
MAG Town of Cave Creek Bike Study Task 4 Assessment Report



June 25, 2012
MAG Project #481

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TASK 4 Assessment Report for Preferred Alternative

Introduction

The Maricopa Association of Governments (MAG) Design Assistance Program provides communities in Maricopa County the opportunity to develop community projects by assisting in the early planning and design stages. The intent of the program is to stimulate the integration of pedestrian and bicycle facilities into the planning and design of all types of infrastructure and development. The Town of Cave Creek identified a need to establish a bike lane along Cave Creek Road and provide a pedestrian circulation network in its Town Core Area. This Study is tasked to review existing conditions and conduct research to measure public opinion on issues related to cycling and the pedestrian environment along Cave Creek Road. The study also intends to identify barriers to cycling and improvements to encourage more cycling;

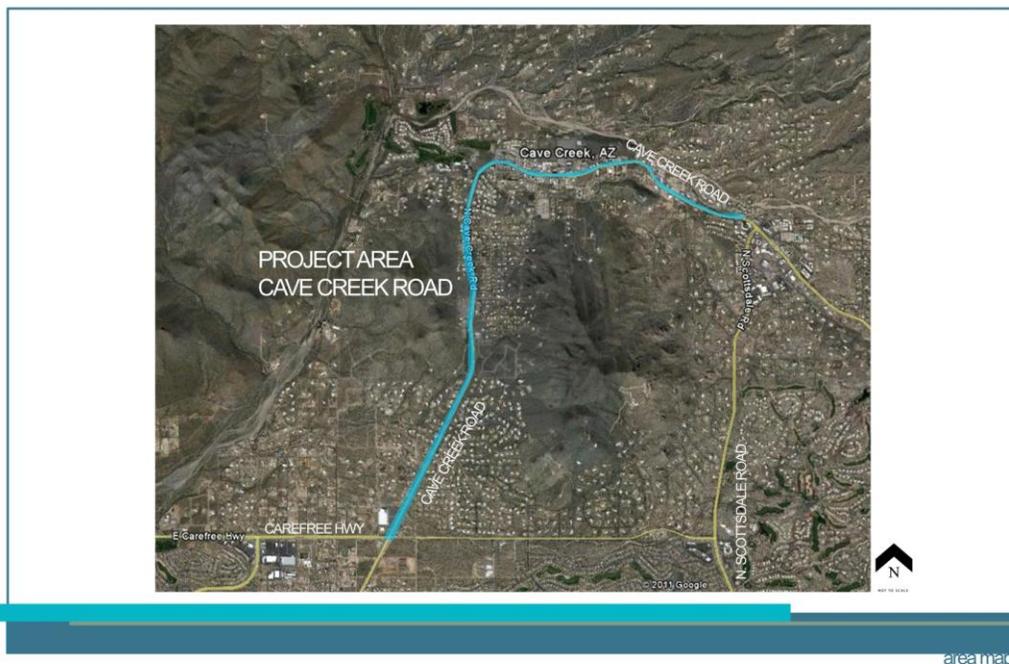
The MAG Cave Creek Bike Study developed a design scope of work that included setting project goals, reviewing existing conditions, researching project area opportunities and constraints, preparing alternative concepts, engaging a core group of stakeholders and the public, refining a preferred concept, providing pricing estimate for the preferred concept, preparing 15% level design plans, and summarizing the project findings. This document has progressed through the refined concept stage and has accomplished the goals established in the project scope of work. Design Concept Alternatives were prepared based upon the findings of the opportunity and constraints map and the second Stakeholder meeting. The concepts were presented during the third Stakeholder meeting and the community provided feedback and comments. Stakeholders were asked about project priorities and ranking of design features. From this meeting, a preferred alternative was prepared with input from Town Staff. This report summarizes the findings and provides background on the project issues.



Project Information

This project will result in a vision for bicycle lanes and improvement concepts for the entire length of Cave Creek Road between Carefree Highway and Scopa Trail, at the limits of the Town of Cave Creek. This will be the design intent concept for cycling along the entire corridor, and includes a main street pedestrian concept for the Town Core area. The project is located within Maricopa County in the northeast part of the county within the town limits of Cave Creek and Carefree, Arizona. This project study will develop the creation of a 4.5 mile spine of bicycle lanes from the intersection of Carefree Highway and Cave Creek Road (coincidentally the north end of the Phoenix Sonoran Bikeway) to the east edge of the Town of Cave Creek at Scopa Trail along Cave Creek Road. This linkage will provide cyclists in Cave Creek and Carefree a safe and comfortable route to the Town Core District, residential neighborhoods, and recreational trails and activity areas. In addition to the bike lane, a proposed off-road trail and shared-use path is envisioned for pedestrians, off-road cyclists, and equestrian users. A main street pedestrian district is part of this study and will provide a paved pathway system, landscaping, site amenities, way-finding signage, and comfort nodes as part of the enhancement of the Town Core.

The graphic below illustrates the project area:



Background Data

The Maricopa Association of Governments (MAG) has established a Bike Ways map of the Metropolitan Phoenix Area that identifies bike lanes, bike routes, paved multi-use paths, and multi-use trails. The need for this project is driven by a desire to provide connections to this larger network of circulation. The Town of Cave Creek does not provide any facilities for on-street cycling within its current roadway network, requiring cyclists to share the road with motorized traffic in rural areas that may not have paved shoulders or that may have shoulders that drop off beyond the edge of pavement. This project will address these issues and provide a defined area for cyclists to use for commuting, recreation, and exercise. It will provide a much needed bike lane connection to the existing bike route along Carefree Highway and extend the existing Phoenix Sonoran Bikeway north along Cave Creek Road through the center of the town core and to the border of the Town of Carefree.



The current conditions of the project area have a variety of on and off road bicycle experience at or near the Cave Creek Road corridors. The existing roadway is asphalt and has areas of paved and unpaved shoulders. Paved shoulders vary from as little as 6 inches to as wide as 6 feet. No bike lane striping, signage, or pavement markings exist. The project area falls within both the Town of Cave Creek and the Town of Carefree. Both municipalities maintain their own pavement within their respective jurisdictions. Cave Creek Road has posted speed limits of 45 mph in the south 2 miles of the project area and reduces to 25 mph in the Town Core, in roughly the area where the roadway changes direction at Spur Cross Road to the east limits of town at Scopa Trail. Native desert landscaping occurs along much of the corridor, and a landscaped median is present along the entire corridor length. A primitive off-road trail exists in short, disconnected segments within the existing right-of-way of Cave Creek Road. Some areas in the Town Core have an aggregate based multi-use trail approximately 6 feet in width.

The current conditions of the pedestrian areas along the corridor have a variety of pavement types and conditions. There is a short segment of a concrete sidewalk near the new developments of CVS pharmacy and Lowes hardware store at the south end of the project area. No paved continuous

paved pathway network exists until limited segments are found in the Town Core area. In the Town Core area, short disconnected segments of paved pathways exist at individual parcels exist. Each segment has a different path width and uses different materials. As noted in the previous paragraph, an aggregate based multi-use trail is also present in the Town Core. Much of the pedestrian environment in the Town Core is non-ADA compliant. Site amenities and pedestrian environment facilities such as seating, bicycle racks, litter receptacles, way-finding signage, ADA ramps, pedestrian level lighting, designated crosswalks, and public area landscaping are lacking.



In review of the existing conditions of the project area, an opportunities and constraints map was prepared (**Appendix B**) to graphically identify project area issues that affect the bicycle and pedestrians users. Issues that will impact the design of a bicycle lane and a pedestrian Town Core that will require future development include the following:

- Environmental issues
- Drainage Impacts
- Utility Service Facilities impacts
- Traffic Analysis issues
 - Identify Non-Compliant Areas
 - Identify Parking needs
 - Parking headlight screening
 - Identify Access management issues (full parcel width access)
 - Sight visibility
 - Lack of a public transit alternative

Project Scope

The Town of Cave Creek Bike Study area is approximately 4.5 miles in length from the intersection of Carefree Highway north and east to Scopa Trail (limits of the Town of Cave Creek & the Town of Carefree). The project design intent is to provide a dedicated bike lane along this corridor and provide a main street pedestrian area in the Town Core. A Complete Streets approach has been undertaken by this project to address the entire roadway environment within the existing right-of-way. This approach develops a vision for not only the roadway section, but also for the zones beyond the edge of vehicle pavements. This project will allow and encourage bicyclists to utilize the corridor for circulation and recreation. It will also promote an improved Town Core pedestrian and cyclist environment. This environment will encourage users to park once and circulate, thereby eliminating micro jaunts (journeys of less than 1/4 mile) that impact local congestion and air quality.



Preferred Concept

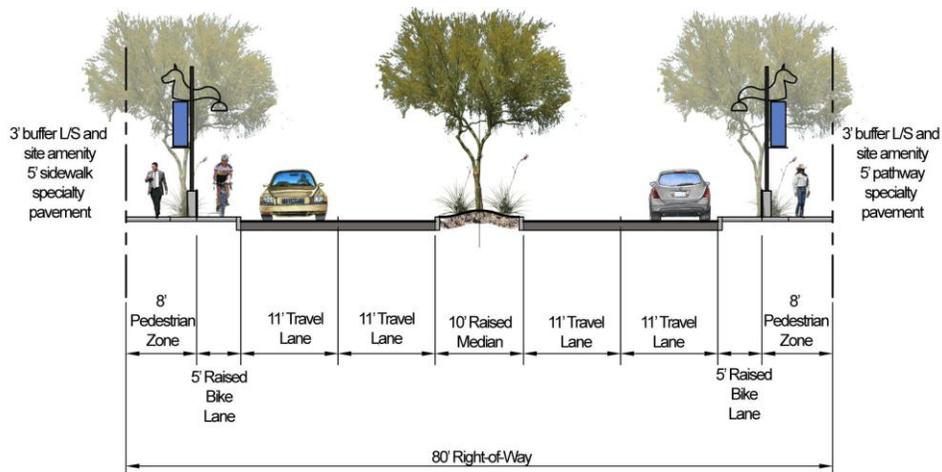
The corridor of Cave Creek Road falls within the jurisdictions of the Town of Cave Creek and the Town of Carefree. At the southern end of the corridor, approximately 1 mile of the road is located within the Town of Carefree with Cave Creek bordering the right-of-way. A variety of right-of-way widths occur along the length of Cave Creek Road and vary between 80 feet and 130 feet in width. Different Zoning and Land Uses occur along the length of the corridor as well. Some areas are General Commercial and others are Residential, Multi-Family, and Town Core categories. These zoning and land use conditions drive the concept vision and design structure to be identified by 3 separate segment section types. These segment types are identified as **Type-01 (Main Street Town Core Spine)**, **Type-02 (Redline Roadway)**, and **Type-03 (Business**



Core District). The Preferred Alternative Plan Concept design is shown in **Appendix C**. Each typical segment type section is shown in **Appendix D**, Preferred Alternative Section Concept. Bikeway and pedestrian configurations are depicted in the typical sections. Each segment and section was developed from evaluating the existing conditions and the opportunities and constraints each presented. In conjunction with the existing conditions, other issues were examined with the bicyclists and pedestrians needs in mind to design the most appropriate design alternative.

Typical Segment Type-01 (Main Street Town Core Spine),

- Limit the number of crosswalks to keep conflicts between pedestrian, cyclists, and motor vehicles to a minimum.
- Develop a 5 ft wide concrete bike lane at the same grade as the roadway.
- Road Diet lane widths to 11 feet and median to 10 feet.
- Add 8 feet pedestrian zone behind bike lane. Provide 3 foot buffer separation for landscaping and site amenities and 5 foot wide specialty pavement pathway. Themed pavements.
- In areas where right of way is greater than 80 feet, provide comfort nodes, micro parks, or an added landscape buffer behind the pathway. Pathway widths should also increase to 8 feet where possible. Signature Shade features.
- Provide landscape shade and retain rural character of Cave Creek.
- Provide signage for bypass bike routes of the core area (loop connections).

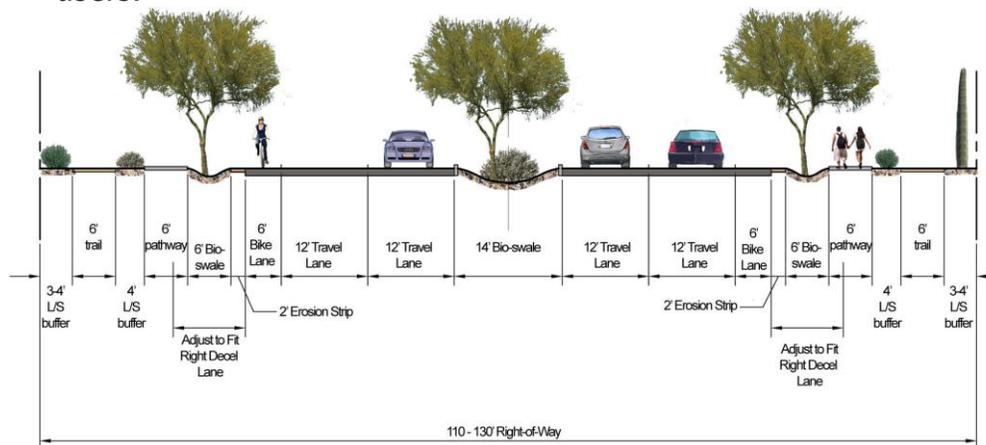


type 1

Typical Segment Type-02 (Redline Roadway),

The Roadway will provide a premium cycling experience and include the following design elements for the on-street bike lane:

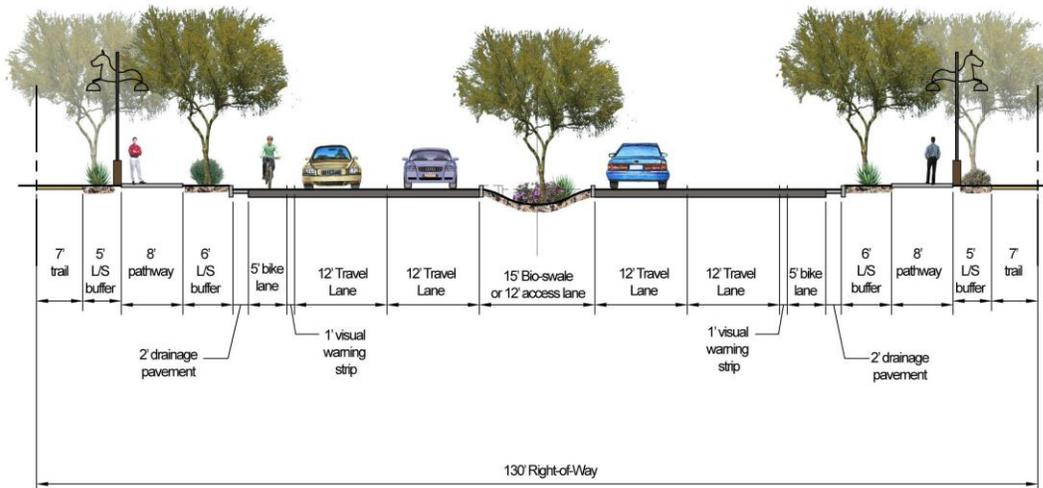
- 6 feet width of high performance rubberized asphalt pavement. (Includes striping width) for potential cyclist racing or training.
- A 12" wide solid pavement stripe separating vehicle travel lanes.
- Roadway signage at approximately 1/4 mile intervals.
- Destination and linkage signage to nearby recreational facilities and networks.
- Off roadway paved shared-use path, 6 feet wide with a 6 foot landscaped buffer separation from the on-road bike lane. The desire is to keep Basic and Children cyclists separated from vehicle traffic and provide an alternative slower route.
- Off roadway unpaved shared-use path (trail), 6 feet wide with a 4 foot landscaped buffer separation from the paved path. This unpaved path will provide a dedicated route for equestrians rough terrain cyclists and joggers. A 3 foot or more outside landscape buffer is included.
- Specialty distance markers imbedded in pavement, and vertical stone markers for milestone distances.
- Red outside drainage pavement as erosion strip interceptor. Specialty pavement.
- Retain existing 12 foot wide vehicle travel lanes.
- Add deceleration and turn movement lanes with bike through striping.
- Native plantings in a bio-swale to retain regional character.
- Provide a Staging Parking Area at 1 mile intervals for recreational users.



type 2

Typical Segment Type-03 (Business Core)

- 6 feet width of high performance rubberized asphalt pavement. (Includes striping width).
- A 12" wide solid pavement stripe for visual warning.
- Destination and linkage signage to nearby recreational facilities and networks.
- Detached paved pathway, 8 feet wide with a 6 foot landscaped buffer separation from the on-road bike lane. Curb and gutter is proposed for drainage.
- Off roadway unpaved shared-use path (trail), 7 feet wide with a 5 foot landscaped buffer separation from the paved path. This unpaved path will provide a dedicated route for equestrians rough terrain cyclists and joggers.
- Site amenities, pedestrian scale lighting, and landscaped shade in the 5 foot buffer zone.
- Retain existing 12 foot wide vehicle travel lanes.
- Native plantings in all buffers to retain regional character.
- Provide way-finding signage for all user types in this type zone.
- Include equestrian and bicycle staging areas for use at business destinations. Include shade for these rest areas.
- Promote bike user awareness in the zone through pavement markings and signage.

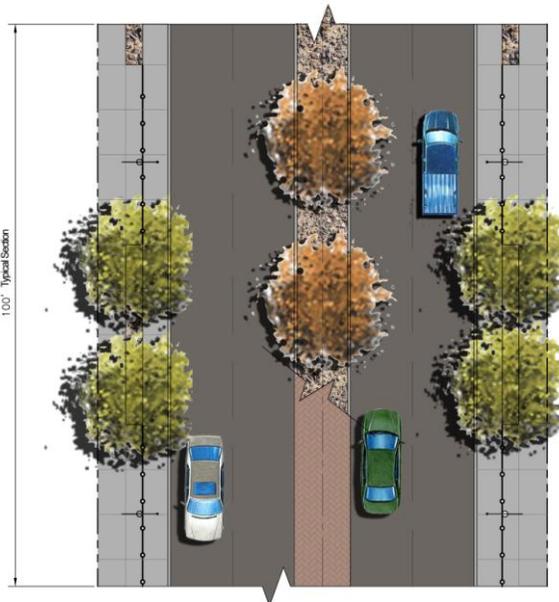


type 3

The crosswalks, bikeways, destination signage, pavement markings, and pavement design as proposed in the preferred concept alternative shall comply with The American Association of State Highway and Transportation Officials - Guide for the Development of Bicycle Facilities (AASHTO) 2011, 6th edition, and the Manual of Uniform Traffic Control Devices (MUTCD) 2009 Edition Part 9. The preferred concept will employ the design criteria of a Bike Lane for the on road bicycle environment along the entire length of the corridor. This design classification is based upon several factors that include the ability of different user types, specific corridor existing conditions, existing roadway conditions, available public right-of-way, and cost feasibly to develop an acceptable bicycle facility.



The pedestrian environment will meet the design criteria as established in the Town of Cave Creek design standards. This environment shall also

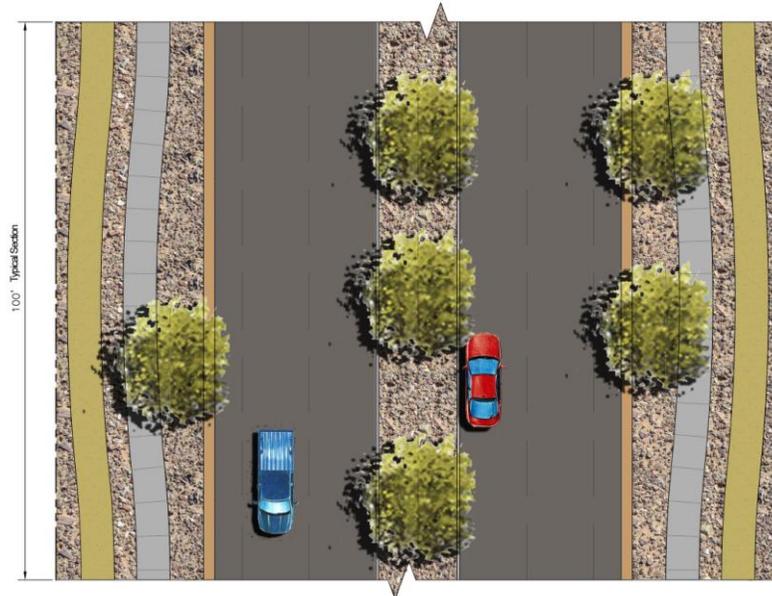


comply with current MAG publications that relate to pedestrian design facilities. The MAG Pedestrian Policies and Design Guidelines Update (2005) and MAG Complete Street Guide (2011) will be employed as design criteria for the pedestrian environment. The pedestrian areas for the Town Core will also preserve the culture and character of the existing Cave Creek experience. The rural, eclectic, and western flavor of the Town Core will be enhanced to promote a more uniform brand, provide improved circulation in the core, and establish

destination nodes along the length of the Town Core Spine. The type of work to be performed for construction will include roadway pavements, roadway

striping, traffic signage, shared use path installation, utility mitigation, paved pathways, curb & gutter, driveways, landscape, site furnishings, way-finding elements, pedestrian scale lighting, un-signalized pedestrian crossings, and drainage measures. There is no increased right-of-way need or any land purchase requirements for this project. The project will be developed in phases that are defined in segments and layers. Priorities of installation will be set by the available future funding amount and the funding source criteria. Initial high priority is to begin the bike lane from Carefree Highway north to the Town Core where right-of-way is 110 feet in width, or greater. This may be accomplished through restriping the existing roadway and adding asphalt pavement in areas where a new bike lane would be when no paved shoulder exists. An extra wide 12" paint stripe separating the bike lane from vehicle lanes is recommended due to operating speeds that are sometimes higher than the posted speed limit of the roadway, the undulating grades of the natural area, limited lighting levels of the roadway, and concerns about restricted sight distances in rural areas. An added erosion mitigation strip of porous bound aggregate is also recommended for the initial phase where no curb and gutter exists. A secondary design layer of providing a drainage bio-swale and landscaping buffer beyond the bike lane along with an 8 foot wide concrete multi-use path is the next priority for the same area. The extension of the bike lane through the Main Street Town Core Spine area where right-of-way is limited to 80-95 feet is the third level of priority. This third

layer of design and development would be limited to the implementation of a road-diet for this segment by reducing the existing median width, restriping lanes to 11 feet wide, and providing a dedicated 5 foot wide bike lane in the downtown area. Roadway improvements would include the pedestrian crossings proposed for the town core area. A fourth level of priority would improve the Main Street Town Core Spine behind the edge of roadway or curbs in the primary area of the pedestrian environment. This pedestrian environment will provide trees for shade and comfort, continuous



layer of design and development would be limited to the implementation of a road-diet for this segment by reducing the existing median width, restriping lanes to 11 feet wide, and providing a dedicated 5 foot wide bike lane in the downtown area. Roadway improvements would include the pedestrian crossings proposed for the town core area. A fourth level of priority would improve the Main Street Town Core Spine behind the edge of roadway or curbs in the primary area of the pedestrian environment. This pedestrian environment will provide trees for shade and comfort, continuous

and consistent paved pathways, pedestrian level lighting, way-finding signage, and site amenities such as seating features, bike storage, equestrian facilities, drinking fountains, litter or recycling containers, and artistic opportunities.

Project Development

The development of the Bike Study and Main Street Town Core Spine presents design issues that will require further assessment and issue identification. The design development and construction documentation will provide greater detail of the needs of the Cave Creek Road corridor as it pertains to *environmental, drainage, utility, traffic management, and outside agency involvement*. Programming of the improvement area and the operations and maintenance of the design solution will also be factors requiring evaluation at advanced design stages.

Environmental issues

Environmental issue review will become a scope of work item for future design projects. Confirming cultural and biological non-impact of the proposed bike and pedestrian improvements is critical. The surrounding area of Cave Creek is rural and native and has the potential for habitat and wildlife corridors to occur within the project limits. One example is the Western Burrowing Owl, a migratory bird that can be found on undeveloped land in almost any rural or urban setting. A second example that occurred recently in Cave Creek that had adverse effects on another project—but will not affect this project—was the discovery of a previously-unknown environmentally-sensitive area. Therefore, while the Town Core area is more developed and environmental issues are not anticipated, it will be required that these and other issues can be ruled out.



Drainage impacts

The types of improvements considered in this report should not change any existing drainage patterns as at most they would add relatively minor amounts of pavement to the edges of Cave Creek Road. Hence, detailed drainage studies were not warranted for this project. Some drainage impacts have been identified during this project's analysis of existing data and shown on the Opportunities and Constraints Map. In 3 separate areas,

drainage reports have noted areas of scour, erosion, and flooding potential. Drainage structures and facilities may be required in future phases that encroach in the areas identified. The remainder of this section will summarize the results of our investigation into storm drainage in the corridor.

Two documents were prepared for the Town and the Flood Control District of Maricopa County in 2007 and 2008 analyzing drainage in the Cave Creek area. The 2007 document was the *Cave Creek DMP Final Hydrology Report* (7/30/07, HDR), the information from which was used to develop the 2008 *Cave Creek Drainage Master Plan* (1/25/08, HDR). A portion of the

Drainage Master Plan (DMP) analyzed ten previously unstudied wash crossings of Cave Creek Road. All were part of a larger area designated the “Mormon Girl Wash Tributaries”. All ten are between Carefree Highway and Blue Ridge Drive, the southern seven in the Town of Carefree, the northern three in Cave Creek. Of these ten, the DMP identified three in Carefree for which culverts should be installed to



convey storm water from one side of Cave Creek Road to the other and, therefore, allow much more of the Town of Cave Creek to be accessible during a 100-year flood event as depicted on Figure 10b of the DMP. Of these three, two have since been replaced with culverts on the southern end of the corridor as improvements were made to Cave Creek Road. The third is historically and locally known as the “Mormon Girl Wash” and is more-accurately described in the DMP as the Northern Branch of an Unnamed Central Tributary (UCT) to Cave Creek (i.e., the actual creek). This wash is the northernmost of the washes in the Town of Carefree and crosses Cave Creek Road between New River Road and Canyon Ridge Drive. It is beyond the scope of this report to recommend that the Town of Carefree construct the third culvert as part of bicycle facilities, especially considering the expense; however, should a separate funding source be identified or should other improvements to Cave Creek Road in this area be considered by Carefree, then this culvert should at least be considered. The DMP did not recommend replacing any of the other seven wash crossings with culverts.

Utility Service Facilities impacts Specific utility impacts have not been identified in the initial data gathering of this project. Due to the varying land uses and character of the corridor along Cave Creek Road and its length, different utility conditions occur. Some areas have overhead power and/or

other aboveground services and others have uninvestigated underground services. The Maricopa County Department of Transportation operates the traffic signal at Cave Creek Road/Carefree Highway for the Town of Cave Creek; it is the only traffic signal in the study corridor. Eight different utility organizations listed below have been identified as having facilities, such as water, sewer, electric power, communications, and gas, in the corridor. The following have not been investigated as part of this project; such investigation will be required of future projects.



The following have not been investigated as part of this project; such investigation will be required of future projects.

- Arizona Public Service (electricity)
- Black Mountain Sewer Corporation/Liberty Water (sewer)
- The Town of Carefree, as the Carefree Water Company (water)
- Century Link (communications)
- The City of Phoenix (water)
- Cox Communications (cable television and fiber optics)
- Southwest Gas (gas)
- The Town of Cave Creek (water and sewer)

Traffic Management Analysis

Traffic management analysis of the area will be required. Initial observation of the corridor has identified a number of traffic related areas of concern. The opportunity and constraints map has identified locations where there are deceleration and right turn lanes into residential neighborhoods that at present make no provisions for bicycles. The Town's Access Management guidelines will be applied and enforced to the extent possible within existing commercial areas where driveway access is virtually uncontrolled, such as in the Town Core area. Reductions in width and number of driveways may be necessary and consistent guidelines of



within existing commercial areas where driveway access is virtually uncontrolled, such as in the Town Core area. Reductions in width and number of driveways may be necessary and consistent guidelines of

commercial property access applied. Landscaped medians control some left turn movements, but additional median openings could be beneficial. Stacking distances of the access lanes will need to be reviewed during future design stages. All design criteria will be required to conform to the latest local and industry guidelines.

Parking Needs. Public parking is a major issue for the Town of Cave Creek. Parking in the Town Core area is by all accounts at a premium on days with special events, of which there is an average more than one every two months, usually lasting for an entire weekend. Often in downtown areas, there are publicly-owned parcels on which are operated municipal parking lots. They can be operated with or without parking meters, with or without time durations (i.e., “2 hour limit”), etc. Sometimes these areas are located on a cross street or on a minor street that parallels the downtown thoroughfare. By having parking available, visitors are encouraged to come downtown and eat or shop, which contributes to the vitality of the downtown area and results in revenue to the municipality in the form of sales taxes that may offset the actual and opportunity costs of providing the parking. There are a few vacant parcels along the Town Core area of Cave Creek Road; however, all are privately-owned. The Town does not already own any parcels along or near Cave Creek Road with the exception of an active maintenance yard on Hidden Valley Drive. Additionally, there are no cross streets or parallel streets on which to locate a municipal parking lot that would be convenient for visitors to the Town Core area. Thus, there is some motivation to consider how best to maximize the use of existing facilities.



Private development parking standards are also an area of concern, as is the existing lack of headlight screening between parking areas and the adjacent thoroughfare. Parking needs studies can be conducted to calculate the number of parking spaces required per land use per Town Zoning regulations. Shared parking studies can identify areas where parking can be shared by complementary uses, such as between a tavern, which needs parking more in the evenings and later, and a diner that only serves breakfast and lunch, or from offices that are generally not opened after 5 PM or on weekends.

As individual projects or layers are identified and design begins, it may be beneficial to conduct these parking studies or a comprehensive study to

identify those areas where parking is insufficient and where parking can be shared or otherwise be made available for special events.

Outside Agency Involvement

Given the nature of this project, involvement with outside agencies is inevitable and coordination with outside agencies will be a critical part of the process of providing bicycle lanes, multi-use trails, and/or other amenities in the Cave Creek Road corridor. The corridor begins at Carefree Highway in the Town of Carefree before entering the Town of Cave Creek; thus, coordination and an Intergovernmental Agreement (IGA) will be required between these two neighboring towns.

The bicycle lanes are intended to become part of a larger regional loop system. Thus cooperation and coordination with those other entities that provide these systems will be important.

The Federal funding anticipated for implementation of the projects will warrant coordination with MAG and any other agencies by which these funds are locally administered.

Private Property Access. Town of Cave Creek Technical Design Guideline #2, Transportation (9/22/09) contains the various guidelines governing access to private property from adjacent public streets. Briefly, Section 5 provides guidance to the types of driveways that are acceptable to the Town, the spacing of driveways, the storage length to be provided, and when deceleration lanes should be provided. Section 7 addresses private access drives and, in a strict sense, may only be broadly applicable to this project; its purpose is to provide guidance on the planning, design, and construction of private access drives in conjunction with the access requirements for emergency service vehicles. Section 8 is on right-of-way management and in the first subsection establishes the Town's principles in regard to access management, which is described as "attempt[ing] to balance the need to provide good mobility for through traffic with the requirements for reasonable access to adjacent land uses." It describes in detail the permitting process for uses proposed within Town rights-of-way; it does not indicate that permits are needed for individual driveways.



Sight Distance. In the context of road design, sight distance is how far a driver can see before his/her line of sight is obstructed. Insufficient sight distance can have implications for the operations of a roadway, for which stopping sight distance is a design criterion, or an intersection, at which several different intersection sight distances are calculated depending on the type of movement drivers are expected to make. All sight distances are dependent on several factors, not the least of which is speed, typically a design speed several (usually five or ten) miles per hour greater than the posted speed limit.

As its name implies, stopping sight distance on a roadway is the distance a driver must be able to see in order to make a determination as to whether a situation requires a stop and, if so, also allows a sufficient distance to be able to make a comfortable—and not an emergency—stop. Since a curve in the roadway, whether horizontal (to the right or left) or vertical (crest), often becomes an outer limit for a stopping sight distance, minimum curve lengths are required during design.

Intersection sight distances for stop-controlled intersections are applicable to movements from the stop-controlled minor approach and vary depending on whether the driver intends to turn left, turn right, or cross, as well as to left turns from the major roadway. In addition to speed, the number of lanes on each roadway is a major factor considered in these calculations, as this affects the distance a vehicle must travel in order to reach its intended place in the new traffic stream.

In general, it can be concluded that sight distances on Cave Creek Road are adequate given the current lane configurations, roadway geometry, and posted speeds. (It is acknowledged that posted speed limits may have been set to compensate for any limiting sight distances or roadway geometry.) Additional pavement for bicycle lanes in certain areas, the potential narrowing of lanes in others, and proposed roadside appurtenances for bicyclists all have the possibility of affecting sight distances as these may change the original conditions upon which the sight distance calculations were based. As each individual project or layer is



designed, field observations and engineering survey will be required to determine the adequacy of sight distances for the proposed conditions.

Non-Compliant Areas. As noted in the above discussion of sight distances, in general it can be concluded that Cave Creek Road has no obvious areas of non-compliance considering existing roadway geometry and the posted speed limits. The tightest curve on Cave Creek Road, that is, the curve with the smallest radius, is the curve just to the west of the Town Core. It has a radius of approximately 850 feet. The Town's design guidelines and the ***American Association of State Highway and Transportation Officials (AASHTO) Roadside Design Guide*** (6th Edition, 2011) govern in this case. Per the Town Design Guidelines, an Urban Minor Arterial roadway, the

classification of Cave Creek Road, with rolling terrain should have a minimum radius of 925 with a design speed of 50 mph. In mountainous terrain, a minimum radius of 725 feet is allowed with a 45 mph design speed. The AASHTO design guide indicates that a roadway without any super-elevation (curve banking) can be designed with a minimum



radius of 667 feet at a design speed of 40 miles per hour and with 900 feet at a design speed of 45 mph. Thus, the tightest of the curves appears to be adequately designed without the consideration of any other non-roadway design related factors (roadside vegetation, structures, etc.) that may have rendered the design non-compliant in specific areas. As individual projects or layers are developed, field observations and engineering surveys will be required to identify any areas that do not conform to current design standards. Any such areas identified will have to be evaluated to determine if they can be brought up to current standards without design exceptions.

Corridor Programming

The proposed bike lanes will be utilized by different classes of users. These classes include utilitarian cyclists (riders who bike for commuting, alternative transit mode, and school transportation), recreational cyclists (those who bike for fitness, competitive training, and outdoor appreciation), and non-cyclists (non-bike owners, automotive users, and mobility impaired users).

The programming of the corridor will be to encourage alternative transit modes and to provide safe and convenient recreational facilities for local and regional users. Safety on roadway remains the public's principal concern about cycling in the area. This project will provide a comfortable biking experience on a major road.

This project will also improve the quality of cycling routes and facilities in the area and extend the regional bike network. It will also address the disconnect that exist today in destination and service routes. Some of the current cycling concerns include visibility, awareness, traffic density, lack of network, bike theft, unclear signage and markings, disregard for cyclists, careless drivers, general safety, and road conditions. Improvements in safety-related infrastructure such as more bike lanes, paths and safer road conditions hold the greatest potential to move people from recreational cycling to cycling as their primary mode of transportation.



The pedestrian programming of the corridor will improve by providing the linkages that are missing today. Giving a short trip alternative to driving will greatly reduce localized traffic and improve on air-quality. Establishing a safe and comfortable pedestrian environment along the corridor will encourage more uses for recreation and develop better walk-ability within the community.

Seasonal considerations and special events

There are 6-7 major annual seasonal events within the Town of Cave Creek. These events occur throughout the year and are typically held during fair weather seasons. The following are the major event:

- Super Bowl host events (January / February)
- Fiesta Days (April)
- Independence Day Celebration (July 4th)
- Taste of Cave Creek culinary festival (October)
- Wild West Days (November)
- Cave Creek Bicycle Fest (November)
- Marathon Luminaire Run (December)

With the development of a premium bike lane and pedestrian district, additional events are anticipated to occur. A future bike lane loop around Black Mountain has been envisioned to be developed in partnership with the Town of Carefree and the City of Scottsdale. This loop of on-street bike lanes will allow for competitive race events to be planned. A stronger pedestrian environment in the Town Core will also be a catalyst to allow for more events and activities such as art markets, recreation competitions, farmers markets, and cultural themed annual destinations.



Operations and Maintenance of the improvements

Every improvement project requires regular maintenance to prolong the life cycle of the investment. This ongoing operations and maintenance practice is a cost that needs to be evaluated to ensure that the project is affordable after installation and kept in a quality condition.



The maintenance of the bike lane will include the same level of management as the existing road with its asphalt, pavement markings, signage, and landscape materials. Asphalt will require preservation coatings, sealants, selective repairs, and surface treatments. The pavement markings will need to be reapplied at a standard interval and when accelerated UV damage, cracking, and fading occur. Signage replacement will be required only for accident or vandalism damage. A prorated replacement cost is suggested to be determined for 15 year period (assume replacement of each sign once every 15 years and project the annual costs into an operations and maintenance budget). The landscape materials in the medians and edges of pavement will not require regular



maintenance. Due to the rural desert character of the area and the landscape design, naturalized pruning is done only when visibility and safety issues are concerns. The irrigation for this type of landscaping does not require a regular maintenance cycle and should be addressed only when accidental damage or vandalism has occurred. An annual event for both landscape and irrigation assessment is recommended to be adequate for

maintenance, but an allowance for 1 additional yearly event should be allocated to plan for accident damage or natural storm event replacements.

The maintenance of pedestrian area improvements will be borne entirely by the Town of Cave Creek. Shared Use Paths, pavements, trails, landscape

buffers, site amenities, and specialty features will require various levels of maintenance based upon each materials life cycle. Wood features require preservation and replacement. Concrete may crack or and get vandalized, adding to repair costs. Lighting fixtures can burn out and require replacement. Each segment of the preferred concept pedestrian zone will require a variety of level of service.

Currently, the Town provides roadway maintenance through an annual budget and management program. The Town has staff that performs services of maintenance and small scale repairs. Contractors are engaged for capital improvements and large scale repair or replacement of materials.

The Town does not maintain the landscaped areas of the corridor. Much of the landscaping is native or natural desert and requires little to no maintenance. Contractors are engaged on an annual basis to maintain landscaping and irrigation along the corridor. Pruning, selective removals, weed control, and management of the irrigation system are typical contract tasks.



Preliminary Project Costs

The implementation of a large scale project such as this one requires a long range vision to identify smaller project segments that make the development of the preferred concept affordable. The preferred concept has 2 main components in the Bike Lane and the Pedestrian Area Features. The Bike Lane and the roadway improvements are cost items that can be independent of the pedestrian design elements. The pedestrian improvements are dependent upon the implemented roadway changes to make the space required for those available features.



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Costs for the Bike Lane improvements have been detailed in a spreadsheet format as Appendix A. This spreadsheet has identified a cost per 100 foot pricing for a typical section for each segment type. The pricing is based upon improving both sides of the roadway equally. The preferred concept has different segment types based upon right of way availability, land use, zoning, and site opportunities and constraints. A total number of linear feet are referenced for each segment to be able to identify complete segment costs. This system can roughly identify the distance of improvements that a future project can afford based upon any funding amount. Additional design features that are required in select areas have been identified separately. For example, if a part of a segment is required to have a deceleration right turn lane that cost is shown as an addition to the baseline bike lane costs.



Costs for the Pedestrian Area Features have been detailed in a spreadsheet format as shown in **Appendix A**. This spreadsheet has identified a cost per 100 foot pricing for a typical section of each area type. The pricing is based upon improving both sides of the roadway equally.

Impacts to existing pedestrian / bicycle systems and connections

The existing 4.5 mile corridor has distinctly different character types along its length. There are rural residential areas, a central business core, and light commercial transition areas. Existing pedestrian systems will be greatly improved with the implementation of the Preferred Alternative Concept. Missing linkages of disconnected segments can be completed, existing non-ADA compliant pedestrian walks and paths can be corrected, connections to destinations can be provided, and roadway crossings can be established or improved. Existing bicycle systems can be joined to a safer dedicated network with the implementation of the Preferred Alternative Concept. On-road cycling will no longer be required to share the rural road or be forced to the uneven conditions of the shoulders. Connections to already established and future on and off-road trails and paths can be made with this concept.



Funding Source Options identification and evaluation

The successful implementation to the Preferred Alternative Concept will be dependent on the acquisition of outside funding sources. The Town of Cave Creek has limited annual budgets and does not have a strong source of tax generation developments in order to save for a project of this magnitude in a reasonable time scale. The pursuit of funding sources will be critical to the realization of this project. Options for sources of funding for project phases or priorities include the following:

- CMAQ - Congestion Mitigation and Air Quality Improvement Program. Federal level funding administered by ADOT for the FHWA and the FTA to fund projects that reduce tailpipe emissions by encouraging alternate modes of transit other than motorized vehicles.
- MAG TIP - Maricopa Association of Governments Transportation Improvement Program. This regional program funds transportation projects from the SAFETEA-LU act and identifies a 5 year guide of the preservation, management, and expansion of public transportation services.

- ADOT-TE – Transportation Enhancement program is developed to enhance surface transportation activities by developing projects that go above and beyond what transportation projects typically do. There is a website that serves as a guide to the funding application process at www.azdot.gov/highways/SWProjMgmt/enhancement_scenic/enhancement/about.asp.
- Safe Routes to Schools – Federal level program for funding projects that provide connections to elementary and middle school campus sites and encourages walking and bicycling as modes of commuting. The program is administered by the FHWA.
- Grants and Other Programs – There are several State and Federal opportunities for funding projects via grants and programs. These opportunities typically require applications and justification of need by the local sponsor.

Implementation Schedule

The implementation of the entire concept is based upon availability of current and future funding sources. The initial development phase of the Preferred Alternative

Concept is anticipated to require \$2.84M with the goal of providing 1.5 miles of improvements. Design engineering documents will require 12 months to develop and 1 month to bid for construction. Construction of this initial phase will require an additional 6 months from notice to proceed to the selected contractor. Additional phases are anticipated to be completed as development layers in



separated segments over a period of time from 2014 to 2018 with an average of 1 phase designed and 1 phase constructed each year.