Southern Navajo/Apache County Sub Regional Transportation Plan Final Report

September, 2007

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Southern Navajo/Apache County Sub-Regional Transportation Plan

Final Report

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(Project Numbers: 06-100-10400; 06-100-10800)

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1.0 INTRODUCTION

1.1 STUDY CONTEXT

Navajo and Apache Counties are located in the central portion of eastern Arizona, as shown in Figure 1-1. This region, which is a major destination in Arizona's "White Mountains," is experiencing rapid population and economic growth. The recent intensification of development activity coupled with anticipated natural regional growth has led to the need for an updated transportation plan to address the issues and infrastructure needs of key growth centers located within the White Mountains.

1.2 STUDY AREA OVERVIEW

This Southern Navajo/Apache County Sub-Regional Transportation Plan specifically addresses the needs of the Town of Pinetop-Lakeside, the City of Show Low, the Town of Snowflake, and the Town of Taylor. It also addresses the unincorporated areas of southern Navajo and Apache Counties, including the communities of Concho and Vernon. The focus of this sub-regional study is the roadway system in an area of southern Navajo and Apache Counties bounded by the Town of Pinetop-Lakeside in the south, the Town of Snowflake in the north, Pulp Mill Road to the west, and the Concho area in Apache County to the east (Figure 1-2). The approximately 1,900 square-mile Study Area is served by one major east-west Federal highway and four Arizona State Highways.

1.3 COMMUNITY INVOLVEMENT

The Southern Navajo County/Apache County Sub-Regional Transportation Plan was developed in collaboration with a Technical Advisory Committee (TAC) comprised of the following participants representing local and regional governmental entities:

Dusty Parsons, Navajo County	Tom Thomas, Town of Pinetop-Lakeside
Dave Swietanski, Navajo County	Ken Patterson, City of Show Low
Montana Slack, Navajo County	Gary Fenstermaker, Town of Snowflake
Jim Matteson, Navajo County	Dick Prior, Town of Taylor
Ferrin Crosby, Apache County	Ron Solomon, Town of Taylor

TAC meetings were held at major project milestones to review study results and provide guidance to the planning process:

- May 11, 2006
- September 21, 2006
- January 11, 2006

These meetings included workshops that helped shape the scope of this project in terms of goals and deliverables. They also provided a source for valuable data regarding the existing conditions of the municipalities and unincorporated communities of the Study Area, including previous studies, comprehensive planning documents, and submitted development proposals.

In addition, coordination was maintained with the standing White Mountain Regional Transportation Committee (WMRTC). The recommended roadway transportation improvement plan was presented to the White Mountain Regional Transportation Committee on May 11, 2007. The plan was presented to the Navajo County Board of Supervisors on May 1, 2007.

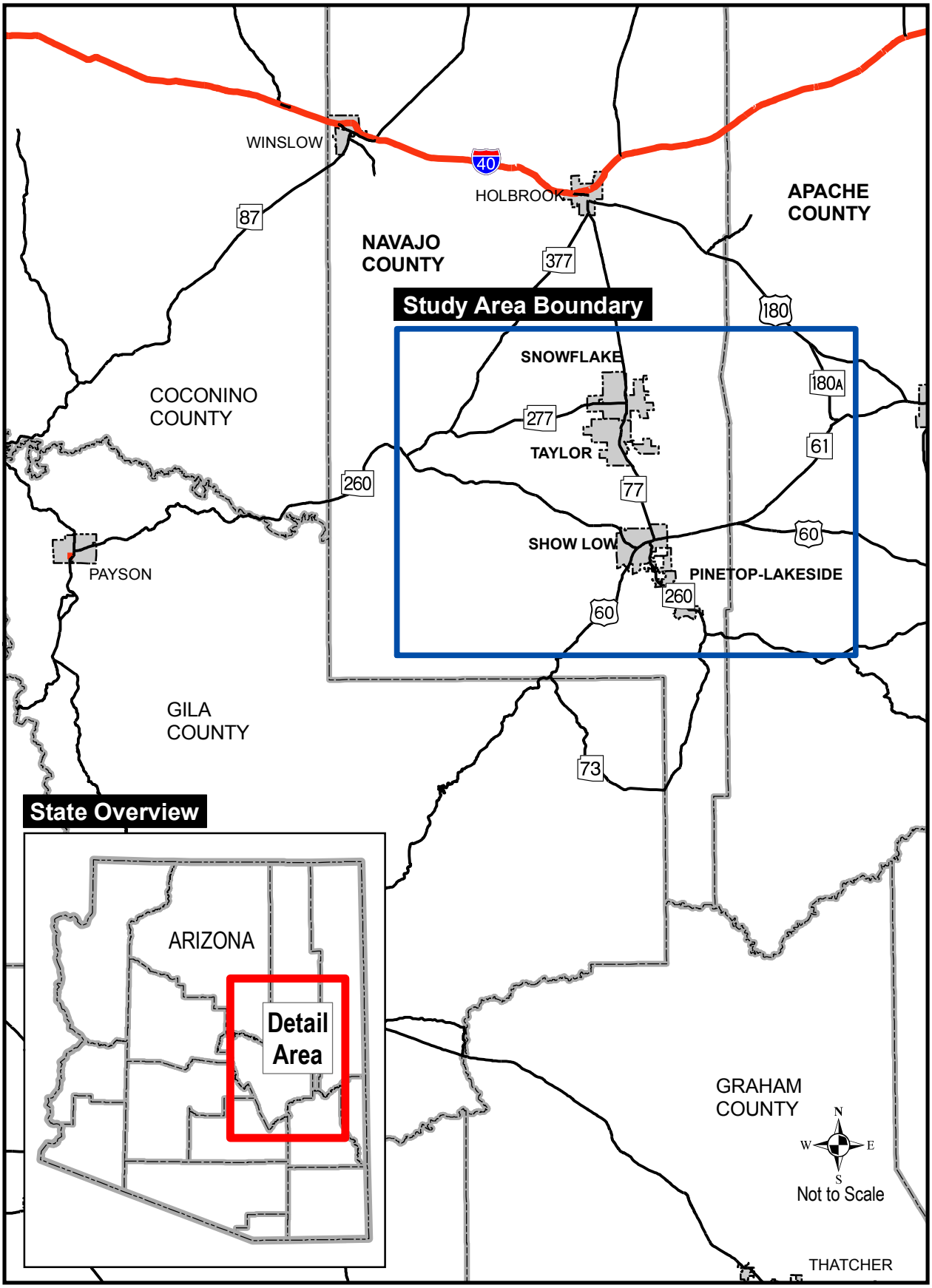

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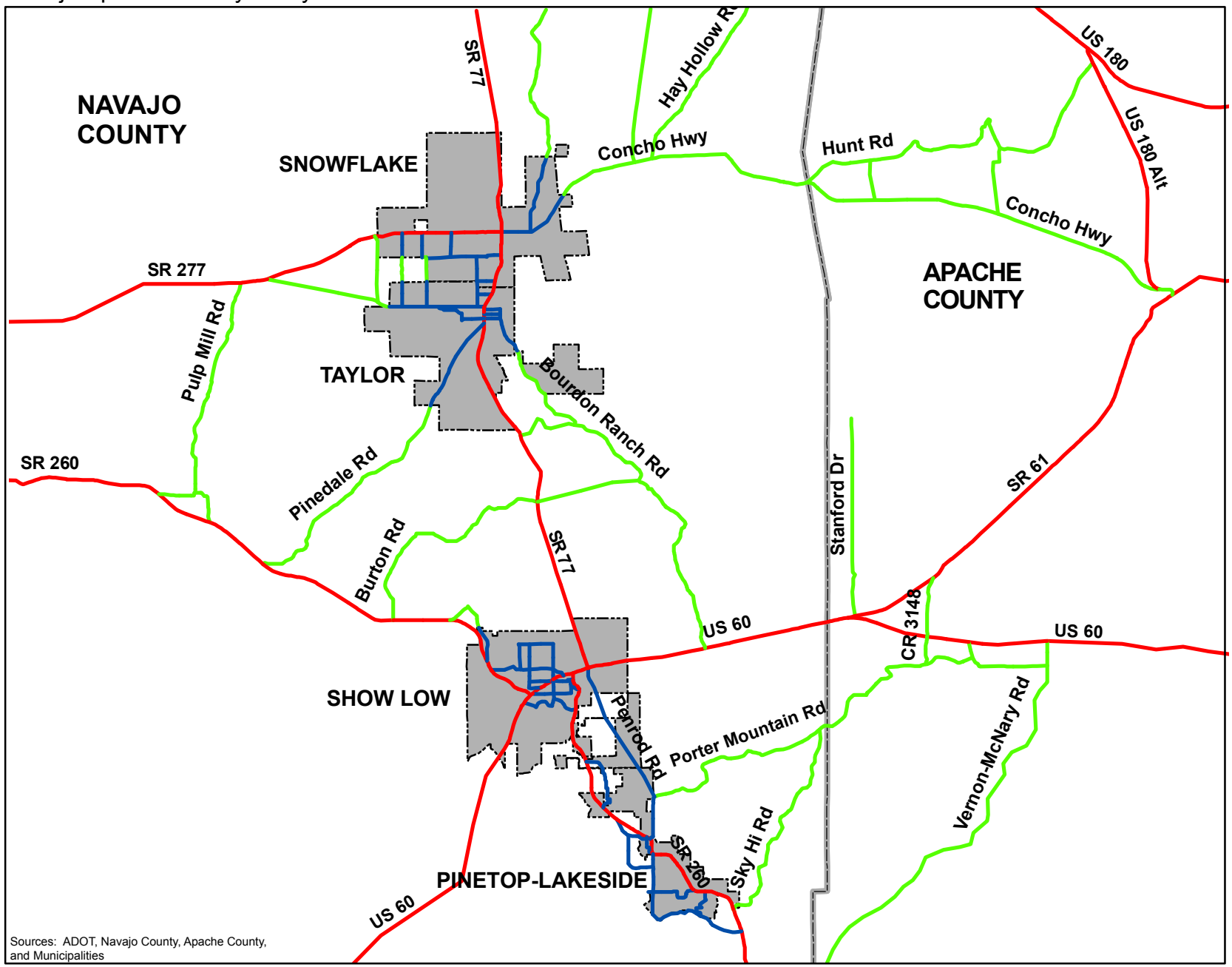
FIGURE 1-1
VICINITY MAP

Navajo/Apache County Study Area Overview



STUDY AREA AND MAJOR ROADWAY NETWORK

Jurisdiction
- County
- Arizona Dept of Transportation
- Municipality

Base Map Features
- Cities/Towns

N

Not to Scale

Sources: ADOT, Navajo County, Apache County, and Municipalities

FIGURE 1-2

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Southern Navajo/Apache County Sub-Regional Transportation Plan

1.4 STUDY GOALS AND OBJECTIVES

Five goals were set to be addressed within the context of this planning study:

(1) Understand key stakeholder issues and needs;
(2) Identify imminent and future developments within the Study Area;
(3) Develop a customized travel demand model to facilitate forecasting land use and associated transportation volumes;
(4) Produce growth forecasts for each municipality and the unincorporated areas of Navajo and Apache Counties; and
(5) Analyze feasible alternatives for improving the roadway network in the Study Area.

1.5 REPORT ORGANIZATION

This Sub-Regional Transportation Plan provides details on the study process and findings for the entire Southern Navajo/Apache County Study Area. The following subjects are addressed in this report:

- Chapter 2 – Methodologies and Standards
- Chapter 3 – Current Conditions
- Chapter 4 – Travel Demand Model Development
- Chapter 5 – Socioeconomic Projections
- Chapter 6 – Analysis of Improvement Alternatives
- Chapter 7 – Implementation Plan
- Chapter 8 – Policies and Guidelines

In addition to this report, providing comprehensive documentation of the study, a separate Executive Summary has been prepared for wide distribution. Also, separate Community Transportation Plans have been prepared for the four municipalities participating in the study. These separate planning reports highlight pertinent study findings associated with each municipality.

2.0 METHODOLOGIES AND STANDARDS

This chapter identifies the procedures and standards used to evaluate existing and future roadway segment performance.

2.1 LEVEL OF SERVICE CONCEPT

Level of Service (LOS) is a quantitative measurement of the operational characteristics of traffic and the perception of traffic conditions by both motorists and passengers. There are six levels of service defined by the *Highway Capacity Manual*, published by the Transportation Research Board (TRB). Each LOS is given a letter designation from 'A' to 'F', with 'A' representing the optimal or best traffic conditions and 'F' the worst traffic conditions. Roadway segment LOS is characterized by the *Highway Capacity Manual* as follows:

LOS 'A': Best or Optimal – free flow operations (on uninterrupted flow facilities) and very low delay (on interrupted flow facilities). Freedom to select desired speeds and to maneuver within traffic is extremely high.

LOS 'B': Stable Flow – presence of other users is noticeable. Freedom to select desired speeds is relatively unaffected, but there is a slight decline in the freedom to maneuver within traffic.

LOS 'C': Stable Flow – presence of other users is affecting driver's operations. Maneuvering within traffic requires substantial vigilance on the part of the user.

LOS 'D': Stable Flow – high density of traffic is noticeable. Speed and freedom to maneuver are severely restricted. Driver is experiencing a generally poor level of comfort and convenience.

LOS 'E': Near Capacity Flow – the speed for all drivers is reduced to a low, but relatively uniform value. Freedom to maneuver within traffic is extremely difficult. Comfort and convenience levels are extremely poor.

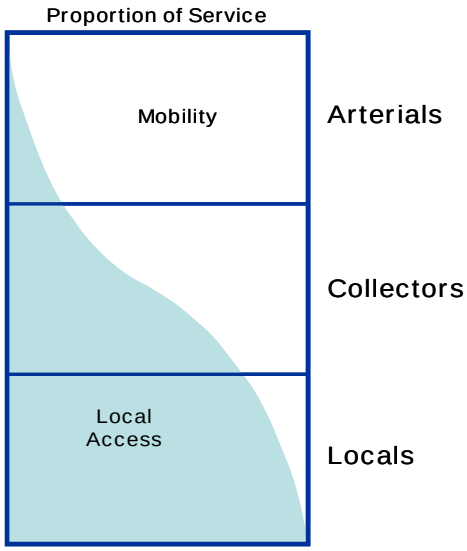
LOS 'F': Worst – facility has failed. A total breakdown in traffic flow has occurred; stop-and-go traffic operations are the norm.

For typical long-range transportation planning studies in urbanized areas, LOS 'D' usually is adopted as the operational standard, because it allows for a generally accepted quality of service. To maintain consistency with other area plans in the region, this standard was adopted for determining future need for roadway facilities.

2.2 FUNCTIONAL CLASSIFICATION

Roads are classified according to generally accepted design and traffic characteristics (see graphic at right). The functional classification system categorizes roads by how they perform in regard to providing access and mobility. A principal arterial, for example, provides mobility for longer distance trips with high speeds and minimal access to adjoining properties. Conversely, the function of a local street is to serve neighborhoods with direct access

Relationship of Functionally Classified Systems in serving Traffic Mobility and Land Access



Source: *Safety Effectiveness of Highway Design Features,* Volume I, Access Control, FHWA, 1992

at lower speeds. The functional classification system relevant to the Study Area includes three primary classifications: Urban Arterial, Rural Arterial, and Collector. Because of the sub-regional focus of this study, local streets were not analyzed.

2.3 LEVEL OF SERVICE THRESHOLDS

The analysis of roadway segment LOS is based on the number of lanes in the segment, the functional classification of the roadway, the maximum desired capacity of the roadway, and the existing or forecast average daily traffic (ADT) volume. The planning-level daily roadway capacities used for the Sub-Regional Transportation Plan Study Area were based on arterial capacities published in *2002 Quality/Level of Service Manual* published by the Florida Department of Transportation (FDOT) (refer to Appendix A). Values presented in the FDOT publication were adjusted to reflect local conditions, based on conversations with Navajo County Public Works Department staff. Table 2-1 identifies the daily per lane capacity adopted for modeling purposes for each functional classification applicable to the Study Area roadway network.

TABLE 2-1
PLANNING-LEVEL ROADWAY CAPACITY BY FUNCTIONAL CLASSIFICATION

Functional Classification	Number of Lanes	Daily Per Lane Capacity	LOS at Theoretical Maximum
Urban Arterial	2 – 4	8,900	E
Rural Arterial	2	11,150	E
Rural Arterial	4	14,575	E
Collector	2 -4	7,500	E

Source: *Generalized Level of Service Volume Tables*, 2002 Quality/Level of Service Handbook, Florida Department of Transportation, 2002.

The LOS thresholds in Table 2-1 were identified to permit analysis of roadway segment performance. This was accomplished by establishing volume-to-capacity (V/C) ratios for each LOS. The daily per lane capacities in each direction for each roadway were used in conjunction with daily traffic volume estimates in the evaluation year to determine V/C ratios for Study Area roadways. Table 2-2 shows how the V/C ratios relate to the standard LOS classifications. The LOS standard of 'D' provides the basis for determining whether an operational deficiency potentially exists on an Arterial or Collector facility. That is to say, if existing or projected traffic volumes exceed the LOS 'D' volume threshold (i.e., greater than 0.90), it is concluded that the facility is approaching capacity, and the roadway's ability to accommodate traffic operations is considered deficient. Therefore, consideration of potential solutions (e.g., widening, new turn lanes, access management actions, new alignments, etc.) is appropriate and justified.

TABLE 2-2
LEVELS OF SERVICE

LOS	Maximum V/C
A	0.00 - 0.30
B	0.30 – 0.54
C	0.54 – 0.75
D	0.75 – 0.90
E	0.90 – 1.00
F	>1.00

Source: Maricopa County Transportation System Plan, 2006.

3.0 CURRENT CONDITIONS

This section provides an overview of existing conditions within the Sub-Regional Transportation Plan Study Area. It includes an updated estimate of the Study Area's population and employment in 2006, an inventory of roadway facilities, and an overview of current transit operations.

3.1 CURRENT SOCIOECONOMIC CONDITIONS

An estimate of 2006 population and employment in the Study Area was developed from several sources, including: Census 2000 population data; historic building permit activity; and a commercial employment database.

3.1.1 2006 POPULATION AND DWELLING UNIT ESTIMATE

Significant growth has occurred within the Study Area, since the year 2000. The 2000 Census identified over 22,900 dwelling units (DUs) within the Study Area. It recorded over 35,600 people living in 13,000 households. Approximately 57 percent of the total DUs were occupied on census day, which was April 1, 2000. This low occupancy rate reflects the large number of seasonal summer homes in the Study Area. In addition to variations in seasonal occupancy, the number of persons living in each household also varied by location with the Study Area. The average number of persons per household for the Study Area was 2.74.

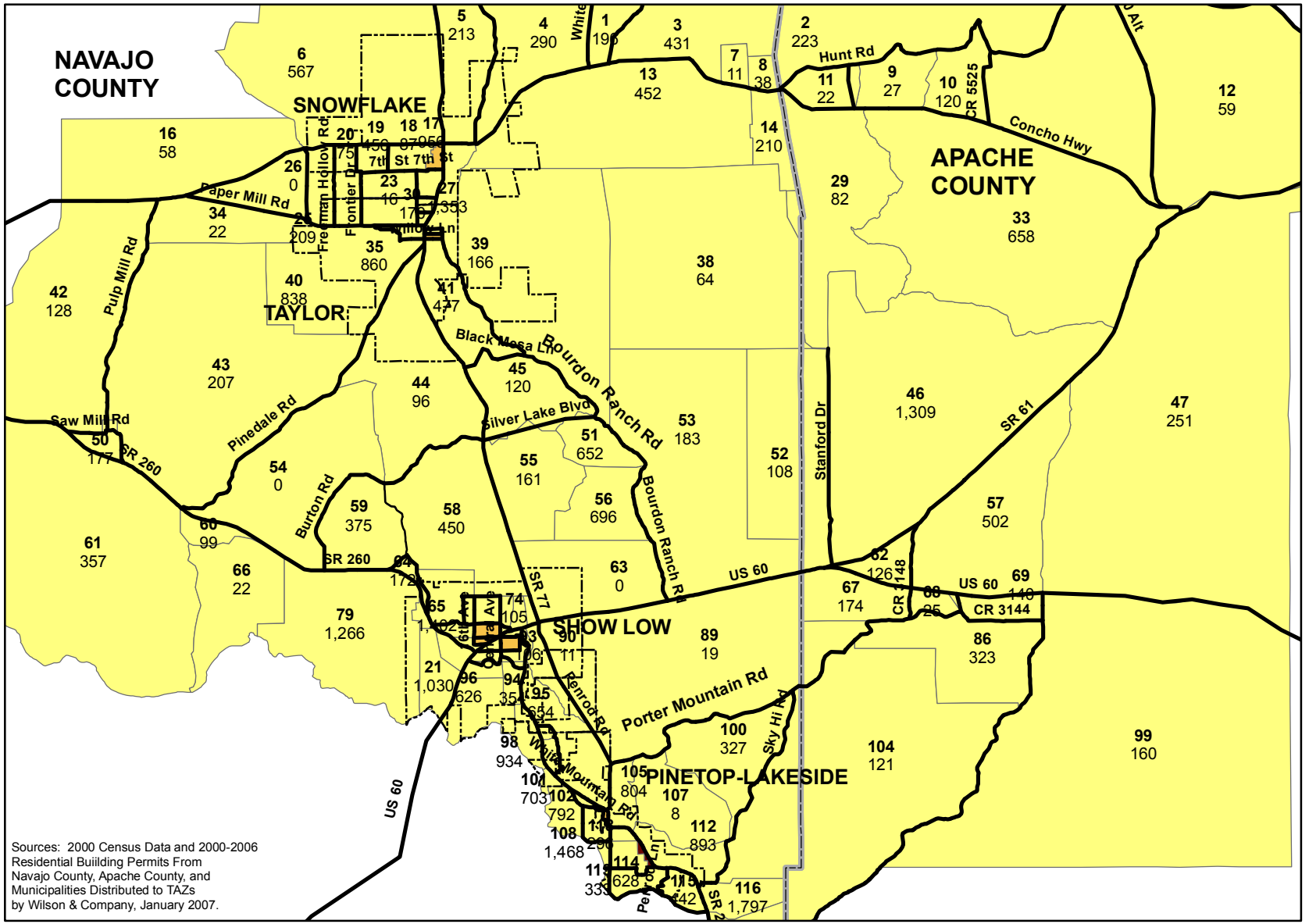
A review of building permit data from Navajo County, Apache County, Pinetop-Lakeside, Show Low, Snowflake, and Taylor indicated that nearly 5,400 new dwelling units were added between January 1, 2000, and May 31, 2006, putting the total estimated number of DUs in 2006 at 28,300. This growth increment amounted to a nearly five percent annual increase in dwelling units between 2000 and 2006.

The 2006 Study Area population was estimated by applying the observed seasonal occupancy patterns and household size to the updated estimated of DUs. Based on these factors, the 2006 Study Area population was estimated at 43,870. Figure 3-1 shows the estimated population density by traffic analysis zone (TAZ) in the Study Area in 2006. Figures displaying the 2006 population density for each of Study Area municipality are presented in Appendix B.

3.1.2 YEAR 2006 EMPLOYMENT ESTIMATE

The 2006 employment estimate for the Study Area was developed using the *White Mountain Regional Transportation Plan*, 1999, coupled with information from a commercial database purchased for this study. The commercial database provided information on business location, number of employees, and industry type. Focusing on major employers, the database information then was cross-checked against employer information included in the *White Mountain Regional Transportation Plan*, 1999. The study team verified the validity of the updated employment database with study participants and the TAC. Through this process, over 15,000 jobs were documented as currently in the Study Area. Table 3-1 shows the job totals by employment sector.

Navajo/Apache County Study Area Overview



Sources: 2000 Census Data and 2000-2006 Residential Buiilding Permits From Navajo County, Apache County, and Municipalities Distributed to TAZs by Wilson & Company, January 2007.

YEAR 2006 ESTIMATED POPULATION DENSITY BY TRAFFIC ANALYSIS ZONE

Population Density per Square Mile

- 0 - 1,500
- 1,500 - 4,000
- 4,000 - 6,500
- 6,500 +

Base Map Features

- Arterials
- Cities/Towns
- XX Traffic Analysis Zone
- X,XXX Popoulation Estimate

N

Not to Scale

FIGURE 3-1

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Southern Navajo/Apache County Sub-Regional Transportation Plan

TABLE 3-1
SOUTHERN NAVAJO/APACHE COUNTY STUDY AREA 2006 TOTAL EMPLOYMENT

Sector	Employment
Retail	5,028
Office	7,164
Government	1,273
General	1,761
Total	15,226

Sources: InfoUSA, 2006; *White Mountain Regional Transportation Plan*, 1999; & Wilson & Company, May 2007.

Figure 3-2 shows the estimated employment density by TAZ in the Study Area in 2006. Figures showing the employment density of each Study Area municipality are presented in Appendix B.

3.1.3 SCHOOL ENROLLMENT

School enrollment was verified through the area school districts including:

- Blue Ridge Unified School District (Pinetop-Lakeside);
- Snowflake Unified School District; and
- Show Low Unified School District.

The school districts reported total elementary and junior high school enrollment in 2006 was 5,111. Total reported high school enrollment in 2006 was 2,446.

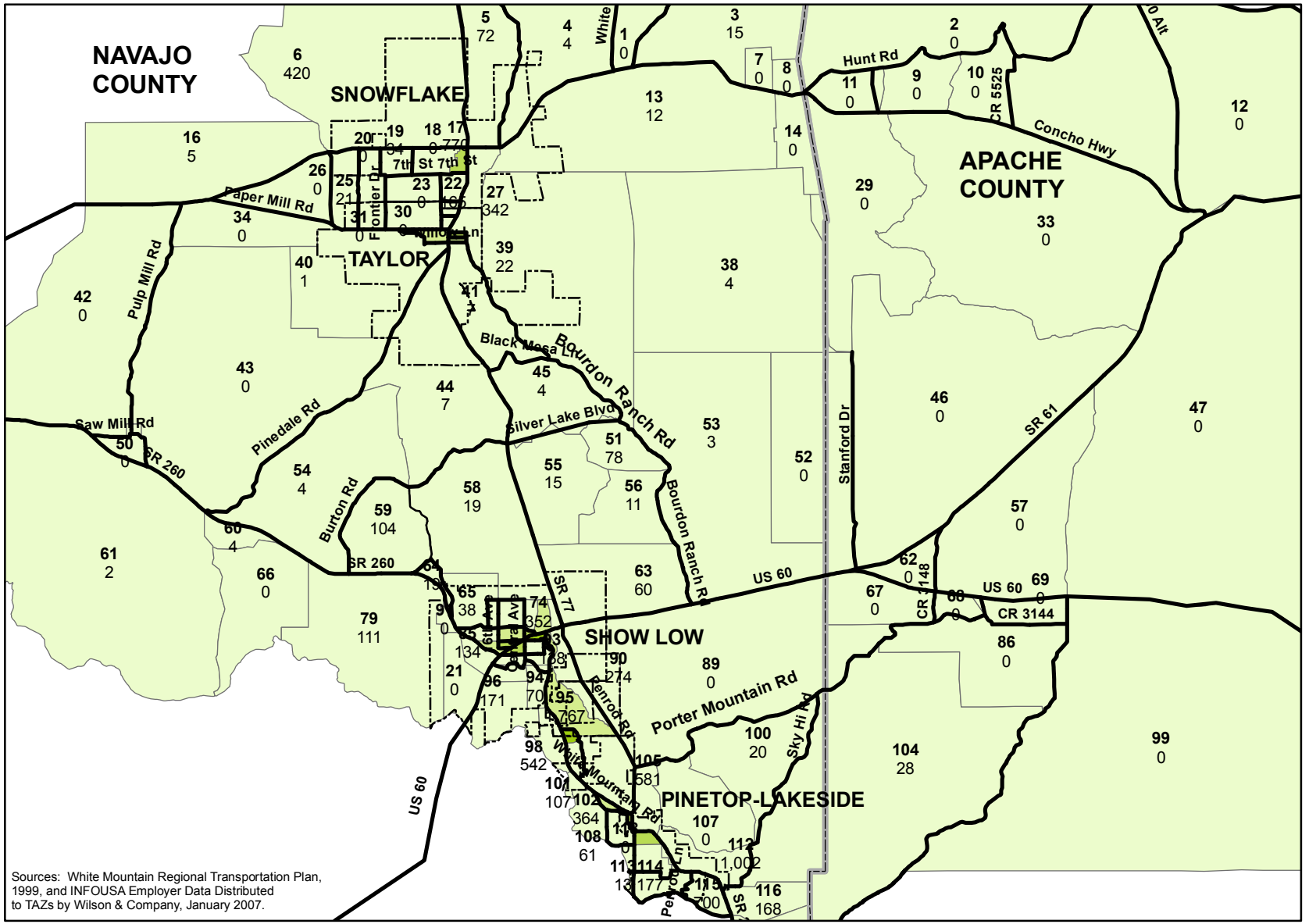
3.2 EXISTING ROADWAY NETWORK

State and Federal highways form the arterial backbone of the existing sub-regional roadway system in southern Navajo and Apache Counties (refer to Figure 1-2). These facilities, maintained by the Arizona Department of Transportation (ADOT), provide intra-regional mobility between the communities of Pinetop-Lakeside, Show Low, Taylor, and Snowflake. The State and Federal roadways also provide inter-regional linkages between the Study Area and other major population centers, including the Phoenix metropolitan area. The sub-regional roadways that are the focus of this study include:

US 60: US 60 (aka Deuce of Clubs in Show Low) is part of the National Highway System (NHS) and, as such, its function is to provide access between an arterial and a major port, airport, public transportation facility, or other intermodal transportation facility. US 60 functions as a State Principal Arterial and provides connectivity between Show Low and Globe and the Phoenix metropolitan area to the southwest and Springerville/Eager in Apache County to the east, as well as New Mexico. Through Show Low, between SR 260 (S. Clark Road) and SR 77 (N. Penrod Road) US 60 is a four-lane facility with a continuous center left-turn lane. In rural portions of the Study Area, this facility exists as a two-lane highway. US 60 is coincident with SR 260 and SR 77 in central Show Low.

SR 260: SR 260 is a State Major Regional Principal Arterial providing access between Show Low and Payson to the west and Pinetop-Lakeside to the southeast, as well as Springerville/Eager to the east. SR 260 is coincident with US 60 and SR 77 through central Show Low. North of US 60, on the west side of Show Low, SR 260 is known as S. Clark Road. South of US 60, on the east side of Show Low, SR 260 is White Mountain Road. In the urbanized portions of Show Low and Pinetop-Lakeside, SR 260 is a four-lane facility with a continuous center left-turn lane. In rural portions of the Study Area (west of Show Low and south of Pinetop-Lakeside), this facility exists as a two-lane highway.

Navajo/Apache County Study Area Overview



YEAR 2006 ESTIMATED EMPLOYMENT DENSITY BY TRAFFIC ANALYSIS ZONE

Employment Density per Square Mile

- 0 - 500
- 501 - 1000
- 1001 - 3000
- 3001 - 6000

Base Map Features

- Arterials
- Cities/Towns
- XX Traffic Analysis Zone
- X,XXX Employment Estimate

N

Not to Scale

FIGURE 3-2

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Southern Navajo/Apache County Sub-Regional Transportation Plan

SR 77: SR 77 (aka Penrod Road north of US 60) is a State Principal Arterial providing connectivity between the communities of Show Low and Taylor/Snowflake to the north. Beyond Snowflake to the north, SR 77 provides a connection with Holbrook, the Navajo County seat, and Interstate 40 (I-40). SR 77, which is coincident with US 60 and SR 260 through central Show Low, connects Show Low with Globe and Tucson to the south. In the urbanized portion of central Show Low, SR 77 is a four-lane facility with a continuous center left-turn lane. In rural portions of the Study Area northeast of Show Low, this facility is a two-lane highway.

SR 277: SR 277 is a State Principal Arterial that provides access between Snowflake and Heber/Overgaard in western Navajo County, as well as Payson in Gila County via SR 377 and SR 260. This rural facility exists as a two-lane highway.

Bourdon Ranch Road: This north-south roadway is a County Minor Arterial that provides access to growing development in the White Mountain Lakes area between Show Low and Taylor. It is anticipated that this facility will become a significant reliever to SR 77 as growth occurs in this corridor between these two communities. The roadway exists as a rural two-lane highway.

Lone Pine Dam Road: This roadway is a County Minor Arterial (Old Highway 60) that provides access between the Linden area west of Show Low and SR 77 near the White Mountain Lakes area. Navajo County anticipates this roadway will serve in the future as a key bypass facility to relieve SR 77. It exists as a rural two-lane highway.

Penrod Road: This north-south roadway is a Municipal Minor Arterial that parallels SR 260 south of Show Low and provides access between Pinetop -Lakeside and SR 77 at US 60 east of Show Low. It exists as a rural two-lane highway.

3.3 ROADWAY CHARACTERISTICS

The primary roadway characteristics of interest for this study are: jurisdictional responsibility, roadway functional classification, number of lanes or roadway cross-section, and traffic volumes.

3.3.1 JURISDICTIONAL RESPONSIBILITY

ADOT is responsible for maintaining all State and Federal routes in the Study Area. Navajo County and Apache County administer all roadways in the unincorporated portions of their respective counties. The Town of Pinetop-Lakeside, City of Show Low, Town of Snowflake, and Town of Taylor administer all roadways within their corporate limits that are not the responsibility of other entities. Refer to Figure 1-2 for the specific jurisdictional responsibility for the Study Area's major roadways.

3.3.2 ROADWAY FUNCTIONAL CLASSIFICATION

The Study Area roadway network is defined by four roadway functional classifications. Table 3-2 summarizes the principal characteristics of each of these functional classifications. As noted earlier, the level of access generally increases and capacity decreases as functional classification changes from Arterial roadway to Local roadway. Also, the purpose of the roadway changes from efficiently moving large volumes of traffic to providing direct property access. Chapter 8 presents the roadway cross-sections associated with each roadway functional classification

TABLE 3-2
ROADWAY FUNCTIONAL CLASSIFICATION CHARACTERISTICS

Functional Classification	Characteristics
Principal or Major Arterial	Provides regional mobility with limited direct access. Direct commercial access can occur, but access is infrequent to preserve capacity and mobility.
Minor Arterial	Provides access between Major Arterial and Major Collector routes. The level of access generally is less than seen on a Major Arterial, but more than a Major Collector. Direct commercial access is typically provided on Minor Arterial routes.
Major Collector	Provides access between Minor Collector and Minor Arterial routes. The level of access generally is less than on a Minor Collector, but more than a Minor Arterial.
Minor Collector	Provides access between local streets and Major Collector routes

Source: Wilson & Company, May 2007

3.3.3 NUMBER OF LANES

Most roadways in the Study Area are two-lane facilities with one travel lane in each direction, i.e., there are two directional travel lanes. Most four-lane facilities have two travel lanes in each direction (four directional travel lanes) with a continuous center left-turn lane. Figure 3-3 shows the number of directional travel lanes associated with major Study Area roadways. Figures providing detailed travel lane information for each Study Area municipality are presented in Appendix C.

3.3.4 TRAFFIC COUNTS

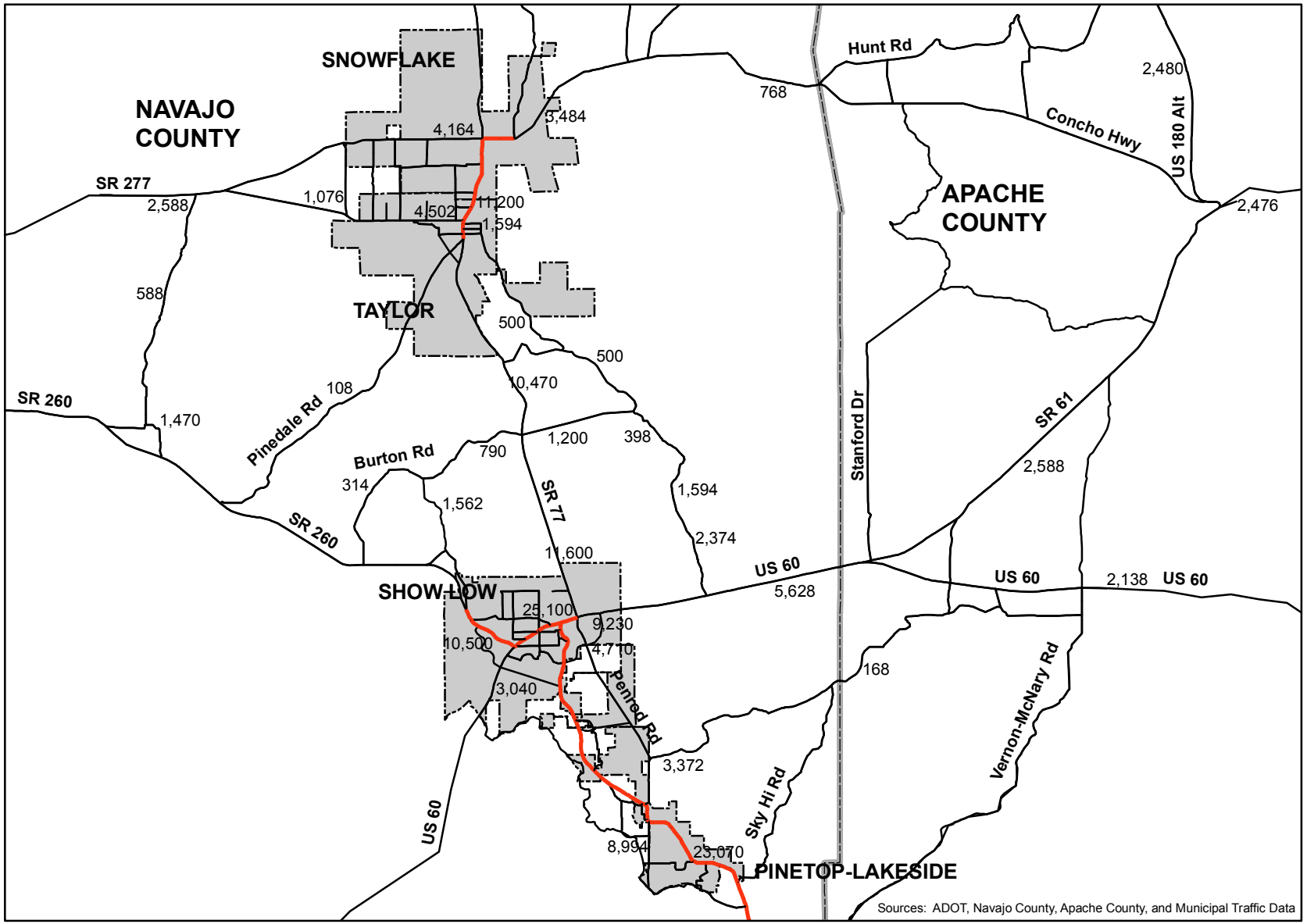
A traffic count database for the year 2006 was compiled from ADOT, Navajo County, Apache County, and municipal sources. Where necessary, historic traffic count data were adjusted based on recent growth trends, to provide a reliable approximation of current (2006) traffic levels. Refer to Figure 3-3 for current traffic counts on major roadways in the Study Area. Figures providing traffic counts on major roadways in each Study Area municipality are presented in Appendix C.

3.4 MULTI-MODAL TRANSPORTATION

Through the *Four Seasons Connection* Public Transit System, the City of Show Low and Town of Pinetop-Lakeside provide deviated fixed-route public bus service between the two communities. This service includes scheduled service and a pick-up service for disabled individuals, who are not able to access the transit system at existing bus stops.

Two 16-passenger buses operate Monday through Saturday, beginning at 6:30 a.m. and ending at 6:30 p.m. Presently, there are 57 scheduled stops along the route serving the two communities, linking both residential areas and high traffic commercial and retail centers. This service also provides access to the Show Low Regional Airport (northeast of Show Low) and Hon-Dah Resort and Conference Center (south of Pinetop-Lakeside). *Four Seasons Connection* also provides direct service to the County health and welfare facilities, Department of Economic Security offices, and local medical offices, including the Navapache Regional Medical Center. *Four Seasons Connection* served approximately 107,000 passenger trips in Fiscal Year 2005-2006. This is up from 31,000 annual passenger trips when the service was initiated in 1997.

Navajo/Apache County Study Area Overview



YEAR 2006 ROADWAY NETWORK AND TRAFFIC COUNTS

FIGURE 3-3

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Southern Navajo/Apache County Sub-Regional Transportation Plan

The acquisition of most capital items, such as buses and maintenance buildings, is supported through grants from the Federal Transit Administration (FTA) through ADOT. ADOT and FTA also provide matching grants to Show Low and Pinetop-Lakeside to fund route operations, vehicle maintenance, and administration.

4.0 TRAVEL DEMAND MODEL DEVELOPMENT

Building from the legacy of the travel demand model developed and applied for the *White Mountain Regional Transportation Plan*, 1999, a new travel demand model was developed for this study using the TransCAD travel demand modeling software platform. The Southern Navajo/Apache County Travel Demand Model was developed using Geographic Information Systems (GIS) data provided by study participants and incorporated socioeconomic and traffic count data for the year 2006, as discussed above.

4.1 MODEL CONSTRAINTS

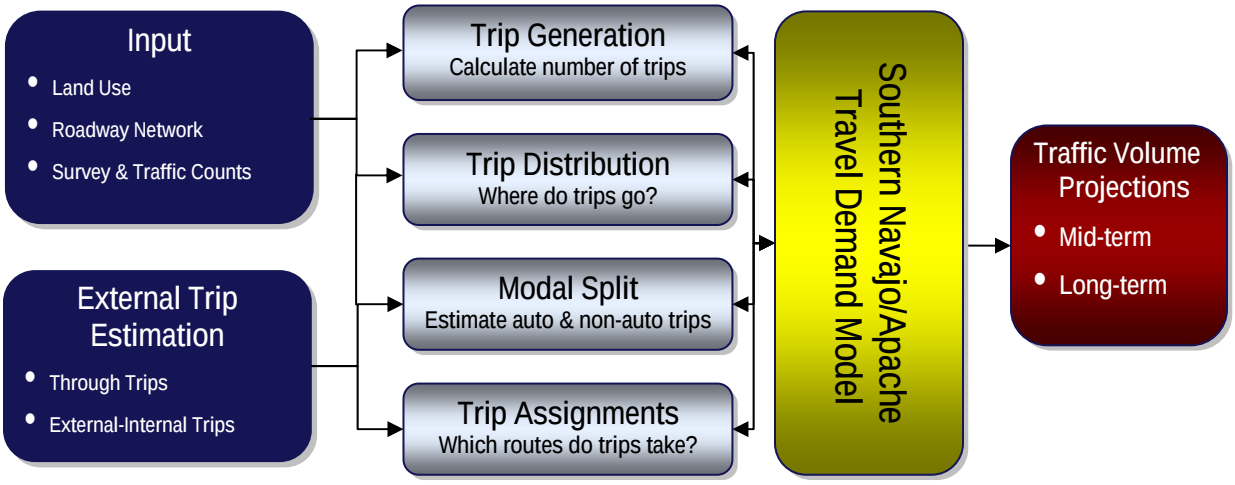
The quick response travel demand modeling capability developed for this study was a highway-only model and did not permit consideration of modal split between automobile and transit modes. However, as patronage on the *Four Seasons Connection* transit system grows, mode split will become an increasingly important part of the mobility solution for the heavily traveled corridor connecting Pinetop-Lakeside and Show Low. Therefore, consideration should be given to including a mode choice step in the travel demand modeling process when future updates of this transportation plan are contemplated.

Also, it is important to note that the travel demand model developed for this study was not responsive to radical changes in traffic during the peak tourism season. The adopted model replicates ADT conditions on roadway segments, as represented by the year 2006 traffic counts presented in the previous chapter. These ADT conditions are consistent with the April 1, 2000, seasonal dwelling unit occupancy patterns identified by the Census 2000 data.

4.2 MODEL DEVELOPMENT PROCESS

The travel demand model of the *White Mountain Regional Transportation Plan,* 1999, was adapted for this study. Figure 4-1 depicts the traffic model development process employed in preparation of that model. A brief summary of the modeling process used for forecasting future travel demand and traffic levels on streets and highways for this sub-regional study is presented below.

FIGURE 4-1
TRAVEL DEMAND MODEL DEVELOPMENT PROCESS



The travel demand model developed for the Southern Navajo/Apache County Sub-Regional Transportation Plan follows a four-step process to determine/forecast traffic volumes for a defined roadway network based on specified inputs and estimates of external trips. The Trip Generation Module converts household information into vehicle trips between TAZs. Each household generates an average of approximately ten trips daily – five separate round-trips. Employment information is used in the Trip Distribution Module to determine where the trips generated by households want to go. The model process allows for a Modal Split Module to determine the number of trips or parts of trips by automobile versus transit as part of a trip (this function was not applied for this study). Finally, the Trip Assignment Module then makes a determination as to which routes would be taken by trips originating at Study Area households.

The fundamental criteria applied within the Trip Assignment Module are the shortest path in the shortest amount of time. Trip assignment takes into account speed, functional classification of the roadway, capacity of the roadway, and the amount of traffic using that route. If a route is too congested, the model will assign trips to a different route that offers a shorter travel time. The final result is a forecast of anticipated traffic flows, based on Study Area socioeconomic characteristics and the capacity of the available roadway network. However, before a forecast can be made, a current year model is built to calibrate the model based on existing traffic counts.

4.3 MODEL CALIBRATION AND VALIDATION

Model validation is a process involving iterative adjustment of model parameters until model-simulated traffic volumes reasonably agree with actual traffic counts. Several measures to evaluate model performance are provided in the Federal Highway Administration's (FWHA) *Travel Model Validation and Reasonableness Checking Manual*, February, 1997. For this study, traffic volume estimates generated for key Study Area roadway segments for 2006 were compared to actual 2006 traffic counts. Results of the comparison are illustrated in Figure 4-2. Appendix D presents the FHWA model calibration parameters together with a tabular comparison of the model-generated 2006 volumes on key roadway segments.

Figure 4-2 and the tables in Appendix D show that the majority of roadway segments meet the FHWA deviation criteria, with the exception of the following locations:

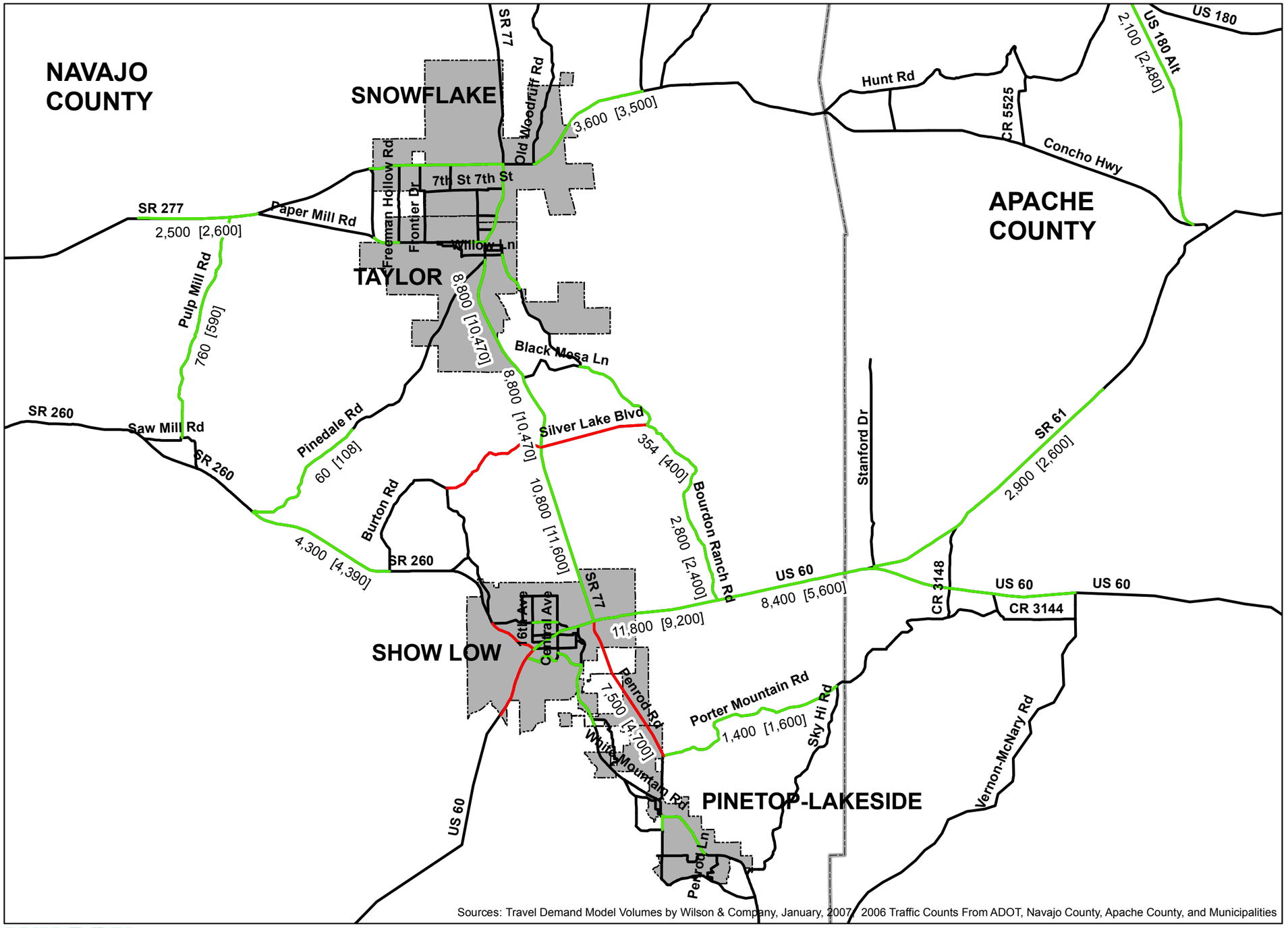
- SR 260 from Old Linden Road to US 60;
- US 60 from Rim Road to SR 260;
- US 60 from Bourdon Ranch Rd to SR 61;
- Lone Pine Dam Road, west of SR 77;
- Silver Lake Boulevard from SR 77 to Bourdon Ranch Road; and
- Penrod Road from Porter Mountain Road to US 60.

The analysis indicates the model performed well with respect to key Study Area arterials. While there are some higher deviations on low-volume rural facilities, the model, in general, adequately replicated year 2006 ADT counts. Therefore, the model was determined to be a suitable forecasting tool for future travel demand in the Study Area.

4.4 TRIP GENERATION

Table 4-1 shows the trip-generation characteristics of socioeconomic units by land use category. These quick response trip-generation rates used in the travel demand model were based on the *Institute of Transportation Engineers Trip Generation*, 7th Edition, 2001. Trip-generation rates were adjusted on a zone-by-zone basis during model validation to fit Study Area trip-making characteristics.

Navajo/Apache County Study Area Overview



Sources: Travel Demand Model Volumes by Wilson & Company, January, 2007. 2006 Traffic Counts From ADOT, Navajo County, Apache County, and Municipalities

YEAR 2006 MODEL VALIDATION SUMMARY

FHWA Model Volume-Traffic Count Difference Target

X,XXX Model Volume (2006 Traffic Count)

Within FHWA Target

Exceeds FHWA Target

Base Map Features

Arterials

Cities/Towns

N

Not to Scale

FIGURE 4-2

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Southern Navajo/Apache County Sub-Regional Transportation Plan

TABLE 4-1
VEHICLE-TRIP GENERATION CHARACTERISTICS

Land Use Category	Socioeconomic Unit	Average Daily Vehicle Trips per Unit
Residential	Dwelling Units	11.0
Retail	Employee	21.0
Office	Employee	11.0
General	Employee	7.0
Government Office	Employee	10.0
Primary School	Student	0.5
Secondary School	Student	0.8

Source: *Trip Generation*, 7th Edition, Institute of Transportation Engineers, 2001 and Wilson & Company, 2007.

4.5 EXTERNAL TRIPS

External trips are trips with one or more trip ends outside the Study Area. There primarily are two types of external trips. The first are external-internal, internal-external trips. These are regional trips with one trip end inside the Study Area and the other outside the Study Area. This would include travel between the cities of Show Low and Holbrook, for example. The other type of external trip does not stop within the Study Area – a trip between St. Johns in Apache County and Payson in Gila County, for example. Updated external trip estimates were based on traffic counts at Study Area cordon crossings at the outer boundaries of the Study Area. National Cooperative Highway Research Program Report (NCHRP) 365, *Travel Estimation Techniques for Urban Planning,* published by the Transportation Research Board in 1998, provides guidelines for estimating through-trip percentages based on roadway functional classification and facility type. These guidelines were used to develop the year 2006 external trip estimates shown in Table 4-2.

TABLE 4-2
YEAR 2006 STUDY AREA EXTERNAL DAILY VEHICLE TRIPS

Location	2006 Traffic Count	Share of Through Vehicle Trips	No. of Through Vehicle Trips	Internal-External Vehicles
US 180, West of SR 180A	710	29%	206	504
US 180, East of SR 180A	460	29%	134	328
SR 61, East of Concho	2.480	29%	718	1,759
US 60, East of Vernon	2,140	29%	620	1,519
SR 260, South of Rim Rd	3,720	29%	1,077	2,638
US 60, West of Show Low	3,040	29%	882	2,158
SR 260, West of Paper Mill Rd	4,390	29%	1,273	3,117
SR 277, West of Paper Mill Rd	2,590	29%	751	1,838
SR 77, North of Snowflake	4,500	29%	1,306	3,197

Source: Wilson & Company, May 2007.

5.0 SOCIOECONOMIC PROJECTIONS

Urban growth in southern Navajo and Apache counties within the Study Area is expected to continue through 2030, driven by a rising demand for the lifestyle and recreational opportunities offered by the White Mountains. Population and employment forecasts for 2015 and 2030 were developed in consultation with the TAC. The process included a review of growth projections from previous plans and studies. Land ownership patterns within the Study Area also were assessed. A workshop then was conducted with the TAC to identify planned and approved developments and long-range growth areas. Through this process, Study Area population and employment growth projections were established. This chapter outlines the approach used to develop future population and employment projections and present the results of this process.

5.1 PREVIOUS PLANS AND STUDIES

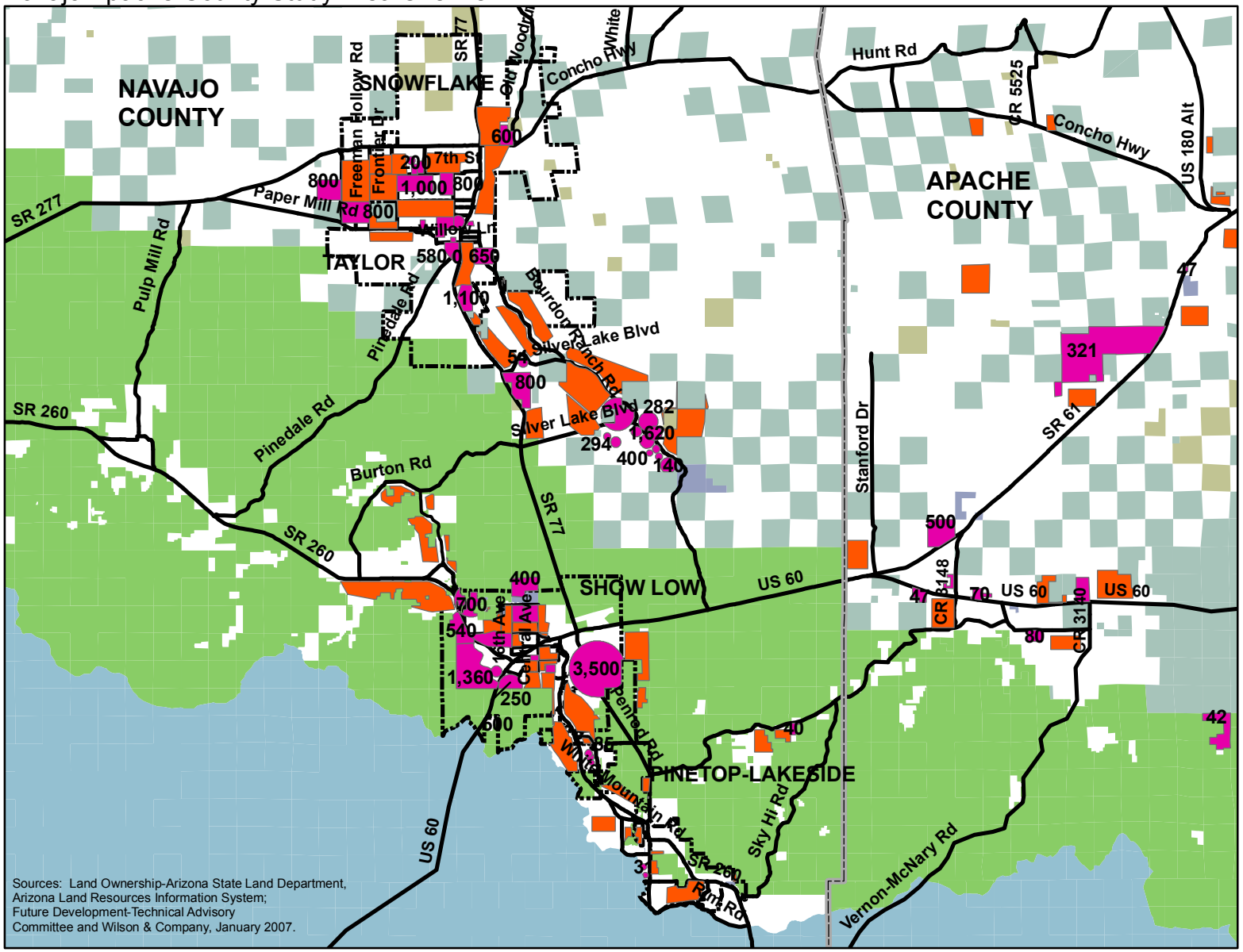
General Plans, county Comprehensive Plans, and other planning studies provided a context for the year 2030 growth scenario developed for the Study Area. These sources provided information on land use, circulation, as well as actual and potential growth areas for input into existing and future socioeconomic forecasts. Plans referenced for this study included:

- White Mountain Regional Transportation Plan, Lima & Associates, et al., April 1999.
- Navajo County Comprehensive Plan, May 2004.
- Apache County Comprehensive Plan, August 2004.
- Town of Snowflake General Plan, July 1999.
- Town of Taylor 2015 General Plan, December 2003.
- City of Show Low General Plan, CSC/Counts, October 1999.
- City of Show Low Major Streets and Routes Plan, Olsson Associates, January 2002.
- Town of Pinetop-Lakeside/Navajo County Regional Plan, BRW, March 2001.
- Pinetop-Lakeside Population Projection Report, July 2005.
- Traffic Impact Study for Show Low Bluff Planned Unit Development (PUD), Ironside Engineering & Development, Inc., December 2004.

5.2 PLANNED DEVELOPMENTS AND LAND OWNERSHIP PATTERNS

At a workshop held with the TAC, each participating jurisdiction provided the study team with information relating to known, active developments and subdivisions. Representatives from the jurisdictions identified approximately 23,000 new residential lots, 232 acres of commercial development, 15 acres of office park, and 160 acres of industrial development within the Study Area that were part of an entitlement process that was either started or about to start. Figure 5-1 shows the locations of new or pending planned developments and potential future development areas within the Study Area relative to the overall context of land ownership defined by a mosaic of State, Federal, Indian reservation, and private lands. Similar maps were prepared and included in the Community Transportation Plans for the four municipalities in the Study Area.

Navajo/Apache County Study Area Overview



LAND OWNERSHIP AND PLANNED DEVELOPMENTS

Land Ownership

- Bureau of Land Management
- National Forest
- Indian Reservation
- Arizona Game and Fish Department
- Private Land
- State Trust Land

Future Developments

- XXX — New/Pending Development with Potential Dwelling Units
- Potential Development Area

Base Map Features

- Cities/Towns
- Arterials

N

Not to Scale

FIGURE 5-1

WILSON & COMPANY

Southern Navajo/Apache County Sub-Regional Transportation Plan

5.3 POPULATION AND EMPLOYMENT PROJECTIONS

Forecasts of DU growth were based on a projected compound annual growth rate of five percent between 2006 and 2030. This means the growth rate would be more gradual at first but would increase as the Study Area population base expands. This annual rate is consistent with the growth shown by historic building permit data from 2000 to 2006 discussed above. Between 2006 and 2030, an average of 2,700 new DUs is expected annually. Population estimates for 2030 were developed by applying growth rates for both seasonal DU occupancy and number of persons per household to the DU projections. As noted above, these rates vary by location throughout the Study Area.

Employment growth was projected to increase at the same pace as population growth. In 2006, the Study Area reported less than one job per household. This low jobs/housing balance means that many persons living in the Study Area may rely on outside sources of income or jobs outside the Study Area. This is an indicator of the higher number of retirement and second homes in the Study Area. For planning purposes, it is expected that this demographic characteristic will not change significantly through the 2030 planning horizon, and that the overall ratio of jobs per household in 2006 will be similar to 2030. Table 5-1 shows the Study Area population and employment projections for 2015 and 2030 compared to the 2000 Census data and the population and employment estimates estimated for 2006.

TABLE 5-1
STUDY AREA POPULATION AND EMPLOYMENT ESTIMATES BASED ON APRIL 1 OCCUPANCY

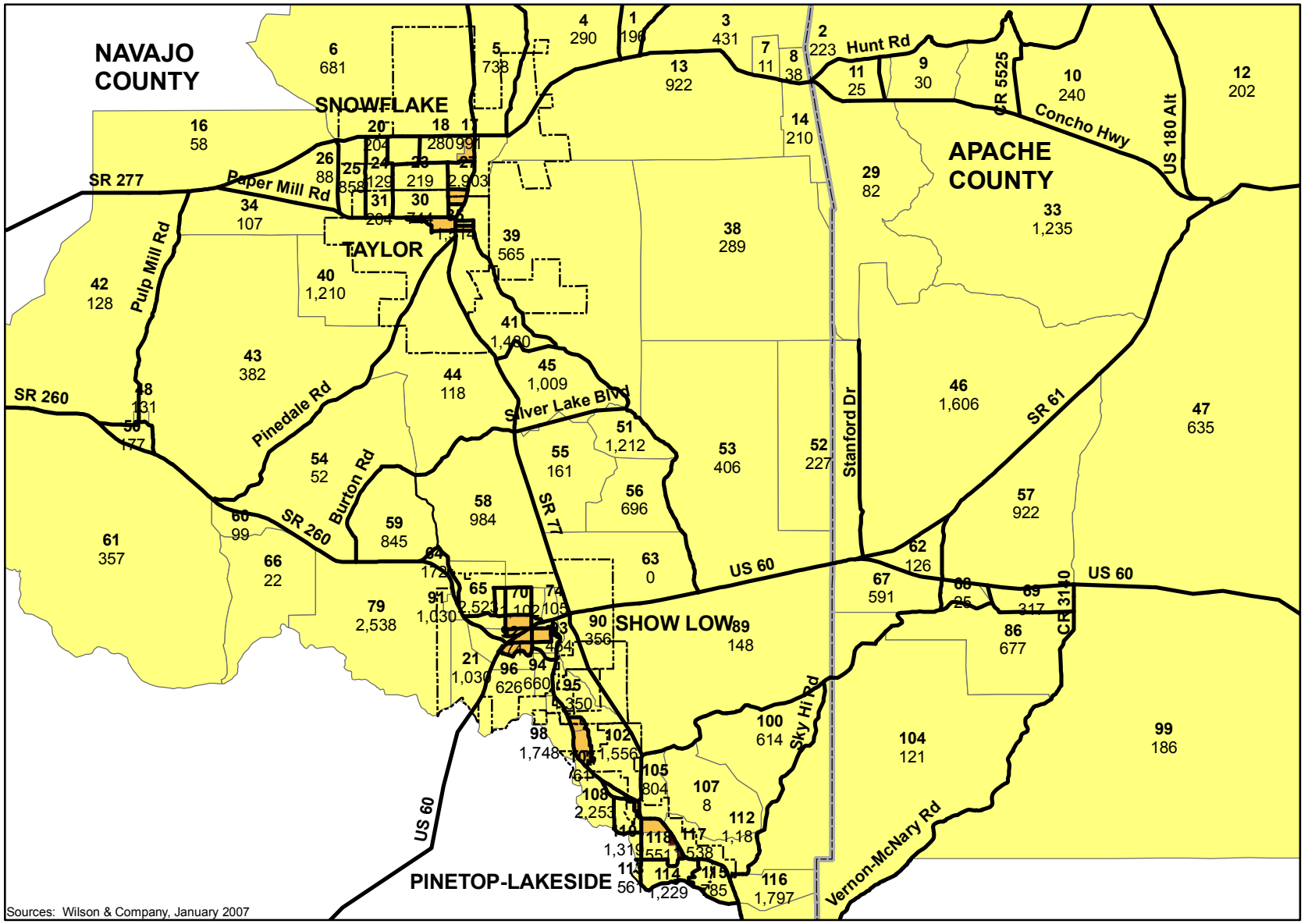
Year	Dwelling Units	Occupied Dwelling Units	Population	Employment
2000	22,904 [a]	13,010 [a]	35,653 [a]	9,502 [b]
2006	28,299 [c]	16,135	43,870	15,300 [d]
2015	44,300 [e]	26,500	74,200	23,800 [e]
2030	93,500 [e]	61,200	177,000	51,704 [e]

Sources:
a) U.S. Census Bureau
b) US Census Bureau ZIP Code Business Patterns, 2000.
c) Includes 5,400 single- and multi-family building permits issued between January 1, 2000, and May 31, 2006.
d) Estimate by Wilson & Company based on July 2006 InfoUSA employment data.
e) Estimate by Wilson & Company based on growth projection.

5.4 POPULATION AND EMPLOYMENT ALLOCATION

Working with the TAC, population growth for each forecast horizon year (2015 and 2030) was allocated to private lands throughout the Study Area. This allocation was based on the currently planned and approved developments and the land use densities and intensities shown in the various General Plans and Comprehensive Plans. Figures 5-2 and 5-3 show the expected change in estimated population density in the Study Area by TAZ for the years 2015 and 2030, respectively. Figures 5-4 and 5-5 show the expected change in estimated employment density in the Study Area by TAZ for the years 2015 and 2030, respectively. Most employment growth is expected to occur in the urbanized areas of Pinetop-Lakeside, Show Low, Taylor, and Snowflake. However, some new employment was allocated to the new growth areas in anticipation of retail and service jobs that invariably accompany new developments. Population and employment density maps for each municipality in the Study Area are presented in Appendix E.

Navajo/Apache County Study Area Overview



YEAR 2015 ESTIMATED POPULATION DENSITY BY TRAFFIC ANALYSIS ZONE

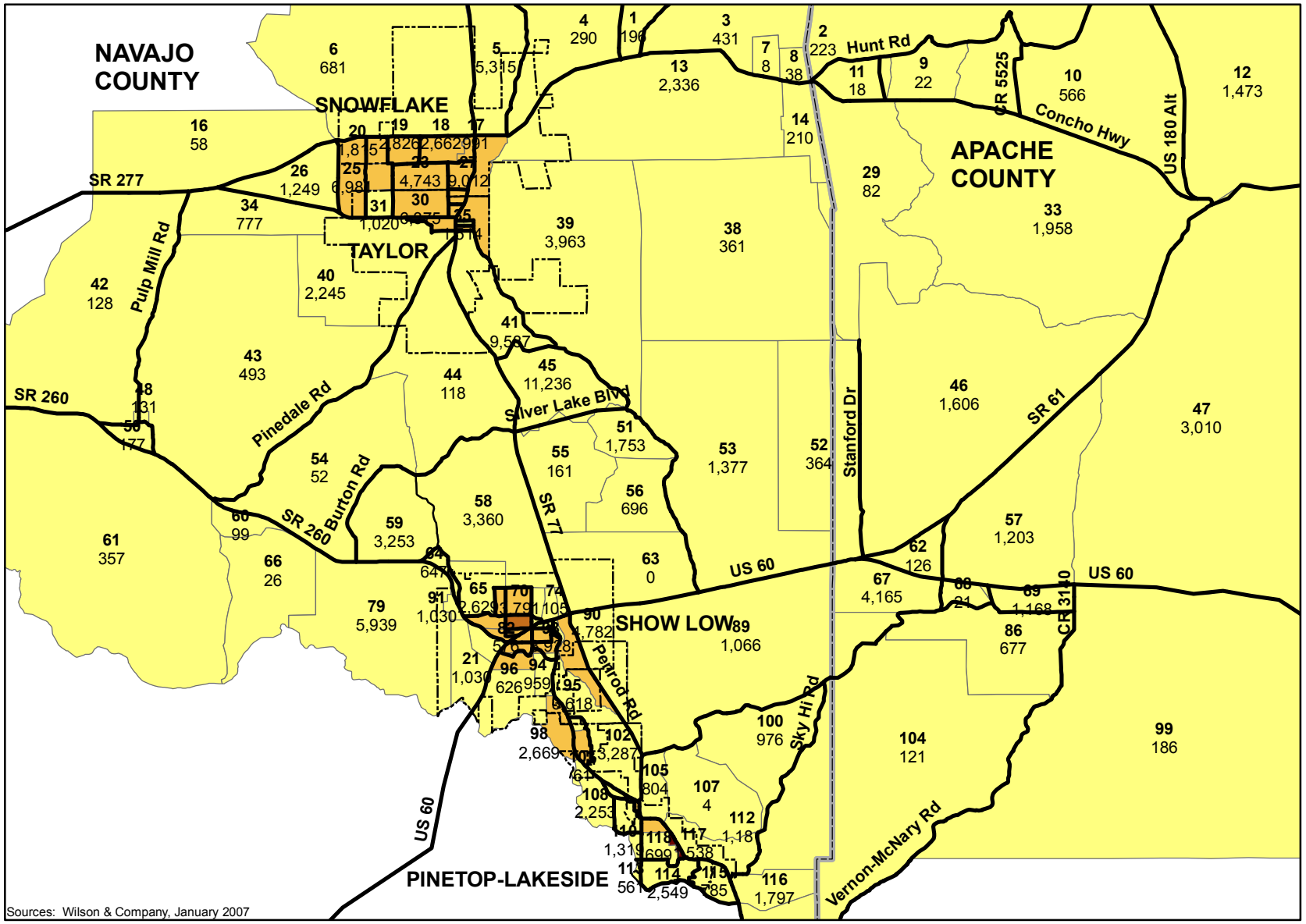
Sources: Wilson & Company, January 2007

WILSON & COMPANY

Southern Navajo/Apache County Sub-Regional Transportation Plan

FIGURE 5-2

Navajo/Apache County Study Area Overview



Sources: Wilson & Company, January 2007

YEAR 2030 ESTIMATED POPULATION DENSITY BY TRAFFIC ANALYSIS ZONE

Population Density per Square Mile

- 0 - 1500
- 1501 - 4000
- 4001 - 6500
- 6500 - 20000

Base Map Features

- Arterials
- Cities/Towns
- XX Traffic Analysis Zone
- X,XXX Population Estimate

N

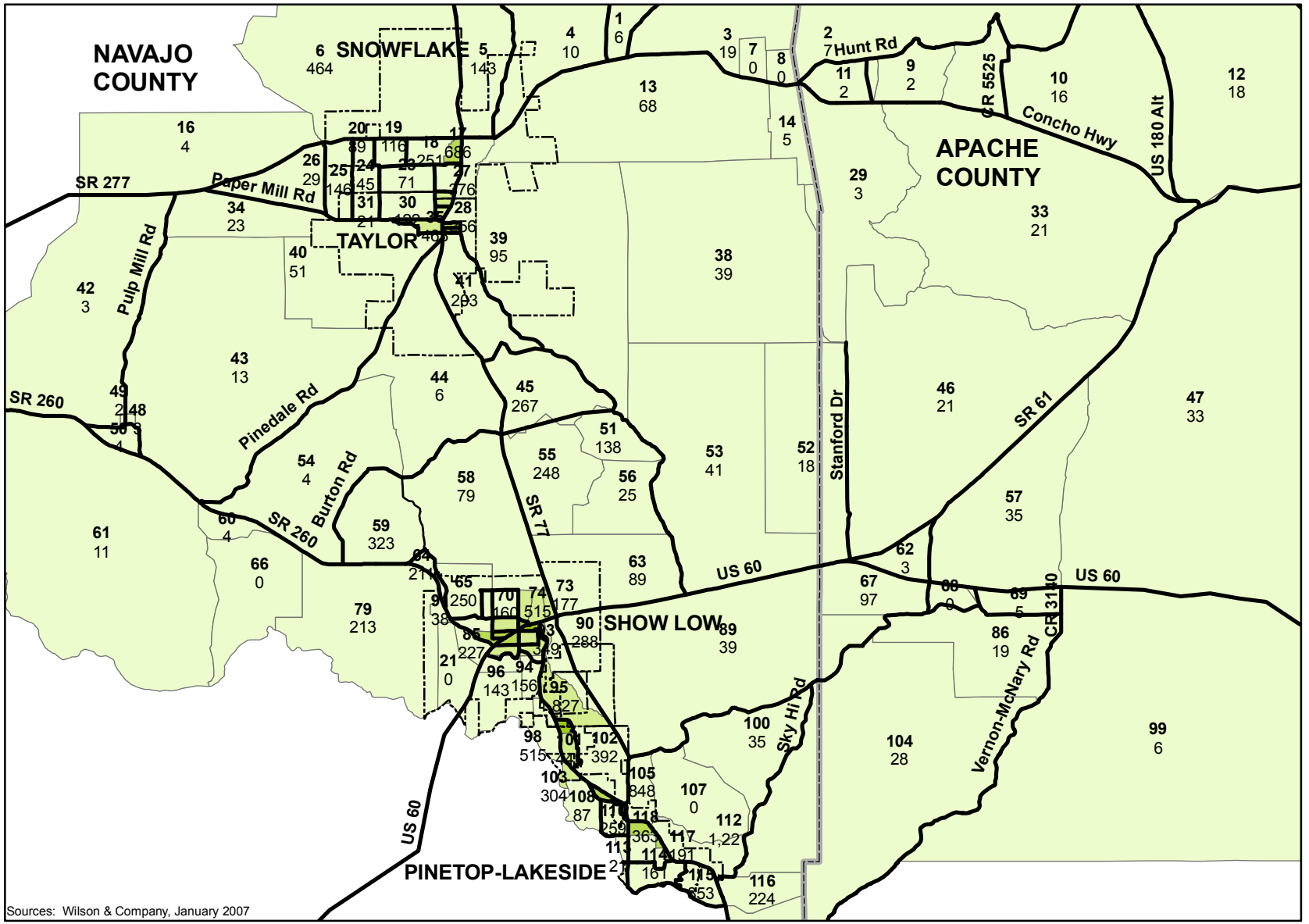
Not to Scale

FIGURE 5-3

WILSON & COMPANY

Southern Navajo/Apache County Sub-Regional Transportation Plan

Navajo/Apache County Study Area Overview



YEAR 2015 ESTIMATED EMPLOYMENT DENSITY BY TRAFFIC ANALYSIS ZONE

Employment Density per Square Mile

- 0 - 500
- 501 - 1000
- 1001 - 3000
- 3000 +

Base Map Features

- Arterials
- Cities/Towns
- XX Traffic Analysis Zone
- X,XXX Employment Estimate

N

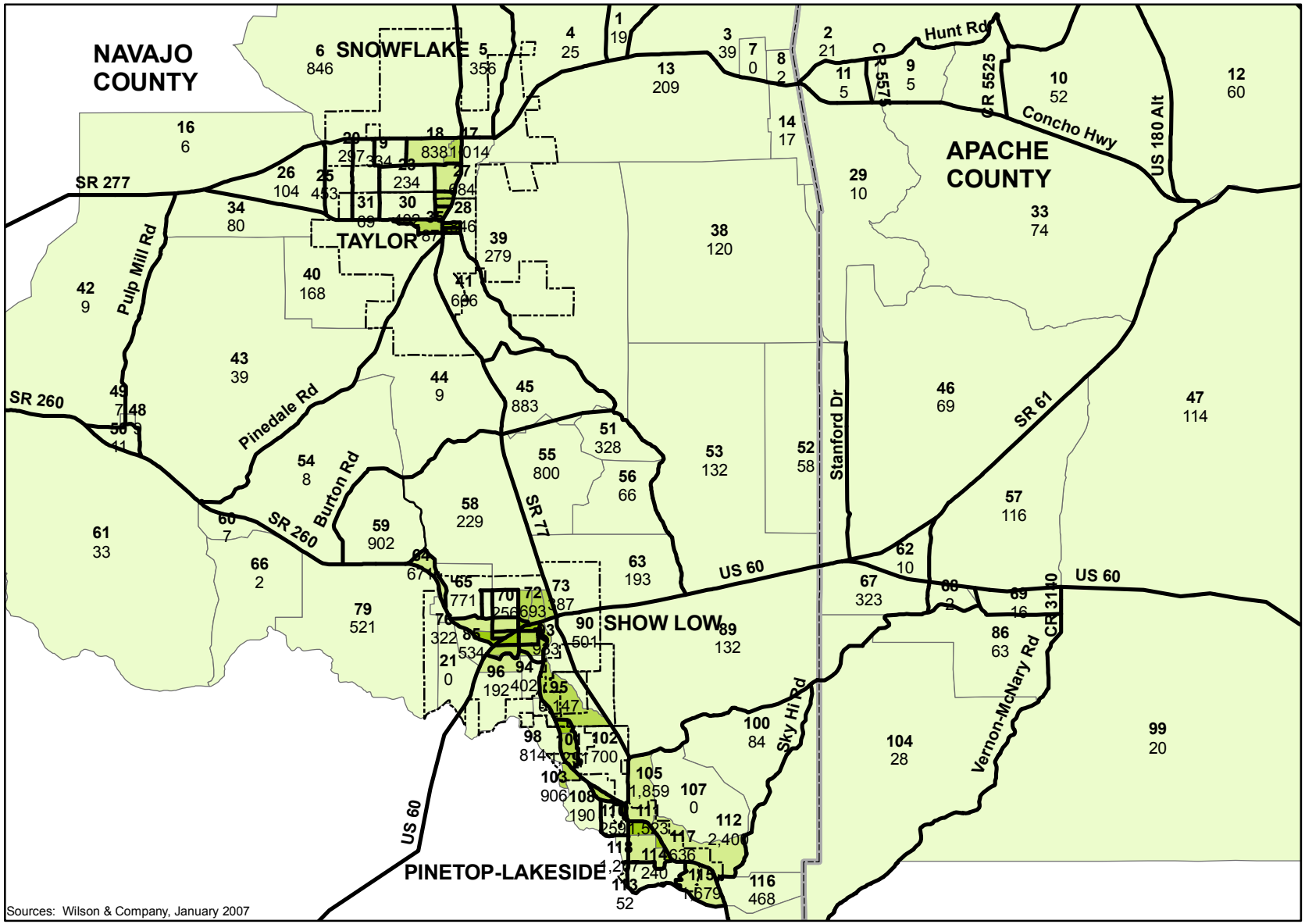
Not to Scale

FIGURE 5-4

WILSON & COMPANY

Southern Navajo/Apache County Sub-Regional Transportation Plan

Navajo/Apache County Study Area Overview



YEAR 2030 ESTIMATED EMPLOYMENT DENSITY BY TRAFFIC ANALYSIS ZONE

Employment Density per Square Mile

- 0 - 500
- 501 - 1000
- 1001 - 3000
- 3000 +

Base Map Features

- Arterials
- Cities/Towns
- XX Traffic Analysis Zone
- X,XXX Employment Estimate

N

Not to Scale

FIGURE 5-5

WILSON & COMPANY

Southern Navajo/Apache County Sub-Regional Transportation Plan

6.0 ANALYSIS OF IMPROVEMENT ALTERNATIVES

The purpose of this chapter is to present the evaluation of future roadway network improvement alternatives. This evaluation includes a series of traffic assignments generated with the 2015 and 2030 socioeconomic projections. These travel demand model assignments were developed to test different network improvement scenarios. The output of the model permits evaluation and analysis of both roadway segments and key Study Area intersections.

6.1 BASIS FOR DEFINING IMPROVEMENT ALTERNATIVES

6.1.1 ROADWAY CROSS-SECTIONS

The maximum roadway cross-section was limited to two travel lanes in each direction per instructions received from study participants. Specifically, urban arterials were limited to a five-lane cross-section with two travel lanes in each direction and a continuous center left-turn lane. Rural arterials were limited to a four-lane cross-section with two travel lanes in each direction. This policy reflects the community desire to meet mobility needs with transportation facilities that maintain the Study Area's rural character. This means that, when all existing routes have been widened to the maximum cross-section, new alternative alignments must be considered to accommodate travel demand generated by the projected 2030 population and employment growth increment.

6.1.2 ROADWAY LEVEL OF SERVICE

The goal of a typical long-range transportation planning study is provide for LOS 'C' on new roadways and LOS 'D' on existing roadways. The planning goal for rural State highways is LOS 'B'. The 1999 *White Mountain Regional Transportation Plan* accommodated 2020 travel demand estimates at a desirable LOS. However, as urbanization of the Study Area continues, it will be increasingly difficult to plan a roadway system that maintains the higher LOS expected in a transitioning rural area. As noted in Section 2.1, LOS 'D' was adopted as the prime guideline, because it allows for a generally acceptable LOS and is consistent with other plans in the region. Nevertheless, constraints to capacity improvements, such as physical barriers, policy decisions, or funding limitations, can limit the ability of a plan to accommodate future travel demand estimates at a desirable LOS. Thus, the daily, per-lane capacity adopted for planning-level modeling purposes was set for LOS 'E' (refer to Table 2-1).

6.1.3 COMMITTED AND PLANNED DEVELOPMENT

Alternative network improvement scenarios were developed by identifying possible and potential improvement projects from several sources:

- Committed (i.e., in the "pipeline") roadway improvement projects;
- Planned roadway improvements, identified through past planning; and
- Improvements revealed with evaluation of roadway network deficiencies.

Each of these sources provided the framework for selecting appropriate roadway network improvement options to be included for modeling purposes.

6.1.4 EXTERNAL TRAFFIC FORECASTS

An important component of future year travel demand forecasts is external traffic growth. The estimate of external traffic growth was based on historic traffic and population growth trends. Table 6-1 shows the

TABLE 6-1
CURRENT AND FUTURE EXTERNAL DAILY TRAFFIC VOLUMES

Location	2006 Traffic Count	Year 2015 Estimate	Year 2030 Estimate
US 180, West of SR 180A	710	930	1,750
US 180, East of SR 180A	460	610	1,130
SR 61, East of Concho	2,480	7,600	13,950
US 60, East of Vernon	2,140	4,200	7,600
SR 260, South of Rim Rd (Pinetop-Lakeside)	9,570	15,900	36,800
US 60, West of Rim Rd (Show Low)	3,040	5,900	10,800
SR 260, West of Paper Mill Rd	4,390	6,900	12,800
SR 277, West of Paper Mill Rd	2,590	5,080	9,300
SR 77, North of Snowflake	4,500	6,900	12,600
Total	29,880	54,020	106,730

Sources: 2006 – ADOT, Navajo County, Apache County, & municipal planning and published data, adjusted to reflect current development trends; 2015 & 2030 –Wilson & Company Travel Demand Model results, May 2007.

existing (2006) ADT counts and 2015 and 2030 daily traffic volume forecasts at nine external stations located at the perimeter of the Study Area. In 2006, there were close to 30,000 average weekday vehicle trips with at least one trip end in the Study Area. Weekday external daily vehicle trips are forecast to grow at five percent per year over the 24-year planning horizon of this study. Thus, in 2030, it is estimated there will be over 106,000 average weekday vehicle trips traveling to, from, and through the Study Area.

6.2 EXISTING-PLUS-COMMITTED ROADWAY NETWORK

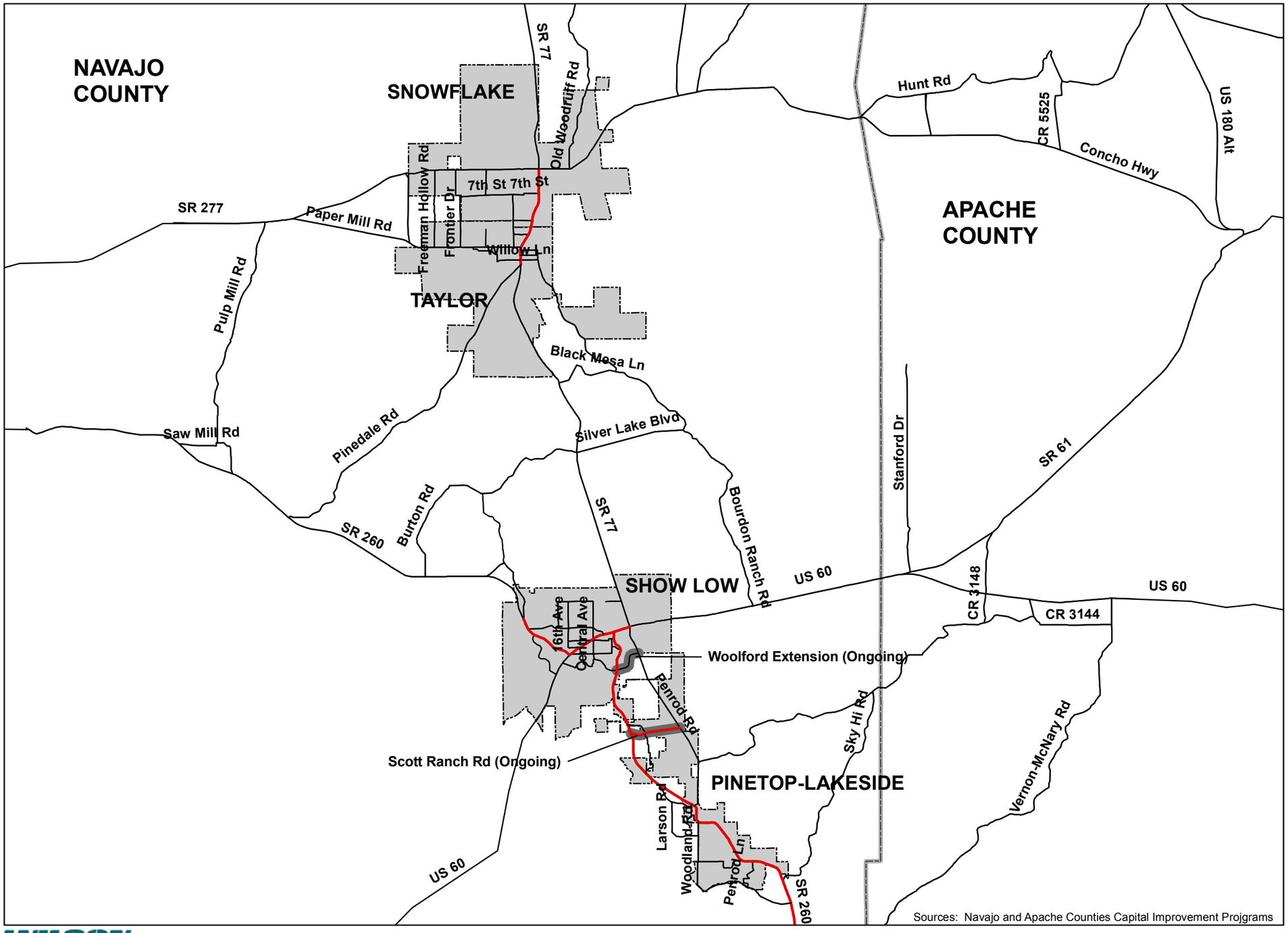
As the sub-region of southern Navajo and Apache Counties grow, new roadway facilities are being added to provide access to new developments and meet additional travel demand. When a roadway capacity improvement is added to a jurisdiction's five-year capital improvement program (CIP), it is considered a "committed" improvement. In the case of the Study Area, two committed roadway improvements were identified:

- Woolford Extension, SR 260 to Penrod Road – New two-lane road; and
- Scott Ranch Road, SR 260 to Penrod Road – New two-lane road.

These two roadway improvement projects primarily are developer-funded and related to growth in the SR 260 corridor between Pinetop-Lakeside and Show Low:

Five-year programmed roadway improvements were inputs for a 2030 "Existing-Plus-Committed" roadway network (Figure 6-1). The Southern Navajo/Apache County Travel Demand Model then was used to forecast average 2030 daily traffic volumes, based on trips generated from the 2030 population and employment growth projections (Figure 6-2). This traffic forecast reflects the seasonal occupancy rates associated with the Census 2000 population and DU data. As no major new roadway improvement projects are anticipated under the 2030 Existing-Plus-Committed roadway network, it essentially represents a "No-Build" or "Do-Nothing" improvement scenario.

Navajo/Apache County Study Area Overview



EXISTING-PLUS-COMMITTED ROADWAY NETWORK

Directional Lanes

1 Lane

2 Lanes

Improvement Scenario

Existing-Plus-Committed

Base Map Features

Cities/Towns

N

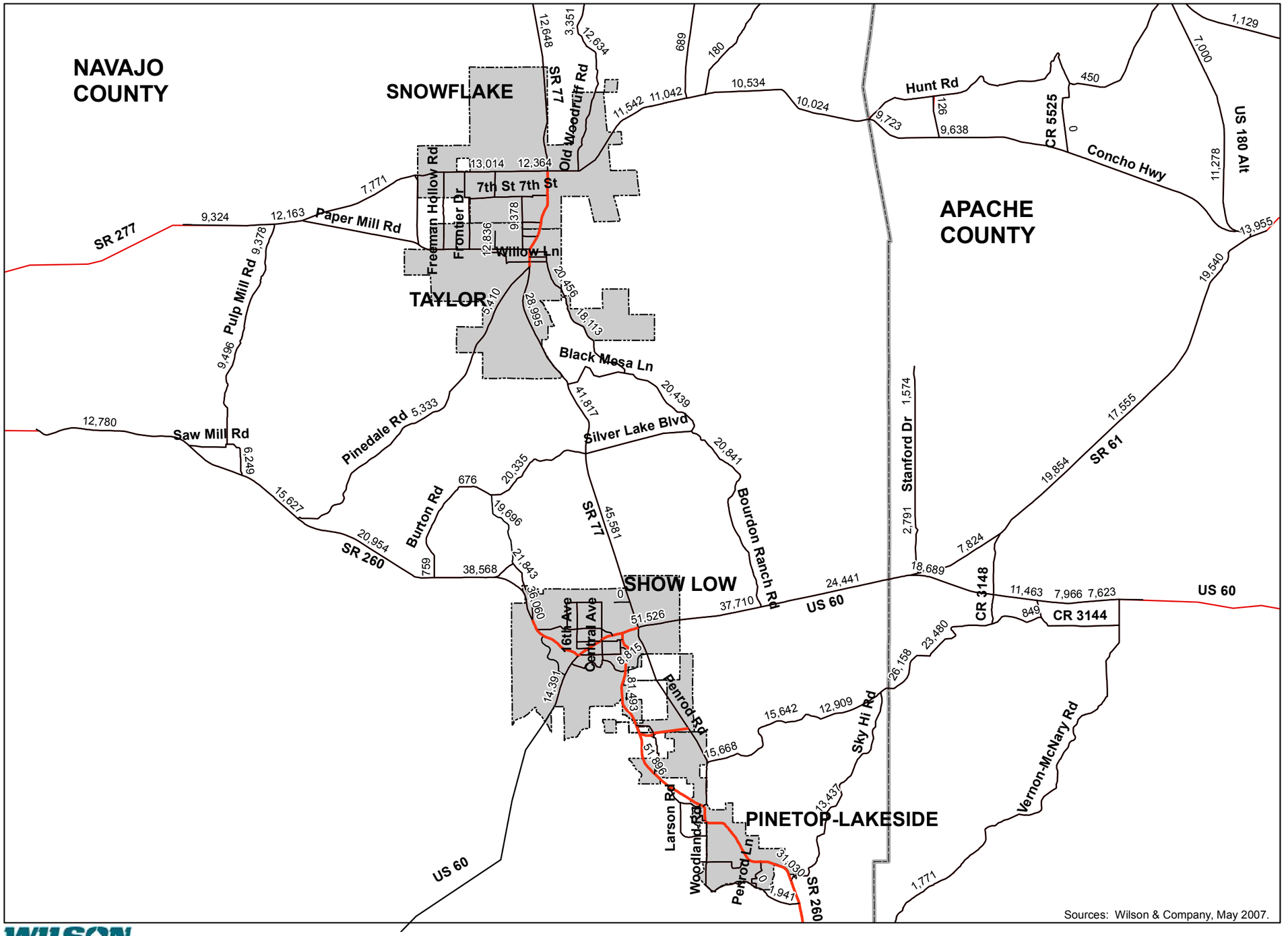
Not to Scale

FIGURE 6-1

WILSON & COMPANY

Southern Navajo/Apache County Sub-Regional Transportation Plan

Navajo/Apache County Study Area Overview



YEAR 2030 TRAFFIC ASSIGNMENT: EXISTING-PLUS-COMMITTED ROADWAY NETWORK

Directional Lanes

- 1 Lane
- 2 Lanes
- X,XXX - Daily Volume Estimate

* Based on 2030 Socioeconomic Data

Base Map Features

- Cities/Towns

N

Not to Scale

FIGURE 6-2

WILSON & COMPANY

Southern Navajo/Apache County Sub-Regional Transportation Plan

6.2.1 CUT-LINE ANALYSIS PROCESS

Forecast traffic volumes were evaluated to determine whether the Existing-Plus-Committed roadway network would have adequate capacity to accommodate the forecast 2030 travel demand. The evaluation consisted of a "cut-line" analysis that focused on key travel corridors. Cut-line analysis is a technique that allows a broader assessment of the relationship between network capacity and travel demand. Traffic volumes on specific facilities may be high or low, due to variances in the model assignment process. The cut-line analysis permits evaluation of traffic volumes as the total demand for travel in a given direction over a broader portion of the network.

The capacity of a given link in the network is a function of the number of lanes and the functional classification of a roadway. Each roadway crossed by the cut-line is reviewed to determine the daily capacity threshold associated with its functional classification. Capacity values for each individual roadway crossing the cut-line are added together to arrive at a total capacity value for each cut-line. This total capacity value then is compared to the total traffic volume crossing the cut-line. The comparison yields a volume-to-capacity (V/C) ratio, which provides a basis for assessing the adequacy of network capacity of a travel corridor relative to network travel demand.

6.2.2 CUT-LINE ANALYSIS RESULTS

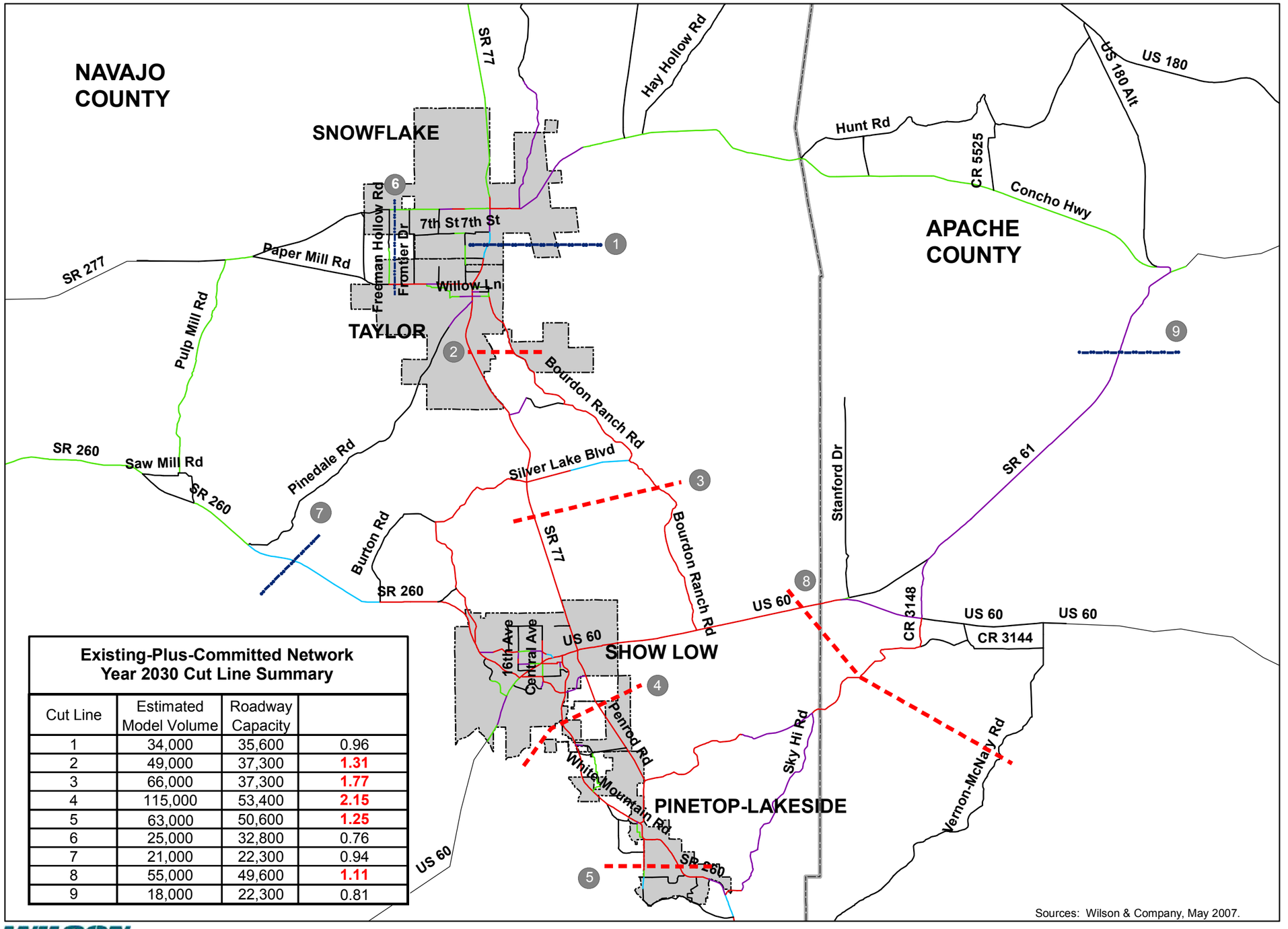
As shown in Figure 6-3, an imaginary line was drawn across all major roadway facilities in nine travel corridors. The cut-line analysis and the resulting V/C ratios reveal areas within the roadway network that would experience volume demand in excess of the network capacity provided. Thus, cut-lines with a projected V/C value greater than one (1.0) represent locations with insufficient network capacity, and additional or expanded facilities would be needed to fully accommodate future demand in the corridor. The V/C ratios provide another tool for understanding the corridor-level, roadway capacity needs to accommodate the potential impact of more than 130,000 new people in the Study Area through 2030.

The "cut-line" analysis results summarized in Table 6-2 (see also inset table of Figure 6-3) shows that the majority of the sub-regional arterial roadway network is forecast to carry daily traffic volumes in 2030 that will exceed the capacity of Study Area roadways, assuming a No-Build improvement scenario. Five of the nine cut-lines are forecast to have V/C ratios exceeding 1.0 (red highlight). Two others (Cut-Lines 1 and 7) will be just below capacity. In particular, the north-south corridors connecting Pinetop-Lakeside, Show Low, Taylor, and Snowflake (Cut-Lines 2 – 5) exhibit the highest over-capacity conditions and, therefore, the greatest need for enhanced connectivity. The east-west routes supporting travel principally in the Show Low area also exhibit over capacity conditions, but to a lesser extent (see values for Cut-Lines 7 and 8). Clearly, the existing Study Area roadway network will not have adequate capacity to handle the forecast 2030 travel demand without significant improvement to existing facilities and the addition of new sub-regional transportation facilities in these critical corridors.

6.3 COMMITTED-PLUS-PLANNED ROADWAY NETWORK

Information in the previous section provides evidence that forecast travel demand in 2030 would overwhelm the Existing-Plus-Committed roadway network. The information provides a definitive case for improving existing facilities and identifying new improvements in the major travel corridors, particularly to accommodate north-south travel between the Pinetop-Lakeside, Show Low, Taylor, and Snowflake. Additional capacity also is needed on east-west routes serving the City of Show Low, which is the largest community in the Study Area. Therefore, a second sub-regional roadway network was defined and tested.

Navajo/Apache County Study Area Overview



Existing-Plus-Committed Network Year 2030 Cut Line Summary

Cut Line	Estimated Model Volume	Roadway Capacity	
1	34,000	35,600	0.96
2	49,000	37,300	**1.31**
3	66,000	37,300	**1.77**
4	115,000	53,400	**2.15**
5	63,000	50,600	**1.25**
6	25,000	32,800	0.76
7	21,000	22,300	0.94
8	55,000	49,600	**1.11**
9	18,000	22,300	0.81

Sources: Wilson & Company, May 2007.

FORECAST 2030 LEVEL OF SERVICE: EXISTING-PLUS-COMMITTED ROADWAY NETWORK

Level of Service

- LOS A - B
- LOS C
- LOS D
- LOS E
- LOS F

* Based on 2030 Socioeconomic Data

Base Map Features

- Cities/Towns
- 1 Cut Line Reference Number
- Cut Line Over Capacity
- Cut Line Under Capacity

N

Not to Scale

FIGURE 6-3

WILSON & COMPANY

Southern Navajo/Apache County Sub-Regional Transportation Plan

TABLE 6-2
YEAR 2030 EXISTING-PLUS-COMMITTED ROADWAY NETWORK CUT-LINE EVALUATION

Cut-line	Location	Year 2030 Daily Volume	Roadway Capacity	V/C Ratio
North-South Roadways				
1	Town of Snowflake	34,000	35,600	0.96
2	Town of Taylor	49,000	37,300	1.31
3	Between Towns of Taylor and Show-Low	66,000	37,300	1.77
4	City of Show Low	115,000	53,400	2.15
5	Town of Pinetop-Lakeside	63,000	50,600	1.25
East-West Roadways				
6	West of Snowflake/Taylor	25,000	32,800	0.76
7	West of Show Low	21,000	22,300	0.94
8	East of Show Low and Pinetop-Lakeside	55,000	49,600	1.11
9	SR 61 West of Concho Highway	18,000	22,300	0.81

Red highlighting indicates Cut-Line is over capacity.

Source: Wilson & Company, May 2007.

The "Committed-Plus-Planned" roadway network includes the two capacity improvements incorporated in the Existing-Plus-Committed network (Figure 6-4). Under the Committed-Plus-Planned improvement scenario, the No-Build scenario, is augmented with new alignment and widening proposals presented in earlier planning studies. The Committed-Plus-Planned improvement scenario also includes new proposals for widening some existing facilities. Appendix F includes detailed, larger scale maps showing the Committed-Plus-Planned roadway system improvements for each Study Area municipality and the communities of Vernon and Concho in Apache County.

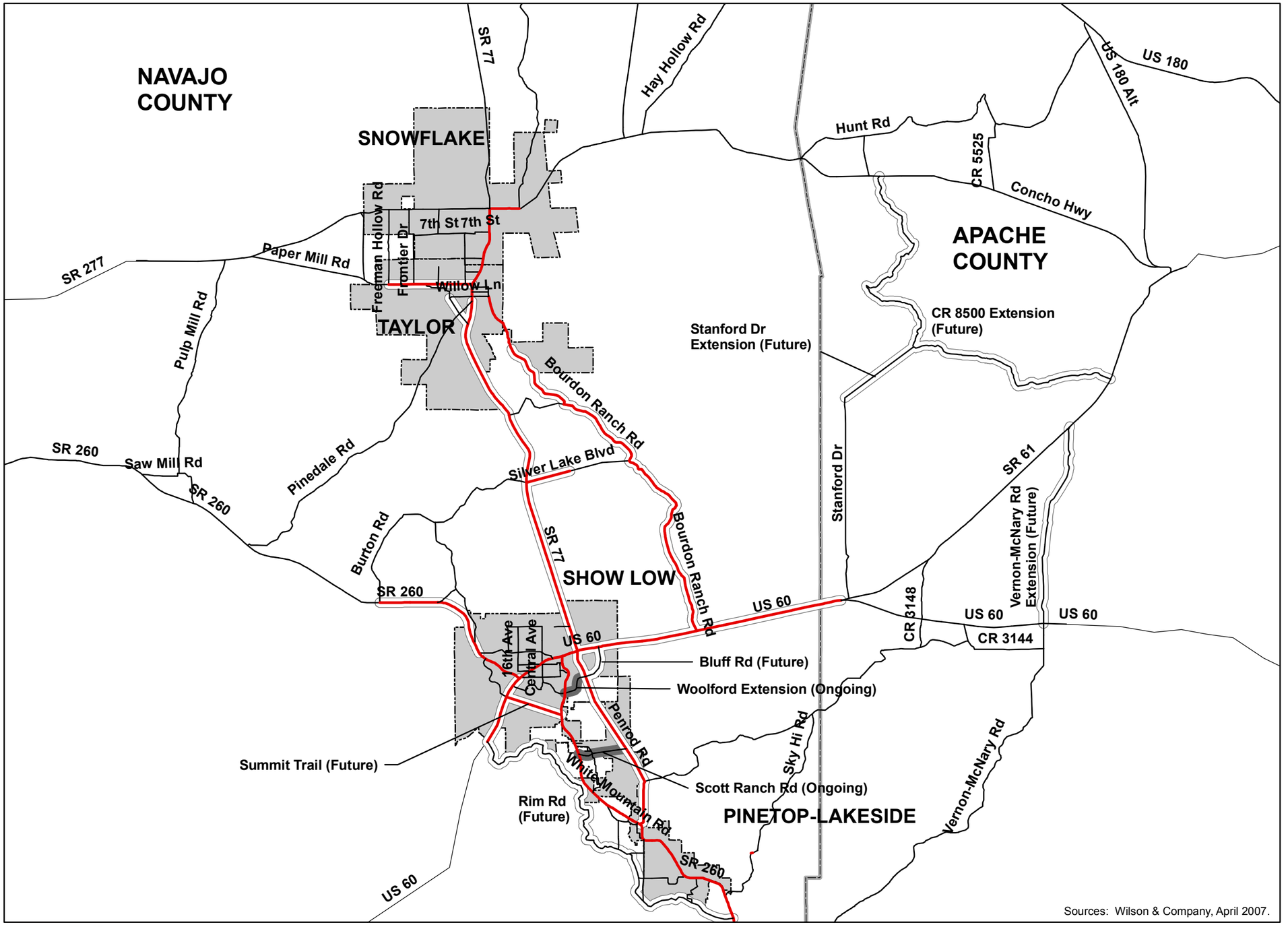
6.3.1 PLANNED ROADWAY IMPROVEMENTS

The improvements identified in this section were incorporated in the Committed-Plus-Planned roadway network (refer to Figure 6-4). The Existing-Plus-Committed roadway network was modified to incorporate the improvements, then the sub-regional Southern Navajo/Apache County Travel Demand Model was used to generate a second traffic assignment, based again on 2030 population and employment growth data (Figure 6-5). The travel demand forecast from this second model run provided the basis for identifying any remaining roadway network deficiencies that were not exposed during earlier planning efforts. Appendix F includes detailed, larger scale figures showing improvements and forecast 2030 traffic assignments associated with the Committed-Plus-Planned roadway network for each study area municipality and the communities of Vernon and Concho.

ARIZONA DEPARTMENT OF TRANSPORTATION

State and Federal highways are the backbone of the roadway transportation network within the Study Area. To accommodate the travel demand forecast for 2030, significant widening will be needed on these facilities to provide additional capacity. Many improvements were identified in the 1999 *White Mountain Regional Transportation Plan*. However, the Committed-Plus-Planned improvement scenario extends the recommendations for State highway improvements beyond those found in earlier studies.

Navajo/Apache County Study Area Overview



COMMITTED-PLUS-PLANNED ROADWAY NETWORK

Directional Lanes

- 1 Lane
- 2 Lanes

Improvement Scenario

- Existing-Plus-Committed
- Committed-Plus-Planned

Base Map Features

- Cities/Towns

N

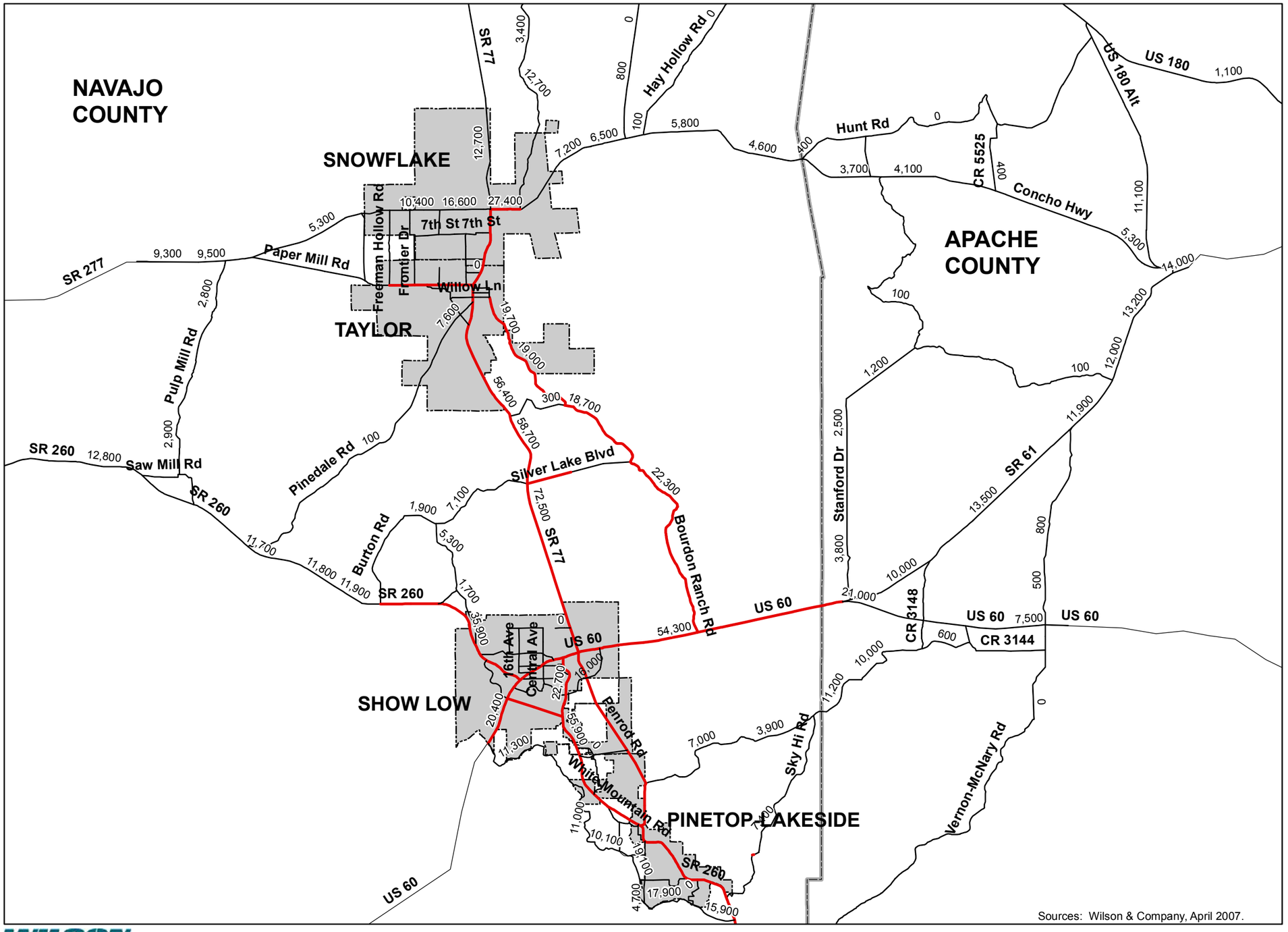
Not to Scale

FIGURE 6-4

WILSON & COMPANY

Southern Navajo/Apache County Sub-Regional Transportation Plan

Navajo/Apache County Study Area Overview



YEAR 2030 TRAFFIC ASSIGNMENT: COMMITTED-PLUS-PLANNED ROADWAY NETWORK

Directional Lanes

- 1 Lane
- 2 Lanes
- X,XXX - Daily Volume Estimate

* Based on 2030 Socioeconomic Data

Base Map Features

- Cities/Towns

N

Not to Scale

FIGURE 6-5

WILSON & COMPANY

Southern Navajo/Apache County Sub-Regional Transportation Plan

US 60

Several projects were identified that would improve the capacity of US 60, which will be impacted not only by traffic volume increases associated with projected population and employment growth but also by other roadway improvements:

- US 60 (West) – between Rim Road and Summit Trail: The paving of Rim Road between US 60 and Pinetop-Lakeside is expected to provide relief to SR 260 (White Mountain Road) and, thereby, reduce traffic through central Show Low on US 60. Bypass traffic from Rim Road, however, is expected to increase traffic volume on this segment of US 60 to more than 20,000 vehicles per day in 2030. Widening to four lanes will be required to accommodate this volume
- US 60 (West) – between Summit Trail and SR 260 (N. Clark Road): The planned Summit Trail Bypass in the City of Show Low between US 60 and SR 260 (White Mountain Road) is expected to increase traffic volume on this segment of US 60 to more than 35,000 vehicles per day in year 2030. Widening to four lanes with strict access management control will be required to accommodate this volume
- US 60 (East) – between SR 77 and Bourdon Ranch Road: The traffic volume on this segment of US 60 is forecast to increase to more than 54,000 vehicles per day by 2030. This volume is more typical of a limited access expressway than an arterial. Widening to four lanes together with strict access management control will be required to accommodate this volume.
- US 60 (East) – between Bourdon Ranch Road and SR 61: Population growth in the Concho and Vernon areas of Apache County is expected to result in increasing traffic volumes on US 60 between Bourdon Ranch Road and SR 61 to almost 32,000 vehicles per day in 2030. Widening US 60 to four lanes together with strict access management control will be required to accommodate this volume.

SR 77

- SR 77 (N. Penrod Road) – between US 60 and Silver Lake Boulevard: Traffic volume on this segment of SR 77 is estimated to exceed 72,000 vehicles per day in 2030. This volume is more typical of a limited access expressway than an arterial. Widening to four lanes together with strict access management control will be required to accommodate this volume.
- SR 77 (S. Main Street) – between Silver Lake Boulevard and Pinedale Road in Taylor: Traffic volume on this segment of SR 77 is expected to exceed 58,000 vehicles per day in the year 2030. This volume is more typical of a limited access expressway than an arterial. Widening SR 77 to four lanes together with strict access management control will be required to accommodate this volume.

SR 260

- SR 260 (N. Clark Road) – between Burton Road and Old Linden Road: Due to population growth pressures on the west side of Show Low, the volume on this segment of SR 260 is expected to exceed 35,000 vehicles per day. Widening to four lanes together with strict access management control will be required to accommodate this volume.

Improvements to State and Federal highways in the Study Area can be made only after in-depth planning and engineering studies are conducted by ADOT, and upon approval of the State Transportation Board. The recommendations for improvements to State facilities presented through this study can serve only as suggestions for further study.

NAVAJO COUNTY

Navajo County transportation facilities will have an increasing role in the sub-regional mobility solution as population growth occurs. In addition to providing access to growth areas, such as White Mountain Lakes, County roads will become more heavily used as sub-regional bypass routes as the State Highway System becomes more congested.

- Bourdon Ranch Road (South) – between US 60 and Silver Lake Boulevard: This roadway segment provides access to the growing White Mountain Lakes area. It also serves as a sub-regional bypass to SR 77. Traffic volumes are forecast to be more than 27,000 vehicles per day in 2030. Widening to four lanes will be required to accommodate this volume at an acceptable LOS.
- Bourdon Ranch Road (North) – between Silver Lake Boulevard and the Town of Taylor: This roadway segment, like the one to the south (above), provides access to the growing White Mountain Lakes area. It also serves as a sub-regional bypass to SR 77. Traffic volumes are forecast to be more than 19,000 vehicles per day in 2030. Widening to four lanes will be required to accommodate this volume at an acceptable LOS.
- Silver Lake Boulevard – between White Mountain Lakes and SR 77: This roadway segment provides direct access to White Mountain Lakes. Traffic volumes on this facility are forecast to grow to more than 29,000 vehicles per day in 2030. Widening to two travel lanes in each direction will be required to accommodate this volume at an acceptable LOS.

APACHE COUNTY

While steady population growth is forecast in Apache County through the year 2030 planning horizon, existing County facilities are expected to accommodate forecast 2030 travel demand. However, several new roads have been identified during previous planning efforts that would improve access within the Study Area.

- Stanford Drive Extension – from existing terminus to new CR 8500: A new two-lane north-south extension of Stanford Drive to a new CR 8500 (see below) is planned to establish a direct connection to Concho Highway to improve access into this growing rural residential area.
- CR 8500 (New) – between Stanford Drive extension and SR 61: This new two-lane east-west roadway is planned to improve access into this growing rural residential area.
- Vernon-McNary Road – between SR 61 and US 60: A new two-lane extension of this roadway is planned to improve access to the growing Vernon area.

TOWN OF PINETOP-LAKESIDE

Three improvements included in the Committed-Plus-Planned roadway network are located in the Town of Pinetop-Lakeside.

- Rim Road – between US 60 in Show Low and White Mountain Road (SR 260) in Pinetop-Lakeside: The improvement of this two-lane roadway is expected to provide an alternative to the congested US 60 and SR 260 highway corridors. The eastern portion of this two-lane facility is forecast to carry more than 19,000 vehicles per day in 2030.
- Penrod Road – between Porter Mountain Road and US 60: This parallel facility to White Mountain Road (SR 260) provides sub-regional connectivity. Traffic volumes between Porter Mountain Road and US 60 are expected to exceed 50,000 vehicles per day in 2030. This level of traffic is more

typical of a limited access expressway than an arterial. Widening to four lanes together with strict access management control will be required to accommodate this volume at an acceptable LOS.

- Porter Mountain Road – between White Mountain Road (SR 260) and Penrod Road: This roadway segment is an important link in the corridor providing sub-regional connectivity between Pinetop-Lakeside and Show Low. Traffic volumes are forecast to exceed 42,000 vehicles per day in 2030. Widening to four lanes together with strict access management control will be required to accommodate this volume at an acceptable LOS.

CITY OF SHOW LOW

Roadway capacity improvements included in the Committed-Plus-Planned within the City of Show Low involve widening existing facilities and constructing new bypass alignments to provide relief to the congested central business district (CBD).

- Penrod Road – between Porter Mountain Road and US 60: This parallel facility to White Mountain Road (SR 260) provides sub-regional connectivity between Pinetop-Lakeside and Show Low. Traffic volumes are forecast to exceed 50,000 vehicles per day in 2030. This volume is more typical of a limited access expressway than an arterial. Widening to four lanes together with strict access management control will be required to accommodate this volume at an acceptable LOS.
- Summit Trail – between US 60 and White Mountain Road: A planned four-lane extension of this roadway will provide relief to US 60 (Deuce of Clubs) and White Mountain Road (SR 260) in the central portions of Show Low. This bypass is forecast to carry more than 21,000 vehicles per day in 2030.
- Rim Road – between US 60 in Show Low and White Mountain Road (SR 260): Improvement of the portion of this roadway in Pinetop-Lakeside in conjunction with improvements in Show Low is expected to provide an alternative to the congested US 60 and SR 260 highway corridors. The western portion of this two-lane facility is forecast to carry more than 11,000 vehicles per day.
- Bluff Road (New) – between Penrod Road and US 60: This new two-lane collector, planned as part of the Show Low Bluff Planned Unit Development (PUD) will provide access to developments in the southeast quadrant of the Penrod Road/US 60 intersection. It also will provide some relief to the US 60/SR 77 intersection. This facility is forecast to carry 16,000 vehicles per day in 2030.

TOWN OF TAYLOR

Two improvements incorporated in the Committed-Plus-Planned roadway network are located within the Town of Taylor.

- Paper Mill Road – between Freeman Hollow Road and SR 77: Forecast 2030 traffic volumes on is roadway segment are expected to exceed 10,000 vehicles per day. This facility would require widening to four lanes to accommodate forecast 2030 travel demand at an acceptable LOS.
- Airport Access Road (New) – between SR 77 and Airport Road: This new two-lane access roadway is planned to improve access to Taylor Airport and the industrial park around the railroad spur. It also will serve to relieve the congested Paper Mill Road/SR 77 intersection.

TOWN OF SNOWFLAKE

While steady population growth is projected to occur in Snowflake through the 2030 planning horizon, existing roadway facilities are expected to accommodate future travel demand; no new sub-regional Committed-Plus-Planned improvement needs were identified.

6.3.2 COMMITTED-PLUS-PLANNED CUT-LINE ANALYSIS

The cut-line analysis was revised to evaluate the overall performance of the Committed-Plus-Planned roadway network (Figure 6-6). Table 6-3 summarizes the results of the cut-line analysis conducted to evaluate the Committed-Plus-Planned roadway network. As indicated in the figure and table, planned improvements would address many of the deficiencies identified within the Existing-Plus-Committed roadway network. In particular, sufficient capacity is provided along each of the east-west cut-lines. Three key north-south corridors (Cut-Lines 1, 3, and 4) still are forecast to have 2030 traffic volumes in excess of planned capacities (red highlight). However, the V/C ratios have been reduced significantly from the conditions forecast under the No-Build assumptions of the Existing-Plus-Committed roadway network.

TABLE 6-3
YEAR 2030 COMMITTED-PLUS-PLANNED ROADWAY NETWORK CUT-LINE EVALUATION

Cut-line	Location	Year 2030 Daily Volume	Roadway Capacity	V/C Ratio
North-South Roadways				
1	Town of Snowflake	37,000	35,600	1.04
2	Town of Taylor	75,400	88,300	0.85
3	Between Towns of Taylor and Show-Low	94,000	88,300	1.06
4	City of Show Low	133,000	89,000	1.49
5	Town of Pinetop-Lakeside	71,000	71,200	0.99
East-West Roadways				
6	West of Snowflake/Taylor	28,000	47,800	0.59
7	West of Show Low	12,000	22,300	0.54
8	East of Show Low and Pinetop-Lakeside	43,500	88,300	0.49
9	SR 61 West of Concho Highway	12,000	22,300	0.54

Red highlighting indicates Cut-line is over capacity.

Source: Wilson & Company, May 2007.

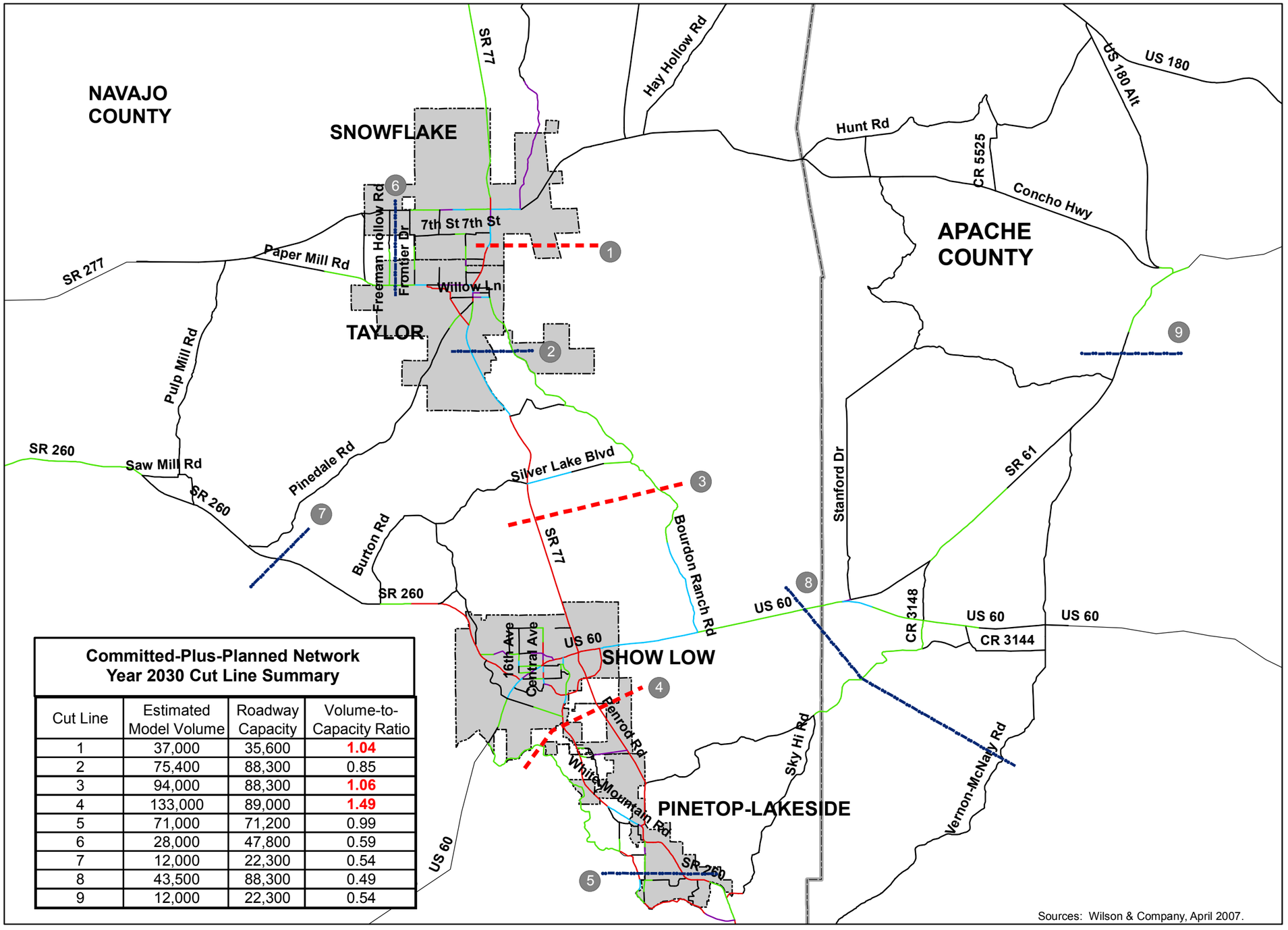
6.4 IMPROVEMENT ALTERNATIVE 'A'

As evidenced by the cut-line analysis of the Committed-Plus-Planned roadway network, even with implementation of a large number of major improvements, there still will be the need to increase network capacity and connectivity to facilitate north-south travel throughout the Study Area in 2030. In consultation with the TAC, possible new Navajo County highway corridors were identified and specific roadway improvements were added to the Committed-Plus-Planned roadway network to address this need. The potential new roadway facilities together with improvements included in the Committed-Plus-Planned roadway network constitute Alternative 'A' (Figure 6-7). A third traffic assignment was modeled to provide a basis for evaluating Alternative 'A', using the same 2030 population and employment growth data used for the previous travel demand model runs. Figure 6-8 shows the forecast traffic counts for major roadways in the Study Area. Appendix G contains detailed, larger scale figures showing Alternative 'A' roadway system improvements and 2030 traffic assignments for each study area municipality and the communities of Vernon and Concho.

6.4.1 PROPOSED CAPACITY ENHANCING IMPROVEMENTS

Five potential new roadway alignments were identified for inclusion in the Alternative 'A' roadway network.

Navajo/Apache County Study Area Overview



Committed-Plus-Planned Network Year 2030 Cut Line Summary

Cut Line	Estimated Model Volume	Roadway Capacity	Volume-to-Capacity Ratio
1	37,000	35,600	**1.04**
2	75,400	88,300	0.85
3	94,000	88,300	**1.06**
4	133,000	89,000	**1.49**
5	71,000	71,200	0.99
6	28,000	47,800	0.59
7	12,000	22,300	0.54
8	43,500	88,300	0.49
9	12,000	22,300	0.54

FORECAST 2030 LEVEL OF SERVICE COMMITTED-PLUS-PLANNED ROADWAY NETWORK

Level of Service

- LOS A - B
- LOS C
- LOS D
- LOS E
- LOS F

* Based on 2030 Socioeconomic Data

Base Map Features

- Cities/Towns
- 1 Cut Line Reference Number
- Cut Line Over Capacity
- Cut Line Under Capacity

N

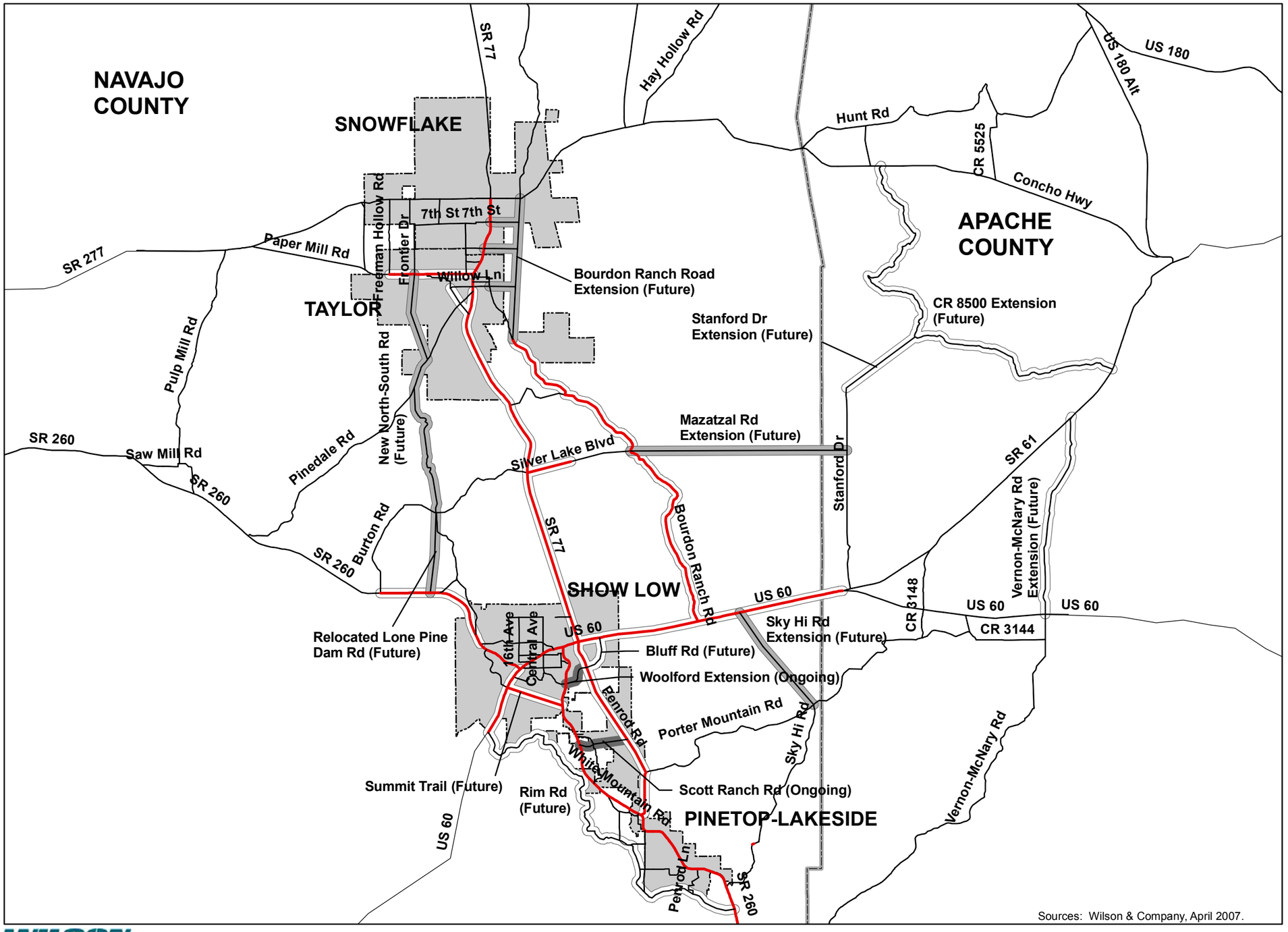
Not to Scale

FIGURE 6-6

WILSON & COMPANY

Southern Navajo/Apache County Sub-Regional Transportation Plan

Navajo/Apache County Study Area Overview



Sources: Wilson & Company, April 2007.

ALTERNATIVE A ROADWAY NETWORK

Directional Lanes

- 1 Lane
- 2 Lanes

Improvement Scenario

- Existing-Plus-Committed
- Committed-Plus-Planned
- Alternative A

Base Map Features

- Cities/Towns

N

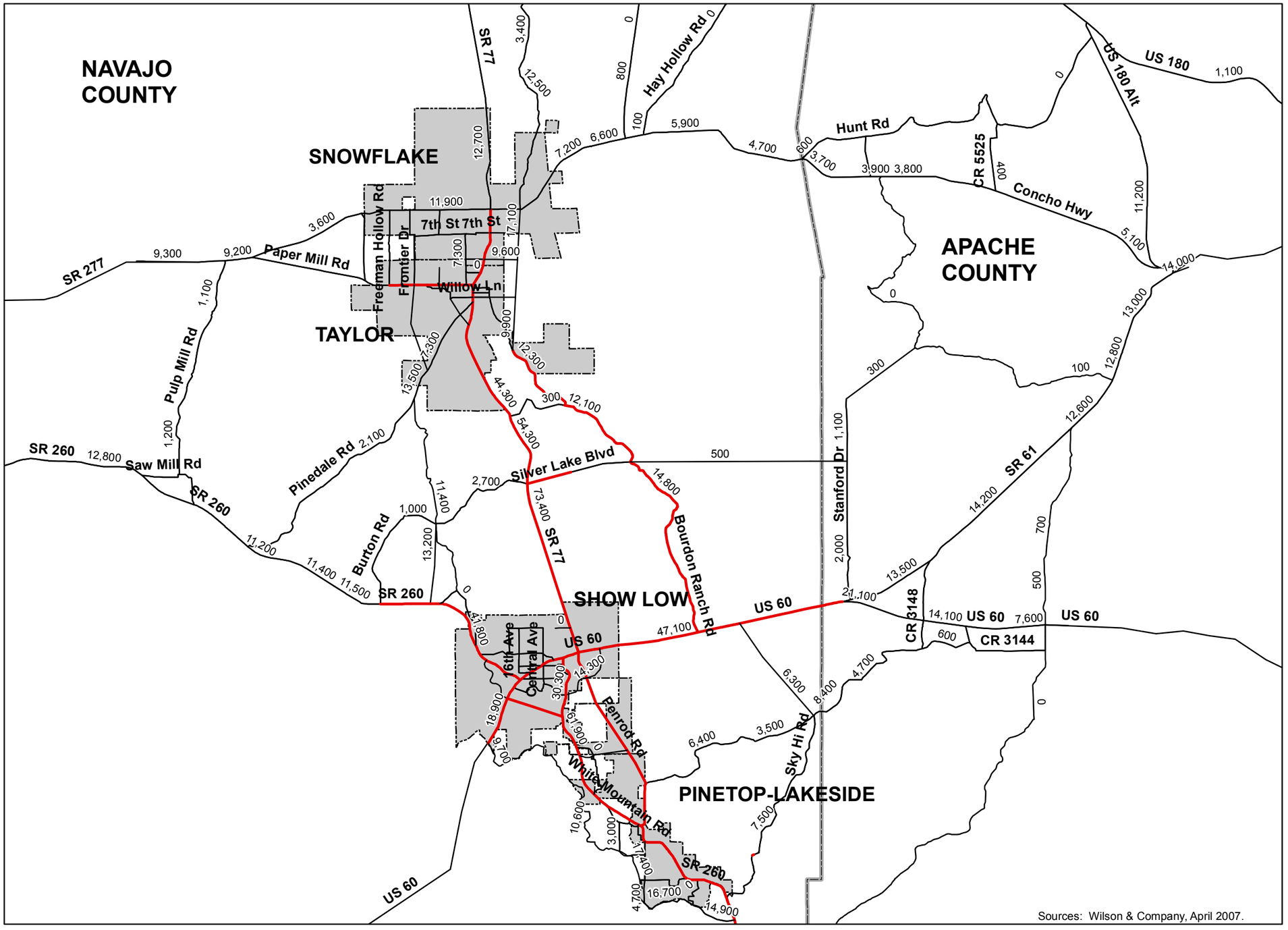
Not to Scale

FIGURE 6-7

WILSON & COMPANY

Southern Navajo/Apache County Sub-Regional Transportation Plan

Navajo/Apache County Study Area Overview



YEAR 2030 TRAFFIC ASSIGNMENT: ALTERNATIVE A ROADWAY NETWORK

Directional Lanes

- 1 Lane
- 2 Lanes
- X,XXX - Daily Volume Estimate

* Based on 2030 Socioeconomic Data

Base Map Features

- Cities/Towns

N

Not to Scale

FIGURE 6-8

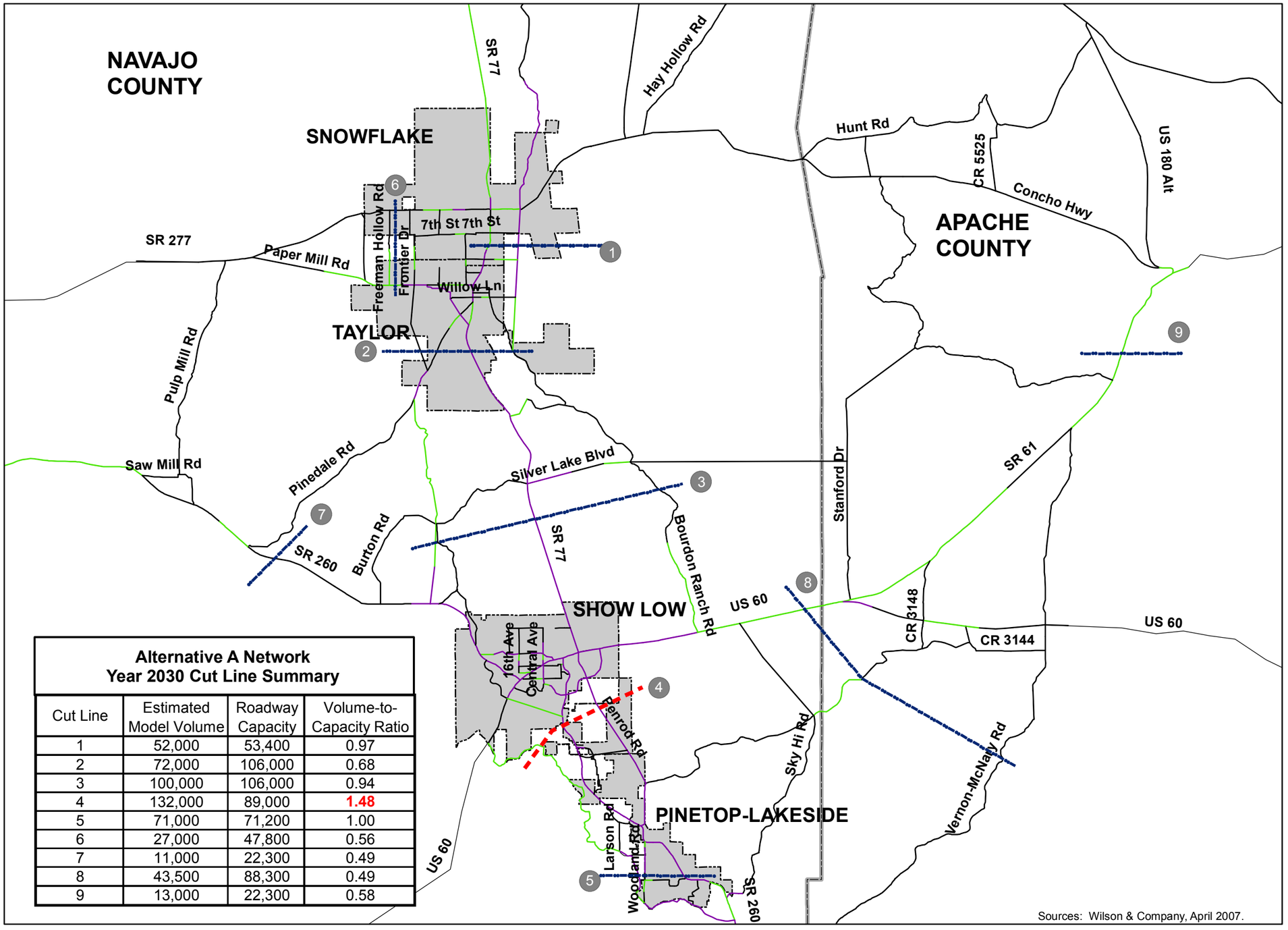
- Bourdon Ranch Road Extension – between Old Woodruff Road at Concho Highway in northeast Snowflake to Bourdon Ranch Road southeast of Taylor: Extension of Bourdon Ranch Road was identified as a potential new north-south, two-lane Minor Arterial east of the Towns of Taylor and Snowflake. Connectivity also would be provided to the existing street network in Snowflake and Taylor to the west of this alignment. This new alignment would help to relieve congestion along SR 77 in Taylor and Snowflake forecast for 2030. Connectivity would be enhanced with extension of the city streets to this new roadway. Year 2030 traffic volumes on the Bourdon Ranch Road Extension are forecast to exceed 18,000 vehicles per day on some sections.
- North-South Road – between Centennial Boulevard at Paper Mill Road in the north to Lone Pine Dam Road in the south: The possibility of a new "North-South Road" west of the Town of Taylor was identified. This proposed two-lane Minor Arterial roadway generally would follow the existing Forest Road 133 (FR 133) alignment between Lone Pine Dam Road and Pinedale Road. This new facility would serve to relieve congestion along SR 77 between Show Low and Taylor. Traffic volumes on this new roadway are forecast to exceed 13,000 vehicles per day in 2030 on some sections.
- Lone Pine Dam Road – between SR 260 (S. Clark Road) and SR 77: This is an important Navajo County Minor Arterial that provides a north-south bypass around Show Low. This facility also forms the southern section of the new "North-South Road" described above. Traffic volumes on Lone Pine Dam Road are forecast to exceed 13,000 vehicles per day. As part of upgrading Lone Pine Dam Road to handle this increase in bypass traffic volume, it is proposed that the roadway be relocated west of its existing alignment away from the growing residential neighborhood at the SR 260/Lone Pine Dam Road intersection. A detailed corridor study should be conducted to select an appropriate new alignment to begin right-of-way protection.
- Sky Hi Road Extension – between US 60 east of Bourdon Ranch Road and Porter Mountain Road: The unused Apache Railroad right-of-way offers a potential opportunity for a new north-south, two-lane roadway in Apache County. This facility would enhance connectivity between Pinetop-Lakeside in the south and residential growth areas in Apache County. It also would serve to relieve congestion in the Penrod Road/White Mountain Road (SR 260) corridor. Year 2030 traffic volumes are forecast to exceed 7,000 vehicles per day.
- Mazatzal Street Extension – between Bourdon Ranch Road in Navajo County and Stanford Drive in Apache County: This potential new east-west, two-lane Collector roadway would provide new connectivity between White Mountain Lakes and residential developments in the Stanford Drive area. The 2030 traffic volume on the proposed Mazatzal Street Extension is forecast to be 500 vehicles per day.

6.4.2 ALTERNATIVE 'A' CUT-LINE ANALYSIS

Figure 6-9 shows the results of the cut-line analysis performed for Alternative 'A' and indicates the LOS for each roadway segment under Alternative 'A' based on the traffic assignment. Table 6-4 compares the results of the cut-line analysis for the Committed-Plus-Planned roadway network with the Alternative 'A' roadway network. As indicated in Table 6-4, the additional improvements proposed under Alternative 'A' would provide the best network performance based on projected 2030 growth projections. However, even with the additional north-south capacity from the new alignments, some deficiencies would persist:

- The SR 260 corridor in central Pinetop-Lakeside (Cut-Line 5) is forecast to have a V/C ratio of 1.00, meaning this corridor will be at or close to capacity in 2030;

Navajo/Apache County Study Area Overview



Alternative A Network
Year 2030 Cut Line Summary

Cut Line	Estimated Model Volume	Roadway Capacity	Volume-to-Capacity Ratio
1	52,000	53,400	0.97
2	72,000	106,000	0.68
3	100,000	106,000	0.94
4	132,000	89,000	1.48
5	71,000	71,200	1.00
6	27,000	47,800	0.56
7	11,000	22,300	0.49
8	43,500	88,300	0.49
9	13,000	22,300	0.58

FORECAST 2030 LEVEL OF SERVICE: ALTERNATIVE A ROADWAY NETWORK

Level of Service

- LOS A - B
- LOS C
- LOS D
- LOS E
- LOS F

* Based on 2030 Socioeconomic Data

Base Map Features

- Cities/Towns
- 1 Cut Line Reference Number
- Cut Line Over Capacity
- Cut Line Under Capacity

N

Not to Scale

FIGURE 6-9

WILSON & COMPANY

Southern Navajo/Apache County Sub-Regional Transportation Plan

TABLE 6-4
CUT-LINE EVALUATION: COMPARISON OF COMMITTED-PLUS-PLANNED AND ALTERNATIVE 'A' ROADWAY NETWORKS (2030)

Cut-line	Location	Committed-Plus-Planned Network			Alternative 'A' Network		
		2030 Daily Volume	Roadway Capacity	V/C Ratio	2030 Daily Volume	Roadway Capacity	V/C Ratio
North-South Roadways							
1	Town of Snowflake	37,000	35,600	1.04	52,000	53,400	0.97
2	Town of Taylor	75,400	88,300	0.85	72,000	106,000	0.68
3	Between Town of Taylor and City of Show Low	94,000	88,300	1.06	100,000	106,000	0.94
4	City of Show Low	133,000	89,000	1.49	132,000	89,000	1.48
5	Town of Pinetop-Lakeside	71,000	71,200	0.99	71,000	71,200	1.00
East-West Roadways							
6	West of Snowflake/Taylor	28,000	47,800	0.59	27,000	47,800	0.56
7	West of Show Low	12,000	22,300	0.54	11,000	22,300	0.49
8	East of Show Low and Pinetop-Lakeside	43,500	88,300	0.49	43,500	88,300	0.49
9	SR 61, West of Concho Highway	12,000	22,300	0.54	13,000	22,300	0.58

Source: Wilson & Company, May 2007.

- The SR 260/Penrod Road corridor between Pinetop-Lakeside and Show Low (Cut-Line 4) is forecast to be over capacity with a V/C ratio of 1.48, which would be undesirable;
- The SR 77/Bourdon Ranch Road corridor between Show Low and Taylor (Cut-Line 3) is forecast to have a V/C ratio of 0.94, meaning this corridor will be close to capacity in 2030; and
- The SR 77/Bourdon Ranch Road Extension corridor in Snowflake (Cut-line 1) is forecast to have a V/C ratio of 0.97, meaning this corridor also will be close to capacity in 2030.

6.5 ALTERNATIVE 'A' 2015 PHASED CAPACITY IMPROVEMENTS

Figure 6-10 shows the anticipated phasing of roadway network improvement projects incorporated in Alternative 'A'. Roadway capacity improvements to be implemented by 2015 and 2030 are shown for the Study Area. Figure 6-11 displays the forecast traffic volumes in the Study Area in 2015 with the above cited improvements. The next two subsections provide discussions of the specific improvements slated for 2015 and the roadway levels of service expected from these improvements.

6.5.1 2015 IMPROVEMENTS

Specific improvements to be phased in by 2015 are described below by responsible jurisdiction.

ARIZONA DEPARTMENT OF TRANSPORTATION

Three roadway improvements, involving SR 77 and US 60, have been identified for implementation by the State by 2015.

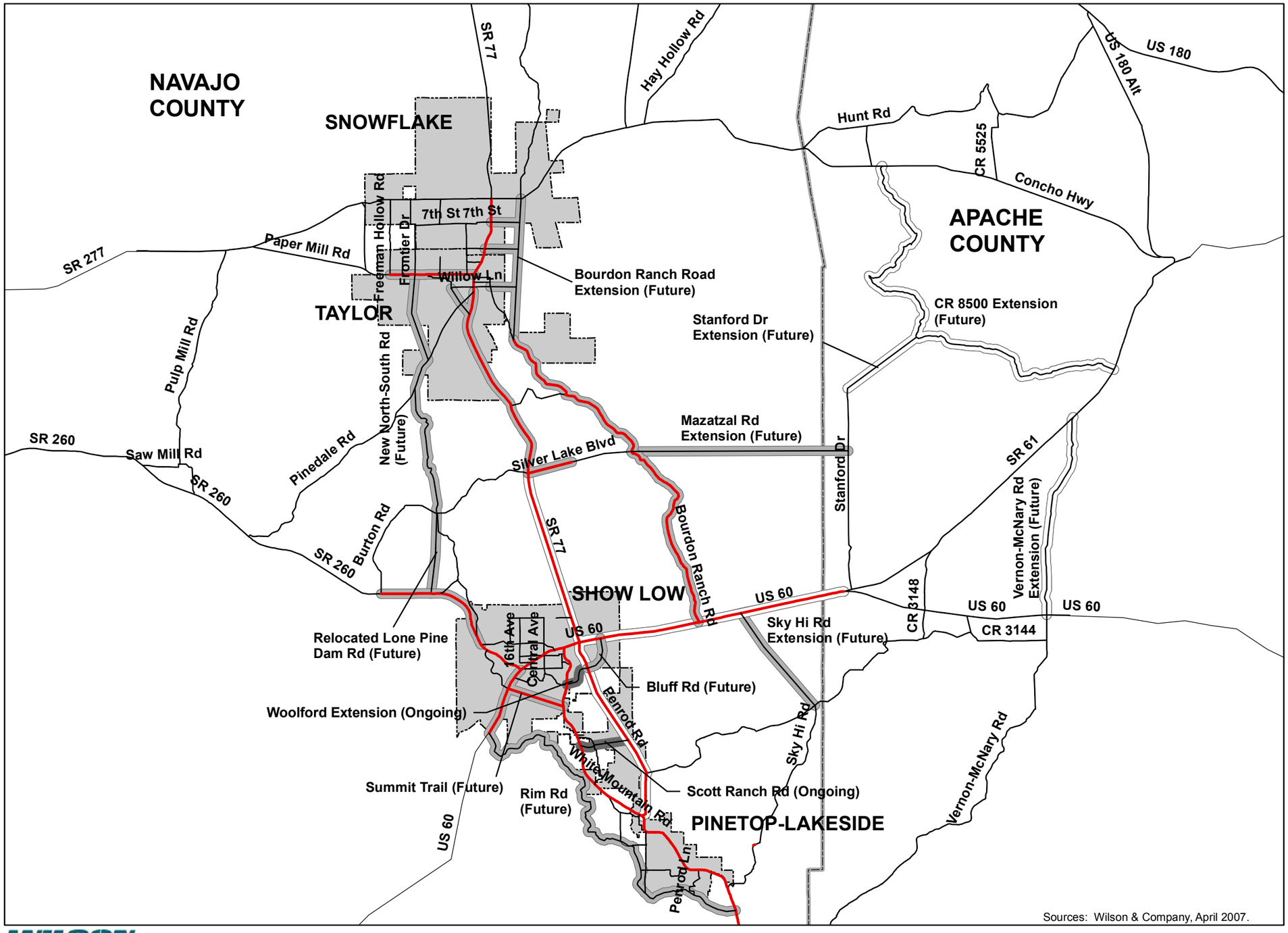
- US 60 – between SR 77 and Bourdon Ranch Road: The traffic volume on this roadway segment is forecast to increase to more than 21,000 vehicles per day by 2015. The existing two-lane facility would operate at LOS 'D' or worse. This facility should be widened to four lanes and appropriate ADOT access management guidelines for this principal arterial should be applied to consolidate driveway and access points to enhance operations and safety on this segment.
- US 60 – between Bourdon Ranch Road and SR 61: Traffic volumes are expected to increase to more than 15,000 vehicles per day in 2015 on this roadway segment. The existing two-lane facility would operate at LOS 'C' or worse. This facility should be widened to four lanes and appropriate ADOT access management guidelines for this principal arterial should be applied to consolidate driveway and access points to enhance operations and safety on this segment.
- SR 77 – between SR 60 and Silver Lake Boulevard: The forecast traffic volume for this roadway segment is estimated to exceed 16,000 vehicles per day in 2015. The existing two-lane facility would operate at LOS 'D' or worse. This facility should be widened to four lanes and appropriate ADOT access management guidelines for this Principal Arterial should be applied to consolidate driveway and access points to enhance operations and safety on this segment.

Improvements to the Federal and State Highway System can be made only after in-depth planning and engineering studies are conducted by ADOT, and upon approval of the State Transportation Board. The recommendations made by this study for improvements to State facilities can serve only as suggestions for further study.

NAVAJO COUNTY

Existing Navajo County facilities are expected to function at an acceptable LOS through 2015.

Navajo/Apache County Study Area Overview



PHASED ROADWAY IMPROVEMENTS: 2015 AND 2030

Directional Lanes

- 1 Lane
- 2 Lanes

Improvement Phase

- Existing-Plus-Committed
- Year 2015
- Year 2030

Base Map Features

- Cities/Towns

N

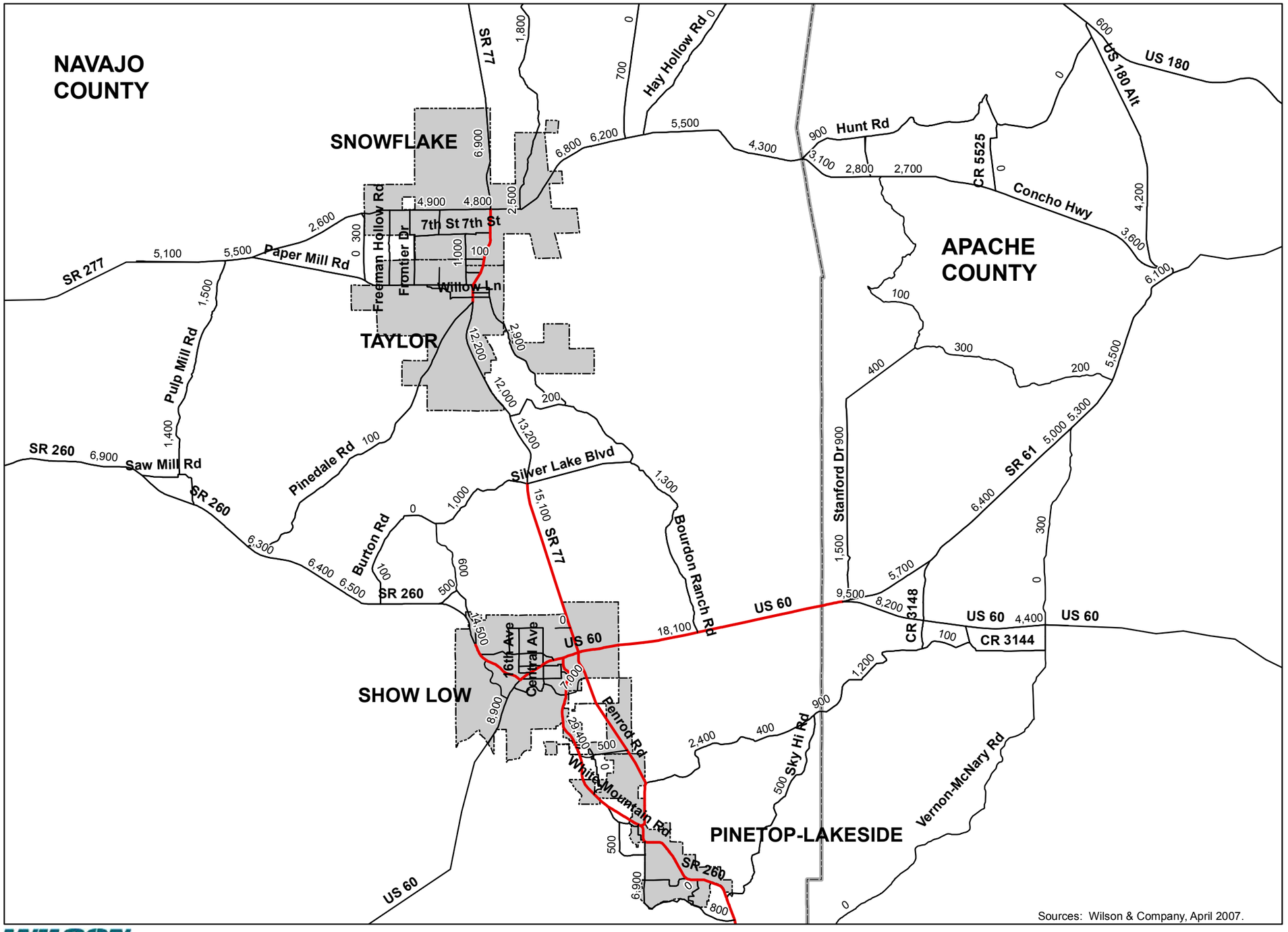
Not to Scale

FIGURE 6-10

WILSON & COMPANY

Southern Navajo/Apache County Sub-Regional Transportation Plan

Navajo/Apache County Study Area Overview



YEAR 2015 TAFFIC ASSIGNMENT: YEAR 2015 PHASED IMPROVEMENTS

Directional Lanes

- 1 Lane
- 2 Lanes
- X,XXX - Daily Volume Estimate

* Based on 2015 Socioeconomic Data

Base Map Features

- Cities/Towns

N

Not to Scale

FIGURE 6-11

WILSON & COMPANY

Southern Navajo/Apache County Sub-Regional Transportation Plan

APACHE COUNTY

Existing Apache County facilities are expected to function at an acceptable LOS through 2015. Nevertheless, there are three roadway improvement projects identified for implementation by 2015:

- Stanford Drive Extension – from existing terminus to new CR 8500: A new two-lane north-south extension of Stanford Drive to a new CR 8500 (see below) is planned to establish a direct connection to Concho Highway to improve access into this growing rural residential area.
- CR 8500 (New) – between Stanford Drive extension and SR 61: This new two-lane east-west roadway is planned to improve access into this growing rural residential area.
- Vernon-McNary Road – between SR 61 and US 60: A new two-lane extension of this roadway is planned to improve access to the growing Vernon area.

TOWN OF PINETOP-LAKESIDE

Year 2015 improvement priorities within the Town of Pinetop-Lakeside include Porter Mountain Road and Penrod Road.

- Penrod Road – between Porter Mountain Road and US 60: This parallel facility to White Mountain Road (SR 260) provides sub-regional connectivity. Traffic volumes between Porter Mountain Road and US 60 are expected to exceed 14,000 vehicles per day in 2015. The existing two-lane facility would operate at LOS 'D' or worse. This facility should be widened to four lanes, and efforts should begin to close driveway openings and consolidate access points to enhance operations and safety on this segment.
- Porter Mountain Road – between White Mountain Road (SR 260) and Penrod Road: This roadway segment is an important link in the corridor providing sub-regional connectivity between Pinetop-Lakeside and Show Low. Traffic volumes are forecast to exceed 18,000 vehicles per day in 2015. The existing two-lane facility would operate at LOS 'D' or worse. This facility should be widened to four lanes, and efforts should begin to close driveway openings and consolidate access points to enhance operations and safety on this segment.

CITY OF SHOW LOW

The key roadway improvement priority for the City of Show Low by 2015 is Penrod Road (south of US 60). This is a parallel facility to White Mountain Road (SR 260). It provides sub-regional connectivity between Pinetop-Lakeside and Show Low. Traffic volumes between Porter Mountain Road and US 60 are forecast to exceed 20,000 vehicles per day in 2015. The existing two-lane facility would operate at LOS 'D' or worse without improvement. This facility should be widened to four lanes, and efforts should begin to close driveway openings and consolidate access points to enhance operations and safety on this segment.

TOWN OF TAYLOR

Existing Town of Taylor facilities are expected to function at an acceptable LOS through 2015.

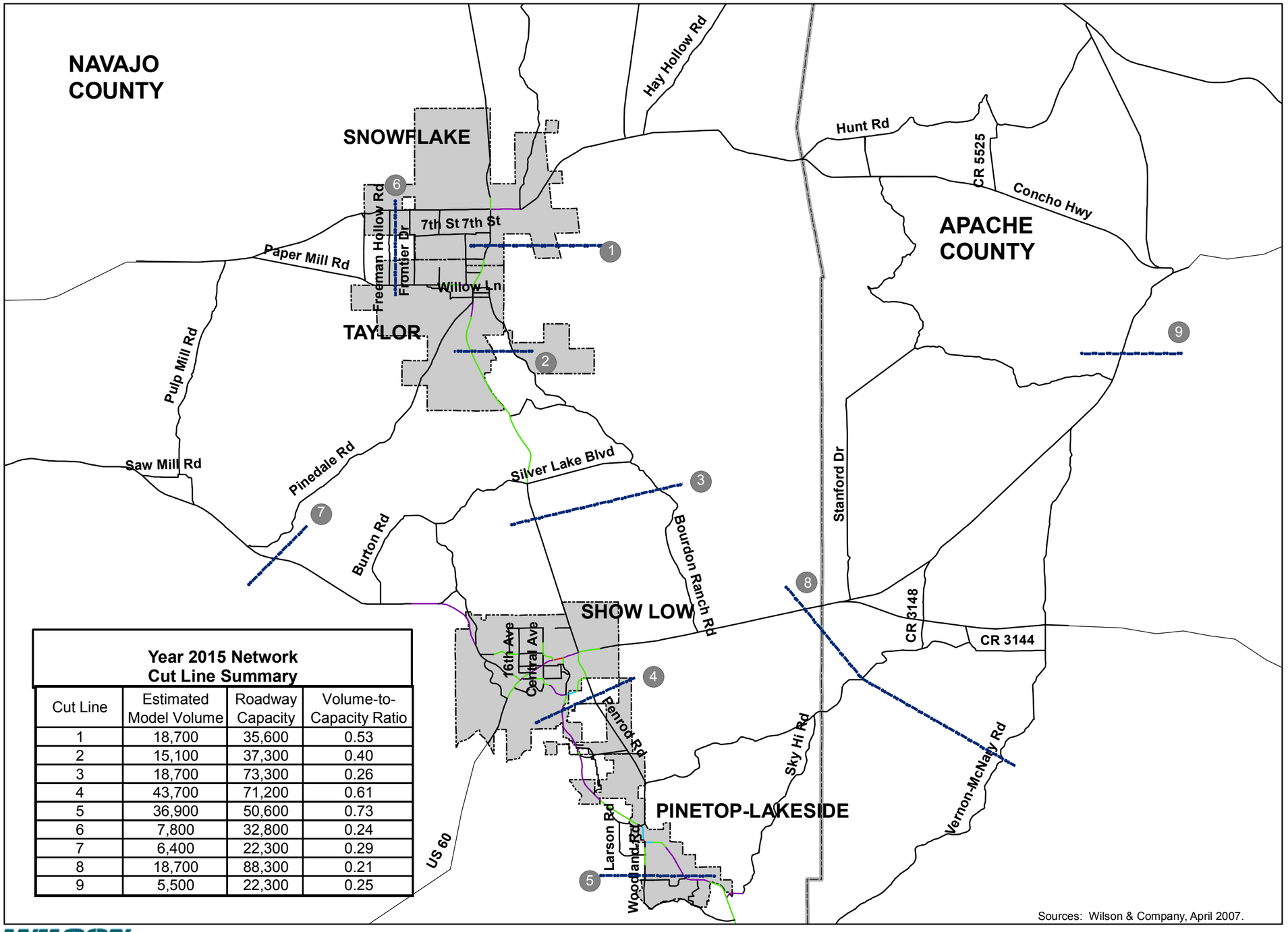
TOWN OF SNOWFLAKE

Existing Town of Snowflake facilities are expected to function at an acceptable LOS through 2015.

6.5.2 YEAR 2015 PHASED IMPROVEMENTS CUT-LINE ANALYSIS

Figure 6-12 shows the forecast level of service with 2015 roadway improvements and the results of the cut-line analysis. In Show Low, a short segment of US 60, between E. Old Linden Road and SR 260, is.

Navajo/Apache County Study Area Overview



Year 2015 Network Cut Line Summary

Cut Line	Estimated Model Volume	Roadway Capacity	Volume-to-Capacity Ratio
1	18,700	35,600	0.53
2	15,100	37,300	0.40
3	18,700	73,300	0.26
4	43,700	71,200	0.61
5	36,900	50,600	0.73
6	7,800	32,800	0.24
7	6,400	22,300	0.29
8	18,700	88,300	0.21
9	5,500	22,300	0.25

FORECAST LEVEL OF SERVICE: YEAR 2015 IMPROVEMENTS

Level of Service

- LOS A - B
- LOS C
- LOS D
- LOS E
- LOS F

Base Map Features

- Cities/Towns
- Cut Line Reference Number
- Cut Line Over Capacity
- Cut Line Under Capacity

N

Not to Scale

FIGURE 6-12

WILSON & COMPANY

Southern Navajo/Apache County Sub-Regional Transportation Plan

forecast to operate at LOS 'F', and a segment of the Woolford Extension, east of SR 260, is forecast to operate at LOS 'E'. In Pinetop-Lakeside, SR260 at the N. Woodland Road intersection is forecast to operate at LOS 'F', and segments of SR 260 on both sides of this intersection would operate at LOS 'E'. Appendix H presents graphics showing proposed 2015 improvements and traffic assignments for each municipality and the Vernon and Concho communities in Apache County.

Cut-line analysis was used to analyze network performance with the major Study Area roadways comprising the 2015 roadway network in place. Table 6-5 shows the results of the cut-line analysis for the phased 2015 Roadway Improvement Needs Network under Alternative 'A'. The 2015 roadway improvements identified above to address LOS deficiencies on key facilities were included in this analysis. This table shows that with implementation of the segment improvements described above by 2015, the roadway network of the Study Area will accommodate forecast year 2015 travel demand. No cut-lines have a V/C ratio exceeding 0.73.

TABLE 6-5
ALTERNATIVE 'A' YEAR 2015 ROADWAY IMPROVEMENTS CUT-LINE EVALUATION

Cut-line	Location	Year 2015 Daily Volume	Roadway Capacity	V/C Ratio
North-South Roadways				
1	Town of Snowflake	18,700	35,600	0.53
2	Town of Taylor	15,100	37,300	0.40
3	Between Towns of Taylor and Show-Low	18,700	73,300	0.26
4	City of Show Low	43,700	71,200	0.61
5	Town of Pinetop-Lakeside	36,900	50,600	0.73
East-West Roadways				
6	West of Snowflake/Taylor	7,800	32,800	0.24
7	West of Show Low	6,400	22,300	0.29
8	East of Show Low and Pinetop-Lakeside	18,700	88,300	0.21
9	SR 61 West of Concho Highway	5,500	22,300	0.25

Source: Wilson & Company, May 2007.

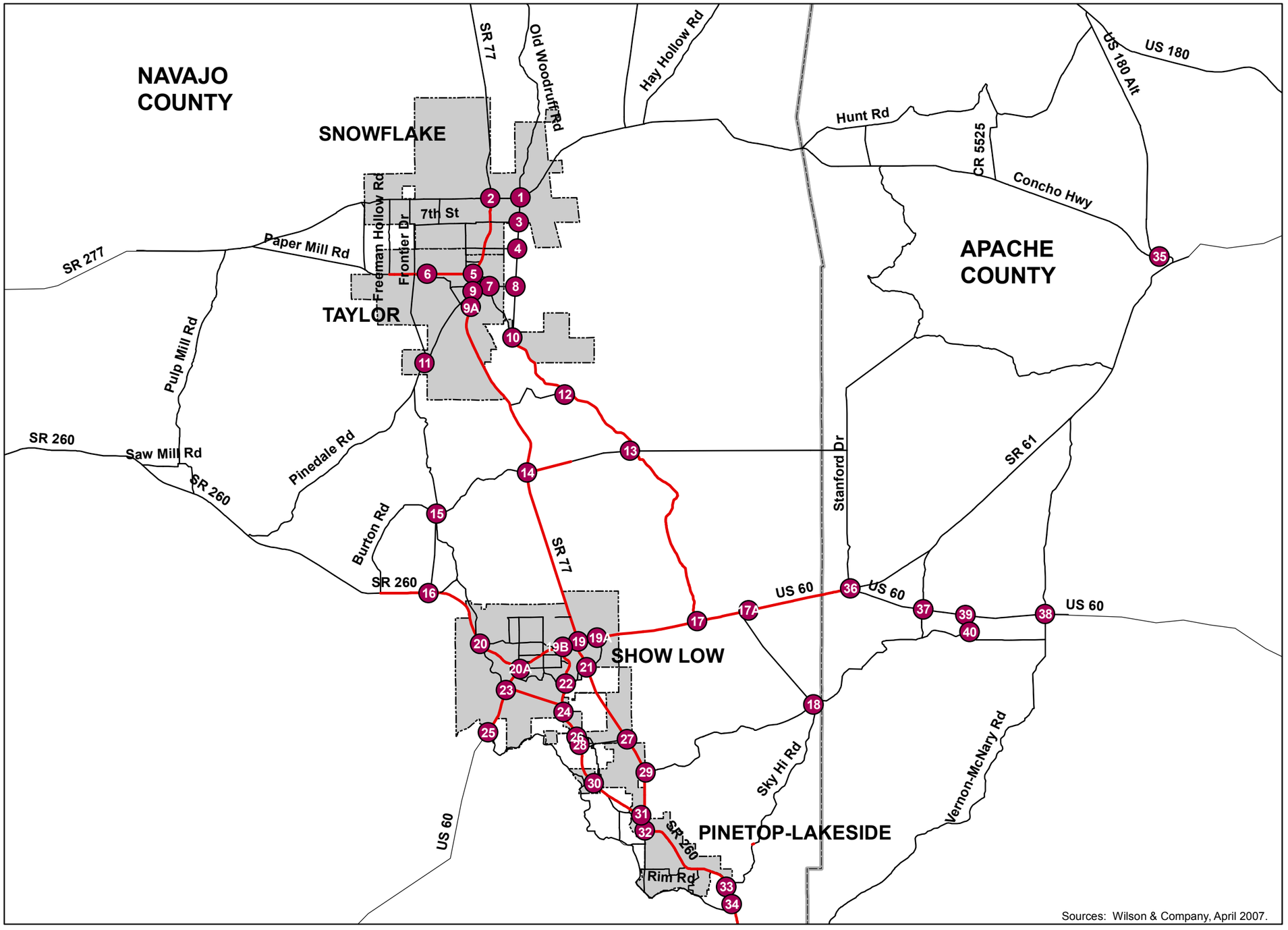
6.6 INTERSECTION ANALYSIS

As traffic volumes on Study Area roadways increase as a direct result of projected population and employment growth, intersection upgrades will be an important part of the overall sub-regional mobility solution. The study team conducted planning-level analyses to identify lane configuration and traffic control type at key existing and future intersection locations in the Study Area. The analyses included an assessment of intersection operations for the year 2030 Alternative 'A' improvement scenario and the interim year 2015 subset of improvement needs. Figure 6-13 shows the location of 45 intersections in the Study Area selected for these planning-level analyses.

6.6.1 ANALYSIS METHODOLOGY

Peak-hour traffic volume forecasts were based on the daily travel demand model volume forecasts for the Alternative 'A' roadway system improvements. The daily model volume estimates were converted to peak-hour/peak-direction volumes using K- and D-factors. The K-factor is the ratio of the hourly two-way traffic to the two-way daily traffic volume estimate. The Directional Distribution (D) factor is the percentage

Navajo/Apache County Study Area Overview



Sources: Wilson & Company, April 2007.

STUDY AREA INTERSECTIONS

Legend

- 2 Travel Lanes
- 4 Travel Lanes
- XX Study Area Intersection

Base Map Features

- Cities/Towns

N

Not to Scale

FIGURE 6-13

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Southern Navajo/Apache County Sub-Regional Transportation Plan

of the total, two-way peak hour traffic traveling in the peak direction. For these planning-level analyses, a K-factor of nine (9) was used to estimate two-way, peak-hour traffic. For rural intersections, a D-factor of 60 was used; at urban intersections, the D-factor was 55. Turning movements at each intersection were estimated using methodology detailed in NCHRP 255, *Highway Traffic Data for Urbanized Area Project Planning and Design*, and implemented in the TurnsW32 software package by Dowling Associates.[1] The Synchro 6 software package by Trafficware® was used to evaluate intersection operations and develop recommendations for lane configuration and traffic control type to accommodate traffic at LOS 'D' or better at the 45 intersections examined.

6.6.2 INTERSECTION ANALYSIS RESULTS

Table 6-6 shows the existing year (2006) traffic control type together with anticipated 2015 and 2030 traffic control types, based on the intersection analyses described above. Diagrams showing required lane configurations, recommended turning movement patterns, and estimated peak-hour traffic volumes for existing and future intersections in the four Study Area municipalities and the unincorporated areas of Navajo and Apache Counties are presented in Appendix I.

YEAR 2015 INTERSECTION ANALYSES

Most existing Study Area intersections should continue to function acceptably under traffic conditions anticipated in 2015. As shown in Table 6-6, nine major sub-regional facilities in the Study Area will require traffic signals to accommodate traffic growth through 2015. Four other facilities will require the installation of "stop" signs.

YEAR 2030 INTERSECTION ANALYSIS

Forecast traffic volumes associated with projected 2030 population and employment growth data for the Study Area indicate significant intersection upgrades will be required. As shown in Table 6-6, nearly every major intersection analyzed in Navajo County will require signalization. It should be noted that the majority of intersections evaluated also will require exclusive left-turn and/or right-turn lanes (refer to diagrams in Appendix I). Two key intersections in the Study Area will require construction of grade-separated traffic interchanges (TIs).

US 60/SR 77/Penrod Road

In 2030, over 230,000 vehicles per day are expected to pass through the intersection of US 60, SR 77/N. Penrod Road, and Penrod Road (south of US 60). This major intersection of key sub-regional routes will require a grade-separated interchange solution to accommodate forecast travel demand. Figure 6-14 presents one possible concept – a modified diamond interchange, which would serve traffic movements at this intersection. The interchange design includes a loop ramp in the southeast quadrant to reduce potential impacts to businesses on US 60 west of Penrod Road. While a detailed engineering study will be required to identify the best interchange solution to accommodate travel demand, this concept shows the magnitude of the investment needed to accommodate anticipated year 2030 travel demand.

SR 77/White Mountain Lake Road

Growth around White Mountain Lake will require a grade-separated intersection at the SR 77/White Mountain Lake Road intersection to accommodate traffic moving between development around White

[1] *Highway Traffic Data for Urbanized Area Project Planning and Design*, Chapter 8, Report 255, National Cooperative Highway Research Program, Transportation Research Board, December 1982.

TABLE 6-6
TRAFFIC CONTROL AT STUDY AREA INTERSECTIONS: EXISTING, 2015, & 2030

No.	Intersection	Existing	2015	2030
	Snowflake/Taylor			
1	Concho Hwy/Old Woodruff Rd	Stop	Signal	Signal
2	SR 77/Concho Hwy	Signal	Signal	Signal
3	7th St/Bourdon Ranch Rd Extension (Future)	N/A	N/A	Signal
4	Rodeo Dr/Bourdon Ranch Rd Extension (Future)	N/A	N/A	Signal
5	Paper Mill Rd/SR 77	Signal	Signal	Signal
6	New North-South Rd/Paper Mill Rd (Future)	Stop	Stop	Signal
7	Willow Ln/Bourdon Ranch Rd	Stop	Stop	Stop
8	Willow Ln (or Center St)/Bourdon Ranch Rd Extension (Future)	N/A	N/A	Signal
9	SR 77/Pinedale Rd	Stop	Signal	Signal
9A	SR 77/Airport Road (Future)	N/A	N/A	N/A *
10	Bourdon Ranch Rd/Bourdon Ranch Rd Extension (Future)	N/A	N/A	Signal
11	New North-South Rd/Pinedale Rd (Future)	N/A	N/A	Signal
	Navajo County			
12	Black Mesa Ln/Bourdon Ranch Rd	Stop	Stop	Stop
13	Silver Lake Blvd/Bourdon Ranch Rd	Stop	Stop	Signal
14A	SR 77/White Mountain Lake Rd	Stop	Signal	Grade-Separated Intersection
14B	SR 77/Lone Pine Dam Rd	Stop	Signal	Signal
15	Burton Rd/Relocated Lone Pine Dam Rd (Future)	N/A	Stop	Signal
16	SR 260/Relocated Lone Pine Dam Rd (Future)	N/A	N/A	Signal
17	US 60/Bourdon Ranch Rd	Stop	Signal	Signal
17A	US 60/Sky Hi Rd Extension (Future)	N/A	N/A	Signal
18	Sky Hi Rd/Porter Mtn Rd	Stop	Stop	Signal
	Show Low			
19	US 60/SR 77	Signal	Signal	Grade-Separated Intersection
19A	US 60/Woolford Extension (Future)	N/A	N/A	Signal
19B	Deuce of Clubs (US 60)/White Mountain Rd (SR 260)	Signal	Signal	Signal
20	Clark Rd (SR 260)/Old Linden Rd	Stop	Signal	Signal
20A	Clark Rd (SR 260)/Deuce of Clubs (US 60)	Signal	Signal	Signal
21	SR 77/Penrod Rd (Future)	N/A	Signal	Signal
22	White Mountain Rd (SR 260)/Woolford Rd	Signal	Signal	Signal
23	US 60/Summit Trail	Stop	Signal	Signal
24	White Mountain Rd (SR 260)/Summit Trail (Future)	N/A	N/A	Signal
25	US 60/Rim Rd (Future)	N/A	N/A	Signal
26	White Mountain Rd (SR 260)/Show Low Lakes Rd	Signal	Signal	Signal
27	Scott Ranch Rd/Penrod Rd	N/A	Stop	Signal
28	White Mountain Rd (SR 260)/Scott Ranch Rd	Stop	Signal	Signal
	Pinetop-Lakeside			
29	Penrod Rd/Porter Mountain Rd	Stop	Signal	Signal
30	White Mountain Rd (SR 260)/Show Low Lakes Rd	Stop	Stop	Signal
31	White Mountain Rd (SR 260)/Porter Mountain Rd	Signal	Signal	Signal
32	White Mountain Rd (SR 260)/Woodland Rd	Signal	Signal	Signal
33	White Mountain Rd (SR 260)/Buck Springs Rd	Signal	Signal	Signal
34	White Mountain Rd (SR 260)/Rim Rd	Stop	Stop	Signal
	Apache County			
35	SR 180A/Concho Hwy	Stop	Stop	Stop
36	SR 61/Stanford Rd	Stop	Stop	Stop
37	US 60/CR 3148	Stop	Stop	Stop
38	US 60/Vernon-McNary Rd (Future)	N/A	Stop	Stop
39	US 60/CR 3154	Stop	Stop	Stop
40	CR 3154/CR 3144	Stop	Stop	Stop

Note:
Shading indicates change from the previous period.
* Intersection solution not resolved in time to be included in this study.

Source: Wilson & Company, May 2006.

POSSIBLE INTERCHANGE DESIGNS

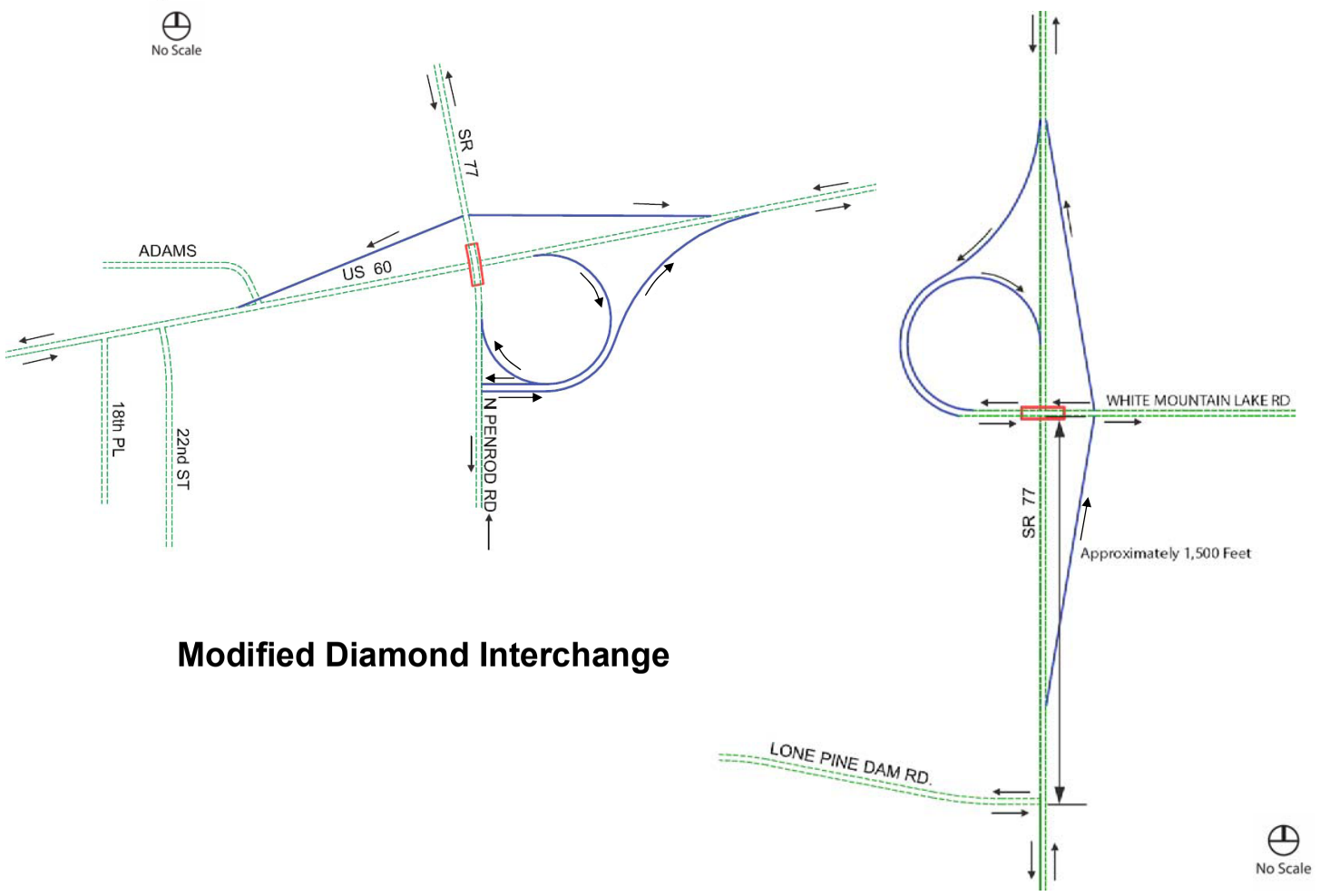

FIGURE 6-14

Mountain Lake and Show Low. Figure 6-14 provides an example of the type of facility required to accommodate the forecast traffic volumes at this location. The trumpet interchange design, with a loop in the northwest quadrant, would move the nose of the southbound on-ramp further north than a standard diamond interchange and, potentially, provide an adequate weave distance between the ramp and Lone Pine Dam Road. While requiring more right-of-way than a standard diamond, this alternative would not require a signal on the west side of the interchange. A detailed engineering study will be required to identify the best solution to accommodate access between White Mountain Lake Road and the Lone Pine Dam Road traffic and SR 77. However, this concept shows the level of investment required to accommodate forecast 2030 travel demand.

7.0 IMPLEMENTATION PLAN

The findings of the previous chapter provided the foundation for formulating the Southern Navajo/Apache County Sub-Region Transportation Plan. This plan contains the following recommendations for implementation:

- Future Roadway Classification Plan
- Year 2030 Roadway Improvement Plan
- Transportation Revenue Outlook
- Implementation Action Items.

Recommendations for implementing each of these long-range transportation planning system elements are based on technical analyses of existing and future conditions as well as input from the TAC, as presented in previous chapters of this document.

7.1 FUTURE ROADWAY FUNCTIONAL CLASSIFICATION PLAN

The Future Roadway Functional Classification Plan (Figure 7-1) is based on the 1999 *White Mountain Regional Transportation Plan* and the 2030 travel demand analysis performed for this study. The Plan identifies four principal roadway classifications that are appropriate to the Study Area's future transportation needs: Principal Arterial, Minor Arterial, Major Collector, and Minor Collector. In addition to identifying future roadway classification, Figure 7-1 also shows the two TIs that will be required to accommodate forecast 2030 traffic in the central portion of the Study Area.

The importance of the Future Roadway Functional Classification Plan is that the concept of functional classification establishes a decision/design framework for future transportation facilities.

> *The level of service required to fulfill [each] function for the anticipated volume and composition of traffic provides a rational and cost-effective basis for the selection of design speed and geometric criteria within the range of values available to the designer (for the specified functional classification). The use of functional classification as a design type should appropriately integrate the highway planning and design process.*[2]

The Federal Highway Administration (FHWA) provides elaboration of this concept as a roadway network design tool:

> *Once the functional classification of a particular roadway has been established, so has the allowable range of design speed. With the allowable range of design speed defined, the principal limiting design parameters associated with horizontal and vertical alinement are also defined. Similarly, a determination of functional classification establishes the basic roadway cross section in terms of lane width, shoulder width, type and width of median area, and other major design features.*[3]

An important aspect of future roadway network is right-of-way preservation or protection. This is critical to implementation of roadway improvements, as it permits the flexibility in facility design and development and

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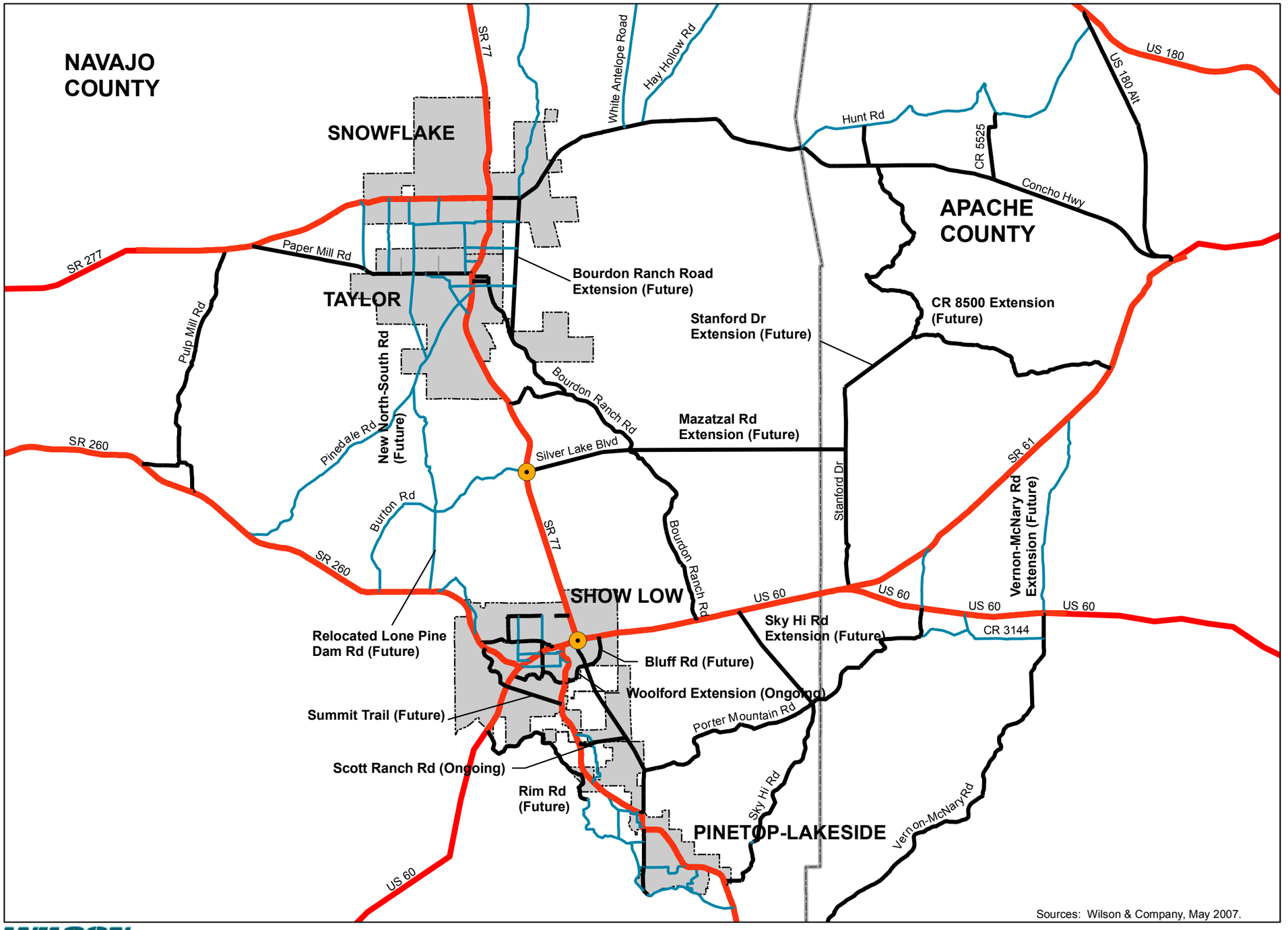
2 *A Policy on the Geometric Design of Highways and Streets* (Green Book), American Association of State Highway and Transportation Officials (AASHTO), Chapter 1, pg. 17.

3 Flexibility in Highway Design, Federal Highway Administration

Navajo/Apache County Study Area Overview



FUTURE 2030 ROADWAY FUNCTIONAL CLASSIFICATION PLAN

Roadway Classifications

- Principal Arterial
- Minor Arterial
- Major Collector
- Minor Collector

Base Map Features

- Cities/Towns
- Traffic Interchange

N

Not to Scale

FIGURE 7-1

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assures the community that the facility can be developed to accommodate forecast 2030 travel demand. The Future Roadway Functional Classification Plan provides the framework for identifying right-of-way requirements for the existing and future roadway network. Thus, specific right-of-way requirements for each planned roadway facility should be considered when reviewing future development proposals. To help guide right-of-way protection in the Study Area, Chapter 8 identifies the appropriate cross-section for each functional classification shown in the Future Roadway Functional Classification Plan.

7.2 YEAR 2030 ROADWAY IMPROVEMENT PLAN

The Year 2030 Roadway Improvement Plan (Figure 7-2) includes the Alternative 'A' roadway improvements detailed in Chapter 6. These improvement recommendations were developed to assure adequate roadway system capacity to handle forecast 2030 travel demand generated by the Study Area's future permanent population and economic activity. Nevertheless, as the sub-region experiences its seasonal influx of visitors in the summer and autumn months, the Study Area roadway network is expected to operate over capacity in several key corridors.

7.3 IMPROVEMENT PLAN COST ESTIMATES

Table 7-1 provides a summary of the total estimated Study Area improvement costs (2006 dollars) for the Year 2030 Roadway Improvement Plan. Table 7-2 presents the roadway capacity improvements for each participating jurisdiction together with a planning-level capital cost estimate and the recommended timeframe for implementation. The cost estimates are based on cost data presented in the *Transportation System Plan Update*, 2006, published by the Maricopa County Department of Transportation (MCDOT). Cost estimates assume an average cost per lane mile of $1,270,000, which includes planning, design, construction management, and right-of-way. When an existing two-lane roadway showed a need to be upgraded to four travel lanes, it was assumed that the entire facility would be reconstructed.

TABLE 7-1
ESTIMATED ROADWAY IMPROVEMENT COSTS BY MAJOR JURISDICTION

Jurisdiction	Needed Lane Miles	Estimated Improvement Cost
Navajo County	137	$ 174 million
Apache County	70	$ 89 million
ADOT	131	$ 226 million
Municipalities	103	$ 131 million
Total	441	$ 620 million

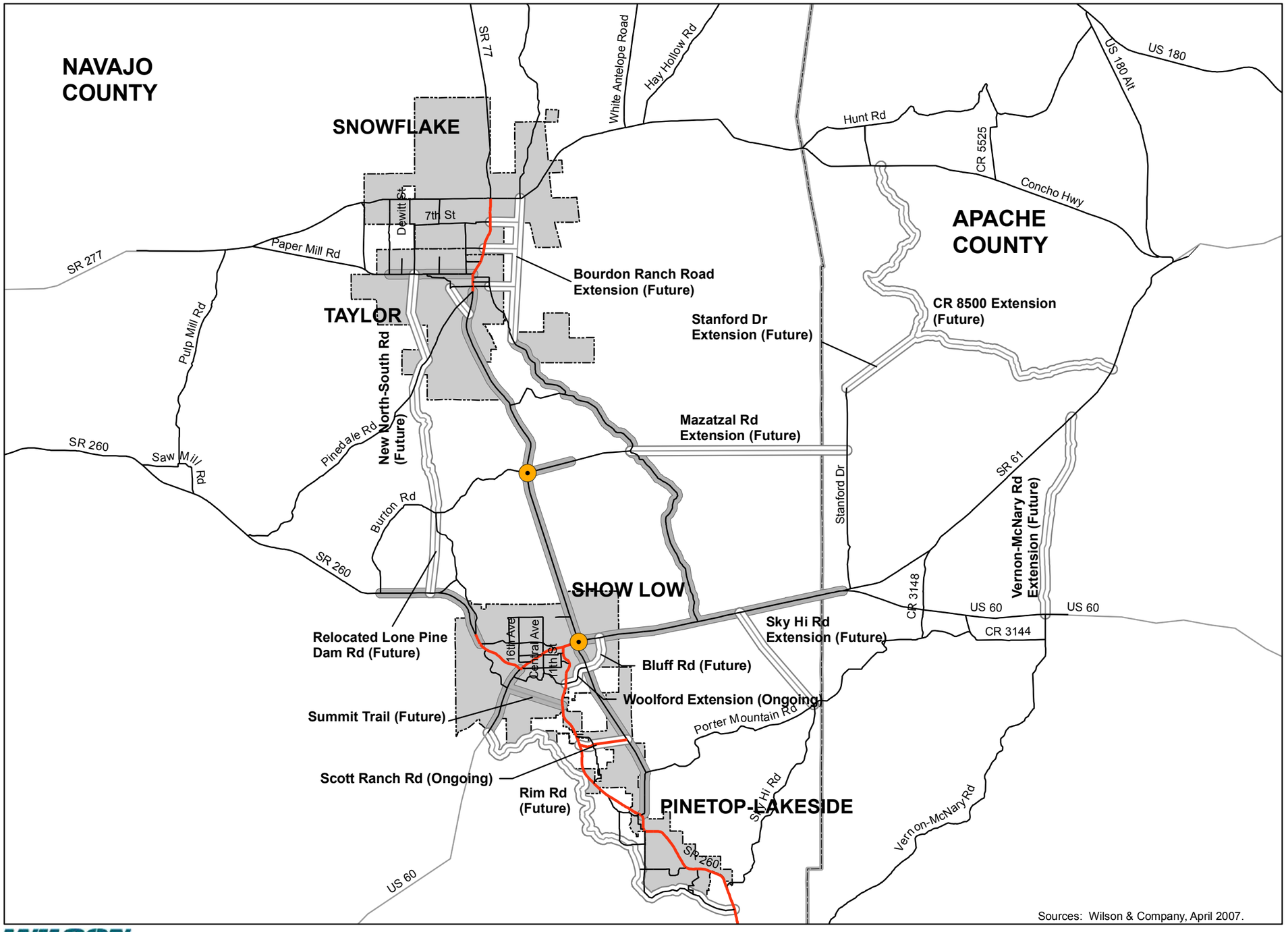
Source: Wilson & Company, May 2007.

7.4 TRANSPORTATION REVENUE OUTLOOK

Existing and potential revenues available for funding recommended transportation improvements within the Study Area are outlined below:

- Highway User Revenue Fund (HURF). This is the principal source of funding for roadway construction and maintenance in Arizona. HURF revenues come from a variety of sources including state motor fuel taxes, motor carrier taxes, vehicle registration fees and a portion of

Navajo/Apache County Study Area Overview



YEAR 2030 ROADWAY IMPROVEMENT PLAN

Existing Roadway Network
- 2 Lanes
- 4 Lanes

Future Network Improvement
- 2 Lanes
- 4 Lanes
- New Traffic Interchange

Base Map Features
- Cities/Towns

N

Not to Scale

FIGURE 7-2

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Southern Navajo/Apache County Sub-Regional Transportation Plan

TABLE 7-2
PROJECT COST DETAIL: YEAR 2030 ROADWAY IMPROVEMENT PLAN

Street Name	From	To	Length	Number of Travel Lanes		Improvement Cost Estimate (2006 $)	Recommended Priority
				Existing	Future		
Navajo County							
North-South Facilities							
Western North-South Bypass	Pinedale Rd	Paper Mill Rd	3.50	0	2	$ 8,890,000	Long Range
Forest Rd 133	Lone Pine Dam Rd	Pinedale Rd	5.50	0	2	$ 13,970,000	Long Range
Lone Pine Dam Rd	SR 260 (Clark Rd)	Forest Rd 133	3.20	0	2	$ 8,128,000	Long Range
Bourdon Ranch Rd	US 60 (Deuce of Clubs)	Silver Lake Blvd	8.20	2	4	$ 41,656,000	Long Range
Bourdon Ranch Rd	Silver Lake Blvd	Bourdon Ranch Rd Extension	7.00	2	4	$ 35,560,000	Long Range
Bourdon Ranch Rd Extension	Bourdon Ranch Rd	Concho Hwy	5.60	0	2	$ 14,224,000	Long Range
Porter Mountain Rd	SR 260 (White Mountain Rd)	Penrod Rd	0.90	2	4	$ 4,572,000	Long Range
Sky Hi Rd Extension	Porter Mountain Rd	US 60	4.50	0	2	$ 11,430,000	Long Range
East-West Facilities							
White Mountain Lake Rd	SR 77	Silver Creek Dr	3.25	2	4	$ 16,510,000	Long Range
Mazatzal Rd Extension	Bourdon Ranch Rd	Apache County Line	7.60	0	2	$ 19,304,000	Long Range
					Total Estimated Improvement Need	$ 174,244,000	
Apache County							
North-South Facilities							
Vernon-McNary Rd Extension	US 60	SR 61	8.20	0	2	$ 20,828,000	Long Range
East-West Facilities							
Mazatzal Rd Extension	Navajo/Apache County Line	Stanford Rd	1.00	0	2	$ 2,540,000	Long Range
CR 8500	Stanford Rd	SR 61	16.00	0	2	$ 40,640,000	Long Range
CR 8500	New East-West Rd	Concho Hwy	10.00	0	2	$ 25,400,000	Long Range
					Total Estimated Improvement Need	$ 89,408,000	
State of Arizona Department of Transportation (ADOT)							
North-South Facilities							
SR 77	Deuce of Clubs (US 60)	White Mountain Lake Rd	8.00	2	4	$ 40,640,000	Mid Range
SR 77	White Mountain Lakes Rd	Pinedale Rd	7.00	2	4	$ 35,560,000	Long Range
East-West Facilities							
SR 260 (Clark Rd)	Burton Rd	Old Linden Rd	5.00	2	4	$ 25,400,000	Long Range
US 60 (Deuce of Clubs)	Rim Rd	Clark Rd (SR 260)	1.96	2	4	$ 9,956,800	Long Range
US 60 (Deuce of Clubs)	SR 77	Bourdon Ranch Rd	4.80	2	4	$ 24,384,000	Mid Range
US 60	Bourdon Ranch Rd	SR 61	5.90	2	4	$ 29,972,000	Long Range
New Traffic Interchanges							
US 60 (Deuce of Clubs) at SR 77						$ 30,000,000	Long Range
SR 77 at Silver Lake Blvd						$ 30,000,000	Long Range
					Total Estimated Improvement Need	$ 225,912,800	

TABLE 7-2
PROJECT COST DETAIL: YEAR 2030 ROADWAY IMPROVEMENT PLAN (CONTINUED)

Street Name	From	To	Length	Number of Travel Lanes		Improvement Cost Estimate (2006 $)	Recommended Priority
				Existing	Future		
Pinetop-Lakeside							
Porter Mountain Rd	SR 260 (White Mountain Rd)	Penrod Rd	1.75	2	4	$ 8,890,000	Mid Range
Penrod Rd	Porter Mountain Rd	Show Low City Limits	1.50	2	4	$ 7,620,000	Mid Range
Rim Rd	SR 260 (White Mountain Rd)	Show Low City Limits	11.40	0	2	$ 28,956,000	Long Range
					Total Estimated Improvement Need	$ 45,466,000	
Show Low							
Woolford Extension	SR 260 (White Mountain Rd)	Penrod Rd	1.22	0	2	$ 3,098,800	Short Range
Summit Way	US 60 (Deuce of Clubs)	SR 260 (White Mountain Rd)	2.30	0	4	$ 11,684,000	Long Range
Scott Ranch Rd	SR 260 (White Mountain Rd)	Penrod Rd	1.94	0	2	$ 4,927,600	Short Range
Penrod Rd	Pinetop-Lakeside City Limits	US 60 (Deuce of Clubs)	4.60	2	4	$ 23,368,000	Mid Range
Rim Rd	Pinetop-Lakeside City Limits	US 60	5.00	0	2	$ 12,700,000	Long Range
					Total Estimated Improvement Need	$ 55,778,400	
Taylor							
Willow Ln (or Center St) Extension	Bourdon Ranch Rd	Bourdon Ranch Rd Extension	1.00	0	2	$ 2,540,000	Long Range
Paper Mill Rd	Freeman Hollow Rd	SR 77	3.33	2	4	$ 16,916,400	Long Range
Airport Rd	Willow Ln	SR 77	1.30	0	2	$ 3,302,000	Long Range
					Total Estimated Improvement Need	$ 22,758,400	
Snowflake							
7th St	SR 77	Bourdon Ranch Rd Extension	1.14	0	2	$ 2,895,600	Long Range
Hatch/Rodeo Dr	SR 77	Bourdon Ranch Rd Extension	1.33	0	2	$ 3,378,200	Long Range
					Total Estimated Improvement Need	$ 6,273,800	
					Total Sub-Region Estimated Improvement Need	$ 619,841,400	

Source: Wilson & Company, May 2007.

vehicle license taxes. These funds are distributed by formula to every city and county in the State and to ADOT. The State Constitution earmarks HURF funds exclusively for street and highway purposes.

- Local Transportation Assistance Fund (LTAF). The LTAF provides State Lottery proceeds to cities and towns for transportation improvements. LTAF funds are allocated using a population-based formula.
- Federal Highway Funds. Federal Highway Funds are apportioned in accordance with the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU) enacted by Congress in 2005.
- Developer Impact Fees. Navajo County has initiated the process to establish a development impact fee to help fund roadway infrastructure needed to accommodate growing travel demand. The Town of Pinetop-Lakeside has a development impact fee ordinance in place. The City of Show Low and Town of Snowflake are considering a development impact fee for transportation.
- Half-Cent Sales Tax. Another funding alternative is a half-cent sales tax dedicated to transportation improvements. It is authorized in Arizona Revised Statute 42-1484: *County Transportation Excise Tax for Roads; Counties with Population of Four Hundred Thousand or Fewer Persons.* This revenue stream could have a significant role in funding the transportation improvements identified in this study.

7.5 IMPLEMENTATION ACTION ITEMS

The principal action items required to support implementation of key elements of the Sub-Regional Transportation Plan include on-going stakeholder coordination, maintaining a current database of traffic information, conducting key corridor studies, participation in regional planning efforts, and periodically updating this transportation study. The following section elaborates on these implementation action items.

7.5.1 STAKEHOLDER COORDINATION

An important part of the long-term Year 2030 Roadway Improvement Plan is continued coordination between the counties, municipalities, and the State. The White Mountain Regional Transportation Committee is an effective forum for coordinating timely improvements to the State Highway System to ensure regional mobility as growth occurs.

7.5.2 CORRIDOR STUDIES

Protection of right-of-way is essential to maintaining the integrity of the planned high-capacity regional and sub-regional roadways identified in this long-range transportation plan. Corridor studies typically identify the required right-of-way, intersection configuration, bridge and other drainage needs, and potential environmental concerns. It is recommended that study participants, in partnership with key stakeholders, undertake detailed planning and engineering studies to define and evaluate the following corridors:

- SR 77 – between US 60 and White Mountain Lake Road;
- US 60 – between SR 77 and Bourdon Ranch Road;
- Summit Trail – between US 60 and White Mountain Rd (SR 260);
- Rim Road – between US 60 southwest of Show Low and SR 260 south of Pinetop-Lakeside;
- New North-South corridor – including a relocated Lone Pine Dam Road, Forest Road 133, and Pinedale Road;

- Bourdon Ranch Road Extension – between Bourdon Ranch Road and Concho Highway;
- Scott Ranch Road – between SR-260 to Penrod Road, proximate to the Pinetop-Lakeside and Show Low boundary; and
- Sky Hi Road Extension – between US 60 and Porter Mountain Road on Apache Railroad right-of-way.

These studies will provide essential tools for facilitating coordination between adjacent jurisdictions, the counties, ADOT, and the development community to maintain the integrity of future transportation corridors.

7.5.3 ROADWAY SAFETY REVIEW

Study participants should conduct periodic reviews of roadway accident data to identify safety trends.

7.5.4 TRAFFIC DATA COLLECTION

Permanent traffic count stations should be established at strategic locations to collect data on the daily, weekly, and annual variations in traffic volumes. Data from permanent count stations would be a valuable resource to engineers and planners establishing transportation infrastructure needs. Study participants should continue updates of roadway and traffic conditions through periodic roadway inventories and/or an annual system-wide traffic count program.

7.5.5 HOUSEHOLD TRAVEL SURVEY

Study participants should undertake a regional household travel survey to provide a reliable foundation of travel data to support more accurate travel demand forecasts. This household travel survey would seek to measure sub-regional trip-making characteristics. It would facilitate collection of data on trip generation, trip length, and modal choice for both the permanent and seasonal Study Area population. These data would enable future studies to establish peak season travel demand forecasts. Public transit service will have an important role in the future mobility solution of the Study Area; data from a travel survey would facilitate analysis of mode choice.

7.5.6 MONITOR AND UPDATE TRAVEL DEMAND MODEL AND TRANSPORTATION PLAN

Study participants should maintain current DU and employment databases to support periodic updates of the Southern Navajo/Apache County Travel Demand Model and guide prioritization of roadway improvement projects. Significant changes in development patterns should trigger an update of the travel demand forecasts for the Study Area. At a minimum, a major review of this transportation plan should be undertaken every five years.

8.0 POLICIES AND GUIDELINES

The principal policies and guidelines needed to implement the recommendations of this Sub-Regional Transportation Plan are (1) roadway functional classification, as this guides decisions regarding the type and character of facilities to be developed, and (2) roadway cross-sections, as these guide planners and decisionmakers regarding the necessary protection of rights-of-way to assure facilities can be developed when needed.

8.1 ROADWAY FUNCTIONAL CLASSIFICATION

The Future Roadway Functional Classification Plan (as discussed in the previous chapter) classifies roadways according to specific design and traffic characteristics. Functional classification categorizes roads by how they perform in regard to providing mobility and access. The full functional classification definitions defined below should be treated as policy guidance for understanding, defining, and developing the Study Area's future roadway network in conjunction with the Future Roadway Functional Classification Plan.

- Principal Arterial: This facility serves regional circulation needs. It moves traffic at moderate speeds, while providing limited access to adjacent land. Access is controlled through raised medians and through spacing and location of driveways and intersections. In the Study Area, a Principal Arterial is a two- or four-lane State highway.
- Minor Arterial: The primary purpose of the Minor Arterial is to serve regional/sub-regional traffic circulation needs by moving traffic at moderate speeds, while providing limited access to adjacent land. Typically, a Minor Arterial generally is a four-lane highway, although this facility also can be a two-lane roadway.
- Major Collector: This facility serves shorter trips within the Study Area, generally less than three miles. A Major Collector primarily functions to collect and distribute traffic between key traffic generators, local streets, and arterial streets. Major Collectors facilitate direct access to fronting properties.
- Minor Collector: Minor Collectors serve shorter trips than a Major Collector, generally less than one mile. They provide direct access to fronting properties and collect and distribute traffic between key traffic generators, local streets, and arterial streets.

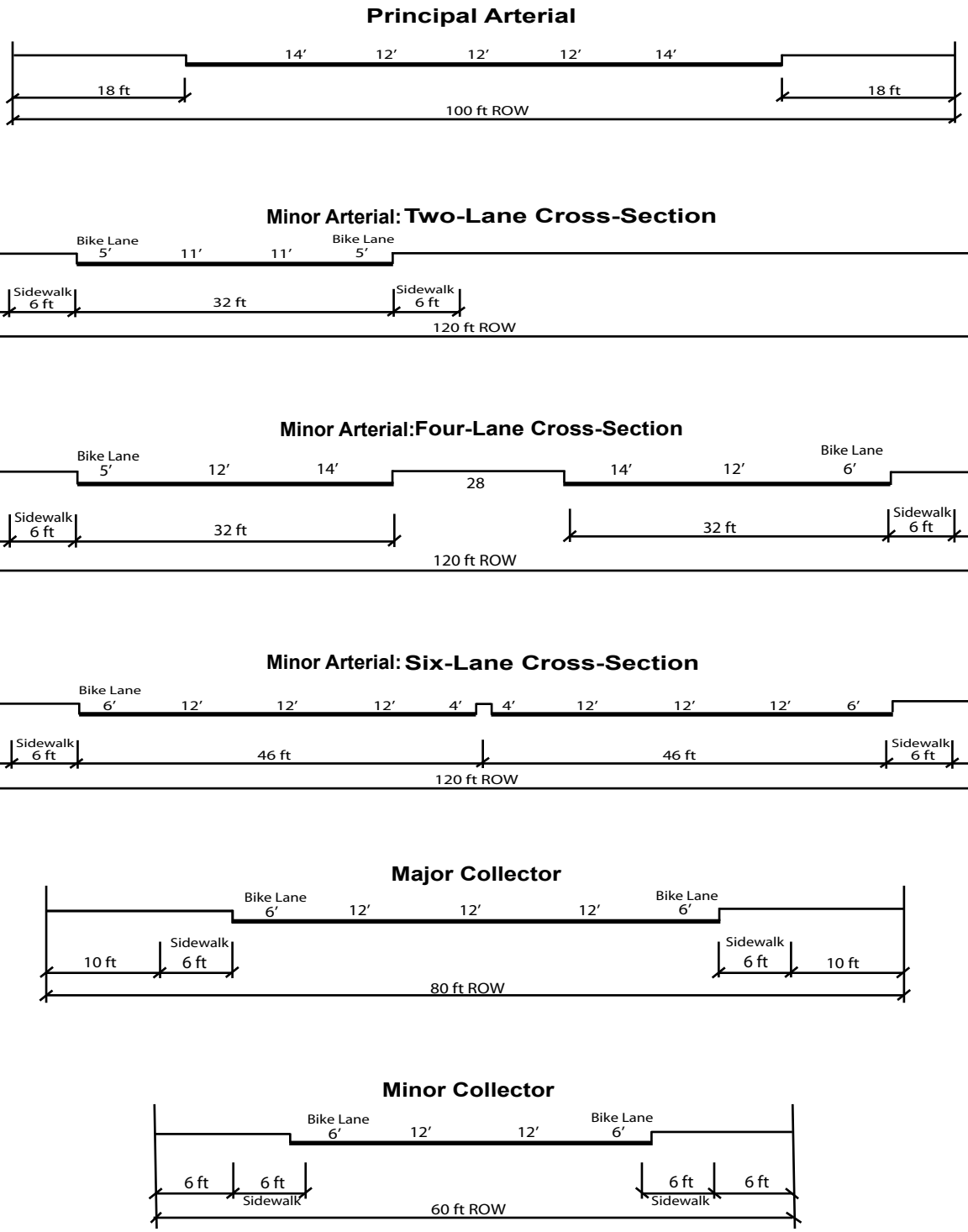
8.2 ROADWAY CROSS-SECTIONS

Roadway cross-sections for the functional classes of highways were adopted for this Sub-Regional Transportation Plan from the *2002 City of Show Low Major Streets and Routes Plan.* Specific descriptions of roadway cross-sections by functional classification are presented below. Figure 8-1 shows the physical design and dimensions of each cross-section.

8.2.1 PRINCIPAL ARTERIAL

CROSS-SECTION DESIGN

A Principal Arterial cross-section, as shown in Figure 8-1, is constructed within 100 feet of right-of-way. In urban areas, there typically are four travel lanes (two in each direction) and a 12-foot median that could be



SOURCE: 2002 City of Show Low Streets and Routes Plan

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FIGURE 8-1
TYPICAL ROADWAY CROSS-SECTIONS

either a raised median or a continuous center two-way left-turn lane. The two outside lanes are 14 feet in width, measured to the face of curb. In rural areas, there typically are two 12-foot travel lanes with a paved shoulder.

ACCESS MANAGEMENT

Access to Principal Arterials generally is limited to intersecting arterials and collectors. Access to/from fronting properties generally is not allowed. On-street parking is not allowed; however, the cross-section will accommodate emergency stopping.

8.2.2 MINOR ARTERIAL

CROSS-SECTION DESIGN

A Minor Arterial cross-section, shown in Figure 8-1, has two or four directional travel lanes constructed within 120 feet of right-of-way. Travel lanes are divided by either a continuous center two-way left-turn lane or a raised median. Bike lanes and sidewalks are included in the cross-section of the Minor Arterial. An optional six-lane cross-section is shown in Figure 8-1 should study participants decide in the future to utilize the full right-of-way set aside for this functional class of roadway.

ACCESS MANAGEMENT

Access to Minor Arterial streets is limited to intersections with Major Collectors at quarter-mile spacing and driveways of major developments, such as large commercial, industrial, or office complexes, or master-planned communities. On-street parking is not allowed.

8.2.3 MAJOR COLLECTOR

CROSS-SECTION DESIGN

A Major Collector has two directional travel lanes constructed within 80 feet of right-of-way. As shown in Figure 8-1, opposing travel directions are separated by a continuous center two-way, left-turn lane or a raised median. Bike lanes are included in the cross-section.

ACCESS MANAGEMENT

Access to Major Collector streets is limited to intersections at eighth-mile spacing and driveways to developments on fronting properties. All vehicles entering the traffic stream must be driving forward; no backing into traffic is allowed. On-street parking is not allowed.

8.2.4 MINOR COLLECTOR

CROSS-SECTION DESIGN

The Minor Collector cross-section, as shown in Figure 8-1, includes two directional travel lanes constructed within 60 feet of right-of-way. The 36-foot roadway consists of one12-foot travel lane and one 6-foot bike lane in each direction.

ACCESS MANAGEMENT

Access to Minor Collector streets should be restricted except for large contiguous lots.

8.3 INTERSECTION FLARE

The right-of-way width for roadway cross-sections must expand at intersections to accommodate left-turn and right-turn lanes. Therefore, additional right-of-way, measuring 20 feet by 150 feet, should be protected and procured for each approach at the following intersections: Principal Arterial/Principal Arterial; Principal Arterial/Minor Arterial; and Major Collector/Principal or Minor Arterial. Table 8-1 presents a summary of the roadway width, right-of-way width, and number of lanes for the four functional classifications outlined above.

TABLE 8-1
ROADWAY DESIGN CRITERIA BY FUNCTIONAL CLASSIFICATION

Classification	Roadway Width	Right-of-Way Width	Number of Lanes	Center Lane or Median	Bike Lanes	Sidewalks
Principal Arterial	64 feet	100 feet	4	Yes	No	No
Minor Arterial	32 to 92 feet	120 feet	2 to 4	Yes	Yes	Yes
Major Collector	48 feet	80 feet	2	Yes	Yes	Yes
Minor Collector	36 feet	60 feet	2	No	Yes	Yes

Source: City of Show Low Major Streets and Routes Plan, Olsson Associates, 2002; Wilson & Company, July 2007

APPENDIX A
FLORIDA DEPARTMENT OF TRANSPORTATION
2002 QUALITY/LEVEL OF SERVICE MANUAL TABLES

APPENDIX B
YEAR 2006 POPULATION AND EMPLOYMENT ESTIMATES BY COMMUNITY

TABLE B-1
YEAR 2006 POPULATION AND EMPLOYMENT ESTIMATES BY TRAFFIC ANALYSIS ZONE

TAZ	Dwelling Units	Households	Population	Employment Sector				
				Retail	Office	General	Government	Total
1	109	82	196	0	0	0	0	0
2	189	96	223	0	0	0	0	0
3	213	167	431	3	3	9	0	15
4	134	107	290	0	0	4	0	4
5	76	62	213	49	21	2	0	72
6	155	140	567	299	63	58	0	420
7	6	4	11	0	0	0	0	0
8	23	15	38	0	0	0	0	0
9	15	10	27	0	0	0	0	0
10	98	49	120	0	0	0	0	0
11	13	8	22	0	0	0	0	0
12	30	24	59	0	0	0	0	0
13	245	176	452	0	9	3	0	12
14	120	76	210	0	0	0	0	0
15	0	0	0	0	0	0	0	0
16	36	26	58	5	0	0	0	5
17	358	315	956	177	215	263	109	770
18	29	44	87	0	0	0	0	0
19	217	149	456	17	17	0	0	34
20	17	17	75	0	0	0	0	0
21	0	0	0	0	0	0	0	0
22	229	218	769	62	94	9	0	165
23	6	6	16	0	0	0	0	0
24	0	0	0	0	0	0	0	0
25	68	59	209	0	1	20	0	21
26	0	0	0	0	0	0	0	0
27	441	392	1353	105	205	25	7	342
28	129	125	462	0	4	0	0	4
29	125	43	82	0	0	0	0	0
30	49	47	170	0	0	0	0	0
31	25	23	78	0	0	0	0	0
32	16	16	44	83	8	3	0	94
33	361	252	658	0	0	0	0	0
34	11	8	22	0	0	0	0	0
35	278	254	860	190	135	35	39	399
36	0	0	0	79	58	66	0	203
37	132	116	296	91	12	14	0	117
38	44	30	64	0	1	3	0	4
39	56	51	166	2	20	0	0	22
40	309	272	838	0	1	0	0	1

TABLE B-1
YEAR 2006 POPULATION AND EMPLOYMENT ESTIMATES BY TRAFFIC ANALYSIS ZONE (CONTINUED)

TAZ	Dwelling Units	Households	Population	Employment				
				Retail	Office	General	Government	Total
41	165	144	477	0	4	3	0	7
42	49	38	128	0	0	0	0	0
43	113	72	207	0	0	0	0	0
44	31	30	96	5	0	2	0	7
45	50	41	120	0	1	3	0	4
46	1158	560	1309	0	0	0	0	0
47	132	96	251	0	0	0	0	0
48	33	32	107	0	0	0	0	0
49	39	30	99	0	0	0	0	0
50	52	46	177	0	0	0	0	0
51	528	281	652	16	37	25	0	78
52	89	40	108	0	0	0	0	0
53	107	76	183	0	3	0	0	3
54	33			3	0	1	0	4
55	285	72	161	3	11	1	0	15
56	361	260	696	1	10	0	0	11
57	399	213	502	0	0	0	0	0
58	156	133	450	1	5	13	0	19
59	154	130	375	12	35	54	3	104
60	53	30	99	4	0	0	0	4
61	275	144	357	0	2	0	0	2
62	112	44	126	0	0	0	0	0
63	0			54	3	0	3	60
64	116	74	172	2	10	7	0	19
65	779	555	1402	0	20	18	0	38
66	49	8	22	0	0	0	0	0
67	110	59	174	0	0	0	0	0
68	24	9	25	0	0	0	0	0
69	102	53	140	0	0	0	0	0
70	155	146	498	3	163	0	0	166
71	50	46	146	25	23	3	0	51
72	262	103	298	9	58	4	62	133
73	1	1	3	52	45	24	0	121
74	43	39	105	99	182	58	13	352
75	14	13	44	127	106	10	0	243
76	70	44	93	15	5	8	0	28
77	573	479	1359	43	27	53	205	328
78	98	88	203	288	286	32	233	839
79	799	483	1266	5	82	24	0	111
80	271	196	454	128	41	32	0	201

TABLE B-1
YEAR 2006 POPULATION AND EMPLOYMENT ESTIMATES BY TRAFFIC ANALYSIS ZONE (CONTINUED)

TAZ	Dwelling Units	Households	Population	Employment				
				Retail	Office	General	Government	Total
81	45	44	126	65	72	2	0	139
82	280	157	395	154	63	0	0	217
83	351	302	887	13	101	19	18	151
84	131	124	381	86	241	15	1	343
85	822	570	1468	1	113	20	0	134
86	206	132	323	0	0	0	0	0
87	125	111	312	9	58	1	0	68
88	216	174	424	0	26	3	0	29
89	18	7	19	0	0	0	0	0
90	4	4	11	31	57	132	54	274
91	1048	485	1030	0	0	0	0	0
92	133	133	364	5	19	111	0	135
93	48	39	106	84	46	3	5	138
94	358	148	354	48	20	2	0	70
95	485	217	654	295	1384	84	4	1767
96	554	252	626	3	168	0	0	171
97	14	11	30	754	113	0	0	867
98	701	356	934	193	229	101	19	542
99	122	61	160	0	0	0	0	0
100	294	122	327	0	6	14	0	20
101	297	249	703	65	33	9	0	107
102	484	294	792	44	216	15	89	364
103	51	28	61	25	33	8	0	66
104	176	45	121	0	2	15	11	28
105	482	289	804	96	462	23	0	581
106	292	124	327	54	88	27	0	169
107	4	3	8	0	0	0	0	0
108	989	539	1468	27	14	20	0	61
109	101	79	171	76	117	23	0	216
110	1032	494	1239	1	48	20	190	259
111	497	298	117	240	189	87	0	516
112	697	353	893	380	478	45	99	1002
113	223	134	333	5	4	4	0	13
114	494	257	628	90	76	11	0	177
115	954	200	442	111	523	3	63	700
116	3004	739	1797	0	114	28	26	168
117	1005	603	1538	0	0	0	0	0
118	193	116	296	0	0	0	0	0
119	0	0	0	0	0	0	0	0
120	0	0	0	0	0	0	0	0

Source: Wilson & Company, 2006.

APPENDIX C
YEAR 2006 TRAFFIC COUNT DATA BY COMMUNITY

APPENDIX D
MODEL VALIDATION SUMMARY

TABLE D-1
MODEL CALIBRATION PARAMETERS

Average Annual Daily Traffic	FHWA Desirable Percent Deviation
<1,000	60
1,000-2,500	47
2,500-5,000	36
5,000-10,000	29
10,000-25,000	25
25,000-50,000	22
>50,000	21

Source: Model Validation and Reasonableness Checking Manual, FHWA, February 1997.

TABLE D-2
YEAR 2006 INDIVIDUAL LINK MODEL VOLUME/TRAFFIC COUNT VALIDATION SUMMARY

Facility	From	To	2006 Traffic Count	Model Volume Estimate	Acceptable Model Deviation	Actual Model Deviation	Meets FHWA Target?
State Facilities							
SR 260	Pinedale Road	Burton Road	4,390	4,300	36%	2%	Yes
SR 260	Old Linden Road	US 60	10,500	14,200	25%	35%	**No**
SR 260	Show Low Lake Rd	Woolford Rd	21,800	23,800	25%	9%	Yes
SR 260	Woodland Lake Rd	Woodland Rd	23,000	18,100	25%	21%	Yes
US 60	Rim Road	SR 260	3,040	4,350	36%	43%	**No**
US 60	SR 260	SR 73	20,200	20,200	25%	0%	Yes
US 60	SR 73	SR 77	21,600	21,000	25%	3%	Yes
US 60	SR 77	Bourdon Ranch Rd	9,200	11,800	29%	28%	Yes
US 60	Bourdon Ranch Rd	SR 61	5,600	8,400	29%	50%	**No**
US 60	SR 61	Vernon-McNary Rd	3,900	3,700	36%	5%	Yes
SR 61	US 60	CR 3148	2,600	2,900	36%	12%	Yes
SR 180	US 60	US 180	2,480	2,100	47%	15%	Yes
SR 77	US 60	Silver Lake Blvd	11,600	10,800	25%	7%	Yes
SR 77	Silver Lake Blvd	Pinedale Rd	10,470	8,800	25%	16%	Yes
SR 77	Paper Mill Rd	SR 277	11,100	11,500	25%	4%	Yes
SR 277	Paper Mill Rd	SR 77	1,200	1,600	47%	33%	Yes
SR 277	Clay Springs Rd	Paper Mill Rd	2,600	2,500	36%	4%	Yes
County Facilities							
Bourdon Ranch Rd	North of US 60		2,400	2,800	47%	17%	Yes
Bourdon Ranch Rd	South of Silver Lake Blvd		400	354	60%	12%	Yes
Bourdon Ranch Rd	North of Silver Lake Blvd		500	400	60%	20%	Yes
Bourdon Ranch Rd	South of Willow Lane		1,400	1,000	47%	29%	Yes

TABLE D-2
YEAR 2006 INDIVIDUAL LINK MODEL VOLUME/TRAFFIC COUNT VALIDATION SUMMARY (CONTINUED)

Facility	From	To	2006 Traffic Count	Model Volume Estimate	Acceptable Deviation	Percent Deviation	Meets FHWA Target?
County Facilities (Cont'd)							
Lone Pine Dam Rd	West of SR 77		790	260	60%	67%	**No**
Pinedale Rd	North of SR 260		108	60	60%	44%	Yes
Pulp Mill Rd	North of Saw Mill Rd		590	760	60%	29%	Yes
Porter Mountain Rd	Penrod Rd	Sky Hi Rd	1,600	1,400	47%	13%	Yes
Silver Lake Blvd	SR 77	Bourdon Ranch Rd	1,200	2,000	47%	67%	**No**
Concho Highway	Old Woodruff Rd	White Antelope Rd	3,500	3,600	36%	3%	Yes
Show Low							
Old Linden Rd	16th Ave	Central Ave	3,800	4,600	36%	21%	Yes
Penrod Rd	Porter Mountain Rd	US 60	4,700	7,500	36%	60%	**No**
Woolford St	Central Ave	SR 73	8,400	8,900	29%	6%	Yes
Sierra Pines Trl	US 60	Central Ave	620	380	60%	39%	Yes
Pinetop-Lakeside							
Woodland Rd	South of SR 73		9,000	8,250	29%	8%	Yes
Taylor							
Paper Mill Rd	West of SR 77		4,500	5,400	36%	20%	Yes
Paper Mill Rd	Malapai/Freeman Hollow Rd	Freeman Hollow Rd	1,100	1,560	47%	42%	Yes

Source: Wilson & Company, May 2007.

APPENDIX E
COMMUNITY POPULATION AND EMPLOYMENT PROJECTIONS: 2015 & 2030

TABLE E-1
YEAR 2015 AND YEAR 2030 POPULATION AND EMPLOYMENT PROJECTIONS BY TRAFFIC ANALYSIS ZONE

TAZ	Year 2015								Year 2030							
	Dwelling Units	House-holds	Popul-ation	Employment					Dwelling Units	House-holds	Popul-ation	Employment				
				Retail	Office	General	Govern-ment	Total				Retail	Office	General	Govern-ment	Total
1	109	82	196	2	2	1	1	6	109	82	196	6	9	2	2	19
2	189	96	223	2	3	1	1	7	189	96	223	7	10	2	2	21
3	213	167	431	4	4	11	0	19	213	167	431	8	8	23	0	39
4	134	107	290	0	0	10	0	10	134	107	290	0	0	25	0	25
5	262	215	738	97	42	4	0	143	1884	1548	5315	242	104	10	0	356
6	186	168	681	330	70	64	0	464	186	168	681	602	127	117	0	846
7	6	4	11	0	0	0	0	0	6	4	11	0	0	0	0	0
8	23	15	38	0	0	0	0	0	23	15	38	1	1	0	0	2
9	17	11	30	1	1	0	0	2	17	11	30	2	2	1	0	5
10	196	98	240	5	7	2	2	16	462	231	566	17	25	6	4	52
11	14	9	25	1	1	0	0	2	14	9	25	2	2	1	0	5
12	103	82	202	6	8	2	2	18	749	599	1473	20	28	7	5	60
13	498	359	922	0	51	17	0	68	1263	910	2336	0	157	52	0	209
14	120	76	210	2	2	1	0	5	120	76	210	6	8	2	1	17
15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16	36	26	58	4	0	0	0	4	36	26	58	6	0	0	0	6
17	378	235	721	152	192	238	104	686	369	325	991	211	283	356	164	1014
18	151	109	280	94	86	71	0	251	1395	868	2662	313	288	237	0	838
19	436	358	1189	58	58	0	0	116	1037	851	2826	167	167	0	0	334
20	80	46	204	30	42	10	7	89	718	409	1815	99	141	33	24	297
21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22	259	247	871	98	149	14	0	261	259	247	871	224	339	33	0	597
23	141	80	219	23	34	8	6	71	1809	1031	4743	78	111	26	19	234
24	83	47	129	15	22	5	3	45	1163	663	1817	50	71	17	12	150
25	278	242	858	0	7	139	0	146	2265	1968	6981	0	22	431	0	453
26	57	32	88	10	14	3	2	29	800	456	1249	35	49	12	8	104

TABLE E-1
YEAR 2015 AND YEAR 2030 POPULATION AND EMPLOYMENT PROJECTIONS BY TRAFFIC ANALYSIS ZONE (CONTINUED)

TAZ	Year 2015								Year 2030							
	Dwelling Units	House-holds	Popul-ation	Employment					Dwelling Units	House-holds	Popul-ation	Employment				
				Retail	Office	General	Govern-ment	Total				Retail	Office	General	Govern-ment	Total
27	945	841	2903	115	226	27	8	376	2934	2611	9012	210	410	50	14	684
28	193	188	695	38	196	22	0	256	193	188	695	125	646	75	0	846
29	125	43	82	1	2	0	0	3	125	43	82	3	5	1	1	10
30	216	206	744	40	58	14	10	122	1852	1766	6375	134	191	45	32	402
31	66	60	204	7	10	2	2	21	330	300	1020	23	32	8	6	69
32	44	25	68	177	17	6	0	200	232	132	488	450	42	17	0	509
33	678	473	1235	7	10	2	2	21	1075	750	1958	25	35	8	6	74
34	54	39	107	8	11	2	2	23	494	353	777	27	38	9	6	80
35	492	450	1524	221	157	40	45	463	489	447	1514	418	298	76	85	877
36	67	38	104	122	90	102	0	314	67	38	104	274	201	229	0	704
37	132	118	390	210	27	32	0	269	132	118	390	548	72	84	0	704
38	200	135	289	0	10	29	0	39	250	1200	2566	0	30	90	0	120
39	188	173	565	9	86	0	0	95	1321	1214	3963	25	254	0	0	279
40	271	238	733	0	51	0	0	51	828	729	2245	0	168	0	0	168
41	513	447	1480	0	116	87	0	203	3320	2896	9587	0	381	285	0	666
42	49	38	128	1	2	0	0	3	49	38	128	3	4	1	1	9
43	210	133	382	4	6	2	1	13	271	172	493	13	19	4	3	39
44	38	37	118	4	0	2	0	6	38	37	118	6	0	3	0	9
45	422	345	1009	0	67	200	0	267	4693	3840	11236	0	221	662	0	883
46	1420	687	1606	7	10	2	2	21	1420	687	1606	23	32	8	6	69
47	333	243	635	11	16	4	2	33	1579	1152	3010	38	54	13	9	114
48	40	39	131	1	2	0	0	3	40	39	131	3	4	1	1	9
49	39	30	99	1	1	0	0	2	39	30	99	2	3	1	1	7
50	52	46	177	2	2	0	0	4	52	46	177	4	5	1	1	11
51	982	522	1212	28	66	44	0	138	1419	755	1753	67	156	105	0	328
52	188	84	227	6	8	2	2	18	300	258	697	19	28	6	5	58

TABLE E-1
YEAR 2015 AND YEAR 2030 POPULATION AND EMPLOYMENT PROJECTIONS BY TRAFFIC ANALYSIS ZONE (CONTINUED)

TAZ	Year 2015								Year 2030							
	Dwelling Units	House-holds	Popul-ation	Employment					Dwelling Units	House-holds	Popul-ation	Employment				
				Retail	Office	General	Govern-ment	Total				Retail	Office	General	Govern-ment	Total
53	237	169	406	0	41	0	0	41	804	573	1377	0	132	0	0	132
54	33	19	52	3	0	1	0	4	33	19	52	6	0	2	0	8
55	285	72	161	50	182	16	0	248	285	72	161	160	587	53	0	800
56	361	260	696	2	23	0	0	25	361	260	696	6	60	0	0	66
57	732	391	922	12	17	4	2	35	954	510	1203	39	55	13	9	116
58	343	291	984	4	21	54	0	79	1170	994	3360	12	60	157	0	229
59	348	293	845	37	109	167	10	323	1341	1128	3253	104	304	468	26	902
60	53	30	99	4	0	0	0	4	53	30	99	7	0	0	0	7
61	275	144	357	0	11	0	0	11	275	144	357	0	33	0	0	33
62	112	44	126	1	2	0	0	3	112	44	126	3	5	1	1	10
63	13	7	19	79	5	0	5	89	0	7	19	173	10	0	10	193
64	116	74	172	22	111	78	0	211	439	74	172	71	353	247	0	671
65	1403	999	2523	0	132	118	0	250	1462	1041	2629	0	406	365	0	771
66	49	8	22	0	0	0	0	0	49	8	26	1	1	0	0	2
67	373	201	591	32	46	11	8	97	2623	1416	4165	108	153	36	26	323
68	24	9	25	0	0	0	0	0	24	9	21	1	1	0	0	2
69	231	120	317	2	2	1	0	5	850	442	1168	5	8	2	1	16
70	343	323	1102	3	157	0	0	160	1180	1111	3791	5	251	0	0	256
71	115	105	334	40	37	5	0	82	440	403	1282	92	84	10	0	186
72	481	189	548	18	120	8	128	274	600	236	684	47	302	21	323	693
73	1	1	3	76	66	35	0	177	1	1	3	166	144	77	0	387
74	43	39	105	145	266	85	19	515	43	39	105	317	582	186	42	1127
75	14	13	44	125	104	10	0	239	14	13	44	203	170	16	0	389
76	174	110	233	59	20	32	0	111	800	504	1067	172	58	92	0	322
77	600	502	1424	43	27	53	205	328	940	502	1424	43	27	53	205	328
78	98	88	203	262	259	29	211	761	98	88	203	392	388	43	317	1140

TABLE E-1
YEAR 2015 AND YEAR 2030 POPULATION AND EMPLOYMENT PROJECTIONS BY TRAFFIC ANALYSIS ZONE (CONTINUED)

TAZ	Year 2015								Year 2030							
	Dwelling Units	House-holds	Popul-ation	Employment					Dwelling Units	House-holds	Popul-ation	Employment				
				Retail	Office	General	Govern-ment	Total				Retail	Office	General	Govern-ment	Total
79	1600	968	2538	10	157	46	0	213	3745	2265	5939	23	385	113	0	521
80	271	196	454	141	45	35	0	221	271	196	454	255	82	64	0	401
81	58	57	163	165	182	5	0	352	58	57	163	441	488	14	0	943
82	280	157	395	333	136	0	0	469	409	157	395	852	348	0	0	1200
83	466	401	1178	23	181	34	32	270	466	401	1178	56	435	82	78	651
84	271	256	787	135	378	24	2	539	305	288	886	308	860	54	4	1226
85	860	597	1537	2	191	34	0	227	860	597	1537	4	450	80	0	534
86	431	277	677	6	9	2	2	19	431	277	677	21	30	7	5	63
87	248	220	618	54	343	6	0	403	564	500	1405	163	1048	18	0	1229
88	399	321	783	0	273	31	0	304	534	430	1049	0	866	100	0	966
89	138	54	148	13	18	5	3	39	1475	574	1066	44	62	15	11	132
90	228	130	356	33	60	138	57	288	3051	1739	4782	57	104	241	99	501
91	1183	548	1164	13	18	4	3	38	595	548	1164	42	59	14	10	125
92	303	173	474	8	30	180	0	218	1110	633	1734	18	69	415	0	502
93	211	171	464	213	116	7	13	349	1792	1449	3928	568	311	20	34	933
94	668	276	660	107	44	5	0	156	970	401	959	276	114	12	0	402
95	1000	448	1350	305	1431	87	4	1827	2680	1201	3618	525	2465	150	7	3147
96	554	252	626	2	141	0	0	143	554	252	626	3	189	0	0	192
97	211	162	444	739	110	0	0	849	211	162	324	1206	181	0	0	1387
98	1310	666	1748	183	218	96	18	515	2000	1017	2669	290	344	152	28	814
99	142	71	186	2	2	1	1	6	142	71	186	7	9	2	2	20
100	551	229	614	0	10	25	0	35	878	364	976	0	25	59	0	84
101	452	378	1068	268	136	37	0	441	452	378	1068	784	398	109	0	1291
102	952	578	1556	47	233	16	96	392	2013	1221	3287	85	415	29	171	700
103	51	28	61	115	152	37	0	304	51	28	61	343	453	110	0	906
104	176	45	121	0	2	15	11	28	176	45	121	0	2	15	11	28

TABLE E-1
YEAR 2015 AND YEAR 2030 POPULATION AND EMPLOYMENT PROJECTIONS BY TRAFFIC ANALYSIS ZONE (CONTINUED)

TAZ	Year 2015								Year 2030							
	Dwelling Units	House-holds	Popul-ation	Employment					Dwelling Units	House-holds	Popul-ation	Employment				
				Retail	Office	General	Govern-ment	Total				Retail	Office	General	Govern-ment	Total
105	482	289	804	140	674	34	0	848	482	289	804	307	1478	74	0	1859
106	292	124	327	94	154	47	0	295	292	124	327	224	366	112	0	702
107	4	3	8	0	0	0	0	0	4	3	4	0	0	0	0	0
108	1517	827	2253	38	20	29	0	87	1517	827	2253	84	44	62	0	190
109	101	79	171	117	180	35	0	332	101	79	171	264	406	80	0	750
110	1100	526	1319	1	48	20	190	259	1100	526	1319	1	48	20	190	259
111	677	409	1042	333	262	121	0	716	677	409	1042	708	558	257	0	1523
112	921	467	1181	463	582	55	121	1221	921	467	1181	910	1145	108	237	2400
113	376	226	561	9	6	6	0	21	376	226	561	20	16	16	0	52
114	966	503	1229	82	69	10	0	161	2005	1043	2549	122	103	15	0	240
115	1712	358	791	135	638	3	77	853	1695	355	785	266	1255	7	151	1679
116	3004	739	1797	0	152	38	34	224	3004	739	1797	0	318	78	72	468
117	1005	978	3993	64	90	22	15	191	175	170	694	212	302	71	51	636
118	352	201	551	121	172	40	30	363	448	255	699	402	573	134	98	1207
119	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
120	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Source: Wilson & Company, May 2007.

APPENDIX F
COMMITTED-PLUS-PLANNED ROADWAY NETWORK: STUDY AREA COMMUNITIES

APPENDIX G
ALTERNATIVE 'A' ROADWAY NETWORK: STUDY AREA COMMUNITIES

APPENDIX H
2015 & 2030 PHASED ROADWAY IMPROVEMENTS: STUDY AREA COMMUNITIES

APPENDIX I
2015 & 2030 INTERSECTION LANE CONFIGURATIONS AND TRAFFIC COUNTS