Existing Conditions: Traffic and Transportation

Introduction

Roadways fulfill two primary functions: mobility and access. Mobility is basically the ability to move quickly from place to place. Access refers to gaining entrance to a property. Generally, these two purposes of a roadway are in competition with each other. One of the challenges for the Corridor Study was for the stakeholders in southern Leavenworth County to reach agreement, or at least give consent, as to the proper balance of the access and mobility functions in the corridor, now, and in the future as the corridor changes.

The corridor is critical to the growth of development in southern Leavenworth County. It serves as a unique transportation resource that serves as the most important thoroughfare for southern Leavenworth County, Basehor, and Tonganoxie. Because of the great cost of constructing the US 24/40 Highway facility, it is important to protect and enhance the highway's primary function of mobility, and to carefully manage its function of access. However, US 24/40 must also provide access to the supporting system of roads that can in turn also provide access to properties, most probably through signalized intersections.

Roads must provide access and mobility, but must also do so in a safe manner. Wherever there are occasions for vehicles to come into contact with other vehicles—as when one vehicle is traveling at a different speed or a different direction from another vehicle—there is a potential for a collision. These possible conflicts most often occur at intersections, where vehicles change both speed and direction. Because collision experience is most often related to intersections, reduction in the number of intersections can also provide reduction in accidents. As traffic volumes increase in the future, the number of accidents may also increase, unless the number of access points is correspondingly decreased.

A review of the corridor's existing mobility, access, and safety also included consideration of occasional on demand transit and bicycle use. No special accommodations to US 24/40 are needed to support the County's existing on demand dial-a-ride service. No specific accommodations have been provided for bicycle use along US 24/40.

Roadway Capacity Analysis

The capacity of a roadway to carry traffic depends not only on the number of lanes, but also on the number of traffic signals and driveways along the road. For example, a freeway can carry more traffic per lane than a city street because freeway access is completely controlled, as opposed to a city street, which has frequent intersections.

The Transportation Research Board has produced methodologies to quantify the quality of roadway operations for multi lane highways, two lane highways, and urban streets in the *Highway Capacity Manual* (HCM). The HCM describes the quality of roadway operation in terms of level of service (LOS) for multi lane highways, two lane highways, and urban streets.

These grades of operation are expressed in terms of LOS A through LOS F, for the best operation through the worst. Because these types of roadways are so different in their characteristics, the equations used to determine the LOS are different. However, in all cases, LOS can be somewhat correlated with traffic volumes, number of lanes, and speeds. Traffic volumes, number of lanes, and speeds vary significantly on US 24/40 Highway throughout the corridor. For example, slower speeds of 30 mph to 55 mph in Tonganoxie result in a LOS B as opposed to the LOS A in the rural section of US 24/40 where the posted speed is 65 mph. Furthermore, it can be expected that the character of US 24/40 will change over time from a highway into an urban highway with traffic signals.

Figure 2-1 depicts the 2006 daily traffic volumes on US 24/40 Highway and the posted speed limit sections in the corridor. Using the methodologies from the HCM for the different sections of the highway, LOS for each section has been identified in **Figure 2-2.** Figure 2-2 also depicts the ratio of the traffic volume to the highway's capacity to carry traffic at LOS C. The capacity of the highway to carry traffic was determined for the number of vehicles that can be accommodated under LOS C conditions. In general, the sections of the highway in west Tonganoxie and south of Tonganoxie where speeds and/or number of lanes are reduced currently operate at LOS C. This section can accommodate an additional 1200 vehicles per day and still remain at level of service C without widening of the highway. It is recommended that traffic volumes in west Tonganoxie and south of Tonganoxie on US 24/40 continue to be monitored with respect to the need to widen the existing two lane highway section. Through the remainder of Tonganoxie and through Basehor the LOS is B. The rural section of the highway between Basehor and Tonganoxie currently operates at LOS A. These four lane sections provide ample capacity to remain at a high level of service.

Roadway Access

One of the challenges for the Corridor Study was for the stakeholders in southern Leavenworth County to reach agreement, or at least consent, as to the proper balance of the access and mobility functions in the corridor now, and in the future as the corridor changes. The existing access patterns along US 24/40 originated in response to the adjacent land developments requesting access in the way most economical for the property development: direct access onto the adjacent highway. Having once obtained the access permits, those properties have thereafter continued to have direct access onto US 24/40. One of the purposes of this study and the resultant plan is to establish the appropriate balance between access and mobility in the corridor. US 24/40 Highway must provide sufficient mobility to move traffic from the regional business and residential centers to the land developments along the corridor, and the supporting roadway system must provide access to those developments.

The Kansas Department of Transportation (KDOT) has developed an access management policy for the highways under its jurisdiction, the *Corridor Management Policy*. This policy contains a matrix of minimum allowable access spacing based on type of highway, land uses being served, traffic volumes, and vehicle speeds. The matrix provides minimum allowable access spacing for US 24/40 Highway that varies from 135 feet in the low speed developed sections to 2640 feet in the high speed undeveloped sections. It must be emphasized that these distances are *minimums* to be applied to accommodate the need for property access under past development patterns. This study provides Leavenworth County and the cities of

Basehor and Tonganoxie an opportunity to establish access management guidelines that will better serve the corridor in terms of appearance, mobility, and safety. US 24/40 is classified as a B Route by the *Corridor Management Policy* in that a corridor study has been completed for the route.

It must be further emphasized, that as development patterns change and traffic volumes increase, application of the KDOT minimum spacing criteria throughout the corridor will result in a deterioration of mobility on US 24/40 Highway. An enhancement of mobility on the highway does not necessarily mean that existing driveways will be closed for the current property owners, or that future developments and redevelopments will not have access. What it means is that as new development or redevelopment occurs, access permits will be more restrictive than the minimums outlined in the *Corridor Management Policy*. New access will be provided as necessary to support the developments in the corridor, but will be shared between multiple parcels, so that new shared public access locations may eventually be spaced one quarter, one half, or even one mile apart. It is recommended that KDOT, the cities, and the county pursue access management opportunities throughout the corridor, as described in Section 7 of this report.

KDOT maintains an inventory of existing access locations along US 24/40 Highway which is summarized in **Table 2-1**. Most of these access points (122 of 153) serve individual properties as the picture below shows. Ideally, an important facility such as US 24/40 Highway should be dedicated to primarily providing mobility to the public, with necessary access provided to public streets, rather than serving as a multi-million dollar facility to serve a few properties. None of the 122 private access points meet the minimum spacing requirements of the *Corridor Management Policy*. Of the public access points, the spacing between Washington and Grace, 4th and 5th, and Village Terrace and Woodfield in Tonganoxie also do not meet the minimum spacing requirements in the *Corridor Management Policy*.

(Example Private Access)

Table 2-1: Driveways by Type and Surface Width

Driveway Surface	Number of Driveways by Surface Width					Sub-Total
	12 ft.	18 ft.	24 ft.	36 ft.	48 ft.	
Private Access Driveways						
Asphalt	61	12	16	1		90
Concrete	8	2	4			14
Gravel	13	2			1	16
Turf	2					2
				Total Private		*122*
Public Access Driveways						
Asphalt		5	22			27
Gravel	3		1			4
				Total Public		*31*
	Total Number of Driveways					**153**

Source: KDOT

The Institute of Transportation Engineers (ITE) publication *Traffic Engineering Handbook* identifies spacing of access appropriate to maintaining safety. When the speed differentials between vehicles slowing to turn and through vehicles continuing down the road are high, the potential for severe collisions is greater. For posted speeds of 30 mph, ITE recommends all access spacing be no less than 210 feet, and no less than 550 feet for a posted speed of 55 mph. Those spacing standards equate to 25 driveways per mile and 10 driveways per mile, respectively. Sections of US 24/40 Highway through both Basehor and Tonganoxie exceed the number of recommended access points per mile.

Where the density of access points is greater than the ITE density thresholds, collision potential can be somewhat mitigated through a variety of access management strategies, including construction of raised medians, center two way left turn lanes and right turn lanes, consolidation of driveways, and improvement of driveway design standards.

US 24/40 Corridor Study **Figure 2-1** **Posted Speed Limit and Annual Average Daily Traffic**

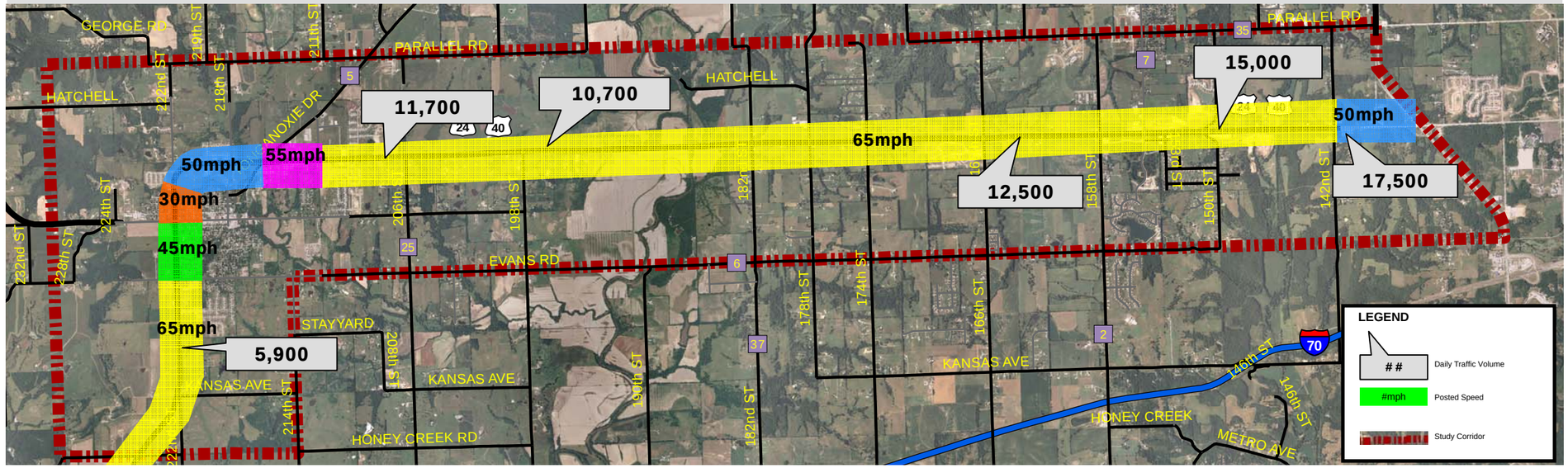
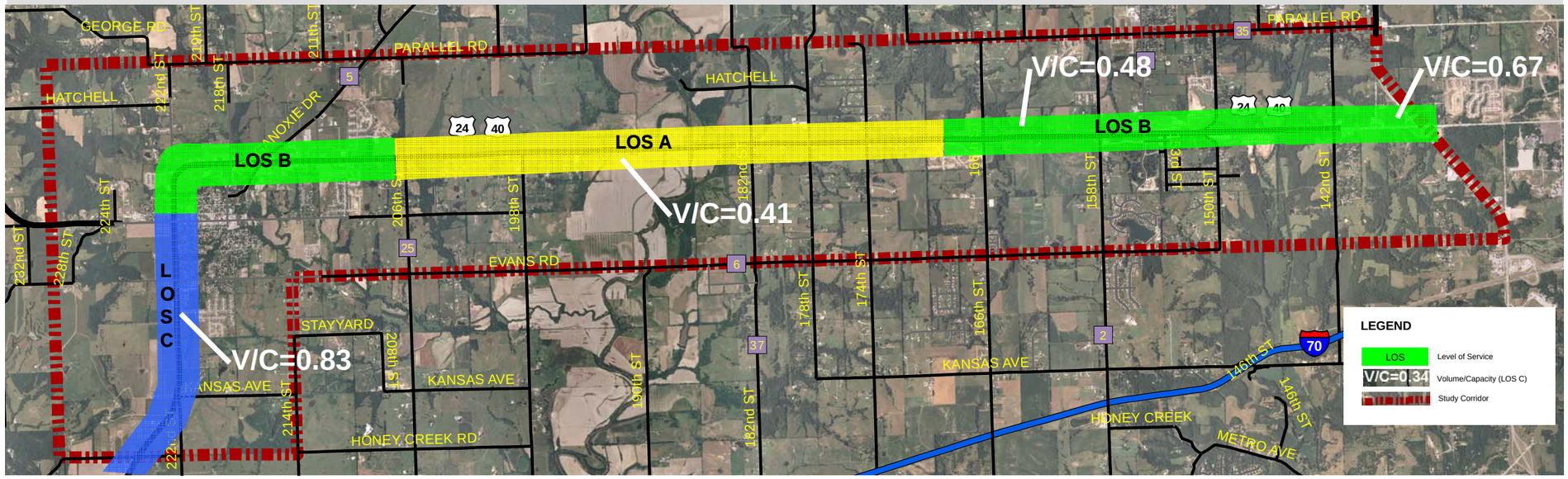


Figure 2-2 **Corridor Level of Service**



Blank page – back of 11 x 17

Traffic Safety Analysis

Roads must not only provide access and mobility, but should do so safely. Wherever there are occasions for vehicles to come into contact with other vehicles, such as when one vehicle is traveling at a different speed or a different direction from another vehicle, there is a potential for a collision. These possible conflicts most often occur at intersections where vehicles change both speed and direction. **Figure 2-3** illustrates the number of ways in which vehicles can potentially conflict. The figure illustrates that a full access intersection provides 36 ways that a collision can occur, while more restrictive access reduces the number of potential conflict points.

KDOT provided a summary of three years of vehicle collision experience for the corridor. Three years is a typical time frame appropriate for reviewing and evaluating collisions history. A review of the collision history on US 24/40, and a review of the corridor, were conducted for the years 2003, 2004, and 2005. The records show 260 collisions. Of the 260 collisions, 3 resulted in fatalities, 56 resulted in injuries, and the remaining 201 resulted in property damage only; 147 involved only one vehicle. Typically, single vehicle collisions are not related to highway access. The contributing causes for the 113 multi-vehicle collisions have been summarized in **Table 2-2.**

Table 2-2: Multi-Vehicle Collision Contributing Factors

Contributing Factors	Number of Collisions
Under influence of alcohol	3
Failed to yield	23
Disregarded signs, signals, or markings	3
Too fast for conditions	1
Improper turn	1
Wrong side or wrong way	5
Following too close	10
Improper lane change	5
Asleep	3
Inattention	29
Ill	1
Mobile phone or electronic distraction	2
Glare	1
Cargo	2
Unspecified	24

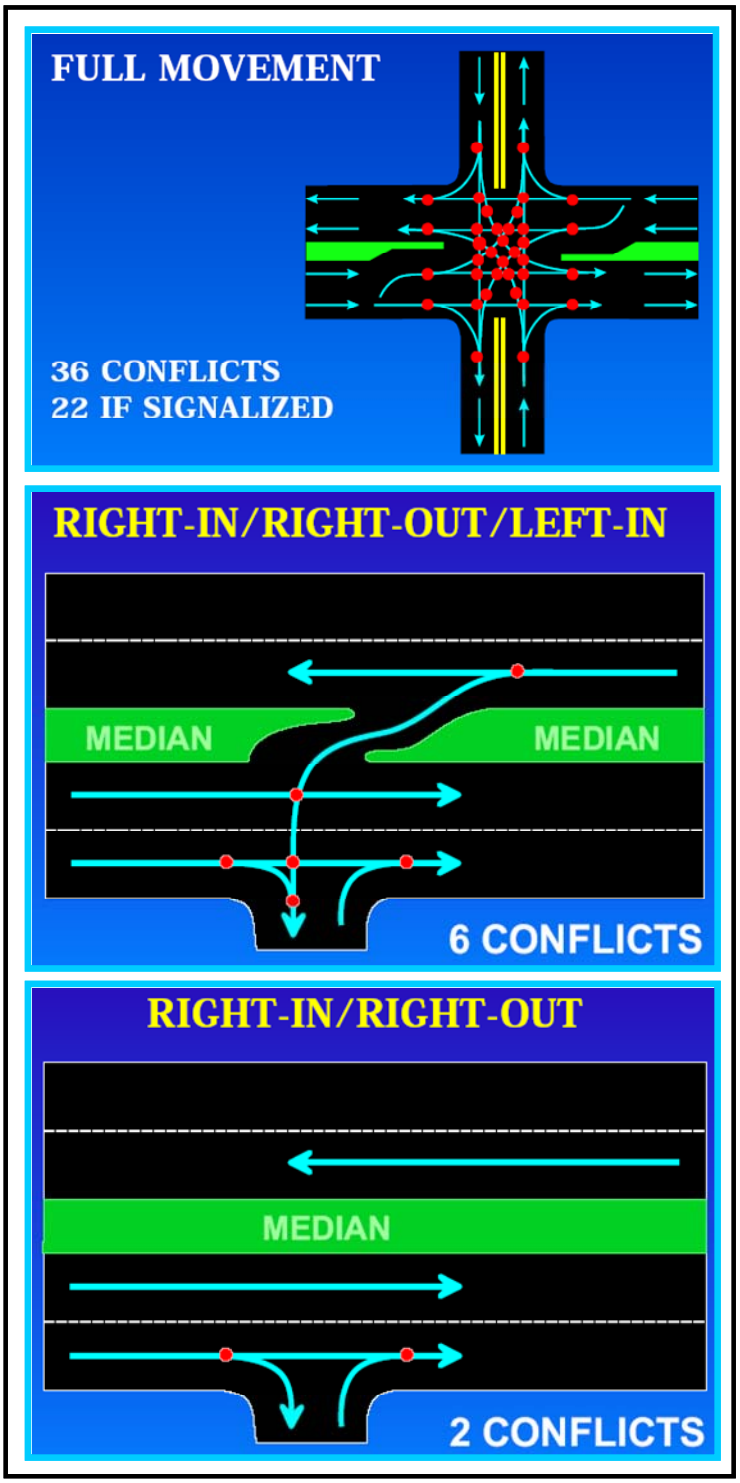
KDOT evaluates collision experience on highways in terms of the number of accidents per million vehicle miles traveled (VMT). Using the statewide collision experience as a basis, they have determined different average collision rates for different types of highways. The study section of US 24/40 contains three types of highways: two lanes, four lanes undivided, and four lanes divided. The number of collisions per million VMT has been determined for each of the three sections of US 24/40 and compared to the statewide average, and to the driveway density on a per mile basis. **Table 2-3** summarizes these comparative rates for the three section of US 24/40.

Table 2-3: Comparison of Collision Rates and Driveway Density

Type of Section	Length of Section (miles)	Collision Rate (per million VMT)	Statewide Average (per million VMT)	Driveway Density (number per mile)
2 Lanes	1.496	2.897	1.641	22.73
4 Lanes Undivided	1.741	2.511	2.378	26.42
4 Lanes Divided	8.609	1.324	.0988	8.48

The comparison of these statistics would seem to indicate that there is a relationship between access management through the provision of medians and reduction in the number of driveways, with a lesser collision rate. In all cases, the US 24/40 collision rates are higher than the state average. Also, fewer driveways per mile, combined with a median (an access management tool), gives the lowest collision rate on the corridor. As traffic volumes increase in the future, it could be expected the number of accidents will also increase. However, implementation of this Corridor Study will provide opportunities to offset rising accident rates through the applications of medians, driveway reductions, and other access management tools. It is recommended that KDOT, the cities, and the county actively pursue opportunities for improved access management, as presented in Section 7 of this report.

Figure 2-3: Potential Conflicts



Applications of full or partial medians reduce the number of potential conflict points.

Transit Service

The US 24/40 Highway Corridor is currently not serviced by any form of public transportation. Countywide, the form of public transportation available is a paratransit (i.e., demand responsive or dial-a-ride type of transportation service) provided by the Leavenworth County Council on Aging. The dial-a-ride service is available for medical, education, personal business, shopping, employment, meals, and recreational trip purposes. Advance reservation is required. Service is available only during weekdays between 8:00 a.m. to 3:00 p.m. It is available for residents in Leavenworth County including the cities of Leavenworth, Lansing, Fort Leavenworth, Tonganoxie, Easton, Basehor, Linwood, and Reno.

Furthermore, the land use patterns indicate a significant portion of the residents in the corridor must work outside the corridor. This commuting pattern provides opportunities for carpooling. It is recommended that KDOT, the cities, and the county promote carpooling as opportunities to do so arise.

Bicycle Level of Service Analysis

US 24/40 Highway varies from a 4-lane divided section west of K-7 Highway to Tonganoxie where it changes to a 5-lane section from Laming Road to just south of 2nd Street. The highway then becomes a 4-lane section with no medians to just south of 5th Street before it transitions to a 2-lane undivided section to the west end of the study area. The highway has paved shoulders on both sides that vary in width from 10 feet along the 4-lane divided section to 4 feet along the 2-lane undivided section. Bicycle operation along the highway is not encouraged.

Currently, there are no marked bicycle lanes and no off-road regional trail accommodations in the corridor. However, there are paved County roads throughout the corridor that would provide some level of accommodation to bicyclists and limited segments of local bicycle trails that can connect into future regional trails. It is recommended that the cities and county promote bicycling outside the venue of US 24/40 as a highway corridor.

Roadway Right-of-Way Inventory

The width of existing right-of-way for US 24/40 Highway is of interest because right-of-way provides a limitation on the number of through and auxiliary lanes which can be added to the existing highway without acquiring private property. In the rural sections of the highway, acquisition of right-of-way, while costing money, generally does not cause a significant devaluing of the remaining property. Within the developed sections of the corridor, right-of-way acquisition could affect building setbacks, parking areas, driveways, sidewalk, utilities, and other infrastructure features. This not only increases the cost of the right-of-way but may also impact the usability of the remaining property. Thus, an awareness of whether additional right-of-way will be required for improvements to US 24/40 Highway is relevant to the feasibility and costs of providing future improvements to the corridor.

Highway right-of-way widths vary throughout the corridor from approximately 100 feet to more than 400 feet wide. Generally, a greater right-of-way width is required where ditches provide surface drainage than where enclosed storm sewers are used with curbs. The rural portions of US 24/40 Highway carry surface drainage in ditches, and thus the highway requires wider right-of-way widths. The four and five lane sections of the highway generally have sufficient right-of-way width to accommodate any additional auxiliary lanes which may be needed in the immediate future. More than 4 through lanes are not anticipated within the 2030 planning horizon of this study.

The existing highway sections of less than four lanes plus a median or center turn lane will require acquisition of additional right-of-way for any widening of the highway. Acquisition of right-of-way in the four lanes without median or center turn lane section or in the two lane section may involve total property takings because of the existing building setbacks in those sections. Consequently, proposals for widening should be considered only as needed to enhance safety or for needed traffic capacity. Right-of-way needs through these sections can be minimized through the construction of a curb and gutter roadway template instead of the shoulder and ditch template used through the rest of the corridor for the highway. It is recommended that as development proposals are submitted to the cities and county for review and approval, additional right of way be dedicated to support the short range and long range traffic and access management recommendations described in Section 7 of this report.