

SECONDARY AND CUMULATIVE IMPACTS

Phoenix has grown from a small agricultural town to a major metropolitan area (see the section, *Historical Context of the Proposed Action*, beginning on page 1-5). Growth is expected to continue and result in secondary and cumulative effects on the area's natural resources, communities, residents, infrastructure, and economic conditions.

OVERVIEW OF HISTORIC, EXISTING, AND FUTURE CONDITIONS

Demographics

Population in the Study Area is projected to grow by 76 percent from 2005 to 2035. From 1990 to 2000, population grew by more than 80 percent, so the trend of fast growth seen in recent decades is likely to continue (note discussion of recent economic downturn, on page 1-11). Employment is projected to grow by 112 percent from 2005 through 2035. In line with these projections, 144 development proposals, largely consisting of new residential subdivisions, were identified for the Study Area (see the section, *Development Plans*, on page 4-7).

Within the Study Area, minority populations account for 68 percent of the population, more than the average for Maricopa County (41 percent). Low-income population percentages are also above the Maricopa County average of 14 percent, with 16 percent of the Study Area population identified as low-income.

Land Use and Ownership

Much of the Study Area was converted to agricultural use prior to the 1950s. Urbanization generally began in the 1950s and has now reduced agricultural and undeveloped land to 21 and 12 percent of the Study Area, respectively.

Approximately 56 percent of the Study Area is developed, with residential (31 percent single-family and 2 percent multifamily), commercial (4 percent), industrial (14 percent), transportation (2 percent), or public/quasi-public land uses (3 percent). The I-10 (Papago Freeway)

corridor is the most intensely developed portion of the Study Area. Moving south from I-10 (Papago Freeway), the Study Area is characterized by increasingly less dense development. Much of the Goodyear area included in the Study Area is undeveloped, attesting to the lower density of development west of the Phoenix metropolitan center (see the section, *Existing Land Use, Land Use Trends, and Ownership*, beginning on page 4-3, for related information). Analysis of secondary and cumulative impacts revealed little difference (with one exception) among the action alternatives. Therefore, except where noted, the impacts discussion focuses on the proposed action, which considers all of the action alternatives.

SECONDARY IMPACTS

Regulatory Basis

Secondary impacts (sometimes referred to as indirect impacts) are “caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable. Secondary impacts may include growth inducing effects and other effects related to induced changes in the pattern of land use, population density or growth rate, and related effects on air and water and other natural systems, including ecosystems” (40 C.F.R. § 1508.8). An example is how the construction of a new highway interchange at a cross street can attract the building of a new gas station.

FHWA implements NEPA and CEQ guidelines under 23 C.F.R. § 771 (FHWA 1992). FHWA has interim guidance on secondary (indirect) and cumulative impact analysis (FHWA 2003). The FHWA interim guidance supplements the CEQ guidance; combined, they provide the primary basis for analysis. The information presented follows two principles outlined by the CEQ guidance (1997) in considering secondary and cumulative analyses: 1) focus only on the effects and resources within the context of the proposed action, and 2) present a concise list of issues that have relevance to the anticipated effects of the proposed action or eventual decision.

Analysis of Potential Impacts

Resources Not Subject to Secondary Impact Analysis

The relation of the proposed action to social, cultural, technical, economic, and natural components of the environment was reviewed to determine the potential for secondary impacts to occur. Based on this assessment, certain resources were excluded from analysis. The rationale for determining which resources would not be given further consideration for secondary impact analysis is presented in Table 4-55.

Resources Subject to Secondary Impact Analysis

The effects among action alternatives are anticipated to be comparable. Critical issues warranting secondary impact analysis are biological resources, water resources, air quality, cultural resources, land use, and economic conditions. (One secondary impact under economic conditions would result from the W101 Alternative and its Options. The direct impact of land conversion to a nontaxable land base by the alternative would lead to a substantial reduction in the City of Tolleson's tax revenues. The secondary effect would be sufficient to lead to possible reductions in the provision of public services to city residents. The impact is discussed further in the section, *Economic Impacts*, beginning on page 4-46). The resource, the proposed action impact, and reasonably foreseeable impact are presented in Table 4-56.

Induced Travel

Induced travel is a phrase used to describe observed traffic volume increases occurring on a new highway after it is opened. The observation is prominent in areas where congestion is already evident (the Phoenix metropolitan area is an example).

The proposed action would be constructed where existing traffic congestion has already decreased travel speeds throughout much of the Regional Freeway and Highway System and the major arterial street network.

Table 4-55 Resources Not Considered for to Secondary Impact Analysis

Resource	Rationale
Topography	While the proposed action would alter topography in the Study Area, the direct impacts from the proposed action are adequately presented in the <i>Topography, Geology, and Soils</i> section of this chapter. Therefore, no further consideration is given because the proposed action is not expected to cause topographic changes beyond direct impacts.
Energy	While construction and operation of the proposed action would result in the direct use of energy, the proposed action and its alternatives would not use energy at a magnitude or rate beyond consumption as determined if no action were undertaken. Therefore, no further consideration will be given because the proposed action is not expected to vary usage levels considerably from existing and projected traffic patterns.
Utilities	While construction of the proposed action would require the relocation and adjustment of utilities, no new utility projects are identified in the Study Area to support the proposed action. Therefore, no further consideration is given.
Environmental justice	The evaluation to determine whether disproportionate impacts on any environmental justice population would occur revealed that all action alternatives would have direct impacts on Title VI and environmental justice populations. The proposed action would be accessible to all populations in the Study Area, the impacts would not be disproportionately high on any population, and mobility benefits would occur. Benefits would include enhanced access to and from employment opportunities and enhanced movement of goods and services for improved access to such goods and services for all population segments. Therefore, no secondary impacts would occur.
Recreational land	Section 6(f) lands would not be affected by the proposed action and, therefore, no further consideration is warranted. The Section 4(f) process required consideration of direct and indirect impacts; therefore, the Section 4(f) evaluation performed for this project adequately considered secondary impacts, and no further consideration is given to recreational land.
Noise	Noise is an unwanted sound that can intrude on and have effects on the resources of the human and natural environments. The noise analysis conducted for the proposed action took into account projected future noise from traffic on the proposed action. No additional noise would be expected because of the proposed action; therefore, no further consideration is given.
Hazardous materials	Hazardous material sites are a byproduct of the human environment. The <i>Hazardous Materials</i> section of this chapter considered the direct and indirect potential for the proposed action to disturb such sites; therefore, no further consideration is given.
Demographics	Because this project and other transportation projects have been designed to respond to population forecasts (as opposed to encouraging population growth where it might not otherwise occur), no secondary impacts on demographics have been identified. Therefore, no further consideration is given.
Wild and scenic rivers	No wild and scenic rivers occur in the Study Area; therefore, no secondary impacts would occur. No further consideration is given.
Sole source aquifer	No sole source aquifers occur in the Study Area; therefore, no secondary impacts would occur. No further consideration is given.
Floodplains	The proposed action may cause changes in land development at select locations adjacent to its alignment. In some instances, such changes may be proposed within designated floodplains in the Study Area. Ultimately, however, incompatible use or development within floodplains would not be facilitated by the proposed action. Developments in the area must comply with State and local zoning and floodplain ordinances; therefore, no secondary impacts would occur.
Visual quality	The proposed freeway would be a part of the transition in land use from low-density, open uses to residential, commercial, and light industrial uses. This is a trend that is underway and would continue with or without the proposed freeway. The road cuts proposed for the western end of the South Mountains and the direct impacts from the proposed action are adequately presented in the <i>Topography, Geology, and Soils</i> section of this chapter and no additional impacts would occur; therefore, no secondary impacts would occur.

To avoid congestion, over time, some travelers have diverted to alternative routes, changed the time of day they make their trips, switched to different travel modes, traveled to other destinations, or decided not to make a particular trip at all. Because the proposed action would carry substantially more traffic before it would become congested, many of these travelers may switch to the new facility when opened to take advantage of decreased travel times. Some travelers using transit as a choice may also switch and, further, some may choose to travel to different (more distant) destinations (e.g., for shopping) or take a trip that they previously avoided altogether because it was previously “too much trouble” to make. The behavior triggering such a switch is often associated with drivers’ perceptions of a decreased generalized cost of travel, including both travel time and out-of-pocket costs. It is commonly recognized, however, that the causes of this “switch” are more complex and involve various travel behavior responses, evolving individual needs, residential and business location decisions, and changes in regional population and economic growth.

Some induced travel would represent new trips. Most of the increase in traffic caused by induced travel, however, is expected to come from trips already being made before the proposed action would be put into operation (predictable traveler behavior accounted for in the travel demand forecasts conducted for the proposed action). The resulting traffic increase on the proposed freeway would also be expected to be largely offset by decreases in traffic volumes on parallel routes and at other times of the day. It is fully expected that the net effect on daily VMT in the region as a result would be minimal. Examples in the region where this phenomenon has been experienced include the openings of SR 101L (Pima Freeway) in Scottsdale and of SR 202L (Red Mountain Freeway) in Mesa.

SR 101L (Pima Freeway) was opened to traffic in 2002, from SR 202L (Red Mountain Freeway) to I-17. The section from the Red Mountain Freeway to Shea Boulevard was opened in 1999. On opening, changes in traffic volumes were experienced on Hayden and Scottsdale roads (both parallel the Pima Freeway 1 mile and 2 miles to the west, respectively). Both are major arterial streets with cross sections of four to six lanes.

Table 4-56 Secondary Impacts, Action Alternatives

Resource	Proposed Action Impact	Reasonably Foreseeable Impact
Biological	Habitat loss from direct conversion to transportation use	Habitat loss from urban development
	Vehicle-animal collisions	Wildlife population reduction
	Loss of native vegetation	Increased rate of land conversion
Water	Loss and/or alteration of natural drainage features	Loss from urban development
	Modification of groundwater tables from pumping to drain a depressed facility: eventual impact on the water table by removing this water from use	Groundwater drawdown from continued development
Air quality	Particulate matter attributable to construction activities	Construction activities related to continued rapid urban growth in the region
Cultural resources	Disturbance to known historic and prehistoric sites	Enhanced access to undisturbed land
	Discovery of previously unknown cultural resources	Discovery of previously unknown cultural resources related to ongoing urban development
Land use	Conversion of agricultural land to other uses	Ongoing residential, industrial, and commercial development
	Land use ownership and conversions	Conversion of zoned parcels to more intensive land uses
	Alteration of community character	Ongoing residential, industrial, and commercial development and its effect on community character
Economic conditions	Enhanced movement of goods, people, and materials; property value changes	Projected growth in land values and economic activity in Study Area

The analysis, conducted by the City of Scottsdale, illustrates a reduction in traffic along both major arterial streets after the freeway was completed. Traffic reduction on Hayden Road ranged from 13,900 to 48,300 vehicles per day (vpd), with an average reduction of 31,000 vpd. Scottsdale Road, which is farther away from the freeway, experienced a reduction of between 2,100 and 13,300 vpd, with an average reduction of 10,000 vpd.

The Red Mountain Freeway, from its interchange with SR 101L to Gilbert Road, was opened to traffic in 2002, and the extension to Higley Road was opened in 2003. On opening, changes in traffic volumes were

experienced on McDowell, McKellips, and Brown roads (all generally parallel the Red Mountain Freeway 1, 2, and 3 miles to the south, respectively). All are major arterial streets with cross sections of four to six lanes.

The analysis, conducted by the City of Mesa, illustrates a reduction in traffic along all three major arterial streets after the freeway was opened. The traffic reduction on McDowell Road ranged from 6,300 vpd to 9,900 vpd, with an average reduction of 8,600 vpd. The traffic reduction on McKellips Road ranged from 2,300 vpd to 33,900 vpd, with an average reduction of 19,000 vpd. The traffic on Brown Road ranged from an increase of 300 vpd at the eastern end to a reduction of 9,700 vpd,

with an average reduction of 4,500 vpd. The largest reduction was on the western end of the road, near Country Club Drive.

Both examples provide insight to general driver behavior. At the time of opening, both freeways represented driver savings in time and/or travel costs. Consequently, drivers moved from the arterial street network to the freeway system. Over the course of time, it would be expected that some drivers would return to the arterial street network as more vehicles traveled on the freeways. For the proposed action, a net reduction on the arterial street network would be anticipated through the design year of 2035 because traffic volumes on the arterial street network would be projected to be less with the proposed action in place than without the proposed action.

For the proposed action, the minimal contribution to overall traffic use by induced travel would be expected to have both positive and negative consequences (positive effects on the neighboring road network have been previously addressed). Changes in driving behavior leading to the use of the proposed action would be the result of perceived benefits, which could include reduced total daily travel time and cost or an increased value associated with a new destination (e.g., a previously “inaccessible” shopping area with more variety or lower prices).

As a negative consequence, each user of the proposed action would contribute to increased congestion on the freeway. As congestion increased on the new facility, the benefit attributable to potential travel time savings would be expected to decline. Congestion-related impacts (e.g., reduced air quality) would also increase over time. The overall contribution to projected traffic volumes on the proposed action, however, would be anticipated to be minimal (some of which is accounted for in regional traffic models).

It is important to consider that improvements proposed for any type of transportation system (e.g., a new bus route, rail transit line, commuter rail service) would likely lead to changes in travel behavior, which, in turn, would lead to increased use of the particular system. Improvements made to a given transportation system are meant to attract new users. If this were not a primary goal, the improvements would be neither effective nor

warranted. For the proposed action, a goal is to attract users of other segments of the Regional Freeway and Highway System and the local arterial street network, now and in the future, to the proposed action to optimize, in part, the entire regional transportation system (as outlined in the proposed action's purpose and need in Chapter 1). Further, it is important to consider that, as improvements are made to all transportation systems, cyclical benefits and impacts would occur. For example, as auto trips would be diverted to transit (either because of direct improvements or increased congestion), traffic congestion on parallel highway facilities may diminish, at least temporarily. The resulting reduction in highway traffic congestion may, in turn, attract additional highway trips, similar to an increase in highway capacity.

FHWA's position relative to induced travel is consistent with the consensus of the transportation planning and travel behavior research community: induced travel is neither more nor less than the cumulative result of individual traveler choices and land development decisions made in response to an improved level of transportation service. Many of the travel choice decisions are accounted for in current travel forecasting models or land use-transportation interaction models.

Induced Growth

Unplanned growth is often termed "urban sprawl." Generally, the reference is made in the context of rapid and uncontrolled urban growth onto previously undeveloped land—usually on the outskirts of an existing urban area. Construction of projects like the proposed action is often identified as a major contributor to urban sprawl. Freeway projects are often cited as making land at the urban fringe more accessible and, therefore, more attractive for development.

But, as with issues surrounding induced demand, the relationship between transportation improvements and land development is complex. Land accessibility in a particular area as a result of a freeway project may make land more attractive for development, but other factors, such as utility infrastructure, quality of public services, land acquisition and development costs, economic

conditions, and entitlement costs, assume major roles in determining where and how development would occur. In fact, in many cases, new development being attracted to one part of a metropolitan region often represents development that has been redirected from other parts of the region.

Until the economic downturn that began in 2007, the past rate of growth and development far exceeded the ability of any major transportation infrastructure to keep pace. (Factors like affordable cost of living, employment opportunities, mild climate, reasonable accessibility, and a development-oriented regulatory environment will contribute to a resumption of a solid rate of growth.) Examination of data comparing population and land use between 1975 and 2000 suggests major transportation infrastructure projects like the proposed action are not major contributors to or inducers of growth in the region. For example, from 1975 to 2000, population increased by 211 percent from just over 1 million people to over 3.1 million people. The acreage of urban area increased from nearly 226,000 acres to just over 549,000 acres (143 percent increase). During this same time frame (and actually dating back to development patterns of the 1950s), population densities have remained constant at two households per acre. While newer development between 1991 and 2000 has generally been at four households per acre, the overall densities remain well below what transportation planners use as a rule of thumb for the minimum density needed to support a public transit-based network: seven households per acre. VMT have increased from 17 miles per day to approximately 21 miles daily (a 24 percent increase), and traffic delay and related congestion costs increased 350 to 360 percent in that same time period.

While the recession has dramatically slowed growth in the Phoenix metropolitan area—and theoretically provided an opportunity for transportation infrastructure to catch up with the demographic forces that have historically fueled high growth—it has also affected resources at all levels of government that are the sources of funding for expansion of the regional transportation infrastructure. Federal economic stimulus funding has benefited projects that were far along in the

planning process. Locally, Proposition 400 funding for transportation development in the MAG region depends on revenues from a tax on retail sales, which have been substantially lower than prerecession projections. Nationally, revenues derived from the federal fuel tax and which in part provide funding for highway development have decreased since the recession began (FHWA 2009b). More fuel-efficient vehicles and overall lower vehicle use have also contributed to this national decline in revenues. Because transportation capacity seriously lags transportation demand in the Study Area, it can be assumed the proposed action would neither induce growth nor facilitate any increase in the rate of growth under current or projected growth environments.

The proposed action would be implemented in a historically quickly urbanizing area (most noticeably in the Western Section of the Study Area—note that a nationwide recession beginning in 2007 has slowed growth). On the eastern side of the Study Area, the proposed action abuts public parkland, Native American Community land, and a near-fully developed area and, therefore, any contribution to accelerated or induced growth is constrained. Historical and projected growth and the factors (including the proposed action) contributing to such growth are well-documented in Chapter 1, *Purpose and Need*, and in the sections, *Land Use* and *Economic Impacts*, beginning on pages 4-3 and 4-46, respectively. The proposed action would be built in an area planned for urban growth as established in local jurisdictions' land use planning activities for at least the last 25 years. If, on the other hand, the proposed action were to be located in rural or fringe areas, it would provide access to large tracts of undeveloped land. Some similar types of projects, in fact, in other parts of the country, were developed specifically to promote nonhighway economic development. In two such cases, FHWA is monitoring where a substantial highway improvement was completed whose purpose was to promote economic development. In the case of the proposed action, the purpose of the project is not to promote economic development but to respond to a growing need for additional transportation capacity as a result of regional growth occurring now and as projected.

CUMULATIVE IMPACTS

Regulatory Basis

Federal guidance defines *cumulative impacts* as “the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions” (40 C.F.R. § 1508.7). Cumulative impacts are considered direct effects, which are “caused by the action and occur at the same time and place” (40 C.F.R. § 1508.8). Put another way, cumulative impacts occur where several actions in an area combine to create an impact greater than any one individual activity.

Methodology

The cumulative impact analyses considered:

- ▶ environmental resources that would be directly affected by the proposed action
- ▶ the area in which effects of the proposed action would be felt
- ▶ impacts that would result from the proposed action
- ▶ other past, proposed, and reasonably foreseeable future actions that have had or could be expected to affect the same area
- ▶ expected impacts from other actions
- ▶ the overall expected impact if the individual impacts were allowed to accumulate

Parameters established to conduct the analyses were:

- ▶ Assess those critical, or at-risk, resources expected to substantially experience a cumulative impact. Logically, if the proposed action would not directly affect a particular environmental resource, the action would not contribute to a cumulative impact on that resource. This focused the analysis on critical, or at-risk, resources and fulfilled CEQ guidance (2005) that agencies should use scoping to focus on the extent to which information is “relevant to reasonably foreseeable significant adverse impacts” and is “essential to a reasoned choice among alternatives.”

- ▶ During the analyses, follow two principles outlined by CEQ guidance (1997) in considering critical conditions: 1) focus only on the effects and resources within the context of the proposed action, and 2) present a concise list of issues that have relevance to the anticipated effects of the proposed action or eventual decision.
- ▶ Establish a geographic, or spatial, boundary for impact assessment. The size of the cumulative impact study areas varied depending on the critical resource.
- ▶ Determine time frames for which to assess cumulative impacts as driven by CEQ guidance to consider past, present, and reasonably foreseeable changes that could result in cumulative impacts when combined with the effects of the proposed action. The start of the general urbanization of the greater Phoenix metropolitan area beginning in the 1950s was established as the historic time limit. Although not a specific individual action, the Study Area’s urbanization is noteworthy because it highlights the “current aggregate effects of past actions without delving into the historical details of individual past actions” (CEQ 2005). In addition, the design year (estimated time when the freeway would provide its intended traffic capacity) of 2035 was used as the future time limit.
- ▶ Identify past, existing, and proposed relevant actions. Relevant actions were identified to evaluate when—in combination with the proposed action and its associated impacts—they could result in cumulative impacts. Reasonably foreseeable changes were limited to projects currently planned and funded. The following types of activities that could contribute to cumulative impacts were:
 - > other highway projects initiated by the proposed action
 - > planned mass transit projects in the Study Area
 - > other major infrastructure projects (e.g., utility expansion)
 - > other general development patterns

Other proposed transportation projects within or near the Study Area include high-capacity transit on

I-10, median and outside widening of I-10 (Papago Freeway) between SR 85 and SR 101L, SR 30 freeway, I-10 Local/Express lanes, SR 303L extension, I-17 expansion project, and the ARS project. No other major infrastructure projects were identified aside from local arterial street widenings to serve existing growth.

Analysis of Potential Impacts

Resources Not Subject to Cumulative Impact Analysis

The relation of the proposed action to social, cultural, technical, economic, and natural components of the environment was reviewed to determine the potential for cumulative impacts. Resources assessed and determined not to be subject to cumulative impact analysis are presented in Table 4-57.

Resources Subject to Cumulative Impact Analysis

The contribution to cumulative effects among action alternatives is anticipated to be comparatively the same. The following critical issues warranted cumulative impact analysis.

Biological Resources

Habitat Loss

Construction and operation of the proposed action would irrevocably convert existing natural habitat to a transportation use and, therefore, contribute to a reduction in the amount of wildlife habitat in the region (EPA 2004). From 1975 to 2000, the proportion of land in human-related uses (e.g., urban) increased by an estimated 15 percent (the rate of increase to human-related uses was greatest during the “pre-freeway” period of 1975 to 1986). During this period, natural land uses decreased by 5 percent. Ongoing planned and permitted residential, commercial, and transportation development would likely further this trend of habitat loss through direct conversion, habitat isolation (addressed below), and native plant loss (addressed below). Also, wildlife typically is displaced, causing either increased competition among species members and/or population reduction.

Table 4-57 Resources Not Considered for Cumulative Impact Analysis

Resource	Rationale
Energy	While construction and operation of the proposed action would result in the direct use of energy, the proposed action and its alternatives would not use energy at a magnitude or rate beyond consumption as determined if no action were undertaken. Therefore, no further consideration will be given because the proposed action is not expected to vary usage levels considerably from existing and projected traffic patterns.
Utilities	While construction of the proposed action would require the relocation and adjustment of utilities, no new utility projects are identified in the Study Area to support the proposed action. Therefore, no further consideration is given.
Hazardous materials	Hazardous materials are not considered a resource upon which impacts from the proposed action or from other known projects would occur. Instead, hazardous material sites are a byproduct of the human environment. The hazardous materials report prepared for the proposed action considered the direct and indirect potential for the proposed action to disturb such sites; therefore, no further consideration is given.
Demographics	Because this project and other transportation projects have been designed to respond to population forecasts (as opposed to encouraging population growth where it might not otherwise occur), no cumulative impacts on demographics have been identified. Therefore, no further consideration is given.
Economics	The proposed action would not induce economic growth nor facilitate any increase in the rate of growth under the growth environment because the proposed action provides only a portion of the capacity shortfall in transportation support infrastructure that has been experienced throughout the region and, in particular, in the southwestern Phoenix metropolitan area. In addition, growth is geographically constrained by the presence of the existing urbanized area, Community ^a land, and SMPP. ^b Therefore, no cumulative impacts would occur.
Wild and scenic rivers	No wild and scenic rivers occur in the Study Area; therefore, no cumulative impacts would occur. No further consideration is given.
Sole source aquifer	No sole source aquifers occur in the Study Area; therefore, no cumulative impacts would occur. No further consideration is given.
Floodplains	Incompatible use or development within floodplains would not be facilitated by the proposed action. Developments within the area must comply with State and local zoning and floodplain ordinances; therefore, no cumulative impacts would occur.

^a Gila River Indian Community ^b Phoenix South Mountain Park/Preserve

Habitat Connectivity

Construction and operation of the proposed action would bisect existing natural habitat for the purposes of a transportation use and, therefore, would contribute to habitat isolation, inhibiting the movement of wildlife for life requirements. This effect would likely be most prevalent in the areas between the South Mountains and Sierra Estrella. Ongoing planned residential, commercial, and transportation development is reviewed

and permitted by local jurisdictions on a case-by-case basis; however, most developments are too small to consider their individual contributing effects on habitat connectivity. However, when considered together, these ongoing developments would contribute to continued adverse effects on habitat connectivity. The provision of mitigation for the proposed action in the form of multiuse crossings to be situated in cooperation with federal and State wildlife officials would minimize impacts attributable to the proposed action.

Vehicle-animal Collisions

The movement of wildlife for life requirements in the Study Area suggests the construction and operation of the proposed action would increase the potential for vehicle-animal collisions in the region. This potential impact would likely be most prevalent along the segment of the freeway that would be between the South Mountains and Sierra Estrella. Ongoing planned and permitted development in this area would also contribute to an increase in collisions; however, this increase may be moderated by 1) slower travel speeds on the current and future local arterial street network, 2) lesser concentrations of wildlife in developing areas, and 3) the provision of mitigation for the proposed action in the form of multiuse crossings to be situated in cooperation with federal and State wildlife officials. Together, the proposed action and future projects (e.g., SR 30, ARS) would place high volumes of traffic near undisturbed areas along the Gila and Salt rivers. Therefore, these planned projects and the ongoing development would contribute to increasing numbers of vehicle-animal collisions. Over time, as the southwestern Phoenix metropolitan area develops, the incidence of this type of impact would likely diminish as habitat decreases and becomes less able to sustain large wildlife populations.

Native Plants

Ongoing conversion of natural areas to human-based development contributes to continued loss of native plants in the region. The proposed action would contribute to the loss of native plants because it would convert land known to have native plants to a transportation use (although the impact would be offset somewhat by project-specific proposed mitigation). Future residential, industrial, commercial, and transportation projects in conjunction with the proposed action can be reasonably expected to contribute to a loss of native vegetation, as defined and protected under the Arizona Native Plant Act (A.R.S. § 3-901 et seq.). Notably, the proposed action as currently planned would convert natural areas around the South Mountains to a transportation use.

Invasive Species

The introduction of nonnative species and noxious weeds has occurred since the 1950s as a result of agricultural, industrial, and residential uses. The native plant species within and adjacent to the Study Area would decrease in both number and diversity, which could have an impact on endemic animal species, especially songbirds, that depend on them for food, shelter, and nesting. Nonnative trees and shrubs tend to attract nonnative bird species such as the house sparrow, European starling, and rock dove, and these bird species compete with native species for resources. The nonnative species readily adapt to their new environments, and most have prospered around the Study Area for many years. This is not always the case with endemic species and, over time, competition can lead to the depletion of a particular native species. If individuals of a native animal species present in the Study Area have another habitat to move to, with more available food and shelter, they stand a better chance of survival. Areas such as Tres Rios, Rio Salado, SMPP, and the Sierra Estrella are viable areas for native birds and small mammals. Federally funded and State-funded transportation projects in Arizona would increase the spread of noxious plants. Future residential, industrial, and commercial development and transportation projects without federal or State funding can also be reasonably expected to contribute to the potential introduction and spread of invasive species.

Threatened and Endangered Species

Several other projects in the Study Area could contribute to cumulative effects on the Yuma clapper rail and yellow-billed cuckoo. The proposed SR 30 freeway, from SR 303L to SR 202L (proposed South Mountain Freeway), would be located between the Gila and Salt rivers and Lower Buckeye Road; NEPA requirements will be addressed in an environmental assessment for that federally funded project. Also, the Rio Salado Oeste and Tres Rios wetlands projects will help restore wetlands and riparian areas along the Salt and Gila rivers from 83rd Avenue to the west. The restoration of the Salt and Gila rivers' riparian and wetland habitat could improve habitat conditions for the Yuma clapper rail and yellow-billed cuckoo. Effects on the Yuma

clapper rail and yellow-billed cuckoo would be addressed in NEPA documentation for these projects as well.

Piers for a proposed freeway bridge along the W59 (Preferred) Alternative would be placed in the riverbed of the Salt River through the eastern half of a 192-acre BLM parcel leased to the City of Phoenix under provisions of the Recreation and Public Purposes Act for inclusion in the proposed Rio Salado Oeste project. The City of Phoenix is aware of, has planned for, and has incorporated the proposed freeway in its *General Plan*. The City has designated the Rio Salado Oeste project as incorporating the proposed freeway. Although the lease does not include a reference to the proposed freeway, BLM would support working with the City of Phoenix to take the steps necessary to amend the lease in a manner that would allow the proposed freeway to pass through the property, if the W59 Alternative were identified as the Selected Alternative in the EIS and ROD. Both parties concurred with this approach in August 2005 (see Appendix 1-1). As a result of this coordination and cooperative planning, no impacts on the proposed uses of this land or other planned wetlands and riparian restoration projects would occur.

Cumulative impacts resulting from future State or private actions are anticipated to include noise impacts and general human disturbance resulting from continuing development. No critical habitat is designated within the Study Area for any listed species (within the limits of disturbance, the proposed action may affect individuals of the Sonoran desert tortoise population occurring in the Study Area).

Water Resources

Surface Water

Contaminants from Stormwater Runoff

Existing sources of water affecting water quality include drainage from the South Mountains through development areas, Gila Drain Floodway discharge, sand and gravel pit operations in and upstream of the Study Area, and the 91st Avenue WWTP treatment ponds. The proposed action, along with other planned roadway improvements (e.g., local arterial roadway widening

and new roadway projects such as the proposed SR 30 and ARS), would contribute to cumulative impacts on water quality. Regionally, the presence of urban uses near water courses has increased by 8 percent from 1975 to 2000 (EPA 2004). Specifically, stormwater flow from other projects or other physical jurisdictions would combine with stormwater flow originating directly from the proposed action. Runoff from the freeway during infrequent rain storms would likely include lead, zinc, filterable residue, and total nitrogen. Other projects may include transportation, commercial, and residential development, which would result in less permeable surfaces to accommodate recharge and more impervious surfaces that act as pollution collection surfaces. This associated development would result in higher runoff volumes and a higher potential for pollutant discharges into receiving streams. However, these impacts would be minimized by providing BMPs during construction, following current design standards for detention facilities, and complying with federal and State permits for stormwater discharges.

Natural Drainage Features

Continued conversion of undisturbed land to human-based development in the region has altered surface drainage features, particularly ephemeral washes. The proposed action would contribute to such effects by altering natural drainage features immediately adjacent to the project (although the impact would be offset by project-specific proposed mitigation).

Future residential, industrial, commercial, and transportation projects would also modify natural drainageways. Unlike the proposed action, the ability to manage and mitigate impacts from some ongoing planned and permitted residential and commercial development would be limited and, therefore, less likely subject to regulatory compliance that could reduce effects.

Groundwater

Groundwater is a source of public water supply in Arizona. In 1995, groundwater withdrawal in the Phoenix AMA supplied 39 percent of the total consumption of 2.29 acre-feet (ADWR 1999). About

64 percent of the withdrawal was used for agriculture. The remainder was used for public water supply, industrial, domestic, and other purposes. Population growth has resulted in the retirement of agricultural land and the conversion of the intended use of groundwater supplies to urban uses. Issues created by groundwater overdraft include decreased water levels in aquifers and increased well drilling and pumping costs. Some wells in the Study Area displaced by the proposed freeway would have to be fully replaced in accordance with 2006 ADWR well spacing and well replacement rules. Known land development planned in the Study Area as presented in the *Land Use* section of this chapter would likely contribute to increasing demands on groundwater supply; the proposed action could place further demand on water supplies temporarily during construction and for maintenance purposes. These demands on supply would be likely offset through the application of water reuse BMPs.

The profile of the proposed action would be depressed in certain areas of the Study Area that have relatively high groundwater tables. Water falling on the freeway would be concentrated into low areas along depressed sections and would then drain by gravity from the depressed sections of the freeway to the river. With development ongoing in the areas where depressed freeway sections are being considered, it is possible the proposed action could contribute to reductions in groundwater supply. Because surface drainage from storms would drain by gravity to the river, it is expected the proposed action would have little cumulative effect on groundwater. These effects would be minimized by providing BMPs during construction, following current design standards for detention facilities, and complying with federal and State permits for stormwater discharges.

Water Availability

Ongoing planned and permitted residential, commercial, and industrial development in the region would likely continue to place a demand on water availability. The proposed action would have little cumulative effect on water availability.

Cultural Resources

The proposed action may contribute to cumulative cultural resources impacts. However, the proposed action and other major planned transportation projects would potentially create preservation in place (enhancement) opportunities not typically associated with private-sector development projects. The opportunity to preserve in place would be the result of federal and State regulations promoting preservation of such resources when associated with a publicly funded project; these federal and State regulations generally are not applied to privately funded projects. Although the types of impacts would be typical of those experienced in constructing and operating other parts of the region's freeway system, some of these impacts would be effectively mitigated through the implementation of enhancement and management plans and other strategies.

Land Use

The amount of agricultural land in the Phoenix metropolitan area has decreased from over 50 percent in 1975 to just over 35 percent in 2000 (EPA 2004). With the exclusion of reservation land and, possibly, ranches, Maricopa County in 2007 had only 8 percent of its land as farmland (National Agricultural Statistics Service 2009). After considering what is planned by local municipal zoning ordinances, only 12 percent of the Study Area is planned for future agricultural use. Urban growth in the Phoenix metropolitan area is contributing to the conversion of farmland to urban uses. The proposed action would contribute by converting farmland within the proposed R/W to a transportation use. Other planned transportation projects (e.g., SR 30, ARS, I-10 Widening) would also contribute to the farmland conversion. Future residential, industrial, and commercial development projects and local street improvements would also contribute to farmland conversion, most of which is planned for in local jurisdictions' planning documents.

The proposed action is considered a contributing factor to the cumulative impacts on residential and business displacements. Other primary contributors

to displacement impacts would be other planned transportation projects (e.g., SR 30, ARS, and some arterial street widening projects). Future residential, industrial, and commercial development projects and local street improvements are not expected to result in substantial relocations because the vast majority of this development would occur within existing transportation R/W or on vacant parcels or agricultural land.

A transition from rural agricultural to moderate density homogeneous single-family residential use has continued to occur. Several factors contribute to the change: affordable cost of living, employment opportunities, mild climate, reasonable accessibility, and a development-oriented regulatory environment. Examination of data comparing population and land use between 1975 and 2000 suggests major transportation infrastructure projects like the proposed action are not major contributors to or inducers of growth in the region. For example, from 1975 to 2000, population increased by 211 percent from just over 1 million people to over 3.1 million people. The extent of urban area increased from nearly 226,000 acres to just over 549,000 acres (143 percent increase). During this same time frame (and actually dating back to development patterns of the 1950s), population densities have remained constant at two households per acre. While newer development between 1991 and 2000 is at four households per acre, the overall densities remain well below what transportation planners use as a rule of thumb for the minimum density needed to support a public transit-based network: seven households per acre. VMT and traffic delay and related congestion costs have increased in that same time period. Until the economic downturn that began in 2007, the past rate of growth and development far exceeded the ability of any major transportation infrastructure to keep pace. While the recession has slowed growth in the Phoenix metropolitan area—and theoretically provided an opportunity for transportation infrastructure to catch up with the demographic forces that have historically fueled high growth—it has also reduced governmental sources of funding for expansion of the regional transportation

infrastructure. Locally, Proposition 400 funding for transportation development in the MAG region depends on revenues from a tax on retail sales, which are substantially lower than prerecession projections. Nationally, the federal fuel tax, which in part provides funding for highway development, has decreased from 6 to 4 percent since the recession began (FHWA 2009b). The use of more fuel-efficient vehicles and overall lower vehicle usage has also contributed to the national decline in revenues. Because transportation capacity seriously lags transportation demand in the Study Area, it can be assumed the proposed action would neither induce growth nor facilitate any increase in the rate of growth under current or projected growth environments.

The proposed action would displace residences, businesses, public and quasi-public facilities; alter current access patterns; and introduce a major transportation facility where one does not currently exist. Other planned transportation projects (e.g., ARS) would have similar effects. The construction and operation of these projects would have a cumulative effect on the region's communities that maintain distinct characteristics. The planned projects, including the proposed action, could affect distinct communities' characteristics through displacements, noise intrusion, the introduction of a high-intensity land use that may conflict with more passive community land uses, and alteration of a community's sense of place and/or internal circulation.

Environmental Justice

The evaluation to determine whether there would be disproportionate impacts on any population with environmental justice characteristics revealed that all action alternatives would have direct but not disproportionate impacts on such populations. Considering the proposed action would be accessible to all populations in the Study Area, the impacts would not be disproportionately high, and mobility benefits would occur. Benefits would include enhanced access to and from employment opportunities and enhanced movement of goods and services for improved access to such goods and services for all population segments.

Some populations with environmental justice characteristics have specific needs associated with their identity being tied directly to geographic setting. For Native American populations near and adjacent to the proposed action, association with cultural values of the South Mountains is important to identity and is established through direct spiritual and visual access to the mountains. Land developments in the area have encroached on the South Mountains, and the proposed action would contribute to further encroachment on the southern side of the mountains. The contribution of the proposed action to this cumulative effect would be offset somewhat by the provision of freeway underpasses, allowing individuals from the populations to continue unrestricted access to the mountains, and by the provision of R/W fences along the border with the Community, which would prevent some of the unlawful trespass that currently occurs. Continued land development in the area also would contribute to a cumulative modification of visual access to the resource, and the proposed action also would contribute to the alteration of views of the mountains [although the effect would be offset by measures to be undertaken to minimize harm to the resource, as described in Chapter 5, *Section 4(f) Evaluation*].

Visual Resources

The area has experienced and will continue to experience a rapid transition in land use from low-density, open uses to residential, commercial, and light industrial uses. Large subdivisions have been developed in open agricultural land, and residential development has encroached onto the southern side of the South Mountains. These actions would all generally contribute to the continuation of the rapid development of the southwestern Phoenix metropolitan area from an agricultural-oriented past to a suburban- and urban-appearing present and future. The proposed freeway would be a part of this trend. The perception of open spaces with distant mountain backdrops would change to one of expanding suburban and urban development. The backdrop would remain, but the foreground and middle ground would change so substantially that the visual

perception, over time, would change dramatically. This is a trend that is underway and would continue with or without the proposed freeway. Sensitive views along the E1 Alternative would be affected; however, the road cuts proposed for the western end of the South Mountains would be treated to ensure that the newly exposed rock faces would be characteristic of the adjacent natural rock features, including scale, shape, slope, and fracturing to the extent that could be practicable and feasible as identified through geotechnical testing and constructibility reviews. Rounding and blending of new slopes to mimic the existing contours to highlight natural formations and warping slopes at intersections of cuts and natural grades to transition with natural ground surfaces would be attempted. Because of the enactment of the Phoenix Mountain Preserve Act in 1990 [see Chapter 5, *Section 4(f)*], it is unlikely that additional impacts to the South Mountains of this magnitude would occur.

Recreational Land

Recreational lands and facilities are valued in the Phoenix metropolitan area. This value is established through identification of recreation as an important and key element in local and regional land use plans and through recognition of its role as an important component of the region's tourism industry. In the region, recreational resources take the form of a wide array of facilities such as neighborhood, community, and regional parks; active playfields (e.g., baseball fields); equestrian, bicycle, and multiuse trails; and mountain preserves and open space. In the past, some of these resources have been converted to residential, commercial, and transportation uses. The enactment of the Phoenix Mountain Preserve Act in 1990 [see Chapter 5, *Section 4(f) Evaluation*] was intended to curb the loss of mountain preserve resources from land development encroachment. The proposed action, by design, takes measures to minimize its contribution to further loss of recreational resources. With the exception of SMPP (where avoidance was determined not feasible), all recreational resources were avoided. Measures to minimize harm to SMPP, including the provision of

replacement lands as described in Chapter 5, would reduce impacts to the lowest level possible and would ensure that active recreational areas within SMPP would not be affected. As development continues in the Study Area and surroundings, it is reasonable to conclude that such developments (as permitted by local jurisdictions on a case-by-case basis) may use recreational land in the future. Conversely, many new residential developments are setting aside land for future park development, some of which may be transferred to public ownership and access. Transportation projects in the region have resulted in uses of some recreational facilities, but in many cases these projects have resulted in improved access or provided additional protection to recreational lands.

Noise

Noise is an unwanted sound that can intrude on and have effects on the resources of the human and natural environments. The noise analysis conducted for the proposed action considered potential impacts where they are likely to occur (within 1,000 feet of the proposed alignments) based on the increase over existing ambient levels and projected future levels attributable to the proposed action. The transportation demand model used to predict traffic volumes on the proposed freeway would redistribute traffic on regional freeways and arterial streets in response to the construction of the proposed action. Therefore, increases or decreases in traffic (and noise) on these facilities would also be predicted. With the planned growth and urbanization in the Study Area,

noise levels would be expected to increase because of the increased density of human activities. To minimize noise impacts from construction activities, construction best practices (e.g., properly operating, maintaining, and shielding equipment noise from sensitive receivers) would be used as much as possible.

Air Quality

Air quality may be a local, regional, or global issue depending on the particular pollutants or issue. At the local and regional level, air quality issues are normally related to criteria pollutants for which national air quality standards have been established and to MSATs. Emissions of these pollutants (mostly derived from mobile sources) have generally decreased in the Phoenix metropolitan area over time. These decreases may largely be associated with cleaner fuels and lower-emission vehicles. More gains may be achieved, except that VMT will likely increase and may continue to offset the emissions decreases in the future. A future increase in overall traffic volumes can be expected in the region following construction of planned residential and commercial developments. The proposed action is intended to reroute existing traffic patterns and accommodate future traffic volumes (as opposed to generating additional volumes) and, therefore, is not expected to contribute to a cumulative impact on air quality. Transportation projects planned in the region would minimize subsequent increases in vehicular emissions by reducing congestion and vehicle idling. In heavily congested conditions, some emissions increase with decreased speeds. More fuel is consumed because automobile engines do not operate optimally at low speeds and more emissions may be emitted. Additionally, a vehicle's emissions control equipment is not as effective at low speeds as it is at typical freeway speeds. Future emission levels would also be reduced by the use of cleaner-burning fuels, technological advances in automotive design (including the greater use of alternative fuel vehicles), reformulated gasoline, gas can standards, stricter enforcement of emission standards during inspections, heavy-duty diesel engine and on-highway diesel sulfur control programs, and others.

Table 4-58 Representative Project-specific Mitigation Measures

Issue	Proposed Action Impact	Mitigation Measure
Biological resources	Habitat loss from direct conversion to transportation use	Construct wildlife crossings; salvage native plants; provide native plantings in right-of-way; implement measures to prevent the spread of invasive species in accordance with Executive Order 13112
	Habitat isolation and fragmentation	
	Vehicle-animal collisions	
	Loss of native vegetation	
	Introduction of noxious weeds	
Water resources	Threatened and endangered species	Best management practices used; erosion control provided during and after construction; measures included in the Arizona Stormwater Pollution Prevention Plan and Arizona Pollutant Discharge Elimination System Permit
	Increased runoff and flushed contaminants from impervious surfaces	
Land use	Loss and/or alteration of natural drainage features	Fill in jurisdictional areas avoided or limited by narrowing the roadway width or by other means; compliance with Sections 404 and 401 permits
	Residential and business displacements	Relocations conducted in accordance with federal and State guidance/regulations; land uses converted in accordance with applicable planning and zoning
	Alteration of community character and cohesion	Overpasses; architectural treatment of structures; and adherence to established design standards, general plans, and zoning
	Local traffic access pattern alteration; improved traffic flows during operation	Alternative access routes identified during construction as part of the traffic plan
Economic conditions	Public service access	ADOT ^a traffic plan to minimize construction impacts on existing routes
	Enhanced movement of goods, materials, and people; property value changes	Local governments to ensure development is consistent with local and regional planning

^a Arizona Department of Transportation

At the global level, the potential change in GHG emissions is very small in the context of the affected environment. FHWA is working to develop strategies to reduce transportation's contribution to GHG emissions—particularly CO₂ emissions—and to assess the risks to transportation systems and services from climate change. FHWA will continue to pursue these efforts as productive steps to address this important issue. In addition, construction best practices to be implemented represent practicable project-level measures that, while not substantially reducing global GHG emissions, may help reduce GHG emissions on an incremental basis and could contribute in the long term to meaningful cumulative reduction when considered across the Federal-aid highway program.

NO-ACTION ALTERNATIVE

If the proposed action were not implemented, the incremental effects contributed *solely* by the proposed action would not occur. The No-Action Alternative would not, however, preclude other activities from affecting resources in a similar manner. Most cumulative impacts would result from ongoing conversion of land to more intensive, human-based development. These effects, such as the permanent loss of cultural resources and the permanent loss of agricultural land, would occur without the proposed action in place.

MITIGATION

Disclosure of secondary and cumulative impacts does not require ADOT to propose and implement mitigation measures to address such impacts. Project-specific mitigation measures as proposed to address direct impacts inherently address reductions in such overall impacts as well. The disclosure primarily is for information purposes. By disclosing these types of impacts, those concerned are provided a mechanism to contact responsible parties either contributing to such impacts or having regulatory authority pertaining to such matters. For example, EPA has enacted rules to reduce vehicle emissions at national and regional levels. Local jurisdictions governing land development have enacted local zoning ordinances to control and regulate development.

Mitigation measures in Table 4-58 summarize project-specific measures already presented throughout this chapter. When implemented, the measures would help to offset the adverse secondary and cumulative impacts of the action alternatives.

CONCLUSIONS

The action alternatives would have comparable secondary and cumulative effects. The various activities affecting resources and people in the Study Area as well as the proposed action could have localized variations at the project level. When viewed cumulatively, however,

a broader view of each resource should be considered, and, from this perspective, each action alternative would have comparable effects. All alternatives would occur in an already rapidly urbanizing area (most noticeably in the Western Section of the Study Area—note that the current recession has slowed growth), an area planned for urban growth as established in local jurisdictions' land use planning activities for the last 25 years. As such, the proposed action would not provide new or substantially improved access to a large, undeveloped geographic area. Therefore, the action alternatives are not expected to induce growth in the region. For the action alternatives, the minimal contribution to overall traffic use by induced travel is expected to have both positive and negative consequences.

Secondary and cumulative impacts from any of the action alternatives would occur. The proposed action may produce secondary impacts on biological resources, water resources, air quality, known historic and prehistoric sites, newly discovered historic and prehistoric sites, land use conversions and displacements and relocations, community character and cohesion, and on property value changes. As a result of the proposed action, cumulative impacts may occur on biological resources, water resources, cultural resources, land use, environmental justice, visual resources, noise, and air quality.