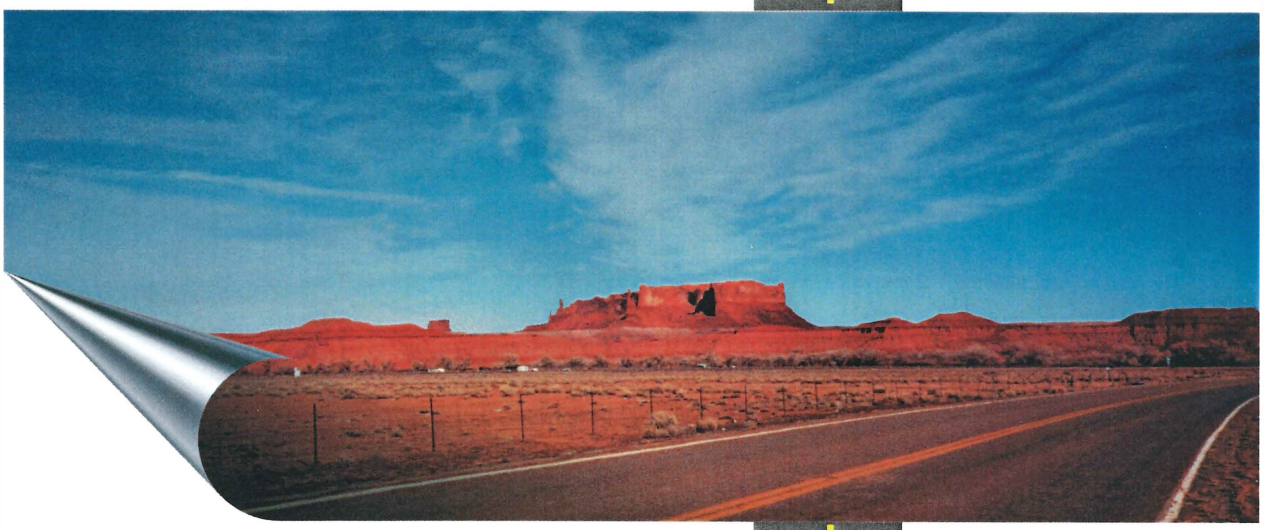
US 191 Multimodal Corridor Profile Study



Prepared for

ADOT

TRANSPORTATION CONSULTANTS, INC.

US 191 Springerville to Junction US 160 Multimodal Corridor Profile Study

Prepared for:

Arizona Department of Transportation
206 South 17th Avenue, Room 340B
Phoenix, AZ 85007
602/255-8010

Prepared by:

LSC Transportation Consultants, Inc.
101 North Tejon Street, Suite 200
Colorado Springs, CO 80903
719/633-2868

LSC #985950

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Chapter I

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CHAPTER I
Introduction

I. PROJECT BACKGROUND

Congress passed the Intermodal Surface Transportation Efficiency Act (ISTEA) in 1991. The Arizona Department of Transportation (ADOT) developed the state's first multimodal transportation plan (*Arizona State Transportation Plan*, December 1994) to fulfill the requirements of ISTEA. The statewide plan recognized the need to analyze strategic transportation corridors within the state. The US 191-Springerville to Junction US 160 Corridor was identified as one of the transportation corridors to be studied.

The corridors of statewide significance are defined as broad geographic areas through which various modes of travel provide connections for the movement of people, goods, and services. Each corridor includes one or more state highways, and may include other modes of transportation such as railroads, bus routes, and pipelines. The corridor profile study is intended to provide information for establishing priorities and identifying additional improvement strategies which should be incorporated into the statewide multimodal transportation plan. The corridor profile study also provides information which may be used in more detailed management actions and engineering/design studies for the particular corridor.

II. STUDY PURPOSE

The purpose of the corridor profile study is:

- To determine the extent of the issues within the corridor relative to developed performance criteria, local and environmental concerns, and statewide strategic investments.
- To move toward the strategic goal of ADOT to enhance the mobility of people, goods, and services.
- To improve the selection of project priorities for the state as scarce resources are allocated.

III. STUDY GOALS AND OBJECTIVES

Corridor profile studies fulfill many of ADOT's planning obligations. The study goals and findings are designed to meet these obligations. The following are the goals for the corridor profile study:

- To identify and resolve major planning issues prior to the initiation of project programming and engineering development.
- To preserve transportation rights-of-way.
- To protect transportation investments.
- To respond to planning requirements.

The above goals will be addressed through the following specific objectives:

- Perform analyses at an appropriate and effective level of detail.
- Coordinate with local, regional, and state travel planning efforts.
- Provide opportunities for public involvement during appropriate points in the planning process.
- Address environmental concerns and issues.
- Perform transportation investment analysis.

IV. CORRIDOR LIMITS

The US 191-Springerville to Junction US 160 Corridor contains the following segments of the state highway system:

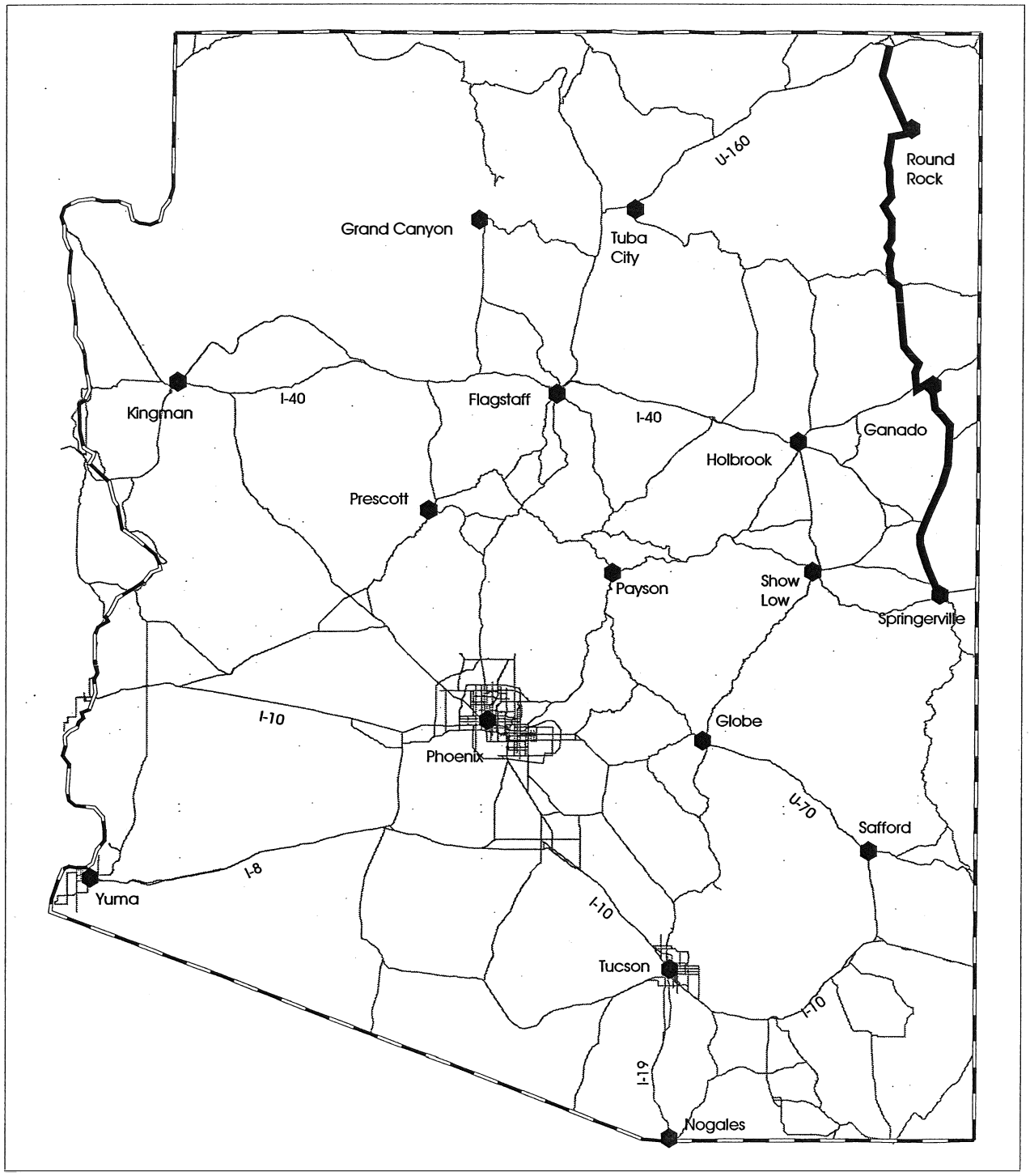
Table I-1
US 191 Project Limits

South Terminus	North Terminus	Mile Post Limits
US 191-Springerville	Junction US 160	316.00 to 510.00

Figure I-1 shows the location of the corridor limits.

Figure I-1

Vicinity Map



LEGEND

- Highways
- State
- Project Location
- Cities & Towns

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V. ORGANIZATION OF REPORT

The US 191-Springerville to Junction US 160 Multimodal Corridor Profile Final Report consists of five chapters supplemented by appendices which document the study effort. Chapters and appendices include:

- Chapter I – Introduction
- Chapter II – Inventory of Existing Conditions
- Chapter III – Analysis of Existing and Projected Needs and Deficiencies
- Chapter IV – Identification of Feasible Investment Options and Management Actions
- Chapter V – Evaluation of Alternate Investment Options and Management Opportunities
- Appendix A – Level of Service Definitions
- Appendix B – Comments Received from Corridor Contacts
- Appendix C – Travel Time Comparison

VI. LOCAL INVOLVEMENT

Throughout the study, efforts were made to involve local governments and citizens in the process. Two working papers and a draft of this Final Report were provided to local contacts throughout the study area. The list of individuals and agencies is provided in Appendix B along with comments which were received. The first public meeting was held on April 27, 1999 in Chinle. The public meetings on the Draft Final Report were held on April 11, 2000 in Kayenta and April 12, 2000 in Chinle. The Chinle Chapter also held a public meeting that discussed Technical Memorandum #2 on November 14, 1999 at the Chinle Chapter House. The meeting announcements were published in the local newspapers and announcements were mailed to the local contacts. Comments were incorporated into the Final Report.

Chapter II

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CHAPTER II

Inventory of Existing Conditions

I. REVIEW OF PERTINENT STUDIES AND PLANS

This chapter reviews studies identified as having a bearing on the US 191-Springerville to Junction US 160 Multimodal Corridor Profile Study. The review of reports and other materials is organized chronologically from least to most recent. The review is broken down into two sections: previous corridor/large area/statewide studies and local/subarea studies.

A. Previous ADOT Corridor Studies

1. Access Management Practices in Other States and Improvements for Arizona

This study was released by the Transportation Planning Division of the Arizona Department of Transportation in December 1990. The aim of this document was to review comprehensive access management programs in other states for the purposes of pursuing such a program in Arizona. The rationale behind the study was succinctly stated in the document's introduction:

> "Operating under increasing fiscal constraints, departments of transportation across the nation are shifting emphasis away from new highway construction toward more effective and efficient management of existing roads and streets. Improved access management is widely recognized as one of the most important tools available to the state to maintain a highway's traffic-carrying capacity without additional expensive reconstruction or the construction of new bypass routes."

The document sets the stage for the report by discussing the issues of government regulation (land use and other) and property rights, and seeking to clarify what states can legitimately do, based upon published reports and court cases. Essentially this section establishes that access to state highways does not have to be guaranteed, that only "reasonable" access must be provided. Further, unless the siting of an access causes "unique" damage to a single property's value, no compensation or damages are normally due, even when the property values are moderately affected.

The study sent mail surveys to 47 states, receiving responses from 38. Responses ranged in quality from thorough to incomplete. Time constraints did not permit follow-up with non-respondents or incomplete responses.

The study then reviews traditional approaches to access management, before moving on to analyzing the new approaches. Particular attention is given to the states of Colorado, Florida, and New Jersey. The review looks at regulatory powers, permit fees and timetables, variance procedures, and access classification schemes.

The study concludes by recommending "ways to rectify recurring problems in Arizona." The primary recommendation was for ADOT to work on passing enabling legislation for a comprehensive access management program for all state highways.

There are numerous suggestions about what such enabling legislation should say, beginning with establishing the need for access management based on public health, safety, and welfare. Other suggestions include setting the hierarchy of rights (public right higher than individual property owners), providing coordinated planning and permitting, establishing procedures for permit appeals, and establishing the institutional framework for administering such a program. To date, these suggestions have not been implemented in a comprehensive access management program.

2. Arizona State Rail Plan Update 1994

Information on this report was provided in summary form by the Arizona Department of Transportation. The US 191-Springerville to Junction US 160 Corridor includes the Burlington Northern/Santa Fe Railway which runs east/west through Sanders and just south of Chambers. The second rail line crosses the US 191 Corridor between Witch Well and St. Johns and is associated with the local fossil-fueled electric-generating plants.

3. Arizona State Transportation Plan

This set of reports, the plan itself and its executive summary, was released in December 1994 by the Arizona Department of Transportation. According to the executive summary, "The 1994 Arizona State Transportation Plan is the state's first multimodal plan." (ES-1). The plan itself is presented in 11 total chapters, including the Introduction (Chapter 1).

Chapter 2 explains how the State Transportation Plan (STP) was developed. It provides a graphic showing the ebbs and flows of participation from various parties

including the public, from advisory committees, and the role of data in the process.

Chapter 3 elaborates on the public involvement process. The overall process included a public opinion survey, public meetings, newsletters, State Transportation Board hearings, mailings to self-identified interested parties, a speaker's bureau, media briefings, legislative briefings, and governmental coordination. The April 1994 public opinion survey contacted 1,423 persons across the state by phone. The two most important problems identified by the survey were lack of public transportation (29 percent) and traffic congestion (28 percent). Follow-up work done at public meetings showed that of all public transportation investments that could be made, elderly, disabled, and fixed-route services were preferred. Of roadway and intercity investments that could be made, improving the existing roadways was rated the highest. Finally, of the alternative modes available, bicycling was preferred to carpooling, walking, telecommuting, or no-drive days. The report notes that 164 public meetings were held.

Chapter 4 reviews the management systems required by the 1991 Intermodal Surface Transportation Efficiency Act (ISTEA). For each management system, the state was to specify data collection methods, performance measures, and from those two, determine transportation needs. The six management systems are as follows: bridge, pavement, congestion, intermodal, safety, and public transportation. All management systems were to have a completed work plan by October 1994, full implementation varying by system.

Chapter 5 looked at the financial/economic picture for the state in short-term (1-3 years), mid-term (3-5 years), and long-term (5-20 years) time frames. The short-term picture involves continuing recovery from the early 1990s recession, with growth in Arizona being stronger than the nation as a whole. The mid-term picture focuses largely on the effects of NAFTA which are anticipated to increase Arizona's future economic outlook. The long-term picture, however, notes that population increases will overshadow employment increases. This chapter concludes with a review of technological and other changes expected to impact the future of transportation in Arizona. Overall, the report concludes it would be difficult to imagine a future that is not dominated by the automobile, as today's world is. While changes in propulsion (electric, natural gas) may occur, the auto is still expected to be the primary mode of travel. Low-density development is envisioned to be the driving force behind this trend. Nevertheless, the report concludes that the bicycle and public transit will become relatively more important in Arizona's transportation future.

In Chapter 6, current and future conditions of the transportation system are discussed. (The discussion here will be limited to US 191 concerns.) US 191 had several classification listings on the 1994 Highway System Classification. US 191 from Springerville to St. Johns is listed as a minor arterial. From St. Johns to just south of Chinle, US 191 was listed as a major collector. North of Chinle to the US 160 Junction, US 191 is listed as a major collector. The US 191 Corridor from Springerville north to Sanders is also identified as a National Intercity Truck Route.

Chapter 7 reviews the financial needs of the future transportation system and compares it to available revenues. The 1994 report made the assumption that federal revenues would, at minimum, continue at previous levels into the future. Even given that assumption, shortfalls were predicted for the entire transportation system.

Chapter 8 presents the goals and objectives for the state's transportation efforts. The six major goals were best summarized in the Executive Summary:

1. Transportation System To develop and maintain an integrated, balanced, and multimodal State Transportation System that meets the needs of Arizona.
2. Economic Development To develop a transportation system that promotes Arizona's economic development, accommodates the state's population growth and serves permanent and part-time residents and tourists.
3. Land Use To develop a transportation system that is compatible with existing and planned land uses.
4. Environmental Considerations To develop a transportation system that preserves and enhances Arizona's environmental conditions and values.
5. Implementation and Financing To develop an effective system for implementing the elements of the planned transportation system on a stable and equitable funding basis.
6. Coordination To establish a coordinated transportation system that is compatible among all transportation modes and all governmental jurisdictions.

Chapter 9 discusses system implementation strategies in general terms, establishing an overall focus of preserving existing facilities and maximizing person carrying capacity. It is in Chapter 10 that specific corridors are discussed. US 191 is identified as one of 50 total statewide significant corridors and is known as the "Springerville - 4 Corners" corridor in the report. Issues to be specifically ad-

dressed in the corridor include the following: the need for a range of modal choices, planning efforts for passenger and freight movement, maximizing the efficiency and effectiveness of the corridor, identifying environmental concerns, and being sensitive to tribal needs and desires. Chapter 11 of the State Plan summarizes the report and re-emphasizes important recommendations.

4. Bicycling in Arizona

This report was released in December 1995 by the Transportation Planning Group of the Arizona Department of Transportation. This brief report represents the State Bicycle Plan. The purpose of the report is to explain ADOT's policies relating to bicycle travel on the State Highway System, to provide the bicycle element of the intermodal State Transportation Plan, to fulfill ISTEA requirements, to set the framework for future bicycle planning/data collection, and to provide information to the public.

ADOT's policies are succinctly stated in Chapter III. In general, bicycles are allowed on all state highways except specific identified segments where alternate routes exist. Most of the prohibited highway segments are along interstates in urban areas. In addition, the *Arizona Bicycle Facilities Planning and Design Guidelines* are discussed. They were developed by the Governor's Arizona Bicycle Task Force (GABTF) in November 1988 and conform with AASHTO and MUTCD criteria in effect at that time.

Eight funding sources for bicycle programs and infrastructure are identified and discussed. Among them are National Highway System (NHS) funds, Congestion Mitigation and Air Quality Improvement Program (CMAQ) funds, and Federal Transit Funding. Matching requirements for many of the sources are also discussed.

Pedestrian overpass facilities (for use by dismounted bicyclists) are identified. Bicycle suitability ratings for state highways are defined. A reference is made to the *Arizona Bicycle Suitability Map,* which contains suitability ratings and gradient information for cyclists. (That map was released in 1991 and updated in 1998). The Suitability Map shows that US 191 from Springerville to Sanders is more suitable for bicycles. However, US 191 from Sanders to Junction US 160 is less suitable for bicycles.

The report documents an April 1995 survey conducted to identify Arizona residents' perceptions and attitudes about bicycle usage. One of the findings was that 75 percent of the public would like to see more bicycle lanes provided. Enforcement of bicycle laws was also supported. The report concludes with information about bicycle safety education. The safety information documents accident rates,

presenting statistics about injuries with and without helmets. Additional data needs are also identified.

In July 1998, an addendum to the 1995 Bicycling in Arizona was released. The new Bicycle Policy refers to the accommodation of bicyclists on the state highway system. In short, the policy affects all new construction or reconstruction projects. The new Bicycle Policy will consider provisions for bicycle travel and recognizes bicycles as a part of the shared roadway in Arizona.

5. Northern Arizona Transit Development Plan

The Northern Arizona Transit Development Plan was prepared by RAE Consultants, Inc. for the Northern Arizona Council of Governments (NACOG) and the Arizona Department of Transportation (ADOT). The study was completed in September 1995. This study looked at the setting for public transit services, reviewed the current "supply" of such services, forecasted the future "demand" for public transit, and analyzed alternate means of suppling services to meet future demands.

This study looked at region-wide issues as well as subarea issues. The defined subareas included Prescott/Prescott Valley/Chino Valley, Cottonwood/Clarkdale, Flagstaff, Navajo Nation, Hopi Tribe, Show Low/Pinetop-Lakeside, Sedona, the Grand Canyon Area, and Page.

The NACOG region's population is projected to grow from 343,554 persons in 1995 to 421,163 persons in 2000. The Navajo Reservation experienced a seven percent increase from 1990 to 1995. The 1995 population estimate for the Navajo Reservation was 51,928. The report provides additional information about the NACOG region as a whole. That information includes economic data, employment statistics, and individual community descriptions.

The report reviews the services of over 60 transportation providers, including public, private, and nonprofit providers. The largest systems in the region, the Section 18 operators, include Tri City Transit serving the Prescott area, Cottonwood Area Transit System (CATS), Pine Country Transit/Special Needs Transportation Services in the Flagstaff area, Navajo Transit System serving Ganado, Chinle, and other northeast Arizona towns, and Hopi Senom Transit serving Keams Canyon, Tuba City, and Kykotsmovi. The US 191-Springerville to Junction US 160 Corridor has several public transportation operators within the study limits. The providers within the US 191 Corridor include:

- Navajo Transit System - Chinle, Ganado, Chambers

- Navajo Area Agency on Aging
- Chinle Nursing Home
- St. Michael's Association for Special Education
- Toyei Industries, Inc.
- City of St. Johns Emergency Service
- Sanders Unified School District

Demand estimates for the NACOG region indicate a need for 1,187,140 passenger-trips annually. The need is split out by different types of passengers as follows: 48 percent elderly, 7 percent mobility-limited (disabled), and 45 percent general public.

In the corridor study subarea (Unincorporated Apache County, Springerville, and St. Johns), the demand estimates indicate a need for 207,430 passenger-trips annually. Of the subarea demand for transit trips, 39,980 are for elderly trips, 13,560 are for disabled trips, and the remaining 153,890 are general public trips.

The NACOG demand estimates are compared to the existing number of trips provided, showing that only about 30 percent of the total demand is currently being met region-wide. In the unincorporated areas of Apache County, Springerville, and St. Johns, approximately 50 percent of the demand for public transit is being met. Currently, no services exist in St. Johns and Springerville. Subarea concerns for the Navajo Nation include the need to upgrade equipment and the need for coordination between paratransit and fixed-route providers. Another concern pertains to the connectivity to medical, work, and service centers for residents living in the remote areas.

Service alternatives were developed both regionally and for subareas. Most of the regional alternatives relate to intercity services, and all the regional alternatives are targeted for the populous areas in the eastern part of the NACOG region (Prescott, Flagstaff, Sedona, and the Grand Canyon primarily). It is recommended that regional intercity service be expanded with more hours of service and additional days of service.

Local subarea recommendations for the Navajo Nation include expanded and coordinated paratransit services. The paratransit coordinated service could be for the senior services and also provide feeder service to the Navajo Transit System.

6. 1995 Arizona Transportation Needs Assessment

This report was prepared by the Arizona Department of Transportation under the guidance of the Arizona Transportation Needs Assessment Technical Advisory

Committee. The report was released in December 1995. The report "evaluates the status and condition of Arizona's transportation systems, and identifies financial needs exceeding expected revenues for highway, transit, rail, and aviation systems for five-year (1996-2000) and ten-year (1996-2005) periods." The report notes the evaluation is based upon assumptions about population and economic growth as well as the "proper mix" of transportation modes.

The report comments on major trends affecting the provision of transportation services and infrastructure. Major pieces of federal legislation include ISTEA, ADA, and NAFTA. Information technologies are also cited as a major influencing factor.

Some of the assumptions of the report are summarized here. Population is expected to increase 50 percent over 20 years, statewide. Large growth in the number of drivers and air passengers are both anticipated. Transit ridership in metropolitan areas is expected to increase 60 percent over 20 years. Amtrak passenger rail service is expected to grow by more than 50 percent in the next 20 years.

The total unmet need for all road projects (state, county, and city) is $8.8 billion over the next 10 years. The total transit unmet need is $1.0 billion. Total rail needs (freight and passenger) amount to $0.7 billion, with $0.6 billion in funding not met by projected revenues. The total aviation needs are between $0.7 billion and $0.9 billion, with unmet needs at $0.2 to $0.4 billion.

7. Transit and Intercity Bus Analysis

Information for this analysis was provided in summary form by the Arizona Department of Transportation. That summary is repeated here.

Intercity operators within the US 191 Corridor include the Navajo Transit System. Privately operated services are not subsidized in Arizona, nor regulated. Greyhound Bus Lines provides limited services in the US 191 Corridor, between Sanders and Chambers.

Intercity bus services are an important state resource that should be expanded. Intercity buses serve more destinations than any other public passenger service. They provide a critically needed service for low-income persons.

8. Arizona Statewide Rural ITS Plan

In January 1999, the Executive Summary for the Arizona Rural ITS Plan was released. ADOT initiated a comprehensive effort to examine the application of ITS to Arizona's rural transportation network. The Strategic Plan for Statewide Deploy-

ment of Intelligent Transportation Systems in Arizona was a 12-month study to identify the needs of the state's rural transportation system users, and develop a plan to address those needs using advanced transportation technologies and programs.

Short-term, mid-term, and long-term deployment scenarios were developed to provide Arizona with a phased, modular approach to implementing ITS throughout the state. Several high-priority projects have been identified to be implemented over the next few years. Most of the near-term projects focus on traveler information, incident and emergency management, and commercial vehicle technologies. These projects use time-proven technologies and have high potential for success, which makes them ideal "quick start" projects that can quickly show the benefits of ITS to many different transportation system users.

As a result of the study efforts, the following list presents the recommended projects and technologies for Arizona's rural ITS.

Short-Term - 1999-2001

Traveler Information – Interface to broadcast media, Highway Closure and Restriction System, Voice Remote Access System, cellular phone traveler information services, tourist and Yellow Pages information via cable TV. Also includes permanent and portable variable message signs, web-based tourist and traveler information, and an information clearinghouse.

Emergency Response – Computer-aided dispatching (CAD) for police, fire, search and rescue, HAZMAT response teams, and the Department of Public Safety. Cellular telephones with automatic distress calling and location reporting. Call boxes and motorist service patrols along remote rural routes. Closed-circuit television (CCTV) cameras and audio monitoring of rest areas and border crossings. Emergency phones at rest areas and transit stops. Traffic signal preemption for emergency vehicles. Coordination of emergency management policies and efforts among agencies.

Commercial Vehicle Operations (CVO) – In-vehicle devices (automatic vehicle identification and location), automated vehicle status reporting, computer-aided dispatching , and weigh-in-motion. Also includes enhanced port of entry features such as CCTV and electronic clearance.

Emissions and Environmental Hazards Sensing – Visibility sensors at dust storm areas, weather alert systems with flash flood sensors, and Road Weather Information Systems.

Incident Management – Mayday systems, common communication lines within Arizona and with neighboring states, increased coordination with Emergency Management Systems (EMS) and traveler information systems, coordinated signal

systems, CCTV at high accident locations, and real-time information about route closures.

Mid-Term - 2002-2007

Commercial Vehicle Operations (CVO) – Expanded CVO processing and administrative functions, increased automated clearance capabilities, and vehicle-to-roadside communications. Also includes onboard technologies such as audio warning systems, pre-crash safety systems, and in-vehicle driver monitoring sensors. Participation in Commercial Vehicle Information Systems and Networks (CVISN) program. Improved HAZMAT routing and incident management.

Emergency Routing – Highway/rail intersection signal preemption for emergency vehicles, expanded rural E911, and increased coordination among EMS.

Transit – Automatic Vehicle Location (AVL) and Automatic Vehicle Identification (AVI) for transit vehicles, coordinated transit dispatch, improved routing, and audio/video monitoring of transit stops.

Traveler Information Dissemination – In-vehicle systems and route guidance, Highway Advisory Radio, and coordinated yellow pages/reservation processing via kiosk, Internet, telephone, interactive TV, and personal computer.

Safety – Increased Mayday support with automated route planning, lateral safety warning (collision sensors), longitudinal safety warning, wildlife warning signs, and railroad crossing signs.

Long-Term - 2008 and Beyond

Advanced vehicle lateral and longitudinal control, enhanced route guidance (including portable processors with Geographic Information Systems (GIS) and Graphical User Interface), in-vehicle signing ("heads-up" and dash mounted displays). Enhanced integration and communication among Traffic Management Centers and field devices, including regional traffic control.

A planning-level estimate of public cost of deploying the ITS projects and programs recommended in the Statewide Strategic Plan is approximately $108,478,000. The projected funding includes the cost of procurement, installation, operations, and maintenance over the next 15 years. Private funding could be estimated at up to two times the public investment, which could total more than $200 million in private funds over the next 15 years.

ITEM	
ITS Communications Infrastructure	$4,015,000
Field Hardware/Software	$45,940,000
Other Deployment Efforts	$500,000
System Design, Contingency, Construction Engineering	$20,182,000
Operations and Maintenance (15 yrs)	$37,841,000
TOTAL	***$108,478,000***

B. Small Area Studies

1. Navajo Tourism Master Plan

The Navajo Nation formulated the Navajo Tourism Master Plan to coordinate tourism development within the Navajo Reservation. It is the hope of the Navajo Nation to increase tourism expenditures to approximately 20 percent of the total state tourism expenditures. The purpose of the plan is to help revitalize the Navajo economy and develop, strengthen, and manage an increasing tourism industry.

2. Navajo Nation 2020 Transportation Plan

The 2020 Transportation Plan for the Navajo Nation addresses future transportation needs of the Navajo Indian Reservation Roads (IRR) system. The plan provides policies and implementation guidelines for future planning and programming of Navajo IRR construction. The primary purpose of the plan is to provide projections and justifications for future funding requirements for long-range transportation infrastructure programming, as required by federal regulations.

The 20-year plan is organized into 10 chapters. Chapter I provides an introduction and information regarding the Navajo IRR Program. Chapter II provides essential background information regarding the Navajo Nation. Chapter III provides statistics of the overall Navajo IRR systems. Chapter IV discusses traffic volume and future demand on the Navajo-BIA roads. Chapter V assesses and identifies the Navajo Nation overall transportation needs. Chapter VI summarizes 20-year improvement and funding needs for the highway program, outlines goals and strategies, and provides recommendations for long-range and short-range implementation. Chapter VII discusses Navajo transit needs and plans. Chapter VIII discusses benefits to the Navajo Nation and future plans for all Navajo IRR contracts. Chapter IX acknowledges programs and individuals of their contribution to the development of this plan. Chapter X identifies reference sources used in the plan.

The report does recommend designating US 160 and US 191 through the reservation as state scenic byways.

3. Southern Apache County Regional Transportation Study, 1992

BRW developed the multimodal area-wide transportation plan in 1992 to address existing and projected transportation system needs in a staged manner. An inventory of the existing transportation facilities, planned improvements, and socioeconomic forecasts were provided to analyze future transportation conditions, deficiencies, and development improvement plans.

Improvements for the City of St. Johns are listed below.

- Add bike routes, lanes, and trails to the busy roadways and scenic corridors.
- Paint center stripes on collector streets where justified by safety and traffic speeds, and adequate width exists.
- Mount signs at heights in conformance with zoning laws.
- Install a traffic-actuated traffic signal if necessary to provide a higher level of traffic safety.
- Improve intersection at curve on main thoroughfare through town, tricky traffic merging and turn maneuvers.
- Construct a curbed, raised island in the northwest quadrant to eliminate the merging traffic feature. This island will also provide an opportunity for a landscaped area to enhance the scenic character.

Improvements to highways are listed below.

- Provide signs directing traffic to use US 191 as a regional connection from Interstate 40 to recreational sites such as the Apache Sitgreaves National Forest, Greer, Sunrise Recreational Area, the mountain lakes, and Alpine. These signs could be coordinated with regional recreation site information located at rest areas along Interstate 40.
- Realign the US 60 intersection with US 180/191 by providing a 90-degree intersection east of the existing location. This will improve safety of a location projected to experience increased traffic in the future.
- Zuni Wash Bridge, US 191, milepost 331.62, between St. Johns and Sanders – Widen each shoulder to four feet to improve safety for motorists and cyclists.
- Rio Puerco Bridge, US 191, milepost 368.16, south of Sanders – Widen each shoulder to four feet to improve safety for motorist and cyclists.

4. White Mountain Regional Transportation Study, Draft Reports, December 1998

Preliminary reports for the White Mountain Regional Transportation Study were prepared by Lima & Associates. The study for the White Mountain Area identifies the existing socioeconomic conditions and projections, existing transportation conditions, accident data, and roadway data for the study area. The study will be completed in 1999.

II. SOCIOECONOMIC ENVIRONMENT

A. Corridor Width for the Socioeconomic Environment

The socioeconomic environment is defined as the area within 10,000 feet, either side, of the corridor highway centerline. Where data limitations preclude application of this definition, the socioeconomic environment will be adjusted and documented accordingly.

B. Major Population Areas, Existing and Future Demographics, Major Employment Centers, and Economic Base

The rural, undeveloped character of the corridor as a whole is punctuated by small population and economic activity centers. Table II-1 shows the population of the counties and larger towns in the counties including the corridor area.

Table II-1

US 191 - Springerville to Junction US 160
Existing and Projected Population

		Population		
County	**Town**	**1997**	**2000**	**2010**
Apache		65,333	67,925	76,650
	Chinle	5,657	5,903	6,962
	Ganado	1,394	1,455	1,715
	Many Farms	1,432	1,494	1,762
	Springerville	1,964	2,050	2,451
	St. Johns	3,646	3,805	4,487

Source: Arizona Dept. of Economic Security, Research Administration, Population Statistics Unit, 1997.

Since 1990, Apache County has recorded an estimated annual growth rate at less than one percent. However, the recent opening of Fort Apache Reservation's casino and a new state prison in southern Apache County have brought a slight boost to the county's economy through the creation of new jobs. The annual growth rate for the next 10 years is projected to be 1.25 percent for Apache County.

Economy

The economy of the study corridor is driven by tourism, livestock, lumbering, utilities, and government. Apache County has approximately 36 percent of their jobs in the government sector. These include Apache County, Navajo Tribal Utility Authority, and Indian Health Services. Major employers with over 100 employees in Apache County along the US 191 Corridor include Indian Health Services - Chinle, Navajo Tribal Utility Authority, Sage Memorial Hospital - Ganado, Salt River Project Coronado Generating Station - St. Johns, Tucson Electric Power - Springerville, and White Mountain Community Hospital – Springerville.

Community Descriptions

The community descriptions were prepared using *Arizona County Profiles* and *Community Profiles* from the Arizona Department of Commerce. Much of the data presented in these profiles is attributed to the Arizona Department of Economic Security, the 1990 Census, and the Arizona Transit Development Plans.

Chinle is the entrance to the Canyon de Chelly National Monument. Chinle became a center for population growth and trade after 1868 when the US signed a treaty with the Navajos. Today, the community is a designated major "growth center" on the Navajo Reservation by the tribal government. It is an important trade, administrative, and educational center within the Chinle Chapter. The largest number of jobs in Chinle are in public services, administration, and educational services. Chinle offers a wide range of community facilities including shopping and recreational activities. Chinle has many scenic attractions nearby. The closest is Canyon de Chelly which is discussed in more detail later in the report.

Many Farms, or as the residents call it, *Da'ah'eh Halani*, is an Indian community within the Navajo Nation, 15 miles north of Chinle. Many Farms emerged as a community in 1937 when the local reservoir's irrigation dam was constructed. Today, Many Farms includes the campus of the Bureau of Indian Affairs Boarding School and the Many Farms BIA High School. Many Farms is considered by the Navajo Nation Government to be a secondary growth center. Area scenic attractions include Many Farms Lake and Canyon de Chelly. Many Farms includes limited community facilities for residents and visitors.

St. Johns is a community of 3,300 people located 18 miles west of the New Mexico border. Originally named El Vadito ("little river crossing") by the Spanish explorers, St. Johns was a thriving Spanish-American agricultural community in 1873. Mormon pioneers from Utah settled in 1879 and the name was changed to San Juan (Spanish for St. John) and to St. Johns in 1880. Once a traditional agri-

cultural community, St. Johns now houses two fossil-fueled electric-generating plants, which employ over 500 people. The shortest and most scenic route from Phoenix to Albuquerque is through St. Johns, which is also surrounded by numerous tourist and visitor destinations. These include the Apache, Zuni, and Navajo Reservations, archeological sites, Petrified Forest National Park, Lyman Lake State Park, and many other sites. St. Johns offers a wide range of community facilities for residents and visitors.

Springerville located in Apache County is in an area known as the Round Valley in the foothills of the White Mountains. Springerville is a full service community in the Round Valley area and serves as a tourism hub to the Blue Wilderness Area, three Indian Reservations, Petrified Forest National Park, Apache-Sitgreaves National Forest, Indian petroglyphs, three major archeological sites, and volcanic formations in the area. The Little Colorado River runs through Springerville, adding water-related recreation activities, such as hunting, fishing, and hiking, to its abundance of other outdoor recreation activities.

Springerville medical facilities include a 25-bed hospital and a 44-bed convalescent care facility. Springerville's 1990 population was 1,802 persons and has increased to the current population of 1,948. Thirty-six percent of the population is under age 16, while seven percent are age 65 or older. Springerville and Eagar have a labor force of 2,136 with an unemployment rate of approximately seven percent.

Other communities along the US 191 Corridor include:

- Mexican Water
- Rock Point
- Round Rock
- Valley Store
- Ganado
- Klagetoh
- Wide Ruin
- Chambers
- Sanders
- Witch Well

The small communities along the corridor provide limited services to visitors and local residents of the area. However, major businesses, shopping, and other activities are located in Chinle, St. Johns, and Springerville.

C. Existing and Projected Land Uses and Ownership

Apache County has 11,211 square miles covered by Indian Reservations: Apache, Navajo, and Zuni. Another 20 percent of the total square miles is covered by

public lands in the form of national forests, national monuments, and national parks. The remaining 16 percent is held in private and corporate ownership.

Land ownership along the US 191 Corridor is depicted in Figure II-1. The four major land ownerships, for purposes of this study, are county lands, federal lands, state lands, and privately-owned lands.

D. Jurisdictional Boundaries

Figure II-2 illustrates various jurisdictional boundaries including county lines and the location of the small communities along the corridor. Also illustrated in Figure II-2 is the location of the Hopi Reservation, which is surrounded by the Navajo Reservation.

Figure II-1

Existing Land Ownership

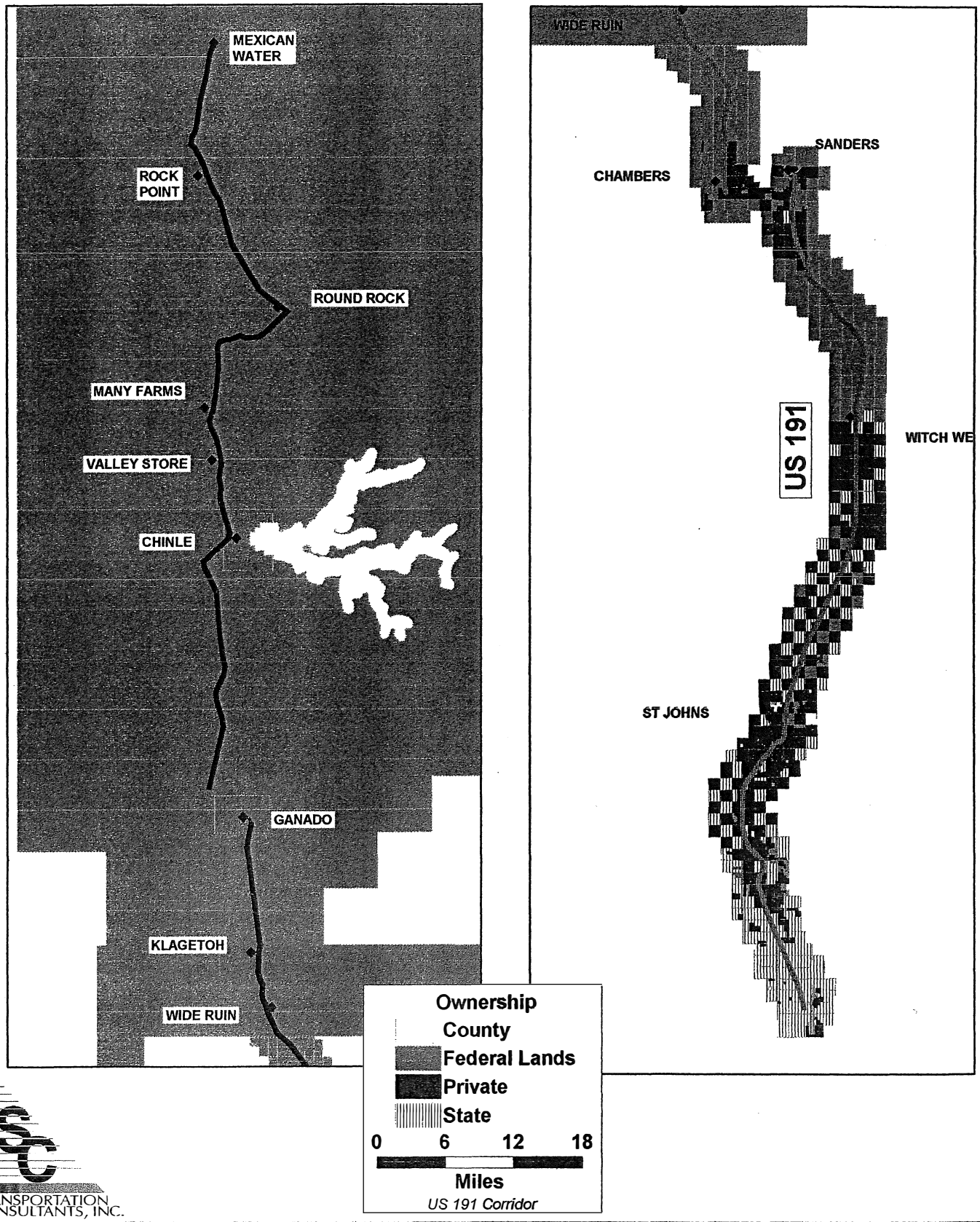
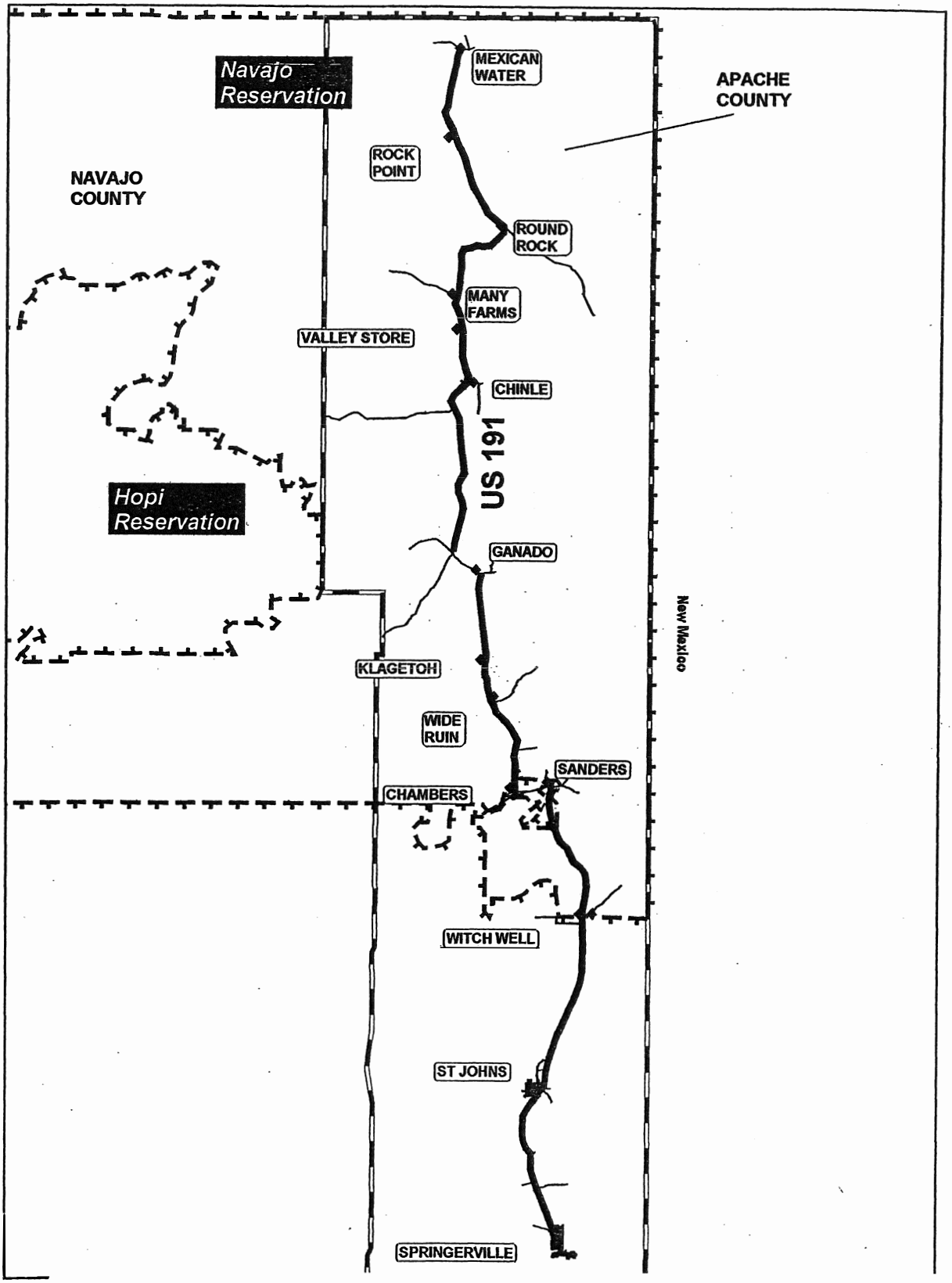


Figure II-2

Jurisdictional Boundaries



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E. Large-Scale, Planned Developments

LSC contacted numerous persons along the US 191 Corridor to identify any future large-scale, planned developments. These include contact persons from the Navajo Nation Transportation Department, Navajo Nation Department of Tourism, Mexican Water Chapter, Rock Point Chapter, Round Rock Chapter, Many Farms Chapter, Chinle Chapter, Ganado Chapter, Klagetoh Chapter, Wide Ruin Chapter, Navajo Roads Department, Apache County Roads Department, City of St. Johns, Navajo Nation Economic Development Department, Navajo-Hopi Relocation Office, and Northern Arizona Council of Governments (NACOG). A limited number of responses were received.

The City of St. Johns does not have any future developments or plans along the US 191 Corridor. The Mexican Water Chapter reported that the Chapter Administration Building may be moved to the parcel across the highway from the Mexican Water Trading Post within the next five years. Other commercial development may occur at the US 191 and US 160 junction in the future. However, land ownership and acquisition rights are currently in discussion with the Navajo Tribe. The Round Rock Chapter reported 10 additional housing units are under construction by the Navajo Housing Authority. The site is approximately one-half mile north of US 191 near Thriftway. The houses are expected to be completed by winter 1999.

The Klagetoh Chapter reports two new developments scheduled to be completed and operating within the next five years. These projects located directly along the US 191 Corridor include:

- Senior Citizens Group Home Site – Construction to begin in 2000, approximately one acre
- Convenience Store Site – 2.5 acres

The Navajo-Hopi Relocation Office reported a couple of different development plans in the US 191 Corridor area. The first development is in the Sanders area on land adjacent to US 191. The project begins approximately nine miles south of Sanders and includes five sites of residential housing units. The development is for single housing units with approximately 35-40 units per subdivision.

The second development project includes a planned rural community just south of Sanders with approximately 350 units. This project began in 1987 and houses were occupied as early as 1988. Currently, just over 150 are occupied and it is expected to fill all units. The attractions within the planned community include rodeo grounds, high school, Chapter House, industrial area, and an IHS Clinic.

The Arizona Department of Commerce awarded the Navajo Nation, Chinle Chapter $101,000 for economic development infrastructure improvements. The Chinle Chapter reported these monies will be used for construction turnout improvements west of US 191 at Route 7. At that same intersection, a turning lane will be added for safety and improved traffic flow. The development occurring includes a convenience/service station with a fast food restaurant within the service area. The site is approximately three acres.

F. Title VI and Environmental Justice Considerations

This section presents considerations related to Title VI of the Civil Rights Act of 1964 and Executive Order 12898 on Environmental Justice. The discussion presented relates specifically to the environmental planning process for identified Arizona Department of Transportation (ADOT) projects. Title VI and related statutes assure that individuals are not excluded from participation in, denied the benefit of, or subjected to discrimination on the basis of race, color, national origin, age, sex, and disability. Executive Order 12898 directs that programs, policies, and activities not have a disproportionately high and adverse human health and environmental effect on minority and low-income populations. Wherever minority and low-income populations are mentioned, age, gender, and disability are also to be included.

The US 191 Corridor extends from Springerville to Junction US 160. The accompanying maps summarize the demographic data of the population living along this corridor. The demographic data depicted in the accompanying maps has been taken from the 1990 Census.

Figure II-3 illustrates minority populations within the corridor. Along US 191, every census block group within the Navajo Reservation has over 90 percent of the population as minority, or more specifically, American Indian. South of Sanders along US 191, approximately 75 percent of the population is minority. Census tracts surrounding St. Johns and Springerville have approximately five percent of the population as minority.

Figure II-3

Minority Population - US 191 Corridor

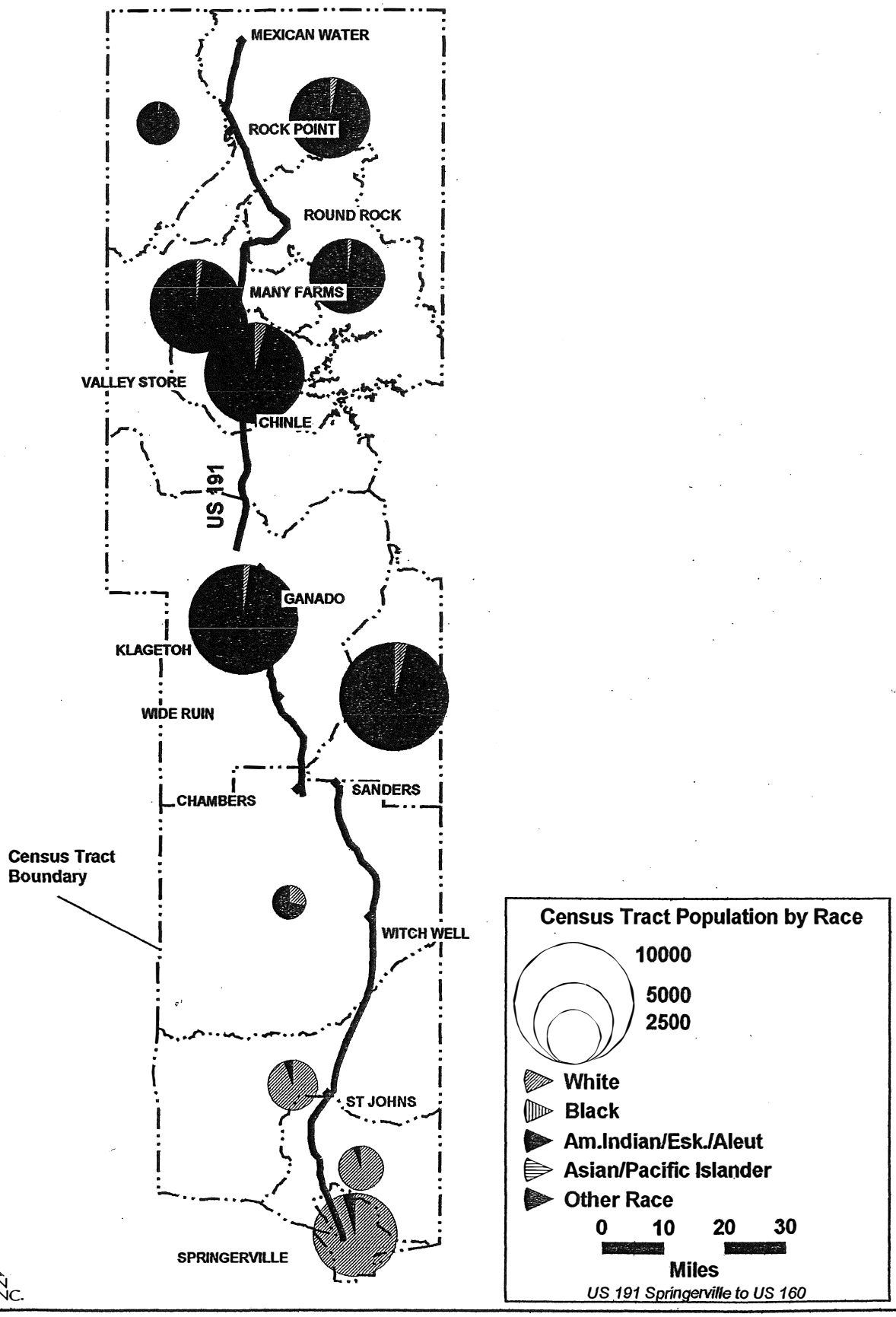

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Figure II-4 shows the percentage of the low-income population. The northern portion of US 191 has over 50 percent of the total population along the corridor below poverty. The census tract surrounding St. Johns has the lowest percentage of persons below poverty level. The US 191 Corridor has a fairly high level of persons with disabilities. The census tracts on the Navajo Reservation have over 10 percent of the population having a disability and some reporting over 25 percent of the population having a disability. The census tract surrounding St. Johns has approximately 10 percent of the population with a disability. This is illustrated in Figure II-5.

Figure II-6 illustrates census tract population by age group. Age group 21-59 represents, in all census blocks along US 191, over 40 percent of the population. The senior population over age 60 represents approximately 10 percent of the population along the corridor.

Figure II-7 illustrates population by gender within the US 191 Corridor. The corridor has an even male-to-female ratio. The census tract west of Mexican Water has a slightly higher percentage of females than males.

Efforts were made throughout the corridor profile study to involve members of the minority and low-income communities. Public meetings were held in April 1999 and April 2000 in Chinle and Kayenta to provide opportunities for public input. The public meetings follow a very informal format to allow sufficient time for attendees to ask questions, receive answers, and provide input.

When individual projects are programmed, the specific impacts will be identified and those projects which may directly affect the minority and low-income populations identified in this screening will incorporate a continuing public participation process. The public participation process will actively seek input on the impacts and potential mitigation measures related to the specific project.

Figure II-4

Low Income Population - US 191 Corridor

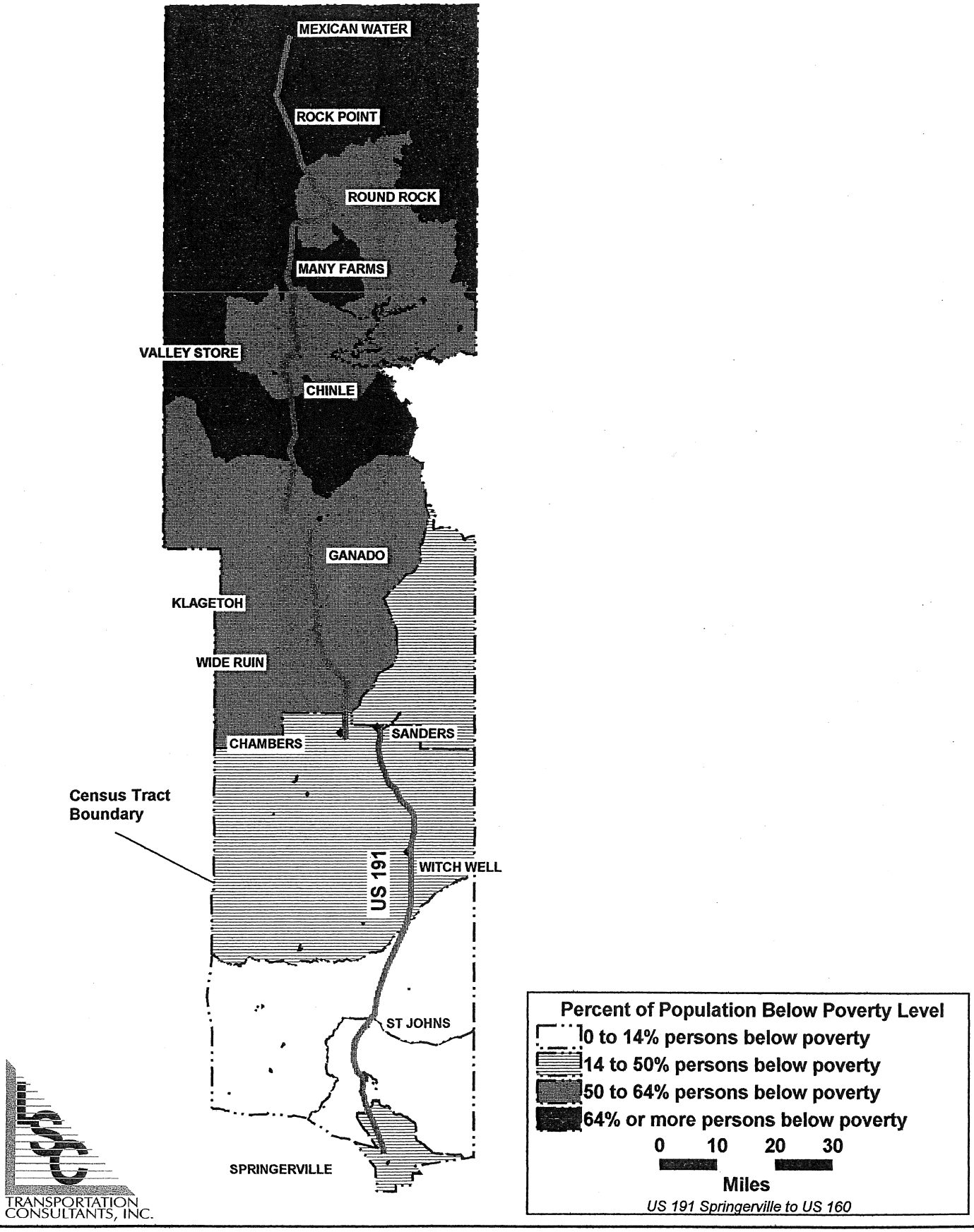


Figure II-5

Population with Disability - US 191 Corridor

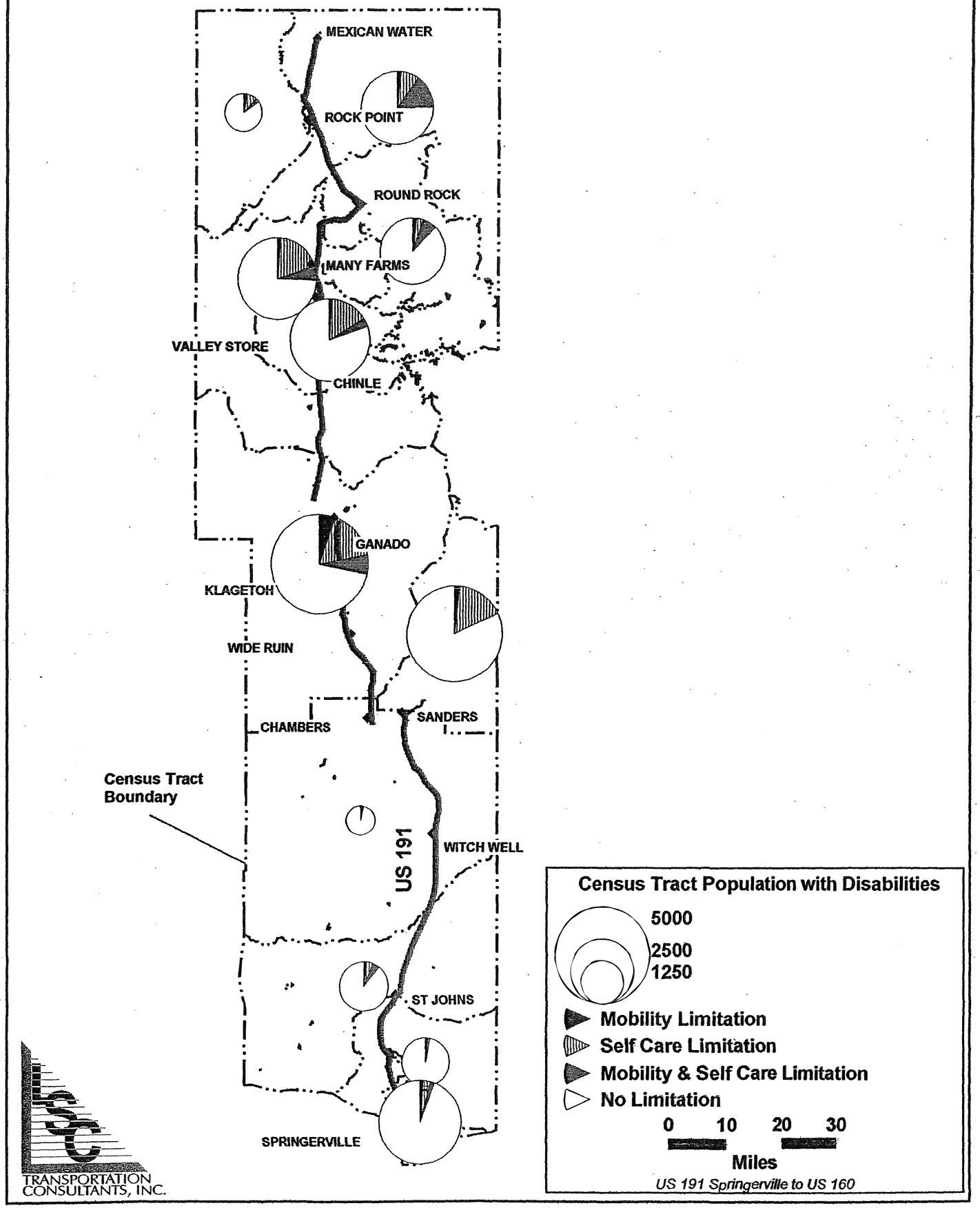


Figure II-6

Population by Age Group - US 191 Corridor

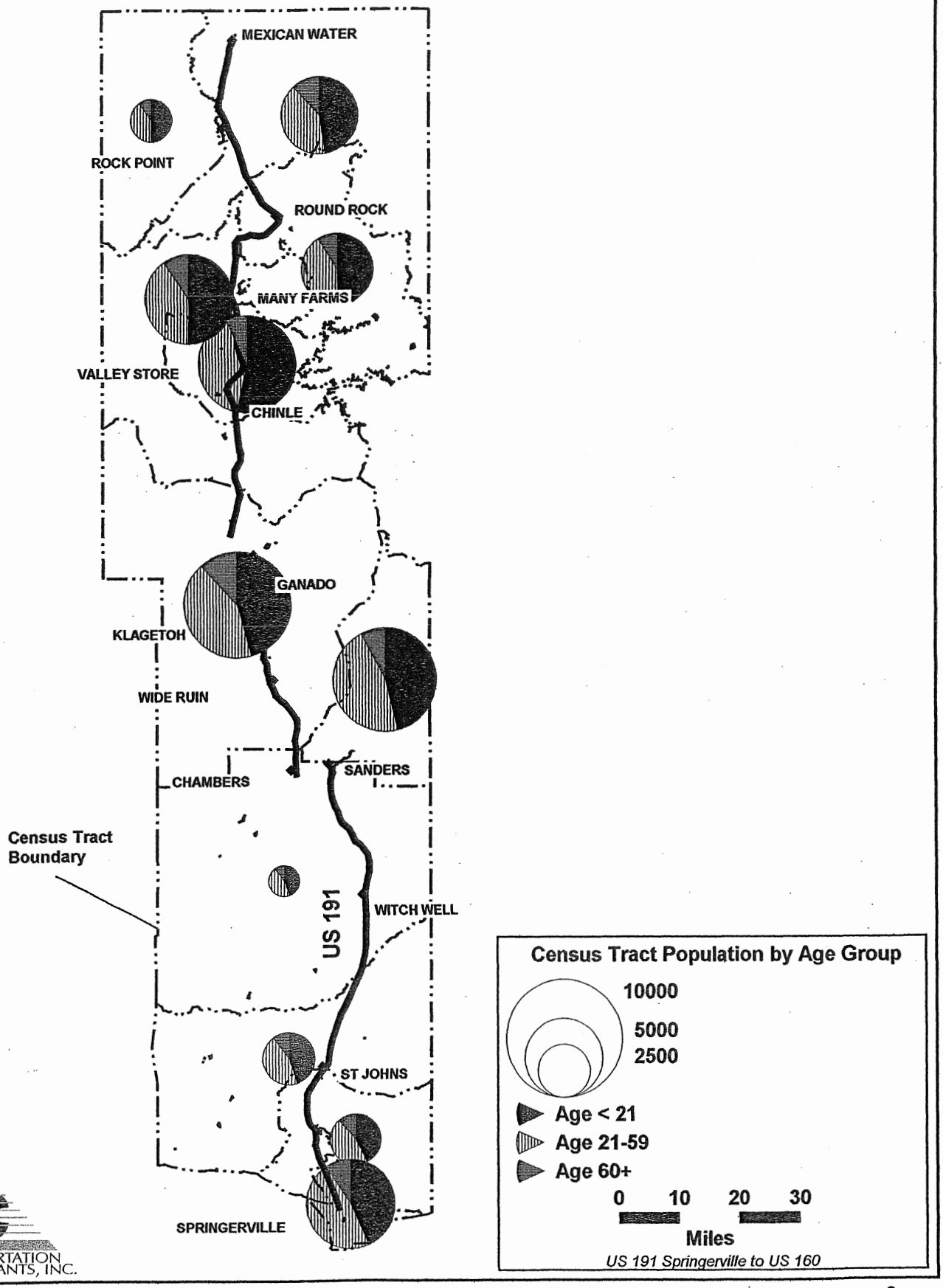
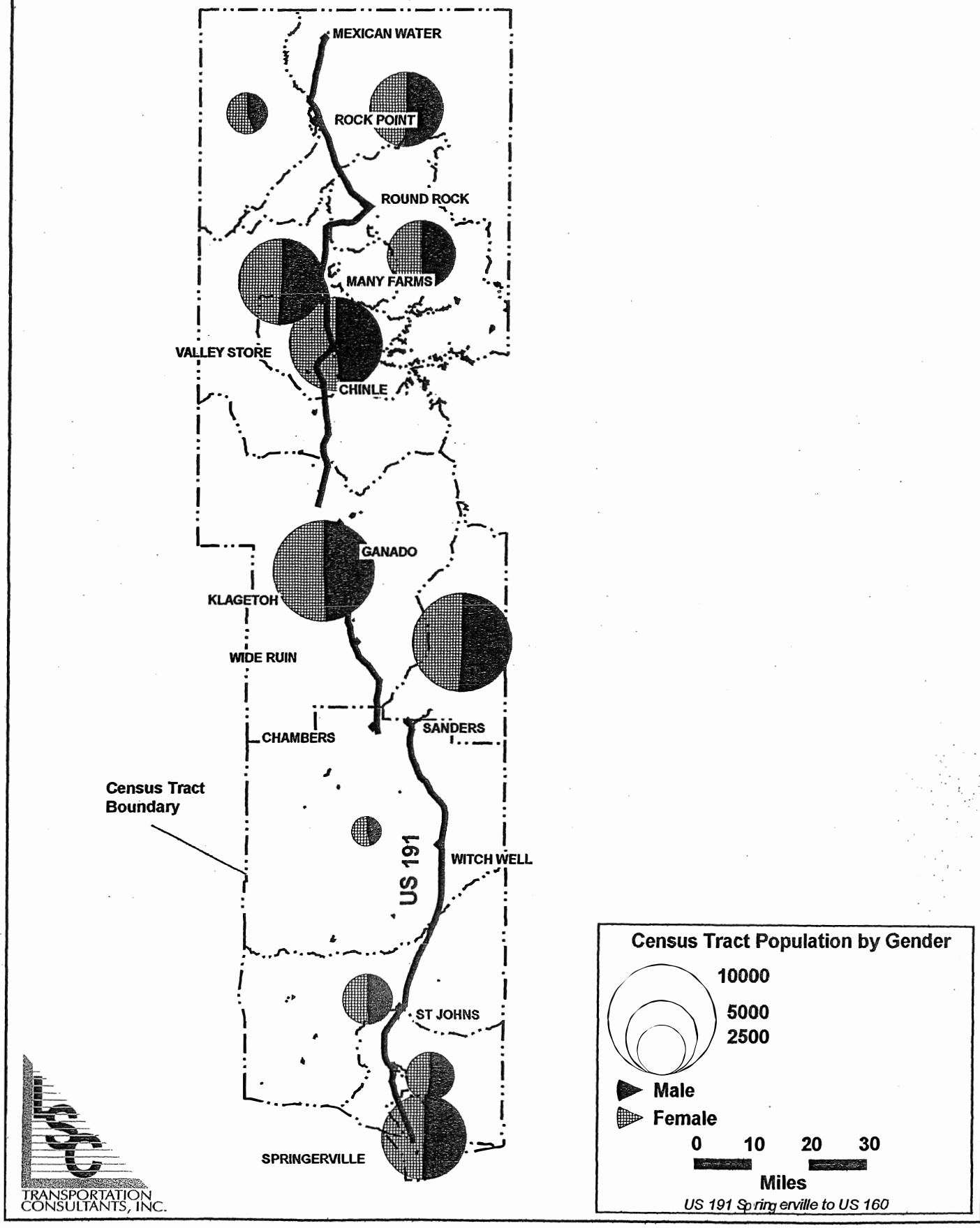


Figure II-7

Population by Gender - US 191 Corridor



III. PHYSICAL AND NATURAL ENVIRONMENT

A. General Topography and Character of the Corridor

The US 191-Springerville to Junction US 160 Corridor begins at the edge of the Colorado Plateau Province and the Central Highlands, as shown in Figure II-8. The corridor begins at the city limits of Springerville and heads north through St. Johns to Sanders. The corridor continues north from Chambers to Ganado and north to Mexican Water at the US 160 junction. The vegetation cover is a transitional zone, between Mountain Brush and Juniper Grass.

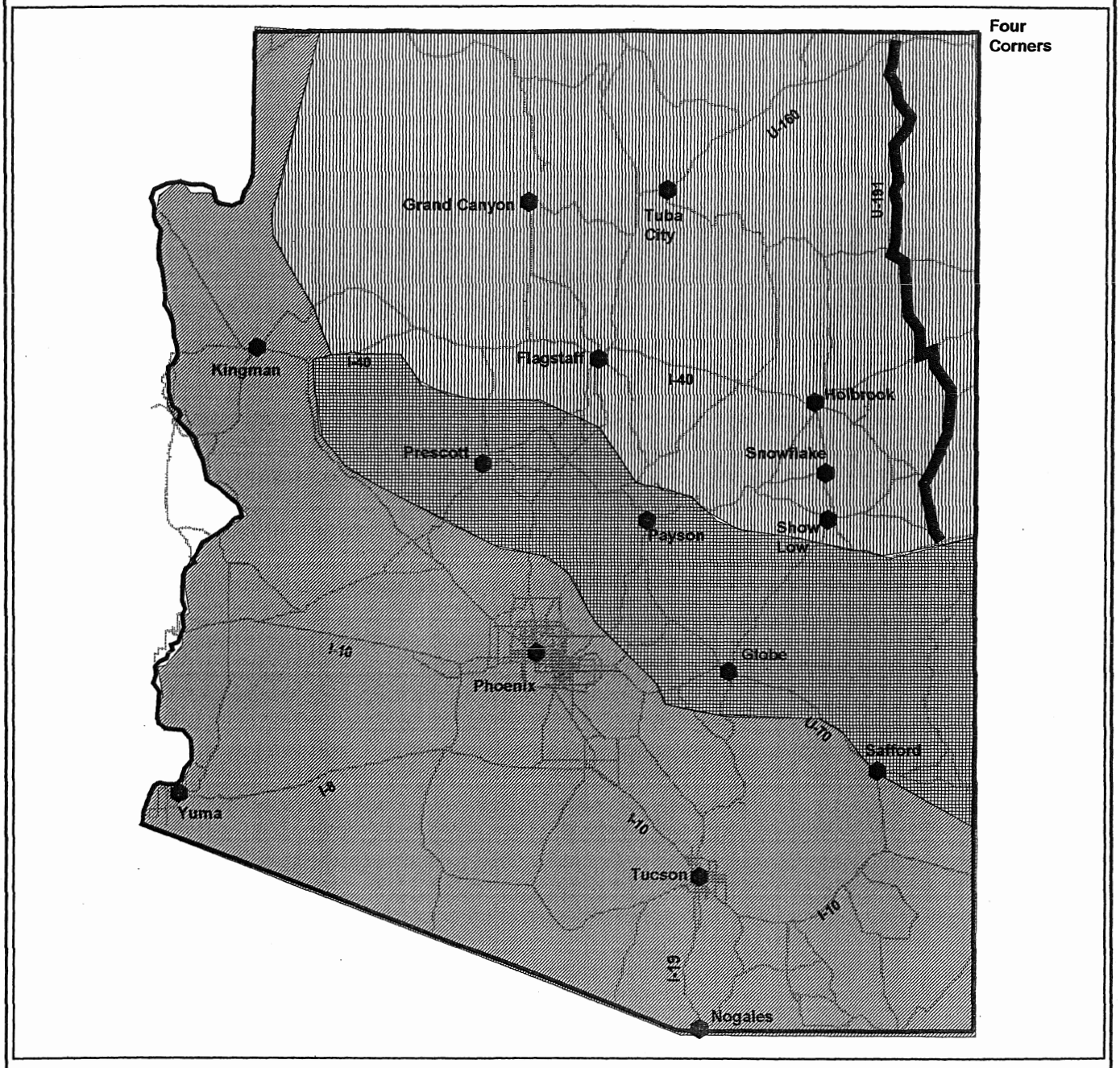
The Central Highland Province is a geologic and physiographic transition between the two other provinces, with the Mogollon Rim along its northern boundary. The type and distribution of aquifers vary, with alluvial aquifers occupying relatively small basins, aquifers in consolidated sedimentary rocks, and fractured aquifers in hard rocks. Most perennial streams in the state originate in this province, which receives the highest annual precipitation—16 to 32 inches.

The Colorado Plateau Uplands Province is underlain by extensive consolidation sedimentary rock formations. Most of the groundwater is withdrawn from these formations more than 1,000 feet deep, although localized alluvial aquifers also provide some groundwater. This province has annual precipitation ranging from 10 to 25 inches. The eastern half of the province is a barren plateau, with isolated alluvial deposits occurring only as narrow strips along large drainages, while the western half (north of the Grand Canyon) is wooded plateaus and mountain peaks which rise higher than 8,000 feet in elevation.

The predominant vegetation in the corridor includes desert, grasslands, and woodlands. The woodland areas include the Great Basin Conifer Woodland. The grassland areas include the Plains and Great Basin Grassland, and the desert areas include Great Basin Desert Scrub. Figure II-9 illustrates each vegetation area.

Figure II-8

Geologic Provinces of Arizona



LEGEND

- Highways
- State Boundary
- Project Location
- Cities & Towns
- Colo. Plateau Province
- Central Highlands
- Basin & Range Province

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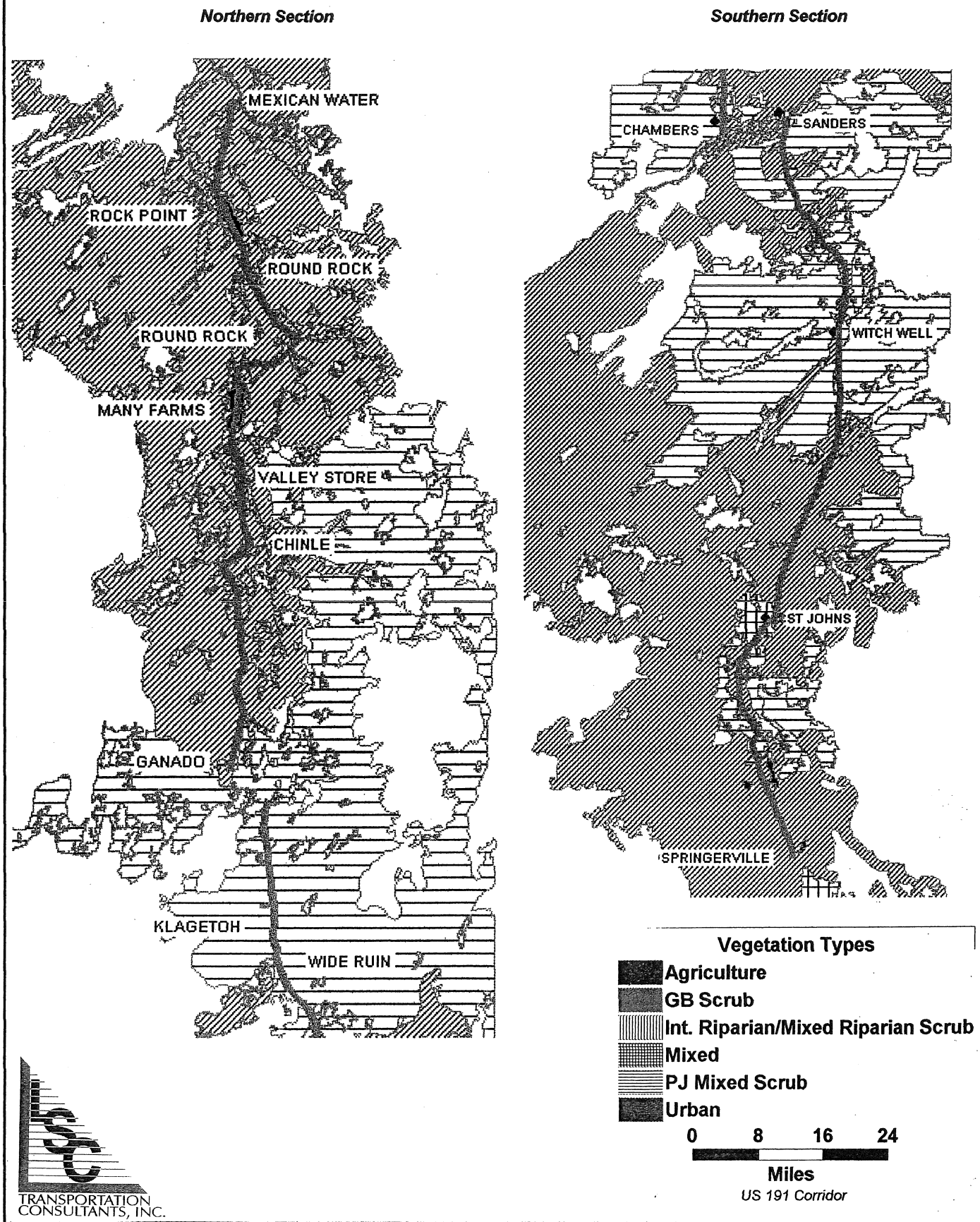
Figure II-9

Existing Types of Vegetation



B. Sensitive Species and Habitats

Information obtained from the Arizona Game and Fish Department, Habitat Branch identifies several species as Critical Habitat. Critical Habitat is not necessarily designated or proposed within Arizona or within each county where the species occurs. Local U.S. Fish and Wildlife Services have specific information about Critical Habitats and their locations. Candidate species for the Endangered Species Act of 1973 are those which are being considered for addition to the list of threatened or endangered species and for which there is sufficient information to support a proposal for listing. Candidate species do not have legal protection under the Act, but U.S. Fish and Wildlife recommends they be considered in planning processes in the event they become listed or proposed for listing prior to completion of a project.

Table II-2 provides a very broad list of species located within Apache County traversed by the study corridor. According to the U.S. Fish and Wildlife Service, staff reductions no longer permit compilation of project specific species lists and information.

Table II-2
Sensitive Species and Habitats
US 191 Springerville to Junction US 160

County	Common Name	Status on Endangered Species Act *see definition below	Critical Habitat *see definition below	US Forest Service Sensitive List*	Taxonomic Group
Apache					
	Southwestern Willow Flycatcher	LE	P		Bird
	American Peregrine Falcon	LE	Y	S	Bird
	Bald Eagle	LT		S	Bird
	Mexican Spotted Owl	LT	Y	S	Bird
	Little Colorado Spinedace	LT	Y	S	Fish
	Apache (Arizona) Trout	LT		S	Fish
	Black-Footed Ferret	LE		S	Mammal
	Navajo Sedge	LT	Y		Plant

* LE = Listed Endangered: imminent jeopardy of extinction
LT = Listed Threatened: imminent jeopardy of becoming Endangered
PE = Proposed Endangered
P = Proposed: Critical Habitat has been proposed
Y = Yes: Critical Habitat has been designated
S = Sensitive: those taxa occurring on National Forests in Arizona which are considered sensitive by the Regional Forester

Source: Special Status Species by County for Arizona, Arizona Game and Fish Department, March 1997.

C. National Parks, Monuments, and Wildlife Refuges

No national parks or wildlife refuges are located within the study corridor. However, there are several National Monuments in the study area. Wildlife Areas and National Parks are located near the study area. These sites include:

- Canyon De Chelly National Monument – The Monument houses approximately five periods of Indian culture dating from 350 A.D. to 1300 A.D. The 26-mile canyon provides hundreds of Anasazi ruins, Navajo homes, and farms.
- Petrified Forest National Park
- Apache Sitgreaves National Forest
- Becker Lake Wildlife Area
- Sipe White Mountain Wildlife Area

D. Wilderness Areas

The Wilderness Act of 1964 was created to preserve their "primeval character" and "natural condition" by preventing the intrusion of such human facilities as roads and other development. No part of the corridor passes near or through a wilderness area. However, the Petrified Forest Wilderness Area is located west of Chambers.

E. Wild and Scenic Rivers

According to the "Arizona Statewide Wild and Scenic Rivers Legislative Environmental Impact Statement," no river or stream segments or any other watercourse in the US 191 study area are on or recommended for inclusion on the wild and scenic rivers list.

F. Historic Properties and Existing or Potential 4(f) Issues

In 1990, according to the Department of Anthropology at Arizona State University, Arizona voters approved legislation that provides $1.7 million annually from the state lottery fund to be applied towards the preservation of cultural resources. Section 4(f) of the Department of Transportation Act of 1966 establishes protection for parks, historic sites, and other recreational open spaces. The protection was established to prevent the conversion of historically and culturally significant sites to other uses such as highways. Title 23, U.S.C., Section 138 set forth provisions similar to those of Section 4(f). In January 1983, Section 4(f) was amended and codified in Title 49 U.S.C., Section 303 and reads as follows:

(a) It is the policy of the United States Government that special effort be made to preserve the natural beauty of the country side and public park and recreation lands, wildlife and waterfowl refuges, and historic sites.

(b) The Secretary of Transportation shall cooperate and consult with the Secretaries of the Interior, Housing and Urban Development, and Agriculture, and the States, in developing transportation plans and programs that include measures to maintain or enhance the natural beauty of lands crossed by transportation activities or facilities.

(c) The Secretary may approve a transportation program or project requiring the use of publicly owned land of a public park, recreational area, or wildlife and waterfowl refuge, or land of an historic site of national, state, or local significance (as determined by the federal, state, or local officials having jurisdiction over the park, recreation area, refuge, or site) only if –

I. there is no prudent and feasible alternative to using that land; and

II. the program or project includes all possible planning to minimize harm to the park, recreation area, wildlife and waterfowl refuge, or historic site resulting from the use.

It is important to note that the above referenced codes (hereafter referred to as Section 4(f)) apply only to publicly owned parks, recreational areas, and wildlife refuges. In most cases, historic sites must be on or eligible for inclusion in the National Register of Historic Places (NRHP) to be covered under Section 4(f). Local officials may document a site that is considered important to their community, but not eligible for inclusion on the NRHP, and submit documentation to FHWA asking that the site be given special consideration. Also, very important to the US 191 Corridor, multiple-use lands such as National Forests and Bureau of Land Management lands, are not covered under Section 4(f) if the administering agency has not identified the area as a park or recreational area in their management plan.

Other regulations assisting in the preservation of the cultural environment include the Archaeological Resources Protection Act, 1979, and the American Indian Religious Freedom Act, 1978. Cultural resources must be evaluated under each of these acts to ensure adequate protection of our cultural heritage.

Several well-known sites along the US 191 Corridor are listed as Historical/ Archaeological Sites according to the USDA Forest Service. These sites are listed below.

- Beautiful Valley Overlook, designated by the Navajo Nation.
- Hubbell Trading Post, National Historic Site – home of the oldest known trading post.
- Raven Site Indian Ruins and Archaeological Center, located 12 miles from Springerville. The prehistoric city exhibits cultural features of both the Mogollon and Anasazi people.
- Rattlesnake Point at Lyman Lake State Park is an archaeological site near Springerville.
- The Madonna of the Trail is located in Springerville. It is one of 12 statues built across the country in the 1930s to honor the Spirit of the Pioneer Woman.
- The *Beale Wagon Road* historic trail traverses the US 191 Corridor near Chambers and Sanders according to the Arizona State Parks Office. Lieutenant Edward Beale was ordered to lay out a wagon road from Fort Defiance to the eastern frontier of California in 1857. Beale used 25 camels to navigate the arid wastes of the Great American Desert. Thousands of immigrants used this trail as they made their way to and through the northern area of the state. The railroad later followed the Beale Wagon trail, and eventually the nostalgic Route 66.
- Wide Ruins Historic District - listed on the National Register of Historic Places.

Other sites not located within the study area, but nearby, include Antelope House Ruin and White House Ruin near Chinle.

By the request of the Navajo Nation Historic Preservation Department, historical and archaeological sites not publicly documented will remain confidential and not included within the report. The Navajo Nation has assumed the responsibilities of the Arizona State Historic Preservation Office on Navajo lands. The US 191 Corridor traverses reservation land. It is anticipated by the Navajo Historic Preservation Office that subsequent consultation will be necessary for any recommendations within the corridor. The consultation will perform the necessary archaeological and site surveys for each project.

Many archaeological surveys have been performed along the US 191 Corridor. The following publicly documented archaeological sites by ADOT Environmental Planning Section are presented below.

Between MP 330 and MP 470

- Anasazi artifact scatter, A.D. 500-875
- Anasazi artifact scatter, A.D. 1000-1200
- Anasazi artifact scatter with features, A.D. 500-875
- Basketmaker III Pit house village with artifact scatter, A.D. 530-875
- Artifacts, A.D. 1000-1300
- Artifacts, A.D. 850-1200
- 1274 charcoal and artifact scatter, Anasazi pit house village
- Anasazi artifact scatter with possible habitation structure and feature area, A.D. 1010-1210
- Kayenta Anasazi artifact scatter, A.D. 875-1150
- Kayenta Anasazi artifact scatter, A.D. 850-1100
- Kayenta Anasazi artifact scatter, A.D. 850-1150
- Artifact scatter with possible subsurface rock feature, A.D. 800-1200

Between MP 1 and MP 115

- Habitation of Navajo 1930-1950, hogan
- Artifact scatter
- Artifact scatter, A.D. 700-1300
- Habitation
- Artifact surface scatter. Recommended to avoid, if possible, or test archaeological site.
- Lithic surface scatter. Recommended to avoid, if possible, or test archaeological site.
- Habitation. Recommended to avoid, if possible.
- Sweatlodge. Recommended to avoid, if possible, or test archaeological site.
- Brush structure. Recommended to avoid, if possible, or test archaeological site.
- Habitation. Recommended to avoid, if possible, or test archaeological site.
- Possible structure. Recommended to avoid, if possible, or test archaeological site.
- Possible campsite. Recommended to avoid, if possible.
- Bus stop shelter. Recommended to avoid, if possible.
- Brush shelter. Recommended to avoid, if possible.
- Surface trash scatter. Recommended to avoid, if possible.
- Surface scatter of materials. Recommended to avoid, if possible.
- Sign pad. Recommended to avoid, if possible.
- Habitation and activity loci. Recommended to avoid, if possible.
- Anasazi artifact scatter with ash stains, A.D. 800-1300
- (Chambers to Klagetoh) – A total of 137 different sites are reported within the study area. Sites have a significant level of overall site integrity and avoidance is recommended for all sites.

The above information was provided by the Arizona State Parks, Office of Planning, State Historic Preservation Office (SHPO), and Grants and the Navajo Nation Historic Preservation Department. The Arizona State Parks Office does have the complete list of Historic Places on the National Register if needed for further information.

To comply with regulations, agencies are required to inventory cultural resources on lands that will be affected by actions undertaken in their jurisdiction. The first step for the US 191 Corridor is the preparation and identification of sites within this corridor study. This includes researching archaeological data and studies to identify any areas that may be affected by a change. The corridor contains many areas where a significant amount of cultural resources are found. Future projects within this area will inevitably need to assess the effects of the action on these resources. In some cases, if a resource is to be affected by the project, steps are taken to avoid and preserve the property. In other cases, where avoidance is not feasible, steps are taken to "mitigate" the effects of the project on the cultural resource.

Data on file at the SHPO and other agencies suggest that, in most cases, compliance with preservation law results in the avoidance of cultural resources. Computer data from 1989 to the present suggests that on average, 91 percent of the projects on record did not affect significant cultural properties. Less than one percent of projects had an "adverse effect" on significant cultural properties, while an average of eight percent had "no adverse effect" to significant cultural properties. Determinations of "no adverse effect" to archaeological sites generally means that data were collected from the site prior to project impact. For historic buildings, "no adverse effect" generally means that alterations to the building are made in compliance with federal standards. "Adverse effects" result when it is not possible to mitigate the effects of project actions.

G. Unique Waters, Sole-Source Aquifers, Riparian Areas, and Wetlands

Typically for the Southwest, riparian areas and wetlands overlap territories. The riparian area includes the natural watercourse and aquatic habitat and extends to the upland area where vegetation transitions into xeric, more drought tolerant species. Riparian areas encompass the wetlands, which make up only a small portion of the total riparian area. Therefore, wetland regulations only protect a small portion of the riparian area. The Arizona Water Quality Assessment of 1996 reported the approximate extent of Riparian Areas for the state is 266,786 acres (4,629 miles) for perennial streams. The number is unknown for non-perennial streams.

The U.S. Army Corps of Engineers has jurisdiction over the "waters of the United States" including wetlands. Due to staffing constraints, the Corps conducts determination of jurisdictional waters and permit requirements on a case-by-case basis only. Therefore, potential areas of improvement within the study area would need to be submitted to the Corps on a project-specific basis. Tribal lands are not sub-

ject to Arizona's water quality laws, but are subject to EPA water quality regulations. The Arizona Department of Environmental Quality (ADEQ) seeks to work cooperatively with tribal governments in protecting the environment.

Figure II-10 illustrates the existing riparian areas along the US 191 Corridor. As indicated, the corridor has several riparian areas along the south end of US 191 near Springerville. The areas do include significant riparian habitat as well. It is the drainages (riparian areas) where most of the sensitive species reside. This riparian area along US 191 is also known as the Wenima Riparian Corridor.

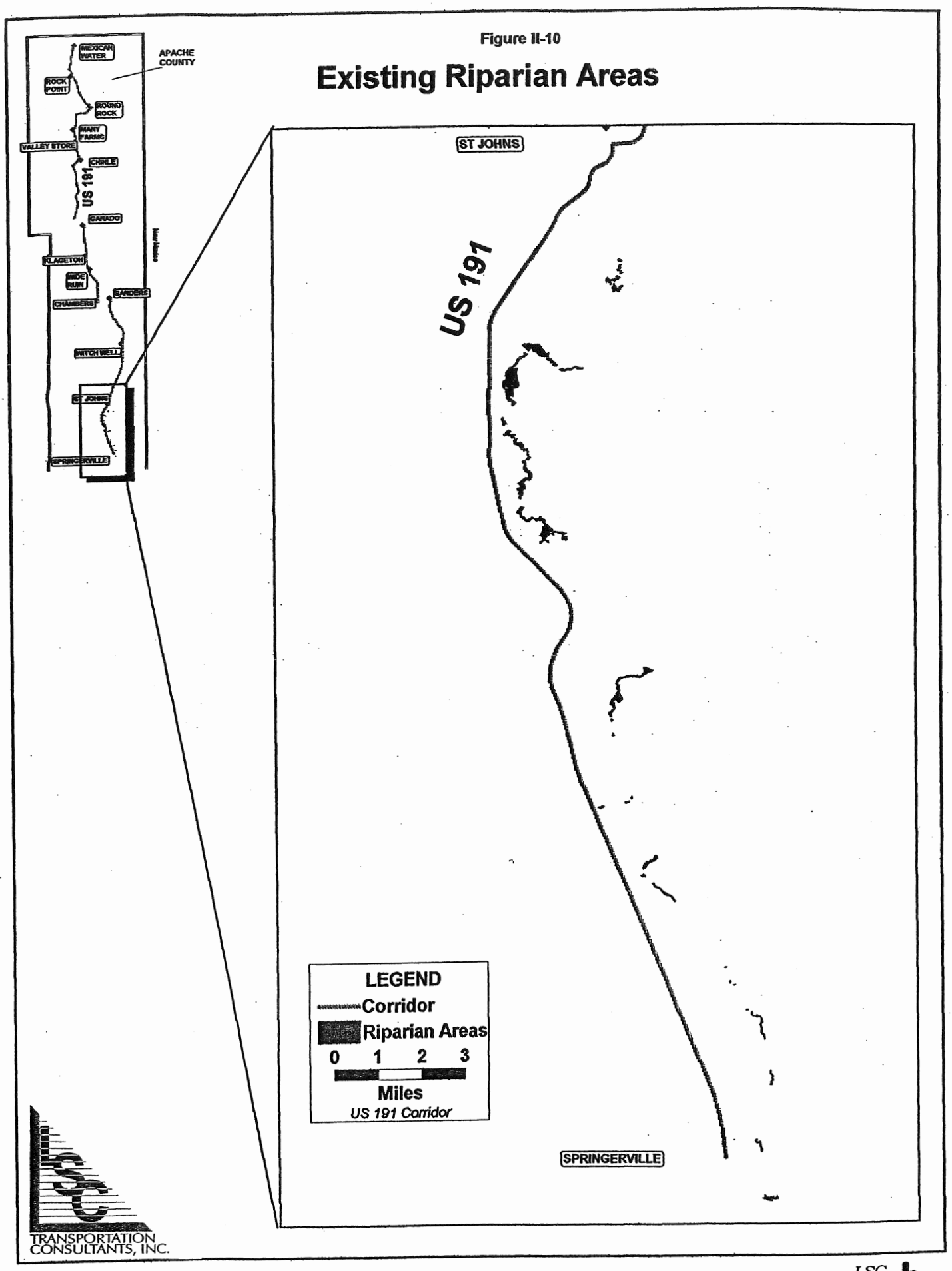
In 1992, Arizona legislation (Arizona Revised Statutes 45-101) established a definition of riparian areas and assigned various duties to state agencies in an effort to create a body of knowledge and to better understand riparian issues within the state. This statute includes the following definition:

> *"Riparian Area means a geographically delineated area with distinct resource values, that is characterized by deep-rooted species that depend on having roots in the water table or its capillary zone, and that occurs within or adjacent to a natural perennial or intermittent stream channel or adjacent to a lake, pond, or marsh bed maintained primarily by natural water sources. Riparian area does not include areas in or adjacent to ephemeral stream channels, artificially created stock ponds, manmade storage reservoirs constructed primarily for conservation or regulatory storage, municipal and industrial ponds, or manmade water and transportation, distribution, or off-stream storage and collection systems."*

The U.S. Environmental Protection Agency's Sole Source Aquifer Program was established under Section 1424(e) of the Safe Drinking Water Act (SDWA). Since 1977, it has been used to help prevent contamination of groundwater by federally-funded projects and to increase public awareness of groundwater resources. The US 191 Corridor is in EPA Region 9 which has nine designated Sole Source Aquifers. The US 191 Corridor is in the Little Colorado - San Juan Watershed. There are no unique waters in this watershed.

Figure II-10

Existing Riparian Areas



Groundwater basins within the watershed include the Little Colorado River Basin and a portion of the Coconino Plateau Basin. Special studies within the US 191 Corridor include:

- An ADEQ virus and parasite monitoring was performed in the vicinity of the Springerville Wastewater Treatment Plant. Human enteric viruses were detected near Nutrioso Creek.

- The USGS completed an investigation of residual radionuclide and trace element contamination of the Puerco River due to a tailings pond breach in New Mexico in 1979. The findings and conclusions of this study were presence of radioactivity is a potential concern for residents who drink water from shallow private wells that are less than 400 feet from the river near Chambers, Arizona. Other findings were natural radioactivity exceeding standards in some alluvial and bedrock wells near Sanders which were not affected by mining.

Some of the major ADEQ monitored surface water assessments for the US 191 Corridor include the Little Colorado River, Nutrioso Creek, and the Puerco River. According to ADEQ, one groundwater contaminant site is located within the US 191 Corridor. The site is located near St. Johns and has naturally occurring contaminant problems. The site has fluoride levels greater than 2.4 mg/l and radium readings from 5.67-34.6 pCi/l. ADEQ reports no existing registered dry wells within the US 191 Corridor.

H. Noise Receptors

According to the 1996 ADOT Noise Abatement Policy, regulation 23 CFR Part 722, *Procedures for Abatement of Highway Traffic Noise and Construction Noise*, provides procedures to help protect the public health and welfare, to supply noise abatement criteria, and to establish requirements for information to be given to local officials for use in the planning and design of highways.

Potential noise receptors have been defined as those inhabited structures and populations within 1,000 feet of the existing roadway. The US 191 Corridor passes through small developed communities containing residences, hospitals, schools, and other types of land uses which could be adversely affected by high noise levels. In the rural areas of the corridor, residences located near the roadway could also be adversely affected by high noise levels. Identifying specific noise receptors will require applying a detailed noise model to detailed design elements of the projects within the corridor.

I. Solid Waste Sites

There are three solid waste facilities within the US 191 Corridor, according to the ADEQ Directory of Active and Inactive Solid Waste Facilities. Table II-3 includes a list of facilities and the approximate location of the site. A collection point waste site is located north of Chinle. It is known as the Chinle Waste Transfer Station.

Table II-3
Solid Waste Facilities
US 191 – Springerville to Junction US 160 Corridor

County	Facility Name	Operator	Address
Apache			
	Apache County Blue Hills Regional	Apache County	St. Johns
	Springerville Generation Station	Tucson Electric Power	Springerville
	Coronado Generating Station	Salt River Project	St. Johns

Source: ADEQ Solid Waste Section, Directory of Active and Inactive Solid Waste Facilities, Oct. 1996.

J. Areas of Environmental Concern, Compliance Enforcement Actions, or Hazardous Waste Investigations

The Comprehensive Environmental Response, Compensation and Liability Information System (CERCLIS) involves potential and confirmed hazardous waste sites at which the Environmental Protection Agency Superfund program has some involvement. CERCLIS contains sites which are either proposed to be or are on the National Priorities List (NPL) and sites which are in the screening and assessment phase for possible inclusion on the NPL. There are no CERCLIS sites along the US 191 Corridor.

The Water Quality Assurance Revolving Fund (WQARF) Priority List identifies sites that are most in need of cleanup and proposes them to be added to the WQARF priority list. Table II-4 lists the active sites along the US 191 Corridor. Inclusion of any facility or site on the list does not mean that the location is contaminated, is causing contamination, or is in violation of state of federal statutes or regulations.

Table II-4
Sites/Facilities with Possible
Contamination of Soil, Surface Water, or Groundwater
US 191 - Springerville to Junction US 160 Corridor

County	Name	City
Apache		
	Salt River Project, Coronado Plant	St. Johns
	Transwestern Pipeline Co.	Klagetoh
	Chinle Abandoned Landfill	Chinle
	Ganado Community Dump	Ganado
	Nazlini Dip Vat	Ganado
	Steamboat Dip Vat	Ganado
	Puerco River Site	Sanders

Source: AZ CERCLA Information and Data Systems, May 1997.

Table II-5 lists sites and locations of the underground storage tanks within the US 191 Corridor.

Table II-5
Underground Storage Tank Facilities and Tanks
US 191–Springerville to Junction US 160 Corridor

County	Facility	Owner	Location
Apache			
	Big Lake	US Forest Service	Springerville
	Big Lake Tackle & Supply	William H Law	Springerville
	Bus Yard	Round Valley School District	Springerville
	Cerro Montosa Maintenance	ADOT Equipment Services	Springerville
	Church of LDS	Church of LDS	Springerville
	Circle K	Circle K Corporation	Springerville
	East Springerville Station	Becker Petroleum Products	Springerville
	Former Phelps Diesel Repair	Unknown	Springerville
	Giant Four Corners	Giant Four Corners, Inc.	Springerville
	Harper Enterprises	Merle Harper	Springerville
	Jim's Garage	Jim's Garage	Springerville
	Little River Stop N Go	Evans Bros, Inc.	Springerville
	Murphy True Value	H. Pappas	Springerville
	Old Fed Mart	Whiting Investments	Springerville
	PM Texaco	Patricia Miles	Springerville
	Sierra Exxon	Woody's Enterprises, Ltd	Springerville
	Springerville 66	Graves Oil Butane	Springerville
	Springerville Auto Supply	John Lang	Springerville
	Springerville Generating Station	Brown & Root USA, Inc.	Springerville
	Springerville Inn	Dhiraj Kalidas	Springerville
	Springerville Maintenance Facility	ADOT Equipment Services	Springerville
	Springerville Maverik Store	Maverik Country Stores, Inc	Springerville
	Springerville Municipal Airport	Town of Springerville	Springerville
	Springerville Service Center	Navopache Electric Cooperative	Springerville
	Springerville Town Yard	Town of Springerville	Springerville
	TNT Bulk Plant	TNT Bulk Plant	Springerville
	US Forest Service	US Forest Service	Springerville
	White Mountain Hereford Ranch	Dennis Sipe	Springerville
	White Mountain Hospital	White Mountain Hospital	Springerville
	Chambers Trading Post	Tony Konheiser	Chambers
	Chambers Yard	Apache County Roads Dept.	Chambers
	Bell Gas of Arizona	Bell Gall of Arizona	Chambers
	Englehard	Engelhard	Sanders
	Maintenance Yard Sanders School	Sanders Unified School District	Sanders
	Sanders Radio	AT&T Communications	Sanders
	Thriftway	Giant Four Corners, Inc.	Sanders
	Zuni Vortac	Fed Aviation Admin. Airway Fac.	Sanders
	7-2-11 Food Store	n/a	Many Farms
	Apache County Roads Dept.	Apache County Roads Dept.	Chinle
	Cottonwood Day School	BIA	Chinle
	Rock Point Community School	BIA	Rock Point
	Chinle Boarding School	BIA	Chinle
	Rough Rock Demo. School	BIA	Chinle
	Blue Gap Trading Co.	BIA	Chinle
	Canyon de Chelly Maint. Yard	n/a	Chinle
	Cheto Mines	n/a	Sanders
	Chinle District	n/a	Chinle
	Eddie Arthur Auto Service	n/a	Chinle
	Fleming Begaye & Co.	n/a	Chinle
	Ganado School District	Ganado School District	Ganado
	Greasewood Trading Post	n/a	Ganado
	Many Farms Elementary School	n/a	Many Farms
	Many Farms Trading Post	n/a	Many Farms
	Martinez Service Station	n/a	Chinle
	Mora's Conoco	n/a	Ganado
	Navajo Chinle Fleet Mgmt	n/a	Chinle
	Navajo Station	n/a	Ganado
	Rock Point Trading Post	n/a	Rock Point
	Thriftway	n/a	Ganado
	Thriftway	n/a	Many Farms
	Transportation Dept.	n/a	Chinle
	Westsun Store	Wendall Mortenson	Klagetoh

Source: ADEQ UST Facility and Tank List, Vol. 1 & 2, Jan. 1998.

According to the Department of Environmental Quality, the US 191 Corridor has five leaking underground storage tanks. Table II-6 lists each facility site.

Table II-6
Leaking Underground Storage Tanks
US 191 - Springerville to Junction US 160 Corridor

Facility Name	Location
Chambers Yard	Chambers
Maintenance Yard Sanders Schools	Sanders
Engelhard	Sanders
Zuni Vortac	Sanders
AT & T Sanders Radio	Sanders

Source: ADEQ, LUST File Listing, December 1998.

Table II-7 contains a list of hazardous materials incidents that have been recorded within the US 191 Corridor.

Table II-7
Hazardous Materials Incidents
US 191 - Springerville to Junction US 160 Corridor

County	Name	Incident
Apache		
	Giant Industries	Release of Diesel Fuel
	Navajo Engineering Construction	Release of DDT
	Unknown	Release of Sulfuric Acid
	E.I. DuPont DeNemours	Release of Acetic Acid
	Santa Fe Railroad	Release of Diesel Fuel
	ATSF Railroad	Chromic Acid Fire
	LW Miller Trucking	Release of Sulfuric Acid
	Energy Fuels Nuclear	Release of Uranium Ore
	Navopache Electric Coop	Release of Oil
	City of St. Johns	Release of Malathion
	Dimeh Construction Co.	Release of Asbestos
	Coronado Generating Station	Release of Sulfuric Acid
	BIA/ Facility Mgmt	Release of PCB
	Navopache Electric Coop	Release of Gasoline
	Unknown	Release of Gasoline
	Ganado Middle School	Threat of Misc. Lab Chemicals
	Unknown	Release of Ammonium Nitrate
	Sage Memorial Hospital	Threat of Misc. Chemicals
	Apache Co. Sheriff	Release of Drug Lab Waste
	AAD Disposal Co.	Release of Percholroethylene
	Unknown	Release of Meth Lab Dump
	Coronado Generating Station	Release of Chlorine
	BASF	Release of Paint
	Auto Zone	Miscellaneous Release
	Donco Carriers	Release of Paint
	Rinehart Trucking	Release of Diesel
	Marine International Tran	Release of Diesel
	Puerco Valley High School	Threat of Potassium
	Tucson Electric Power	Release of Sulfuric Acid
	Herman Brothers Trucking	Threat of Cyanide
	Springerville Inn	Release of Diesel
	Unknown	Threat of DDT
	US Express Enterprises Inc	Release of Soap Product
	DEA	Threat of Drug Lab Chemicals
	Praxair Trucking	Release of Nitrogen
	Unknown	Release of Emulsified Tack Coat
	Tucson Electric Power	Release of Mercury

Source: ADEQ Emergency Response Hazardous Material Incident Logbook, May 1998.

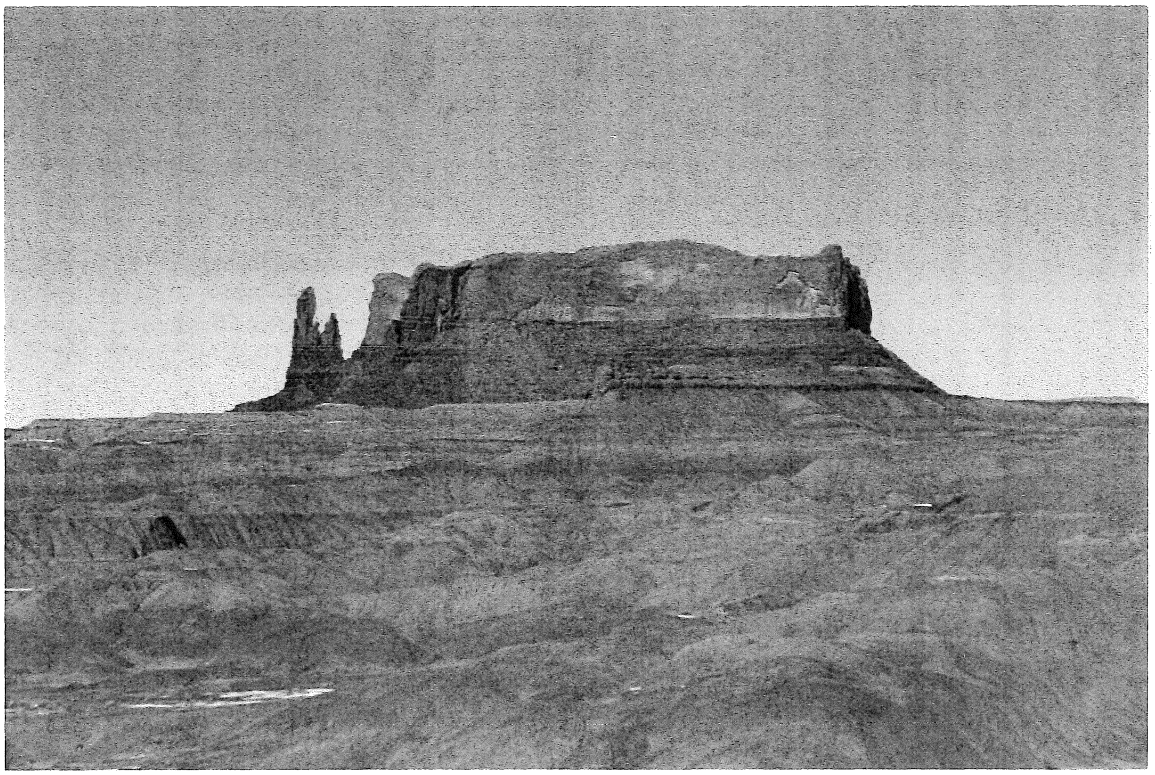
K. BLM Areas of Critical Environmental Concern

There are no Bureau of Land Management parcels in the US 191 study area of the corridor. As such, there are no **BLM-defined** areas of critical environmental concern.

L. Visual (Scenic) Resources

The resident or visitor appreciates the scenic character of the landscape throughout much of the 209-mile corridor. The US 191 Corridor north of Ganado to Chinle is designated as state Scenic Roadway. The remainder of the corridor has many "distinctive" scenic areas for local residents and visitors. Figure II-11 is an example of the scenic view along the corridor near Round Top Ridge.

FIGURE II-11



M. Air Quality Attainment Status

Non-attainment areas are areas which exceed any National Ambient Air Quality Standards (NAAQS) for any pollutant based upon the data collected through air quality monitoring. The US 191 Corridor does not contain any areas designated non-attainment.

IV. EXISTING TRANSPORTATION FACILITIES, SERVICE, AND CONDITIONS

A. Key Characteristics of State Highways Serving Corridor Traffic

This section includes characteristics of the roadways in the corridor including pavement condition, number of lanes, shoulder widths, speed limits, type of terrain, traffic accidents, roadway structures, average daily traffic volumes and projections, and vehicle classification data. These data have been divided into two categories—roadway data (supply characteristics) and traffic data (demand characteristics).

1. Roadway Data

a. Pavement Condition

The existing condition of the pavement surfaces of state highway segments in the corridor has been documented in Figure II-12. This figure shows, for roadway segments, the rating of the pavement surface on a scale from 0 to 5 with 0 being unusable and 5 being new. Table II-8 stratifies pavement ratings from 0 to 5. A moderate rating indicates that the pavement surface is barely tolerable for high speed traffic. Figure II-12 charts the existing pavement surface conditions on US 191 through the corridor.

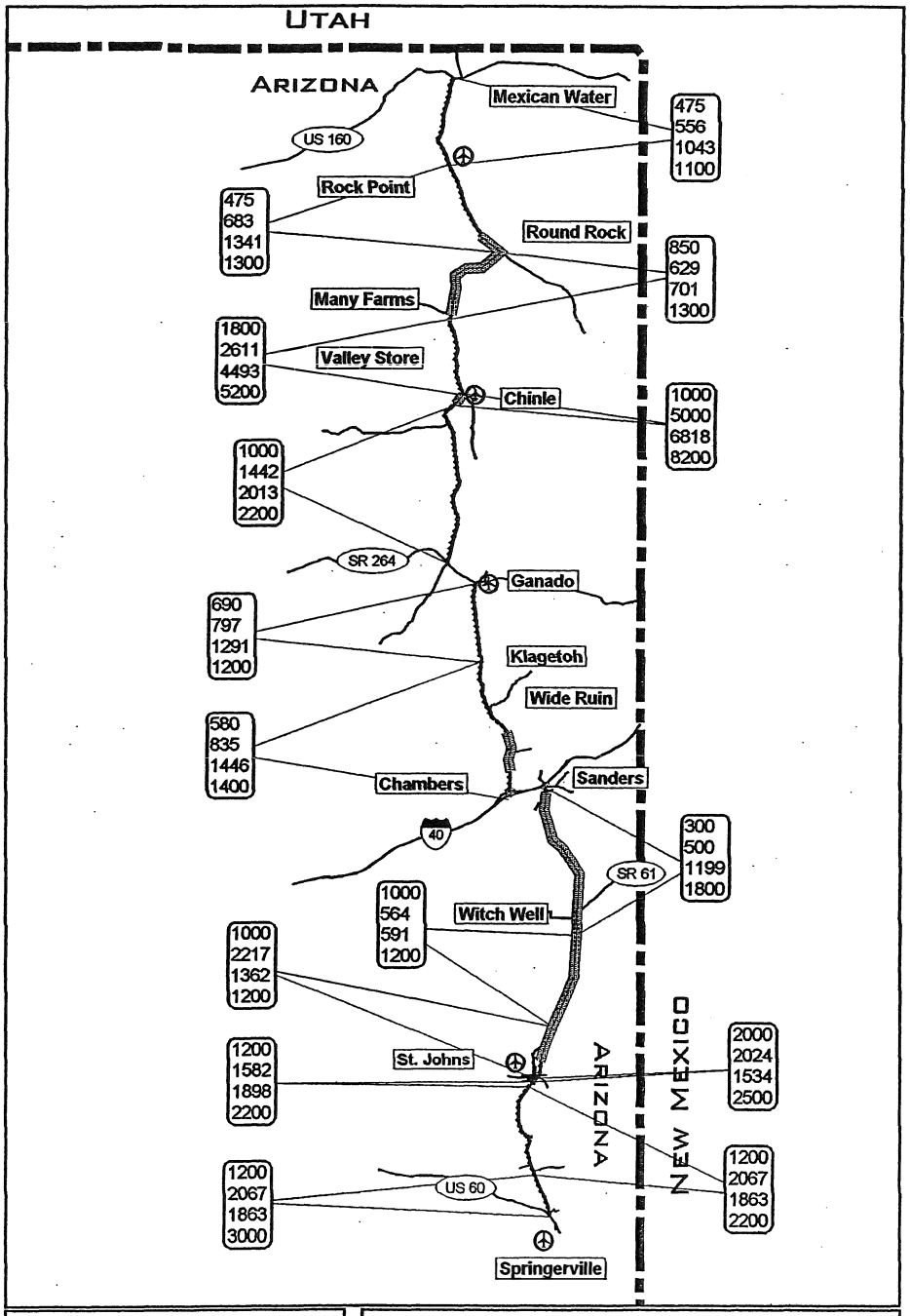
Table II-8
Pavement Condition Ratings

Pavement Rating	Condition
0.0 to 1.0	Very Poor
1.1 to 2.0	Poor
2.1 to 3.0	Moderate
3.1 to 4.0	Good
4.1 to 5.0	Excellent

Within the corridor, 78 miles of US 191 are rated "moderate" and 130.5 miles are rated "good."

Figure II-12

Pavement Conditions, Volumes and Facilities



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b. Cross Section Information

The cross sections of US 191 segments are primarily two-lane rural highway with no uphill passing lanes. The urbanized area of St. Johns has a brief four-lane cross section approximately from MP 370 to MP 369. The urbanized area of Chinle has a five-lane cross section from MP 446.5 to MP 448.5. There are no segments of the corridor with raised medians.

c. Speed Limit Data

Posted speed limits on state highway segments in the corridor vary depending on roadway design, number of accesses, the extent of urbanization, and other factors. The speed limit along rural portions of the corridor is primarily 65 mph. Approaching and within the communities of the corridor, the speed limits are appropriately reduced to between 55 and 35 mph.

d. Terrain Type

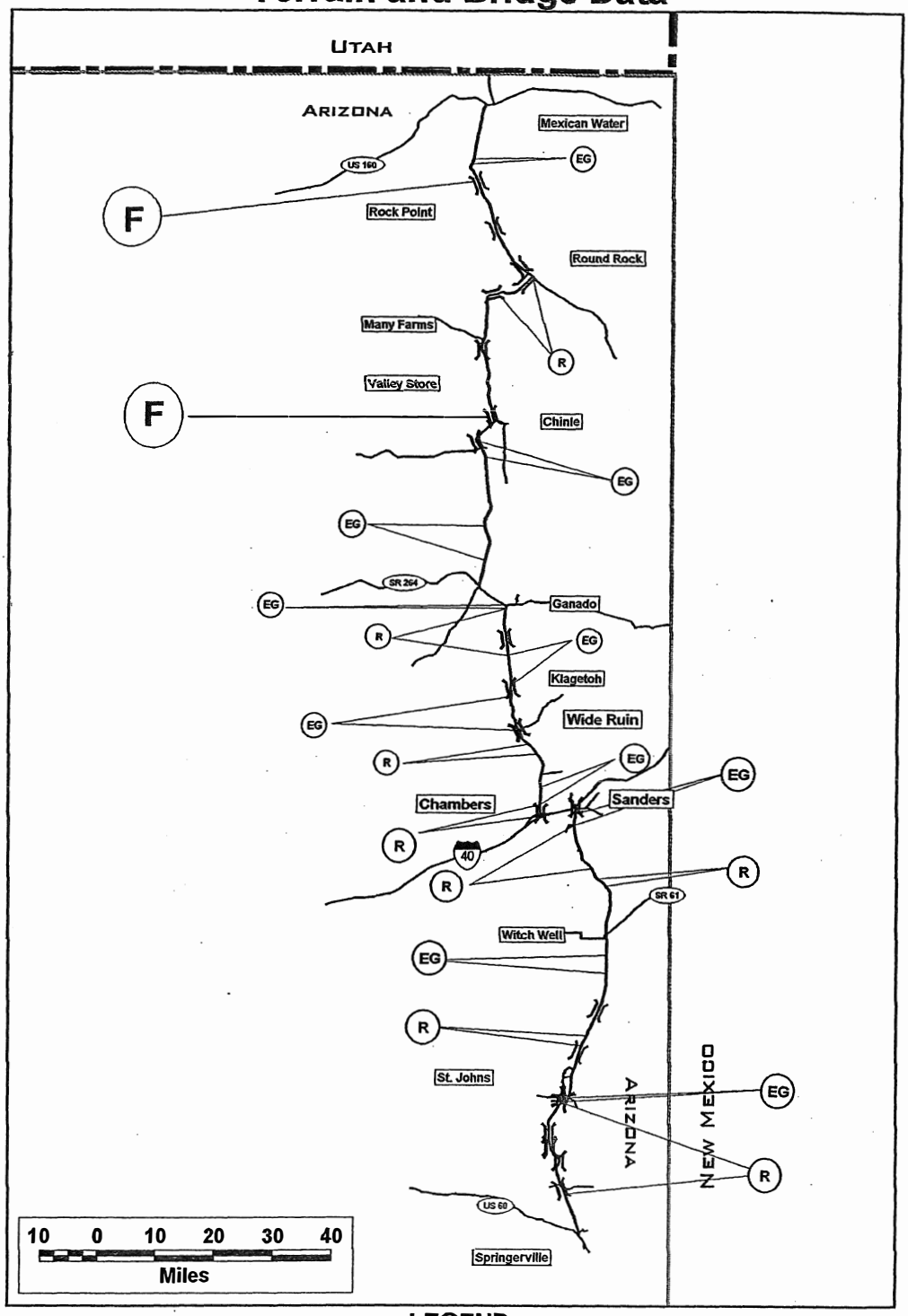
Figure II-13 shows the terrain type for sections of highway in the corridor. Terrain in the corridor is primarily level to rolling with a few extended grades. Although the extended grades are not severe, they have been separated from the perfectly level sections for analysis purposes. There are no extreme terrain conditions such as steep grades within the corridor.

e. Structures Information

Bridge locations on US 191 in the corridor are shown in Figure II-13. These bridge locations were taken from data supplied by ADOT.

Figure II-13

Terrain and Bridge Data



LEGEND

R - Rolling

EG - Extended Grade

All other segments are Level

)(Non-deficient Bridge

F Functionally Deficient Bridge

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2. Traffic Data

a. Accident Data

Accident data on US 191 in the corridor from 1991 to 1996 have been compiled and analyzed. Accident data have been analyzed to determine segments of roadway that warrant attention based upon these safety records. Through discussions with regional transportation officials, it was made apparent that accidents are not always reported on the reservations. For this reason, the recorded number of accidents on any segment may be lower than the actual number. An attempt was made to augment the data provided by ADOT, but no information was available that directly correlated to the number or location of accidents.

Documented accident data are shown in Table II-9. The table shows areas of the corridor where accidents have occurred. These segments of roadway have been classified by accident frequency according to Table II-10. This table shows the accident frequency relative to a range of number of accidents per million vehicle-miles of travel (VMT).

Table II-9
Accident Data

Sect #	From	To	Segment Length	Number of Accidents	Number of Vehicles	Accident Rate	Category
1	394	387	7	0	1,000	0.00	Very Low
2	387	385	2	2	1,000	0.46	Very Low
3	385	371	14	16	1,000	0.52	Very Low
4	371	370	1	1	1,000	0.46	Very Low
5	370	369	1	0	1,000	0.00	Very Low
6	315.5	325	9.5	1	2,001	0.02	Very Low
7	325	327	2	0	1,716	0.00	Very Low
8	327	338	11	4	1,716	0.10	Very Low
9	338	341	3	3	1,716	0.27	Very Low
10	341	353	12	1	994	0.04	Very Low
11	353	355	2	0	994	0.00	Very Low
12	355	357	2	1	994	0.23	Very Low
13	357	365	8	1	994	0.06	Very Low
14	365	367	2	0	994	0.00	Very Low
15	367	368.5	1.5	1	994	0.31	Very Low
16	374	376	2	0	1,150	0.00	Very Low
17	376	379	3	0	1,150	0.00	Very Low
18	379	385	6	0	1,150	0.00	Very Low
19	385	387	2	0	1,150	0.00	Very Low
20	387	390	3	0	1,150	0.00	Very Low
21	390	396	6	0	1,150	0.00	Very Low
22	396	398	2	2	1,150	0.40	Very Low
23	398	403	5	3	1,047	0.26	Very Low
24	403	411	8	3	1,047	0.16	Very Low
25	411	411.5	0.5	1	1,047	0.87	Very Low
26	417.5	422	4.5	8	2,063	0.39	Very Low
27	422	426	4	0	2,063	0.00	Very Low
28	426	428	2	0	2,063	0.00	Very Low
29	428	440	12	4	2,063	0.07	Very Low
30	440	443	3	2	2,063	0.15	Very Low
31	443	446.5	3.5	1	2,063	0.06	Very Low
32	446.5	448.5	2	4	6,514	0.14	Very Low
33	448.5	461	12.5	29	3,440	0.31	Very Low
34	461	462.5	1.5	4	3,440	0.35	Very Low
35	462.5	471	8.5	15	825	0.98	Very Low
36	471	472	1	2	825	1.11	Very Low
37	472	478	6	4	825	0.37	Very Low
38	478	495	17	7	954	0.20	Very Low
39	495	496	1	0	781	0.00	Very Low
40	496	500	4	2	781	0.29	Very Low
41	500	501	1	0	781	0.00	Very Low
42	501	510.5	9.5	4	781	0.25	Very Low

Table II-10 Accident Ratings	
Accidents per Million VMT	**Accident Frequency**
0.0 - 1.15	Very low
1.16 - 1.74	Low
1.75 - 2.00	Moderate
2.01 - 4.00	High
> 4.00	Very high
Source: Arizona Department of Transportation, 1991-96	

To calculate accident rates (accidents per million vehicle-miles), the available data were converted. AADTs for the years 1991 through 1996 were averaged by road segment. The total vehicle-miles traveled was then computed by taking the product of the average AADT values, the road segment length (in miles), and the number of days per year. The average number of accidents per year, per road segment (1991-96) was computed. Then an accident rate could be calculated (accidents/total vehicle-miles) and converted proportionally to standard terms (accidents per million vehicle-miles). There was one fatal accident in this corridor for the six years of data.

Of the 126 accidents in the database, 106 occurred during the nighttime hours. Similarly, 15 of the 16 recorded injuries happened during the night. All but one of the accidents involved a single vehicle. Weather was a possible contributing factor in only 21 of the 126 accidents.

b. Average Daily Traffic

Figure II-12, previously shown, illustrates past, present, and projected future average daily traffic volumes on selected highway segments in the corridor. Volumes from 1976, 1986, 1996, and projected 2013 traffic volumes are shown. Currently, US 191 carries about 1,000 to 2,000 vehicles per day (vpd), average annual daily traffic (AADT), through most of the corridor. Volumes on US 191 in Chinle are about 6,800 vpd.

Future growth in the region is expected to be minimal. Slight decreases in traffic volumes are predicted for some sections of the highway.

c. 1998 Traffic Data

LSC conducted weekday traffic counts in December 1998 at the intersection of US 160 and US 191. The results of those counts are summarized in Table II-11.

Table II-11

1998 Daily Traffic Volume Counts

Location	Route	Mile Post	Field ADT NB	Field ADT SB	Total ADT	Adjusted ADT *	Peak-Hour Directional Split N/S
Mexican Water	US 191 s/o US 160	510	490	438	928	1,205	35/65

** - An adjustment factor of 1.2985 was used to account for seasonal variations*

B. Public Transportation and Private Intercity Bus

1. Intercity Bus

Intercity operators within the US 191 Corridor include the Navajo Transit System and Greyhound Bus Lines. Greyhound Bus Lines provides limited services in the US 191 Corridor, between Sanders and Chambers.

The two operators serving the US 191 Corridor provide limited service to Ganado, Chinle, Many Farms, Valley Store, Klagetoh, Wide Ruin, Chambers, and Sanders. Greyhound Bus routes do not travel on US 191, but travel from Chambers to Sanders on I-40.

The Navajo Transit System uses the US 191 Corridor sparingly. The scheduled routes travel east/west on Highway 264 through Ganado from Window Rock to Tuba City. The route serving the Chinle area travels east/west using Highway 64 and 59. The Navajo Transit System does not currently serve Chambers or Sanders. The route serving these towns was discontinued in 1997 due to lack of ridership. The bus schedule for the major stops only is shown in Table II-12.

Table II-12 Navajo Transit Bus Schedule for Major Routes		
Route	**Read Down**	**Read Up**
#1 – Tuba City	6:00 a.m.	7:00 p.m.
Kykotsmoui	7:11 a.m.	5:55 p.m.
Keams Canyon	8:00 a.m.	5:10 p.m.
Ganado	9:10 a.m.	3:51 p.m.
Window Rock-Fed	9:50 a.m.	3:10 p.m.
#2 – Toyei	6:15 a.m.	6:55 p.m.
Ganado	7:00 a.m.	6:10 p.m.
Window Rock-Fed	7:40 a.m.	5:30 p.m.
#3 – Kayenta Thriftway	6:00 a.m.	7:15 p.m.
Chinle-Baldwin's	7:45 a.m.	5:31 p.m.
Ft. Defiance	9:30 a.m.	3:35 p.m.

Source: ADOT Intercity Bus Analysis, 1995.

2. General Public Service and Other Transportation Providers

The US 191-Springerville to Junction US 160 Corridor has several general public transportation operators within the study limits. These include:

- Navajo Transit System - Chinle, Ganado, Chambers
- Navajo Area Agency on Aging
- Chinle Nursing Home
- St. Michael's Association for Special Education
- Toyei Industries, Inc.
- City of St. Johns Emergency Service
- Sanders Unified School District
- Saferide
- Ganado Unified School District
- Navajo Nation Headstart Programs
- Wide Ruins Community School

The *Navajo Transit System (NTS)* also provides general public service; however, US 191 is used sparingly by the NTS system. NTS has local public transit service for the Window Rock and Fort Defiance areas only. As stated previously, the scheduled NTS routes travel east/west on Highway 264 through Ganado from Window Rock to Tuba City. The route serving Chinle travels east/west using Highways 64 and 59.

The *Navajo Area Agency on Aging* provides transportation for on-site and home delivered meals and general transportation services for recreational, social, educational, and medical purposes. One of the regional offices for NAAA is in Chinle. The Chinle regional agency provided 31,179 one-way passenger-trips in the 1994-95 fiscal year.

The *Chinle Nursing Home* provides transportation for the residents of the home. The demand-responsive service is available seven days a week at no cost to the resident. The agency operates three vehicles, one of which is wheelchair accessible. Occasionally, Safe-Ride is requested to help with providing transportation. The Chinle Nursing home provides a total of 2,600 passenger-trips annually. Operating costs are covered by a contract with the Navajo Tribe.

The *St. Michael's Association for Special Education* serves the Northeast Arizona Navajo Reservation. The fixed-route and schedule service is provided Sunday through Friday. All passengers are disabled, and no fare is charged for the service. The school operates 15 vehicles; six cars, two vans, and seven buses. Two full-time and eight part-time drivers are employed by the school. Operating funds are provided by the tribe, the State of Arizona public schools, and Bureau of Indian Affairs.

Toyei Industries provides programs and services for tribal members on the Navajo Reservation. Demand-response transportation service is available daily to disabled persons. The agency operates four vans, one of which is currently wheelchair accessible. Another van will soon be converted for wheelchair accessibility. One van was provided through Section 16 program by the Arizona Department of Transportation, one van is leased, and two of the vans were purchased with tribal grants. A total of 3,650 annual passenger-trips are provided.

The *City of St. Johns Emergency Service* provides fire suppression, rescue, and pre-hospital medical care and transportation in St. Johns and the surrounding area. This demand-responsive service is available 24 hours a day, 365 days a year. General transportation service is not provided.

The *Sanders Unified School District* provides school bus service for students Monday through Friday, with morning, afternoon, and "late" runs. There is no fare charged for the fixed-route service. The district operates 17 buses, none of which are wheelchair accessible. A total of 600 one-way passenger-trips are provided annually. Operating costs are funded by the State of Arizona.

3. Future Needs

The Intercity Bus Analysis report concludes that intercity bus services are an important state resource that should be continued, if not expanded. The report recommends that the state coordinate with intercity bus providers regarding the planning and development of all transportation modes and facilities.

The Northern Arizona Transit Development Plan suggests that additional local public transportation of all types is needed. Transportation for elderly, disabled, and medical trips appears to be the most pressing need.

The Northern Arizona TDP identified the following needs for the US 191 Corridor.

- Need to provide transportation other than work commute trips for trips such as shopping, medical, or personal business trips.
- Need to coordinate fixed routes and paratransit routes between transportation providers.
- Need for the Navajo Nation to upgrade existing equipment.
- Need to maintain connectivity to medical, work, and service centers for residents living in remote locations.
- Expand and coordinate existing senior services.

The 1994 State Transportation Plan generally reaffirms the need for planning to include both passenger and freight transportation, to maximize efficiency, effectiveness, and function of the corridor, and to identify environmental issues, with inclusive planning and public input being required as part of the decision making process.

C. Rail Freight Service

The US 191-Springerville to Junction US 160 Corridor includes the Burlington Northern/Santa Fe Railway which runs east/west through Sanders and just south of Chambers. The second rail line crosses the US 191 Corridor between Witch Well and St. Johns and is associated with the local fossil-fueled electric-generating plants.

D. Pipeline Facilities

Within this corridor there are three different pipelines. The El Paso Gas Company has a major pipeline running east/west from the Window Rock area toward Flagstaff. It crosses US 191 south of Ganado. The same company has a north/south pipeline running between Ganado and Chinle east of US 191. The northern ter-

minus is within the corridor study area but does not cross US 191. The third pipeline is owned by ENRON and crosses US 191 in the area of Klagetoh.

E. Bicycle and Pedestrian Facilities

Bicycles are permitted on all state highways within the US 191 Corridor. Some roadway segments are more suitable than others for bicycle travel. The Governor's Arizona Bicycle Task Force, in cooperation with ADOT, has identified sections of the corridor (as well as the remainder of the state) as being either more suitable or less suitable for bicycle travel.

These classifications are based on the combined effects of three factors: traffic volume (the average number of cars per day per lane), lane width (center line to outside of paved surface including shoulder), and the percentage of commercial vehicles to total traffic volume. The factor for lane width was weighted twice the other two.

Cycle Arizona (1998), which contains suitability ratings and gradient information for cyclists, is a publication of Arizona Department of Transportation. The Suitability Map shows that US 191 – Springerville to Sanders is "more suitable" for bicycles. From Chambers north to Junction US 160, US 191 is rated "less suitable" for bicycles. Although traffic volumes are quite low, there is little shoulder on US 191 between St. Johns and Sanders. Therefore, this section should likely be rated as "less suitable."

Pedestrian walkways, mostly sidewalks, are located solely in St. Johns and Chinle. These sidewalks are not appropriate for bicycles as a transportation mode as they are narrow and contain numerous curb cuts which disrupt the continuity of the travel path. There is sufficient pavement width for bicycle use in St. Johns. Certainly, there are many walkways not located adjacent to roadways, such as trails and pedestrian paths, but these facilities do not serve a primarily transportation function and are not counted as walkways for the purposes of this report.

F. Aviation Facilities

Airports in the corridor include the Springerville-Eagar Municipal Airport and the St. Johns Industrial Airpark. These locations are illustrated in Figure II-12, previously shown. Residents of Springerville and the surrounding area have access to the Springerville Municipal airport with a lighted and paved 6,600-foot runway, and a 5,600-foot paved crosswind runway. The St. Johns Industrial Airpark has

a lighted and paved 5,320-foot runway. Airports located on the Navajo Reservation within the US 191 Corridor include the Rock Point Airport, Chinle Airport, and Ganado Airport.

G. Intermodal Facilities

There are no existing intermodal facilities within the US 191 Corridor. The State of Arizona does not have an overall state policy guiding coordination of shuttle companies, airlines, intercity bus companies, and rail. Even for the different intercity bus companies that serve the same location, the service is overly fragmented and, more often than not, utilizing different facilities in the same town or city.

The Arizona State Transportation Plan, December 1994, acknowledges the need for a more efficient use of existing facilities and the future need for intermodal transfer capabilities. This will be needed to accommodate the projected growth over the next 20 years. Intermodal sites must have the ingredients of multiple modes (intercity bus, rail, airlines, local public transit, taxicabs, airport shuttle service, etc.), non-integrated service delivery systems, and existing facilities that could handle the service of each mode.

V. PLANNED OR PROGRAMMED TRANSPORTATION IMPROVEMENTS

A. State Highway Improvements (ADOT Five-Year Program)

The only major project included in the ADOT Five-Year Program for the US 191-Springerville to US 160 Corridor is resurfacing from MP 362 to MP 382 with an ARAC overlay and seal coat. Slight geometric improvements are included in this 1998 fiscal year project. Total cost is $3,955,000.

B. Public Transportation Improvements

Primary public transportation needs are discussed previously in this chapter. Currently there are no other public transportation projects which are planned within the US 191 Corridor.

C. Planned Pedestrian or Bicycle Facility Improvements

The Arizona Department of Transportation does not have specific pedestrian facility improvements planned within the corridor. As discussed previously, ADOT

does not designate bicycle facilities, and therefore does not have bicycle facility improvements planned within the corridor. However, accommodations for bicyclists (e.g., paved shoulders) are generally included as part of roadway improvement projects.

D. Planned Airport Improvement Projects

Two airports in the corridor, located in St. Johns and Springerville, have significant planned improvements. Table II-13 lists the projects identified in the Arizona Five-Year Airport Development Program, FY 1998-2002.

Table II-13
Five-Year Airport Development Program

Airport	Year	Project Description	Total Cost
St. Johns	1999	Grade, drain and surface apron	$600,000
Springerville	1999	Land acquisition; fencing; grade, drain and surface road	$769,022
St. Johns	2000	Grade, drain and surface runway	$675,000
Springerville	2000	Grade, drain and surface taxiway, apron and runway extension	$1,136,330
St. Johns	2001	Surface taxiway	$220,000
Springerville	2001	MITL; GVGI; REIL	$1,503,942

MITL - Medium Intensity Taxiway Lights
GVGI - General Visual Glideslope Indicator
REIL - Runway End Identifier Lights

Source: Arizona Airport Development Program FY 1998-2002

Chapter III

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CHAPTER III

Analysis of Existing and Projected Needs and Deficiencies

I. EVALUATION OF EXISTING NEEDS AND DEFICIENCIES

A. Congestion and Capacity Deficiencies

Congestion and capacity deficiencies were evaluated using the procedures presented in the 1994 and 1997 *Highway Capacity Manual Special Report 209,* 3rd Edition, published by the Transportation Research Board. The analysis procedures for multilane rural and two-lane rural highways were utilized to determine the existing (1996) and 2013 projected levels of service on roadway segments and key intersections in the corridor. Level of service (LOS) is a measure of the amount of congestion on a highway facility. Level of service is rated on a scale from "A" to "F." For highway segments, LOS A is indicative of low traffic densities, motorists traveling at or close to desired speeds, and low percent of time delay. LOS F indicates high densities and most vehicles traveling below their desired speed. ADOT desires a LOS C or better on its highways. Complete descriptions of LOS are provided in Appendix A.

ADOT annual average daily traffic volumes, as shown in Chapter II, were used as a basis for projecting 2013 traffic volumes used in the LOS analysis. Peak-hour volume as a percent of peak seasonal traffic volume and directional split were obtained from ADOT traffic counts in the corridor. Table III-1 shows the results of the 1996 LOS analysis for the annual average daily traffic and 2013 projected levels of service. Figure III-1 illustrates the peak-hour level of service based on 1996 peak season average daily traffic. Vehicle classification information was taken from data provided by ADOT.

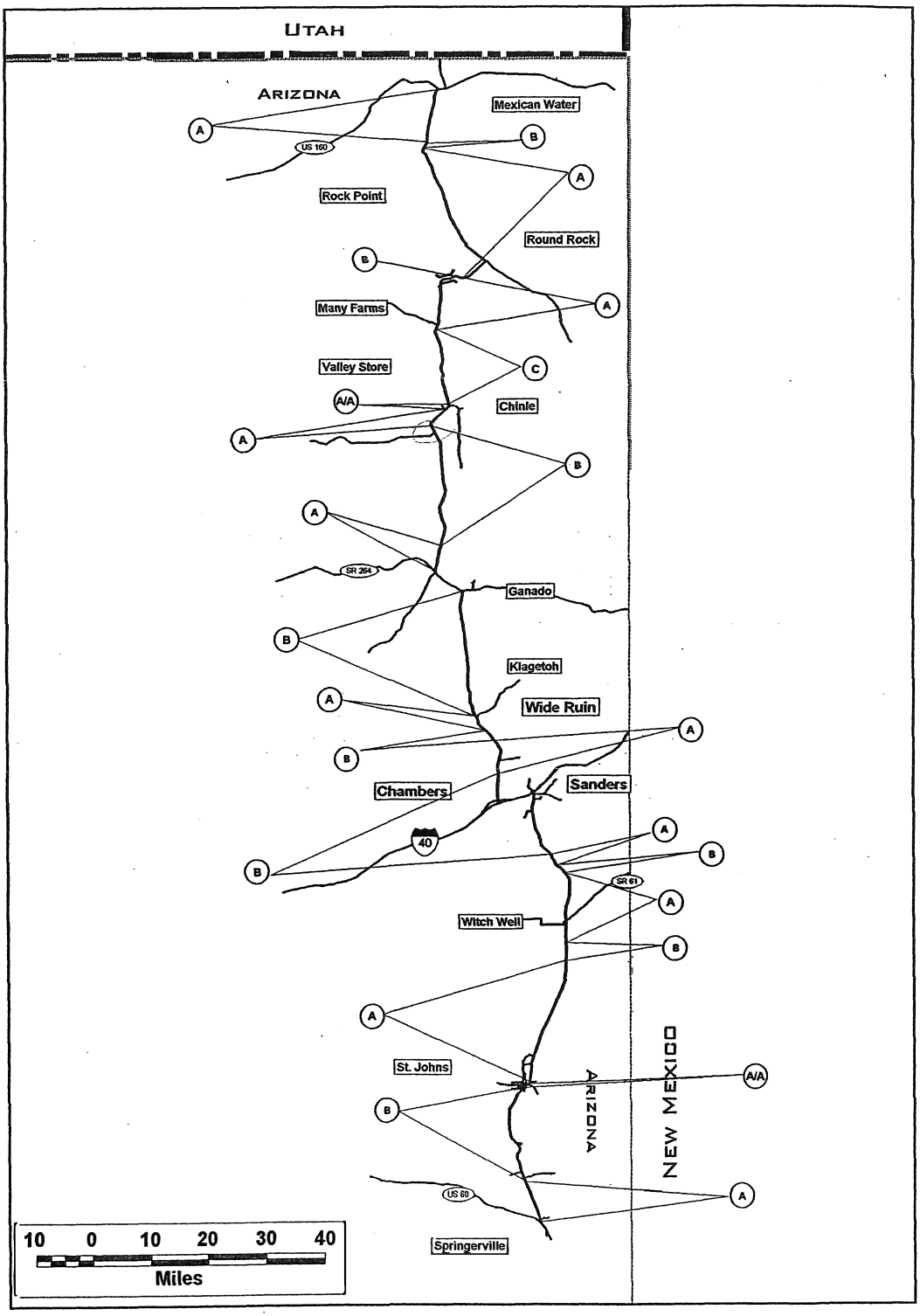
Table III-1
1996 and 2013 Level of Service

From MP	To MP	Lanes	Speed	Terrain Type	1996 LOS	2013 LOS
394	387	2	65	Level	A	B
387	371	2	65	Rolling	B	B
371	370	2	55	Rolling	B	B
370	369	4	35	Hill	A/A	A/A
315.5	325	2	55	Level	A	A
325	327	2	55	Rolling	A	A
327	338	2	65	Level	A	A
338	341	2	65	Hill	B	B
341	353	2	65	Level	A	B
353	355	2	65	Rolling	B	B
355	357	2	65	Level	A	B
357	365	2	65	Rolling	B	B
365	367	2	55	4% Grade	B	B
367	368.5	2	35	Level	B	B
374	376	2	50	Rolling	B	B
376	379	2	65	Level	B	B
379	385	2	65	Level	A	A
385	387	2	65	Rolling	B	B
387	390	2	65	Level	A	A
390	396	2	65	Composite Grade	B	B
396	398	2	50	Level	B	A
398	403	2	65	Composite Grade	B	B
403	411	2	65	Rolling	B	B
411	411.5	2	45	Hill	B	B
417.5	422	2	65	Level	A	A
422	426	2	65	Hill	B	B
426	428	2	65	Hill	B	B
428	440	2	65	Level	B	B
440	443	2	65	Hill	B	B
443	446.5	2	65	Level	A	A
446.5	448.5	5	45	Level	A/A	A/A
448.5	461	2	65	Level	C	C
461	462.5	2	65	Level	A	A
462.5	471	2	65	Level	A	A
471	472	2	55	Rolling	B	B
472	478	2	65	Rolling	A	A
478	495	2	65	Level	A	A
495	496	2	45	Level	A	A
496	500	2	65	Level	A	A
500	501	2	65	Hill	B	B
501	510.5	2	65	Level	A	A

Level of Service based on Seasonal Peak-Hour Volume.

Figure III-1

1996 Level of Service



LEGEND

C - Section level of service

A/A - Eastbound LOS/Westbound LOS

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Table III-1 shows that the LOS is generally the same or worse during peak periods than on an average daily basis. There are no segments in the corridor with LOS D or worse.

Access Control

Arizona is one of many states which does not have strong access control powers. Access control is an issue in the communities of Chinle, St. Johns, and all of the smaller towns with frontage along US 191. The traffic volumes along US 191 are not high, but access control is directly related to safety.

Within each of these communities there are numerous direct access points to the state highways with no other means of property access. As the number of access points along a road increases, the roadway capacity decreases and the number of vehicular conflicts increases. Frequent access points along a street can significantly decrease the capacity of a roadway.

B. Geometric and Structural Elements Failing to Conform to AASHTO Design Standards

There is only one road improvement project currently planned or underway in the corridor. This project is identified in Chapter II. However, exclusive of this project, there are several sections of highway that still do not meet AASHTO standards.

The majority (176 of 208.5 miles) of US 191 has existing shoulders less than six feet, the AASHTO minimum standard. The sections with sufficient shoulders are:

MP 394 - MP 371 (US 60 northward)
MP 365 - MP 368.5 (Sanders area)
MP 379 - MP 385 (North of Chambers)

C. Functionally Obsolete or Structurally Deficient Bridges

Figure II-13, shown in Chapter II, illustrates the bridges on US 191 within the corridor. Of the total number of bridges, two are functionally obsolete. No bridges are structurally obsolete. The information in the previously-cited figure is based upon the Bridge Management System (BMS) database available from ADOT.

No functionally-obsolete culverts, overpasses, or viaducts have yet been identified separate from the above-mentioned bridges.

D. Pavement Deficiencies

The Highway Performance Management System database was used to rate pavement condition on US 191 in the corridor. Chapter II presents pavement conditions as one of "Very Poor", "Poor", "Moderate", "Good", or "Excellent." The pavement condition on roads in the corridor is generally good. Table III-2 identifies the roadway segments by pavement condition category.

Table III-2
Pavement Condition

From Milepost	To Milepost	Pavement Condition
394	319	Good
319	367	Moderate
367	368	Good
368	368.5	Moderate
374	375	Moderate
375	378	Good
378	385	Moderate
385	411.5	Good
411.5	446	Good
446	447.5	Moderate
447.5	462	Good
462	482	Moderate
482	510.5	Good

Source: Arizona Department of Transportation

E. High Accident Locations

Accident data over the period from 1991 to 1996 were analyzed in Chapter II. Accident rates were calculated by dividing the annual average number of accidents by the average annual traffic volume over the same period. The accident rates indicated in this report may be lower than the actual rates due to a problem with unreported accidents on the reservations. Supplemental information was unavailable to augment the ADOT database so the ADOT figures were used as presented. The accident rates were assigned to one of five frequency categories. From that assignment, no high accident locations were identified.

Although, there are no sections of highway with an accident frequency rating worse than "low", the consistent type of accident can be addressed. Approximately 67 percent of all accidents were single-vehicle, nighttime accidents with clear road conditions. The installation of delineating posts and/or recessed center-line

reflectors would aid nighttime navigation through the corridor. The installation of rumble strips along improved shoulders would reduce the number of accidents due to drivers falling asleep at the wheel.

The database, provided by ADOT, does not include details of accidents such as vehicle type, alcohol involvement, or wildlife involvement. As a result, it is difficult to recommend other specific improvements such as truck speed limits, education or extensive fencing.

F. Drainage Concerns

The Holbrook District Engineer indicated that between MP 340.5 and 365 there are numerous pipe and box culverts with problems. The terrain is higher than the roadway in sections which cannot be remedied without rebuilding the roadway.

G. Suitability for Bicycle Traffic

While bicycles are permitted on all highways within the corridor, some segments are more suitable than others.

According to the *Arizona Bicycle Facilities Planning & Design Guidelines* (1988), the minimum desirable bicycle lane width is four feet (1.2 meters), where the roadway shoulder, if paved, can provide additional maneuvering width. For roadways without curbs or gutters, the minimum recommended width is five feet (1.5 meters), again, not including paved shoulders. Additional widths are desirable where motor vehicle speeds exceed 35 mph (55 km/h). The US 191 Corridor generally does not have adequate pavement width for bicycles.

In some locations, where the shoulders are wider, ADOT roadway design has implemented shoulder rumble-strips. Although these do increase motor vehicle safety, they decrease the utility of the road for cyclists because of safety concerns.

H. Adequacy of Pedestrian Facilities

Few of the developed areas along the US 191 Corridor provide sidewalks. Pedestrian issues are of particular concern in Chinle. The high number of vehicle access points makes for added potential pedestrian conflicts. Most of the sidewalks directly front roadways with vehicles traveling in excess of 35 mph (55 km/h). Finally, the opportunities for crossing are limited. There is only one signal in Chinle. Not only are pedestrians crossing between intersections, they are forced to use the two-way, left-turn lane as their refuge.

I. Unmet Public Transportation Needs

Intercity Bus

As established in Chapter II, there are two existing intercity bus providers, Navajo Transit System and Greyhound Bus Lines. The providers serve Chinle and Ganado, but do not travel on the US 191 Corridor. It is recommended that regional intercity service be expanded with more hours of service and additional days of service. No estimates are available to gauge the level of latent intercity demand that is not currently served. Unmet needs for the elderly, disabled, and low-income populations are discussed in detail within Chapter II. Establishing a transit center in Springerville could provide transit services which could tie in with regional transit services to Phoenix and other urban areas.

J. Traveler Services

Other than the small towns, there is a lack of traveler services in the US 191 Corridor. Additional traveler information services are needed.

II. ESTIMATION OF FUTURE (20-YEAR) TRAVEL DEMAND

A. Estimation of Current Number of Daily Person-Trips

There currently are no vehicle occupancy data available for the US 191-Springerville to US 160 Corridor. It is estimated that vehicle occupancy for automobiles is 1.5 persons per vehicle. Using this figure combined with actual AADT, the annual average number of daily person-trips has been estimated. These estimates are shown in Table III-3. The vehicle occupancy of trucks is estimated to be one person per vehicle.

Table III-3

Current Average Number of Trips per Day

US 191-Springerville to Junction US 160 Corridor

Highway Segment From MP	To MP	Daily Person-Trips
394	387	2,795
387	371	2,795
371	370	2,847
370	369	2,301
315.5	325	2,043
325	327	887
327	338	887
338	341	887
341	353	1,799
353	355	1,799
355	357	1,799
357	365	1,799
365	367	1,799
367	368.5	1,799
374	376	2,169
376	379	2,169
379	385	2,169
385	387	2,169
387	390	2,169
390	396	2,169
396	398	2,169
398	403	1,937
403	411	1,937
411	411.5	1,937
417.5	422	3,020
422	426	3,020
426	428	3,020
428	440	3,020
440	443	3,020
443	446.5	3,020
446.5	448.5	10,227
448.5	461	6,740
461	462.5	1,052
462.5	471	1,052
471	472	1,052
472	478	1,052
478	495	2,012
495	496	1,565
496	500	1,565
500	501	1,565
501	510.5	1,565
Average Per Mile		2,395

B. Estimation of Current Modal Split

There is an almost insignificant mode split in this corridor. There is no passenger rail service in the corridor, and there are no data available for the percentage of pedestrian or bicycle travel in the corridor. Due to the long trip lengths and rural nature of areas outside of built-up areas of Chinle, Chambers, Sanders, St. Johns, and Springerville, it is assumed that bicycle/pedestrian trips are limited to these local areas. There is limited intercity bus service. However, neither transit provider traverses US 191. These factors indicate that 100 percent of the trips occur by automobile/truck.

C. Estimation of Future Person-Trips and Vehicle-Trips

The estimates for existing vehicle occupancies and classification percentages were assumed for 2013 estimates within the US 191 Corridor. ADOT 2013 AADT projections and these values were used to estimate the annual average daily number of person-trips. The 1998 Navajo Nation Long-Range Comprehensive Transportation Plan identifies two proposed transit routes traveling from Chinle to Window Rock, which would travel on US 191 from Chinle to Ganado. The second route is proposed for Klagetoh to Window Rock, which would travel on US 191 from Klagetoh to Sanders. The future estimates for the average number of trips per day are shown in Table III-4. This table also illustrates the estimates of the number of person-trips by mode for the proposed transit routes. Intercity bus average trips per day are estimated at one percent of the total daily person-trips.

Table III-4
2013 Average Number of Trips per Day
US 191-Springerville to Junction US 160 Corridor

Highway Segment			Mode	
From MP	To MP	Daily Person-Trips	Auto/Truck	Intercity Bus
394	387	4,500	4,500	0
387	371	3,300	3,300	0
371	370	3,300	3,300	0
370	369	3,750	3,750	0
315.5	325	1,800	1,800	0
325	327	1,800	1,800	0
327	338	1,800	1,800	0
338	341	1,800	1,800	0
341	353	2,700	2,700	0
353	355	2,700	2,700	0
355	357	2,700	2,700	0
357	365	2,700	2,700	0
365	367	2,700	2,700	0
367	368.5	2,700	2,673	27
374	376	2,100	2,079	21
376	379	2,100	2,079	21
379	385	2,100	2,079	21
385	387	2,100	2,079	21
387	390	2,100	2,079	21
390	396	2,100	2,079	21
396	398	2,100	2,079	21
398	403	1,800	1,800	0
403	411	1,800	1,800	0
411	411.5	1,800	1,782	18
417.5	422	3,300	3,267	33
422	426	3,300	3,267	33
426	428	3,300	3,267	33
428	440	3,300	3,267	33
440	443	3,300	3,267	33
443	446.5	3,300	3,267	33
446.5	448.5	12,300	12,177	123
448.5	461	7,800	7,800	0
461	462.5	1,950	1,950	0
462.5	471	1,950	1,950	0
471	472	1,950	1,950	0
472	478	1,950	1,950	0
478	495	1,950	1,950	0
495	496	1,650	1,650	0
496	500	1,650	1,650	0
500	501	1,650	1,650	0
501	510.5	1,650	1,650	0
Average Per Mile		2,858		

III. EVALUATION OF FUTURE TRANSPORTATION NEEDS AND DEFICIENCIES

A. Congestion

The 2013 projected levels of service have been calculated for roadway segments in the corridor. Figure III-2 illustrates the peak-hour level of service based on 2013 projected peak season average daily traffic for weekday volumes.

No segments are expected to experience significant peak-hour congestion in 2013. Localized growth may exceed regional projections resulting in areas with some traffic congestion. District ADOT personnel feel that the Chinle area will continue to grow faster than the surrounding region resulting in a need to widen to five lanes.

B. Public Transit Needs and Improvements

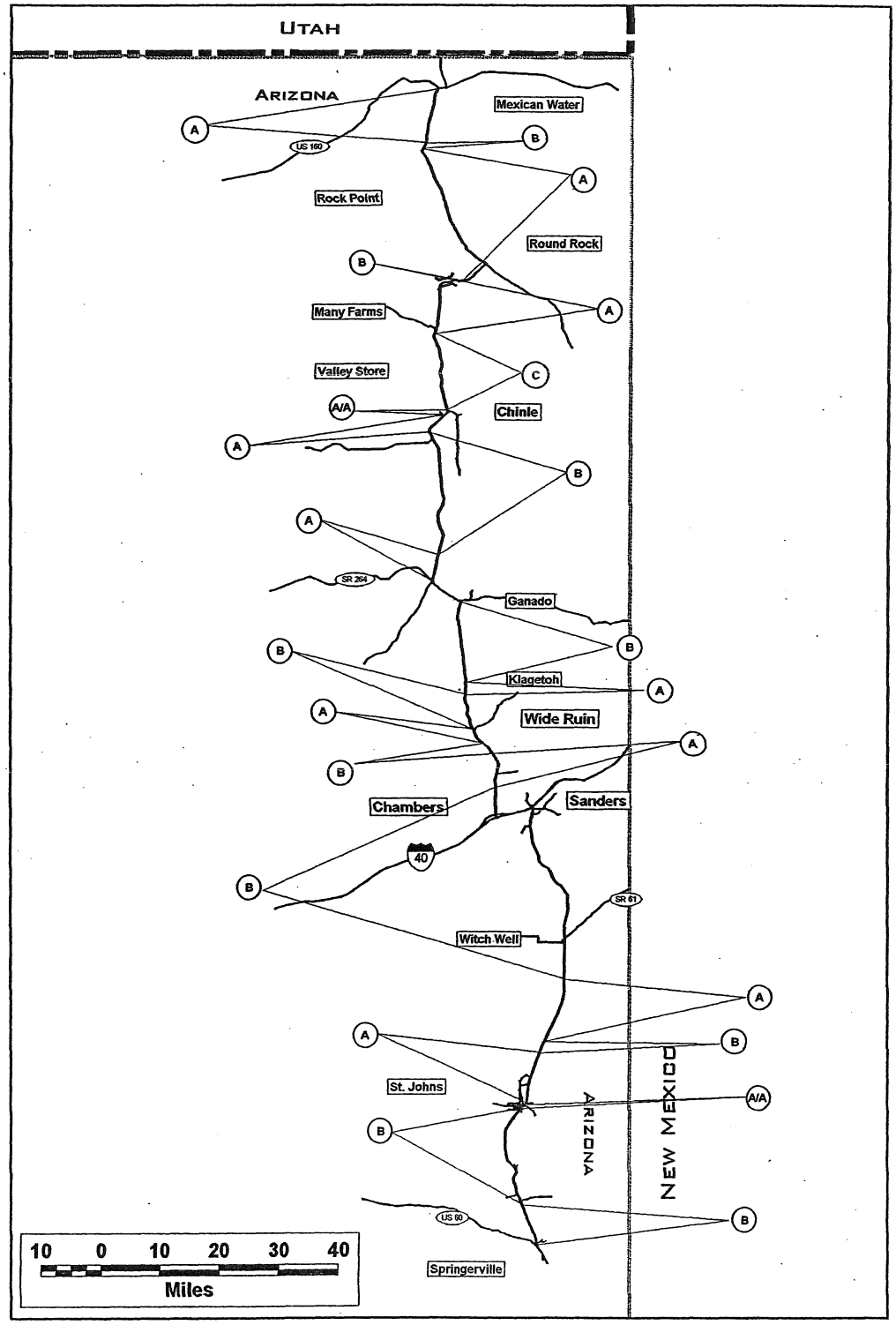
As the population of the rural areas within the corridor increases, there will be an increasing need for expanded intercity bus service in the US 191 Corridor. An increase in intercity bus service could increase accessibility to area residents who are mobility impaired and provide an essential service to those persons without vehicles. The Northern Arizona Transit Development Plan suggests that local public transportation is needed for the elderly and disabled persons. The most pressing need is transportation to medical trips for the local areas.

The US 191Corridor has the following public transit needs and improvements:

- Need to provide transportation other than work commute trips for trips such as shopping, medical, or personal business trips.
- Need to coordinate fixed routes and paratransit routes between transportation providers.
- Need for the Navajo Nation to upgrade existing equipment.
- Expand and coordinate existing senior services.

Figure III-2

2013 Level of Service



LEGEND

C - Section level of service

A/A - Eastbound LOS/Westbound LOS

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C. Non-Capacity Deficiencies

Other than the small towns, there is a lack of traveler services in the US 191-Springerville to US 160 Corridor. Additional rest areas and traveler information services may be needed.

IV. SUMMARY OF EXISTING AND PROJECTED DEFICIENCIES

A. Identification of Deficiencies with the Most Severe Impact on Transportation

For this corridor, conditions that are considered to have the most severe impact on transportation are as follows:

- Segments with LOS D or worse
- Locations with high accident frequency

B. Identification of Needs and Deficiencies that Represent Substandard or Non-Optimal Conditions

The remaining identified deficiencies not listed above in Section B are categorized as "substandard" or "non-optimal" conditions. These deficiencies are as follows:

- Projected LOS D or worse
- Substandard roadway shoulders or geometrics
- Lack of local transit service
- Sidewalk discontinuities

C. Prioritization of Deficiencies

Deficiencies identified within the US 191-Springerville to US 160 Corridor are prioritized according to their impact on transportation facilities and conditions. Deficiencies presented above in Section A are considered to be first priority deficiencies. Deficiencies identified in Section B are divided into second and third priority deficiencies. Second priority deficiencies include projected LOS D or worse traffic congestion and substandard shoulder widths. Third priority deficiencies include transit service deficiencies, inconsistent roadway geometrics, and sidewalk discontinuities.

The following provides a discussion of first, second, and third priorities. Deficiencies are briefly described in terms of type of deficiency or proposed work for

the location. First, second, and third priorities have been determined apart from funding source, amount, availability, or scheduling. Funding issues with respect to prioritized deficiencies are evaluated in the following sections.

1. First Priority Deficiencies

There are no first priority deficiencies in this corridor.

2. Second Priority Deficiencies

A. *MP 371-370*: This section of two-lane highway needs shoulder upgrades to conform with AASHTO minimum standards.

B. *MP 315.5-340.5*: This section of two-lane highway needs shoulder upgrades to conform with AASHTO minimum standards.

C. *MP 340.5-365*: This section of two-lane highway needs to be rebuilt in sections to eliminate drainage problems. The entire segment needs shoulder upgrades to conform with AASHTO minimum standards.

D. *MP 374-379*: This section of two-lane highway needs shoulder upgrades to conform with AASHTO minimum standards.

E. *MP 385-411.5*: This section of two-lane highway needs shoulder upgrades to conform with AASHTO minimum standards.

F. *MP 417.5-446.5*: This section of two-lane highway needs shoulder upgrades to conform with AASHTO minimum standards.

G. *MP 448.5-510.5*: This section of two-lane highway needs shoulder upgrades to conform with AASHTO minimum standards.

3. Third Priority Deficiencies

H. *Chinle Pedestrian/Bicycle Facilities* Sidewalks are provided on US 191 in the central part of town. In undeveloped areas, sidewalks do not exist causing discontinuities in the pedestrian network. On segments with curb and gutter, the highway is wide enough to provide a separate bike lane, but it is not striped for that purpose. In undeveloped areas, shoulders are not currently adequate for bicyclists. Pedestrian crosswalks are only provided at signalized intersections.

Chapter IV

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CHAPTER IV

Identification of Feasible Investment Options and Management Actions

I. REVENUE SOURCES AND ESTIMATES

A. Revenue Sources

Three major public revenue sources are currently available for transportation improvements within Apache County. These sources include:

- Arizona Highway User Revenue Fund (HURF)
- Arizona Local Area Transportation Assistance Fund (LTAF)
- Transportation Equity Act for the 21st Century (TEA-21)

These funds are primarily dedicated to roadway and transit purposes, with some availability for bicycle lanes/paved shoulder improvements as well as pedestrian facilities. Certain funding categories within these major revenue sources are available and/or dedicated to public transit.

An additional funding source is a local fuel tax for the Reservation. The Navajo Nation is presently pursuing the introduction of such a fuel tax. Current discussions indicate the fuel tax could be dedicated for transportation purposes, and may provide a future revenue source for improvements along US 191.

Provided below are brief summaries of current revenue sources and their applications. These summaries are excerpted directly from the *1994 Arizona State Transportation Plan* and summary pamphlets from the U.S. Department of Transportation (TEA-21 User's Guide, Surface Transportation Policy Project, 1998 and Non-Traditional funds for Community Transportation, Community Transportation January/February 1999). These descriptions are supplemented by additional information from the 1995 Arizona Transportation Needs Assessment.

1. **Highway User Revenue Trends** – The cornerstone of highway financing in Arizona is the Highway User Revenue Fund. The State of Arizona taxes motor fuels and collects a variety of fees and charges relating to the registration of motor vehicles operated on the public highways of the state.

These collections include gasoline and fuel taxes, motor carrier taxes, vehicle license taxes, motor vehicle registration fees, and other miscellaneous fees. These revenues are deposited in the Arizona Highway User Revenue Fund and are then distributed to the cities, towns, and counties of the state and to the State Highway Fund which is administered by ADOT. These taxes represent the primary source of revenues available to the state for highway construction and improvements and other related expenses. The State Constitution restricts the use of these funds to highway purposes. The Highway User Fund is not available to reservation lands. All other lands along US 191 are eligible for these funds.

2. **Local Transportation Assistance Fund** – The LTAF is derived from Arizona Lottery receipts. A maximum of $23 million may be deposited in the LTAF from the state lottery fund each fiscal year. LTAF revenue is allocated only to cities and towns upon request in amounts proportionate to the relative population of all cities and towns that have requested funds (each requesting city or town is guaranteed a minimum of $10,000). Cities and towns with populations in excess of 300,000 must use LTAF funds for public transportation. In addition, up to 10 percent of funds may be used for the arts, or disabled and handicapped assistance. The LTAF is not available to reservation lands. All other lands along US 191 are eligible for these funds.

3. **Federal Highway Funds** – On June 9, 1998, President Clinton signed into law a new federal transportation bill called TEA-21, The Transportation Equity Act for the 21st Century. It is the direct successor to the 1991 Intermodal Surface Transportation Efficiency Act–ISTEA. TEA-21 replicates ISTEA with a few minor exceptions. The Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA) repealed the Federal-aid Primary, Secondary, and Urban Systems and their associated funding categories. In their place, three new categories of assistance were established: the National Highway System (NHS), the Surface Transportation Program (STP), and the Congestion Mitigation and Air Quality Improvement Program (CMAQ). Other major categories, such as the Interstate Maintenance (formerly known as the Interstate 4R Program), Bridge, Federal Lands, Indian Reservation Roads, and Emergency Relief Programs, were continued under ISTEA.

TEA-21 changes include the new programs:

- Transportation and Community and System Preservation Pilot Program
- Access to Jobs
- National Corridor Planning
- Development and Coordinated Border Infrastructure
- Wildlife Refuge Roads

- Safety Incentives to Prevent Operation of Motor Vehicles by Intoxicated Persons
- Transportation Infrastructure Finance and Innovation
- Clean Fuel Formula Grants

ISTEA's equity-based funding categories—Interstate Reimbursement, Hold Harmless, 90 Percent of Payments, Donor State Bonus, and Minimum Allocation—have been collapsed into one new category called Minimum Guarantee in the new TEA-21 law. The overall structure of TEA-21 remains substantially similar to ISTEA.

TEA-21 continues the Transportation Enhancements program as a 10 percent set-aside from the Surface Transportation Program, and makes a few changes to the rules that govern it. These include a small portion of Transportation Enhancement funds which are now transferable to other uses at state option. Twenty-five percent of a state's new Transportation Enhancements funding is transferable to other programs, where "new" funds are those that exceed the amount the state received in fiscal year 1997. Preliminary calculations indicated that about three percent of total Transportation Enhancement funds will be subject to transfer.

Surface Transportation funds may be used on either NHS or federal-aid roads, although bridge, safety, carpool-related, and bicycle/pedestrian projects may be on any public road. Importantly, the funds may be used for mass transit projects, among other eligible activities. Another important and far-reaching provision for local governments concerns the requirement that a state must distribute 50 percent of its STP apportionment to urban areas with over 200,000 population and to other areas of the state based on population. Rural areas of the state (less than 5,000 population) are guaranteed an amount based on previous Secondary Program funding. Another 30 percent may be used in any area of the state. Half of the other 20 percent must be used for Safety Construction activities and half for Transportation Enhancement activities. TEA-21 creates a completely new Transit Enhancements program, which sets aside a small amount from the Urban Area Formula program for enhancement-like activities that relate directly to transit. Urbanized areas with a population over 200,000 are required to spend one percent of urban area formula funds for transit enhancements.

Also, the CMAQ Program, which directs funds primarily to areas that have failed to attain certain air quality standards, allows a variety of programs and projects to achieve its objectives. These include mass transit improve-

ments and high-occupancy vehicle facilities. These funds are not available for use in Apache County.

TEA-21 provides a wide range of eligible activities to which funds may be addressed working through and with the states. Funding under both the NHS and STP may be used in non-traditional ways; e.g., bicycle facilities and pedestrian walkways, carpool and vanpool projects, and fringe and corridor parking facilities.

The additional flexibility is most prevalent in the STP, but is available in other programs such as the NHS as well. Funds under the NHS, for example, may be used to pay the startup costs for traffic management and control projects. NHS funding also allows construction of a project on a non-NHS highway and construction of any transit project that is eligible under the Federal Transit Act as long as this kind of project: 1) is in the corridor of a fully access-controlled NHS facility, 2) will improve the level of service of the NHS facility, and 3) is more cost-effective than an improvement on the NHS facility.

In addition to those listed above, STP funds may be used for capital and operating costs of traffic management and control systems and may be used to pay capital costs for transit projects and publicly-owned intracity or intercity bus terminals and facilities. Similarly, other sections of TEA-21 allow transit funds to be used for highway projects.

While providing flexibility in the STP, TEA-21 also mandates specific funding for Safety Construction projects and Transportation Enhancement activities. Safety Construction projects are for low-cost improvements to reduce highway and rail-highway crossing hazards. Enhancements are identified as a discrete set of activities (e.g., bikeways, scenic highways, preservation of historic transportation facilities, and rails-to-trails initiatives) with a goal of integrating transportation systems into communities to enhance their livability. Local officials have an opportunity to sponsor enhancement projects or to support enhancement proposals by others (state, private entities, etc.).

Under the Indian Reservation Roads (IRR) Program, funds are authorized from the Highway Trust Fund and allocated to the Bureau of Indian Affairs (BIA) based on Indian population, BIA road mileage, and Indian land area. Eligible roads include public roads owned by the BIA and state/local roads within or providing access to Indian lands. Also eligible are other project-related items including adjacent vehicular parking, interpretive signage,

provision for pedestrians and bicycles, construction of roadside rest areas, and other appropriate facilities such as visitor areas. US 191, from Witch Well north to US 160, is located on the Navajo Indian Reservation, and eligible for IRR funds.

Federal roadway revenue forecasts conducted by the federal government for the State of Arizona continue federal support for transportation programs. For the period from fiscal year 1998 to fiscal year 2003, annual apportionment estimates pursuant to TEA-21 after the redistribution of minimum guarantee funds are projected at $407,826,000 for the State of Arizona. From fiscal year 2003 onward, a three percent annual growth rate is assumed.

New tools created by TEA-21 include "Job Access and Reverse Commute Grants"; "Taxes and Commuter Choice"; "Transportation and Community and System Preservation Pilot Program (TCSP)"; "New Starts"; "Biking Transportation and Pedestrian Walkways"; "Transportation Infrastructure Finance and Innovation Act (TIFIA)"; "Clean Fuels"; and "Rethinking Equity."

4. **RARF (Regional Area Road Fund)**
State law (ARS 42-1482 through 42-1484) grants some counties authority to enact transportation excise taxes, subject to voter appeal. An increase in existing transaction privilege (sales) taxes by as much as 10 percent can be directed to transportation projects. The beneficiary of RARF monies is the county levying the transportation excise tax. Proceeds from taxes are placed in Regional Area Road Funds. Within the US 191 Corridor, these funds would be administered at the county level. Apache County currently uses a general excise tax with no other designated taxes or monies for transportation projects.

5. **Public Transit** – Arizona's small urban and rural services are funded by two federal programs administered by ADOT. One is the Federal Transit Administration Section (FTA) 5311 (formerly Section 18) program for general public service in rural areas. The other is the FTA Section 5310 (formerly Section 16) program which funds vehicles for organizations providing specialized transportation services for the elderly or disabled. The total statewide cost of general public systems in Arizona's rural and small urban areas is approximately $3.8 million annually. Each year the requests for funding exceed available revenue, and an estimated $1.4 million is unfunded annually.

The Arizona Department of Transportation reports two intercity operators in the US 191 Corridor. Privately operated services are not subsidized in Arizona, nor regulated. The intercity operators within the corridor include Greyhound Lines, Inc. and Navajo Transit System (NTS). Each of these providers is described in detail within Chapter II.

6. **Bicycle/Pedestrian Funds** – *National Highway System (NHS) Funds* may be used to construct bicycle transportation facilities and pedestrian walkways on land adjacent to any highway on the National Highway System (other than the Interstate System). These bicycle facilities must be principally for transportation rather than recreation. These bicycle and pedestrian projects must be located and designed pursuant to an overall plan developed by each metropolitan planning organization (MPO) and state.

   Surface Transportation Program (STP) Funds may be used for either the construction of bicycle transportation facilities and pedestrian walkways, or non-construction projects (such as brochures, public service announcements, and route maps) related to safe bicycle use. These bicycle projects must be principally for transportation rather than recreation. These bicycle and pedestrian projects must be located and designed pursuant to an overall plan developed by each MPO and state.

   Ten percent of each state's annual STP funds are available only for "Transportation Enhancement Activities" (TEAs). Of the ten defined TEAs, two are specifically bicycle and pedestrian-related: "provision of facilities for bicyclists and pedestrians" and "preservation of abandoned railway corridors (including the conversion and use thereof for pedestrian or bicycle trails)."

   Congestion Mitigation and Air Quality Improvement (CMAQ) Program Funds may be used for either the construction of bicycle transportation facilities and pedestrian walkways, or non-construction projects (such as brochures, public service announcements, and route maps) related to safe bicycle use. (These funds are unavailable for use in Apache County.)

   Federal Lands Highway Funds may be used to construct pedestrian walkways and bicycle transportation facilities in conjunction with roads, highways, and parkways at the discretion of the department charged with the administration of such funds. These bicycle facilities must be used principally for transportation rather than recreation. These bicycle and pedestrian facilities must be located and designed pursuant to an overall plan developed by each MPO and state.

Scenic Byways Program Fund monies may be used to construct facilities along the highway for the use of pedestrians and bicyclists.

National Recreational Trails Fund monies may be used for a variety of recreational trails programs to benefit bicyclists, pedestrians, and other non-motorized and motorized users. Projects must be consistent with a Statewide Comprehensive Outdoor Recreation Plan required by the Land and Water Conservation Fund Act. Each state governor designates the agency responsible for administering these funds within the state. Half of the annual appropriation is distributed equally among the states. The other half is based on the amount of non-highway recreational fuels used in each state. Within each state, 30 percent of the funds are allocated for non-motorized uses, another 30 percent for motorized uses, and the remaining 40 percent among trail uses at the discretion of the state.

Section 402 Funding– Pedestrian and bicyclist safety remain priority areas for highway safety program funding. The priority status of safety programs for pedestrians and bicyclists expedites the approval process for these safety efforts.

A program guideline has been developed to offer states guidance in developing and managing a statewide bicycle and pedestrian safety program.

Federal Transit Funding– Sections 1202, 1203, 1204, and 1401 of TEA-21 continue to allow transit funds to be used for bicycle and pedestrian access to transit facilities, to provide shelters and parking facilities for bicycles in or around transit facilities, or to install racks or other equipment for transporting bicycles on transit vehicles.

7. **Aviation** – Revenue sources for aviation include federal, state, and local governments as well as some private funding. Statewide federal revenues account for over two-thirds of the total dollars. Airports within the corridor include the Springerville-Eagar Municipal Airport and the St. Johns Industrial Airpark.

8. **Freight and Passenger Rail** – Minimal public funding is available for rail. According to the 1995 Arizona Transportation Needs Assessment, qualifying projects in Arizona which are eligible for federal rail assistance are estimated to cost approximately $686 million to implement. Total federal assistance available in Arizona for railroads is projected to be only $4 million over the next 10 years. There is no passenger rail service within the

US 191 Corridor. The Burlington Northern/Santa Fe Railway runs through the Sanders and Chambers area. A second rail line crosses the US 191 Corridor at Witch Well. This rail line is associated with the local fossil-fueled electric-generating plants.

9. **Pipelines** – No public revenues are available for pipeline improvements within Arizona. Three different pipelines are located within the US 191 Corridor. The El Paso Gas Company has a major pipeline running east/west from the Window Rock area toward Flagstaff. It crosses US 191 south of Ganado. The same company has a north/south pipeline running between Ganado and Chinle east of US 191. The northern terminus is within the corridor study area but does not cross US 191. The third pipeline, owned by ENRON, crosses US 191 in the area of Klagetoh.

B. Revenue Estimates

The 1995 Arizona Transportation Needs Assessment estimates a total of $4.6 billion from combined federal and state revenue sources will be available for the entire state highway system over the next 10 years. In addition, $40 million is expected to be available for small urban and rural transit services during this time period. Dedication of a reasonable percentage of these funds to the US 191 Corridor improvements will serve to maintain and enhance the corridor as an essential transportation link within Arizona.

In estimating the amount of statewide revenues that will be allocated to the corridor, factors such as economic development, availability of recreational activities, projected transportation deficiencies, and tax equities should be taken into account. Revenue forecasts from the 1995 Arizona Transportation Needs Assessment project approximately $1.5 million for the counties of Arizona and over $4.5 million for the State. The single most important source of funding for small urban and rural transit for the US 191 Corridor is federal funding, while local contributions and passenger fares are other significant sources.

Less than one percent of the state's population, according to the 1990 Census, reside in the Springerville to US 160 Corridor. According to the ADOT 1996 HPMS database, around 333,000 state vehicle-miles of travel, or approximately 0.8 percent of total state vehicle-miles of travel, occur within the corridor. The US 191 Corridor according to ADOT has approximately 209 lane miles. The area north and south of Chinle (MP 446.5 to MP 448.5) is classified as Minor Arterial. The remainder of the corridor is classified as Major Collector. Given these factors and the magnitude of identified deficiencies in the corridor, it is recommended at least one

percent of statewide highway revenues and 17 percent of small urban and rural transit revenues be dedicated to the US 191 Corridor. This would result in an average annual revenue allocation of approximately $7.5 million, or $150 million over the 20-year period to address identified deficiencies in the US 191 Corridor.

Additional revenue sources should be considered to address projected deficiencies in the corridor. These include private funds/land dedication to address some of the access control issues that continue to arise in the corridor and Indian Reservation Road funds to address deficiencies resulting from the increased tourist activities occurring on the Indian Reservation within the corridor.

II. FINANCIAL OPPORTUNITIES/CONSTRAINTS

In order to effectively examine financial opportunities and constraints within the Springerville to US 160 Corridor, it is important to fully understand the character of improvements needed to mitigate the identified deficiencies. There are six basic types of improvements required in this corridor.

- *Rural Widening/Realignment* - This represents the majority of upgrade needed and is ideally suited to the typical state/federal revenue mechanism, especially since a large portion of the improvements will be made within reservation and state land.

- *Site-Specific Safety Improvements* - As major improvements are completed, the number of high accident areas will be reduced. In the interim, minor upgrades need to be considered where warranted. Federal and state revenue sources are earmarked for such improvements.

- *Small Urban Areas (Chinle, Many Farms, St. Johns, Springerville)* - The presence of US 191 within these communities has sustained economic vitality but the combination of through traffic, traffic destined to tourist services, and local traffic has created congested conditions within some of these areas. Projected growth in tourism and population will lead to ever increasing congestion unless improvements are made. The interaction of through traffic with local business traffic creates opportunities to address multiple needs. For example, access control improvements through the use of medians and pedestrian crosswalks and bike/pedestrian facilities can improve traffic operations while enhancing the aesthetics and character of the urban environment. Cost-sharing with public agencies and private land owners through right-of-way dedication and improvement districts should be evaluated. In addition, implementation of local improvements, such as

constructing collectors to increase circulation, could divert local traffic from the congested state highways. By using federal and state dollars to fund local transportation studies in these areas, plans and policies could be developed for access control and land use planning which would serve to protect the traffic-carrying capacity of US 191.

- *Transit Service Improvements* - Transit Services are present within the US 191 Corridor. Coordination between the existing agencies should be addressed to develop an efficient transit system. Federal funding for rural areas was reduced by 17 percent for FY 1996-97, but remained constant for FY 1997-98. The 1995 Arizona Transportation Needs Assessment estimates that "one out of every three dollars that will be required to maintain current levels of service for small urban and rural transit is currently unfunded. Eight out of every ten dollars of expenditures necessary to meet projected demand is currently unfunded." It will be difficult for the small urban areas in this corridor to compete for these limited dollars with established transit systems in other areas. Intercity services are currently provided by private over-the-road operators and general public operators. Public funding is not anticipated to be available for private for-profit operations; however, public dollars could be used for transit centers and amenities within the corridor.

- *Pedestrian/Bikeway Facilities* - In rural portions of the corridor, wide lanes and paved shoulders which meet AASHTO standards can also serve as bike facilities. These are usually part of the highway upgrade and ideally suited to the typical state/federal revenue mechanism. In the small urban areas located in the corridor, there is little room for adequate pedestrian/bike facilities and any space devoted to these facilities may detract from roadway capacity. Moreover, providing interruptions of traffic for ped-signals or crosswalks may reduce the traffic operations on the state highway. Thus there may be a reluctance to use state dollars for such projects. There are limited federal dollars available for pedestrian/bike facilities through the TEA-21 Transportation Enhancement Program. There are many opportunities, however, to use local funds, especially through improvements made as part of private developments, to construct these types of improvements.

- *Traveler Services* - Since the corridor is the primary north/south route in the northeast area of the state and provides significant recreational and tourism opportunities, traveler services such as rest areas and amenities are ideally suited to the typical state/federal revenue mechanism. There is also great interest at the national level in Intelligent Transportation Sys-

tems (ITS) with significant federal funding available. A unique rural ITS proposal for the corridor may have a chance of being funded.

III. RIGHT-OF-WAY OPPORTUNITIES/CONSTRAINTS

There are limited opportunities for right-of-way acquisition in the Springerville to US 160 Corridor.

- *Navajo Indian Reservation*- Additional right-of-way may be needed at Mile Post 425.5 near the proposed scenic view/rest area pull-out. The additional right-of-way would be used for turning lanes to ensure appropriate safety at the pull-out.

Additional right-of-way for proposed projects may be needed for improvements to the roadway. However, there are constraints for the Arizona Department of Transportation due to the fact that within the Navajo Nation the right of way is considered trust land. Obtaining the right-of-way may have complications due to the trust land and also due to a precedent set by recent federal court cases. The court cases ruled that if land is dedicated to use of right-of-way by state agencies, the tribes lose administrative authority over that land.

IV. ENVIRONMENTAL OPPORTUNITIES/CONSTRAINTS

As noted in Chapter II, some of the environmental concerns affecting potential transportation projects are discussed. Improvements in other parts of the corridor will not have significant impacts, since most will occur within developing urban areas. Chapter II also identified the following environmental opportunities and constraints:

A. Sensitive Species and Habitats

Table II-2, within Chapter II, illustrates a very broad list of species located within Apache County traversed by the study corridor. The table refers to four taxonomic groups including bird, fish, plant, and mammal. According to the U.S. Fish and Wildlife Service, staff reductions no longer permit compilation of project-specific species lists and information.

B. Wilderness Areas

No part of the US 191 Corridor passes near or through a wilderness area.

C. Historic Properties/Section 4(f) Sites

Chapter II, *Historic Properties and Existing or Potential 4(f) Issues* section, illustrates a large list of sites that are in the National Register of Historic Places. The list was provided by the Arizona State Parks, Office of Planning, SHPO (State Historic Preservation Office), and Grants and Navajo Nation Historic Preservation Department. Additional archaeological sites recorded by ADOT Environmental Planning Section are included in the chapter. The ADOT Environmental Planning Office recommends additional archaeological testing be implemented at these sites before any further development or roadway improvements are recommended. Any major modifications to the rights-of-way of the existing state route, or any proposed new roadways should involve interested local parties to determine these sites and mitigate impacts to them.

D. Unique Waters, Sole-Source Aquifers

The U.S. Environmental Protection Agency's Sole Source Aquifer Program was established under Section 1424(e) of the Safe Drinking Water Act (SDWA). Since 1977, it has been used to help prevent contamination of groundwater by federally-funded projects and to increase public awareness of groundwater resources. The Springerville to US 160 Corridor is in EPA Region 9 which has nine designated Sole Source Aquifers. The US 191 Corridor is in the Little Colorado-San Juan Watershed. There are no unique waters in this watershed.

The Little Colorado-San Juan Watershed contains the Little Colorado River and the Coconino Plateau groundwater basins. Special studies within the US 191 Corridor include a virus and parasite monitoring near the Springerville Wastewater Treatment Plant and an investigation of residual radionuclide and trace element contamination in the Puerco River near Sanders.

Some of the major ADEQ monitored surface water assessments for the US 191 Corridor include Little Colorado River, Nutrioso Creek, and the Puerco River.

E. Visual Resources

Residents and visitors appreciate the scenic character of the landscape throughout much of the corridor. The US 191 Corridor north of Ganado to Chinle is designated as a state Scenic Roadway. The remainder of the corridor has some "distinctive"scenic areas for local residents and visitors.

F. Underground Storage Tanks

Tables II-5 and II-6, in Chapter II, list sites and locations of leaking and non-leaking underground storage tanks along the US 191 Corridor. The tables illustrate the facility and approximate location of the tanks.

G. Solid Waste Sites

Three solid waste facilities exist within the Springerville to US 160 Corridor. Table II-3, within Chapter II, includes a list of facilities, operator of the facility, and the approximate location of the site.

H. Existing Noise Receptors

Potential noise receptors have been defined as those human structures and populations within 1,000 feet of the existing roadway. The Springerville to US 160 Corridor passes through developed communities containing residences, hospitals, schools, and other types of land uses which could be adversely affected by high noise levels. In the rural areas of the corridor, residences located near the roadway could also be adversely affected by high noise levels. Identifying specific noise receptors will require applying a detailed noise model to appropriate areas of the corridor.

V. INVESTMENT OPPORTUNITIES/MANAGEMENT ACTIONS

A. Feasible Highway Projects for Capacity Deficiencies

There are no indications that any of the sections of US 191 will require capacity improvements within the planning window. Feasible highway capacity improvements are presented below.

B. Site-Specific Highway Improvement Projects

Implementation of these safety improvement projects may also mitigate other non-safety deficiencies identified in Chapter III. For example, construction of AASHTO standard shoulders should also result in the provision of improved pedestrian and bicycle facilities. Figure IV-1 indicates the approximate locations of the following recommended projects.

1. *MP 371-370* - Add paved shoulders to meet current AASHTO standards and to accommodate bicycles. This includes the installation of edge line rumble strips.

2. *MP 316-340* - Rebuild roadway including sub-base.

3. *MP 340-365* - Rebuild roadway including sub-base and improve drainage.

4. *MP 374-379* - Add paved shoulders to meet current AASHTO standards and to accommodate bicycles. This includes the installation of edge line rumble strips.

5. *MP 385-411.5* - Widen paved shoulders to meet current AASHTO standards and to accommodate bicycles. This includes the installation of edge line rumble strips.

6. *MP 417.5-427* - Rebuild roadway including sub-base and improve drainage.

7. *MP 427-441* - Add paved shoulders to meet current AASHTO standards and to accommodate bicycles. This includes the installation of edge line rumble strips.

8. *MP 441-444* - Rebuild roadway including sub-base and eliminate sharp curve.

9. *MP 444-446.5* - Rebuild roadway including sub-base and improve drainage.

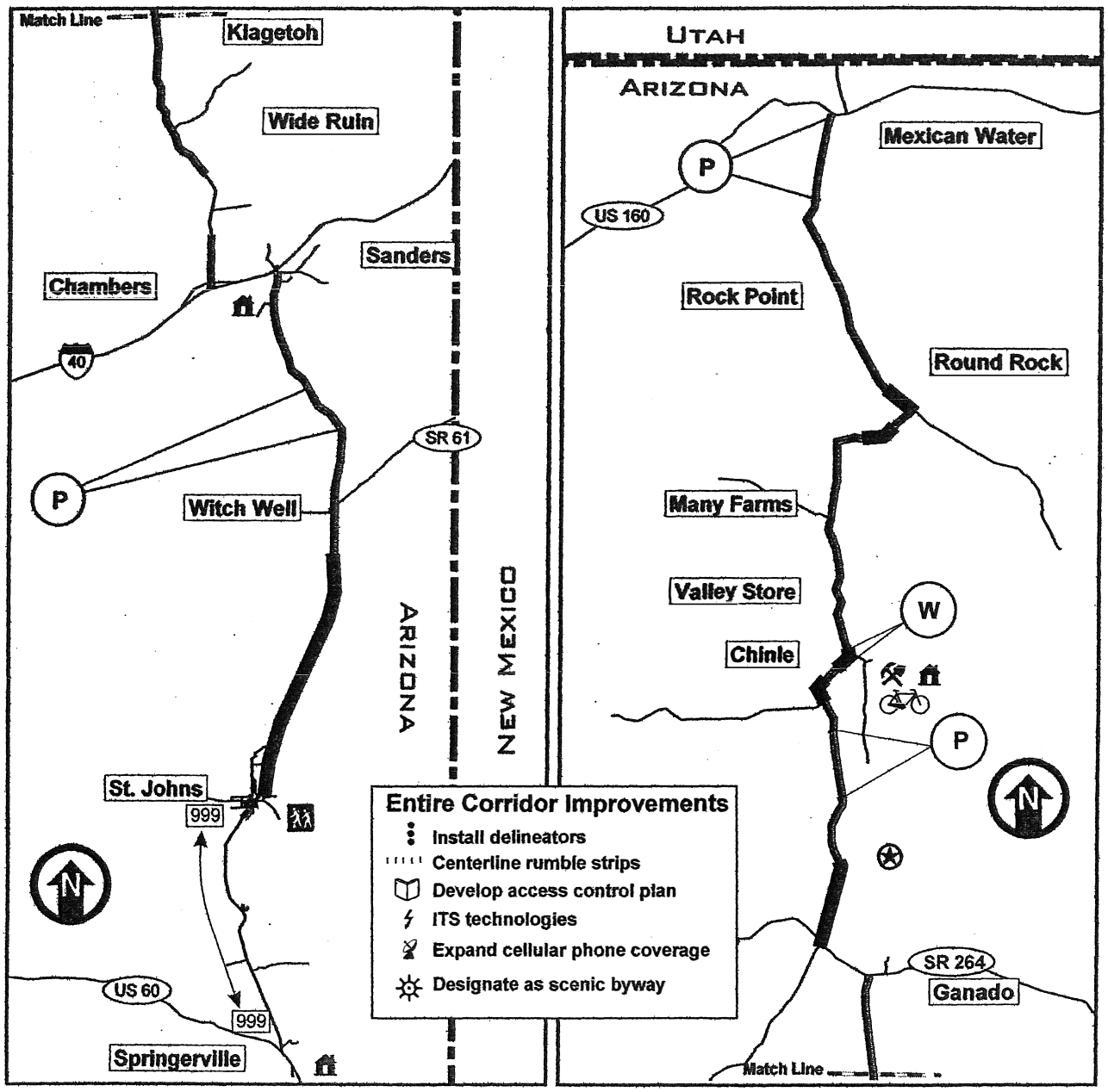
10. *MP 446.5-448.5* - Widen to a five-lane cross section to accommodate local growth.

11. *MP 448.5-471.5* - Add paved shoulders to meet current AASHTO standards and to accommodate bicycles. This includes the installation of edge line rumble strips.

12. *MP 471.5-475.5* - Rebuild roadway including sub-base.

13. *MP 475.5-4478* - Add paved shoulders to meet current AASHTO standards and to accommodate bicycles. This includes the installation of edge line rumble strips.

Figure IV-1
Recommended Improvements



Legend

- Rebuild Road
- Add Shoulders
- Construct Intermodal Center
- Construct Rest Area
- Bicycle Facilities
- Construct Raised Median
- Construct Multi-use Trail
- Pavement Rehabilitation
- Widen to Five Lanes
- Renumber Mileposts

6 0 6 12 18 24
Miles

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14. *MP 478-482* - Rebuild roadway including sub-base.

15. *MP 482-510.5* - Add paved shoulders to meet current AASHTO standards and to accommodate bicycles. This includes the installation of edge line rumble strips.

16. *Entire Corridor* - Install delineators along shoulder.

17. *Entire Corridor* - Install centerline rumble strips on two-lane sections.

18. *Entire Corridor* - Review passing distances based on existing speed limits.

19. *Entire Corridor* - Eliminate passing sections within speed change zones.

C. Pavement Rehabilitation Projects

1. *MP 350-357* - Remove and replace the travel surface.

2. *MP 431-438* - Remove and replace the travel surface.

3. *MP 501-510.5* - Remove and replace the travel surface.

D. Transportation System Management Strategies

1. *Chinle* - Construct raised medians to control access, provide refuge for pedestrians, and add to the aesthetic quality of the urban environment.

2. *Entire Corridor* - Development of an Access Control Plan for both rural and urban portions of US 191. This would include the specification of permitted access points, acceleration and deceleration lane lengths, and necessary provisions for domestic and wild animal control fences.

E. Transit Service Improvements

1. *Navajo Transit System and other providers* - Expand and coordinate paratransit and senior services. Particular concern for medical trips, work, and service centers from remote areas.

2. *Navajo Transit System* - Upgrade equipment.

3. *Entire Corridor* - Expand intercity service along US 191 with more hours and additional days of service.

4. *Entire Corridor* - Encourage major employers to initiate and support rideshare, carpool, or vanpool programs.

5. *Entire Corridor* - Initiate and sponsor innovative transit programs such as Share/Care mileage reimbursement for rural shared-ride (carpool) trips into activity centers. These programs would benefit employees commuting to and from major activity centers.

6. *Entire Corridor* - Introduce a marketing programs to educate and create awareness of transportation services that are offered in an area, who provides the services, who uses the services, and who funds the services.

7. *Entire Corridor* - Ensure effective planning for public and specialized transit service locally and within the region. This would include five-year Transportation Development Plans (TDPs) for all transit services within the corridor.

8. *Springerville* - Construct transit center/bus depot, which would serve both local and intercity providers.

9. *Chinle* - Develop Intermodal Center (Transit Center/Depot) for local and intercity service.

10. *Sanders* - Develop Intermodal Center (Transit Center/Depot) for local and intercity service.

F. Pedestrian/Bicycle Facilities

1. *Chinle* - Construct crosswalks at selected locations utilizing highly visible improvements such as brick walk/pavers for crosswalks, light posts, banners/flags, and ADA curbing. Future widening projects should incorporate pedestrian crossings into the design through the construction of raised medians, grade-separated crossing, and other pedestrian-friendly features.

2. Add bike route/trail through St. Johns parallel to US 191.

G. Traveler Services

1. *MP 425.5* - Construct a rest area at Beautiful Valley Overlook.

2. Install Variable Message Signs as part of the Arizona ITS program.

3. Install Road Weather Information Systems equipment as part of the Arizona ITS program.

4. *Entire Corridor* - Expand cellular phone coverage area or install emergency call boxes at appropriate locations.

5. US 191 - Recommend as a state-designated scenic byway.

6. Re-number the mileposts on US 191 between Springerville and St. Johns to have a consistent direction and range of milepost numbers. US 191 was designated a primary corridor in 1994 by Arizona Department of Transportation. Therefore, the numbering of the corridor should follow US 191, not US 180.

Chapter V

TRANSPORTATION
CONSULTANTS, INC.

CHAPTER V

Evaluation of Alternate Investment Options and Management Actions

I. EVALUATION OF INVESTMENT OPTIONS AND MANAGEMENT OPPORTUNITIES AS RELATED TO PERFORMANCE CRITERIA

Chapter IV identified a variety of investment options and management actions that could be implemented to address the deficiencies and needs that have been documented for the US 191-Springerville to US 160 Corridor. These investment opportunities and management actions can be grouped in seven areas: feasible highway projects for capacity improvements, site-specific highway improvement projects, pavement preservation projects, transportation system management strategies, transit service improvements, pedestrian/bicycle facilities, and traveler services. In order to prioritize these investment opportunities and management actions, they are evaluated with a set of performance criteria.

A. Performance Criteria

The following performance criteria were developed by ADOT for use in determining potential impacts of the investment opportunities and management actions. To analyze the potential impacts, both positive and negative, of each possible investment option, a rating system was developed for each of the applicable performance criteria (several were discarded as either not applicable or redundant with other criteria). The criteria application is summarized within a matrix illustrated in Table V-3. The rating system is based on a scale of "1" to "5," with investment options which have potentially serious negative impacts receiving a rating of "1," options with potentially neutral impacts receiving a rating of "3," and options with potentially high positive impacts receiving a rating of "5."

1. Number of Annual Person-Trips

Average daily 1996 and 2013 person-trips by highway facility, presented in Chapter III, were estimated based on assumed values for vehicle occupancy for passenger vehicles, trucks, and buses, and estimates of bicycle and pedestrian trips based in part on regional mode split, census data, and supplemental information provided by ADOT. The number of person-trips for each investment option has

been estimated for each roadway section within which the option falls. For options which encompass more than one roadway segment, the number of person-trips has been averaged over all of the segments involved.

For purposes of economic analysis and comparison of the cost-effectiveness of the alternatives, estimates of annual average daily person-trips were further refined within this chapter to reflect trips at the approximate midpoint of the average structural or functional life of an investment option or management action. The scale used for this measure is illustrated in Table V-1. Of the highway options, projects in the areas of Chinle had the highest ratings while the corridor sections from St. Johns to Sanders had the lowest. The transit and pedestrian/bicycle options generally served relatively few person-trips and received lower ratings than the highway options.

Table V-1
Rating Scale for Annual Average Daily Person-Trips

Daily Person-Trips	Rating
2 - 5,000	1
5,001 - 10,000	2
10,001 - 30,000	3
30,001 - 50,000	4
> 50,000	5

2. Travel Time Impacts by Person-Trip

The amount of time a person spends traveling on the roadway and waiting in delays will affect the traveler's perception of how well the roadway serves its intended purpose of providing a convenient and economical method of travel. Actual investments will have compound effects on travel time. The travel time may be affected negatively during roadway improvements as lanes are closed for construction and traffic re-routed, but will be positively affected after the roadway work is completed.

As a matter of policy, ADOT attempts to maintain the operational efficiency of rural state roadways at Level of Service (LOS) C or better. The LOS was calculated for each roadway segment along the corridor and those results are shown in Chapter III. The difference between LOS C and the 2013 calculated LOS can be used to determine which segments of the roadway are expected to operate below

their design expectations. Using the *Highway Capacity Manual Special Report 209* published by the Transportation Research Board in 1997, average operating speeds for multi-lane highways and two-lane roadways can be assumed based on the LOS of the roadway. Utilizing these average operating speeds and the length of each roadway segment, a travel time per mile can be calculated for each roadway segment based on the 2013 LOS presented in Chapter III. This same procedure can also be used to calculate the travel time per mile on each roadway segment if traffic were traveling at the design LOS C. These two travel times per mile are compared for each segment and a percentage difference determined, assigning segments that are performing above the design LOS C a positive percentage. The following scale was then assigned to these percentage differences to form a rating between "1" and "5" to indicate which roadway segments will perform the most below their design expectations (a rating of "5" indicates a greater need for improvement):

Table V-2
Rating Scale for Travel Times

Percent Difference	Rating
<-50%	5
-50% to 0%	4
0	3
> 0%	1

Complete calculations are shown in Appendix C. This rating method is typically applied to projects addressing capacity deficiencies, but there are none in this corridor. The criterion was retained so that projects added at a later date could use these ratings and remain consistent with the projects listed herein. All of the recommended projects received a rating of "3."

3. Vehicle Operating Costs

Vehicle operating costs are affected by a variety of factors including the condition of the roadway, delays from roadway congestion, and the terrain. Since pavement condition does not vary significantly within the corridor and terrain and congestion are included in the travel time measure, use of vehicle operating cost as a performance measure would duplicate other measures. Thus vehicle operating cost was eliminated as a performance criterion.

4. Motor Fuel Usage

The use of motor fuel is affected by a variety of factors including type of terrain, the condition of the roadway, and how much delay is experienced by the vehicle. Again, since pavement condition does not vary significantly within the corridor and congestion and terrain are included in the travel time measure, the application of motor fuel usage as a performance measure would duplicate another performance measure. Thus motor fuel usage was eliminated as a performance criterion.

5. Infrastructure Operations and Maintenance Costs

Impacts of investment options on infrastructure operations and maintenance costs are important to consider due to their significant portion (approximately 20 percent) of ADOT's annual expenditures on transportation facilities. For this criterion, project improvements which involve construction of facilities which did not previously exist (e.g., new roadways, installation of traffic signals, rest areas) are considered to have negative impacts on operations and maintenance, due to their increase of the overall transportation system. Improvements which replace existing facilities (e.g., major pavement rehabilitation and bridge reconstruction) are considered to have positive impacts on operations and maintenance costs.

6. Traffic Accident Rates

Investment options which have potentially high positive impacts on accident rates primarily involve upgrading of transportation facilities to current American Association of State Highway and Transportation Officials (AASHTO) roadway development standards. Numerous locations throughout the corridor should benefit through reconstruction and/or project upgrades. Examples include addition of paved shoulders, spot shoulder and pedestrian safety improvements, and access control improvements. Accident rates on segments within and adjacent to the Indian Reservations may be higher than indicated in this report due to unreported accidents. The accident information provided by ADOT is the best data available at this time.

7. Person-Hours of Delay

Person-hours of delay are accumulated due to roadway congestion which causes motorists to be traveling slower than their desired speed. In addition to the lost time incurred, there is generally a negative attitude that accompanies person-hours of delay as travelers become frustrated because they cannot get to their destination in a timely and efficient manner. The impact of person-hours of delay has been previously addressed in item Number 2, Travel Time. For this reason, person-hours of delay has been eliminated as a performance criterion.

8. Annual Vehicle-Miles Traveled

Since the alignment of the corridor is not changing, there will be no change in the number of annual vehicle-miles traveled due to roadway improvements. The transit, rail, and bike/pedestrian investment options, however, will have positive impacts on annual vehicle-miles traveled.

9. Impacts on the Transportation Disadvantaged

Investment options and management opportunities are evaluated for their impacts on persons with limited transportation opportunities, such as the elderly, persons with disabilities, children under the age of 16, and households with low incomes. In the US 191 Corridor, transit service is limited. However, the transit recommendations for increased service hours and service areas will provide positive future benefits to people with limited mobility. Provision of pedestrian and bicycle improvements along the US 191 Corridor should also provide benefits to people with limited travel options. All other investment options should have neutral or positive impacts on the transportation disadvantaged.

10. Conformity with Local Land Development Plans and Complexity of Approval Process

Investment options must be considered for potential positive or negative impacts on local land development plans and processes. In general, the transportation improvements under consideration for the corridor are consistent with local development plans. In particular, access control measures and the construction of collector streets to relieve congestion on US 191 are consistent with the Transportation Plans of the small urban areas along the corridor.

11. Conformity/Complexity with Respect to Public Land Expected

This criterion addresses the potential impact of a project on public, tribal, and National Forest Service lands, also including designated Wilderness Areas. Acquiring right-of-way from the Navajo Nation and other government-controlled lands is expected to be an involved process; therefore, segments involving such right-of-way acquisition received a rating of "2."

12. Proximity to Existing/Future Wilderness Areas

As discussed in Chapter II, the US 191 Corridor does not run through and is not located near any wilderness area. For this reason, Proximity to Existing/Future Wilderness Areas has been eliminated as a performance criterion.

13. Proximity to Existing/Future Historic Properties/High Density Archaeological Resource Areas

This criterion is intended to ensure the integrity of Arizona's cultural history by identifying those projects which would have a negative impact on historic and archaeological resources. Chapter II outlines the areas within this corridor that are designated as historic properties and/or high density archaeological areas. While these resources should be avoided, adjacent projects will be required to follow federal guidelines for the preservation of, or the mitigation of impacts to, such resources. There are several potential 4(f) resources within the US 191 Corridor and these are documented in Chapter II. The Historic Preservation Office of the Navajo Nation has the complete list of Historic Places on the National Register if needed for further information. Widening projects and other improvements requiring land acquisition received a rating of "2." All other projects are rated as neutral.

14. Sensitive Species and Habitats

Information about sensitive species and habitats for US 191 is available from the Fish and Wildlife Service of the United States, Department of Interior, State of Arizona Game and Fish Department, Arizona Department Bureau of Land Management, and State Historic Preservation Office. Several major biotic communities exist within the corridor including Great Basin Conifer Woodland, Plains and Great Basin Grassland, and Great Basin Desert Scrub. The US 191 study area has several riparian areas located between St. Johns and Springerville.

Table II-2 within Chapter II, provides a very broad list of species located within Apache County traversed by the study corridor. According to the U.S. Fish and Wildlife Service, staff reductions no longer permit compilation of project-specific species lists and information.

Based on their proximity to these sensitive species and habitats, some of the southern corridor options received a rating of "2." All other options were rated as neutral ("3") if they were within city or town limits.

15. Potential Disturbance to Visual Resources

US 191, north of Ganado to Chinle, is designated as a state Scenic Roadway. The US 191 Corridor has strong scenic values to the passing traveler. The project for designating the US 191 Corridor a state Scenic Byway received a positive rating as well as the construction of the scenic view. The remainder of the corridor was rated as neutral.

16. Other Sensitive Environments

Other sensitive areas include Bureau of Land Management (BLM) Areas of Critical Environmental Concern (ACECs), 4(f) properties, and wild and scenic rivers. As discussed in Chapter II, there are no wild or scenic rivers in the US 191 Corridor. There are also no BLM parcels in the study corridor, and 4(f) properties are addressed under #11 - Public Lands and #13 - High Density Archaeological Resource Areas. Since there are no areas that meet those specifications within the corridor, this measure has been eliminated as a performance criterion.

17. Encroachment on Landfills and Other Hazardous Material Concern Areas

There are three solid waste facilities within the US 191 Corridor. Chapter II provides a complete list of these sites. Chapter II also lists existing Leaking and Non-leaking Underground Storage Tanks, Sites/Facilities with Possible Contamination of Soil, Surface Water, or Groundwater, and Hazardous Waste Incidents along US 191. The rating for the identified investment options is based on the direct impact on the movement and storage of hazmats. Safety improvements such as shoulder improvements were rated at "4" or "5" while other options received a neutral rating. Projects which might disturb these areas would receive a rating of "1" or "2."

18. Sensitive Noise Receptors

As discussed in Chapter II, noise receptors exist wherever the corridor is flanked by residences, hospitals, nursing homes, or other human uses of the land which may be adversely affected by high noise levels. This situation occurs in the urbanized areas and in the sparsely developed rural areas where residences have been built near the roadway. In general, residences and other structures located within about 1,000 feet of the existing roadway should be considered a potential receptor. Table V-3 shows a rating of "2" for this criterion when the roadway segment travels through an urbanized area such as Chinle, Many Farms, or St. Johns.

19. Air Quality Non-Attainment Areas

According to the Department of Environmental Quality, Air Quality Planning Section, a non-attainment area is an area which exceeds any National Ambient Air Quality Standard for any pollutant based upon the data collected through air quality monitoring. The US 191 Corridor does attain the NAAQS for pollutants and is considered an attainment area. Table V-3 illustrates ratings of "3" to "5" for this criterion based on whether specific areas will be affected by any of the identified investment options.

20. Community Cohesion

Interruption of community cohesion will occur when implementing some of the investment opportunities presented for the US 191 Corridor. Most of the interruptions will be temporary such as performing road construction and installing and/or replacing roadway signs. Other interruptions will be long term, such as constructing medians and access control improvements in Chinle that reduce traffic congestion and accidents. The length of the interruption of the community cohesion and whether it is a temporary or long-term interruption are considered in the rating for community cohesion given. For the rating shown in Table V-3, a rating has been assigned based on a visual inspection of the amount of development in the roadway segment. Near the urbanized areas the rating is lower while between towns the rating is higher.

21. Title VI and Environmental Justice Considerations

Title VI and related statutes assure that individuals are not excluded from participation in, denied the benefit of, or subjected to discrimination on the basis of race, color, national origin, age, sex, and disability. Table V-3 indicates ratings of "3" to "5" for this criterion based on whether specific areas or groups will be affected by the identified investment options.

B. Rating of Each Investment Opportunity and Management Action

Table V-3 shows the rating of each investment opportunity and management action using the performance criteria. For each performance criterion, an investment option was given a rating of 1, 2, 3, 4, or 5, with "1" signifying a potentially negative impact and "5" signifying a potentially positive impact.

C. Weighting of Performance Criteria

Table V-3 gives a weight that was applied to each performance criterion. These weights were derived from the analysis of corridors of statewide significance contained in the *1994 Arizona State Transportation Plan.* Most of the performance criteria received a weighting of "1." To reflect the State Plan's goals for mobility and conservation of resources, travel time impacts, impacts on the transportation disadvantaged, and reduction in vehicle-miles traveled received weights of "2." The high priority placed on safety was translated into a weight of "4" for impact on accident rates. Finally, to get the greatest return from limited transportation funds, the number of person-trips per year that will be impacted received a weight of "4." By applying these weights to the numerical ratings, an overall score for each investment opportunity and management action was calculated and is shown in Table V-3.

Table V-3
US 191 - Springerville to US 160 Corridor Performance Ratings

From MP	To MP	Investment Option	Estimated Avg. Annual Person-Trips Impact	Travel Time Impacts	Infra-structure O&M	Traffic Accident Rate(1)	Reduce Vehicle-Miles Traveled	Impacts on Transport. Disadvant.	Local Land Develop.	Public Land Impacts	Historic and Archeological Resource Preservation	Sensitive Species & Habitats	Visual Resource Preservation	Landfill and Hazardous Waste Encroachment	Sensitive Noise Receptors	Air Quality Non-Attainment	Community Cohesion	Enviro. Justice	Score (/120)
			Performance Criteria Weight																
			4	2	1	4	1	2	1	1	1	1	1	1	1	1	1	1	
		Site-Specific Highway Safety Improvement Projects																	
371	370	Add paved shoulders to AASHTO standards	1	3	2	5	3	3	3	3	3	2	3	4	3	3	3	3	71
316	340	Rebuild roadway	1	3	5	4	3	3	3	3	3	3	3	4	3	3	3	3	71
340	365	Rebuild roadway and Improve drainage	1	3	5	4	3	3	3	3	3	3	3	4	3	3	3	3	71
374	379	Add paved shoulders to AASHTO standards	1	3	2	5	3	3	3	2	3	3	3	4	3	3	3	3	71
385	411.5	Add paved shoulders to AASHTO standards	1	3	2	5	3	3	3	2	3	3	3	4	3	3	3	3	71
417.5	427	Rebuild roadway and Improve drainage	1	3	5	4	3	3	3	2	3	3	3	4	3	3	3	3	70
427	441	Add paved shoulders to AASHTO standards	1	3	2	5	3	3	3	2	3	3	3	4	3	3	3	3	71
441	444	Rebuild roadway	1	3	5	5	3	3	3	2	3	3	3	4	3	3	3	3	74
444	446.5	Add paved shoulders to AASHTO standards	1	3	2	5	3	3	3	2	3	3	3	4	3	3	3	3	71
446.5	448.5	Widen to five-lane cross section	3	3	5	5	2	3	3	3	3	3	3	4	2	3	4	3	82
448.5	471.5	Add paved shoulders to AASHTO standards	1	3	2	5	3	3	3	2	3	3	3	4	2	3	3	3	70
471.5	475.5	Rebuild roadway	1	3	5	4	3	3	3	2	3	3	3	4	3	3	3	3	70
475.5	478	Add paved shoulders to AASHTO standards	1	3	2	5	3	3	3	2	3	3	3	4	3	3	3	3	71
478	482	Rebuild roadway	1	3	5	4	3	3	3	2	3	3	3	4	3	3	3	3	70
482	510.5	Add paved shoulders to AASHTO standards	1	3	2	5	3	3	3	2	3	3	3	4	3	3	3	3	71
Entire Corridor		Install delineators along shoulder	1	3	2	5	3	3	3	3	3	3	3	5	3	3	3	3	73
Entire Corridor		Install centerline rumble strips	1	3	3	5	3	3	3	3	3	3	3	5	2	3	3	3	73
Entire Corridor		Review passing distances	1	3	3	5	3	3	3	3	3	3	3	5	3	3	3	3	74
Entire Corridor		Eliminate passing within speed change zones	1	3	3	5	3	3	3	3	3	3	3	5	3	3	3	3	74
		Pavement Preservation Projects																	
350	357	Pavement Rehabilitation	1	3	5	3	3	3	3	3	3	3	3	4	3	3	3	3	67
431	438	Pavement Rehabilitation	1	3	5	3	3	3	3	3	3	3	3	4	3	3	3	3	67
501	510.5	Pavement Rehabilitation	1	3	5	3	3	3	3	3	3	3	3	4	3	3	3	3	67
		Transportation System Management Strategies																	
Entire Corridor		Develop an Access Control Plan for rural/urban portions	1	3	3	4	3	3	5	3	3	3	3	4	3	3	3	3	71
Chinle		Construct raised medians	3	3	1	4	2	3	3	3	3	3	3	4	2	3	2	3	72
		Transit Service Improvements																	
Navajo Transit		Expand paratransit and senior services	1	3	3	3	4	4	3	3	3	3	3	3	3	4	3	5	70
Navajo Transit		Upgrade equipment	1	3	5	3	3	4	3	3	3	3	3	3	3	5	3	3	70
Entire Corridor		Expand Intercity service along US 191	1	3	5	3	4	4	3	3	3	3	3	3	3	5	3	5	73
Entire Corridor		Encourage employers to start and support rideshare programs	1	3	3	3	5	4	3	3	3	3	3	3	3	5	3	5	72
Entire Corridor		Sponsor mileage reimbursement program	1	3	3	3	5	4	3	3	3	3	3	3	3	5	3	5	72
Entire Corridor		Market transportation service on regional basis	1	3	3	3	4	4	3	3	3	3	3	3	3	4	3	5	70
Entire Corridor		Ensure planning of transit service	1	3	3	3	4	4	3	3	3	3	3	3	3	4	3	5	70
Springerville		Construct transit center/bus depot	1	3	2	3	5	4	3	3	3	2	3	3	3	4	2	5	68
Chinle		Construct transit center/bus depot	1	3	2	3	5	4	3	2	3	3	3	3	3	4	2	5	68
Sanders		Construct transit center/bus depot	1	3	2	3	5	4	3	3	3	3	3	3	3	4	2	5	69
		Pedestrian/Bicycle Facilities																	
Chinle		Construct high-visibility pedestrian crossings	1	3	2	4	3	4	3	3	3	3	3	3	3	4	2	3	69
St. Johns		Construct a multi-use trail parallel to SR 64	1	3	2	3	4	4	3	3	2	2	3	3	3	4	3	4	66
		Traveler Services																	
Entire Corridor		Designate as a scenic byway	1	3	3	3	3	3	3	3	3	3	5	3	3	3	3	3	66
Entire Corridor		Install variable message signs within ITS program	1	3	2	3	3	3	3	3	3	3	3	3	3	3	3	3	63
Entire Corridor		Install road weather information systems within ITS program	1	3	2	3	3	3	3	3	3	3	3	3	3	3	3	3	63
St. Johns South		Re-number mileposts	1	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	64
425.5		Construct a rest area at Beautiful Valley Overlook	1	3	2	3	3	3	3	2	2	3	5	3	3	3	3	3	63
Entire Corridor		Expand cellular phone coverage/install emergency call boxes	1	3	2	3	3	3	3	2	2	3	3	4	3	3	3	3	62

Note: 1) Accident rating may be low due to poor reporting practices on reservations

III. PRELIMINARY COST ESTIMATES FOR INVESTMENT OPTIONS

Preliminary cost estimates have been prepared for each of the proposed investment options. These estimates are intended to reflect an order-of-magnitude of the costs involved and should not be used as a true construction or implementation cost estimate. The level of detail of the individual estimates varies. Common roadway construction projects such as a pavement preservation project use a straightforward cost per unit or cost per mile estimating technique. The per unit costs are based on similar project costs found in ADOT construction cost books, from programmed project cost estimates, or from project assessment reports.

In addition, cost estimates for projects listed in past transportation studies such as other corridor profile studies were used. Table V-4 lists the preliminary cost estimates for the proposed investment options. Each option has a reference as to how the estimate was determined, as presented below.

Table V-4 References:

A) Addition of shoulder/bike facilities are estimated to cost $700,000 per mile. This includes the installation of edge line rumble strips.
B) Re-construction of a two-lane facility is expected to cost $1,000,000 per mile not including site-specific drainage requirements.
C) Widening of a four-lane facility to five lanes is expected to cost $2,500,000 per mile, not including site-specific drainage requirements.
D) Installation of delineators along both shoulders of the road is estimated to cost $500 per mile. Estimate is based on information supplied by Colorado DOT.
E) The installation of centerline rumble strips is estimated to cost between $550 and $650 per mile. Estimate is based on information provided by ADOT
F) The cost of re-surveying the corridor for passing sight distance is estimated at $750 per mile.
G) Policy-oriented reports are anticipated to cost between $10,000 and $50,000 depending on the topic and expected duration of the study.
H) Resurfacing projects are expected to cost $450,000 per mile.
I) Estimates from the 1995 ADOT/Northern Arizona Transit Development Plan and the 1998 Navajo Nation Long-Range Comprehensive Transportation Plan.
J) Transit program estimates are based on similar current program costs.
K) Estimates for five-year Transportation Development Plans (TDPs) are based on current costs to produce multimodal plans.
L) Construction of an intermodal center is expected to cost approximately $500,000.
M) Crosswalks are estimated to cost $100,000 per site.

N) Multi-use facilities are estimated to cost $100,000 per mile based on similar projects.
O) Variable Message Signs are estimated to cost $200,000 per site.
P) Road weather information systems are estimated to cost $50,000 per site.
Q) Re-numbering the mileposts and updating relevant data is estimated at $300 per mile.
R) Constructing the scenic view with necessary facilities is estimated at $750,000.
S) Expanding the phone coverage in the corridor is estimated to cost around $175,000 per tower.

Design, engineering, and contingency costs are included in the above costs. Total estimated costs for each investment option or management action are given in Table V-4.

Table V-4
US 191 - Springerville to US 160 Corridor Investment Option Preliminary Cost Estimates

From MP	To MP		Quantity	Unit Cost	Extension	Total	Reference
		Site-Specific Highway Safety Improvement Projects					
371	370	Add paved shoulders to AASHTO standards	1 miles	$700,000	$700,000		A
316	340	Rebuild roadway	24 miles	$1,000,000	$24,000,000		B
340	365	Rebuild roadway and improve drainage	25 miles	$1,250,000	$31,250,000		B
374	379	Add paved shoulders to AASHTO standards	5 miles	$700,000	$3,500,000		A
385	411.5	Add paved shoulders to AASHTO standards	26.5 miles	$700,000	$18,550,000		A
417.5	427	Rebuild roadway and improve drainage	10 miles	$1,250,000	$12,500,000		B
427	441	Add paved shoulders to AASHTO standards	14 miles	$700,000	$9,800,000		A
441	444	Rebuild roadway	3 miles	$1,000,000	$3,000,000		B
444	446.5	Add paved shoulders to AASHTO standards	2.5 miles	$700,000	$1,750,000		A
446.5	448.5	Widen to five-lane cross section	2 miles	$2,500,000	$5,000,000		C
448.5	471.5	Add paved shoulders to AASHTO standards	23 miles	$700,000	$16,100,000		A
471.5	475.5	Rebuild roadway	4 miles	$1,000,000	$4,000,000		B
475.5	478	Add paved shoulders to AASHTO standards	2.5 miles	$700,000	$1,750,000		A
478	482	Rebuild roadway	4 miles	$1,000,000	$4,000,000		B
482	510.5	Add paved shoulders to AASHTO standards	28.5 miles	$700,000	$19,950,000		A
Entire Corridor		Install delineators along shoulder	205.5 miles	$500	$102,750		D
Entire Corridor		Install centerline rumble strips	205.5 miles	$650	$133,575		E
Entire Corridor		Review passing distances	205.5 miles	$750	$154,125		F
Entire Corridor		Eliminate passing within speed change zones	1 report	$25,000	$25,000		G
						$156,265,450	
		Pavement Preservation Projects					
350	357	Pavement Rehabilitation	7 miles	$450,000	$3,150,000		H
431	438	Pavement Rehabilitation	7 miles	$450,000	$3,150,000		H
501	510.5	Pavement Rehabilitation	9.5 miles	$450,000	$4,275,000		H
						$10,575,000	
		Transportation System Management Strategies					
Entire Corridor		Develop an Access Control Plan for rural/urban portions	1 report	$50,000	$50,000		G
Chinle		Construct raised medians	1 report	$50,000	$50,000		G
						$100,000	
		Transit Service Improvements					
Navajo Transit		Expand paratransit and senior services	20 years	$316,400	$6,328,000		I
Navajo Transit		Upgrade equipment	20 years	$198,000	$3,960,000		I
Entire Corridor		Expand intercity service along US 191	20 years	$108,000	$2,160,000		I
Entire Corridor		Encourage employers to start and support rideshare programs	20 years	$10,000	$200,000		J
Entire Corridor		Sponsor mileage reimbursement program	15 years	$50,000	$750,000		J
Entire Corridor		Market transportation service on regional basis	20 years	$20,000	$400,000		J
Entire Corridor		Ensure planning of transit service	15 years	$270,000	$4,050,000		K
Springerville		Construct transit center/bus depot	1 site	$500,000	$500,000		L
Chinle		Construct transit center/bus depot	1 site	$500,000	$500,000		L
Sanders		Construct transit center/bus depot	1 site	$500,000	$500,000		L
						$19,348,000	
		Pedestrian/Bicycle Facilities					
Chinle		Construct high-visibility pedestrian crossings	2 sites	$100,000	$200,000		M
St. Johns		Construct a multi-use trail parallel to SR 64	4 miles	$100,000	$400,000		N
						$600,000	
		Traveler Services					
Entire Corridor		Designate as a scenic byway	1 report	$10,000	$10,000		G
Entire Corridor		Install variable message signs within ITS program	5 sites	$200,000	$1,000,000		O
Entire Corridor		Install road weather information systems within ITS program	2 sites	$50,000	$100,000		P
St. Johns South		Re-number mileposts	25 miles	$300	$7,500		Q
425.5		Construct a rest area at Beautiful Valley Overlook	1 site	$750,000	$750,000		R
Entire Corridor		Expand cellular phone coverage/install emergency call boxes	1 project	$875,000	$875,000		S
						$2,742,500	
		TOTAL COSTS				$189,630,950	

Arizona Five-Year Program - 2000 - 2004

367	368	Widen curb, gutter & sidewalk	1 mile	$6,000,000	$6,000,000	
368		Design Roadway	1 site	$1,000,000	$1,000,000	
440		Design Concept Report	1 report	$100,000	$100,000	

LSC, 1999

IV. IDENTIFICATION OF STRATEGIES THAT BEST MEET EACH DEFICIENCY

A. Estimated Cost Effectiveness of Investment Options

A simple measure of the cost-effectiveness of an investment option is to calculate a life-cycle cost per person-trip. To calculate this measure, estimates of average annual person-trips have been refined to reflect trips at the approximate midpoint of the average structural or functional life of an improvement opportunity or management action. This method is used in order to perform comparative economic analysis of the cost-effectiveness of the options. This approach and using annualized costs of each option (annual maintenance and operation costs plus annualized capital costs) were applied to determine the relative annualized cost-effectiveness of investment options based on the cost per person-trip affected.

The resulting cost per person-trip estimates for each investment opportunity and management action are displayed in Table V-5. This measure, however, does not take into consideration the length of the project or length of the trip. To account for this factor, annualized cost per person-mile was calculated for each option. This measure is also displayed in Table V-5.

Table V-5
US 191 - Springerville to US 160 Corridor Multimodal Investment Options
Cost-Effectiveness and Performance Measure Scores

From MP	To MP	Investment Option	Estimated Avg. Annual Person-Trips (000s) (1)	Estimated Cost (1998$)	Estimated Project Lifespan (years)	Estimated Annualized Cost (1998$) (2)	Annualized Cost per Person-Trip (3)	Cost per Trip Rating	Annualized Cost per Person-Mile (4)	Cost per Person-Mile Rating	Cost Effec-tiveness Score (5)	Performance Measure Score	Overall Score (/170)
		Site-Specific Highway Safety Improvement Projects											
371	370	Add paved shoulders to AASHTO standards	1,460	$700,000	10	$99,664	$0.07	5	6.83	2	35	71	106
316	340	Rebuild roadway	621	$24,000,000	20	$2,265,430	$3.65	1	15.21	1	10	71	81
340	365	Rebuild roadway and improve drainage	889	$31,250,000	20	$2,949,779	$3.32	1	13.28	1	10	71	81
374	379	Add paved shoulders to AASHTO standards	774	$3,500,000	10	$498,321	$0.64	1	12.87	1	10	71	81
385	411.5	Add paved shoulders to AASHTO standards	730	$18,550,000	10	$2,641,103	$3.62	1	13.65	1	10	71	81
417.5	427	Rebuild roadway and improve drainage	1,175	$12,500,000	20	$1,179,912	$1.00	1	10.05	1	10	70	80
427	441	Add paved shoulders to AASHTO standards	1,175	$9,800,000	10	$1,395,300	$1.19	1	8.49	2	15	71	86
441	444	Rebuild roadway	1,175	$3,000,000	20	$283,179	$0.24	3	8.04	2	25	74	99
444	446.5	Add paved shoulders to AASHTO standards	1,175	$1,750,000	10	$249,161	$0.21	3	8.49	2	25	71	96
446.5	448.5	Widen to five-lane cross section	4,490	$5,000,000	20	$471,965	$0.11	5	5.26	2	35	82	117
448.5	471.5	Add paved shoulders to AASHTO standards	1,767	$16,100,000	10	$2,292,278	$1.30	1	5.64	2	15	70	85
471.5	475.5	Rebuild roadway	615	$4,000,000	20	$377,572	$0.61	1	15.34	1	10	70	80
475.5	478	Add paved shoulders to AASHTO standards	615	$1,750,000	10	$249,161	$0.40	1	16.20	1	10	71	81
478	482	Rebuild roadway	718	$4,000,000	20	$377,572	$0.53	1	13.14	1	10	70	80
482	510.5	Add paved shoulders to AASHTO standards	657	$19,950,000	10	$2,840,431	$4.32	1	15.17	1	10	71	81
Entire Corridor		Install delineators along shoulder	748	$102,750	10	$14,629	$0.02	5	0.01	5	50	73	123
Entire Corridor		Install centerline rumble strips	748	$133,575	10	$19,018	$0.03	5	0.01	5	50	73	123
Entire Corridor		Review passing distances	748	$154,125	10	$21,944	$0.03	5	0.01	5	50	74	124
Entire Corridor		Eliminate passing within speed change zones	748	$25,000	10	$3,559	$0.00	5	0.00	5	50	74	124
		Pavement Preservation Projects											
350	357	Pavement Rehabilitation	889	$3,150,000	20	$297,338	$0.33	2	4.78	3	25	67	92
431	438	Pavement Rehabilitation	1,175	$3,150,000	20	$297,338	$0.25	3	3.62	3	30	67	97
501	510.5	Pavement Rehabilitation	593	$4,275,000	20	$403,530	$0.68	1	7.16	2	15	67	82
		Transportation System Management Strategies											
Entire Corridor		Develop an Access Control Plan for rural/urban portions	892	$50,000	20	$4,720	$0.01	5	0.53	5	50	71	121
Chinle		Construct raised medians	4,267	$50,000	20	$4,720	$0.00	5	0.11	5	50	72	122
		Transit Service Improvements											
Navajo Transit		Expand paratransit and senior services	55	$6,328,000	20	$597,318	$10.91	1	54.55	1	10	70	80
Navajo Transit		Upgrade equipment	55	$3,960,000	20	$373,796	$6.83	1	34.14	1	10	70	80
Entire Corridor		Expand intercity service along US 191	55	$2,160,000	20	$203,889	$3.72	1	18.62	1	10	73	83
Entire Corridor		Encourage employers to start and support rideshare programs	55	$200,000	20	$18,879	$0.34	2	1.72	4	30	72	102
Entire Corridor		Sponsor mileage reimbursement program	55	$750,000	20	$70,795	$1.29	1	8.62	2	15	72	87
Entire Corridor		Market transportation service on regional basis	55	$400,000	20	$37,757	$0.69	1	3.45	3	20	70	90
Entire Corridor		Ensure planning of transit service	55	$4,050,000	20	$382,291	$6.98	1	46.55	1	10	70	80
Springerville		Construct transit center/bus depot	55	$500,000	20	$47,196	$0.86	1	86.20	1	10	68	78
Chinle		Construct transit center/bus depot	55	$500,000	20	$47,196	$0.86	1	86.20	1	10	68	78
Sanders		Construct transit center/bus depot	110	$500,000	20	$47,196	$0.43	1	43.10	1	10	69	79
		Pedestrian/Bicycle Facilities											
Chinle		Construct high-visibility pedestrian crossings	548	$200,000	20	$18,879	$0.03	5	1.72	4	45	69	114
St. Johns		Construct a multi-use trail parallel to SR 64	11	$400,000	20	$37,757	$3.45	1	86.20	1	10	66	76
		Traveler Services											
Entire Corridor		Designate as a scenic byway	892	$10,000	20	$944	$0.00	5	0.11	5	50	66	116
Entire Corridor		Install variable message signs within ITS program	1,065	$1,000,000	20	$94,393	$0.09	5	1.77	4	45	63	108
Entire Corridor		Install road weather information systems within ITS program	892	$100,000	20	$9,439	$0.01	5	0.53	5	50	63	113
St. Johns South		Re-number mileposts	1,460	$7,500	20	$708	$0.00	5	0.00	5	50	64	114
425.5		Construct a rest area at Beautiful Valley Overlook	1,175	$750,000	20	$70,795	$0.06	5	6.03	2	35	63	98
Entire Corridor		Expand cellular phone coverage/install emergency call boxes	892	$875,000	20	$82,594	$0.09	5	9.26	2	35	62	97
		Total		$189,630,950									

Notes:
(1) Average annual person-trips are estimated for midpoint of estimated project life.
(2) Assumes a 7% discount rate.
(3) Based on average annual person-trips over estimated project life.
(4) Cents per mile
(5) Cost per trip Rating x 5 plus Cost per person-mile rating x 5

B. Ranking of Investment Options

This section involves combining the results of the cost-effectiveness analysis with the results of the ratings and weighting of performance criteria.

To translate the cost per person-trip into a rating scheme similar to that used for the other performance criteria, the following table was used.

Table V-6
Rating Scale for Cost per Person-Trip

Cost per Person-Trip	Rating
$0 - $.10	5
$.11 - $.20	4
$.21 - $.30	3
$.31 - $.40	2
> $.40	1

In a similar manner, Table V-7 was developed to translate the cost per person-mile into a rating scheme similar to that used for the other performance criteria.

Table V-7
Rating Scale for Cost per Person-Mile

Cost per Person-Mile	Rating
0 - 1.0 cents	5
1.1 - 2.5 cents	4
2.6 - 5.0 cents	3
5.1 - 10 cents	2
> 10 cents	1

The annualized cost per trip rating and the annualized cost per person-mile were each multiplied by a weight of "5" and summed to get an overall cost-effectiveness score. An investment option with perfect scores from the cost-effectiveness analysis (perfect score = 50) and from the other performance criteria (perfect score = 120) would receive a perfect score of 170. The individual ratings and overall scores are displayed in Table V-5, which ranks the investment options by overall score within each category.

Based on a rank order by overall score, the highest ranking investment options are shown in Table V-8.

Table V-8
US 191 - Springerville to US 160 Corridor Multimodal Investment Options
Cost-Effectiveness and Performance Measure Scores

From MP	To MP	Investment Option	Estimated Avg. Annual Person-Trips (000s) (1)	Estimated Cost (1996$)	Estimated Project Life-Span (years)	Estimated Annualized Cost (1996$) (2)	Annualized Cost per Person-Trip (3)	Cost per Trip Rating	Annualized Cost per Person-Mile (4)	Cost per Person-Mile Rating	Cost Effec-tiveness Score (5)	Performance Measure Score	Overall Score
Entire Corridor		Eliminate passing within speed change zones	748	$25,000	10	$3,559	$0.00	5	0.00	5	50	74	124
Entire Corridor		Review passing distances	748	$154,125	10	$21,944	$0.03	5	0.01	5	50	74	124
Entire Corridor		Install delineators along shoulder	748	$102,750	10	$14,629	$0.02	5	0.01	5	50	73	123
Entire Corridor		Install centerline rumble strips	748	$133,575	10	$19,018	$0.03	5	0.01	5	50	73	123
Chinle		Construct raised medians	4,267	$50,000	20	$4,720	$0.00	5	0.11	5	50	72	122
Entire Corridor		Develop an Access Control Plan for rural/urban portions	892	$50,000	20	$4,720	$0.01	5	0.53	5	50	71	121
446.5	448.5	Widen to five-lane cross section	4,490	$5,000,000	20	$471,965	$0.11	5	5.26	2	35	82	117
Entire Corridor		Designate as a scenic byway	892	$10,000	20	$944	$0.00	5	0.11	5	50	66	116
Chinle		Construct high-visibility pedestrian crossings	548	$200,000	20	$18,879	$0.03	5	1.72	4	45	69	114
St. Johns South		Re-number mileposts	1,460	$7,500	20	$708	$0.00	5	0.00	5	50	64	114
Entire Corridor		Install road weather information systems within ITS program	892	$100,000	20	$9,439	$0.01	5	0.53	5	50	63	113
Entire Corridor		Install variable message signs within ITS program	1,065	$1,000,000	20	$94,393	$0.09	5	1.77	4	45	63	108
371	370	Add paved shoulders to AASHTO standards	1,460	$700,000	10	$99,664	$0.07	5	6.83	2	35	71	106
Entire Corridor		Encourage employers to start and support rideshare programs	55	$200,000	20	$18,879	$0.34	2	1.72	4	30	72	102
441	444	Rebuild roadway	1,175	$3,000,000	20	$283,179	$0.24	3	8.04	2	25	74	99
425.5		Construct a rest area at Beautiful Valley Overlook	1,175	$750,000	20	$70,795	$0.06	5	6.03	2	35	63	98
431	438	Pavement Rehabilitation	1,175	$3,150,000	20	$297,338	$0.25	3	3.62	3	30	67	97
Entire Corridor		Expand cellular phone coverage/install emergency call boxes	892	$875,000	20	$82,594	$0.09	5	9.26	2	35	62	97
444	446.5	Add paved shoulders to AASHTO standards	1,175	$1,750,000	10	$249,161	$0.21	3	8.49	2	25	71	96
350	357	Pavement Rehabilitation	889	$3,150,000	20	$297,338	$0.33	2	4.78	3	25	67	92
Entire Corridor		Market transportation service on regional basis	55	$400,000	20	$37,757	$0.69	1	3.45	3	20	70	90
Entire Corridor		Sponsor mileage reimbursement program	55	$750,000	20	$70,795	$1.29	1	8.62	2	15	72	87
427	441	Add paved shoulders to AASHTO standards	1,175	$9,800,000	10	$1,395,300	$1.19	1	8.49	2	15	71	86
448.5	471.5	Add paved shoulders to AASHTO standards	1,767	$16,100,000	10	$2,292,278	$1.30	1	5.64	2	15	70	85
Entire Corridor		Expand intercity service along US 191	55	$2,160,000	20	$203,889	$3.72	1	18.62	1	10	73	83
501	510.5	Pavement Rehabilitation	593	$4,275,000	20	$403,530	$0.68	1	7.16	2	15	67	82
340	365	Rebuild roadway and improve drainage	889	$31,250,000	20	$2,949,779	$3.32	1	13.28	1	10	71	81
475.5	478	Add paved shoulders to AASHTO standards	615	$1,750,000	10	$249,161	$0.40	1	16.20	1	10	71	81
482	510.5	Add paved shoulders to AASHTO standards	657	$19,950,000	10	$2,840,431	$4.32	1	15.17	1	10	71	81
374	379	Add paved shoulders to AASHTO standards	774	$3,500,000	10	$498,321	$0.64	1	12.87	1	10	71	81
385	411.5	Add paved shoulders to AASHTO standards	730	$18,550,000	10	$2,641,103	$3.62	1	13.65	1	10	71	81
316	340	Rebuild roadway	621	$24,000,000	20	$2,265,430	$3.65	1	15.21	1	10	71	81
Navajo Transit		Upgrade equipment	55	$3,960,000	20	$373,796	$6.83	1	34.14	1	10	70	80
Navajo Transit		Expand paratransit and senior services	55	$6,328,000	20	$597,318	$10.91	1	54.55	1	10	70	80
471.5	475.5	Rebuild roadway	615	$4,000,000	20	$377,572	$0.61	1	15.34	1	10	70	80
478	482	Rebuild roadway	718	$4,000,000	20	$377,572	$0.53	1	13.14	1	10	70	80
417.5	427	Rebuild roadway and improve drainage	1,175	$12,500,000	20	$1,179,912	$1.00	1	10.05	1	10	70	80
Entire Corridor		Ensure planning of transit service	55	$4,050,000	20	$382,291	$6.98	1	46.55	1	10	70	80
Sanders		Construct transit center/bus depot	110	$500,000	20	$47,196	$0.43	1	43.10	1	10	69	79
Chinle		Construct transit center/bus depot	55	$500,000	20	$47,196	$0.86	1	86.20	1	10	68	78
Springerville		Construct transit center/bus depot	55	$500,000	20	$47,196	$0.86	1	86.20	1	10	68	78
St. Johns		Construct a multi-use trail parallel to SR 64	11	$400,000	20	$37,757	$3.45	1	86.20	1	10	66	76
				$189,630,950									

LSC, 1999

Appendix A

TRANSPORTATION
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Level of Service Definitions

The following descriptions have been adopted directly from the Transportation Research Board's *Highway Capacity Manual, Special Report 209, Third Edition* which was updated in December 1997. The methodologies used in the preceding report are consistent with the descriptions listed here and within the original text.

Capacity analysis is a procedure to estimate the traffic-carrying ability of roadway sections and intersections. It provides the engineer with a tool to analyze and improve existing roadways and to plan and design future roadways. The capacity of a roadway or intersection is measured through six levels of service (LOS), which are listed below:

LOS A	-	Free flow
LOS B	-	Free flow
LOS C	-	Stable flow, some backup
LOS D	-	Unstable flow, backup of major duration
LOS E	-	Capacity
LOS F	-	Forced flow

Level of Service A represents the best traffic-carrying ability, while Level of Service F represents the worst. Level of Service C is generally acceptable and provides the design LOS.

TWO-LANE HIGHWAY LEVELS OF SERVICE

Level of service for two-lane highways addresses both mobility and accessibility concerns. The primary measure of service quality is percent time delay with speed and capacity utilization used as secondary measures. The definitions and criteria are for extended segments of two-lane rural highways where efficient mobility is the primary objective of the facility.

Level of Service A is the highest quality of traffic service and occurs when motorists are able to drive at their desired speed. Without strict enforcement, this highest quality would result in average speeds approaching 60 mph on two-lane highways. Passing demand is well below passing capacity and almost no platoons of three or more vehicles are observed. Drivers would be delayed no more than 30 percent of the

time by slow moving vehicles. A maximum flow rate of 420 passenger cars per hour total in both directions may be achieved under ideal conditions.

Level of Service B characterizes the region of traffic flow wherein speeds of 55 mph or slightly higher are expected on level terrain. Drivers are delayed up to 45 percent of the time on the average. Service flow rates of 750 passenger cars per hour total in both directions can be achieved under ideal conditions. Above this flow rate, the number of platoons forming in the traffic stream begins to increase dramatically.

Level of Service C describes the traffic flow conditions with noticeable increases in platoon formation, platoon size, and frequency of passing impediment. While traffic flow is stable, it is becoming susceptible to congestion due to turning traffic and slow moving vehicles. Time delays are up to 60 percent. A service flow rate of up to 1,200 passenger cars per hour total in both directions can be accommodated under ideal conditions.

Level of Service D describes operations which approach unstable traffic flow. The two opposing traffic streams essentially begin to operate separately at higher volume levels as passing becomes extremely difficult. Passing demand is very high while passing capacity approaches zero. Turning vehicles and/or roadside distractions cause major shockwaves in the traffic stream. The percentage of time motorists are delayed approaches 75 percent. Maximum service flow rates are 1,800 passenger cars per hour total in both directions. This is the highest flow rate that can be maintained for any length of time over an extended section of level terrain without a high probability of breakdown.

Level of Service E is defined as traffic flow conditions on two-lane highways having a percent time delay of greater than 75 percent. Passing is virtually impossible and platooning becomes intense when slower vehicles or other interruptions are encountered.

Level of Service F represents heavily congested flow with traffic demand exceeding capacity. Volumes are lower than capacity and speeds are well below capacity speed. Level of Service E is seldom attained over extended sections of two-lane rural high-

ways. Most often, perturbations in traffic flow as level E is approached cause a rapid transition to LOS F.

RURAL AND SUBURBAN HIGHWAYS

Level-of-service (LOS) criteria for multilane highways are defined in terms of density. Density is a measure that quantifies the proximity of vehicles to each other within the traffic stream and indicates the degree of maneuverability within the traffic stream.

LOS criteria depend on the free-flow speed of the highway element being studied—an isolated geometric element, such as a curve or grade of significant length that operates with a reduced speed, or a series of such geometric elements that affect the operation of a longer segment of highway.

Level of Service A describes completely free-flow conditions. The operation of vehicles is virtually unaffected by the presence of other vehicles, and operations are constrained only by the geometric features of the highway and by driver preferences. Vehicles are spaced at an average of 440 feet at a maximum density of 12 passenger cars per mile per lane (pc/mi/ln). Maneuverability within the traffic stream is good. Minor disruptions to flow are easily absorbed at this level without a change in travel speed.

Level of Service B is also indicative of free flow, although the presence of other vehicles begins to be noticeable. Average travel speeds are the same as in LOS A, but drivers have slightly less freedom to maneuver. Vehicles are spaced at an average of approximately 264 feet at a maximum density of 20 pc/mi/ln. Minor disruptions are still easily absorbed at this level, although localized deterioration in level of service will be more obvious.

Level of Service C represents a range in which the influence of traffic density on operations becomes marked. The ability to maneuver within the traffic stream is now clearly affected by the presence of other vehicles. Average travel speeds begin to show some reduction for multilane highways with free-flow speeds over 50 mph. The average spacing of vehicles is reduced to approximately 189 feet at a maximum density

of 28 pc/mi/ln. Minor disruptions may be expected to cause serious local deterioration in service, and queues may form behind any significant traffic disruption.

Level of Service D represents a range in which ability to maneuver is severely restricted because of traffic congestion. Travel speed begins to be reduced by increasing volumes. The average spacing of vehicles is 155 feet at a maximum density of 34 pc/mi/ln. Only minor disruptions can be absorbed without the formation of extensive queues and the deterioration of service to LOS E and LOS F.

Level of Service E represents operations at or near capacity and is quite unstable. The densities at LOS E vary depending upon the free-flow speed. At LOS E, vehicles are operating with the minimum spacing at which uniform flow can be maintained. Thus, as the limits for the level of service are approached, disruptions cannot be damped or readily dissipated, and most disruptions will cause queues to form and service to deteriorate to LOS F. For the majority of multilane highways with free-flow speeds between 45 and 60 mph, passenger-car speeds at capacity range from 40 to 55 mph but are highly variable and unpredictable within that range.

Level of Service F represents forced or breakdown flow. It occurs either at a point where vehicles arrive at a rate greater than the rate at which they are discharged or at a point on a planned facility where forecast demand exceeds computed capacity. Although operations at such points (and on sections immediately downstream) will appear to be at capacity, queues will form behind these breakdowns. Operations within queues are highly unstable, with vehicles experiencing brief periods of movement followed by stoppages. Average travel speeds with queues are generally less than 30 mph. Note that the term "LOS F" may be used to characterize both the point of the breakdown and the operating condition within the queue. It must be remembered, however, that it is the point of breakdown that causes the queue to form and that operations within the queue are generally not related to defects along the highway segment over which the queue extends.

Appendix B

TRANSPORTATION
CONSULTANTS, INC.

Comments Received from Corridor Contacts

The following list contains contact persons for the US 191- Springerville to Junction US 160 Corridor. Some of the contacts were provided by the Arizona Department of Transportation and others were given to the LSC Team by local interested parties. Comments received by various persons are illustrated in the text below. The italicized phrases are comments received. Responses to the comments are bulleted and placed directly after the comment.

- Jeff Swan	*Holbrook District Engineer*	- Dale Buskirk	*ADOT Planning Team*
- Kenneth Sweet	*Executive Director NACOG*	- Robert Miller	*ADOT Statewide Project Mgmt.*
- Delwin Wengert	*Apache County Engineer*	- George Wallace	*ADOT Predesign*
- Cindy Dongoske	*Hopi Tribe Cultural Pres. Office*	- Dennis Mittlestedt	*FHWA*
- Chuck Williams	*Navajo County Engineer*	- Jess Jarvis	*ADOT COG/MPO Team*
- Don Dorman	*Flagstaff District Engineer*	- Richard Duarte	*ADOT Environmental Planning*
- William Towler	*Coconino Co. Planning & Zone*	- Arnold Burnham	*ADOT Priority Planning Team*
- Ron Muldenado	*Historic Pres. Dept., Navajo Nation*	- Roger Walkenhorst	*Navajo Dept. of Transportation*
- Reid Nelson	*Roads Plan. Prog., Navajo Nation*	- Shirley Sorrell	*Round Rock Ch. Coordinator*
- Tony Yazzie	*Klagetoh Chapter Coordinator*	- Clifford Sagg	*Mexican Water Ch. Coordinator*
- Dorothy Baldwin	*Wide Ruin Ch. Coordinator*	- Tim Begay	*Trad. Cult. Prog., Historic Pres.*
- Selisa Norstog	*Navajo Planning Program*	- Tim Varner	*Navajo/Hopi Relocation Office*
- Alan Downer	*Navajo Nation Historic Preservation*	- Wilbur Nez	*Navajo Nation Economic Dev.*
- Rob Middleton	*ADOT Holbrook District*	- Virginia Yazee	*Navajo Tourism Department*
- Ellen Testato	*ADOT Holbrook District*	- Anthony Little	*ADOT*
- Bill Fraser	*BIA Road Improvements*	- Dave Sykes	*ADOT Holbrook District*
- Lee Bigwater	*Navajo Dept. of Transportation*	- Ginger Hula	*Navajo/Hopi Relocation Office*
- Owen Lindauer	*ADOT Environmental Planning*	- Peter Noyes	*Navajo Hist. Preservation*
- Steve Owen	*ADOT*	- Rick Tewa	*Hopi Tribe*
- Tony Perry	*Navajo Economic Development*	- Leo Watchman	*Navajo Nation Roads Dept.*
- Chapter Coordinator	*Chinle Chapter House*	- Chapter Coordinator	*Rock Point Chapter House*
- Chapter Coordinator	*Tonalea Chapter House*	- Chapter Coordinator	*Ganado Chapter House*
- Chapter Coordinator	*Many Farms Chapter House*	- Russell Mockta	*Kykotsmovi Village*

Comments Received

Table II-7 is printed twice in Working Paper #1.

- Chapter II changed to reflect only one Table II-7.

The Sanders Unified School District on Page II-50 of Working Paper #1 should be italicized.

- Text changed.

Text should be changed in Working Paper #2, chapter II, page II-7, regarding carbon monoxide and PM_{10}.

- Text was changed to address the comment.

Highlight this point. This comment is regarding Working Paper #2, page 1-12, C. Historic Properties/ Section 4(f) Sites.

- Comment noted and sentence is underlined to highlight the point.

There are a lack of traveler services within the corridor. No rest areas.

- Comment addressed in the recommended projects.

Livestock on the highway is a problem. Fencing is needed to control cattle and sheep. Also cattle guards and gates should be placed at access points. Who controls the access to the highways?

- An access plan does not currently exist on the Reservation.

The 264/191 junction west of Gallup needs improvement. There are a lot of accidents at the intersection. There is a need for illumination of major intersections such as this one.

- Comment noted and addressed in overall road maintenance.

Sign maintenance is an issue. Signs are knocked down or damaged and not replaced quickly.

- Comment noted and addressed in overall road maintenance.

Don't see a need for VMS in the corridor. There may be a role for automated surface condition and weather reporting.

- Comment noted and addressed in the recommended projects.

More houses are being built along the 191 corridor. What are the ADOT rules regarding animal control at access drives?

- Comment notes and addressed in Chapter II under Large-scaled, Planned Development.

Need passing zones.

- Comment noted and addressed in the recommended projects.

Omit HUD/NHA Housing Site, 3 acres; Fire Station Site, 2 acres; and Trading Post Site, 2 acres in Chapter II.

- Text omitted.

Add Westsun Store, owned by Wendall Mortenson in Klagetoh to Table II-5 in Chapter II.

- Table updated.

Add Saferide, Ganado Unified School District, Navajo Nation Headstart Programs, and Wide Ruins Community School to General Public Service and other Transportation Providers in Chapter II.

- Text added.

Working Paper #2 – Page I-13 and I-14, under Section B, Site-Specific Highway Improvement Projects, MP 340.5 - MP 365 Improvements. There is no comment addressing drainage problems. Throughout this section, there are numerous CMP and Box Culvert problems with drainage. A lot of CMP's do not work properly. The surrounding terrain next to existing roadway is higher than the roadway. Too many dips in the existing roadway, etc. These situations cannot be addressed. Pavement Preservation funds only.

- Improvement project expanded to address sub-base and alignment.

Working Paper #2 -- Chapter I, Part I, Revenue Sources and Estimates: The proposed Navajo fuel tax should be mentioned at least. This is an issue that is ongoing within the Navajo Nation, but it looks as though a fuel tax will be approved and discussion, at the point, is focused on whether it will be dedicated

to transportation improvements or not. This will provide us another source possible funding for improvements within the areas of the Navajo Nation.

- Text added to Chapter IV to reflect this future revenue source.

Working Paper #2 -- Chapter I, Part II, Financial Opportunities/Constraints: Under Rural Widening/ Realignment, "especially since a large portion of the improvement will be made within national forests": along this route the major areas of concern are within Indian Reservation lands, primarily the Navajo Nation and also within state lands as well.

- Text changed in Chapter IV.

Working Paper #2 – Chapter I, Part III, Right-of-Way Opportunities/Constraints: There should be some discussion about obtaining right-of-way within the Chinle small urban area since, at this point, there is discussion about further widening of the roadway so it is at least a five-lane facility through the community of Chinle.

- Widening project added to recommended improvements list.

Working Paper #2 – Chapter I, Part IV, Environmental Opportunities/Constraints, Section C, Historic Properties/Section 4(f) Sites: There is no mention of the Navajo Nation Historic Preservation Department who maintains a fairly extensive file and information on historical sites within the Navajo Nation.

- Chapter II presents the resources used in identifying the historic sites and properties.

Working Paper #2 – Chapter I, Part V, Investment Opportunities/Management Actions, Section B: Site-Specific Highway Improvement Projects: The intersection of US 11 with I-40 at Sanders includes the possible reconstruction of three structures, widening, and there is also some commercial development planned for the area. This is not recognized in the report, especially in the site-specific areas. There should be consideration of widening in this area, along with reconstruction of the traffic interchange.

- This area has monies allotted to it through the five-year plan. Continuation of these projects is in the process of being scoped in Phoenix. The ADOT bridge database does not show that these bridges are deficient nor do projected volumes indicate a need for widening.

Working Paper #2 – Chapter I, Part V. Investment Opportunities/Management Actions, Section D, Transportation System Management Strategies: Introducing raised medians to control access and provide refuge for pedestrians may be beneficial to pedestrians and the look of a town, but may amplify maintenance issues within Chinle and also would cause a larger roadway footprint than what presently exists. Until partnerships can be entered into with the Navajo Nation or the community of Chinle, so items such as raised medians, sidewalks, etc., can be maintained by the community of Navajo Nation, improvements such as this will be of lower priority.

- Comment noted and addressed in the recommended projects.

Working Paper #2 – Chapter I, Part V, Investment Opportunities/Management Actions, Section D, Transportation System Management Strategies: Development of an Access Control Plan within the entire corridor would be very difficult, especially on Navajo Nation lands. Currently Navajo Nation does not do any land planning and has no agency that controls land planning, zoning, or anything along that line that would help with access control. Since the state highway operates on right-of-way that is either under a use permit or easement on Indian trust lands, control of access is very difficult in developing a plan that would meet the needs of both the Department and the Navajo Nation and may be near impossible.

- Comment noted and addressed in the recommended projects.

Working Paper #2 – Under this section, there is no mention of ITS. There are some plans, at least within the area between I-40 and the junction of US 160, to possibly place some variable message signing and

Roadway Weather Information System sites. These are part of the ITI plan that has been put together by the Technology Group of the Intermodal Transportation Division.

- Comment noted and addressed in the recommended projects.

Working Paper #2 – Chapter II, Preliminary Cost Estimates for Investment Options: In reviewing Table II-4 References, C), it is noted that the installation of delineators are estimated to cost $500 per mile, but based on information supplied by Colorado DOT. The information to be used for any analysis should probably be based on Arizona DOT information. D) The installation of centerline rumble strips looks as though the cost is accrued in larger project costs. Is the suggestion of this action to be done separate of paving projects, or should this be included as pavement preservation or new construction projects? L) Crosswalks are estimated to cost $100,000 per site. What is in this cost? The cost of placement of crosswalks with signing and striping is less money, even doing it in-house.

- Cost information provided by ADOT was supplemented by Colorado DOT when costs were unavailable. The cost of rumble strip installation comes from ADOT personnel and is separate from paving projects. The rumble strip cost is included in new construction and paving work. The cost of crosswalks includes design, engineering, contingency costs, signing, curbs, lighting, and striping for the project.

Let's ensure that all references to the Bicycle Suitability Map are for the 1998 version.

- Text changed to reflect the 1998 data.

Chinle Chapter Meeting Notes - Sunday, Nov. 14, 1999 1:15 to 3:15 p.m.
US 191 Corridor Study:
Approximately 50+ people were present at the Chapter meeting.

Jeff Swan generally outlined what a corridor study meant and what was asked for in the study. He then opened the floor to questions and comments from Chapter members, especially in regard to what they saw as the needs.

The following comments were provided:
One person felt the whole route was too narrow and there were too few caution signs. (Nothing specific beyond this general statement).

- Comment noted and included in the recommendations analysis.

Ben Jones: The two-lane highway is inadequate; four-lane highway is needed. The safety of the people traveling the roadway, animals, vehicles, pedestrians, etc. is critical. There needs to be emergency vehicle access including through access to the different health centers and hospitals in the area. The law enforcement is inadequate along 191, both DPS and Navajo Public Safety should provide more patrolling. If the right-of-way actually belongs in the State of Arizona, then more law enforcement activity should take place. Mr. Jones also expressed concern about speeding vehicles concerning the speed that vehicles travel at this time.

- Comment noted. Enforcement of laws along Arizona highways is the responsibility of the local and regional law enforcement agencies and not the Arizona Department of Transportation.

Lorraine: Roadways are the most important link between the communities, especially in the Chinle area. Her statement was to the effect, "our connection to everything." She recommended that there be pedestrian overpasses, both at the Basha's shopping center and at the high school. Requested that livestock underpasses be considered, especially since livestock in the highway is the most dangerous obstacle on all the highways.

- Pedestrian volumes across US 191 are not projected to be high enough to justify pedestrian overpasses. Livestock underpasses will not address the issue of livestock being on the highway. Fence maintenance and cattle guards must be addressed by the land users along the corridor.

Mr. Tsosie: Concerned about the operation of the intersection of US 191 and N7, especially with the approach speeds that are currently in existence. Complained about the speed limit on N7; also asked the question on how we determine speed zones. This was not covered during the meeting. On US 191, he felt that the schools, businesses and different residential areas should be taken into account when determining the speed zones. Noted that there had been several accidents and asked what could be done about those accidents.

- Comment noted.

Ted Evans: Had a question about the right-of-way on the Reservation, and if there was going to be any need for more right-of-way if we went to a divided roadway, or if we went to a five-lane roadway. The Navajo Nation should be working with the State, and vice versa, on laws to address livestock in the right-of-way. Concerned about how one got permission to cut fences to place gates, but yet placed no cattle guard since people have a tendency to leave gates open, and again, allowing livestock on the right-of-way.

- Comment noted.

Haskey: He requested that the Chapter and individual members of the Chapter review the studies when completed. He stated that US 191 needs to be a freeway. There are some people who drive too slow, and some who drive too fast. The traffic speed mix is of concern. US 191 overlaps other routes, including 264, and he is wondering if double the money could be obtained for the overlaps. Highways leading in and out from US 191 should be in addition to the corridor study, specifically mentioned was the Nazlini Highway. More roads should be established and other highways should be established.

- Comment noted. Requests are beyond the scope of this study. But suggestions will be forwarded to ADOT representatives.

Unidentified Person: There is a question about trucks getting off the roadway and parking along side the roadways, and in some cases, restricting sight distance and traffic flow. There need to be more parking areas for trucks, and there is also a need for rest areas. Generally reviewed upcoming work in terms of the DCR studies, the current project for Many Farms to Round Rock, and some of the items that were proposed by the District in the vicinity of Burnside Junction. Also discussed the collection of accident data and how projects were generally programmed.

- Comment noted.

At the end of my portion of the meeting, a resolution was passed, which requested that the Holbrook District along with law enforcement agencies, including Navajo Public Safety and others, provide information to the Chapter, and Chapter would also provide information concerning accidents within their boundaries.

- Comment noted.

Draft Final Report - The District is still of the opinion that more information is required throughout the report. It seems, at least in the way the report is written, continued effort is needed to coordinate with the Navajo Nation and their transportation studies and how they impact US 191. Again, there also needs to be discussion with Navajo Nation Economic Development personnel and institutions, especially in regard to planned development throughout the corridor. We should not be limiting ourselves to only Navajo Nation, but there is also the area of Navajo-Hopi relocation that is involved as well and will be

noted in comments throughout this memo. By not coordinating these efforts with major stakeholders, it does not help in outlining some of the critical issues that are present along the US 191 Corridor.

- The LSC Team previously contacted other entities besides the Navajo Nation. The Economic Development Division referred the LSC Team to the Tourism Department, which is where the majority of Navajo development information originated from. The Navajo-Hopi Relocation Office was also contacted and provided limited information for the study.

Draft Final Report - Chapter II, Community Descriptions, Page II-12: Chinle, Many Farms, St. Johns and Springerville are noted. Ganado is not described though Ganado is described in Figure II-1.

- Community information for the report was provided by the Arizona Department of Commerce (ADC). The ADC did not have a community description for Ganado. Therefore, the location of the town was shown, but not described.

Draft Final Report - Chapter II, F. Historic Properties and Existing or Potential 4(f) Issues, Page II-31: "Several well-known sites along the US 160 Corridor are listed..." This should read the US 191 Corridor.

- Text corrected.

Draft Final Report - Chapter II, Solid Waste Sites, Page 37: There is a solid waste site located north of Chinle. This site is designated as a collection point.

- Additional text added to clarify.

Draft Final Report - Chapter II, Table II-5, Page II-39: The John McCarrell Rock Shop and Norm's EZ Mart is Bell Gas of Arizona.

- Table corrected.

Draft Final Report - Chapter II, Table II-6, Page II-40: Some of the tanks listed, especially in the Chambers ADOT Maintenance Yard, have been replaced as long as two years ago.

- Table corrected.

Draft Final Report - Chapter II, Traffic Data, Page II-47: Rather than stating that it is difficult to get accident data, it should be contingent upon us to pursue getting accident data for US 191. This may take an extra effort. The report is incomplete if we do not obtain the data from Navajo concerning accidents along the 191 Corridor.

- As described in Chapter II, the accident data received to supplement the ADOT data does not correlate to the ADOT data. Acquiring historic accident data from an overall inadequate system is not possible. The recommendation for ADOT and the Navajo Nation to jointly remedy this solution in the future is the most appropriate solution.

Draft Final Report - Chapter II, Large-Scale, Planned Developments, Page II-17: There is no mention whatsoever in Chinle concerning economic growth, especially since there is a grant from the Arizona Department of Commerce for infrastructure improvements for economic development within that area. There is also economic development planned within the Sanders area, especially in the vicinity of the traffic interchange between US 191 and I-40. The follow-up with the Chapters, other than a letter, may be required to assure that we properly address the planned development. Again, in going through the report, the Navajo-Hopi relocation economic stakeholders were not contacted along with the Navajo Nation Economic Development.

- The LSC Team re-contacted the Chinle Chapter and the Navajo-Hopi Relocation Office. Limited information was available. This information was added to Chapter II for the Large-scale, Planned Development section.

Draft Final Report - Chapter II, b. Average Daily Traffic, Page II-48: The fact that the data is so fragmented and literally sporadic in the way it has been reported over the years, there should be an effort made that we make sure that we match up with other studies. Burnside Junction North is one study that has been conducted. There have been signal studies in the Chinle area that should give us information and also validate the existing numbers.

- An effort was made by LSC early in the data collection process to obtain all of the relevant studies along the corridor. All of the received data was considered when analyzing the existing numbers.

Draft Final Report - Chapter II, 2. General Public Service and other Transportation Providers, Page II-50: The first two paragraphs say Navajo Transit System – Chinle, Ganado, Chambers and the next paragraph says "the Navajo Transit System provides general public services; however, not within the US 191 study area". Route #3 listed in Table II-12 shows a stop in Chinle, which says it is using US 191. This apparent conflict needs to be addressed.

- Additional text was added to clarify text.

Draft Final Report - Chapter III, Table III-1, Page III-2: Segment 446.5 to 448.5, which is Chinle, shows Level of Service A in each direction. A signal study determined that there was a warrant for a signal at the turn-off to the hospital, and the question becomes, with a signal warrant and the fact that a traffic signal exists within the community, are we actually operating at a Level of Service A or are we operating at something less?

- The described LOS A is for a road segment and does not include specific delay at intersections. Meeting a signal warrant for a minor street approach does not necessarily indicate that the main thoroughfare is operating with unnecessary delay. It does indicate that the minor street approach is experiencing excessive delay.

Draft Final Report - Chapter III, F. Drainage Concerns, Page III-6: The District did note that between MP 345.5 and 365 there are numerous pipe and box culverts with problems, but it should also be noticed that throughout the Navajo Reservation lands, flooding occurs on a regular basis throughout the corridor. In many cases the facilities were previously under-designed, and the most recent situation was flooding just north of Burnside Junction, which involved the road being closed up to two hours this past year.

- The drainage improvement project has been expanded to envelop the entire corridor.

Draft Final Report - Chapter III, A. Congestion, Page III-11: The Sanders area, given any type of economic development, will continue to grow as well. Continued growth of the schools in that area will also result in increased congestion due to school buses in the vicinity of the interstate and also around the convenience stores.

- Comment noted.

Draft Final Report - Chapter IV, G. Traveler Services, Item #6, Page IV-18: Re-numbering the mileposts between Springerville and St. Johns is making the assumption that US 191 is the primary route. This should be checked since the route between St. Johns and Springerville is also US 180. The mileposts are going from west to east, and if 180 is the primary route, then the mileposts are numbered correctly in that area.

- The assumption of US 191 being the primary route is based upon the Arizona State Transportation Plan, December 1994, which includes this section of US 191 as a Transportation Corridor of Statewide Significance. US 180 did not receive the same or similar designation.

Draft Final Report - In conclusion, this particular profile study is still incomplete. The Multimodal Corridor Profile Study is to determine how each corridor is to compete against one another in terms of

improvements, projects, and ultimately, the impact on the local communities. Without an exhaustive effort to assure ourselves, as a department, that we have all the information necessary to assure that the US 191 Corridor can compete against other corridors and has the data to compete, is very critical. Realizing that there is greater effort required to assure that all issues are addressed, or at least the issues identified, it is recommended by the District that the effort be continued before any type of final report is issued.

- All comments received by the LSC Team have been addressed and the information added to the report.

It is requested that the various Indian Nations/Chapters that were contacted be listed in the report.

- Appendix B was updated to provide all contact persons throughout the study.

There is a concern that in the cultural resources section, the level of detail provided on the location and description for cultural resources may expose these sites to vandalism and damage because anyone with access to the report could simply drive to these sites. I suggest that all specific site locational information in a public document be removed. Description information about the site and very general location information (within 2 miles) is okay for a public document.

The report should also probably mention the Wide Ruins Historic District because US 191 passes through it. This is very likely a Section 4(f) property because it is listed on the National Register of Historic Places and considered by the Navajo to be eligible under criterion 'a.'

- The site specific archeological information was removed from Chapter II. Also, the Wide Ruins historic information was added to the Chapter.

Page II-10, Draft Report - Improvement for the City of St. Johns, 5th bullet: The state made is not an improvement. It just notes the condition of the roadway and intersection.

- Text changed.

Page II-17, Draft Report - Large-Scale Planned Development: Nowhere in this report does it note the impact of planned development that the Navajo/Hopi Relocation Commission has been doing in the Sanders and Witch Well area. There should be contacts initiated with the Navajo/Hopi Relocation Commission in Flagstaff. Also, efforts should be made to discuss developments in terms of shopping areas at the junction of I-40 and 191. There are also several developments that have already been done and others planned in areas south of the Sanders area along 191, especially residential areas.

- Text added to clarify.

Page II-37, Draft Report - Solid Waste Sites: Should the Chinle Waste Transfer Station be mentioned in this area?

- Text added.

Page II-49, 1. Intercity Bus, 3rd paragraph, 2nd sentence, Draft Report - This sentence does not make sense since on Table II-12, the route serving the Chinle area does not travel east/west, it travels north/south along Indian Route 59 and then east/west along 264 to get to the Window Rock - Ft. Defiance area.

- Text and table are correct according to Navajo Transit System.

Page IV-1, A. Revenue Sources, 3rd paragraph:, Draft Report – The Navajo fuel tax has not been dedicated for transportation purposes, and it is unknown if this source of revenue will ever be used for transportation purposes.

- Text changed.

Pages IV-1 and IV-2, A. Revenue Sources, 1. Highway User Revenue Trends and 2. Local Transportation Assistance Fund, Draft Report – In both of these cases, the Highway User Fund and the LTAF are unavailable to reservation lands. On off-reservation lands, the counties and cities have opportunities to use these funds, but Indian tribes do not have the opportunity to access either of these funding sources, and it should be so noted.

- Text added.

Page IV-11, III. Right-of-Way Opportunities/Constraints, Draft Report – It is Navajo Indian Reservation rather than Navajo Indian Reservations. The Navajo Indians only have one reservation.

- Text corrected.

Page IV-18, Item 6, Draft Report – The study only notes to re-number the mileposts between Springerville and St. Johns. US 191 overlaps US 180 in this area. US 180 is primarily an east/west route, and the mileposts are numbered in that direction. US 191, being primarily a south to north route, would have the mileposts going in the opposite direction for the area between Springerville and St. Johns. Therefore, it must be determined which route is the predominant route, and that is to be determined by the Department and also with concurrence from AASHTO, especially in regard to designation of primary routes within Arizona.

- Additional text added to clarify.

Comments from April 12th, 2000 public meeting held in Chinle.

There is a need for speed change warning signs at Rock Point

- Comment noted and passed along to the ADOT district office.

The jurisdiction of the road just east of US 191 in Chinle is in dispute. BIA says it is ADOT's road, ADOT says it is BIA's road.

- Comment noted. This is a legal issue that is outside the scope of this report.

The bridge at the bottom of the hill south of Chinle needs to be widened. The curves north of the junction with 264 need to be improved.

- Two projects have been added to address these concerns.

Appendix C

TRANSPORTATION
CONSULTANTS, INC.

Appendix C

Travel Time Comparison

US 191 - Springerville to US 160 Corridor

Highway Segment	Type of Facility	Expected LOS NB/SB	Expected Speed (mph)	Expected Travel Time (min)	Desired Operating LOS	Desired Operating Speed (mph)	Design Travel Time (min)	Diff. Between Design and Expected	% Diff Between Design and Expected
MP 394-370	Rural two-lane	B	56	2.46	C	52	2.65	0.19	8%
MP 370-369	Urban four-lane	A	61	6.89	C	35 *	12.00	5.11	74%
MP 315.5-367	Rural two-lane	B	56	9.11	C	52	9.81	0.70	8%
MP 367-368.5	Rural two-lane	B	56	10.18	C	35 *	16.29	6.11	60%
MP 374-411.5	Rural two-lane	B	56	1.07	C	52	1.15	0.08	8%
MP 417.5-446.5	Rural two-lane	B	56	10.71	C	52	11.54	0.82	8%
MP 446.5-448.5	Urban five-lane	A	61	2.95	C	45 *	4.00	1.05	36%
MP 448.5-461	Rural two-lane	C	52	5.19	C	52	5.19	0.00	0%
MP 461-510.5	Rural two-lane	B	56	2.14	C	52	2.31	0.16	8%

* - Speed Limit due to geometric limitations or safety concerns

LSC, 1999