I-2504

FEASIBILITY STUDY

I-40, New Interchange at SR 1220 (I-2300)
and
NC 151 Extension along SR 1220 to I-40 (R-2308)
Buncombe County

Prepared by
Planning and Research Branch
Division of Highways
N. C. Department of Transportation

6/29/88
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Description

This report addresses the feasibility of (a) adding an interchange on I-40 at SR 1220 and (b) upgrading SR 1220 to its intersection with US 19-23 and NC 151. (See Figure 1 for general location). With provision of an interchange at I-40 and SR 1220, the NC 151 routing would then be be extended along SR 1220 to I-40 from its terminal at US 19-23. These projects are included in the 1988-1996 Transportation Improvement Program for feasibility study and/or right of way protection. They are not currently funded.

SR 1220

The existing road is a narrow and poorly aligned route traversing light mountainous terrain and serving an area of primarily rural residential development of moderate density. The 18-foot paved facility is a minor collector in the Buncombe County Functional Classification Plan. It currently carries about 2500 vehicles per day. Existing speed limit is 45 MPH.

Interchange Design and Cost

Preliminary design studies show that SR 1220 and its bridge over I-40 are not usable for development of an interchange complex. SR 1220 has poor horizontal and vertical alignments. The bridge over I-40 is on a 10-degree curve, and its southern approach has a grade of 7 percent. Design standards for interchange construction require approximately 0.9 mile of realignment and a new bridge along SR 1220.

Because of the nearby location of a truck weigh station on I-40 west of SR 1220, a ramp in the northwest quadrant of the I-40/SR 1220 intersection is not feasible. Thus, the design for the interchange would be a modified diamond with a loop in the northeast quadrant. The loop would require a longer bridge to accommodate the loop acceleration lane under the bridge. This loop lane must combine with the slow truck deceleration lane along a crest of I-40 westbound lane. On the I-40 eastbound lane, a high speed deceleration lane must combine with a truck acceleration lane. Figure 2 shows the approximate configuration for an interchange and realignment of SR 1220.

The total estimated cost for an interchange at the subject location is $4,250,000, including $3,400,000 for construction and $850,000 for right of way. The cost includes realignment of SR 1220, a new bridge across I-40, and widening of the remaining 0.25 mile portion of SR 1220 to US 19-23. The right of way acquisition would affect three residences and one business. Cost estimates were prepared by the Roadway Design and Right of Way Branches.

Interchange Spacing, Traffic Data, and Economic Analysis

The subject interchange would be 3.0 mile from the nearest interchange to the east at US 19-23 and 3.8 miles from the nearest interchange to the west at SR 1200. The interchange location meets the Federal Highway Administration's requirements for interchange spacing.

Estimated turning movements for the interchange are shown on Figure 3. Initially they would range from 400 to 2200 vehicles per day. By year 2008, these volumes would increase to 600 to 4200 vpd. The traffic volume on SR 1220 would jump to 5000 vpd initially and 8800 vpd in year 2008. Some traffic reduction would occur at adjacent interchanges due to the studied interchange but only to a limited extent. The I-40/US 19-23 interchange would benefit the most from provision of an interchange at SR 1220.

An economic analysis was made to compare the benefits of the interchange to road users with the cost of constructing the interchange and related improvements. Figure 1 shows the routing of traffic with and without the interchange from a traffic centroid on each side of the Interstate route. These centroids are conveniently placed at intersections through which both the alternate movements to the nearest existing interchanges and movements to the studied interchange would pass. Based on these centroid locations, a road user benefit calculation yielded possible annual savings of $141,000 (see attached worksheet). The road user savings are attributed only to those trips generated by the north side of the Interstate route. Trips generated by the south side of the Interstate route would have negative benefits because it would be more economical for them to utilize the shorter alternate route of US 19-23 to the adjacent interchanges on I-40. With the annual cost of capitalizing and maintaining the interchange to be $425,000, the resulting benefit-cost ratio is 0.3. Thus, this ratio indicates that the interchange is not cost effective.

Conclusions

Although it would improve access to the area, enhance development potential, and give minor congestion relief to the adjacent I-40/US 19-23 interchange, provision of an interchange on I-40 at SR 1220 is not physically nor economically desirable. An interchange at this location has three major disadvantages: (a) it requires costly reconstruction of SR 1220 and existing bridge to acceptable standards; (b) it requires linking the high speed interchange ramp and loop lanes with the nearby slow speed ramp lanes serving a truck weigh truck station; and (c) it does not have a favorable benefit-cost ratio.

Based on these disadvantages and the availability of reasonable alternate access provided by US 19-23 to adjacent interchanges, the subject interchange is not recommended for construction.

RGD/sdt

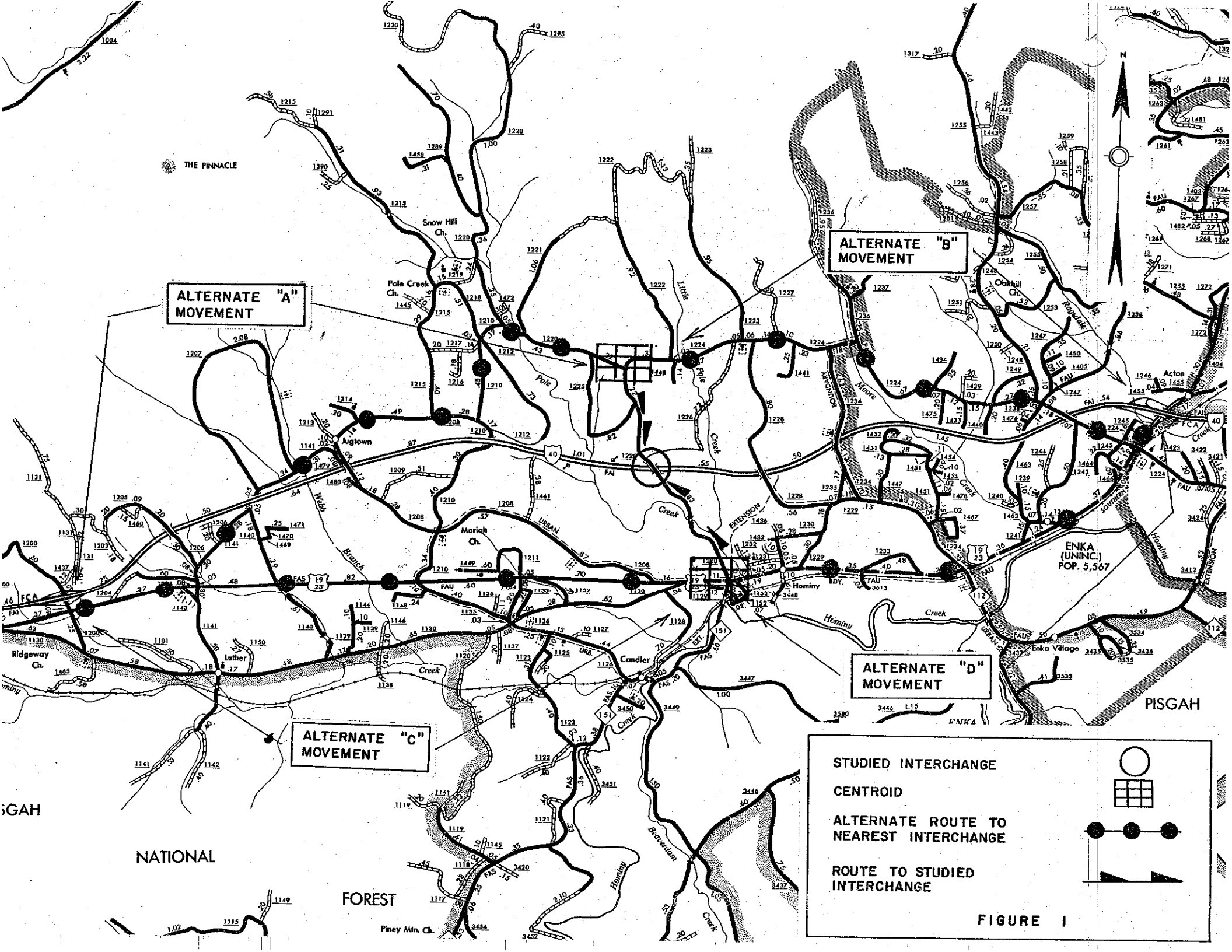

ALTERNATE "A" MOVEMENT
ALTERNATE "B" MOVEMENT
ALTERNATE "C" MOVEMENT
ALTERNATE "D" MOVEMENT
THE PINNACLE
Snow Hill Ch.
Pole Creek Ch.
Jugtown
Moriah Ch.
Ridgeway Ch.
Luther
Candler
S. Hominy
Oakhill Ch.
Acton
ENKA (UNINC.) POP. 5,567
Enka Village
Piney Mtn. Ch.
NATIONAL
FOREST
PISGAH
STUDIED INTERCHANGE
CENTROID
ALTERNATE ROUTE TO NEAREST INTERCHANGE
ROUTE TO STUDIED INTERCHANGE

FIGURE 1

FIGURE 2

INTERCHANGE JUSTIFICATION

I-40 at SR 1220, Buncombe Co.

Est. 1988/2008 ADT in Hundreds

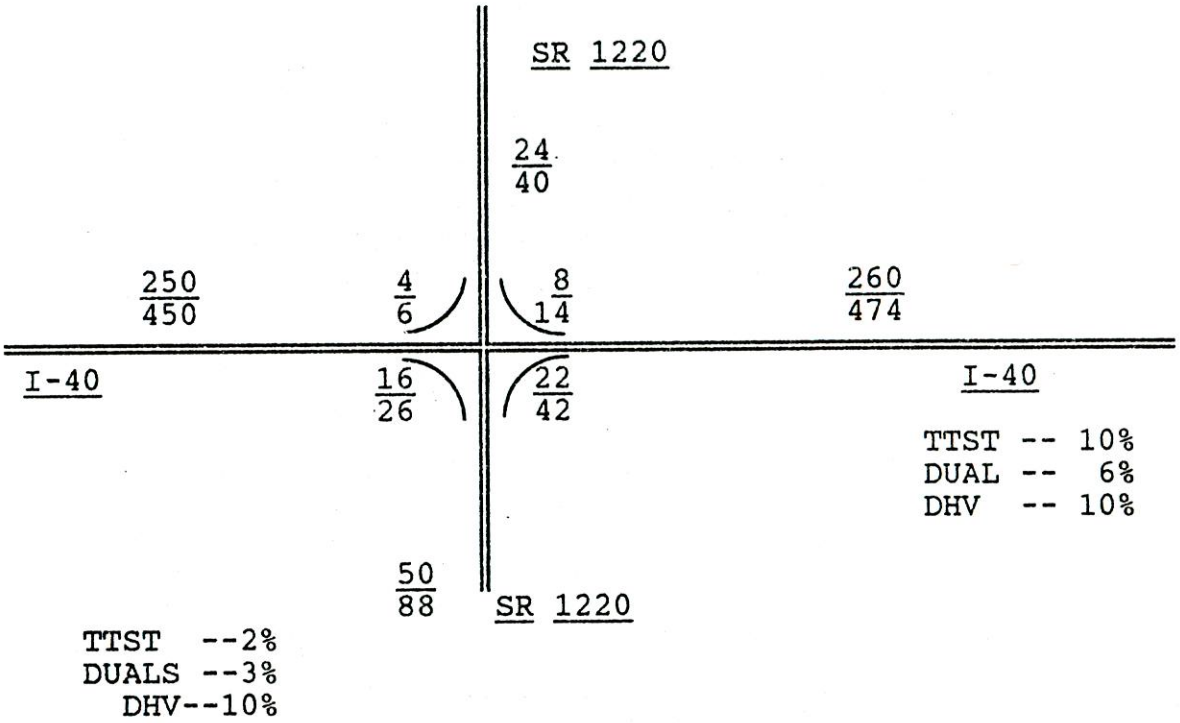
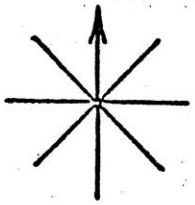


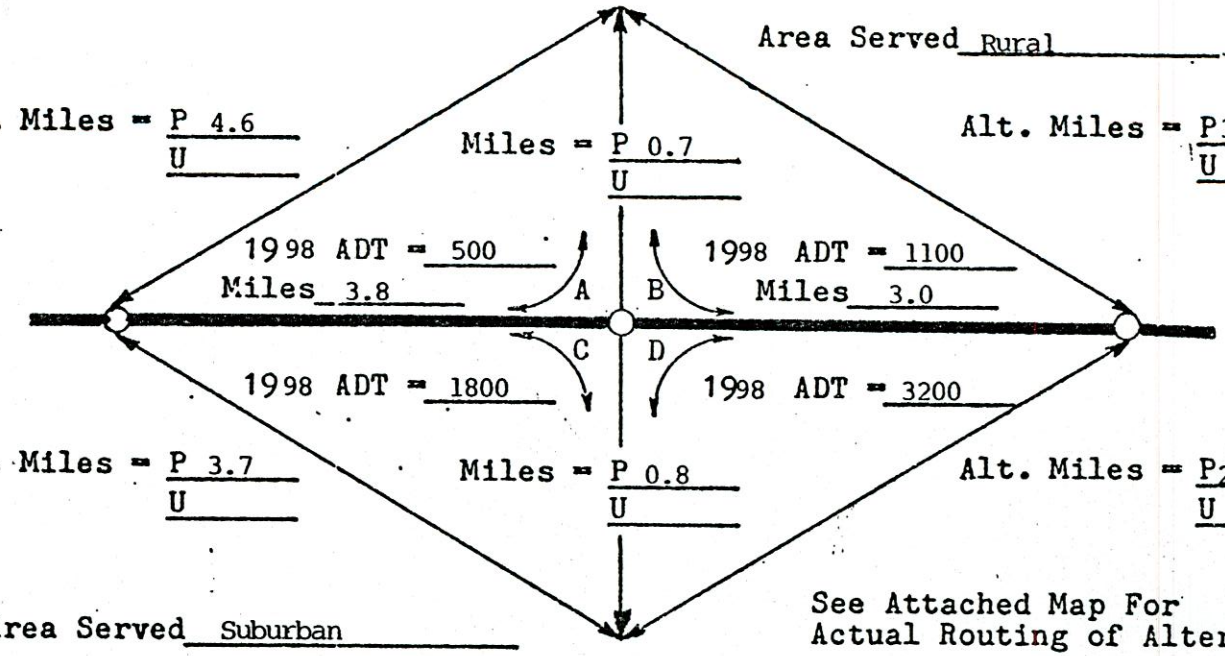
FIGURE 3

WORKSHEET FOR DETERMINING BENEFIT-COST RATIO

INTERSTATE ROUTE NO. 40
INTERCHANGE AT SR 1220

NORTH





See Attached Map For Actual Routing of Alternate

Quad	Without Interchange	With Interchange	Days	ADT	Road User Saving
	cost/mile x miles; cost/mile x miles; cost/stop x net no. stops	cost/mile x miles; cost/mile x miles; cost/mile x miles			
A =	[(.35 x 4.6 + x ____)+(.05 x 3.25)-(.35 x 0.7 + .30 x 3.8 + x ____)]	(365)	(500	)	= $70,800
B =	[(.35 x 3.6 + x ____)+(.05 x 1.0)-(.35 x 0.7 + .30 x 3.0 + x ____)]	(365)	(1100	)	= $70,300
C =	[(.35 x 3.7 + x ____)+(.05 x .5)-(.35 x 0.8 + .30 x 3.8 + x ____)]	(365)	(1800	)	= $Negative
D =	[(.35 x 2.7 + x ____)+(.05 x 1.0)-(.35 x 0.8 + .30 x 3.0 + x ____)]	(365)	(3200	)	= $Negative

TOTAL ANNUAL SUM OF ROAD USER SAVINGS = $141,100

Cost of Interchange ---------- = $4,250,000

Annual capitalization and maintenance cost ($4,250,000 x 0.10) = $ 425,000

Interchange benefit-cost ratio ---------- = 0.33

The interchange is [ ] is not [X] justified based upon benefit-cost ratio