

Increasing Bicycle and Pedestrian Mobility Through Innovation: the Single Point Alternative Mode Interchange

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INTRODUCTION

The greater Las Vegas metropolitan area in Clark County, Nevada is an area that has been growing and continues to grow at a very rapid pace. In the year 1990, 764,464 people resided in the Las Vegas Valley. By the year 2000 the population had reached 1,366,916. Currently, the population is approximately 1,847,495. Thus over the 1990 to 2006 time period, the average annual growth rate is 5.68%! [3] This rapid growth has made the task of projecting future travel demand and planning roadways to meet the future needs difficult. In areas that were zoned decades ago and developed with street rights-of-way that were considered spaciouly wide, real traffic has exceeded all previous estimates and even seven-lane arterial roadways are operating at or above capacity. Unfortunately, with the continued growth of Las Vegas, those already burdened streets are predicted to receive even more traffic.

To prevent the projected traffic from overwhelming the roadway network, the various public agencies in the Las Vegas Valley have been studying novel ways to squeeze more capacity from the already strained rights-of-ways, while trying to minimize the negative impacts on adjacent property owners. A concept that the public agencies are currently pursuing is the "Super arterial". A super arterial is a roadway that possesses traits of both limited access freeways and arterial roadways, which is retrofitted into an existing arterial right of way. The super arterial can be described as a "semi-limited access" roadway, meaning that wherever a secondary route is available to provide access to a parcel bordering the super arterial, access via the super arterial is eliminated.

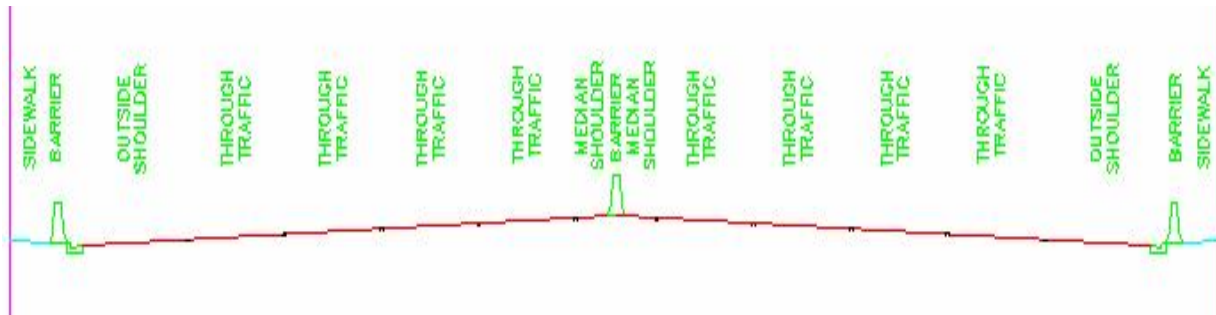


Figure 1: Super Arterial At-Grade Cross Section

Additionally, streets that currently cross the road that is to be upgraded to a super arterial are variously dead-ended, reconfigured to be right-in right-out only intersections, or given a roadway overpass or underpass treatment if the crossing street traffic volumes currently demonstrate a need. At current intersections with major crossing streets, a grade-separated interchange, (usually of the tight urban diamond variety) is utilized to increase capacity and improve level of service.

Several arterial roads are being studied by public agencies in the Las Vegas valley for the super arterial upgrade process. Orth-Rodgers & Associates has been investigating super arterial scenarios for both Rainbow Boulevard, which is a North-South running street, and Desert Inn Road, which runs in an East-West direction and intersects Rainbow Boulevard. Current traffic counts show that with the present configurations of three lanes in each direction and a center turn lane, both of the streets are handling the flows adequately. However, in **Figure 2** one can see that in the year 2005 the intersection of Rainbow Boulevard and Desert Inn Road is projected to experience approximately 89,000 vehicles per day in the NB and SB directions, and

approximately 51,000 vehicles per day in the WB and EB directions.

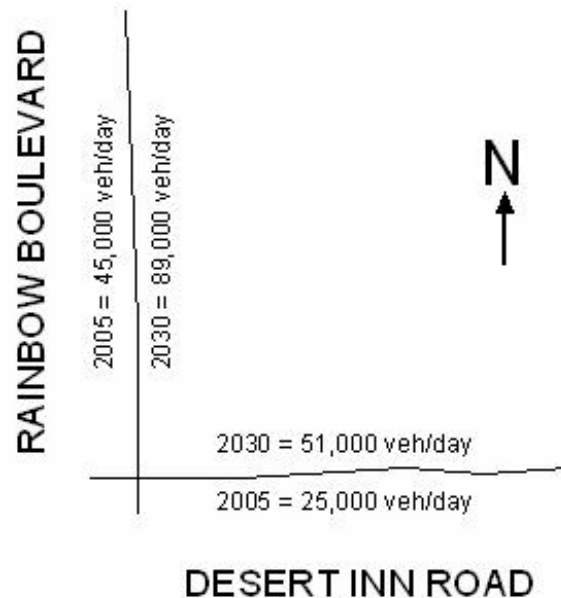


Figure 2: Average Daily Traffic Volumes in 2005 and 2030

Therefore one can see how the application of the super arterial concept to Rainbow Boulevard and Desert Inn Road could be a useful solution. Unfortunately, complicating matters is the fact that the Regional Transportation Commission of Southern Nevada (RTC ó the local metropolitan planning organization) has designated several streets crossing the super arterial routes as bicycle corridors.

THE REGIONAL BICYCLE PLAN

The RTC has developed an Alternative Transportation Mode Master Plan (ATMMP) that is projected to cost \$50,000,000. Expected to take twelve years to complete, the plan will include 735 miles of bicycle lanes and 385 bicycle routes. The goal of the plan is to promote the use of alternative modes of travel by linking bicycle facilities to the farthest reaching points of transit service in the Las Vegas Valley. The RTC's Citizens Area Transit (CAT) bus system carries over 40,000 bike trips every month (bicycles stored on the bus as the cyclist sits inside the bus). For the intermodal bicycle/bus trips to attract significant numbers of trips, safe and accessible bicycle routes are required. To this end, the RTC developed a Regional Bicycle Plan for the Las Vegas Valley, working with various local government agencies and outside

organizations. The working group identified candidate alignments for on-street bicycle lanes and routes and off-street shared use paths. [4]



Figure 3: Map of bicycle corridors in area of Rainbow Boulevard and Desert Inn Road

Several of the streets that cross Rainbow Boulevard or Desert Inn Road, and that have been designated in the Regional Bike Plan as bicycle routes, are not projected to experience enough future vehicular traffic as to merit full vehicular overpasses or underpasses. A traditional pedestrian overpass would provide continuity over the super arterial streets, and would be less expensive than a full vehicular overpass, but it would force bicyclists to disembark and walk their bicycles across the pedestrian overpass. A solution was sought which would provide a uninterrupted path for bicyclists to maintain a high level of service for riders, would be considerably less expensive than a full vehicular overpass, and would be in compliance with all applicable laws.

NEVADA LAWS PERTAINING TO BICYCLES

The Nevada Revised Statutes (NRS) detail regulations for the operation and use of bicycles in Chapter 484. Of particular interest is NRS 484.503 which states, "Traffic laws apply to person riding bicycle." It states, "Every person riding a bicycle upon a roadway has all of the rights and is subject to all of the duties applicable to the driver of a vehicle except as otherwise provided in

NRS 484.504 to 484.513, inclusive, and except as to those provisions of this chapter which by their nature can have no application. [2] Thus if a bicycle is to be operated on a public shared-use roadway, the bicyclist must obey all traffic laws as if he or she were operating an automobile. This means bicycles must travel in the same direction as vehicular traffic.

This last provision, the one that prohibits bicycles from operating counter to the direction of vehicular traffic, is of key importance to the Rainbow Boulevard / Desert Inn Road Super Arterial project. Because of the prohibition on counter flow movement, a standard pedestrian bridge will not suffice for the crossing of the superarterial roadways. Placement of a standard, 10-ft wide bicycle/pedestrian bridge in line with either side of the street will cause bicyclists to either stop, dismount, and walk their bicycles across the minor street perpendicularly to their desired direction of travel, or to continue traveling forward, facing oncoming traffic in violation of the law. Even if all bicyclists dismounted and walked their bicycles to the proper sides of the minor street before resuming their journeys by bicycle, there would be a degradation in bicycle service as stoppage and mode change is involved. A novel concept was sought in order to maintain high quality bicycle travel.

THE SINGLE POINT ALTERNATIVE MODE INTERCHANGE (SPAMI)

The Single Point Alternative Mode Interchange (SPAMI) is a solution proposed for those cross streets designated as bicycle corridors whose vehicular traffic does not necessitate a full overpass. Because of the street's status as a bicycle corridor, a high level of mobility must be maintained for cyclists ó meaning that bicyclists must not be forced to stop. Additionally, lanes must be wide enough, and slopes must be gentle enough to accommodate pedestrians as well. As can be seen in the plan view of the SPAMI concept, **Figure 4**, all approach and departure movements can be performed by bicycles in a legal manner and without stopping and dismounting, with the approach structures all focused around a single center point.

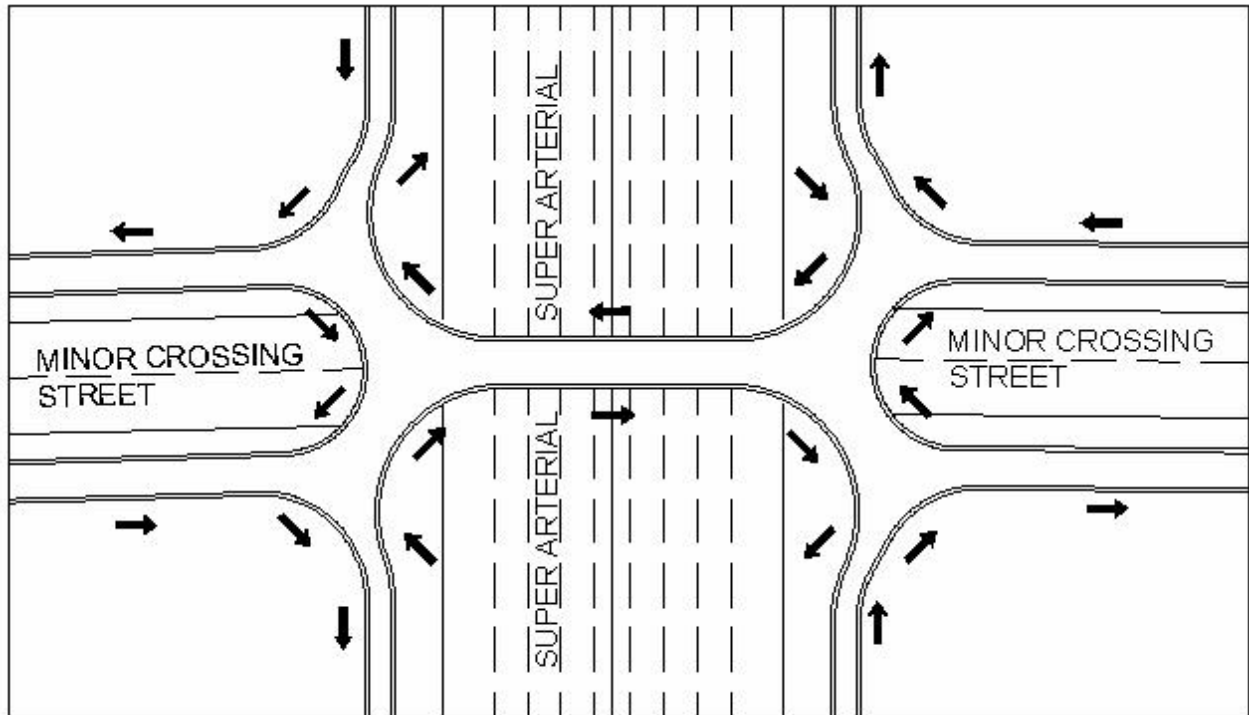


Figure 4: SPAMI Concept in plan view

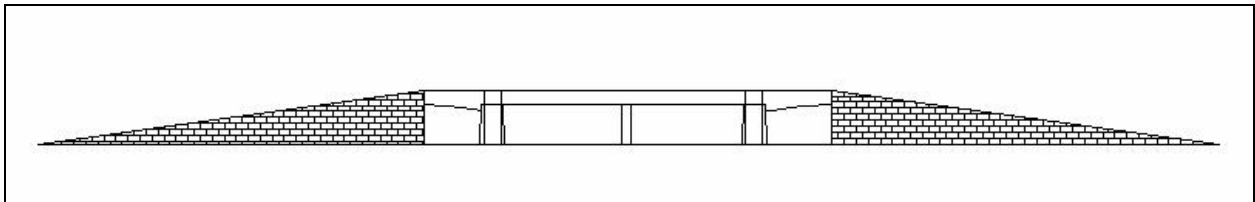


Figure 5: SPAMI Concept in profile view

In the profile, approach ramps would be held to a maximum slope of 8%. With standard clearances considered, a rough cost comparison was made considering a typical SPAMI versus a typical full vehicular overpass. The bridge deck would be 10 feet at its widest. This would allow for two-way, free-flowing bicycle traffic and would accommodate pedestrians as bicycles could pass pedestrians by utilizing the opposing lane. Using curve radii to fit the urban environment, in the case of the Rainbow Boulevard and Desert Inn Road crossing streets, the posted speed limit for bicyclists would be 10 miles per hour.

Considering the super arterial to have a 120-ft wide right of way, the full vehicular bridge was estimated to cost approximately \$2,100,000. In comparison, the SPAMI is predicted to cost approximately \$899,000. A cost-benefit analysis has not yet been undertaken. This is due to

difficulty in predicting the number of bicycle trips that would be made using the routes crossing the super arterials when the Regional Bicycle Plan is fully implemented. Depending upon the numbers of bicyclists using the proposed SPAMI(s), benefits in the form of time savings could be significant.

CONCLUSIONS

It is difficult to say whether or not a bicycle/pedestrian bridge provides benefits in excess of its costs. If an intersection currently has traffic volumes of the degree that bicyclists and pedestrians are dissuaded from crossing the intersection, it is difficult to predict how many pedestrians and bicyclists would desire to cross the intersection if both the volumes of traffic increased and the configuration changed of the roadway to be potentially crossed, while at the same time a grade separation structure was introduced for the pedestrians and bicyclists to use. However, if alternative modes to travel by automobile are to be encouraged, new roadway solutions must be pursued that find novel ways to improve the characteristics of trips made by bicycles and pedestrians. The SPAMI concept would cost less than a full vehicular overpass and would be an effective alternative when maintaining bicycle corridor mobility is of high importance.

REFERENCES

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