KACHINA VILLAGE MULTIMODAL TRANSPORTATION STUDY FINAL REPORT

JANUARY 18, 2010

TASK ASSIGNMENT MPD 27-09
PG TD0262
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ADOT

PREPARED FOR ADOT
AND COCONINO COUNTY

Kimley-Horn
and Associates, Inc.

Kachina Village Multimodal Transportation Study

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Final Report

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Kimley-Horn
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Prepared for:
ARIZONA DEPARTMENT OF TRANSPORTATION
COCONINO COUNTY

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LIST OF EXHIBITS

1.0 INTRODUCTION

1.1 Study Purpose

Kachina Village is an unincorporated community in Coconino County, Arizona. Kachina Village is located approximately six miles south of Flagstaff, Arizona. Kachina Village includes approximately 18.3 miles of County maintained roads, all but two miles of which are paved. Generally speaking, Kachina Village roadways lack sidewalks and pedestrian connections for the community's residents. Currently, low traffic volumes allow for pedestrians to walk along the sides of the roadway. However, steep topography and discontinuity of the pedestrian network makes pedestrian travel difficult for many Kachina Village residents.

Pumphouse Natural Area.
Source: Kimley-Horn and Associates, Inc.

The Kachina Village Multimodal Transportation Study presents improvement recommendations that upon implementation will improve bicycle, pedestrian, and public transportation in the community. A program of projects for short-term (0 to 5 years), mid-term (5 to 10 years), and long-term (10 to 20 years) planning horizons was developed.

Picture of I-17 interchange looking east.
Source: Kimley-Horn and Associates, Inc.

1.2 Study Objectives

Objectives of the Kachina Village Multimodal Transportation Study were:

- Document current and identify future needs relating to pedestrian, bicycle, and transit mobility.
- Summarize current winter maintenance practices and summarize sources of pollution that may be contributing to the potential degradation of the wetlands. Recommend Best Management Practices (BMPs) for transportation maintenance crews and resource managers to limit pollutants from

entering the wetland system.

- Based upon the identified multimodal needs and deficiencies, recommend a program of projects that will improve multimodal mobility and safety conditions in Kachina Village. Provide Coconino County with a planning document that can be used to help secure funding for implementation of the multimodal improvements. The program will be organized into short-term (0 to 5 years), mid-term (5 to 10 years), and long-term (10 to 20 years) projects.

The study resulted in developing two working papers, a public involvement summary report, a final report, and an executive summary.

1.3 Working Paper No. 1 – Current and Future Conditions

Working Paper No. 1 – Current and Future Condition documented current conditions in Kachina Village that influence the community's multimodal transportation system. The review of existing conditions leads to identification of multimodal transportation opportunities and constraints and to the development of a program of projects (*Working Paper No. 2*), that upon implementation will enhance multimodal transportation in Kachina Village.

1.4 Working Paper No. 2 – Program of Projects

Working Paper No. 2 – Program of Projects, proposes a program of projects that address multimodal safety and mobility needs and environmental degradation concerns. Potential funding sources are identified. The proposed projects, upon implementation, will improve safety and mobility between residential areas of Kachina Village, community facilities, and potential future transit facilities. *Working Paper No. 2 – Program of Projects* also includes Environmental Best Management Practices recommendations to minimize the impact of winter roadway maintenance on wetland areas.

The proposed projects are prioritized based on their potential to improve safety and mobility, community perspectives, and cost/funding. The projects are categorized as near-term (0 – 5 years), mid-term (5 – 10 years), and long-term (10 – 20 years) planning horizons.

1.5 Public Involvement Summary Reports

A Public Involvement Summary Report was developed that summarizes public involvement received during two open houses that were held in May and September 2009. The Public Involvement Summary Report is available under separate cover.

1.6 Study Area

The study area is comprised of the unincorporated community of Kachina Village, which is located south of Flagstaff, Arizona, west of Interstate 17 (I-17). The study area is bordered by the Kachina Village Improvement District (KVID) wetlands to the north, Coconino National Forest to the south, I-17 to the east, and the Forest Highlands residential community to the west. The study area is illustrated in **Exhibit 1-1.**

1.7 Technical Advisory Committee

A Technical Advisory Committee (TAC) was established to participate in the study process. The following agencies were represented on the TAC:

- Arizona Department of Transportation, Multimodal Planning Division
- Arizona Department of Transportation, Communication and Community Partnerships
- Arizona Department of Transportation, Office of Environmental Services
- Coconino County Community Development
- Coconino County Parks and Recreation
- Coconino County Public Works
- Flagstaff Metropolitan Planning Organization (FMPO)
- Northern Arizona Intergovernmental Public Transit Authority (NAIPTA)

TAC Meetings were held at key milestones and/or decision points during the study. The purpose of the meetings was to communicate study progress, provide opportunities for discussion, and present study documents for review and comment.

1.8 Final Report Organization

This report documents findings and recommendations of the Kachina Village Multimodal Transportation Study, as organized into the following chapters:

Chapter 1 – Introduction

Chapter 2 – Current Study Area Conditions

Chapter 3 – Winter Maintenance Best Management Practices

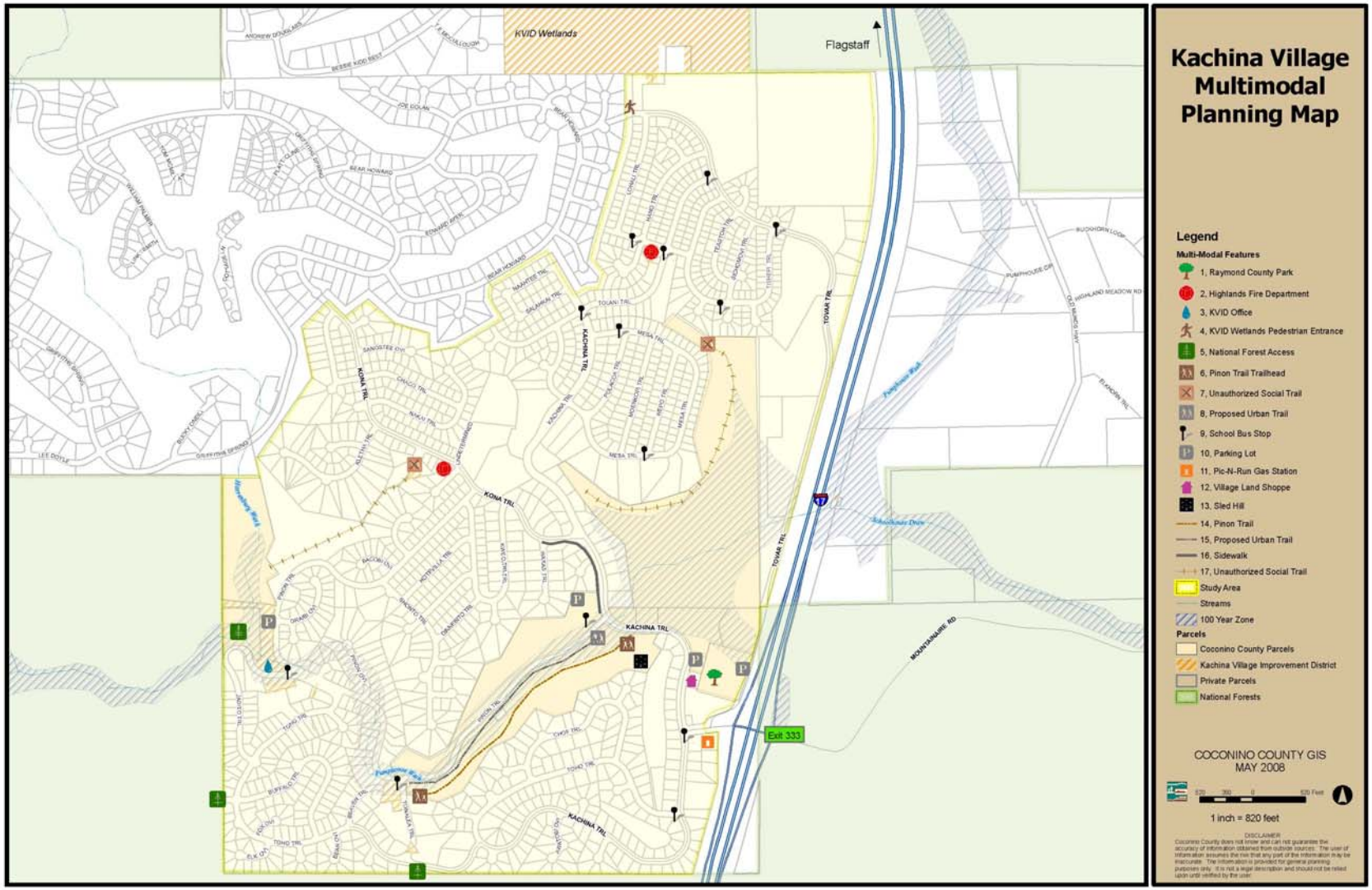
Chapter 4 – Summary of Multimodal Needs

Chapter 5 – Program of Projects

Chapter 6 – Potential Funding Sources

Chapter 7 – Summary of Conclusions

Exhibit 1-1 – Study Area



2.0 CURRENT STUDY AREA CONDITIONS

2.1 Land Use Patterns and Ownership

The *Kachina Village Area Plan*, 2008, describes existing land use patterns in Kachina Village. The Plan states that existing land use patterns in Kachina Village were primarily established as a result of subdivision activity between 1965 and 1972, when zoning classifications were established by the Board of Supervisors as each subdivision unit was approved. As a result, Kachina Village consists of a mix of land uses that includes residential, commercial, open space, and public facilities. Currently, the population of Kachina Village is approximately three thousand residents.

Residential Land Uses

Residential land uses reflect the diversity of the community and include rental units, owner-occupied primary dwellings, and part-time vacation homes (*Kachina Village Area Plan, 2008*).

Residential uses fall into several categories in Kachina Village, including agricultural residential, rural residential, single family residential, multiple family, and manufactured homes. The quality and style of the housing varies throughout the community, and ranges from cabins and mobile homes originally intended for part-time vacation use to homes designed as full-time residences. As the community has evolved over time, many of the older cabins that were originally built for weekend or summer occupancy have been converted to full-time use and upgraded accordingly. Many of the older mobile homes have been replaced with new manufactured or modular homes (*Kachina Village Area Plan, 2008*).

Most of the single family residential lots are located in the southern and western portions of Kachina Village. These single family zoned areas have a typical density of four to six dwelling units per acre (*Kachina Village Area Plan, 2008, Coconino County Zoning and Land Use Maps).* Dispersed throughout the southeastern portion of the study area are lots zoned agricultural and rural residential. The density range on these lots is one to four dwelling units per acre. The northern and northwestern portions of Kachina Village consist of mobile home and multiple family uses, where the density is ten units per acre. Non-residential land uses in the study area consist of commercial, open space, and utility property.

Commercial Land Uses

Commercial land uses include the Pic-N-Run convenience market and Village Land Shoppe real estate office along with approximately 2.6 acres of undeveloped commercially-zoned land located at the intersection of Kachina Blvd. and Kachina Trail. The convenience market occupies 0.64 acres on the south side of Kachina Boulevard. The approximately 2.6 acres of commercially-zoned land on the north side of Kachina Boulevard. adjacent to Raymond Park is vacant (*Kachina Village Area Plan, 2008*).

Wetlands Areas

Wetlands areas are shown in **Exhibit 1-1**, Study Area. Wetlands, washes, floodplains, and riparian areas are important habitat components for a variety of plant and animal species. They also provide recreational opportunities and attractive scenic vistas, which add aesthetic value to a community.

Pumphouse Meadow, the wetland system located on the east side of Kachina Village, and the Pumphouse Wash make up the Pumphouse Natural Area (formerly known as "Pumphouse Greenway System"). The Greenway system, along with Harrenburg Wash, located on the southwest side of Kachina Village, is dedicated open space to preserve the natural systems and sensitive habitats that it supports.

Other Land Uses

Public parklands include Raymond County Park and the Pumphouse Natural Area. Other public facilities include two fire stations, various utility installations including an Arizona Public Service (APS) substation, a Qwest telephone switching facility, and a wireless telecommunications tower (*Kachina Village Area Plan, 2008*).

Kachina Village is surrounded by Coconino National Forest on the north, west, and south sides. East of Kachina Village, and I-17, is privately owned, unincorporated land. Beyond those parcels of private land is the Coconino National Forest again and the unincorporated community of Mountainaire.

2.2 Future Land Use

The *Kachina Village Area Plan*, 2008, states that a number of land use changes occurred between 1997 and 2007, which significantly limit the opportunity for future development:

- Raymond County Park was expanded to 13 acres.
- Pumphouse Natural Area was established to preserve approximately 120 acres of public open space.

Largely as a result of these land use changes, future growth in Kachina Village is limited by the lack of undeveloped private land that is available for development.

Picture of Raymond County Park looking southwest.
Source: Kimley-Horn and Associates, Inc.

Kachina Village is mostly built out except for a few vacant lots scattered throughout the community and a 40-acre vacant parcel in the northeastern corner of the study area. Available inventory of vacant land suitable for development is limited to the 40 acres located at the northeast corner of the community, and approximately 36 vacant residential lots that remain in Kachina Village.

The 40-acre property is bounded by national forest land to the north, I-17 to the east, the mobile home park and individual manufactured home lots to the south, and Forest Highlands' utility compound to the west. A plat has been submitted to Coconino County to develop a 128 lot subdivision on the 40-acre parcel. This parcel is currently zoned General, which requires a 10-acre minimum lot size. Development of a 128 lot subdivision will require a zoning change.

The other potential development opportunity is for a 2.6-acre vacant property that is zoned for commercial use. The property is located on the northeast corner of Kachina Trail and Kachina Blvd., south of Raymond County Park.

2.2.1 Open Space

Raymond County Park

Raymond County Park in Kachina Village consists of 13.5 acres and serves Kachina Village as well as Mountainaire on the east side of I-17. The park is maintained by the Coconino County Parks and Recreation Department. In the County Parks and Recreation classification system, Raymond Park is a community park, which is defined as a facility that serves a group of neighborhoods within a five-mile radius. The park has expanded to 13.5 acres, and includes playground apparatus, a climbing wall, picnic tables, basketball court, ball field, and pond. Coconino County plans to make improvements to the park, which will include construction of a restroom, pavilions, basketball courts, and upgrades to the baseball fields and volleyball courts. The plans also include a trail with viewing areas for people to view the wetlands and wildlife. The trails will likely connect to the sidewalk on Kachina Trail. A connecting trail to that roadway will allow people to walk or ride to the park, as opposed to driving, with little conflict with motor vehicles.

Pumphouse Natural Area

Pumphouse Natural Area is a public open space system in Kachina Village owned and managed by Coconino County. The Pumphouse Natural Area consists of approximately 129 acres. The wetland meadow located northwest of Raymond Park provides habitat for a variety of wildlife, including bull elk in the summer and numerous bird species throughout the year.

2.2.2 Future Community Facilities

The Highlands Fire District (HFD) serves Kachina Village for fire and medical emergencies. The HFD is approximately 25 square miles and includes the communities of Kachina Village, Mountainaire, Forest Highlands, Lower Lake Mary, and Pine Del. There are a total of five fire stations in the HFD service area, and approximately seven thousand people are served by the HFD. Within Kachina Village, there is a fire station on Kona Trail, which is the main station, and another on Tolani Trail.

Expansion needs and improvements are identified as needed in the Highlands Fire District Strategic Plan. A new fire station has been completed in Forest Highlands, and construction is underway on a new fire station in Mountainaire and planned for completion in 2010. Facilities in Kachina Village were considered adequate for the Kachina Village community and improvements and expansions.

The water and wastewater systems in Kachina Village are managed by the KVID. The current system could serve approximately three hundred more connections according to an engineering study conducted in 2001. This would accommodate all of the undeveloped properties, if they were to be developed according to the existing zoning designations and some at higher densities.

2.3 Transportation Network

The roadway system in Kachina Village includes approximately 18.3 miles of County roads, all but two miles of which are paved. Kachina Blvd. is classified as a major collector, while Kachina Trail, Kona Trail, Pinon Trail, and Tovar Trail are classified as minor collectors. All other roads are classified as local streets (*Kachina Village Area Plan, 2008*).

The original development concept for Kachina Country Club Village in 1965 included private paved streets to be maintained by a property owners association. However, by 1969 the plans had changed and unpaved County-maintained roads were approved by the Board of Supervisors. At the time, unpaved roads were considered to be adequate for a vacation community that would be occupied mostly by part-time residents. As the community came to be occupied by more full-time residents, however, there was increased demand for road improvements. As the need and support for paved roads increased, residents petitioned for the formation of road improvement districts in which property owners pay assessments to cover the costs of the paving. Different portions of the community were paved at different times as a majority of owners in each area agreed to the improvement districts. In all, there were three road improvement districts beginning with the southeast portion of the community in 1987, the central portion in 1992, and most of the remaining areas in the north and southwest in 2001. As of 2007, there were only a few local streets that remained unpaved, mostly in the north end of the community where residents requested to be left out of the improvement districts because the assessments would have been a financial hardship (*Kachina Village Area Plan, 2008*).

Kona Trail and Wakas Trail intersection looking east.
Source: Kimley-Horn and Associates, Inc.

2.3.1 Summary of Traffic Volumes

Exhibit 2-1 summarizes traffic conditions on the major roadways in the study area. Traffic count data was obtained from Coconino County. Traffic count data was collected between September 20 and October 4, 2007. This exhibit also includes comments received from TAC members during a walk-about workshop that was held on March 4, 2009.

As illustrated in **Exhibit 2-1** roadways with the highest vehicular traffic in the study area are Kachina Blvd., Kachina Trail, Kona Trail, and Tovar Trail. Kachina Blvd. near the I-17 interchange has the highest traffic volume at nearly 6,000 vehicles per day. Other roads with significant traffic are Kachina Trail

(1,200 to 3,500 vehicles per day), Kona Trail (1,500 vehicles per day), and Tovar Trail (1,500 vehicles per day).

2.3.2 Summary of Traffic Speeds

Traffic safety is and continues to be of concern to Kachina Village residents. The *Kachina Village Area Plan*, 2008, states that excessive speed is a concern to Kachina Village residents. The traffic volume data collected in September and October 2007 also included the average speed traveled on major roadways in Kachina Village. The speed limit on the majority of the roadways in the data set is 25 miles per hour (mph) (Tovar Trail has a speed limit of 35 mph). Of the nine streets for which traffic volume and speed data was collected, four streets experience speeds greater than the speed limit:

- Kachina Trail – Average speed of 30 mph
- Pinon Trail – Average speed of 34 mph
- Toho Trail –Average speed of 30 mph
- Tovar Trail – Average speed of 42 mph

The remaining five roadways experience speeds that are either at or below the speed limit of 25 mph.

2.3.3 Other Issues

As described above, traffic volumes and vehicular speed on Kachina Village roadways are of concern to area residents. Another concern identified by TAC members and in the *Kachina Village Area Plan, 2008* is the unofficial snow-play area near the intersection of Kachina and Pinon Trails. The *Kachina Village Area Plan, 2008*, states that vehicles parking along the roadway create an unsafe condition when combined with winter road conditions. The Plan states that if sledding and snow-play activities continue to be permitted at this location, a designated parking area should be provided and roadside parking restrictions should be enforced. A similar situation occurs at this location in the summer when residents stop along the road to view elk in the meadow.

Exhibit 2-1 – Study Area Roadways

Road Name	Functional Classification	2007 Daily Traffic	Stakeholder Comments on Needs and Deficiencies
Kachina Blvd. and I-17 Interchange	Major Collector	5,855	Pedestrians, bicyclists, and ATV users utilize the I-17 interchange to cross I-17 to access National Forest lands. This exit provides the only crossing of I-17 for several miles, and provides access to National Forest lands as well as the community of Mountainaire.
Kachina Trail – East of Pinon Trail	Minor Collector	3,406	The sidewalk on Kachina Trail will link to the Raymond County Park trail – it will be easier for pedestrians and bicyclists to access the park.
Kachina Trail – South of Mesa Trail	Minor Collector	1,210	

Exhibit 2-1 – Study Area Roadways (continued)

Road Name	Functional Classification	2007 Daily Traffic	Stakeholder Comments on Needs and Deficiencies
Kachina Trail – South of Kachina Blvd.	Minor Collector	926	
Kona Trail – East of Kweo Trail	Minor Collector	1,616	Stakeholder input is that this roadway has the most pedestrian/motor vehicle conflicts. Speed and volume are of concern. Many school children walk and bike along this road. Roadway topography, with steep hills and curves are of concern. The sun angle in the afternoon when children are being dropped off or walking home from school may cause visibility concerns. During rush hour cars move in both directions on the streets.
Mesa Trail – South at Kachina Trail	Local	312	
Mesa Trail – North at Kachina Trail	Local	234	
Pinon Trail – Kachina Trail	Minor Collector	944	Intersection of Pinon Trail and Kachina Trail is congested with motor vehicles, pedestrians, and parked vehicles. Pedestrian conflicts when there's snow. Sidewalks are not always plowed.
Pinon Trail – Kona Trail	Minor Collector	371	See comments for Kona Trail.
Toho Trail – at Kachina Trail	Local	432	
Toho Trail – east of Tonalea Trail	Local	156	
Toho Trail – at Pinon Trail	Local	143	
Tolani Trail – at Kachina Trail	Local	257	

Exhibit 2-1 – Study Area Roadways (continued)

Road Name	Functional Classification	2007 Daily Traffic	Stakeholder Comments on Needs and Deficiencies
Tonalea Trail – at Pinon Trail	Local	494	There has been discussion of constructing an urban trail along the roadside – it hasn't been determined if it will be on the east or west side of the road along Pinon Trail. This road can flood and become impassable – the last time was in 2004. Three-way intersection visible to all, but if eastbound traffic travels too fast, there may not be enough time for left-turning motorists. Possible blind curve for westbound traffic.
Tovar Trail – north of Kachina Blvd.	Minor Collector	1,658	Elk are seen near the Park and people stop along Tovar Trail to view them. There are no sufficient pullouts to accommodate elk viewers. The viewers block one side of Tovar Trail and those who get out conflict with motor vehicles driving past.
Tovar Trail – south of Tolani Trail	Minor Collector	651	

2.2 Crash Summary

Crash data was obtained from ADOT Traffic Records for a five-year period from 2003 to 2007. An overview of the number of crashes by mode (vehicle-only, vehicle-pedestrian, or vehicle-bicycle crashes and injury severity is shown in **Exhibit 2-2**. Study area crash locations are depicted in **Exhibit 2-3**. **Exhibit 2-4** through **Exhibit 2-8** graphically depicts percentages for crash types, injury severity, collision type, and road surface condition.

Exhibit 2-2 – Crash Data Summary: Overview and Injury Severity

	Year					Total	Percentage
	2003	2004	2005	2006	2007		
Number of Crashes							
Vehicle Only Crashes	15	16	16	13	10	**70**	**99%**
Pedestrian Crashes	0	0	1	0	0	**1**	**1%**
Bicycle Crashes	0	0	0	0	0	**0**	**0%**
All Crashes	15	16	17	13	10	**71**	**100%**
Injury Severity							
No Injury	13	13	15	10	6	**57**	**80%**
Possible Injury	2	3	0	1	0	**6**	**8%**
Non-incapacitating Injury	0	0	1	2	2	**5**	**7%**
Incapacitating Injury	0	0	0	0	0	**0**	**0%**
Fatal Injury	0	0	1	0	0	**1**	**1%**
Unreported	0	0	0	0	2	**2**	**3%**

Exhibit 2-3 – Kachina Village Crashes, 2003 – 2007

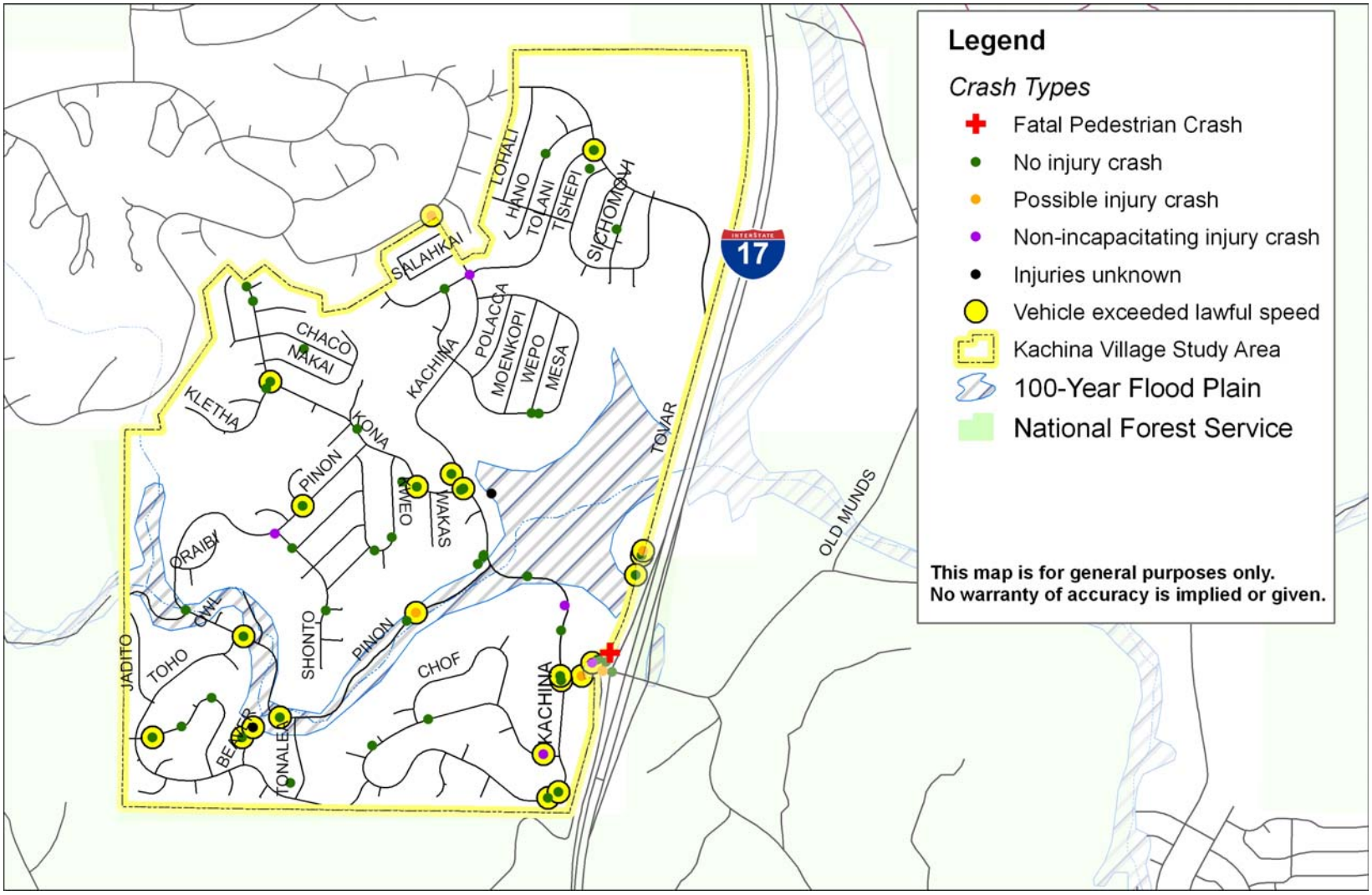


Exhibit 2-4 – Kachina Village Crashes, 2003-2007, Violation Type

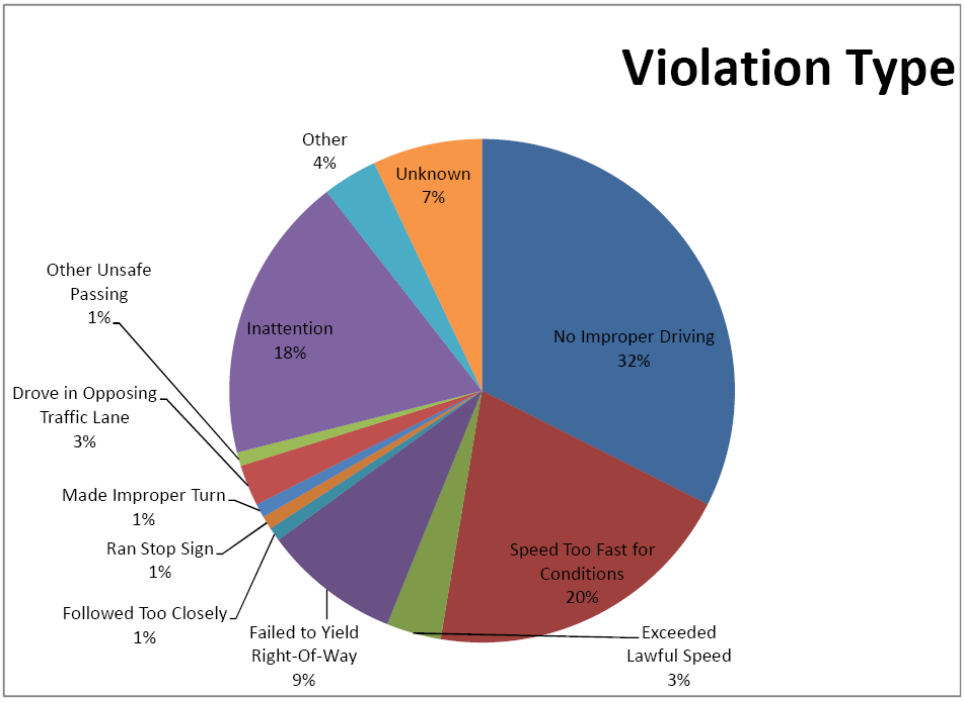


Exhibit 2-5 – Kachina Village Crashes, 2003-2007, Month of Crash

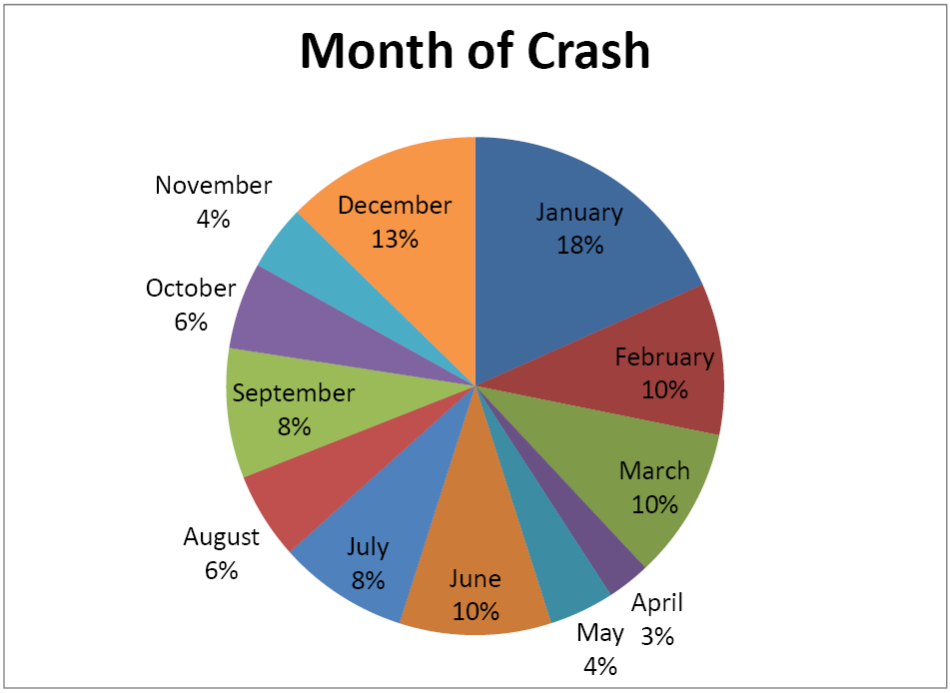


Exhibit 2-6 – Kachina Village Crashes, 2003-2007, Crash Type

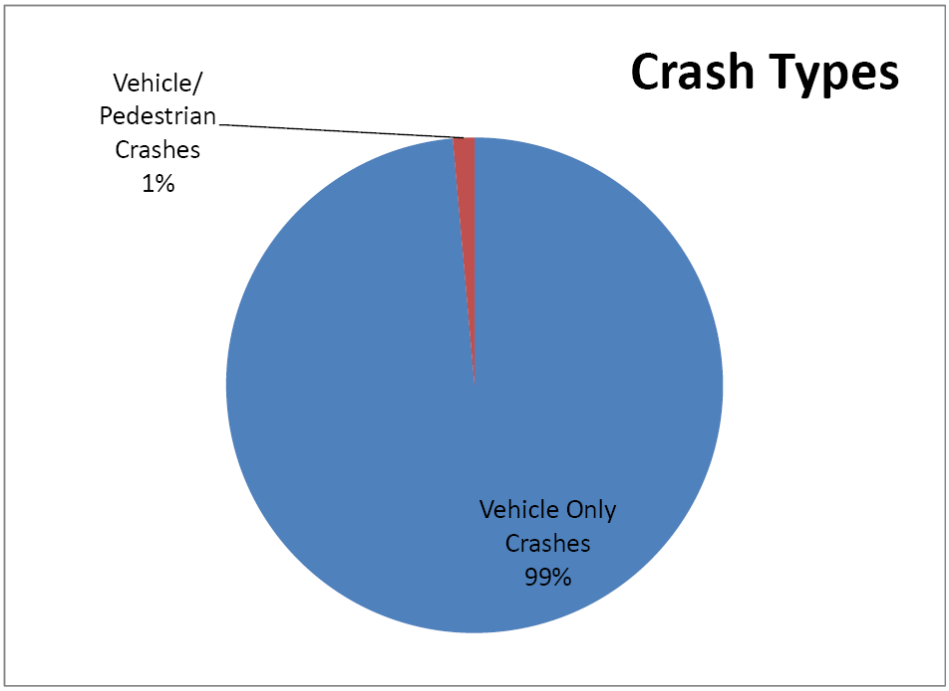


Exhibit 2-7 – Kachina Village Crashes, 2003-2007, Injury Severity

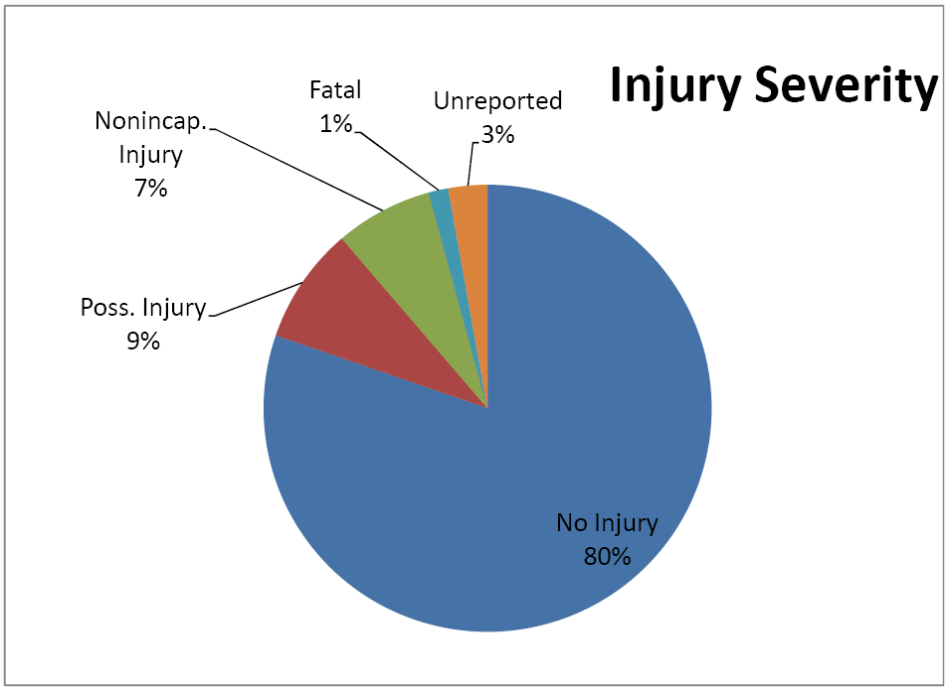


Exhibit 2-8 – Kachina Village Crashes, 2003-2007, Collision Type

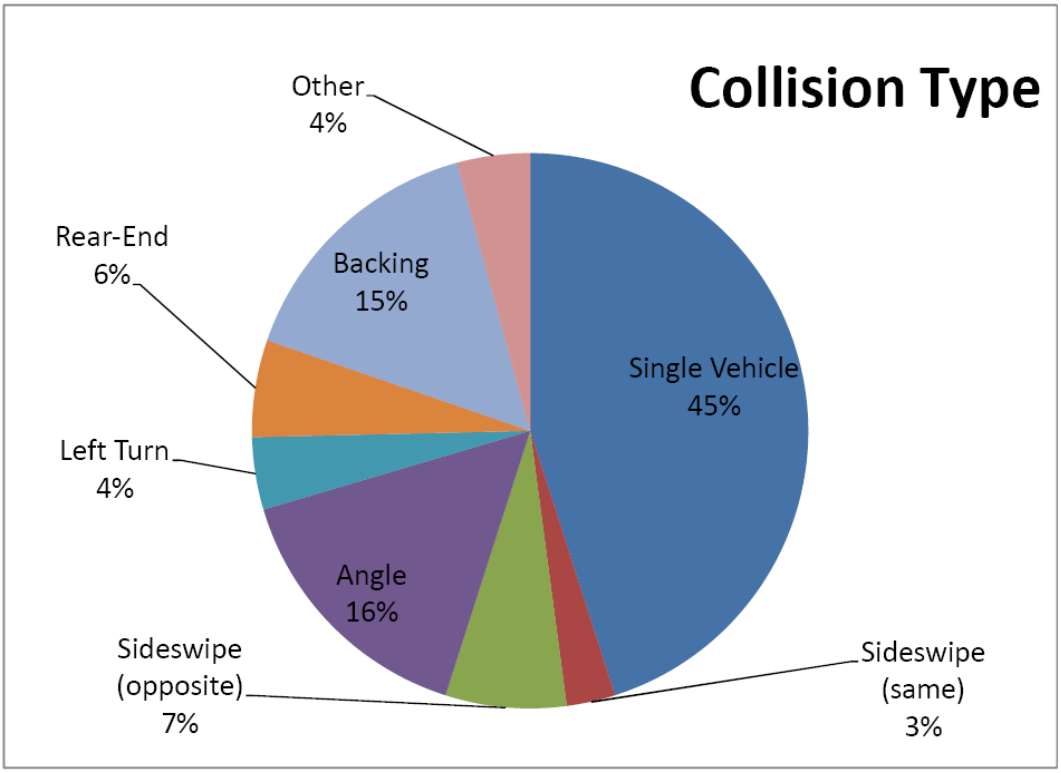
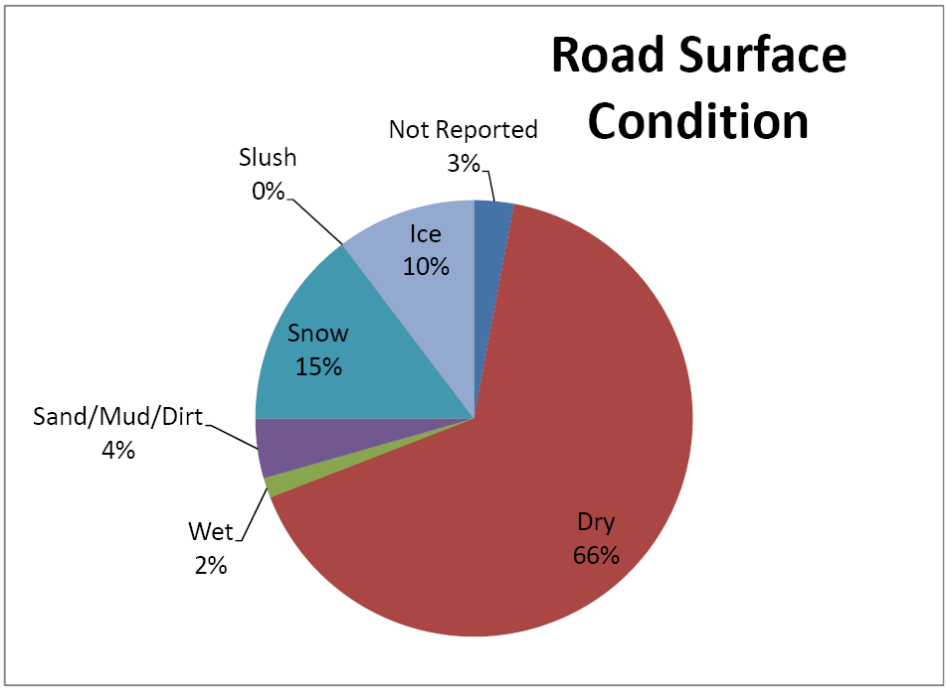


Exhibit 2-9 – Kachina Village Crashes, 2003-2007, Road Surface Condition



2.3 Existing and Future Transit Service

Transit service and facilities in Kachina Village are limited. NAIPTA is the regional transit authority.

Transit service available to residents of Kachina Village is limited to paratransit/special needs service that is provided to persons with disabilities. The paratransit service is called Mountain Lift and operates on a demand-response basis by appointment providing curb-to-curb service in the greater Flagstaff area including Kachina Village. The transit services do not require an eligibility process, which normally includes an application to verify the condition of disability. The services are generally available at 6:30am, 9am, 12pm, 2pm, and 6pm only.

The *Flagstaff Five-Year Transit Plan* adopted in 2005 by the FMPO concluded that some communities outside the city, including Kachina Village, may warrant future transit service. In year three of the plan (2008), the transit plan proposed to implement a demonstration commuter express service to Kachina Village, dependent upon funding by Coconino County or other grant sources. Funding has not been identified for the demonstration program. The demonstration program was proposed to operate for an 18-month period after which it would be re-evaluated to see if it met projected ridership and performance measures.

NAIPTA is currently updating the Five-Year Transit Plan. Draft versions of the plan include two potential scenarios for bringing regular public transit services to Kachina Village, with connections to Flagstaff and Mountainaire.

The first scenario is a fixed loop around Kachina Village. The loop would reallocate the Mountain Lift resources and provide good levels of accessibility to the residents. The draft concepts states that approximately 75 percent of people living in Kachina Village would be within 1/5 of a mile of the route, making it easy for residents to walk to the bus stops. While the loop is convenient for residents, it is costly for the transit provider. Because of Kachina Village's dispersed and disconnected street network, and challenging topography, the loop would take approximately 30 minutes to complete. The long route gives this scenario a much longer travel time to Flagstaff than driving in a personal vehicle, which would diminish the ability of the public transit system to capture riders.

The second scenario is an express route to Flagstaff, with only one stop at a park and ride location in Kachina Village. A potential park and ride location is the parking lot for Raymond County Park. This parking lot is close to the I-17 interchange and gas station, which also has a convenience store. In addition, Coconino County plans to construct a path to connect Raymond Park with the sidewalk on Kachina Trail. Having only one stop in Kachina Village eliminates the problem of having to maneuver around the streets, costing valuable time; however, it also eliminates the accessibility component in the first scenario. Most residents in Kachina Village live at least a half mile from the Raymond Park parking lot. This means that most residents will have to drive or ride their bikes to the bus stop. Once a person is in their personal vehicle, it becomes a challenge to attract them to public transit, especially since the drive to Flagstaff is only 15-20 minutes by car. To make public transit an attractive alternative to driving personal vehicles, the time on the bus must be about the same as with a personal vehicle. Attracting bicyclists might also prove to be challenging. There is currently limited room on the bus for bicycles, only two bicycles allowed on the bus' bike rack, and there are currently no bike lockers at the Raymond Park parking lot or at other locations around Kachina Village.

There are several school bus stops in Kachina Village. Many of the school bus stops in Kachina Village have pedestrian shelters where people can wait for the bus. Locations of bus stops are shown in **Exhibit 1-1**.

2.4 Existing and Future Bicycle and Pedestrian Facilities

Kachina Village was originally developed without sidewalks, pedestrian pathways, trails, bike paths, or other infrastructure designed specifically for non-motorized circulation. As a result, a considerable amount of pedestrian and bicycle traffic occurs directly on the streets.

As the community has transitioned to a year-round residential community, walking and bicycling has became a more frequent occurrence, especially by school age children walking to and from bus stops. The lack of sidewalks and shoulders along the roadways combined with challenging topography is perceived to be unsafe by Kachina Village residents (*Kachina Village Area Plan, 2008*).

Sidewalk on Kachina Trail at the intersection with Pinon Trail, looking north.
Source: Kimley-Horn and Associates, Inc.

Stakeholders have identified that the roads with the highest amount of bicycle and pedestrian traffic are the major and minor collectors, where pedestrians must walk along the roadside. These roads include:

- Kachina Blvd.
- Kachina Trail
- Kona Trail
- Tovar Trail

2.4.1 Sidewalks

As shown in **Exhibit 1-1,** currently, the only roadway segment with sidewalks is a portion of Kachina Trail and Kona Trail. In 2006, the Public Works Department constructed approximately 1,200 feet of sidewalk along a portion of Kachina Trail and the lower part of Kona Trail. Additional sidewalk improvements have been proposed for the upper portion of Kona hill and portions of Kachina and Pinon Trails. There are no other pedestrian or bicycle facilities in Kachina Village (*Kachina Village Area Plan, 2008*). Funding for the sidewalk improvements has not been identified.

The *Kachina Village Area Plan*, 2008, identifies a concept to extend the sidewalk on Kachina Trail / Kona Trail an additional 865 feet of sidewalk along the upper part of Kona Trail. The Plan also identifies a concept to construct approximately one half mile of pedestrian trail along Pinon from Kachina Trail to Tonalea Trail. Other concepts include trails for the Pumphouse Natural Area that are primarily recreation-oriented. Recreational trails are discussed in more detail in the 'Parks and Recreation' element of the plan (*Kachina Village Area Plan, 2008*).

Inclement winter weather exacerbates bicycling and pedestrian conditions in Kachina Village. As previously described in Chapter Two, the current practice of Coconino County is to plow the snow to the side of the roadway, creating snow berms that often encroach on shoulder areas and in walking areas. In addition, once the snow melts, the fine cinders left on the pavement result in slick conditions for pedestrians and bicyclists. An area of particular concern for pedestrians is the hill on Kona Trail, because of steep grade and relatively high traffic volumes. During a walkabout workshop with TAC members in March 2009, TAC members stated that the setting sun during the winter blinds westbound vehicles on Kachina Trail and Kona Trail, which creates a dangerous condition for all roadway users. A TAC member concern is that this increases likelihood of pedestrian-vehicle crashes, particularly when snow berms cover the sidewalk.

2.4.2 Trails

Trails in Kachina Village are shown on **Exhibit 1-1.** Trails and access to surrounding forest lands are an important part of Kachina Village.

Forest Service lands can be accessed from two points on the west side of the community: Toho Trail, at Buffalo Trail, and Pumphouse Wash at Jadito Trail. There is also a Forest Service access point on the south side of the study area off of Toho Trail.

Trails represent an important element of the transportation network for both recreational and non-recreational uses.

Existing authorized trails in Kachina Village include approximately a half mile of improved trail along the east side of Pumphouse Wash, along Pinon Trail. The trail is on Coconino County property and is maintained by the County Parks and Recreation Department. The trail connects the school bus stop at Pinon Trail and Tonalea Trail to Kachina Trail.

The Highland Trail is a brand new trail that connects Fort Tuthill County Park with Kachina Village wetlands, terminating at the entrance to the KVID wetlands. This is shown in **Exhibit 1-1** as "Pedestrian Access to KVID Wetlands". The county plans to extend the trail through the wetlands in 2009 with support from the KVID.

In addition to the above-named authorized trails, pedestrian activity in forest lands in and surrounding Kachina Village has resulted in several unauthorized social trails or user-created trails in and around Kachina Village. Social trails often evolve into an unplanned and poorly located route that can contribute to erosion and other environmental impacts. Social trails in Kachina Village include:

- An unauthorized social trail located west of the Highlands Fire Station. The trail starts on the utility corridor and then passes along the borders of 11 private properties, and then terminates at Harrenburg Wash.
- Another unauthorized trail is located east of Mesa Trail on Coconino County owned lands. It is situated between private parcels and the wetlands.

Stakeholder input suggests that both of these unauthorized trails are used by the residents living adjacent to them and do not attract people who have to drive and park at the trailhead.

Potential new trails in Kachina Village include:

- Additional trails for other parts of the Pumphouse Natural Area. Coconino County has an agreement in place with the KVID to develop public parking and trailhead access to the Pumphouse Wash Trail and to the future trail above the Harrenburg Wash.
- Establish a connection of Kachina Village to the Flagstaff Urban Trail System (FUTS). Potential alternatives include establishing a connection between the terminus of the Highlands Trail located on the north side of the study area to Raymond County Park. Upon completion, the Highlands Regional Trail will start at the KVID wetlands entrance and continue north of State Route 89A just south of Pine Del.
- Stakeholders and TAC members suggested connecting the authorized trail and the unauthorized trail west of the fire station located on Kona Trail to create a one mile loop for recreational use. The loop would follow the authorized trail south and then follow Pumphouse Wash and Harrenburg Wash. At Harrenburg Wash the loop trail would connect with the unauthorized trail (which would become authorized) west of the fire station. The loop would then continue southeast on Kona Trail until it meets up again at the trailhead east of the intersection at Pinon and Kachina Trails. This loop trail would access one of the three National Forest trails access points. Easements through the private parcels would be required to establish a connection between the current unauthorized trail and the authorized trail along Harrenburg Wash.
- Another potential regional trail connection is on Tovar Trail where there are three large culverts located at Schoolhouse Draw and I-17, which is adjacent to Tovar Trail. The culverts are currently tall enough for pedestrians to pass through comfortably; however, the bottom of two of the culverts is filled with water. The third culvert has a thick muddy bottom, but could be dried and used as a passage. Currently, pedestrians and bicyclists use the interchange at I-17 and Kachina Blvd. to access the trails east of I-17. A trail connection under I-17, using the culvert, would allow pedestrians and bicyclists to cross I-17 safely without requiring them to use the interchange. The property immediately adjacent and east of I-17 is privately owned, but further east is the National Forest. The KVID utility easement passes through the private property east of I-17 and there may be a possibility for using that easement as a trail as well.

Culvert under I-17, adjacent to Tovar Trail. The left culvert could potentially be used as a pedestrian crossing to the east side of I-17.
Source: Kimley-Horn and Associates, Inc.

3.0 WINTER MAINTENANCE BEST MANAGEMENT PRACTICES

3.1 Site Conditions

Kachina Village is located at an elevation of approximately 6,700 feet above mean sea level and contains both areas of steep terrain and low lands containing drainages and wetlands. The mean air temperatures in winter months remain near freezing and precipitation typically occurs in the form of snow. More than half of the precipitation in Kachina Village occurs between the months of November and March. It is not uncommon to have a storm system deposit two feet of snow. Winter temperatures and precipitation have been known to last into June in Coconino County, Arizona. Cold temperatures during winter months and the potential for heavy snowfall often result in inclement driving conditions within Kachina Village.

Drainage in Kachina Village flows into the Pumphouse Natural Area, the Pumphouse Wash, and the Harrenburg Wash. These drainage systems are dedicated open space set aside to preserve the natural systems and sensitive habitats that it supports. Guiding water to these systems are roadside drainages that consist of roadside ditches with culverts at intersections that guide the runoff toward low points.

3.2 Current Kachina Village Winter Storm Management Practices

The Maintenance Division of the Coconino County Public Works Department is responsible for maintaining roadway conditions within Kachina Village. A combination of snowplows and cinders are used as the standard approach to address snow and icy roadway conditions in Kachina Village. Clearing snow from roads in Kachina Village is prioritized based on roadway functional classification: arterials, collectors, and residential streets. Once the main routes are cleared, side streets and cul-de-sacs are plowed. The priority system is intended to restore limited mobility within the community while keeping emergency service access as open as possible. The County's stated goal is to have every road open within a 24-hour period, but sometimes due to heavy snowfall, clearing of the main roads takes longer, and clearing of the side streets and cul-de-sacs is delayed accordingly (Kachina Village Area Plan, 2008).

Cinder buildup on Kona Trail.
Source: Kimley-Horn and Associates, Inc.

Cinders are used on the roads to provide traction for vehicles in icy conditions. When the snow and ice melt, however, the runoff from the surrounding higher points of Kachina Village carry the cinders into the washes. There is a drainage outfall structure where the runoff enters Pumphouse Wash. The cinders are allowed to enter the wash and have accumulated several feet deep near this structure and

have altered the drainage patterns. There are currently no standard practices in place to limit cinders from entering local waterways. The County does not currently use anti-icing and de-icing agents in Kachina Village.

3.3 Common Winter Storm Management Techniques

The following sections briefly describe the various winter storm management techniques that could be employed by the County as viable winter storm management techniques within Kachina Village. During open houses held in May and September 2009, residents were asked to fill out a survey, which included questions asking residents to provide input on the current winter management practices. There was a near unanimous response that residents preferred to continue the use of cinders, and opposed the introduction of other techniques described below in this section. Residents were concerned that winter storm management techniques that utilize chemicals will result in greater impacts on the wetlands. Residents stated that if the County were to change its practices from using cinders to a chemical that they be notified and given an opportunity to voice their opinion on the matter. A summary of the survey is available in Appendix A and complete documentation of public input and involvement is available in the *Public Involvement Summary Report*, which is under a separate cover.

Abrasives

Abrasives are applied to roadways during winter storms to improve vehicle traction but are not used to melt ice and snow. Abrasives application is most effective when pavement temperatures are below 15 Fahrenheit (^{o}F) (AASHTO, 2004). In Arizona, abrasives generally consist of volcanic cinders or sand. Cinders are most often used in the northern half of the state, whereas sand occurs and is most often used in the southern half of the state. A limitation of volcanic cinders is that they break down into fine particles that provide less traction. In contrast, sand grains do not break down into finer particles as easily. Cinders applied to roadways often end up in streams and lakes contributing to turbidity and sedimentation and resulting in impacts to fish and aquatic resources. Vehicles may grind abrasives into fine particles that can become airborne when dry, resulting in increased air pollution (AASHTO, 2004). The cinders are also considered 'fill materials' into 'Waters of the United States' and are regulated under the Federal Clean Water Act.

De-icing

De-icing chemicals are an alternative to cinders and could potentially reduce or eliminate the use of cinders. De-icing agents are used to create a brine solution that disrupts the bond that ice has already made with the pavement surface (AASHTO, 2004). Once the ice/pavement bond is broken, it is easier for equipment to remove the ice. De-icing agents are applied during and/or after the start of a winter storm once snow and ice have accumulated on the road (AASHTO, 2004).

De-icing chemicals have the potential to affect the water composition of rivers, streams, and lakes, especially slow-flowing streams and small ponds. The accumulation and persistence of salts in watersheds pose risks to aquatic ecosystems, and attracts wildlife to roadways contributing to increased accidents between vehicles and animals (AASHTO, 2004).

Roadside trees and other vegetation may be affected by increased concentrations of salt on soil and water leading to greater root absorption, and salt accumulation by foliage and branches due to vehicle splash and windblown dry salt. Trees closest to the road (generally those within 20 feet) are the most affected, and there is frequently a distinct injury gradient with distance from the road (AASHTO, 2004).

Several State Highway Maintenance Divisions in the northern U.S. are beginning to experiment with sugar-based de-icing products. Sugar, like salt enhances melting values. Any substance that dissolves in water has this effect, but each substance will have varying outcomes. Most winter storm test applications have added beet sugar or molasses to the standard brine solution. Initial studies show that use of this mixture (sugar and salt) as a winter storm management is less corrosive on metal structures and less destructive to vegetation than salt alone. The effects of this new de-icing product on wildlife have not been fully researched. Salt, such as sodium chloride (NaCl), may attract wildlife to roadways and contribute to roadkill.

Anti-icing

Anti-icing chemicals are used to lower the freezing point of water on a highway surface to prevent snow and ice from initially bonding to the pavement (AASHTO, 2004). Anti-icing chemicals should be applied prior to, or very shortly after, the start of a winter storm to prevent snow and ice from bonding to the pavement. Liquid magnesium chloride ($MgCl_2$) is typically used for anti-icing operations. NaCl is an effective de-icer for pavement temperatures above 22 °F. Calcium chloride ($CaCl_2$) and $MgCl_2$ are very effective de-icing chemicals when pavement temperatures are between -5 and 22 °F (AASHTO, 2004).

Anti-icing chemicals are best applied on shady areas, grades that historically have caused difficulties for motorists during storms, roadway curves, approaches at the bottom of hills, and bridge decks. Unfortunately, anti-icing chemicals, like de-icing, have the potential to affect the water chemistry of slow-flowing streams, rivers, streams, small ponds, and lakes. The accumulation and persistence of salts in watersheds pose risks to aquatic ecosystems, and the presence of NaCl attracts wildlife to roadways and contributes to roadkill (AASHTO, 2004).

Pre-wetting

Pre-wetting is a technique used to enhance the capabilities of abrasives, de-icing, and anti-icing applications by ensuring that more material stays on the roadway surface. Pre-wetting is accomplished by adding liquid chemicals to granular chemicals or abrasives before they are applied to the road. The technique increases the rate at which chemical additives penetrate snow and ice layers on the pavement (ADOT, 2004).

Snowplow

The primary function and purpose of a snowplow is to physically remove snow and loose ice from a roadway without damaging the integrity of the pavement (AASHTO, 2004). Plowing typically is performed when snow or ice inhibits functional traffic flow or when a sufficient amount of snow or ice has accumulated on the pavement (generally agreed to be approximately one inch thick). In addition to plowing snow away from the roadway, snowpack or ice can be fractured and subsequently removed with a blade.

Brooming

Brooming is a technique that can be used for removing snow that is loose or not bonded to the pavement surface. This technique can clear the surface fairly well; however, it will not remove compacted snow and ice and it is most effective in areas that receive little traffic.

Snow Blowers

In areas with significant snow accumulations, snow blowers can be used to remove deep snow accumulations, usually following a heavy storm (TAC, 2003). Snow blowers typically are mounted on

dedicated trucks and blowers can be used in conjunction with snowplows to relocate snow banks and make room for subsequent snowplow piles.

Snow Fences

Depending on the quantity of snow, the use of snow fences to control windblown snow or snowdrift may be utilized at site specific locations. Snow fences are long, fixed, standing structures that are strategically placed within the right-of-way to control drifting snow and improve motorist visibility. Snow fences can minimize the amount of chemical additives or abrasives required and/or the amount of snow to plow.

Vegetation Trimming and Natural Sunlight

Sunlight is a natural method of accelerating snow and ice melt and can be enhanced by reducing shade and trimming canopies that overhang the roadway (ADOT, 2004). Shade reduction may entail thinning trees and/or flattening slopes to increase the amount or duration of sunlight that reaches the road. Thinning trees also has the benefit of reducing fire fuel loads and increasing visibility. However, the potential for a decrease in roadway aesthetics should be a consideration before deciding to thin trees. Tree removal should be targeted for those sections of roadway that have a history of developing patches of ice or being the last sections of road where ice melts.

3.4 Best Management Practices Recommendations

An element of the Kachina Village Multimodal Transportation Study is to recommend BMPs for winter roadway maintenance operations that minimize impacts to wetlands. The recommended BMPs are a result of the analysis conducted in *Working Paper No. 1* and from stakeholder and public input received at public open house meetings held in May and September 2009.

Input received at the public open house meetings expressed preference for the continued use of snowplowing and cinders, as compared to the use of chemical additives. Public input and perspectives is that chemical additives may pose a greater threat to the local wetland system than the naturally occurring cinders. However, many at the public meeting expressed concerned that the cinders threaten the wetland system as they are washed from the roadside and enter the washes through runoff. Another concern expressed is that cinders left on the side of the road and/or on sidewalks contribute to pedestrians walking in the roadway.

Considering stakeholder, TAC, and public input and perspectives, the following management practices are recommended for consideration.

3.4.1 Snowplows and Cinders

Snowplows are an efficient means to remove snow from the roads. Although the community has expressed input about property damage resulting from snowplows, it is anticipated that use of snowplowing will continue in Kachina Village.

Naturally occurring cinders are also currently used in Kachina Village to provide traction on slippery roads. A major concern of Kachina Village stakeholders and the public is that significant cinder accumulation and roadside deposition results throughout the course of the winter, and cinders remain along the roadside after winter maintenance practices have ceased for the season. Deposition of cinders in drainage channels and wetlands was evident during the June 2009 field reconnaissance at the intersection of Kachina Trail and Pinon Trail. This intersection is not only where two of the Kachina

Village's main roads intersect, but also where Pumphouse Wash wetlands narrows down considerably as it flows southwest through Kachina Village. Roadway runoff from the surrounding higher points of Kachina Village carry with it cinders used during winter storms. The deposition of cinders into Pumphouse Wash appears to be altering the drainage pattern near the existing roadway crossing.

RECOMMENDATION: Continue to employ snowplows and cinders as acceptable winter storm management techniques. The use of chemical additives to road surfaces is not desired by the local residents. Additional maintenance practices are recommended below to mitigate cinders deposition.

3.4.2 Roadside Cleaning

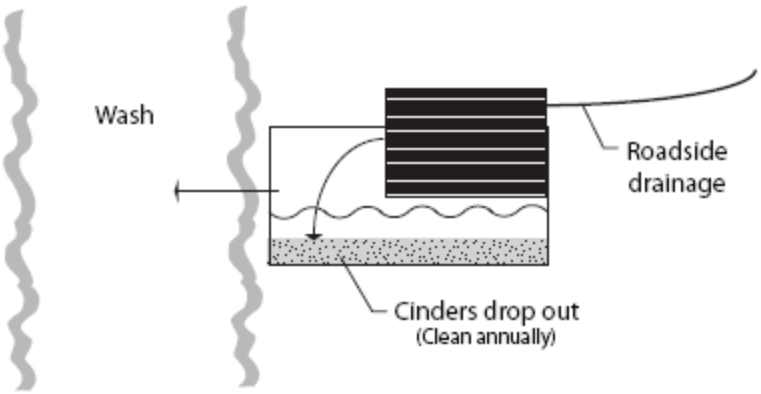
As mentioned above, a major concern of Kachina Village stakeholders and the public is that significant cinder accumulation results throughout the course of the winter, and remain along the roadside after winter maintenance practices have ceased for the season.

RECOMMENDATION: It is recommended that Coconino County identify feasible techniques to remove roadside cinders each spring. Removal of roadside cinders will help to prevent cinders from entering the wetlands. This can potentially be completed through use of suction trucks, street sweepers, or graders.

In addition, the existing box culvert system associated with Kachina Trail and Pumphouse Wash should be routinely cleaned so that all box 'cells' are functioning. This may require coordination with the U.S. Army Corps of Engineers to determine the need for a Clean Water Act permit. Depending on the magnitude of work within waters of the U.S., these activities may qualify under a Nationwide Permit Number 3. Maintenance.

3.4.3 Trap Drain and Drainage Study

Kachina Village is surrounded by washes and wetlands that attract a variety of wildlife to the area. Maintaining the wildlife and the health of the wetlands and washes was noted by the public and stakeholders as a priority. Stakeholders had a number of concerns in regards to what factors were impacting the wetland and washes, including cinders carried by runoff and culverts that are blocked by debris. It is recommended that a drainage study be conducted to examine the drainage patterns in Kachina Village and to determine the extent of the impacts created by cinder buildup in the wetlands and washes.



Conceptual Trap Drain System.

A possible concept to evaluate in the study is the use of a sediment trap or basin. A sediment trap is a filter at the end of a drainage channel where runoff is guided. The trap filters the sediment from the runoff water and allows the water to pass into the

wetlands and retains the sediment. The filter would have to be cleaned annually or whenever excessive buildup occurs to ensure that the system maintains its function. A sediment basin works in a similar fashion, but instead of using a filter, a basin is constructed where the drainage channel enters the wetland or wash. The basin acts as a barrier to slow runoff and naturally separate sediment before the water enters the wetland or wash.

The drainage study should also include an evaluation of the existing box culverts that connect to the wetlands and washes, particularly the bridge on Kachina Trail, just before the intersection with Pinon Trail. Stakeholders observed that a few of the culvert cells were blocked by debris and that the other cells were inundated with water. Stakeholders expressed concern that the blocked cells may potentially alter drainage patterns. A drainage study would be required to determine the cause of the blocked cells, as well as any mitigation required.

RECOMMENDATION: Conduct a drainage study to evaluate the cause of blocked cells as well as any mitigation required. The drainage study should evaluate the feasibility and effectiveness of a sediment basin.

The drainage study should consider constructing a trap drain system at all major roadside drainage locations to capture cinders before entering local drainages. These traps should be cleaned out yearly to remove cinders.

A summary of Environmental Best Management Practices is included in **Exhibit 3-1**.

Bridge on Kachina Trail over the Pumphouse Natural Area and the Pumphouse Wash.
Source: Kimley-Horn and Associates, Inc.

Sediment Basin.
Source: Kentucky Construction Site BMP Planning and Technical Specification Manual

Exhibit 3-1 – Environmental Best Management Practices

Environmental BMPs		
Type of BMP	**Recommendation**	**Comments**
Winter Maintenance Improvements	Continue the use of snowplows to clear the snow and cinders to create traction.	The community desired the continued use current maintenance practices, including the use of cinders since as they perceive it to be the least harmful to the washes and natural environment.
Winter Maintenance Improvements	Clean the roadsides after other winter maintenance practices have ceased for the season to remove cinders before they enter the wash system.	The community has expressed concerns about snowmelt in the spring, which carries and deposits cinders into the surrounding washes. Removing the cinders once snow has ceased for the season would prevent cinders from entering the washes.
Drainage Study	Conduct a drainage study to determine how the drainage system is impacted by cinders, runoff, snow play, and development. Consideration of a trap drain system should be a major element of the study.	The community has expressed concerns about snowmelt in the spring, which carries and deposits cinders into the surrounding washes.

3.4.4 Literature Cited

1. American Association of State Highway and Transportation Officials (AASHTO), 2004, Snow and Ice Control: Guidelines for Materials and Methods, prepared by Blackburn, R.R., Bauer, K., Amsler, D.E., Boselly, S.E., and McElroy, A.D., NCHRP Report 526.

2. Arizona Department of Transportation (ADOT), 2008, Winter Storm Management of Arizona State Highways, Operations Manual. 290 pp.

4.0 SUMMARY OF MULTIMODAL NEEDS

Chapter 4 discusses the process to identify multimodal needs in Kachina Village that served as input to the development of a program of projects. Identification of multimodal needs was based on the following:

- Review of existing conditions, including land uses, and traffic data and crashes, as documented in *Working Paper No. 1 – Current and Future Conditions.*
- Multiple site visits with stakeholders where multimodal transportation opportunities and constraints were discussed and identified.
- Review of stakeholder and public input summarized in *Working Paper No. 1 – Current and Future Conditions.*
- Review of input received at Public Open House Meeting No. 1 (May 2009) and Public Open House Meeting No. 2 (September 2009).

4.1 Summary of Multimodal Transportation Needs and Deficiencies

Working Paper No. 1 – Current and Future Conditions, reviewed Kachina Village land uses and multimodal transportation conditions within the study area. A review of previous studies and plans was conducted, along with a crash data analysis and two site visits to Kachina Village where members of the TAC were present.

The public played a vital role in identifying needs. Two open houses were held, one in May 2009 and a second in September 2009. During the first open house the public viewed boards displaying Kachina Village current conditions and maps of the study area. The public was then asked to write on the maps to indicate where problems exist and what improvements they would like to see. The public was also provided a questionnaire that asked them to identify problems in the area and what could be improved. A detailed record of the comments and questions from the public are included in the *Public Involvement Summary Report,* prepared by URS, which is under a separate cover. A summary of responses submitted from the public open house questionnaire form can be found in **Appendix A**. The second open house focused on obtaining feedback on potential projects for recommendation.

The following sections summarize the needs identified in *Working Paper No. 1 – Current and Future Conditions*.

4.1.1 Pedestrians and Bicycles

Analysis of responses from the public open house question form shows that the majority of pedestrians in Kachina Village walk for recreational purposes.

The roads that were most commonly identified by residents as those that they walk or bicycle on are: Kachina Trail, Toho Trail, and Pinon Trail. Other roads identified include Tovar Trail, Beaver Trail, Tolani Trail, Tishepi Trail, Naahtee Trail, and Kona Trail.

- A general need to improve pedestrian and bicycle accommodation on Kachina Village roadways was identified. This may be achieved through improved shoulders, and/or addition of striping in appropriate areas. A need for improved shoulders was identified by the public on the question form.

- Sidewalks, with exception in limited areas, are generally not desired by the community because they want to maintain the rural character of the community.
- Steep grades and topography have created a few locations where it is difficult to see pedestrians on the road.
- There are several informal "unauthorized" trails in the community. These are of concern because they have not been properly designed or located, and may contribute to erosion and ecological damage.
- A general need exists to improve pedestrian connectivity throughout the community. This may include proper construction of authorized trails, and improved pedestrian accommodation on the roads.
- There is a need to identify connections to the FUTS. This was commonly identified as a need by members of the public on the public question form.

4.1.2 Public Transit

- Members of the public identified a need for transit service to Flagstaff from Kachina Village. Park and ride lots were identified as the most viable option, considering the circuitous layout of the community makes regular transit inefficient, leading to long trip times.
- If funding is identified for public transit to Flagstaff, park and ride lots should be identified.

4.1.3 Roadways

- TAC input is that a lack of pullouts creates congestion on Tovar Trail and Kachina Trail when drivers stop on those roads to view the elk. No comments were received about this issue from members of the public.
- TAC input is that congestion is experienced at the intersection of Kachina Trail and Pinon Trail due to the parked cars, motor vehicle and pedestrian traffic during peak hours.
- According to data collected by Coconino County, speeding occurs on several roads within the community; speeding was a contributing factor for a significant percentage of traffic crashes.
- A need to improve training of snowplow operators was identified by multiple members of the public. Several comments were submitted regarding snow berms across driveways and damage to personal property caused by the snowplows.

Exhibit 4-1 summarizes multimodal opportunities and constraints in Kachina Village.

Exhibit 4-1 – Summary of Multimodal Transportation Opportunities and Constraints

Multimodal Element	Opportunities	Constraints
Multi-use paths and trails	Existing trails can be connected to create a community-wide trail network. "Unauthorized trails" can be formalized and properly sited and designed. Activity nodes in the community (Raymond County Park, wetlands, Pic-n-Run, and Pumphouse Wash) can be connected with trail extensions. Consideration may be given to modifying the culvert that crosses under I-17, adjacent to Tovar Trail, for use as a pedestrian crossing to the east side of I-17 and a connection to Mountainaire. Raymond County Park expansion plans include trails that connect to the sidewalk on Kachina Trail and to the proposed urban trail on Pinon Trail. An urban trail on Pinon Trail could potentially connect to Harrenburg Wash.	Trail easements would need to be acquired to create a connecting trail system in Kachina Village. Any pedestrian crossings off of I-17 would require coordination and approval from ADOT.
Roadways	Most roads in Kachina Village experience relatively low traffic volumes, which is conducive to safety and comfortable use of roads by bicycles. Shoulder widening may be considered to provide bicycle lanes, and would provide wider roads in which snow can be stored during winter roadway maintenance operations. Traffic calming techniques may be considered to reduce vehicle speeds. TAC input is that raised elements (e.g. speed tables) should not be considered due to winter maintenance concerns.	During snowplowing, berms are created along streets in areas used by pedestrians because there is no other place to put the snow due to lack of shoulders. Most roads in Kachina Village range from 24' to 28' wide. With exception in limited locations, roads in Kachina Village are too narrow to install a dedicated bicycle lane without accompanying shoulder widening. Shoulder widening may contribute to increased vehicle speeds, which is counter-productive to improving conditions for bicycles and pedestrians. Traffic calming techniques must consider snow removal techniques. Unseen sharp edges could damage a plow. Cinders that remain on the road after snowmelt create slippery conditions for pedestrians and bicyclists.

Exhibit 4-1 – Summary of Multimodal Transportation Opportunities and Constraints (continued)

Multimodal Element	Opportunities	Constraints
Public Transit	There are a few parking areas located in Kachina Village that could be converted to park and ride lots that would support public transit service to/from Kachina Village and Flagstaff.	Lack of bike lockers in the Raymond County Park parking lot. Using the Raymond County Park parking lot as a park and ride lot may not attract drivers since most residents would have to drive to reach the parking lot. It is difficult to entice drivers to get out of their cars and wait for a bus when they are already in their cars.
Sidewalks	The existing sidewalk on Kona Trail could be extended.	Sidewalks may detract from the community's rural character.

4.1.4 Priority Lanes

As identified above, roadways in Kachina Village are generally too narrow to install dedicated bicycle lanes without widening the existing shoulders. An alternative concept to traditional bicycle lanes for low volume roadways is that of "Priority Lanes". "Priority Lanes" consist of a dashed bicycle lane that is approximately five feet wide on each side of local roadways that are too narrow for traditional bicycle lanes. "Priority Lanes" are different from typical bicycle lanes in that drivers are permitted to cross the lane line markings with care in a "Priority Lane", as long as they yield to bicycles and pedestrians within the "Priority Lane". "Priority Lanes" should only be considered for low volume roads.

When a bicyclist or pedestrian is not present in the "Priority Lane", a vehicle may drive within the "Priority Lane". When a bicyclist or pedestrian is present in the "Priority Lane", the vehicle must move completely out of the "Priority Lane", pass the bicyclist or pedestrian with care, and then move back into the "Priority Lane".

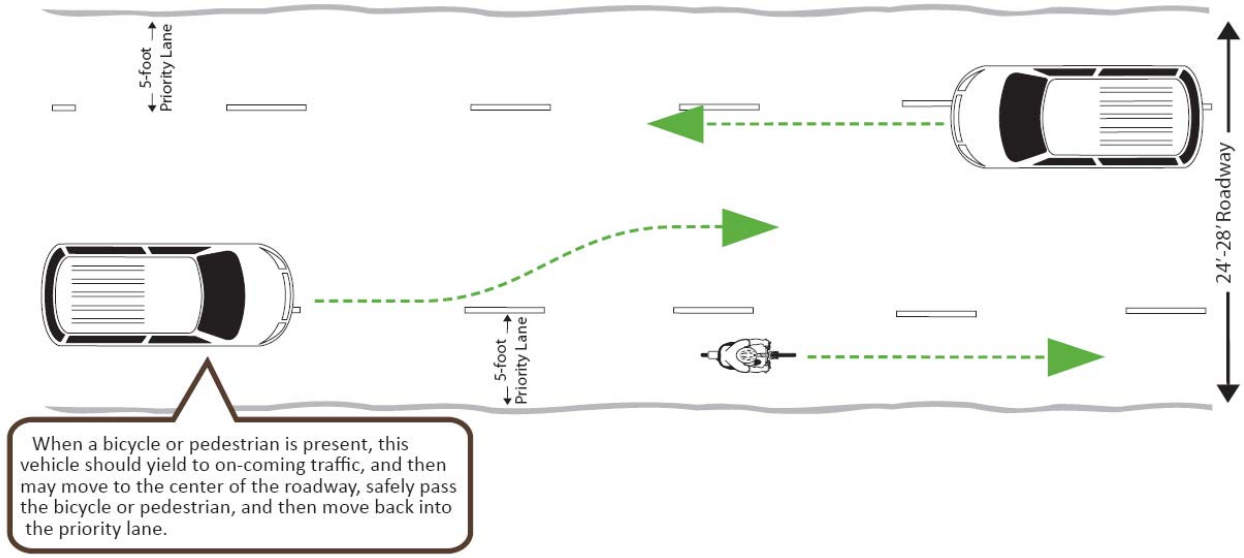
Photo simulation of "Priority Lanes."
Source: Kimley-Horn and Associates, Inc.

The "Priority Lane" is a flexible tool with potential for developing bicycle networks. They can be used to reduce the confusion and conflict between vehicles and bicycles or pedestrians by allowing bicycles, pedestrians, and vehicles to share the road in a predictable manner. **Exhibit 4-2** illustrates how vehicles and bicyclists maneuver on a road with a "Priority Lane". The photo on the left is a simulation of a "Priority Lane".

Although the "Priority Lanes" have been implemented in Europe on low volume rural roadways, this concept is not approved in the current Manual on Uniform Traffic Control Devices (MUTCD). ***For this reason,***

Coconino County staff and ADOT have not endorsed the concept for recommendation in Kachina Village. However, it is recommended that the concept be considered in the future by County staff as a lower cost alternative to improve conditions of bicycles and pedestrians on rural roadways. If "Priority Lanes" are considered in the future, Coconino County may desire to utilize the Federal Highway Administration (FHWA)/MUTCD experimentation process. Information on the experimentation process can be found on the MUTCD website (http://mutcd.fhwa.dot.gov/condexper.htm).

Exhibit 4-2 – Priority Lane



Example of "Priority Lanes" in Switzerland.
Source: Google Maps:
http://maps.google.com/maps?source=earth&layer=c&cbll=46.736227,7.604412&cbp=13,112.09,,0,5&ie=UTF8&ll=46.736175,7.604524&spn=0,359.99716&z=19&panoid=1AYkKmmow61nzNzkAfYXsQ

4.2 Initial Identification of Potential Projects

Based on the inputs described previously in this chapter, a list of potential projects is summarized in **Exhibit 4-2**. The projects are presented in more detail in Chapter 5 – Program of Projects.

Exhibit 4-2 – Initial Identification of Projects

Improvement Project Type	Potential Projects
Shoulder Improvements	Widen to 4' shoulder on Tolani Trail – Tovar Trail to Kachina Trail
Shoulder Improvements	Widen to 4' shoulder on Kachina Trail – Tolani Trail to Kona Trail
Shoulder Improvements	Widen to 4' shoulder on Pinon Trail – Kona Trail to Kachina Trail
Shoulder Improvements	Widen to 4' shoulder on Kachina Trail – Kachina Blvd. to Pinon Trail
Shoulder Improvements	Widen to 4' shoulder on Toho Trail – Pinon Trail to Kachina Trail
Unpaved Trail	Construct an unpaved trail along Tovar Trail – Tishepi Trail to Harrenburg Wash
Unpaved Trail	Construct an unpaved trail along the unauthorized social trail – Kona Trail to Harrenburg Wash
Unpaved Trail	Construct an unpaved trail around Harrenburg Wash – off of Pinon Trail
Unpaved Trail	Construct an unpaved trail from Kachina Village to Highlands Regional Trail
Unpaved Trail	Construct an unpaved trail along Pinon Trail – Kachina Trail to Tonalea Trail
Pathway / Sidewalk Improvements	Construct a pathway or sidewalk along Kachina Trail, Kachina Blvd to Pinon Trail
Sidewalk Construction	Construct a sidewalk along Kona Trail – Pinon Trail to Wakas Trail
Parking and Pullout Improvements	Improve the existing space south of the Village Land Shoppe into a parking or pullout area
Parking and Pullout Improvements	Improve the existing space north of the Village Land Shoppe into a parking or pullout area
Parking and Pullout Improvements	Construct pullouts for motor vehicles along Tovar Trail to view wildlife
Roundabout	Construct a roundabout at intersection of Kachina Trail and Kachina Blvd; the roundabout may serve as an entry monument into Kachina Village

5.0 PROGRAM OF PROJECTS

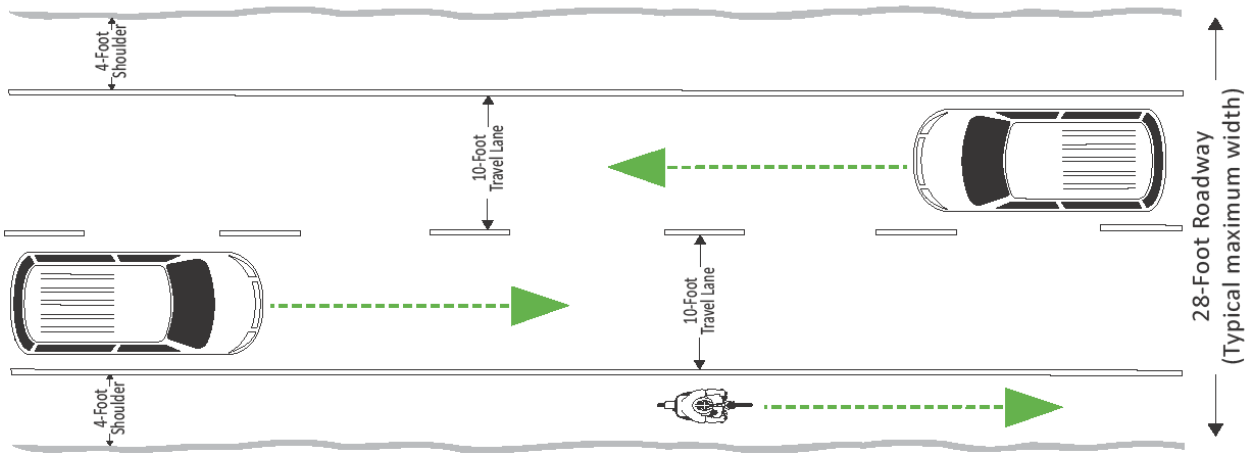
Fifteen improvement projects were identified for Kachina Village through the needs analysis, stakeholder input, and public involvement activities, as presented in Chapter 4. A public open house was held on September 17, 2009, to present and obtain feedback on the projects. Based on the input from that meeting and stakeholders, a program of projects was established for recommendation.

The 15 projects, with associated justifications, are summarized in **Exhibit 5-1**. The projects are divided into short, mid, and long term based on their complexity, community perspectives, and cost/funding. The projects are presented in the following categories: shoulder improvements, unpaved trails, sidewalks, parking and pullout improvements, and intersection improvements.

5.1 Shoulder Improvements

The roadways in Kachina Village are often traveled by pedestrians and bicyclists, but there is a lack of designated space for these users on the roadway. The program of projects includes recommendations for shoulder improvements to four-foot shoulders on both sides of the street, delineated by a solid white stripe, as depicted in **Exhibit 5-1** below. Pedestrians and bicyclists will be able to use this space without conflicting with vehicular traffic. **It is important to emphasize that overall street width should generally not exceed 28 feet, unless otherwise required. In addition, it is recommended that travel lanes be generally limited to ten feet**.

Exhibit 5-1 – Typical 4'Shoulder with White Stripe, and 10' Travel Lanes



5.2 Unpaved Trails

The program of projects includes recommendations for a network of unpaved trails. Through the public involvement process, people were able to identify trails and areas they frequently walked. In these

locations, an unpaved trail is appropriate to accommodate users while maintaining the characteristic of the natural surroundings. For cost-estimating purposes, it is assumed that the unpaved trails will be unpaved and six-feet wide. As trail projects are implemented, specifications may change as appropriate for local conditions.

5.3 Sidewalk Improvements

While the community generally does not support an extensive network of sidewalks in Kachina Village, the program of projects recommends extension of existing sidewalks in selected locations to improve pedestrian safety in areas of steep grades and higher traffic volumes.

5.4 Parking and Pullout Improvements

Kachina Village has numerous areas that are ideal for viewing wildlife. Many of these areas are along major roads or at major intersections in the community, which leads to potential conflicts for pedestrians, bicyclists, and motorists. During the public involvement process, areas were identified where pullouts or parking areas were needed to allow people to pull off of the road and view wildlife safely.

In addition, the public identified a need for park and ride lots if public transit is initiated in Kachina Village.

5.5 Intersection Improvements

The program of projects includes consideration of a roundabout at the intersection of Kachina Boulevard and Kachina Trail. The roundabout would improve conditions for pedestrians at this wide intersection.

5.6 Program of Projects

The locations of these projects are shown in **Exhibit 5-2**, and are mapped in **Exhibit 5-3.** Estimates of probable cost were developed for each project. Supporting detail for the estimates of probable cost is included in **Appendix B**.

Exhibit 5-2 – Program of Projects

Project No.	Road Name	Location	Type of Work	Estimate of Probable Cost	Project Purpose	Length	Comments
Short-Term Projects (0–5 years)							
1	Harrenburg Wash	Off of Pinon Trail	6' Unpaved Trail	$14,689	Trail improvements to create a trail around the Harrenburg Wash, beginning and ending at existing KVID parking area at Oraibi Ovi / Pinon Trail.	0.2 miles	Coconino County identified this trail to allow people to view the wildlife along Harrenburg Wash with little disturbance.
Mid-Term Projects (5–10 years)							
2	Tovar Trail	Tishepi Trail to Kachina Blvd.	6' Unpaved Trail	$80,788	Easement acquisition to create an unpaved multi-use pathway separated from the roadway.	1.1 miles	Tovar Trail experiences higher vehicular speeds; improvements to Tovar Trail will serve to connect to the proposed Highlands Regional Trail. A path separated from the road serves to create a designated area for pedestrians and bicyclists to travel to the Highlands Regional Trail. Cost estimate does not include any required easement or land acquisition costs.
3	Unauthorized social trail	Kona Trail to the Harrenburg Wash	6' Unpaved Trail	$29,377	Trail improvements and easement acquisition to formalize existing unauthorized social trail and connect trail to proposed trail along Harrenburg Wash (Improvement #1).	0.4 miles	Coconino County identified this trail as a connector trail between the Harrenburg Wash and Kona Trail. The trail is already frequently used by those living near the trailhead. Cost estimate does not include any required easement or land acquisition costs.

Exhibit 5-2 – Program of Projects (continued)

Project No.	Road Name	Location	Type of Work	Estimate of Probable Cost	Project Purpose	Length	Comments
Mid-Term Projects (5–10 years) (continued)							
4	Connection to (FUTS)	Kachina Village to FUTS	6' Unpaved Trail	$110,166	Trail improvements to connect Kachina Village to the FUTS. Requires coordination with land owners as plans are developed for existing 40-acre parcel located east of KVID Wetlands.	~1.5 miles (path is undeter-mined)	The public and Coconino County identified this trail as an appropriate location to connect the community to the FUTS. Cost estimate does not include any required easement or land acquisition costs.
5	Pinon Trail	Kachina Trail to Tonalea Trail	6' Unpaved Trail	$36,722	Trail improvements to construct an unpaved path north of the Pumphouse Wash, along Pinon Trail.	0.5 miles	Coconino County identified this section of Pinon Trail as heavily used by bicyclists and pedestrians. Additional grading/fill may be required, which are not reflected in estimate of probable cost.
6	Kona Trail	Pinon Trail to Wakas Trail	Construct 6' Sidewalk	$45,449	Extend the existing sidewalk up Kona Trail to Pinon Trail.	0.2 miles	Kona Trail was identified by the public as a roadway frequently used by pedestrians, bicyclists, and motor vehicles. The Kachina Village Area Plan, 2008 and the public identified Kona Trail as an acceptable location for a sidewalk to create a safer environment for pedestrians and bicyclists. Cost estimate does not include any required easement or land acquisition costs. Additional slope work (grading, fill, cut) may be required, which are not reflected in estimate of probable cost. Estimate of probable cost does not include storm drain extensions that may be required. Additional engineering analysis is required.

Exhibit 5-2 – Program of Projects (continued)

Project No.	Road Name	Location	Type of Work	Estimate of Probable Cost	Project Purpose	Length	Comments
Long-Term Projects (10–20 years)							
7	Kachina Trail	North of the Village Land Shoppe	Parking Improvements (20-space paved parking lot)	$54,863	Improve the existing space into a paved parking area to view wildlife in the Pumphouse Natural Area and to access Raymond County Park.	Undetermined	During the spring, wildlife enters the Pumphouse Natural Area and many motorists stop on the road to view them. Since there are no pullouts to accommodate those who stop, congestion along Kachina Trail becomes an issue. This parking area would provide access to Raymond County Park.
8	Tovar Trail	East of Pumphouse Wash Natural Area	Pullout Improvements (10-space unpaved parking lot)	$34,145	Construct pullouts for motor vehicles to pull out of travel lanes to view wildlife in the Pumphouse Natural Area.	Undetermined	During the spring, wildlife enters the Pumphouse Natural Area and many motorists stop on the road to view them. Since there are no pullouts to accommodate those who stop, congestion along Tovar Trail becomes an issue. Pullouts along this road with views of the Natural Area would alleviate that congestion. Estimate of probable cost does not include land acquisition costs.
9	Kachina Trail	South of the Village Land Shoppe	Parking Improvements (10-space unpaved parking lot)	$34,145	Improve the existing space into a parking area. Cost estimate assumes that the unpaved parking lot will consist of approximately 10 spaces.	2.46 acres	This parking lot was identified by the public as an acceptable location for a parking area to view the wildlife. This location might also be suitable for carpooling and transit services if provided. Estimate of probable cost does not include land acquisition costs.

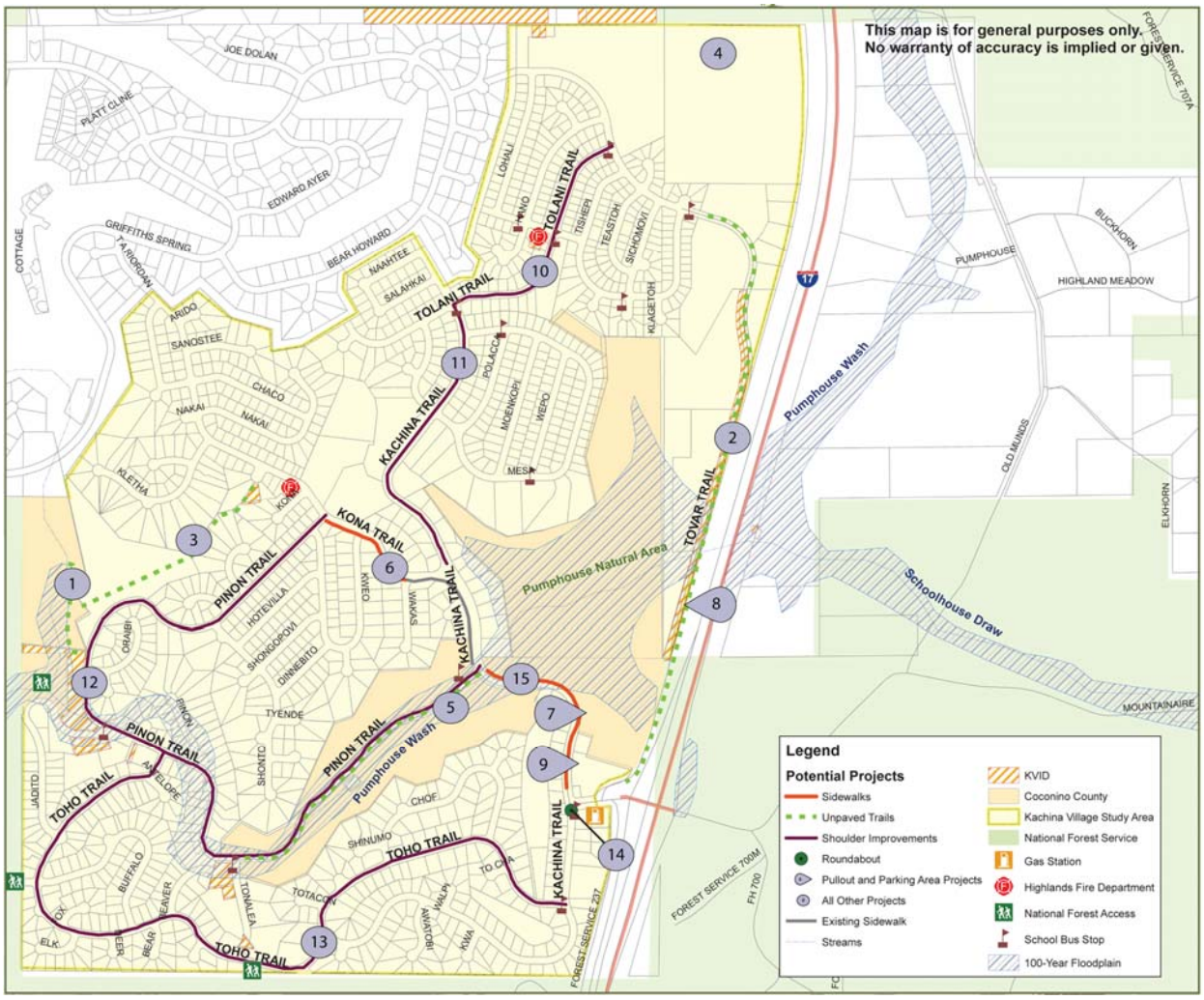
Exhibit 5-2 – Program of Projects (continued)

Project No.	Road Name	Location	Type of Work	Estimate of Probable Cost	Project Purpose	Length	Comments
Long-Term Projects (10–20 years) (continued)							
10	Tolani Trail	Tovar Trail to Kachina Trail	Construct 4' Shoulders	$106,747	Improve the roadway to a total of 28' wide to accommodate 10' travel lanes and a 4' white striped shoulder.	0.4 miles	Tolani Trail was identified by the public as a roadway frequently used by pedestrians. There are also three school bus stops along this route that children walk to. Shoulder improvements may reduce conflicts between pedestrians, bicyclists and motor vehicles.
11	Kachina Trail	Tolani Trail to Kona Trail	Construct 4' Shoulders	$133,434	Improve the roadway to a total of 28' wide to accommodate 10' travel lanes and a 4' white striped shoulder.	0.5 miles	Kachina Trail is a major road in Kachina Village, frequently traveled by vehicles, bicyclists, and pedestrians. Since this section of roadway is steep, shoulder improvements, as opposed to priority lanes, are a preferred way to designate an area for bicyclists and pedestrians to ride or walk safely. Shoulder improvements may require widening the roadway.
12	Pinon Trail	Kona Trail to Kachina Trail	Construct 4' Shoulders	$400,302	Improve the roadway to a total of 28' wide to accommodate 10' travel lanes and a 4' white striped shoulder.	1.5 miles	Pinon Trail was identified by the public as a roadway frequently used by pedestrians. There is one National Forest access point and access to two walking paths off of the roadway. Shoulder improvements will allow pedestrians to access trails within the National Forest and to connect to other trails in the community. Shoulder improvements will also reduce conflicts between pedestrians/bicyclists and motor vehicles.

Exhibit 5-2 – Program of Projects (continued)

Project No.	Road Name	Location	Type of Work	Estimate of Probable Cost	Project Purpose	Length	Comments
Long-Term Projects (10–20 years) (continued)							
13	Toho Trail	Pinon Trail to Kachina Trail	Construct 4' Shoulders	$373,615	Improve the roadway to a total of 28' wide to accommodate 10' travel lanes and a 4' white striped shoulder.	1.4 miles	Toho Trail was identified by the public as a roadway frequently used by pedestrians. There are two National Forest access points off Toho Trail. Shoulder improvements will allow pedestrians to access trails within the National Forest and would reduce conflicts between pedestrians/bicyclists and motor vehicles.
14	Kachina Trail at Kachina Blvd.	Intersection of Kachina Trail and Kachina Blvd.	Construct a single lane roundabout with pedestrian refuges	$250,000	Construct a single lane roundabout at the intersection of Kachina Blvd. and Kachina Trail.	-	The roundabout would serve to replace the current stop controlled intersection. The roundabout would include pedestrian accommodations (crosswalks, pedestrian refuges). The roundabout may be designed to serve as an entry monument into Kachina Village. Additional analysis is required to determine the size and geometry of the roundabout.
15	Kachina Trail	Kachina Blvd. to Pinon Trail	Construct 4' Shoulders Construct 6' Sidewalk	$163,058	Improve the roadway to include a 4' white-striped shoulder, a possible two-way center left turn lane, and a side pathway or sidewalk along Kachina Trail.	0.33 miles	Kachina Trail, between Kachina Blvd. and Pinon Trail, currently consists of bifurcated roadway segments. Shoulder and sidewalk improvements may be achieved in this segment by eliminating the bifurcated segment, and constructing a two-way center left turn lane and shoulder improvements.
Total Cost				$1,876,543			

Exhibit 5-3 – Map of Program of Projects



6.0 POTENTIAL FUNDING SOURCES

Funding for multimodal improvements and/or new facilities, including those recommended for construction in Kachina Village, can be identified from a variety of sources, including Federal, State, and private resources.

6.1 Federal Programs

Section 6.1 identifies potential federal funding sources for pedestrian improvement projects, which include the following and are discussed in detail below:

- Safe, Accountable, Flexible, Efficient Transportation Equity Act, a Legacy for Users (SAFETEA-LU)
- Surface Transportation Program (STP)
- Transportation Enhancement Activity (TE) Funds
- Highway Safety Improvement Program (HSIP)
- Federal Lands Highway Program (FLHP)
- State and Community Traffic Safety Program (Section 402)
- Section 5311 Non-urbanized Area Formula Program
- Metropolitan Planning Funds
- Transportation and Community and System Preservation Pilot Program (TCSP)
- Job Access and Reverse Commute Program (JARC)
- Federal Transit Capital, Urban, and Rural Funds
- Recreational Trails Program (RTP)
- Community Development Block Grants (CDBG)

SAFETEA-LU

On August 10, 2005, the President signed into law SAFETEA-LU. The legislation updated Titles 23 and 49 of the United States Code (U.S.C.) and built upon the significant changes made to the Federal transportation policy and programs by the 1991 Intermodal Surface Transportation Efficiency Act (ISTEA) and the 1998 Transportation Equity Act for the 21st Century (TEA-21). SAFETEA-LU is the largest surface transportation investment in our Nation's history; totaling $244.1 billion over a five year period (2005-2009).

There is available funding for pedestrian facility improvements from the following Federal programs under SAFETEA-LU.

Surface Transportation Program (STP)

The STP provides flexible funding that may be used by states and localities for projects on any Federal-aid highway, including the National Highway System (NHS), bridge projects on public roads, transit capital projects, and public bus terminals and facilities. The program ensures the consideration of bicyclists and pedestrians in the planning process and facility design by requiring ten percent of STP funding to be set aside for Transportation Enhancements (discussed on the following page), which can be spent on pedestrian-related improvements. The STP funds can be used for on-road facilities, off-road trails, construction of sidewalks, crosswalks, traffic calming projects, modification of sidewalks to comply with Americans with Disabilities (ADA) requirements, bicycle and pedestrian signals, parking, and other supplementary facilities. The STP is funded by 80 percent Federal matching funds and 20 percent state

matching funds. The STP has the broadest eligibility requirements, and therefore is considered by states and Metropolitan Planning Organizations (MPOs) as a primary source of funds for pedestrian projects. The STP is funded nationally at $32.5 billion through 2009 and is distributed based on lane-miles of Federal-aid highways, total vehicle miles traveled on those Federal-aid highways, and estimated contributions to the Highway Account of the Highway Trust Fund (HTF).

Transportation Enhancement Activity (TE) Funds

TE funds are apportioned to the states by formulas, based on amounts made available from the STP under Title 23 U.S.C. 104(b)(3). TE funds for the years 2006-2009 are ten percent of the sum of STP funds plus Equity Bonus funds apportioned through the STP, but cannot be less than the amount apportioned in Fiscal Year (FY) 2005. There are 12 eligible activities for TE funds, and of those 12 there are three that apply directly to pedestrian improvements:

- Provision of facilities for bicyclists and pedestrians
- Provision of safety and educational activities for pedestrians and bicyclists
- Preservation of abandoned railroad corridors (including conversion and use for pedestrian and bicycle trails)

Within these three eligible activities the TE funds can be used for a broad range of projects, including, but not limited to, paved shoulders, sidewalks, and both paved and unpaved pathways that primarily serve transportation uses. Projects using TE funds do not have to be located on Federal-aid highways, nor do they have to be construction activities. TE funds should be used on projects that relate to surface transportation and have typically been limited by states to construction projects, planning activities, and related publications rather than salaries and administrative costs. TE funds should not be used to fund projects that are part of the routine design of streets and highways. Instead, they should be used to retrofit poorly designed facilities and for projects that go above and beyond traditional highway designs and projects.

Highway Safety Improvement Program (HSIP)

HSIP is a Federal-aid funding program authorized by SAFETEA-LU to achieve a significant reduction in traffic fatalities and serious injuries on all public roads. The HSIP emphasizes a data-driven, strategic approach to improving highway safety that focuses on results. HSIP funds may be obligated for pedestrian and bicycle safety improvements on any public road or publicly owned pedestrian or bicycle pathway.

To obligate funds, a state must develop and implement a strategic highway safety plan, produce a program of projects or strategies to reduce safety problems, evaluate the plan on a regular basis. States with a Strategic Highway Safety Plan (SHSP) that meet the requirements of Title 23 U.S.C. 148 may obligate HSIP funds for projects on any public road or publicly owned bicycle and pedestrian pathway or trail. The term “highway safety improvement project” means a project described in the State strategic highway safety plan that corrects or improves a hazardous road location or feature, or addresses a highway safety problem. The term includes a project for one or more of the following:

- An improvement for pedestrian or bicyclist safety or safety of the disabled
- Construction of a traffic calming feature

- Installation and maintenance of signs (including fluorescent, yellow-green signs) at pedestrian-bicycle crossings and in school zones.

Federal Lands Highway Program (FLHP)

The FLHP provides funding for a coordinated program of public roads and transit facilities serving Federal and Indian lands. Pedestrian facilities are considered eligible projects if they are in conjunction with projects on Federal Lands Highways (Forest Highways, Indian Reservation Roads, Park Roads and Parkways, Refuge Roads, and Public Lands Highways). A total of $4.5 billion in funds is available through 2009. These funds can be used towards transportation planning, research, engineering, and construction of highways, roads, parkways, and transit facilities. FLHP Funds are typically earmarked.

State and Community Traffic Safety Program (Section 402)

The purpose of the Section 402 program is to assist states and communities with development and implementation of highway safety programs designed to reduce traffic crashes, deaths, injuries, and property damage. Authorized funds for 2009 are $235 million. The funds are allocated based 75 percent on road miles and 25 percent on population. The funds may be used for highway safety projects and programs including those that improve pedestrian safety. Some of these programs include training courses for traffic engineers, safety-related events, enforcement, and education materials.

Section 5311 Non-urbanized Area Formula Program

This program (Title 49 U.S.C. 5311) provides formula funding to states for the purpose of supporting public transportation in areas with populations less than 50,000 people. Eighty percent of the statutory formula is based on the non-urbanized population of the States. Twenty percent of the formula is based on land area. No State may receive more than five percent of the amount apportioned for land area. In addition, Federal Transit Administration (FTA) adds amounts apportioned based on non-urbanized population according to the growing States formula factors of 49 U.S.C. 5340 to the amounts apportioned to the States under the Section 5311 program.

Funds may be used for capital, operating, and administrative assistance to state agencies, local public bodies, Indian tribes, and nonprofit organizations, and operators of public transportation services. The state must use 15 percent of its annual apportionment to support intercity bus service, unless the Governor certifies, after consultation with affected intercity bus providers, that these needs of the state are adequately met. Projects to meet the requirements of the ADA, the Clean Air Act, or bicycle access projects, may be funded at 90 percent Federal match. The maximum FTA share for operating assistance is 50 percent of the net operating costs.

Metropolitan Planning Funds

The purpose of the Metropolitan Planning Funds is to encourage planning, research, and technology transfer for transportation planning and improvements. The funds can be used for pedestrian-related plans and improvements that are part of the metropolitan transportation planning process. The improvements should be included in the Statewide Long Range Transportation Plan and the Transportation Improvement Program. The funds are one percent of the funds States receive for the Interstate Maintenance, NHS, STP, Congestion, Management Air Quality (CMAQ), and Bridge programs. The funds are allocated based on the population of urbanized areas in each state.

Transportation and Community and System Preservation Pilot Program (TCSP)

The TCSP is a competitive grant program designed to support exemplary or innovative projects that show how transportation projects and plans, community development, and preservation activities can be integrated to create communities with a higher quality of life. The annual grant program is administered by the FHWA, in partnership with the FTA and Environmental Protection Agency (EPA), and may be used to fund State, MPO, or local government agencies. Eligible projects that relate to pedestrian improvements include traffic calming, and a broad range of pedestrian facility projects. These projects can act as a feature in other projects that address larger land use and transportation issues. A total of $270 million is funded through 2009. These funds must be equitably distributed to a diversity of populations and geographic regions. A local match is required in accordance with Title 23 U.S.C. 120(b).

Job Access and Reverse Commute Program (JARC)

The JARC program provides grants to local governments and nonprofit organizations to develop transportation services to connect welfare recipients and low-income persons to employment and support services. Job Access projects are targeted at developing new or expanded transportation services such as shuttles, vanpools, new bus routes, connector services to mass transit, and guaranteed ride home programs for welfare recipients and low-income persons. Reverse Commute projects provide transportation services to suburban employment centers from urban, rural and other suburban locations for all populations. Eligible applicants include private nonprofit organizations, State or local governmental authority, and operators of public transportation services including private operators of public transportation services. The JARC program may include activities that support pedestrian and bicycle-related facilities as long as they are related to transit and commuting as opposed to recreation purposes. Available statewide funding for FY 2009 for rural areas (populations less than 50,000 people) is $658,896. Available statewide funding for FY 2009 for small urbanized areas (populations between 50,000 and 199,999 people) is $369,378. All projects funded under this program must be derived from a locally developed, coordinated public transit-human services transportation planning process.

Federal Transit Capital, Urban, and Rural Funds

Federal Transit Capital, Urban, and Rural Funds (Title 49 U.S.C. 5311) provides formula funding to states for the purpose of supporting public transportation in areas with a population less than 50,000 people. The statutory formula is 80 percent based on the non-urbanized population of the states, and 20 percent is based on land area. No state may receive more than five percent of the amount apportioned for land area. In addition, the FTA adds amounts apportioned based on non-urbanized population according to the growing states formula factors of Title 49 U.S.C. 5340 to the amounts apportioned to the states under the Section 5311 program.

Funds may be used for capital, operating, and administrative assistance to state agencies, local public bodies, Indian tribes, nonprofit organizations, and operators of public transportation services. The state must use 15 percent of its annual apportionment to support intercity bus service, unless the Governor certifies, after consultation with affected intercity bus providers, that these needs of the state are adequately met.

The maximum Federal share for capital and project administration is 80 percent (except for projects to meet the requirement of the ADA, the Clean Air Act, or bicycle access projects, which may be funded at

90 percent). The maximum Federal share for operating assistance is 50 percent of the net operating costs. The local share is 50 percent, which shall come from an undistributed cash surplus, a replacement or depreciation cash fund or reserve, or new capital.

Recreational Trails Program (RTP)

The RTP provides funds to states to develop and maintain recreational trails and trail-related facilities for both non-motorized and motorized recreational trail uses. Each state administers its own program. States must use 30 percent of their funds for motorized trail uses, 30 percent for non-motorized trail uses, and 40 percent for diverse trail uses. The RTP is intended to fund recreational trails and may not be used to improve roads for general passenger vehicle use or to provide shoulders or sidewalks along roads. A total of $370 million is funded through 2009. The funds can be used for pedestrian, equestrian, bicycling, and non-motorized activities.

Community Development Block Grants (CDBG)

The CDBG program is administered by the U.S. Department of Housing and Urban Development (HUD) to assist low- to moderate-income neighborhoods. Residents of the neighborhood work closely with city staff to develop a plan for their awarded funds. A neighborhood can choose to spend CDBG monies on installation and repair of curbs, gutters, sidewalks, and installation of streetlights.

6.2 State Programs

The following section discusses Arizona State funding sources for pedestrian improvement projects, which include the following:

- State Sales Tax
- Local Transportation Assistance Fund (LTAF)
- Heritage Fund Grants
- Highway User Revenue Funds (HURF)

The funds are generated from the Arizona Lottery, state taxes, and a percentage of monies from other state funding sources that do not typically fund pedestrian projects. Each state resource is discussed in detail below.

State Sales Tax

The state sales tax revenues, as with local jurisdiction sales tax revenues, are generally budgeted to high priority programs and needs that generally have not included bicycle and pedestrian improvements; however, these revenues are available for bicycle and pedestrian facilities and programs.

Local Transportation Assistance Fund (LTAF)

LTAF funds are generated by the Arizona Lottery and must be used for transit purposes in all jurisdictions. These funds may be available for the construction of sidewalks, bicycle racks, and other facilities that directly relate to transit use. Each county, city, or town in Arizona may apply for and receive a portion of the $23 million the Lottery annually contributes to the LTAF. The monies are used for a variety of transportation-related purposes, many of which improve pedestrian facilities, including street maintenance and improvements, street lighting, transportation service for the elderly and disabled, curbs, gutters, and sidewalks.

Annually, each municipality may use up to ten percent of its LTAF monies, if matched with private monies for cultural, educational, historical, or recreational programs.

Heritage Fund Grants

Arizona voters created the Heritage Fund in 1990, designating up to $20 million a year from Lottery ticket sales for the conservation and protection of the state's wildlife and natural areas. The allocation each year is split equally between Arizona State Parks and the Arizona Game and Fish Department. Grants from the Heritage Fund support a variety of projects in each of Arizona's 15 counties.

The following are pedestrian-related projects that the Arizona Game and Fish Department use Heritage Funds toward:

- New or enhanced wildlife-oriented recreational access (motorized or non-motorized) onto public or State Trust lands previously inaccessible to the public.
- Obtaining perpetual or other long-term rights-of-way to secure public access for wildlife-oriented recreation where it may be jeopardized by potential land development or other land status changes.
- Public works projects providing new or enhanced recreational access opportunities on or to public lands for persons with disabilities.
- Public works projects providing new or enhanced recreational access opportunities on or to public lands through improved design and construction methods.
- Education and information outreach pertaining to public access in Arizona, including ethical and responsible use of private and public lands, and opportunities for volunteerism.
- Realignments of existing access routes to protect sensitive habitat areas.
- Projects that address fugitive dust issues to maintain or enhance motorized vehicular access.

The following are pedestrian-related projects that the Arizona State Parks use Heritage Funds toward:

- Hiking trails
- Picnic ramadas
- Landscaping of community parks
- Historic preservation

Research projects are not applicable for this funding source.

Highway User Revenue Funds (HURF)

The State of Arizona taxes motor fuels and collects a variety of fees relating to the registration and operation of motor vehicles on the public highways of the state. These collections include gasoline and use fuel taxes, motor carrier taxes, vehicle license taxes, motor vehicle registration fees, and other miscellaneous fees. These revenues are deposited in the Arizona Highway User Revenue Fund (HURF) and are then distributed to the cities, towns and counties and to the State Highway Fund. These taxes represent the primary source of revenues available to the state for highway construction and improvements and other related expenses.

HURF funds contribute to a jurisdictions' general funding source for highway improvements. Highway improvement projects vary, but many include provisions for pedestrians. Although the HURF is not

specific to pedestrian improvements, jurisdictions can use the money on highway projects to improve pedestrian safety.

6.3 Summary of Potential Funding Sources

Exhibit 6-1 lists each proposed project, and correlates them with potential funding sources described in sections 6.1 and 6.2. It should be noted that this is not an exhaustive list of potential funding sources. As projects are developed, additional funding sources should be investigated and applicability and availability of funding sources listed below must be verified.

Exhibit 6-1 – Potential Funding Sources for Kachina Village Projects

Project No.	Project Type	Potential Funding Sources	
1-5	Unpaved Trails	• STP • TE	• RTP • Heritage Fund Grant
6	Construct Sidewalk	• STP • TE	• CDBG • LTAF
7-9	Parking and Pullout Improvements	• STP • FTA • TCSP • JARC	• Federal Transit Capital, Urban, and Rural Funds • LTAF
10-13	Construct 4’ Shoulders	• STP • TE	• TCSP • LTAF
14	Construct a Single Lane Roundabout	• STP • HSIP • TCSP	• CDBG • LTAF
15	Construct 4’ Shoulders	• STP • TE • TCSP	• CDBG • LTAF

7.0 SUMMARY OF CONCLUSIONS

Coconino County, Arizona, submitted a funding application to the ADOT PARA (Planning Assistance for Rural Areas) Program to conduct the Kachina Village Multimodal Transportation Study. ADOT subsequently selected the application for funding.

Objectives of the Kachina Village Multimodal Transportation Study were:

- Document current and identify needs relating to pedestrian, bicycle, and transit mobility.
- Summarize current winter maintenance practices and summarize sources of pollution that may be contributing to the potential degradation of the wetlands. Recommend BMPs for transportation maintenance crews and resource managers to limit pollutants from entering the wetland system.
- Recommend a program of projects that addresses identified multimodal needs and deficiencies and improves multimodal mobility and safety conditions in Kachina Village. Provide Coconino County with a planning document that can be used to help secure funding for implementation of the multimodal improvements. The program will be organized into short-term (0 to 5 years), mid-term (5 to 10 years), and long-term (10 to 20 years) projects.

Picture of I-17 interchange looking east.
Source: Kimley-Horn and Associates, Inc.

Summary recommendations for each of the above objectives are summarized below.

7.1 Summary of Needs Relating to Pedestrian, Bicycle and Transit Mobility

Pedestrians and Bicycles

Analysis of responses from the public open house question form shows that the majority of pedestrians in Kachina Village walk for recreational purposes.

The roads that were most commonly identified by residents as those that they walk or bicycle on are: Kachina Trail, Toho Trail, and Pinon Trail. Other roads identified include Tovar Trail, Beaver Trail, Tolani Trail, Tishepi Trail, Naahtee Trail, and Kona Trail.

- A general need to improve pedestrian and bicycle accommodation on Kachina Village roadways was identified. This may be achieved through improved shoulders, and/or addition of striping in appropriate areas. A need for improved shoulders was identified by the public on the question form.

- Sidewalks, with exception in limited areas, are generally not desired by the community because they want to maintain the rural character of the community.
- Steep grades and topography have created a few locations where it is difficult to see pedestrians on the road.
- There are several informal "unauthorized" trails in the community. These are of concern because they have not been properly designed or located, and may contribute to erosion and ecological damage.
- A general need exists to improve pedestrian connectivity throughout the community. This may include proper construction of authorized trails, and improved pedestrian accommodation on the roads.
- There is a need to identify connections to the FUTS. This was commonly identified as a need by members of the public on the public question form.

Public Transit

- Members of the public identified a need for transit service to Flagstaff from Kachina Village. Park and ride lots were identified as the most viable option, considering the circuitous layout of the community makes regular transit inefficient, leading to long trip times.
- If funding is identified for public transit to Flagstaff, park and ride lots should be identified.

Roadways

- TAC input is that a lack of pullouts creates congestion on Tovar Trail and Kachina Trail when drivers stop on those roads to view the elk. No comments were received about this issue from members of the public.
- TAC input is that congestion is experienced at the intersection of Kachina Trail and Pinon Trail due to the parked cars, motor vehicle and pedestrian traffic during peak hours.
- According to data collected by Coconino County, speeding occurs on several roads within the community; speeding was a contributing factor for a significant percentage of traffic crashes.
- A need to improve training of snowplow operators was identified by multiple members of the public. Several comments were submitted regarding snow berms across driveways and damage to personal property caused by the snowplows.

A summary of Multimodal Transportation Opportunities and Constraints is included in **Exhibit 7-1**.

Exhibit 7-1 – Summary of Multimodal Transportation Opportunities and Constraints

Multimodal Element	Opportunities	Constraints
Pedestrians and Bicycles	Existing trails can be connected to create a community-wide trail network. "Unauthorized trails" can be formalized and properly sited and designed. Activity nodes in the community (Raymond County Park, wetlands, Pic-n-Run, and Pumphouse Wash) can be connected with trail extensions. Consideration may be given to modifying the culvert that crosses under I-17, adjacent to Tovar Trail, for use as a pedestrian crossing to the east side of I-17 and a connection to Mountainaire. Raymond County Park expansion plans include trails that connect to the sidewalk on Kachina Trail and to the proposed urban trail on Pinon Trail. An urban trail on Pinon Trail could potentially connect to Harrenburg Wash. The existing sidewalk on Kona Trail could be extended.	Trail easements would need to be acquired to create a connecting trail system in Kachina Village. Any pedestrian crossings off of I-17 would require coordination and approval from ADOT. Sidewalks may detract from the community's rural character.
Roadways	Most roads in Kachina Village experience relatively low traffic volumes, which is conducive to safety and comfortable use of roads by bicycles. Shoulder widening may be considered to provide bicycle lanes, and would provide wider roads in which snow can be stored during winter roadway maintenance operations. Traffic calming techniques may be considered to reduce vehicle speeds. TAC input is that raised elements (e.g. speed tables) should not be considered due to winter maintenance concerns.	During snowplowing, berms are created along streets in areas used by pedestrians because there is no other place to put the snow due to lack of shoulders. Most roads in Kachina Village range from 24' to 28' wide. With exception in limited locations, roads in Kachina Village are too narrow to install a dedicated bicycle lane without accompanying shoulder widening. Shoulder widening may contribute to increased vehicle speeds, which is counterproductive to improving conditions for bicycles and pedestrians. Traffic calming techniques must consider snow removal techniques. Unseen sharp edges could damage a plow. Cinders that remain on the road after snowmelt create slippery conditions for pedestrians and bicyclists.

Exhibit 7-1 – Summary of Multimodal Transportation Opportunities and Constraints (continued)

Multimodal Element	Opportunities	Constraints
Public Transit	There are a few parking areas located in Kachina Village that could be converted to park and ride lots that would support public transit service to/from Kachina Village and Flagstaff.	Lack of bike lockers in the Raymond County Park parking lot. Using the Raymond County Park parking lot as a park and ride lot may not attract drivers since most residents would have to drive to reach the parking lot. It is difficult to entice drivers to get out of their cars and wait for a bus when they are already in their cars.

7.2 Summary of Winter Maintenance Best Management Practice Recommendations

An objective of the study is to recommend BMP recommendations for winter roadway maintenance operations that minimize impacts to wetlands. The recommended BMPs are a result of the analysis conducted during the course of the study and from stakeholder and public input received at public open house meetings held in May and September 2009.

Input received at the public open house meetings expressed preference for the continued use of snowplowing and cinders, as compared to the use of chemical additives. Public input and perspectives are that chemical additives may pose a greater threat to the local wetland system than the naturally occurring cinders. However, many at the public meeting expressed concern that the cinders threaten the wetland system as they are washed from the roadside and enter the washes through runoff. Another expressed concern is that cinders left on the side of the road and/or on sidewalks contribute to pedestrians walking in the roadway.

Considering stakeholder, TAC, and public input and perspectives, the following management practices are recommended for consideration.

Snowplows and Cinders

Snowplows are an efficient means to remove snow from the roads. Although the community has expressed input about property damage resulting from snowplows, it is anticipated that use of snowplowing will continue in Kachina Village.

Naturally occurring cinders are also currently used in Kachina Village to provide traction on slippery roads. A major concern of Kachina Village stakeholders and the public is that significant cinder accumulation and roadside deposition results throughout the course of the winter, and cinders remain along the roadside after winter maintenance practices have ceased for the season. Deposition of cinders in drainage channels and wetlands was evident during the June 2009 field reconnaissance at the intersection of Kachina Trail and Pinon Trail. This intersection is not only where two of the Kachina Village's main roads intersect, but also where Pumphouse Wash wetlands narrows down considerably as it flows southwest through Kachina Village. Roadway runoff from the surrounding higher points of Kachina Village carry with it cinders used during winter storms. The deposition of cinders into Pumphouse Wash appears to be altering the drainage pattern near the existing roadway crossing.

RECOMMENDATION: Continue to employ snowplows and cinders as acceptable winter storm management techniques. The use of chemical additives to road surfaces is not desired by the local residents. Additional maintenance practices are recommended below to mitigate cinders deposition.

Roadside Cleaning

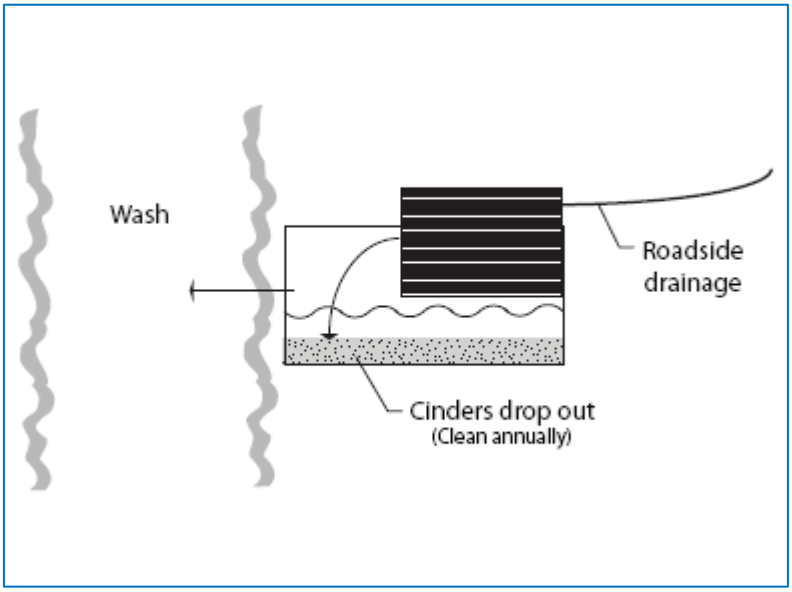
As mentioned above, a major concern of Kachina Village stakeholders and the public is that significant cinder accumulation results throughout the course of the winter, and remain along the roadside after winter maintenance practices have ceased for the season.

RECOMMENDATION: Identify feasible techniques to remove roadside cinders each spring. Removal of roadside cinders will help to prevent cinders from entering the wetlands. This can potentially be completed through use of suction trucks, street sweepers, or graders.

In addition, the existing box culvert system associated with Kachina Trail and Pumphouse Wash should be routinely cleaned so that all box 'cells' are functioning. This may require coordination with the U.S. Army Corps of Engineers to determine the need for a Clean Water Act permit. Depending on the magnitude of work within waters of the U.S., these activities may qualify under a Nationwide Permit Number 3. Maintenance.

Trap Drain and Drainage Study

Kachina Village is surrounded by washes and wetlands that attract a variety of wildlife to the area. Maintaining the wildlife and the health of the wetlands and washes was noted by the public and stakeholders as a priority. Stakeholders had a number of concerns in regards to what factors were impacting the wetland and washes, including cinders carried by runoff and culverts that are blocked by debris. It is recommended that a drainage study be conducted to examine the drainage patterns in Kachina Village and to determine the extent of the impacts created by cinder buildup in the wetlands and washes.



Conceptual Trap Drain System

A possible concept to evaluate in the study is the use of a sediment trap or basin. A sediment trap is a filter at the end of a drainage channel where runoff is guided. The trap filters the sediment from the runoff water and allows the water to pass into the wetlands and retains the sediment. The filter would have to be cleaned annually or whenever excessive buildup occurs to ensure that the system maintains its function. A sediment basin works in a similar fashion, but instead of using a filter, a basin is constructed where the drainage channel enters the wetland or wash. The basin acts as a barrier to slow runoff and naturally separate sediment before the water enters the wetland or wash.

The drainage study should also include an evaluation of the existing box culverts that connect to the wetlands and washes, particularly the bridge on Kachina Trail, just before the intersection with Pinon Trail. Stakeholders observed that a few of the culvert cells were blocked by debris and that the other cells were inundated with water. Stakeholders expressed concern that the blocked cells may potentially alter drainage patterns. A drainage study would be required to determine the cause of the blocked cells, as well as any mitigation required.

RECOMMENDATION: Conduct a drainage study to evaluate the cause of blocked cells as well as any mitigation required. The drainage study should evaluate the feasibility and effectiveness of a sediment basin.

The drainage study should consider constructing a trap drain system at all major roadside drainage locations to capture cinders before entering local drainages. These traps should be cleaned out yearly to remove cinders.

A summary of Environmental Best Management Practices is included in **Exhibit 7-2**.

Exhibit 7-2 – Winter Maintenance Environmental Best Management Practices

Type of BMP	Recommendation	Comments
Winter Maintenance Improvements	Continue the use of snowplows to clear the snow and cinders to create traction.	The community desired the continued use of current maintenance practices, including the use of cinders since as they perceive it to be the least harmful to the washes and natural environment.
Winter Maintenance Improvements	Clean the roadsides after other winter maintenance practices have ceased for the season to remove cinders before they enter the wash system.	The community has expressed concerns about snowmelt in the spring, which carries and deposits cinders into the surrounding washes. Removing the cinders once snow has ceased for the season would prevent cinders from entering the washes.
Drainage Study	Conduct a drainage study to determine how the drainage system is impacted by cinders, runoff, snow play, and development. Consideration of a trap drain system should be a major element of the study.	The community has expressed concerns about snowmelt in the spring, which carries and deposits cinders into the surrounding washes.

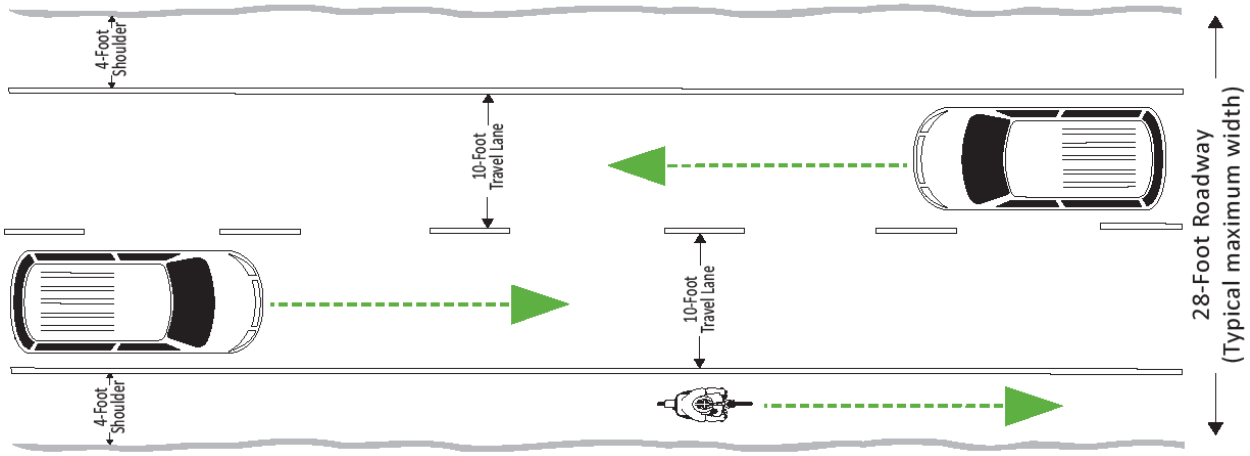
7.3 Recommended Program of Projects

Fifteen improvement projects were identified for Kachina Village through the needs analysis, stakeholder input, and public involvement activities. The 15 projects, with associated justifications, are summarized in **Exhibit 7-4**. The projects are divided into short, mid, and long term based on their complexity, community perspectives, and cost/funding. The projects are presented in the following categories: shoulder improvements, unpaved trails, sidewalks, parking and pullout improvements, and intersection improvements.

Shoulder Improvements

The roadways in Kachina Village are often traveled by pedestrians and bicyclists, but there is a lack of designated space for these users on the roadway. The program of projects includes recommendations for shoulder improvements to four-foot shoulders on both sides of the street, delineated by a solid white stripe, as depicted in **Exhibit 7-3** below. Pedestrians and bicyclists will be able to use this space without conflicting with vehicular traffic. **It is important to emphasize that overall street width should generally not exceed 28 feet, unless otherwise required. In addition, it is recommended that travel lanes be generally limited to ten feet**.

Exhibit 7-3 – Typical 4'Shoulder with White Stripe, and 10' Travel Lanes



Sidewalk Improvements

While the community generally does not support an extensive network of sidewalks in Kachina Village, the program of projects recommends extension of existing sidewalks in selected locations to improve pedestrian safety in areas of steep grades and higher traffic volumes.

Unpaved Trails

The program of projects includes recommendations for a network of unpaved trails. Through the public involvement process, people were able to identify trails and areas they frequently walked. In these locations, an unpaved trail is appropriate to accommodate users while maintaining the characteristic of the natural surroundings. For cost-estimating purposes, it is assumed that the unpaved trails will be unpaved and six-feet wide. As trail projects are implemented, specifications may change as appropriate for local conditions.

Parking and Pullout Improvements

Kachina Village has numerous areas that are ideal for viewing wildlife. Many of these areas are along major roads or at major intersections in the community, which leads to potential conflicts for

pedestrians, bicyclists, and motorists. During the public involvement process, areas were identified where pullouts or parking areas were needed to allow people to pull off of the road and view wildlife safely.

In addition, the public identified a need for park and ride lots if public transit is initiated in Kachina Village.

Intersection Improvements

The program of projects includes consideration of a roundabout at the intersection of Kachina Blvd. and Kachina Trail. The roundabout would improve conditions for pedestrians at this wide intersection.

Program of Projects

The 15 recommended projects are listed in **Exhibit 7-4.** Estimates of probable cost were developed for each project. The locations of projects are shown in **Exhibit 5-3**.

Exhibit 7-4 – Program of Projects

Project No.	Road Name	Location	Type of Work	Estimate of Probable Cost	Project Purpose	Length
Short-Term Projects (0–5 years)						
1	Harrenburg Wash	Off of Pinon Trail	6' Unpaved Trail	$14,689	Trail improvements to create a trail around the Harrenburg Wash, beginning and ending at existing KVID parking area at Oraibi Ovi / Pinon Trail.	0.2 miles
Mid-Term Projects (5–10 years)						
2	Tovar Trail	Tishepi Trail to Kachina Blvd.	6' Unpaved Trail	$80,788	Easement acquisition to create an unpaved multi-use pathway separated from the roadway.	1.1 miles
3	Un-authorized social trail	Kona Trail to the Harrenburg Wash	6' Unpaved Trail	$29,377	Trail improvements and easement acquisition to formalize existing unauthorized social trail and connect trail to proposed trail along Harrenburg Wash (Improvement #1).	0.4 miles
4	Connection to FUTS	Kachina Village to FUTS	6' Unpaved Trail	$110,166	Trail improvements to connect Kachina Village to the FUTS. Requires coordination with land owners as plans are developed for existing 40-acre parcel located east of KVID Wetlands.	~1.5 miles (path is undetermined)
5	Pinon Trail	Kachina Trail to Tonalea Trail	6' Unpaved Trail	$36,722	Trail improvements to construct an unpaved path north of the Pumphouse Wash, along Pinon Trail.	0.5 miles

Exhibit 7-4 – Program of Projects (continued)

Project No.	Road Name	Location	Type of Work	Estimate of Probable Cost	Project Purpose	Length
Mid-Term Projects (5–10 years) (continued)						
6	Kona Trail	Pinon Trail to Wakas Trail	Construct 6' Sidewalk	$45,449	Extend the existing sidewalk up Kona Trail to Pinon Trail.	0.2 miles
Long-Term Projects (10–20 years)						
7	Kachina Trail	North of the Village Land Shoppe	Parking Improve-ments (20-space paved parking lot)	$54,863	Improve the existing space into a paved parking area to view wildlife in the Pumphouse Natural Area and to access Raymond County Park.	Undetermined
8	Tovar Trail	East of Pump-house Wash Natural Area	Pullout Improve-ments (10-space unpaved parking lot)	$34,145	Construct pullouts for motor vehicles to pull out of travel lanes to view wildlife in the Pumphouse Natural Area.	Undetermined
9	Kachina Trail	South of the Village Land Shoppe	Parking Improve-ments (10-space unpaved parking lot)	$34,145	Improve the existing space into a parking area. Cost estimate assumes that the unpaved parking lot will consist of approximately 10 spaces.	2.46 acres
10	Tolani Trail	Tovar Trail to Kachina Trail	Construct 4' Shoulders	$106,747	Improve the roadway to a total of 28' wide to accommodate 10' travel lanes and a 4' white-striped shoulder.	0.4 miles
11	Kachina Trail	Tolani Trail to Kona Trail	Construct 4' Shoulders	$133,434	Improve the roadway to a total of 28' wide to accommodate 10' travel lanes and a 4' white-striped shoulder.	0.5 miles

Exhibit 7-4 – Program of Projects (continued)

Project No.	Road Name	Location	Type of Work	Estimate of Probable Cost	Project Purpose	Length
Long-Term Projects (10–20 years) (continued)						
12	Pinon Trail	Kona Trail to Kachina Trail	Construct 4' Shoulders	$400,302	Improve the roadway to a total of 28' wide to accommodate 10' travel lanes and a 4' white-striped shoulder.	1.5 miles
13	Toho Trail	Pinon Trail to Kachina Trail	Construct 4' Shoulders	$373,615	Improve the roadway to a total of 28' wide to accommodate 10' travel lanes and a 4' white-striped shoulder.	1.4 miles
14	Kachina Trail at Kachina Blvd.	Inter-section of Kachina Trail and Kachina Blvd.	Construct a single lane roundabout with pedestrian refuges	$250,000	Construct a single-lane roundabout at the intersection of Kachina Blvd. and Kachina Trail.	-
15	Kachina Trail	Kachina Blvd. to Pinon Trail	Construct 4' Shoulders Construct 6' Sidewalk	$163,058	Improve the roadway to include a 4' white-striped shoulder, a possible two-way center left turn lane, and a side pathway or sidewalk along Kachina Trail.	0.33 miles
Total Cost				**$1,876,543**		

APPENDIX A – SUMMARY OF RESPONSES SUBMITTED ON PUBLIC OPEN HOUSE QUESTION FORM

Summary of Responses Submitted on Public Open House Question Form

Question	Responses
Which streets do you most commonly cycle or walk along?	▪ Kachina Trail (7 responses) ▪ Toho (5 responses) ▪ Pinon Trail (4 responses) ▪ Tovar Trail (2 responses) ▪ Beaver Trail (2 responses) ▪ Tolani (3 responses) ▪ Tishepi Trail (1 response) ▪ Naahtee (1 response) ▪ Kona Trail (1 response)
How often do you cycle or walk on or alongside roads in Kachina Village?	▪ Once a week or less (4 responses) ▪ 2-3 times a week (2 responses) ▪ More than 3 times a week (2 responses) ▪ Never (0 responses)
What is the purpose of your walking or cycling trips on Kachina Village roads?	▪ Recreation (9 responses) ▪ Exercise (6 responses) ▪ Social (3 responses) ▪ Travel to Work (2 responses) ▪ Errands (2 responses)
Generally, when you walk on Kachina Village roads, what is your destination?	▪ No specific destination, I walk for exercise and recreation (8 responses) ▪ National Forest Access Points (4 responses) ▪ Store/shopping (2 responses) ▪ Work (1 response) ▪ Community Park (1 response) Other: ▪ Would walk to a public bus stop if there was one (1 response)
Please describe any specific bicycling or pedestrian safety concerns that you may have regarding roads in Kachina Village.	General categories of responses include: ▪ Need improved shoulders (4 responses) ▪ Need walkways or sidewalks (3 responses) ▪ Loose gravel/cinders on paved roads (2 responses) ▪ Traffic speeds are too high (1 response) ▪ Poor sight distance on curves (1 response)
If you don't cycle or walk in Kachina Village, what is your reason for not cycling or walking on or along Kachina Village roads?	▪ Destination too far (1 response) ▪ Too dangerous to cycle on I-17 (1 response) ▪ Other (1 response)

Please describe the most important bicycle, pedestrian, or transit needs in Kachina Village.	▪ Transit service to Flagstaff (5 response) ▪ Connect trails to Flagstaff Urban Trail System (3 responses) ▪ Sidewalks/pathways (5 responses) ▪ Shoulders/bicycle lanes (3 responses) ▪ Connect trail system within Kachina Village, access to Forest Service trails (3 responses) ▪ Safety at school bus stops (1 response)
Please list or describe types of bicycle, pedestrian, or transit improvements that you would support (i.e. shoulder improvements, painted lines on roads, sidewalks, multi-use paths, trails, park and ride lots).	▪ Shoulder improvements (6 responses) ▪ Park and ride lots (3 responses) ▪ Painted lines on roads (3 responses) ▪ Public transit service (3 responses) ▪ Pathways and connections (4 responses) ▪ Sidewalks (3 responses) ▪ Improve Raymond Park roads (1 response) ▪ Roadway sweeping (1 response) Specific projects: ▪ Connection by public transit to Flagstaff (2 responses) ▪ Connect Pinon Greenway to trail through Pumphouse Meadow (1 response)
Please list or describe types of bicycle, pedestrian, or transit improvements that you would not support (i.e. shoulder improvements, painted lines on roads, sidewalks, multi-use paths, trails, park and ride lots).	▪ Painted lines (2 responses) ▪ Sidewalks (5 responses) ▪ Curbs (1 response) ▪ Park and ride lots (paved lots of any kind) (1 response) ▪ Multi-use paths (1 response)
If funding were obtained for bicycle, pedestrian, or transit improvement, which of the following should be used to prioritize the construction of pedestrian, bicycle, or transit improvements?	Safety – improve unsafe areas first: ▪ #1 priority (1 response) ▪ #2 priority (0 responses) ▪ #3 priority (1 response) ▪ Checked (3 responses) Complete missing pieces of sidewalk/trails/pathways: ▪ #1 priority (0 responses) ▪ #2 priority (2 responses) ▪ #3 priority (0 responses) ▪ Checked (2 responses) Provide connections – facilitate pedestrian travel to and throughout the community: ▪ #1 priority (1 response) ▪ #2 priority (0 responses) ▪ #3 priority (1 response) ▪ Checked (5 responses)

Winter snowplowing of Kachina Village roads is prioritized based on roadway classification. Main roads are plowed first, followed by side streets and cul-de-sacs. The County's goal is to have all roads open within a 24-hour period. However, clearing of roads sometimes may take longer following heavy snowfall. Please describe your level of satisfaction with snowplowing efforts.	▪ Excellent, no changes are needed (2 responses) ▪ Snowplowing can sometimes take a long time, but I can be patient (5 responses) ▪ Snowplowing frequently takes too long; changes to current practices are needed (0 responses) Other: ▪ Several comments were submitted related to snow removal, damage to property (1 response), and frustration with snow berms (4 responses) that block their driveways and access the roadway.
In addition to snowplowing of roads, Coconino County applies cinders to the roadways to provide traction. The cinders have generally proven to be effective in improving roadway traction. Cinders, however, are often washed into wetland areas in Kachina Village. Alternatives to cinders include applying de-icing chemicals. Please check the box that best describes your satisfaction with use of cinders:	▪ Excellent, no changes are needed - keep applying cinders (5 responses) ▪ We need to identify alternatives to cinders, such as de-icing chemicals (0 responses) ▪ Don't apply any cinders or de-icing chemicals; I am willing to wait until the snow melts (1 response) ▪ Apply de-icing chemicals at specific locations only (i.e. Kona Hill) (2 responses) Other: ▪ No de-icing chemicals or salt (3 responses) ▪ Prefer the continued use of cinders (2 responses) ▪ Remove cinders promptly after snowmelt (2 responses) ▪ Use more cinders and less grading (1 response) ▪ Use less cinders (1 response)
Other	Other comments ▪ Improve training of snowplow operators (4 responses) ▪ Access to Flagstaff Urban Trail System (1 response) ▪ Transit service to Kachina Village (5 responses) ▪ Wildlife protection for animals (Elk crossing over I-17) (1 response) ▪ Any and all modifications should minimize environmental impact (1 response) ▪ Drain pipes are clogged with dirt and debris (1 response) ▪ Yield sign replaced at Toho and Beaver to stop sign (1 response) ▪ Wasted asphalt on corner of Pinon and Tonalea for over a year (1 response)

In addition to the public survey, public input was solicited during a question and answer session during the public open house meeting. Several individuals also mailed/emailed letters with their public comment. The following is a summary of the input received at the public open house as well as other input received prior to the open house (edited for clarity). A detailed record of the comments and questions from the public are included in the Public Involvement Plan, under separate cover.

Roads

- *Traffic speeds*: Speeding is a concern throughout the community, especially on the main roads.
- *Street striping*: Major roadways in the community should have painted lines.
- *Sight distance and curves*: Divided/bifurcated roads are of concern. The divisions are often on steep slopes and curves, making it difficult for visitors to get used to and dangerous in winter conditions.
- *Additional cross-over:* Add a crossover in front of the Village Land Shoppe, just like the one in front of 20 Kachina, to make it safer for oncoming traffic.
- *Visual quality:* The visual quality is poor when turning onto Kachina Trail from Kachina Blvd. In the winter the view consists of cinders and in the summer the view is of weeds. The weeds in the summer also limit visibility around the turn, as well as in other locations around the community (i.e. Toho Trail). Is there a way to improve the sightlines of this entrance area? Perhaps the stop signs could be replaced with a landscaped traffic circle.

Pedestrians

- *Improved shoulders*:
  - Need for wider shoulders along roads for pedestrians, especially along Kachina Trail where it is divided.
  - Improve the shoulders on the community's roadways for pedestrians and make them clearly marked areas to indicate the separation of motorists from pedestrians and bicyclists.
  - Shoulder improvements and striping would be sufficient enough to act as sidewalks. However, sidewalks along Kachina Trail, Tovar Trail, Pinon Trail, and Kachina Blvd. should be considered.
- *Pathway connectivity*:
  - The trails, paths, and Forest Service trails in the community should be connected.
  - Multi-use paths were mentioned as another alternative to create safe places for pedestrians and bicyclists. The country character should be maintained.
  - There needs to be a safe bike/pedestrian path from Mountainaire to Raymond County Park in Kachina Village.
- *Snow berms, snow removal, and street sweeping:*
  - Roads are too narrow to safely walk along, especially in the winter when snow berms are placed where pedestrians walk.
  - More effort should be put toward clearing the sidewalk down the hill along Kona, since it is difficult to walk in the street when there is a lot of snow. Last winter the sidewalk seemed to be forgotten for months at a time.
  - In the spring, cinders should be removed from the roadway to reduce the danger of bicycling and walking on the roadways.

- The snow maintenance operators disregard personal property. They knock over mailboxes, phone pedestals, trees, etc. Other damages include running over pipes, knocking down the retaining walls and the handrails along the main roadway, running into the guardrail on Toho Trail and breaking four posts, clogging the drainage ditches with dirt, and messing up the rip rap.
- Plowing methods should be changed so that berms are not created across driveways.
- The use of cinders should be continued, but they should be removed from the streets once the winter season is over so that they do not run into the wetlands or streams, or create dangerous conditions for pedestrians and bicyclists along the roadside.

Bicycle

- *Regional connectivity to Flagstaff:*
  - Old Munds Highway (or another route identified to connect bicyclists from Kachina Village to State Route 89A) should be improved to allow bicycles so that people can commute to Flagstaff by bicycle without having to ride on I-17, which is dangerous. It is uncomfortable at the very least to be that close to 70 miles per hour traffic on a bicycle.
  - Improvements on Old Munds Highway should be continued east of I-17 as well, connecting to Mountainaire, National Forest trails, and to the I-17 underpass at exit 333 to connect to Kachina Village.
  - For the last several years, we have heard that there is a plan in process to extend the Flagstaff Urban Trail System from Fort Tuthill Park into Kachina Village. This would be a real plus for bicyclists commuting into Flagstaff, since there is no direct route at the moment, except for the freeway.

Public Transportation

- *Public transit service to Kachina Village:*
  - We heartily support public transportation and would love to see bus service down here even though we are retired and probably wouldn't use it much. We would much rather pay for public transport than more road work.
  - Along with the Dial-a-Ride service, which should be maintained, the Mountain Line Bus service should provide daily bus service between Flagstaff and the communities of Kachina Village and Mountainaire.
  - Access to Flagstaff public transit into Kachina Village appropriate for commuting, and complete connection to the Flagstaff Urban Trail System should be priorities – we need to be able to leave our cars behind.
- It may not be efficient to have public buses have stops throughout the community, but having a couple main stops would work well. The bus should go to the east side of town as well if possible, and there should be a main bus stop with bicycle racks.
- The shop on Kachina Trail, next to the wetlands, would be a good location for a park and ride lot.

General Comments

- Any and all modifications should minimize environmental impact and maximize habitat for diverse plant and animal communities.
- Drain pipes become clogged with dirt and debris and need to be maintained.

- It is unclear if sledding is prohibited on the sled hill because there are “No Sledding” signs posted, but it is not enforced, or the enforcement is inconsistent. Perhaps the County can post “Sled At Your Own Risk” signs to put responsibility clearly on the public, or the County can designate an alternative sledding location that is safer.

APPENDIX B – ESTIMATE OF PROBABLE COST DATA SHEETS

List of Abbreviations

S.Y. = Square Yards
L.FT. = Linear Foot
CU. YD. = Cubic Yard
Ton = Material weight in tons

4' Shoulder on both sides of roadway (per mile cost)

ITEM NO	ITEM DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT
2050001	ROADWAY GRADING	S.Y.	4,694	$5.00	$23,470.00
2010011	CLEARING AND GRUBBING	ACRE	1.00	$1,000.00	$1,000.00
2020201	SAW CUTTING	L.FT.	10,560	$1.00	$10,560.00
3030022	AGGREGATE BASE, CLASS 2	CU.YD.	392	$55.00	$21,560.00
4070001	ASPHALTIC CONCRETE (3")	TON	782	$100.00	$78,200.00
7041501	PAVEMENT MARKINGS	L.FT.	15,840	$0.50	$7,920.00
	CONSTRUCTION COST SUBTOTAL				**$142,710.00**
	Design Engineering (15%)				$21,406.50
	Maintenance/Protection of Traffic (10%)				$14,271.00
	Water Supply / Dust Palliative (2%)				$2,854.20
	Mobilization (10%)				$14,271.00
	Erosion Control (5%)				$7,135.50
	Quality Control (5%)				$7,135.50
	Construction Survey / Layout (10%)				$14,271.00
	Contingencies (30%)				$42,813.00
	SUBTOTAL				**$ 266,868**

6' Unpaved Pathway (per mile cost)

ITEM NO	ITEM DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT
2050001	ROADWAY GRADING	S.Y.	3,520	$5.00	$17,600.00
2010011	CLEARING AND GRUBBING	ACRE	0.72	$1,000.00	$720.00
8030020	DECOMPOSED GRANITE (3")	C.Y.	293	$60.00	$17,580.00
	CONSTRUCTION COST SUBTOTAL				**$35,900.00**
	Design Engineering (15%)				$5,385.00
	Water Supply / Dust Palliative (2%)				$718.00
	Mobilization (10%)				$3,590.00
	Erosion Control (5%)				$7,135.50
	Quality Control (2%)				$2,854.20
	Construction Survey / Layout (10%)				$14,271.00
	Contingencies (10%)				$3,590.00
	SUBTOTAL				**$ 73,444**

6' Sidewalk (per mile cost)

ITEM NO	ITEM DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT
2050001	ROADWAY GRADING	S.Y.	3,520	$5.00	$17,600.00
2010011	CLEARING AND GRUBBING	ACRE	0.72	$1,000.00	$720.00
9080201	CONCRETE SIDEWALK	S.F.	31,680	$4.00	$126,720.00
	CONSTRUCTION COST SUBTOTAL				**$145,040.00**
	Design Engineering (15%)				$21,756.00
	Water Supply / Dust Palliative (2%)				$2,900.80
	Mobilization (10%)				$14,504.00
	Erosion Control (5%)				$7,135.50
	Quality Control (5%)				$7,135.50
	Construction Survey / Layout (10%)				$14,271.00
	Contingencies (10%)				$14,504.00
	SUBTOTAL				**$ 227,247**

10-Space Parking Lot (Unpaved)

ITEM NO	ITEM DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT
2050001	ROADWAY GRADING	S.Y.	320	$5.00	$1,600.00
2010011	CLEARING AND GRUBBING	ACRE	0.07	$1,000.00	$70.00
8030020	DECOMPOSED GRANITE (3")	C.Y.	27	$60.00	$1,620.00
	CONCRETE PARKING STOPS (INSTALLED)	EACH	10	$80.00	$800.00
	CONSTRUCTION COST SUBTOTAL				**$4,090.00**
	Design Engineering (15%)				$613.50
	Water Supply / Dust Palliative (2%)				$81.80
	Mobilization (10%)				$409.00
	Erosion Control (5%)				$7,135.50
	Quality Control (5%)				$7,135.50
	Construction Survey / Layout (10%)				$14,271.00
	Contingencies (10%)				$409.00
	SUBTOTAL				**$ 34,145**

20-Space Parking Lot (Paved) (3"AC/3"AB)

ITEM NO	ITEM DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT
2050001	ROADWAY GRADING	S.Y.	640	$5.00	$3,200.00
2010011	CLEARING AND GRUBBING	ACRE	0.13	$1,000.00	$132.00
3030022	AGGREGATE BASE, CLASS 2	CU.YD.	56	$55.00	$3,080.00
4070001	ASPHALTIC CONCRETE (3")	TON	112	$100.00	$11,200.00
	CONCRETE PARKING STOPS (INSTALLED)	EACH	20	$80.00	$1,600.00
	CONSTRUCTION COST SUBTOTAL				**$19,212.20**
	Design Engineering (15%)				$2,881.83
	Water Supply / Dust Palliative (2%)				$384.24
	Mobilization (10%)				$1,921.22
	Erosion Control (5%)				$7,135.50
	Quality Control (5%)				$7,135.50
	Construction Survey / Layout (10%)				$14,271.00
	Contingencies (10%)				$1,921.22
	SUBTOTAL				**$ 54,863**