	Eligible projects include, but are not limited to: • Transportation planning, research, engineering, preventive maintenance, rehabilitation, restoration, construction, and reconstruction of Federal Lands Access Transportation Facilities • Operation and maintenance of transit facilities • Any transportation project eligible under title 23 of the United States Code that is within or adjacent to, or that provides access to Federal lands open to the public.	Funded by contract authority from the Highway Account of the Highway Trust Fund	The funds made available under this program will be available for the current year plus three additional years. Funds are distributed by formula among States that have Federal lands		Allen Grasmick Central Federal Lands Highway Division 12300 West Dakota Avenue Lakewood, CO 80228 Phone: (720) 963-3500 Email: Allen.Grasmick@dot.gov For general program information, visit: http://www.cflhd.gov/programs/flap/AZ/index.cfm

Source: FHWA, ADOT, Navajo Nation, USDOT, AmeriCorps, USDA, Arizona State Parks

Table 10.1. Potential Funding Sources (Continued)

Funding Program	Eligible Uses	Administering Agency	Program and Funding Details	Application Deadline	Contact Information
Highway Safety Improvement Program (HSIP)	The HSIP is a core Federal-aid program with the purpose of achieving a significant reduction in fatalities and serious injuries on all public roads, including non-State-owned public roads and roads on tribal lands. Any project on a public road, trail or path that is consistent with the state's Strategic Highway Safety Plan and corrects a safety problem is eligible for HSIP funding. Eligible projects include, but are not limited to: • Intersection improvements • Construction of shoulders • Traffic calming • Improvements for bicyclists, pedestrians, and individuals with disabilities. • Minimum standards of retro-reflectivity of traffic signs and pavement markings	Federal Highway Administration Funds Administered Through ADOT and Planning Organizations	Project is scoped and request for funding submitted to Regional Planning Organization. The HSIP Local Government Coordinator provides assistance to local agencies throughout the process of identifying and developing the projects. 5.7% for most projects	Applications due in May	Mona Aglan-Swick HSIP Manager ADOT Statewide HSIP Program Phone: (602) 712-7374 Email: maglan@azdot.gov
Governor's Office of Highway Safety	Finances State and local government highway safety projects. Eligible projects include: inventories, need studies, engineering studies, system development, program implementation, or for purchasing equipment. Cannot be used for the construction, design, or maintenance of highways or for highway construction research papers.	Arizona Governor's Office of Highway Safety (GOHS)	Project funding is limited to a maximum of $50,000 per project contract	Applications due in February	Director Alberto Gutier Governor's Office of Highway Safety 3030 North Central Avenue #1550 Phoenix, Arizona. 85012
National Priority Safety Program	Programs include: • Section 405(b): Occupant Protection • Section 405(c): State Traffic Safety Information System Improvements • Section 405(d): Impaired Driving Countermeasures • Section 405(e): Distracted Driving • Section 405(f): Motorcyclist Safety • Section 405(g): Graduated Driver Licensing	National Highway Traffic Safety Administration (NHTSA) at the federal level and Arizona Governor's Office of Highway Safety at the state level		Applications due in July	Director Alberto Gutier Governor's Office of Highway Safety 3030 North Central Avenue #1550 Phoenix, Arizona. 85012

Source: FHWA, ADOT, Navajo Nation, USDOT, AmeriCorps, USDA, Arizona State Parks

Table 10.1. Potential Funding Sources (Continued)

Funding Program	Eligible Uses	Administering Agency	Program and Funding Details	Application Deadline	Contact Information
Section 402 State and Community Highway Safety Grant Program	Funds can be spent in accordance with national guidelines for programs such as reducing impaired driving; reducing speeding; encouraging the use of occupant protection; improving motorcycle safety; improving pedestrian and bicycle safety; improving enforcement of traffic safety laws; improving traffic records; and emergency services.	Arizona Governor's Office of Highway Safety	MAP-21 authorizes funding for the 402 program at $235 million each year in FY 2013 and FY 2014.	Proposals due to the Arizona Governor's Office of Highway Safety in April/May	Director Alberto Gutier Governor's Office of Highway Safety 3030 North Central Avenue #1550 Phoenix, Arizona. 85012
Road Safety Assessment	The Road Safety Assessments (RSA) program conducts Road Safety Assessments on state, local and tribal road facilities. An RSA is defined as a formal examination of user safety of a future or existing roadway by an independent multidisciplinary audit team, which includes qualified and experienced members.	ADOT Traffic Safety Section	Technical assistance, no actual awarding of funds	On-going	Richard S. Weeks, PE, PTOE Program Manager Road Safety Assessment 1615 West Jackson St., Mail Drop 065R Phoenix, AZ 85007-3217 Phone: 602-712-4382 Fax: 602-712-3243 Email: rweeks@azdot.gov
Injury Prevention Program	Eligible project include, but are not limited to: developing, evaluating, and implementing programs designed to prevent injury problems facing tribal governments	Indian Health Services	$75,000 maximum per project		Jacey McCurtain Injury Prevention Specialist P.O. Box 649 Fort Defiance, AZ 86504 Phone: 928-729-8449 Email: jacey.mccurtain@ihs.gov
Navajo Nation Community Development Block Grant	Eligible activities include, but are not limited to: • Housing • Community Facilities: Infrastructure construction, e.g., roads, water and sewer facilities; and, single or multipurpose community buildings. • Economic Development: Wide variety of commercial, industrial, agricultural projects	CDBG Program is a federally funded program and serves as a liaison between U.S. Housing and Urban Development (HUD) and the Navajo Nation.	Southwest Region receives $22.6 million and the Navajo Nation is eligible up to $5.5 million. Eligible applicants under the Navajo Nation are the 110 Chapters and non-profit entities serving the Navajo Nation. CDBG requires a match of 25% or more.	October or November 2014	Navajo Nation Community Development CDBG P.O. Box 2365 Window Rock, Arizona 86515 Phone: 928-871-6539 For general program information, visit: http://www.nndcd.org/

Source: FHWA, ADOT, Navajo Nation, USDOT, AmeriCorps, USDA, Arizona State Parks

Table 10.1. Potential Funding Sources (Continued)

Funding Program	Eligible Uses	Administering Agency	Program and Funding Details	Application Deadline	Contact Information
Navajo Nation Infrastructure and Capital Improvement	Eligible projects include, but are not limited to: The cost for the development of infrastructure such as electric power line, water line, sewer lagoons, waste water treatment facilities, communication and transportation systems, roads and parking lots	Navajo Nation Capital Improvement Office	No limit on length or Funding Request, dependant on available funds. Open to Navajo Nation Chapters, Departments, programs, non-profit organizations	General proposal due annually on March 1st at 5:00 pm	Casey Begay Department Manager II Capital Improvement Office Phone: 928-871-6509 Email: begay_casey@hotmail.com
AmeriCorps Indian Tribes Planning Grants	AmeriCorps planning grants provide up to $75,000 for a one-year period to provide support to an Indian Tribe for the development of an AmeriCorps program that will engage AmeriCorps members in order to address pressing community problems.	AmeriCorps	AmeriCorps State and National sets aside one percent of grant funds to support programs operated by American Indian Tribes		For general program information, contact: Phone: (202) 606-7508 Email: americorpsgrants@cns.gov http://www.nationalservice.gov/build-your-capacity/grants/
USDA Community Facility Grants	Grant funds may be used to assist in the development of essential community facilities. Grant funds can be used to construct, enlarge, or improve community facilities for health care, public safety, and community and public services. This can include the purchase of equipment required for a facility's operation.				USDA Rural Development 230 N 1st Avenue, Suite 509 Phoenix, AZ 85003 Phone: (602) 280-8701 Fax: (602) 280-8770 For general program information, visit:http://www.rurdev.usda.gov/RD_grants.html
Planning Assistance for Rural Areas (PARA) Program	PARA funds are limited to planning applications and may not be used for the design or construction of transportation facilities. PARA funds may be applied to address a broad range of planning issues related to roadway and non-motorized transportation modes. Funds may also be applied to studies dedicated solely to the planning of public transportation services.	Federal funds administered through ADOT	The PARA program is funded 100% by ADOT using Federal Statewide Planning and Research (SPR) funds. The awarded funding is a limit or cap of $250,000 for each PARA study process. Applications for projects are submitted to ADOT MPD on an annual basis.	Applications for planning projects are submitted to ADOT on an annual basis in early summer.	Justin Feek, Program Manager Arizona Department of Transportation - MPD 206 S. 17th Ave., MD 310B Phoenix, AZ 85007 Phone: 602.712.6196 Fax: 602.712.6412 Email: jfeek@azdot.gov
Accelerated Innovation Deployment (AID) Demonstration	Eligible projects include, but are not limited to: • Accelerate adoption of innovative technologies in all aspects of highway transportation • Construct longer-lasting highways • Improve highway efficiency, safety, mobility, reliability, service life, environmental protection, and sustainability	Federal Highway Administration Funds	Award recipients must obligate awarded funds to project within 6 months of allocation.	Open, rolling solicitation. Applicants must submit applications electronically through Grants.gov.	For general program information, visit: http://www.fhwa.dot.gov/accelerating/grants/

Source: FHWA, ADOT, Navajo Nation, USDOT, AmeriCorps, USDA, Arizona State Parks

Table 10.1. Potential Funding Sources (Continued)

Funding Program	Eligible Uses	Administering Agency	Program and Funding Details	Application Deadline	Contact Information
TIGER Grants	Eligible projects include, but are not limited to: • Highway or bridge projects eligible under title 23, United States Code; • Public transportation projects eligible under chapter 53 of title 49, United States Code; • Freight rail projects; • High speed and intercity passenger rail projects; and • Port infrastructure investments	United States Department of Transportation	• $1 million minimum grant • No match requirement, though competitive • applications often feature a match • Tribal Transportation Program (TTP) Funds • eligible to match/complete financing	Applications must be submitted through Grants.gov	Office of the Under Secretary for Policy Office of the Secretary of Transportation 1200 New Jersey Ave, SE Washington, DC 20590 Phone: 202-366-4544 For general program information, visit: http://www.dot.gov/tiger
Transportation Alternatives Program (TAP)	Eligible projects include, but are not limited to: • Bicycle and pedestrian facilities • Safe routes projects for non-drivers • Construction of turnouts and overlooks • Community improvement activities including vegetation management and historic preservation • Environmental mitigation activity including NEPA compliance	Federal Highway Administration Funds Administered Through ADOT and Regional Planning Organizations	TAP funds are available for obligation for a period of 3 years after the last day of the fiscal year for which the funds are authorized.		Patrick Stone TE Section Manager Department of Transportation 1615 W. Jackson Street, MD EM10 Phoenix, AZ 85226 Phone: 602-712-4428 Email: pstone@azdot.gov
Pedestrian and Bicycle Projects					
Transportation Alternatives Program (TAP) - Safe Routes to School	Safe Routes to School (SRTS) eligible projects and activities include: • Infrastructure-related projects. • No infrastructure-related activities. • Safe Routes to School coordinator		80 percent Federal/20 percent State or local match subject to the sliding scale adjustment		Kristin Myers Arizona Department of Transportation Local Public Agency Section 1615 W. Jackson St., Mail Drop EM11 Phoenix, AZ 85007 Phone: (602) 712-6166 Email: KMyers@azdot.gov
Transportation Alternatives Program (TAP) - Recreational Trails Program (RTP)	Recreational Trails Program (RTP) provides funds to the States to develop and maintain recreational trails and trail-related facilities for both nonmotorized and motorized recreational trail uses.	FHWA Administered through Arizona State Parks			Robert Baldwin State Trails Coordinator Arizona State Parks Resources Management Section 1300 W Washington St Phoenix AZ 85007-2932 Phone: 602-542-7130 Email: rbb2@azstateparks.gov

Source: FHWA, ADOT, Navajo Nation, USDOT, AmeriCorps, USDA, Arizona State Parks

Table 10.1. Potential Funding Sources (Continued)

Funding Program	Eligible Uses	Administering Agency	Program and Funding Details	Application Deadline	Contact Information
Transit Projects					
Tribal Transit Program (TTP)	Eligible projects include public transportation capital projects for start-ups, replacement or expansion, operating costs for start-ups, and planning.	Federal Transit Administration	In FY 13 approximately $5 million in funding was available for the TTP. The federal share for projects selected under the TTP discretionary program was up to a 90 percent federal share of project costs, unless the Indian tribe could demonstrate a financial hardship in their application. Eligible applicants could also apply for planning grants of up to $25,000 for planning studies.	Check the TTP Notice of Funding Availability upon publication in the Federal Register. The FY 13 TTP NOFA was published on May 9, 2013 and TTP project applications were due July 8, 2013.	Contact the appropriate FTA Regional Office at *http://www.fta.dot.gov* for proposal-specific information and issues. For general program information, contact : Lorna Wilson, Office of Program Management, (202) 366–0893, Email: *lorna.wilson@dot.gov* Elan Flippin, Office of Program Management, (202) 366–3800, Email: *elan.flippin@dot.gov*.
Enhanced Mobility of Seniors and Individuals with Disabilities (Section 5310)	Program funds are used for capital assistance, the purchase of vehicles, related equipment and operating funds statewide. Eligible recipients include private nonprofit and public agencies that provide transportation to the elderly and disabled.	Federal funds administered through ADOT	Using these funds for operating expenses requires a 50 percent local match while using these funds for capital expenses (including acquisition of public transportation services) requires a 20 percent local match.	Applications due to NACOG in June	Jason Kelly NACOG Mobility Management Planner 43 South San Francisco Street Flagstaff, AZ 86001 Phone: (928) 830-0127. Email: jkelly@nacog.org
Rural Area Formula Grants (Section 5311)	The Rural Program provides funding to States for the purpose of supporting public transportation in rural areas including funding for Tribal Transit, Appalachian region, Intercity Bus and technical assistance programs and services. Rural areas are locations with populations less than 50,000, where many residents often rely on public transit to reach their destinations.	Federal funds administered through ADOT	The Tribal program now consists of a $25 million formula program and a $5 million discretionary grant program. Formula factors include vehicle revenue miles and the number of low-income individuals residing on tribal lands. Federal share may exceed 85% for certain projects related to ADA, CAA, and for certain bicycle projects.	Applications are submitted in December, and awards are generally made in July of each year.	Sara Allred 5311 Program Manager 206 S 17th Ave MD 340B Phoenix, AZ 85007 Phone: 602-712-4498 Email: sallred@azdot.gov
Rural Transit Assistance Program	Training, technical assistance, research, and outreach funding to all 5310, 5311, 5316, and 5317 grantees statewide.	Federal funds administered through ADOT	To be eligible to receive a RTAP Scholarship, applicants must be an active Arizona grantee receiving 5311 and 5310 FTA program funding.	All grantees must submit a RTAP Application at least 30 days prior to the training event.	Sara Allred 5311 Program Manager 206 S 17th Ave MD 340B Phoenix, AZ 85007 Phone: 602-712-4498 Email: sallred@azdot.gov

IMPLEMENTATION GUIDELINES

Implementation of the recommended Improvement Plan to enhance the safety and mobility along roadways within Fort Defiance requires active participation from local citizens, private entities, and local, County, and State government officials. The following actions are recommended to successfully implement the Plan for Improvements developed as part of this study.

- The Fort Defiance Chapter Council needs to formally approve this plan in order to initiate the process of requesting project inclusion in the Navajo Nation TIP and to subsequently receive Federal Lands Highway Program funds or other MAP-21 funds
- Incorporate high priority improvement projects in the State Transportation Improvement Program (STIP). In order to receive any federal funding, transportation improvement projects must be included in the State TIP.
- Work with Apache County, ADOT, and BIA to confirm existing ROW widths and identify areas where additional ROW is required. It is important that as existing roads are reconstructed that right-of-way descriptions are prepared as part of the design surveys. If needed, purchase required ROW from property owners.
- Traffic calming devices should be considered in the design of new roads serving housing, governmental facilities, or commercial developments.
- Solicit grants for bicycle and pedestrian improvements to add bicycle lanes, enhance connections to existing facilities, and to construct new facilities in deficient locations.
- Develop policies and procedures to promote alternative modes of transportation.
- Further research and apply for funding for each project identified in the Plan for Improvements.

APPENDIX A.

PHASE 1 STAKEHOLDER OUTREACH SUMMARY REPORT

Apache County Planning Assistance for Rural Areas Project
ADOT-MPD Task Assignment 029-13

Date: 05/23/2013
Time: 8:30 AM to 10 AM
Location: Apache County District II
Office Conference Room

Stakeholder Input Meetings – Round 1

MEETING 1 (8:30 – 10:00 AM) SUMMARY

Attendees:	Don Sneed (ADOT PM)	Rick Powers (Jacobs)
	Vamshi Yellisetty (Jacobs)	Kirk Arviso (Apache County)
	Calvin Castillo (BIA)	Garren Burbank
	Margie Begay (NDOT)	Thomas Benally (NDOT)
	Willie Tracey Jr (NTS)	Rod Wigman

- Lacking of lighting along roadways is a major concern for community members
- Traffic in the month of August is more than the typical yearly average
- Vegetation along roadways needs to be removed
- There are two bridges along the study roadways. BIA staff mentioned that both bridges are eligible for replacement. The bridge on N7 does not include a walkway for pedestrians which is potentially unsafe
- Navajo DOT staff asked that the census block population by the hospital be verified
- Garren Burbank from Navajo DOT will provide crash data
- Margie Begay will provide the RSA report that was completed for one of the study roads/intersections
- RSA recommends roundabouts or traffic signals at all critical intersections
- Coordinate with NTUA about roadway and utility issues
- Pedestrian and bicycle facilities are needed throughout the study roads. N12, N110 should be a priority
- Exclusive turning lanes are needed for the NTUA road intersection and other major cross streets
- Emergency pullouts are needed especially on two lane roads
- Striping is completely faded and needs to be addressed. Because of limited funding, BIA is focused on unpaved roads and unable to perform regular maintenance on existing paved roads including striping the roads
- Willie Tracy Jr asked the following questions:
    - Q: What is the study timeframe?
      A: The study will be completed in February 2014
    - Q: Is this the time to identify bus stops?

A: Yes

- Q: Why isn't land use representative in the meeting?
- A: Land use folks will be part of another stakeholder meeting
- Q: What are the next steps?
  A: The study team will compile a comprehensive list of deficiencies and needs based on stakeholder feedback and technical analysis. The results will then be presented to the public

- Speeding is a major concern on all roads. Consider enforcement
- Sidewalks and lighting are needed at school zones
- N12/N54 intersection is congested in peak hours and around noon time
- Drainage issues exist at N12/N110 intersection
- Pedestrian crossing is needed along N110 in the vicinity of the Youth Center
- N110/N112 intersection needs to be signalized. Very unsafe
- Sometimes flooding occurs on N112
- Extend N7 corridor to the hilltop on the west end
- Signage needs to be replaced because of reflectivity concerns. Guard rails should also be reflective
- N7 west of N7/N112 is in really bad condition and is difficult to drive during winter conditions
- Pedestrian crossings are needed at school zones, IHS, and NTUA intersections
- Lighting needs to be added at intersections - N12/N110, N7/N112, N12/N7, N112/N110
- Special events generate significantly high traffic volumes - Graduation, Annual Fair
- Bus shelters are needed at bus stops

MEETING 2 (10:30 AM – 12:00 PM) SUMMARY

Attendees:	Don Sneed (ADOT PM)	Rick Powers (Jacobs)
	Vamshi Yellisetty (Jacobs)	Kirk Arviso (Apache County)
	Daniel Wauneka (NTUA)	Rod Wigman (ADOT)

- NTUA has plans to relocate to a new facility to be built in the vicinity of the IHS hospital. The new building is expected to be completed by 2015. The existing NTUA campus will still be used at lower staffing levels
- Street naming should be addressed
- NTUA will provide a GIS data of utilities
- NTUA Driveway/N12 intersection is congested in mornings and evenings. Especially when utility bills are due. Intersection also has sight distance issues
- Need pedestrian crossing on N12 between N110 and N54

- Elderly homes facility is planned at the northwest corner of N7/N12

MEETING 3 (1:00 PM – 2:30 PM) SUMMARY

Attendees:

Don Sneed (ADOT PM)	Rick Powers (Jacobs)
Vamshi Yellisetty (Jacobs)	Kirk Arviso (Apache County)
Zondra Bitsuie (FD Chapter)	Rod Wigman (ADOT)
Antonio Cook (Navajo DPS)	David Tibbs (IHS)
Craig Calvert (IHS)	

- Icing on the roadways in the months of January and February causes unsafe driving conditions
- Raised median should be considered to prevent sliding into opposing traffic during winter months
- The hospital is in a floodplain
- There is no turn lane into the High School
- N7/N12, N12/N110, N112/N110 intersections experience congestion
- N54 might have more truck traffic than other roadways
- Bicycle mode needs to be made a higher priority
- No shoulder on N110 results in vehicles stopping on the road during emergencies
- Speed limits need to be reviewed and enforced
- At N12/N110 intersection, accessing the Conoco gas station is an issue by traffic coming from Window Rock
- Zondra helped identify several proposed new commercial, industrial, and residential developments within the study area

MEETING 4 (3:00 PM – 4:30 PM) SUMMARY

Attendees:

Don Sneed (ADOT PM)	Rick Powers (Jacobs)
Vamshi Yellisetty (Jacobs)	Kirk Arviso (Apache County)
Andrea Chase (NHA)	Rod Wigman (ADOT)
Brian Reed (NHA)	Alexious Becenti (Navajo Forestry)

- NHA mentioned that housing is not sufficient
- Brian identified some potential new developments in the study area
- A comprehensive plan development land use plan was just completed by NHA and is available for download at Hooghan.org
- Lack of lighting, faded striping, and lack of pedestrian and sidewalks are major issues

APPENDIX B.

PHASE 1 PUBLIC OUTREACH SUMMARY REPORT

Fort Defiance Industrial Area Traffic Circulation Study

August 2013

Prepared by
Arizona Department of Transportation

Introduction

Apache County, the Fort Defiance Chapter and the Arizona Department of Transportation (ADOT) are collaborating to conduct a traffic circulation study for the Fort Defiance Industrial Area that will result in a transportation improvement plan that will promote safety and mobility, enhance economic vitality, improve community livability, encourage environmental and cultural sensitivity, and support current and planned economic development.

Public Meeting

To inform and involve community members of the study, ADOT hosted a public meeting at the Fort Defiance Chapter House on Wednesday, August 7, 2013 from 5-7 p.m. Staff present at the meeting included Rick Powers and Vamshi Yellisetty (Jacobs Engineering), Don Sneed, Tony Staffaroni, Rod Wigman and Kee Yazzie (ADOT), Kirk Arviso, Lewis Shirley and Tom White (Apache County), Ben Bennett and Margie Begay (Navajo Dept. of Transportation), and Zondra Bitsuie (Fort Defiance Chapter President). In addition to a presentation, there was an opportunity for Q&A, comments and recommendations on areas for improvement. In total, 12 members of the community were in attendance.

Newspaper Advertisement

A newspaper advertisement providing the date and location of the public meeting was published in the following newspaper:

- Navajo Times (July 4)-published at this date to meet a BIA requirement of 30 day notification

A copy of the advertisement can be found in Appendix A.

Radio Forum

In addition to the newspaper advertisement, representatives from Jacobs, ADOT and Apache County participated in a radio forum on July 24 from 6-8 p.m. on KTNN radio which serves the Fort Defiance-Window Rock and surrounding areas of the Navajo Nation. The study was discussed, questions were answered and community input and participation was encouraged in the study as well as the public meeting held on August 7.

Presentation and Meeting Materials

A Power Point presentation was given at the meeting, and a comment form was provided to each attendee of the meeting.

The following comments/questions were received during the presentation:

- Speeding is a major issue and is not enforced
- Animals on the road is an issue/concern
- Streets are sand and mud covered and get flooded when it rains
- Wellness or health trails are needed for the people exercising in the area
- Buses stop on the roadway blocking traffic and creating unsafe conditions

- Question: What will traffic flow be like with the new sports facility
    - Response: We are working with the School District to obtain a copy of the Traffic Impact Study and design plans. The next step will be to assess if the proposed improvements are sufficient to handle the stadium traffic.
- Pedestrian use needs to be taken into consideration

A copy of the comment form can be found in Appendix B of this report. Comments received on display boards can be found in Appendix C.

Comment Form Summary

The following comments were received and returned via the comment form that was provided at the public meeting. All comments received are included in this summary.

What specific goals should this study focus on?

- Upon the roads throughout the community. Planning of streets-street lights. Maintenance of the roads.
- Safety of the traveling public which includes more traffic regulation signs and pedestrian signs.
- Improved roads, pedestrian walkways, bike trails and the safety of all.
- Safety. Keep livestock off highway esp. at night
- Growth and traffic movement
- Create a safe environment for pedestrians, vehicles, and livestock and domestic animals.
- The maintenance of all the roads. Naming the streets and keep the same title and not change them. The traffic flow on all roads.

Are there any additional current transportation issues that need to be addressed?

- I see a lot of surface treatment in the area of the study when the pavement structure is overlooked. A re-construction or rehab is needed on the pavement typical.
- The main roads should be maintained like marking of the lanes, road signs, and the traffic lights. Keeping the road side clear of high weeds-keeping the curbs clear so water can drain. Keeping livestock off the roadways.
- Improved areas for public transportation to pick up, drop off pedestrians. Also need safe turn around areas.
- Road stripes need to be kept up to date.
- Scenic-byway
- Create barriers to slow down speeding and to stop rural horses.
- The road sides need to be cleaned the weeds get tall especially when the sidewalls is close to the wood. The weeds should be cut on the shoulder of the road to discourage cows from feeding on them. Perhaps having speed bumps will slow the cars down. I think if people are charged with speeding, having to pay or go to court might make them pay attention to speed signs. Developing areas for bus stops and signs parted for bus stops.

What do you see as your top three transportation issues right now in the Fort Defiance community?

- The speed people have driving through the community.
- The making of highway-turning lanes.
- Traffic lights at intersections.
- Erect all signs that have been damaged or removed.
- Use thermo-plastic striping paint as oppose to water based.
- Improve traffic lighting system with current FHWA standard.
- Unsafe roads
- Unsafe/lack of pedestrian walkways
- No street lights
- Unsafe walking areas for exercising
- No roadway stripes
- Streetlights
- Striping
- Speeding from old hospital to intersection.
- Safe paths for pedestrians.
- Awareness for feral and domestic animals
- The speed of traffic through the community.
- The roads need to be marked for lanes, cross walks.
- Street light, majority of people wear black colored clothes and it is hard to see them.

What solutions would you suggest for the issues presented?

- The community leaders need to work with law enforcement roads department.
- Continue traffic studies and get community involvement.
- Work through Ft. Def. Chapter and the community for development of appropriate pedestrian walk ways. Enforce traffic laws.
- More lights along RT 12. Safe walking areas. Wellness path!
- More maintenance funds
- Putting a rumble strip and speed bumps from old hospital to intersection. Replace missing signage.
- Cooperation with road department and law enforcement.

Please specify what you believe are the priority transportation needs within the Fort Defiance community.

- Traffic lights at interchanges at school- well marked lanes @ hospital traffic lights at NTUA, high school turn off.
- Need to enforce traffic laws in the school zones and in the main roadways in the community.
- Need street lights along main roadways and sidewalks.
- Excessive water ponding during monsoon and winter season between 7-2-11 to NTUA
- Widen pavement structures where needed.

- Improve pavement typical section not base on funding increase in traffic volume.
- Safe, effective traffic flow at congestion areas
- Street lights
- Safe pedestrian/bike walkways throughout the community esp. schools, health, and business sites.
- School bus stops need to be moved
- Lights and improved intersections
- Well marked lanes, crosswalks and turning lanes at NTUA the Post Office, Hospital and schools.
- Walking path from highway 110 to Rt 7; Rt 112 to hospital from hospital to Rt7 to Rt 112 to high school. Sidewalks from H.S. to corner station both sides of the road. Street lights from 12 to 110 intersection up to the Post Office.

What transportation issues do you think the Fort Defiance community will face 20 years from now?

- Same traffic problems more cars = people have to drive to their jobs.
- Commuting is expanding/growing. Need an enhanced transportation system to accommodate this growth.
- Every person has two or more vehicles and the population will increase with traffic which a good road maintains is required.
- Too many vehicles on the road
- To account for a rural and very pedestrian usage in our community.
- The same, in the 60 years that I've been in the community I've seen Ft. Defiance change. All the trading posts, garages, cafes disappear because of the red tape of having a business. The main employers are changing BIA, IHS and giving the tribe the 638 programs.

What can be done now to prepare for the future (the next 20 years)?

- Better planning of businesses sites. Tribe has offices all over the place. A plan to establish housing. Organize the community with street names and make use of rural addresses.
- Continue traffic volume studies and get community involved for major concerns.
- Keep marking on highway. Maybe traffic lights esp. during school time. People don't respect the speed limit in school zone.
- Keeping data on growth and accidents.
- Create an infrastructure to keep ahead of these issues.
- To get people action in community offices. Informing community of meetings. Formation of committees. There are limited community bulletin boards in places like P.O., hospital, fueling station, to keep community informed. It was by accident that I found out about this meeting.
- Street lights near congestion areas, schools, hospitals and major businesses.

Do you have any additional comments you wish to share with the project team?

- Thank you for educating us with your study. Also need to enhance water supply, utility, etc. suggest collaborating with their utilities in area to develop a well arranged, structured community development system. Connecting to understand there will be increased health care delivery system, business, and housing, improved fire dept. etc.

- People are taking short cuts behind Conoco Gas Station. More people are using old Sawmill Road for walking-jogging… this needs some upgraded evening times for safety.

- A recommendation of AZDOT to make an effort to create awareness of public and traffic safety to the community. This would address speeding and unsafe drivers.

- Flood Plain, Navajo Nation Emergency Plan at one time came up with potential flooding in Ft. Defiance Valley. Safety of Dam, N.N. water development were involved. Is present safety of dam is rebuilding the Red Lake Dam located @ Navajo, NM. In power point flood plain was covered, but safety of dam had a bigger area of potential flooding.

- It could be nice to make improvements on all the roads in Ft. Defiance, especially into the housing areas and the routes between the main roadways. Building curbs on the main roadways in the community and weeds and trees be manicured well. Right now there are many dead trees that line Rt 110. And the tree garbage are close to utility lines. We have been lucky that they have not been struck by lightning.

Appendix A

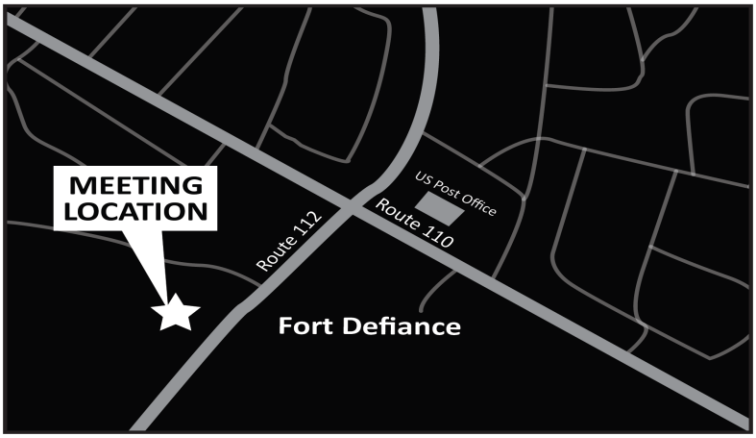
Fort Defiance Industrial Area Traffic Circulation Study

YOU'RE INVITED TO PROVIDE YOUR INPUT AT THE AUG. 7 PUBLIC MEETING

The Navajo Nation has designated the Fort Defiance Industrial Area as a major growth center for community and economic development. In fact, there are several new developments underway and more are planned in the upcoming years. To continue building on this growth and expansion, an efficient transportation system is needed. Apache County, the Fort Defiance Chapter and Arizona Department of Transportation (ADOT) are collaborating to conduct a traffic circulation study that will result in a transportation improvement plan, which will promote safety and mobility, enhance economic vitality, improve community livability, encourage environmental and cultural sensitivity, and support current and planned economic development.

Learn about the study and share your thoughts on the transportation needs in the Fort Defiance area!

Wednesday, Aug. 7, 2013
5 p.m. to 7 p.m. | Fort Defiance Chapter House
Southwest of the Route 110 and Route 112 intersection.
Learn more about this study or submit your comments online at **azdot.gov/ApacheCountyPARA**.



If you require special assistance in order to participate in the public meeting, please contact projects@azdot.gov or 855.712.8530. Requests should be made as soon as possible to allow time to arrange the accommodation.

13-369

ADOT

FOR MORE INFORMATION:
855.712.8530
projects@azdot.gov
azdot.gov/apachecountypara

Appendix B

FORT DEFIANCE INDUSTRIAL AREA TRAFFIC CIRCULATION STUDY
Public Meeting Comment Form

YOUR THOUGHTS, IDEAS, AND COMMENTS

6. What transportation issues do you think the Fort Defiance community will face 20 years from now?

7. What can be done now to prepare for the future (the next 20 years)?

Do you have any additional comments you wish to share with the project team?

Fort Defiance Industrial Area Traffic Circulation Study — ADOT JACOBS

FORT DEFIANCE INDUSTRIAL AREA TRAFFIC CIRCULATION STUDY
Public Meeting Comment Form

STUDY BACKGROUND AND PURPOSE

The Arizona Department of Transportation (ADOT), in coordination with Apache County and the Fort Defiance Chapter of the Navajo Nation, is analyzing the traffic circulation conditions of **Navajo Routes 7, 12, 54, 110, and 112 within the Fort Defiance Community.**

The Study Purpose is to...

- ✔ Conduct a comprehensive evaluation of roadway, pedestrian, bicycle, transit, and trail needs
- ✔ Develop a three-phased improvement plan that promotes safety and mobility, supports economic development, and improves community livability

YOUR INPUT IS REQUESTED

Completion of this form is completely voluntary; all input provided will be incorporated into the study's documentation. Comment forms will be accepted until August 16th, 2013 and can be submitted to the project team at the meeting or mailed/faxed/emailed to:

Don Sneed
Arizona Department of Transportation
206 S. 17th Avenue, MD 310B
Phoenix, AZ 85007
Email: DSneed@azdot.gov
Phone: 602.712.6736
Fax: 602.712.3046

Tony Staffaroni
ADOT Communications
Office of Community Relations
1655 W Jackson St, MD: 126F
Phoenix, AZ 85007
Email: AStaffaroni@azdot.gov
Phone: 855-712-8530

To receive project updates, please submit the following (Optional):

Name: _____

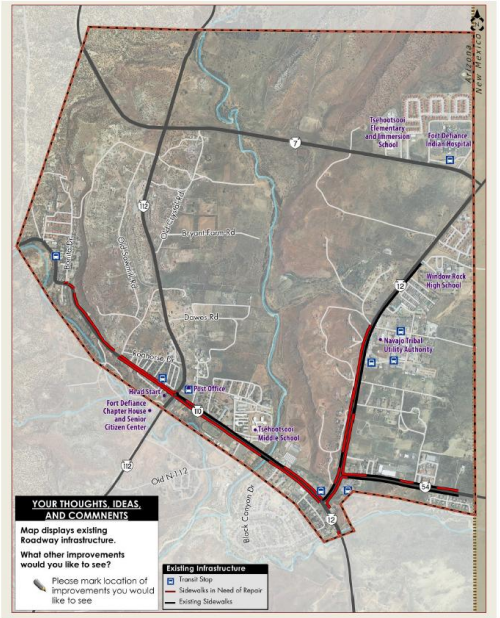
Address: _____ City: _____ Zip: _____

Email Address: _____

Additional information can be found by visiting the project website:
http://www.azdot.gov/ApacheCountyPara
THANK YOU FOR YOUR PARTICIPATION

Fort Defiance Industrial Area Traffic Circulation Study — ADOT JACOBS

WHAT ARE THE AREA'S TRANSPORTATION NEEDS?



Fort Defiance Industrial Area Traffic Circulation Study — ADOT JACOBS

YOUR THOUGHTS, IDEAS, AND COMMENTS

1. What specific goals should this study focus on?

2. Are there any additional current transportation issues that need to be addressed?

3. What do you see as your top three transportation issues right now in the Fort Defiance Community? (examples: unsafe pedestrian walkways, no street lights, congestion, etc.)
   1) _____
   2) _____
   3) _____

4. What solutions would you suggest for the issues presented?

5. Please specify what you believe are the priority transportation needs within the Fort Defiance community? (examples: sidewalks to the high school, additional transit services, turning lanes at NTUA)
   1) _____
   2) _____
   3) _____

Fort Defiance Industrial Area Traffic Circulation Study — ADOT JACOBS

Appendix C


What Are the Area's Transportation Needs?
Arizona
New Mexico
Bonita Dr
Old Crystal Rd
Old Sawmill Rd
Bryant Farm Rd
Dawes Rd
Roadhorse Dr
Old N-112
Black Canyon Dr
Tsehootsooi Elementary and Immersion School
Fort Defiance Indian Hospital
Window Rock High School
Navajo Tribal Utility Authority
Post Office
Head Start
Fort Defiance Chapter House and Senior Citizen Center
Tsehootsooi Middle School
Transit Center
Blind spot going up
Speeding Transit & others
Existing Transit Stop
YOUR THOUGHTS, IDEAS, AND COMMNENTS
1. Map displays existing transportation infrastructure.
Mark on the map the locations in need of additional:
- Sidewalks- Red
- Trail Facilities- Green
- Bike Paths- Blue
- Transit Needs- Purple
2. What roadway improvements would you like to see?
Please mark location of improvements you would like to see (Black)
Existing Infrastructure
Transit Stop
Sidewalks in Need of Repair
Existing Sidewalks
Fort Defiance Industrial Area
ADOT
JACOBS


What Are the Area's Transportation Needs?
Arizona
Bryant Farm Rd
Old Crystal Rd
Old Sawmill Rd
Bonita Dr
Dawes Rd
Redhorse Dr
Old N-112
Black Canyon Dr
Window Rock High School
Navajo Tribal Utility Authority
Post Office
Head Start
Fort Defiance Chapter House and Senior Citizen Center
Tsehootsooi Middle School
Transit Center
YOUR THOUGHTS, IDEAS, AND COMMNENTS
1. Map displays existing transportation infrastructure.
Mark on the map the locations in need of additional:
- Sidewalks- Red
- Trail Facilities- Green
- Bike Paths- Blue
- Transit Needs- Purple
2. What roadway improvements would you like to see?
Please mark location of improvements you would like to see (Black)
Existing Infrastructure
Transit Stop
Sidewalks in Need of Repair
Existing Sidewalks

APPENDIX C.

PHASE 2 STAKEHOLDER OUTREACH SUMMARY REPORT

Apache County Planning Assistance for Rural Areas Project
ADOT-MPD Task Assignment 029-13

Date: 10/16/2013
Time: 8:30 AM to 4:30 PM Navajo Nation
Location: Teleconference

Stakeholder Input Meetings – Round 2

Don Sneed and Kirk Arviso opened each meeting with introductions and turn the time over to Jacobs for presentation and discussion. Rick Powers gave an update on the study purpose, progress to date, future activities and the need for stakeholder input. He also summarized the study area transportations issues that were presented to the public at the August 8th meeting. Vamshi Yellisetty then gave a presentation of recommended improvement strategies including intersection options for signal or round-about, street lighting options, Safety strategies for school zones, speed transition safety concepts, fencing improvements, roadway pavement preservation, bridge replacement options, striping and shoulder widening ideas. Multimodal improvements presented included; pedestrian and bicycle facilities, trails, and repair of damaged sidewalks. Transit improvements included review of growth areas, bus stops, bus shelters, and potential bus pullouts. The final topic presented was a summary of recommended street cross section types for all study roads. The remaining project schedule was presented to the group.

MEETING 1 (8:30 – 10:00 AM) SUMMARY

Attendees: See Sign-In Sheet

Stakeholder Meeting Discussion

- The group was in favor of a round-about at the N112/N110 intersection.
- The preferred option for the N12/N110 intersection was to upgrade the existing signalization, pedestrian crossings and raised medians.
- The participants preferred the LED dark skies friendly lighting option.
- The school zone improvements were well received, the main concern was the impact to snowplows and the high level of maintenance for any pavement markings.
- There was not a strong feeling either way on the HAWK system.
- They support any way to help reduce the traffic speeds in the school zones.
- Pedestrian/students have been observed crossing the road at various locations along the roadway.
- The group agreed with the need for fencing and cattle guard improvements on the study roads.
- Vegetation removal is also needed along selected corridors.
- The pavement is in need of repair.

- Pavement re-striping is sorely needed in the area. The BIA is moving to adopt similar striping requirements as ADOT. Thermoplastic striping will be used. Still concern of the snowplow and cinder abrasion damage to the striping.
- The group liked the idea of having a circular route for use by bicycle and pedestrians.
- They were in favor of the separated multi-use paths were they can be constructed.
- Agreed bus turnouts are needed, as the busses currently stop in the middle of the road at some stops.
- The bridges are prioritized by the BIA and the Fort Defiance structures will have to wait until they move up the priority list to be included for replacement.
- Maintenance and fee agreement will need to be worked out for the street lights.

MEETING 2 (10:15 – 11:30 AM) SUMMARY

Attendees: See Sign-In Sheet See Sign-In Sheet

Stakeholder Meeting Discussion

- A bus stop/pull out is recommended at the high school as some students ride the bus to school.
- The round-about is a good idea at the N12/N110 intersection.
- The signal appears to be the best solution at N12/N110 intersection.
- There are plans to establish a bus stop at the Fort Defiance High School.
- The current bus stops are ok. The BIA prefers the stops are beyond the R/W that may be difficult to accomplish.
- Agreed that an internal circulator route is not needed at this time.
- Bus pullouts would be great, currently the bus stop in the road at several locations.
- Bus shelters would also be appreciated by the riders.

MEETING 3 (1:00 – 1:45 PM) SUMMARY

Attendees: See Sign-In Sheet

Stakeholder Meeting Discussion

This meeting was scheduled primarily for discussion with the school district to discuss school zone safety strategies and the proposed improvements associated with the new stadium construction.

- No real preference on the round-about, agrees with our recommendation.
- Discussion of the speeds through the school zones, this is a real concern to the school district.
- There are approximately 25students, 1800 are bused to school.

- The traffic calming suggestions look like great ideas and will be discussed internally with school staff.
- The flashing lights are currently helping to slow down traffic.
- The grand opening for the new stadium is January 18th. There are improvements to the existing access to the stadium being done at this time. A secondary access is needed and should be recommended in this study. We will look at short-term and long-term access options.

MEETING 4 (2:15 – 3:30 PM) SUMMARY

Attendees: See Sign-In Sheet

Stakeholder Meeting Discussion

- No consensus on the round-about option at N112/N110 intersection, maybe a slight edge in favor of Round-about at N112/N110, signal is preferred at N12?N110.
- Concern about the maintenance responsibility for the roads and improvements. The maintenance responsibility will be identified in the final report.
- Concern about the speed of the traffic throughout the study area.
- The dark sky friendly lighting is preferred, again maintenance is a concern.
- The traffic calming alternatives all look good, no consensus on the preferred treatments.
- Fencing of the roads is needed.
- The trials are a good idea, would prefer trail access extended up to the hospital area.
- The street cross-section types look great, the separated path is preferred when possible.

The final meeting adjourned at 3:30 Navajo Nation Time.

APPENDIX D.

PHASE 2 PUBLIC OUTREACH SUMMARY REPORT

Fort Defiance Industrial Area Traffic Circulation Study

February 2014

Prepared by
Arizona Department of Transportation

Introduction

Apache County, the Fort Defiance Chapter and the Arizona Department of Transportation (ADOT) are collaborating to conduct a traffic circulation study for the Fort Defiance Industrial Area that will result in a transportation improvement plan that will promote safety and mobility, enhance economic vitality, improve community livability, encourage environmental and cultural sensitivity, and support current and planned economic development.

Public Meeting

To inform and involve community members of the study, ADOT hosted a public meeting at the Fort Defiance Chapter House on Wednesday, January 8, 2014 from 5-7 p.m. Staff present at the meeting included Rick Powers and Vamshi Yellisetty (Jacobs Engineering), Don Sneed, Rod Wigman and Kee Yazzie (ADOT), Kirk Arviso, Lewis Shirley and Tom White (Apache County), Ben Bennett and Margie Begay (Navajo Dept. of Transportation), and Zondra Bitsuie (Fort Defiance Chapter President). In addition to a presentation, there was an opportunity for Q&A, comments and recommendations on areas for improvement. In total, 36 members of the community were in attendance. A copy of the sign-in sheets can be found in Appendix A.

Newspaper Advertisement

A newspaper advertisement providing the date and location of the public meeting was published in the following newspaper:

- Navajo Times (December 5)-to meet the BIA 30 day requirement

A copy of the advertisement can be found in Appendix B.

Presentation and Meeting Materials

A Power Point presentation was given at the meeting, and a comment form was provided to each attendee of the meeting.

At the conclusion of the formal presentation, Kirk Arviso, Apache County Administrative Coordinator, and Tom White, Apache County Supervisor, provided closing comments as well as Chapter President Bitsuie. In addition to thanking the community members present for their participation, Jacobs Engineering and ADOT staff were also thanked for their work and efforts on this study as well as efforts ADOT conducts on Statewide Tribal Transportation Planning and Consultation. Next steps were shared, including pursuing funding, forming partnerships and more participation between various agencies and the community as a whole.

The following comments/questions were received from meeting attendees during and after the presentation (including comments left on display boards):

- A bus top needs to be located near the N7/N112 intersection due to it being congested at times. This would be for school buses only and for the safety of students. This should be part of the first phase. Also, near the old hospital and N7, people walk in that area and improvements are needed there.

- There needs to be a walking trail between N112 and N12 along the creek. A lot of students walk to Window Rock High School.
- The study needs to adequately address needs from a business perspective, in particular accesses to businesses in the Fort Defiance area.
- The study should consider photo enforcement as another method for addressing speeding in the Fort Defiance area.
- The Navajo Forestry Department wants to ensure that environmental issues are adequately addressed in the study final report. The Dept. may have submitted comments, if not they will be forwarded via email.
- Short-Mid-Long Term Improvements board:
    - Use Department of Corrections labor to build fence and other minor work.
    - Consider partnerships
- Intersection Improvements board:
    - The roundabout at N112/N110 would make a nice entry into the historic part of town
    - The majority of the public preferred option 2-roundabout for the N112/N110 intersection.
- Pedestrian, Bicycle, Transit and Trail Improvements board:
    - Consider a trail extending from Bryant Farm Road to Window Rock High School.
    - Consider a transit stop on N7 near Old Crystal Road intersection.
    - Consider using magnesium chloride, Polymer, soil cement that is chip sealed for the shared use path to reduce costs.
- Apache County Supervisor White asked how the funding task would be covered.
    - Response: There will be a plan for implementation section in the final report that identifies funding resources and that projects can be cross referenced with potential sources that the Chapter and County can pursue for implementation of the recommended priority projects.

A copy of the comment form can be found in Appendix C of this report. Comments received on comment forms can be found in Appendix D.

Comment Form Summary

The following comments were received and returned via the comment form that was provided at the public meeting. All comments received are included in this summary.

Intersection Improvements

- N112/N110 Option 1: This will greatly improve traffic and minimize any confusion to intersection and an optimizer can be placed.
- N112/N110 Option 1: Good
- N112/N110 Option 2: Not good for speeding-no enforcement at all.
- N12/N110: Placing optimizer in all intersections would greatly assist emergency vehicles when responding.
- N12/N110: Good

Lighting Improvements

- Much needed light along all roads and should be placed immediately for safety concerns.
- Who replaces broken poles, bulbs? NN Police don't even change the damages.

Traffic Calming

- In hopes the long term improvements will occur.
- School zone is too long, hardly any children crossing or walking that part of the road. No enforcement.

Pedestrian/Bicycle Improvements

- Asphalt shared path will be exceptional in our area.
- Any markers for pedestrian pathways?

Roadway Cross Sections and Streetscaping Concepts

- One: Good
- Two: Good
- Three: Good
- Four: Good
- Is there anything missing that should be considered?: Who is to maintain all the improvements to these over the years?
- Is there anything missing that should be considered?: Fire Dept. concerns are no safety area for vehicles to yield to all emergency vehicles. If this can be corrected, will increase safety for all.

General Comments

- The study includes some recommendations for pedestrians flashing crosswalks outside the middle school and the high school. We think these are essential to safety of our children and adults in our town. Additionally, it should be noted that significant pedestrian foot traffic occurs between the east entrance to our neighborhood and the Conoco gas station. It is also a dangerous, unpainted intersection which may be busier than even the post office/chapter house intersection (because of retail traffic at Conoco and foot traffic). We think there should be a crosswalk or intersection rehabilitation there in addition to the other intersection improvements/plans in the study.
- Rez Refuge Ministries submitted a packet of ten comment forms along with some photos of potholes in the area: You'll see in our envelope that most of the comments come from Rio Puerco residents demanding that we have no more potholes in our neighborhood. Residents from age 6 to 70 included comments. Most of the comments are from teenagers who are taking ownership of their neighborhood and working for positive changes in safety, cooperation, and new creative projects.

Appendix A

Fort Defiance Industrial Area Traffic Circulation Study

Wednesday, January 8, 2014 • 5-7 p.m.

Fort Defiance Chapter House

Completion of this sign-in sheet is completely voluntary and helps the project team keep an accurate record of meeting attendees. Under state law, any identifying information provided below will become part of the public record and, as such, must be released to any individual upon request. Please print clearly.

NAME	ADDRESS	PHONE	EMAIL
MARVIN NEZ	FT. DEFIANCE	928 729 6740	
Kirk Arviso	Apache County Dist II	(928) 729 2141	[illegible]@co.apache.az
Charles Lee	Ft Defiance	928-206-3683	None
Angie Lee	" "	" " 3336	"
Beau Bennett	Fort Defiance, AZ. P.O. Box 465, 86504	(505) 227-9974	beausoup83@gmail.co.
Irene Watchman	P.O. Box # 463 Ft. Defiance Az.	(928) 729-2678	N/A
Lewis Shirley	PO Bx 1170, Ft. Def	928-729-2141	lshirley@co.apache.az.us
HERMAN BILLIE	FT. DEF.	928-206-8188	
Sharlene Begay-Platero	NN-Proj. Dev. Dept	505-905-6414	srbp@navajoadvantage.com
Marjorie A Nez	FT DEFIANCE	928-729-6744	Marjorien@wrschool.net
Alex Froom	First	928.729.2111	alex@rezrefuge.org
RAMONE Yazzie Sr.	Navajo EMS 86515 PO BOX 3360 Window Rock, AZ	928 871-7693	med4otta@yahoo.com

ADOT

FOR MORE INFORMATION:
azdot.gov/ApacheCountyPARA

Fort Defiance Industrial Area Traffic Circulation Study

Wednesday, January 8, 2014 • 5-7 p.m.

Fort Defiance Chapter House

Completion of this sign-in sheet is completely voluntary and helps the project team keep an accurate record of meeting attendees. Under state law, any identifying information provided below will become part of the public record and, as such, must be released to any individual upon request. Please print clearly.

NAME	ADDRESS	PHONE	EMAIL
Michael Yazzie	PO Box 230 Ft. Defiance, Az 86504	(928) 729-4278 Navajo Forestry	myazzie_nfd@frontiernet.net
Lucinda Nez	POB 475 F/D Az 86504	928-729-5690	N/A
Jake Tzlimeen	Box 3394 W/R	928-729-5345	jtzlimeen@hoopan.org
Jeff Morgan	PO Box 3340 W/R, AZ 86515	928-871-6915	jmorgune@navajo-nsn.gov
Leland Tso	P.O box 1503 St. Michaels AZ 86511	(920) [redacted]-4062	lelandtso@yahoo.com
Libby Valtea	P.O. Box 663 Window Rock AZ 86515	928 871-6486	lvalteanavajobusiness
Veronica Yellowhair	PO Box 796 Fort Defiance, AZ 86504-0796	(928) 310-2450	pumkin42202@yahoo.com
Tom White Jr.	Apache Cty. Dist. 2	928. 729.2141	
Zondra Bitsuie	PO Box 998 Ft. Defiance, AZ 86504	9283133786	zjbitsuie@gmail.com
Dennis williams	Ft Defiance AZ 86504	928 729 2366	

ADOT

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NAME	ADDRESS	PHONE	EMAIL
Willie Tracey Jr.	Navajo Transit System	928-729-4219	wtracey@navajotransit.com
Dolly M. James	Ft. Def. AZ	505-713-7781	Ø
Annie Milford	Ft. Def. AZ	928-729-2895	Ø
Malu Pacal	" "	928-729-2291	
JAMES MILES	Ft. Defiance.	928-729-2746	
Roger Peshlakai	Ft. Defiance	928 729-4007	
Tom M. White Sr.	Ft. Def. Az		
Daniel Yazzie	1562 Ft. Def. AZ	928-729-2869	
Margie RS Begay	Navajo DOT	(505) 371-8312	mbegay@navajodot.org
Ali [illegible]	Fort Def Az.		
Tim Wauneka	Ft Def Az	—	
Leonard Watchman.	Ft Def Az		

ADOT

FOR MORE INFORMATION:
azdot.gov/ApacheCountyPARA

Appendix B

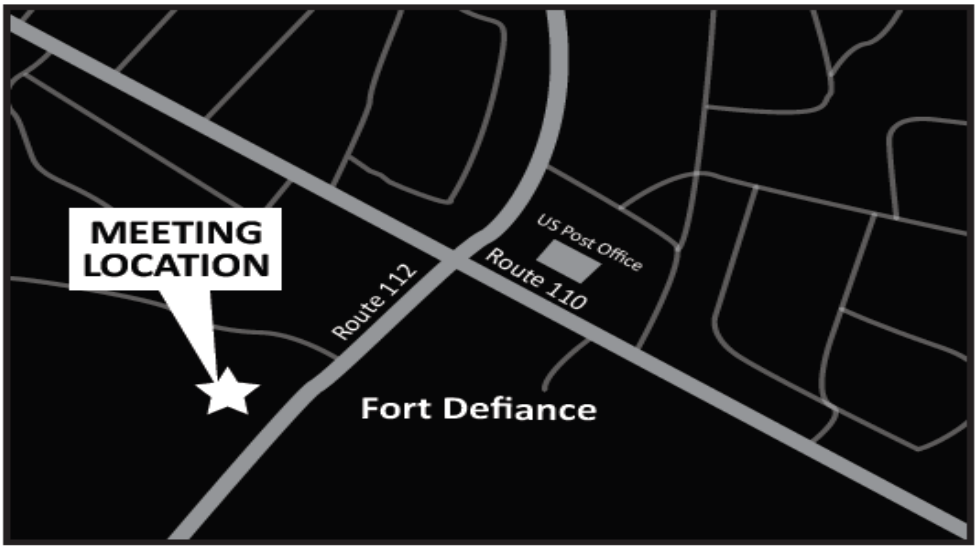
Fort Defiance Industrial Area Traffic Circulation Study

YOU'RE INVITED TO PROVIDE YOUR INPUT AT THE JAN. 8 PUBLIC MEETING

Apache County District II, the Fort Defiance Chapter of the Navajo Nation and Arizona Department of Transportation (ADOT) are collaborating on a traffic circulation study resulting in a transportation improvement plan, which will promote safety and mobility, enhance economic vitality, improve community livability, encourage environmental and cultural sensitivity, and support current and planned economic development of the Fort Defiance Industrial Area.

Learn about the study and share your thoughts on the transportation improvement plan and recommended improvements!

Wednesday, Jan. 8, 2014
5 p.m. to 7 p.m. | Fort Defiance Chapter House
Southwest of the Route 110 and Route 112 intersection.
Learn more about this study or submit your comments online at **azdot.gov/ApacheCountyPARA**.



If you require special assistance in order to participate in the public meeting, please contact projects@azdot.gov or 855.712.8530. Requests should be made as soon as possible to allow time to arrange the accommodation.

13-549

ADOT

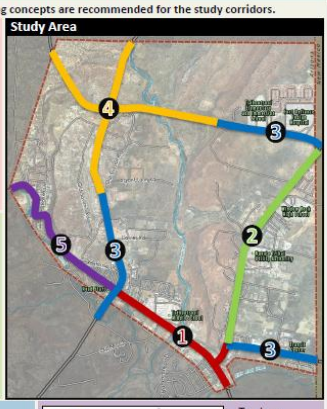
FOR MORE INFORMATION:
855.712.8530
projects@azdot.gov
azdot.gov/apachecountypara

Appendix C

YOUR THOUGHTS, IDEAS, AND COMMENTS

ROADWAY CROSS SECTIONS AND STREETSCAPING CONCEPTS

Redesigned roadway cross-sections and streetscaping concepts are recommended for the study corridors.



1
- Four lanes
- Raised median with left turn pockets
- Landscape buffer
- Narrow concrete shared use path

Comments:

2
- Four lanes
- Two-way center left turn lane
- Landscape buffer
- Extra wide asphalt/ concrete shared use path

Comments:

3
- Two lanes
- Two-way center left turn lane
- Landscape buffer
- Narrow asphalt shared use path

Comments:

5
- Two lanes
- Two-way center left turn lane (Optional)
- Landscape buffer
- Narrow concrete shared use path

Comments:

4
- Two lanes
- No Center turn lane
- Landscape buffer
- Narrow asphalt shared use path

Comments:

Is there anything missing that should be considered?

Fort Defiance Industrial Area Traffic Circulation Study ADOT JACOBS

FORT DEFIANCE INDUSTRIAL AREA TRAFFIC CIRCULATION STUDY

Public Meeting Comment Form

STUDY BACKGROUND AND PURPOSE

The Arizona Department of Transportation (ADOT), in coordination with Apache County District II and the Fort Defiance Chapter of the Navajo Nation, is analyzing the traffic circulation conditions of Navajo Routes 7, 12, 54, 110, and 112 within the project study area.

The Study Purpose is to...

- ✔ Conduct a comprehensive evaluation of roadway, pedestrian, bicycle, transit, and trail needs
- ✔ Develop a three-phased improvement plan that promotes safety and mobility, supports economic development, and improves community liveability

YOUR INPUT IS REQUESTED

Completion of this form is completely voluntary; all input provided will be incorporated into the study's documentation. Comment forms will be accepted until January 24th, 2014 and can be submitted to the project team at the meeting or mailed/faxed/emailed to:

Don Sneed
Arizona Department of Transportation
206 S. 17th Avenue, MD 310B
Phoenix, AZ 85007
Email: DSneed@azdot.gov
Phone: 602.712.6736
Fax: 602.712.3046

Tony Staffaroni
ADOT Communications
Office of Community Relations
1655 W Jackson St, MD: 126F
Phoenix, AZ 85007
Email: AStaffaroni@azdot.gov
Phone: 855-712-8530

To receive project updates, please submit the following (Optional):

Name: _____

Address: _____ City: _____ Zip: _____

Email Address: _____

Additional information can be found by visiting the project website:
http://www.azdot.gov/ApacheCountyPara

THANK YOU FOR YOUR PARTICIPATION

Fort Defiance Industrial Area Traffic Circulation Study ADOT JACOBS

YOUR THOUGHTS, IDEAS, AND COMMENTS

INTERSECTION IMPROVEMENTS

Please review and comment on the following intersection improvements. For the N112/N110 intersection, indicate your preference – traffic signal or roundabout.

N112/N110 Intersection

Option 1 - Signalized Intersection
- Four-way traffic signal
- Exclusive left-turn lanes on N112 and N110
- Pedestrian and bicycle facilities
- ADA compliant ramps

Comments:

Option 2 - Roundabout
- One-lane roundabout
- Pedestrian and bicycle facilities
- ADA compliant ramps
- Additional right-of-way may be required

Comments:

N/2/N110 Intersection

Signalized Intersection Improvements
- Upgrade signal heads to improve visibility
- Reconstruct raised medians
- Upgrade pedestrian walk push buttons
- Improve signing and pavement markings
- Add pedestrian and bicycle facilities throughout
- Reconstruct ADA ramps to meet compliance

Comments:

LIGHTING IMPROVEMENTS

Lighting is recommended along all study corridors.
- Short-term phase: Install lighting in urban and developed areas (N12, N110, N54, and sections of N7 and N112)
- Mid-term phase: Install lighting in rural and undeveloped areas (remaining sections of N7 and N112)

LED style and "Dark Skies" friendly lighting is preferred.

- Long lasting
- Moderate level of maintenance
- Increased visibility of pedestrian, bicycle, and vehicle traffic
- Reduced glare for motorists

Comments:

Fort Defiance Industrial Area Traffic Circulation Study ADOT JACOBS

YOUR THOUGHTS, IDEAS, AND COMMENTS

TRAFFIC CALMING

Traffic calming measures are recommended at school zones and community gateways to address safety concerns.

Short-Term Traffic Calming Improvements – School Zones and Community Gateways

In-Road/On-Road Rumble Strips
- Grooves placed in the roadway surface designed to alert drivers to changing conditions

Speed Limit Pavement Markings
- Highly visible in-pavement markings which can also be seen at night

Flashing Speed Sign
- Alerts drivers of their vehicle speed

Long-Term Traffic Calming Improvements – School Zones

A Double Chicane raised median with a HAWK Beacon System is recommended to address long-term safety issues in school zones.

1 Double Chicane
- Reduces vehicle speed
- Provides island refuge for pedestrians

2 HAWK Beacon System
- Stops vehicles to allow pedestrians to cross safely

Comments:

PEDESTRIAN / BICYCLE IMPROVEMENTS

Shared use paths are recommended along all study corridors to safely accommodate pedestrians and bicyclists.

Asphalt shared use path offset from roadway

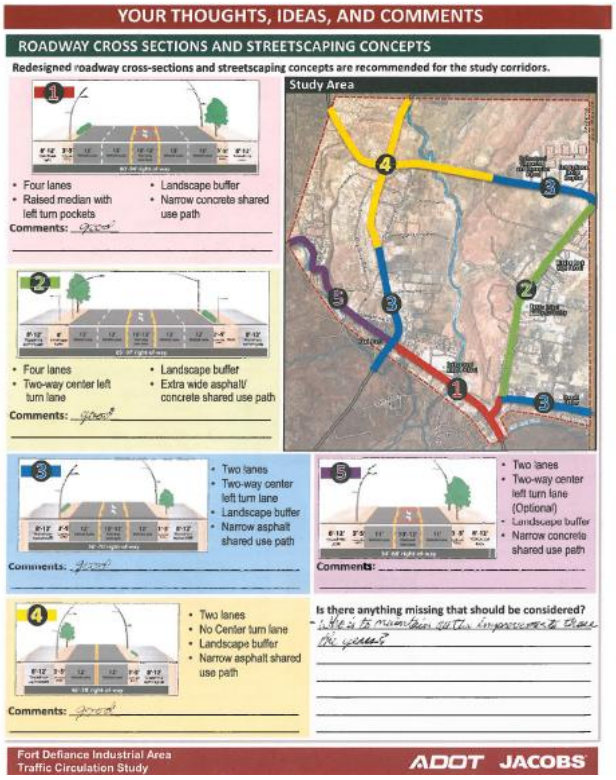
Concrete shared use path offset from roadway

Shared use paths are generally wider than normal sidewalks and designed specifically to accommodate both pedestrians and bicyclists.

Comments:

Fort Defiance Industrial Area Traffic Circulation Study ADOT JACOBS

Appendix D



YOUR THOUGHTS, IDEAS, AND COMMENTS

ROADWAY CROSS SECTIONS AND STREETSCAPING CONCEPTS

Redesigned roadway cross-sections and streetscaping concepts are recommended for the study corridors.

Study Area

- Four lanes
- Raised median with left turn pockets
- Landscape buffer
- Narrow concrete shared use path

Comments: good

- Four lanes
- Two-way center left turn lane
- Landscape buffer
- Extra wide asphalt/ concrete shared use path

Comments: good

- Two lanes
- Two-way center left turn lane
- Landscape buffer
- Narrow asphalt shared use path

Comments: good

- Two lanes
- Two-way center left turn lane (Optional)
- Landscape buffer
- Narrow concrete shared use path

Comments:

- Two lanes
- No Center turn lane
- Landscape buffer
- Narrow asphalt shared use path

Comments: good

Is there anything missing that should be considered?

We'd like to maintain utility improvements done the years

Fort Defiance Industrial Area Traffic Circulation Study ADOT JACOBS

FORT DEFIANCE INDUSTRIAL AREA TRAFFIC CIRCULATION STUDY

Public Meeting Comment Form

STUDY BACKGROUND AND PURPOSE

The Arizona Department of Transportation (ADOT), in coordination with Apache County District II and the Fort Defiance Chapter of the Navajo Nation, is analyzing the traffic circulation conditions of **Navajo Routes 7, 12, 54, 110, and 112** within the project study area.

The Study Purpose is to...

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ADOT Communications
Office of Community Relations
1655 W Jackson St, MD: 126F
Phoenix, AZ 85007
Email: AStaffaroni@azdot.gov
Phone: 855-712-8530

To receive project updates, please submit the following (Optional):

Name: _____

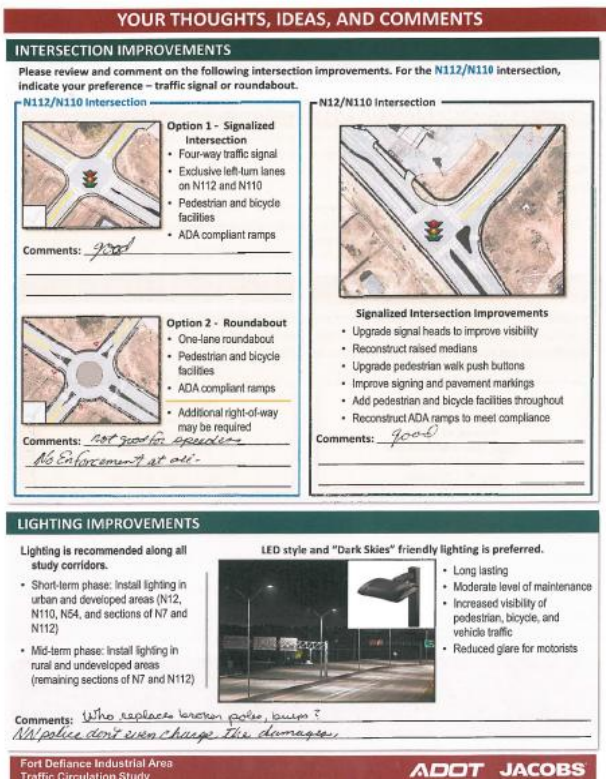
Address: _____ City: _____ Zip: _____

Email Address: _____

Additional information can be found by visiting the project website:
http://www.azdot.gov/ApacheCountyPara

THANK YOU FOR YOUR PARTICIPATION

Fort Defiance Industrial Area Traffic Circulation Study ADOT JACOBS



YOUR THOUGHTS, IDEAS, AND COMMENTS

INTERSECTION IMPROVEMENTS

Please review and comment on the following intersection improvements. For the N112/N110 intersection, indicate your preference – traffic signal or roundabout.

N112/N110 Intersection

Option 1 - Signalized Intersection
- Four-way traffic signal
- Exclusive left-turn lanes on N112 and N110
- Pedestrian and bicycle facilities
- ADA compliant ramps

Comments: good

Option 2 - Roundabout
- One-lane roundabout
- Pedestrian and bicycle facilities
- ADA compliant ramps
- Additional right-of-way may be required

Comments: not good for speeders. No Enforcement at all.

N12/N110 Intersection

Signalized Intersection Improvements
- Upgrade signal heads to improve visibility
- Reconstruct raised medians
- Upgrade pedestrian walk push buttons
- Improve signing and pavement markings
- Add pedestrian and bicycle facilities throughout
- Reconstruct ADA ramps to meet compliance

Comments: good

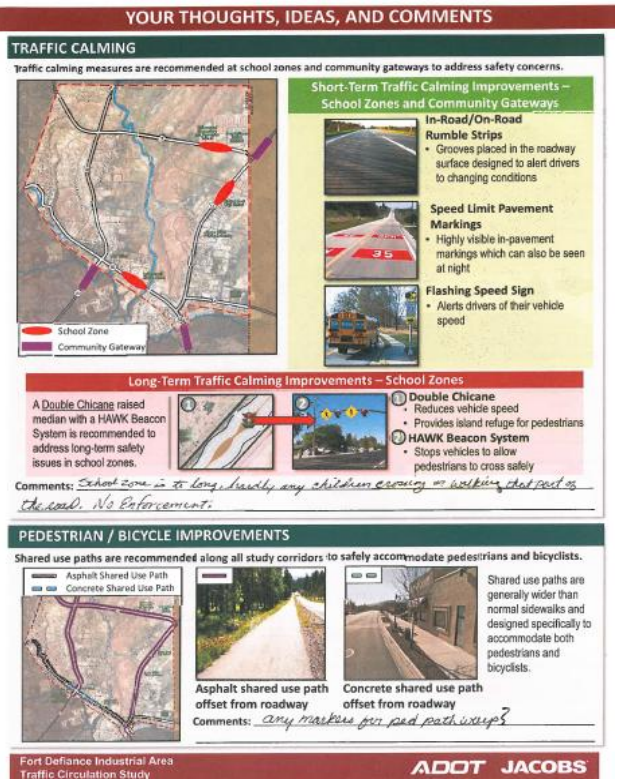
LIGHTING IMPROVEMENTS

Lighting is recommended along all study corridors.
- Short-term phase: Install lighting in urban and developed areas (N12, N110, N54, and sections of N7 and N112)
- Mid-term phase: Install lighting in rural and undeveloped areas (remaining sections of N7 and N112)

LED style and "Dark Skies" friendly lighting is preferred.
- Long lasting
- Moderate level of maintenance
- Increased visibility of pedestrian, bicycle, and vehicle traffic
- Reduced glare for motorists

Comments: Who replaces lantern poles, lamps? NA police don't even charge. Hit damages.

Fort Defiance Industrial Area Traffic Circulation Study ADOT JACOBS



YOUR THOUGHTS, IDEAS, AND COMMENTS

TRAFFIC CALMING

Traffic calming measures are recommended at school zones and community gateways to address safety concerns.

School Zone
Community Gateway

Short-Term Traffic Calming Improvements – School Zones and Community Gateways

In-Road/On-Road Rumble Strips
- Grooves placed in the roadway surface designed to alert drivers to changing conditions

Speed Limit Pavement Markings
- Highly visible in-pavement markings which can also be seen at night

Flashing Speed Sign
- Alerts drivers of their vehicle speed

Long-Term Traffic Calming Improvements – School Zones

A Double Chicane raised median with a HAWK Beacon System is recommended to address long-term safety issues in school zones.

1. Double Chicane
   - Reduces vehicle speed
   - Provides island refuge for pedestrians
2. HAWK Beacon System
   - Stops vehicles to allow pedestrians to cross safely

Comments: School zone is to long, hardly any children crossing or walking that part of the road. No Enforcement.

PEDESTRIAN / BICYCLE IMPROVEMENTS

Shared use paths are recommended along all study corridors to safely accommodate pedestrians and bicyclists.

Asphalt Shared Use Path
Concrete Shared Use Path

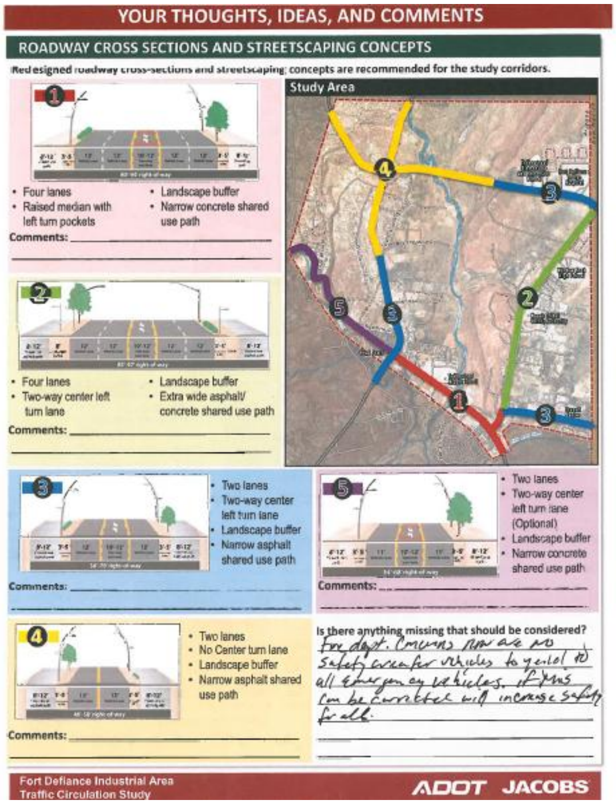
Shared use paths are generally wider than normal sidewalks and designed specifically to accommodate both pedestrians and bicyclists.

Asphalt shared use path offset from roadway

Concrete shared use path offset from roadway

Comments: any markers for ped path xings?

Fort Defiance Industrial Area Traffic Circulation Study ADOT JACOBS



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- Narrow concrete shared use path

Comments:

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- Extra wide asphalt/ concrete shared use path

Comments:

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- Two lanes
- Two-way center left turn lane
- Landscape buffer
- Narrow asphalt shared use path

Comments:

5
- Two lanes
- Two-way center left turn lane (Optional)
- Landscape buffer
- Narrow concrete shared use path

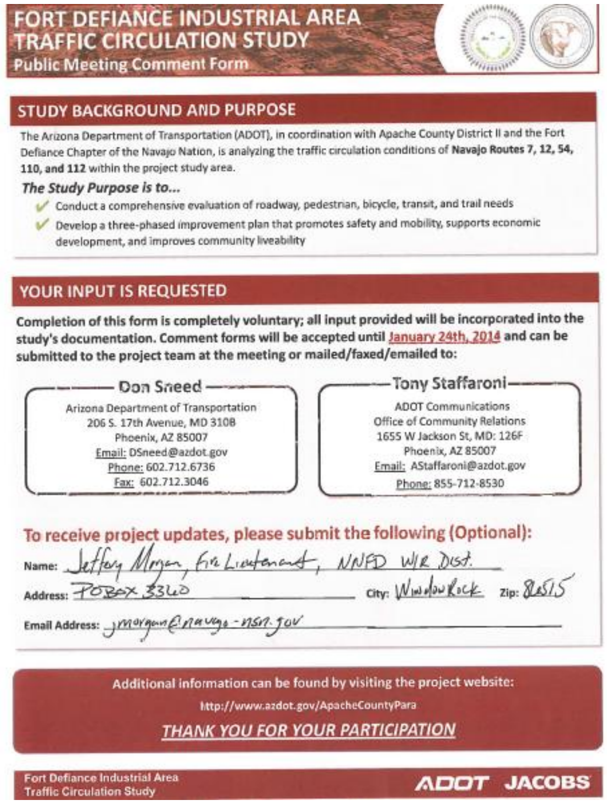
Comments:

4
- Two lanes
- No Center turn lane
- Landscape buffer
- Narrow asphalt shared use path

Comments:

Is there anything missing that should be considered? Fire dept. Concerns now are no safety area for vehicles to yield to all emergency vehicles. If this can be corrected will increase safety for all.

Fort Defiance Industrial Area Traffic Circulation Study — ADOT JACOBS



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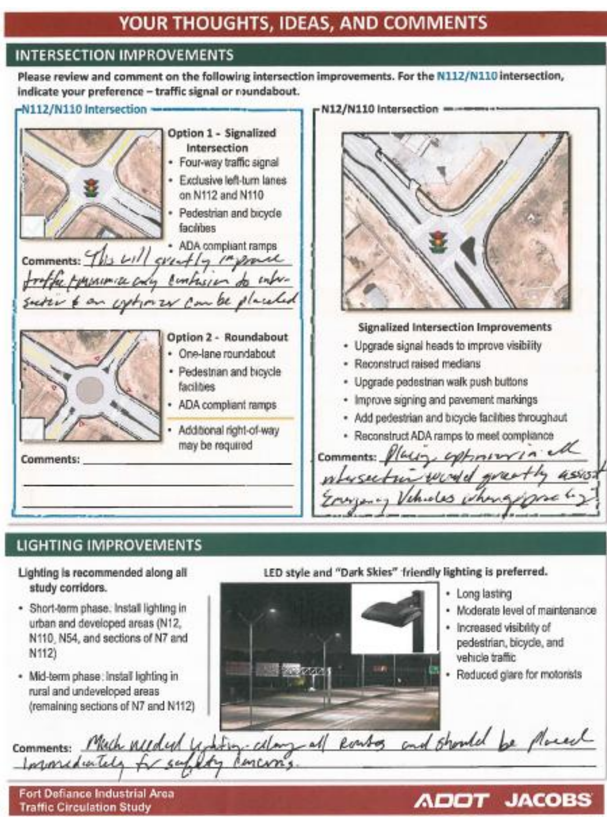
Phoenix, AZ 85007
Email: AStaffaroni@azdot.gov
Phone: 855-712-8530

To receive project updates, please submit the following (Optional):

Name: Jeffery Morgan, Fire Lieutenant, NNFD WR Dist.
Address: PO BOX 3360 City: Window Rock Zip: 86515
Email Address: jmorgan@navajo-nsn.gov

Additional information can be found by visiting the project website:
http://www.azdot.gov/ApacheCountyPara
THANK YOU FOR YOUR PARTICIPATION

Fort Defiance Industrial Area Traffic Circulation Study — ADOT JACOBS



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N112/N110 Intersection

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- Four-way traffic signal
- Exclusive left-turn lanes on N112 and N110
- Pedestrian and bicycle facilities
- ADA compliant ramps

Comments: This will greatly improve traffic minimize any confusion to intersection & an optimizer can be placed

Option 2 - Roundabout
- One-lane roundabout
- Pedestrian and bicycle facilities
- ADA compliant ramps
- Additional right-of-way may be required

Comments:

N12/N110 Intersection

Signalized Intersection Improvements
- Upgrade signal heads to improve visibility
- Reconstruct raised medians
- Upgrade pedestrian walk push buttons
- Improve signing and pavement markings
- Add pedestrian and bicycle facilities throughaut
- Reconstruct ADA ramps to meet compliance

Comments: Placing optimizer in all intersection would greatly assist Emergency Vehicles when approaching!

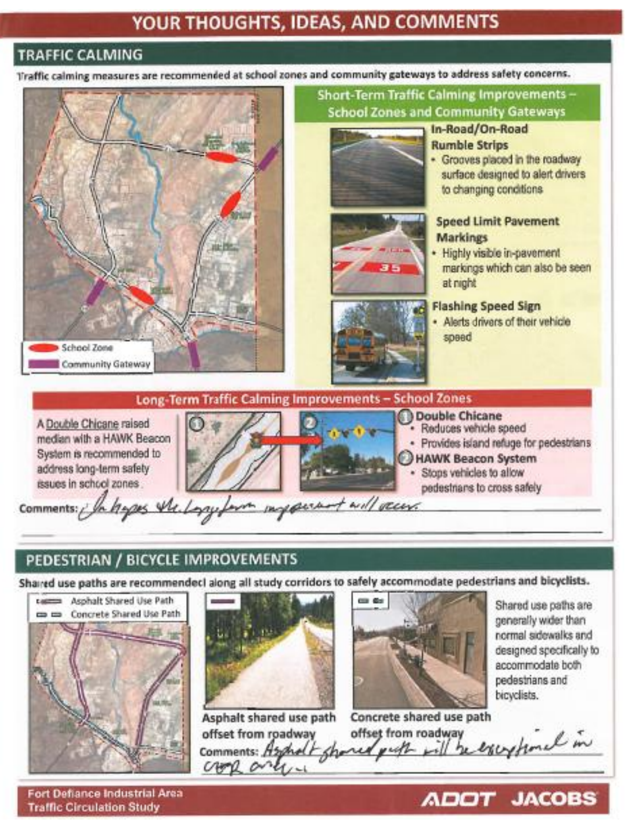
LIGHTING IMPROVEMENTS

Lighting is recommended along all study corridors.
- Short-term phase: Install lighting in urban and developed areas (N12, N110, N54, and sections of N7 and N112)
- Mid-term phase: Install lighting in rural and undeveloped areas (remaining sections of N7 and N112)

LED style and "Dark Skies" friendly lighting is preferred.
- Long lasting
- Moderate level of maintenance
- Increased visibility of pedestrian, bicycle, and vehicle traffic
- Reduced glare for motorists

Comments: Much needed lighting along all routes and should be placed immediately for safety concerns.

Fort Defiance Industrial Area Traffic Circulation Study — ADOT JACOBS



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- Alerts drivers of their vehicle speed

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1 **Double Chicane**
- Reduces vehicle speed
- Provides island refuge for pedestrians

2 **HAWK Beacon System**
- Stops vehicles to allow pedestrians to cross safely

Comments: I hope the long term improvement will occur.

PEDESTRIAN / BICYCLE IMPROVEMENTS

Shared use paths are recommended along all study corridors to safely accommodate pedestrians and bicyclists.

Asphalt Shared Use Path
Concrete Shared Use Path

Asphalt shared use path offset from roadway

Concrete shared use path offset from roadway

Shared use paths are generally wider than normal sidewalks and designed specifically to accommodate both pedestrians and bicyclists.

Comments: Asphalt shared path will be exceptional in [illegible]

Fort Defiance Industrial Area Traffic Circulation Study — ADOT JACOBS

A few examples of potholes and washed-out neighborhood streets in Rio Puerco Acres and Black Rock Acres neighborhoods. Fort Defiance, AZ 1/22/2014

Fort Defiance Industrial Area Traffic Circulation Study
Fort Defiance Chapter House – January 8, 2014
COMMENT FORM

COMMENTS:

January 21, 2014

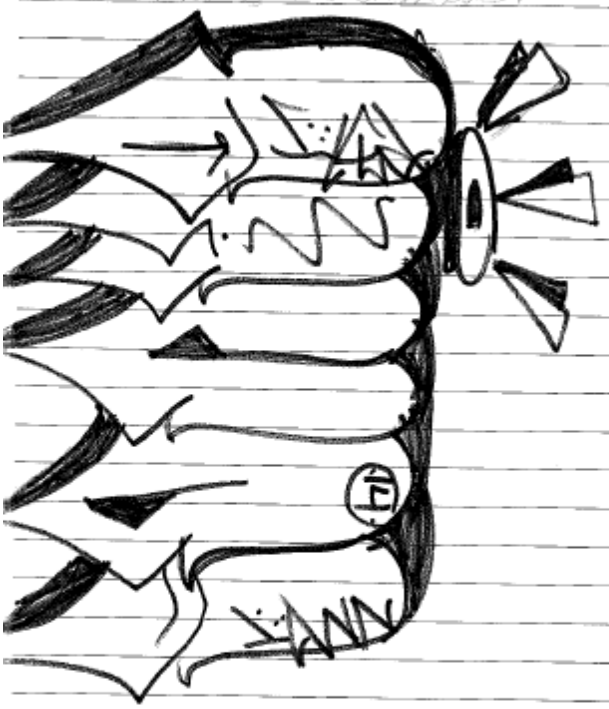
Hello, my name is Andrew Tsosie a resident in Rio Puerco Acres. I am creating an argument to discuss the dilemma of pot-holes in my neighborhood. Recent problems with this resulted in failure. Dirt was used to cover the holes through out the neighborhood. Sometime ago this problem was solved, only temporarily. Many people complain about their vehicles being dent beneath their vehicles. Driving on sidewalks is dangerous, especially for the pedestrians. In this case I myself Andrew Tsosie will volunteer personally just to make my neighborhood a better place. Honestly this has been a problem since I moved here nearly a decade ago. Rez Refuge is an organization that focuses on making the neighborhood beautiful. Outside of Rez Refuge is our land too. Come forth and bring greatness to our neighborhood. Thank you for your time and this concern is not only mines. I speak and write for the people in my area.

ADOT

FOR MORE INFORMATION:
azdot.gov/ApacheCountyPARA

Fort Defiance Industrial Area Traffic Circulation Study
Fort Defiance Chapter House – January 8, 2014
COMMENT FORM

COMMENTS:



ADOT

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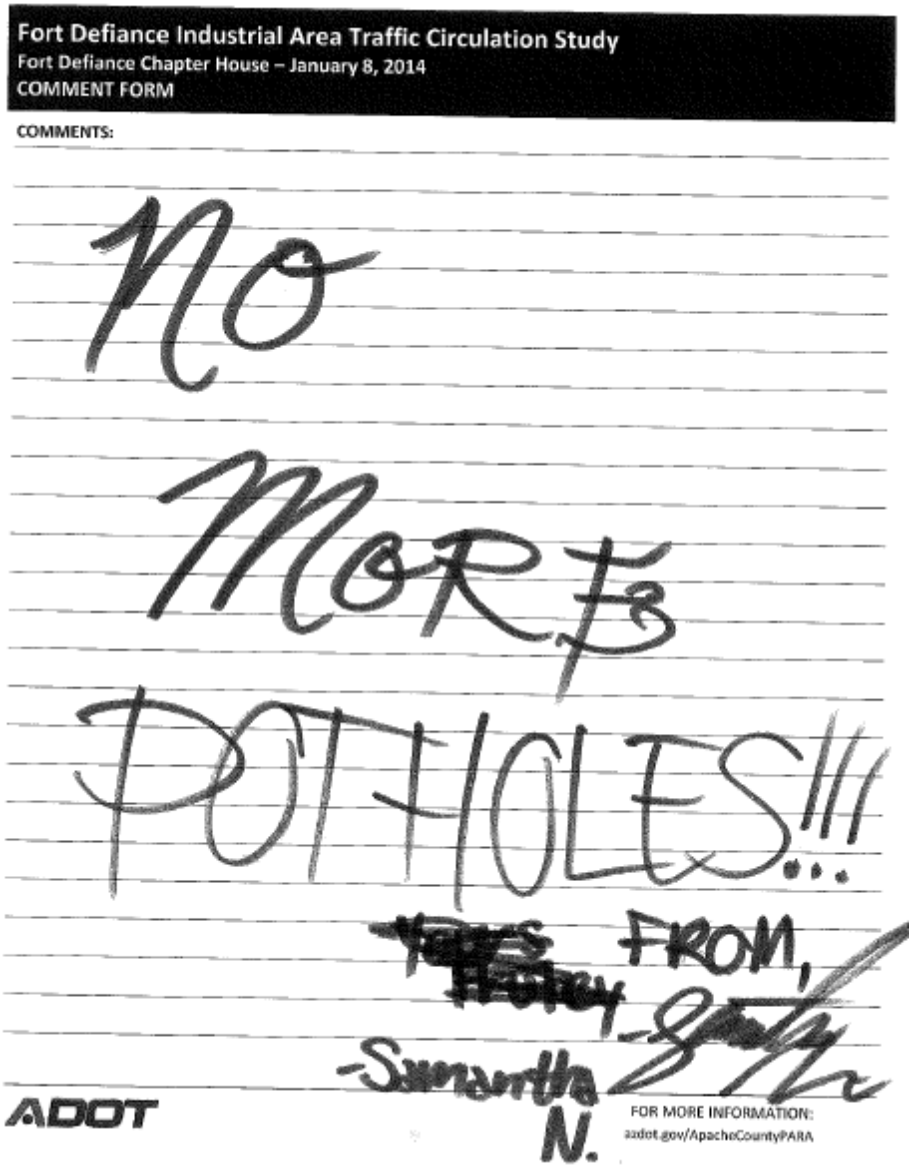


Fort Defiance Industrial Area Traffic Circulation Study
Fort Defiance Chapter House – January 8, 2014
COMMENT FORM

COMMENTS:

No
More
POT HOLES!!!

FROM,
[redacted]
-Samantha
N.

ADOT

FOR MORE INFORMATION:
azdot.gov/ApacheCountyPARA

Fort Defiance Industrial Area Traffic Circulation Study
Fort Defiance Chapter House – January 8, 2014
COMMENT FORM

COMMENTS:

The enclosed comments are collected by the staff at the Rio Puerco Community Center in Fort Defiance, AZ. Pot holes in our neighborhood impede daily life, damage vehicles, threaten drivers and pedestrians, and lower neighbor morale. People think our neighborhood is dangerous and in decay. But we disagree. Our neighborhood is beautiful, growing, and alive.

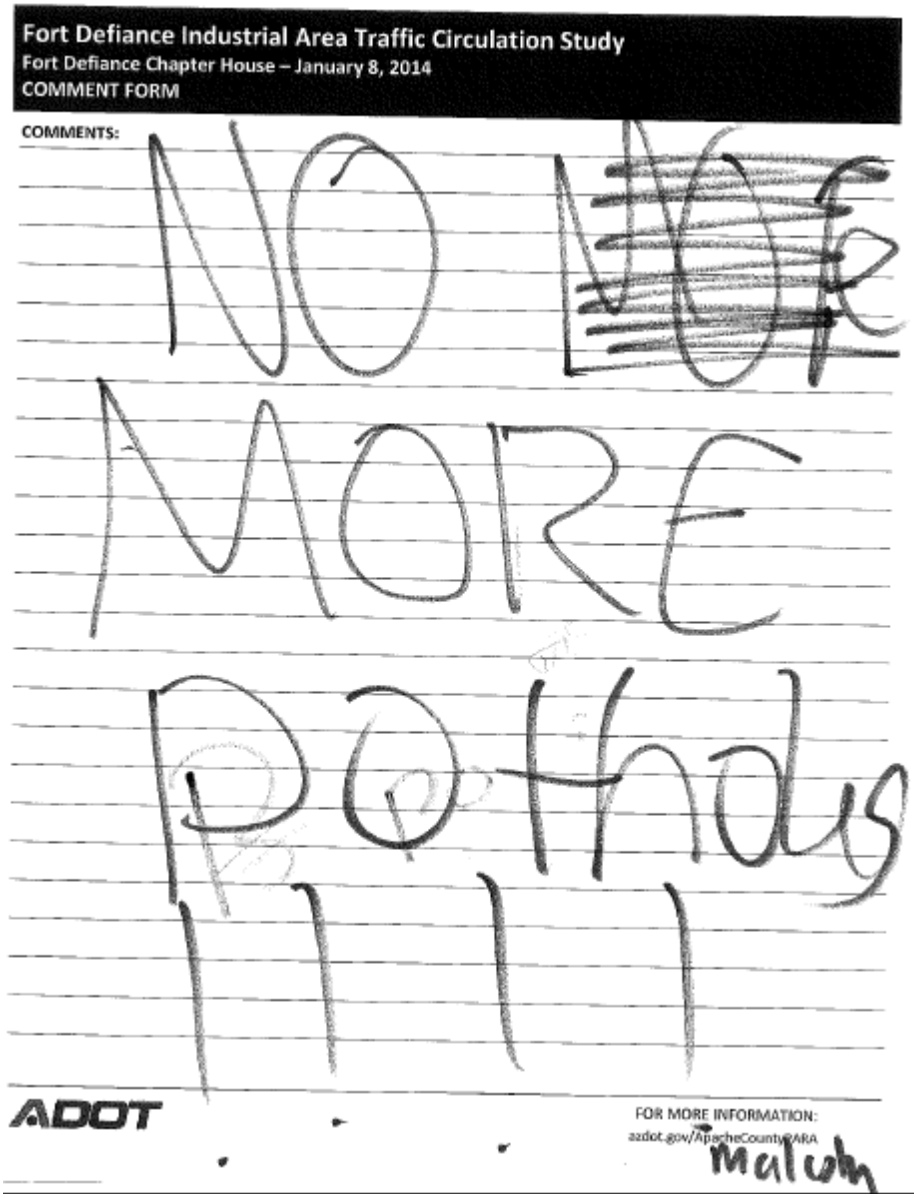
We work together to build a better community. And we need the state of AZ, the county of Apache, and the Navajo Nation to do their part.

No More Potholes!

Rio Puerco Community Center
106 Old Rio Puerco
928.729.2111

ADOT

FOR MORE INFORMATION:
azdot.gov/ApacheCountyPARA



Fort Defiance Industrial Area Traffic Circulation Study
Fort Defiance Chapter House – January 8, 2014
COMMENT FORM

COMMENTS:

NO MORE
MORE
Potholes
!!!!

ADOT

FOR MORE INFORMATION:
azdot.gov/ApacheCountyARA

Malcolm

Fort Defiance Industrial Area Traffic Circulation Study
Fort Defiance Chapter House – January 8, 2014
COMMENT FORM

COMMENTS: NO more potholes in Rio Puerco - Nora Cuvas

ADOT

FOR MORE INFORMATION:
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Shaun Harvey :)

ADOT

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COMMENTS:

I live in Rio Puerco Acres and I know most people who live there would agree that it is "Pot Hole Lane!" So we'd would appreciate it if ADOT could fix our roads. No more Pot Holes!! Thanks.

Rio Puerco Acres House 217
Dorothy Harry

ADOT

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COMMENTS:

I live at Rio Puerco Acres at House #17. I have been living here since 1997. Over the years, I have observed the roads getting potholes. This damages our vehicles and also makes the neighborhood roads look bad. Please have them repaired.

Thank You
Sharon Lynn
House #217
Rio Puerco Acres
Ft. Defiance, Az

ADOT

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COMMENTS:

I reside at HSA 217 Rio Puerco Acres. We just need roads fixed and a tornado shelter.

Alton J.

ADOT

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