Chapter 7 EVALUATION OF ALTERNATIVES

As noted in Chapter 1 of this report, Phase 1 of the US 64–NC 49 Corridor Study is the initial step in a successively more refined alternatives evaluation process that will ultimately result in definition of a master plan of physical and operational improvements as well as associated state and local government policy actions for the corridor. Phase 1 addresses the transportation needs of the region through an evaluation of broad roadway investment strategies against a set of project objectives stemming from the purposes of the Strategic Highway Corridors concept and criteria for Strategic Highway Corridors selection.

7.1 Evaluation Criteria and Measures of Effectiveness

The degree to which alternatives achieve project objectives is determined through the application of evaluation criteria that reflect the project objectives. The project objectives for the US 64–NC 49 Corridor Study can be summarized into the following categories:

- Mobility Benefits
- Growth Management Benefits
- Economic Development Benefits
- Environmental Issues
- Cost Effectiveness Benefits

Evaluation criteria developed in coordination with the Corridor Development Team are presented in **Figure 7.1**. The criteria were limited to those that would demonstrate an appreciable difference among the alternatives. The evaluation criteria are defined by measures of effectiveness (MOE). MOEs are the actual data against which the relative performance of each alternative is evaluated.

7.2 Rating Scale

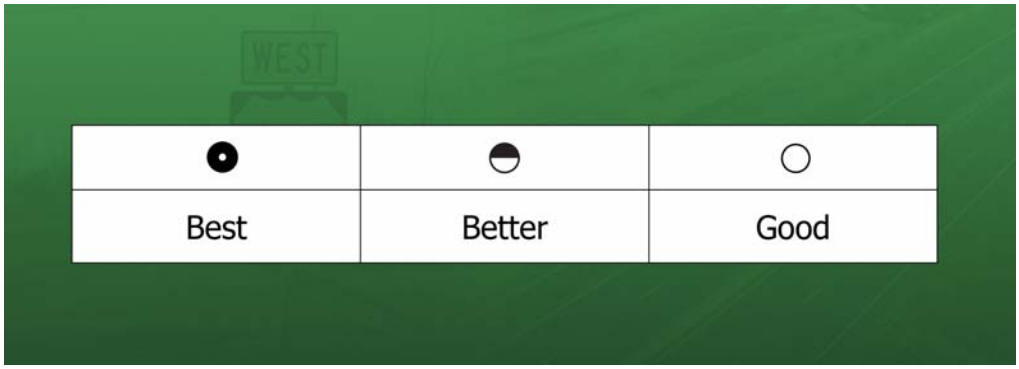
As shown in **Figure 7.2**, the performance of each of the alternatives was rated as "Good", "Better", or "Best" with regard to its degree of satisfaction of each evaluation criteria. The Build alternatives were compared against the No-build (or Baseline) condition.

Figure 7.1: Evaluation Criteria

TIER 1 ALTERNATIVES EVALUATION MATRIX

Study Objective Category Evaluation Criteria	Measure of Effectiveness
MOBILITY BENEFITS	
Travel Time	Percent reduction in travel time from Charlotte to Raleigh vs. baseline condition.
Travel Diversion I-85 and I-40	Percent Interstate traffic reduction from baseline condition.
Safety	Reduction in accidents using National (and/or Statewide) average accident rates by facility type vs. baseline condition.
Accommodation of Transit Plans	Alternative's potential to facilitate implementation of transit initiatives.
GROWTH MANAGEMENT BENEFITS	
Development Pattern Impacts	Potential to direct growth consistent with locally desired development patterns and policies.
ECONOMIC BENEFITS	
Accessibility	Percent change in number of jobs or households within specified travel times to specific destinations vs. baseline condition.
Development Opportunity	Potential for improved access to future development that includes major employers.
ENVIRONMENTAL ISSUES	
Sensitivity to environmental factors	Potential for adverse impact based on facility footprint and location.
Sensitivity to social factors	Potential for adverse impact based on facility footprint and location.
COST EFFECTIVENESS BENEFITS	
Transportation User Benefits	Travel time, operating, and safety cost savings relative to the baseline condition.
Capital Cost	Estimate of probable cost.
User Benefits / Capital Costs	Calculated ratio.

Figure 7.2: Alternatives' Rating Scale



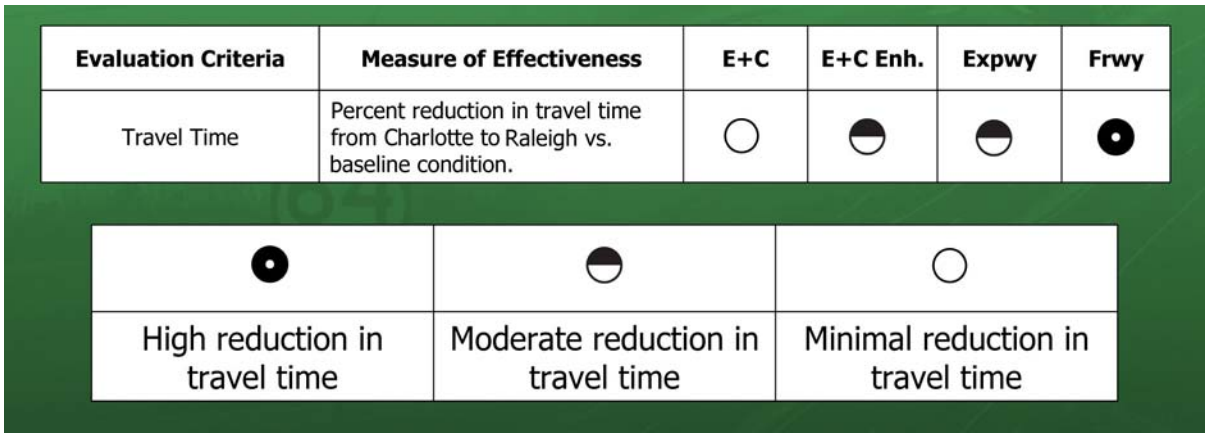
7.3 Evaluation Results

The following sections present the MOE results associated with each of the alternatives that were examined relative to each of the evaluation criteria. It should be noted that these results describe the performance of each alternative for each evaluation factor relative to the performance of the Baseline condition. As described previously, the Baseline assumed the implementation of all of the identified Existing plus Committed (E+C) projects throughout the study area **except** those projects associated with the US 64 and NC 49 mainlines.

7.3.1 Travel Time Savings

Figure 7.3 presents the MOE and alternatives' rating for the *Travel Time Savings* evaluation criteria.

Figure 7.3: Travel Time Savings MOE and Alternatives' Rating



The MOE results for each alternative are provided below:

- E+C Alternative reduces average travel time by approximately three percent (five minutes) on I-40/I-85 and seven percent (ten minutes) on US 64/NC 49.
- E+C Enhanced Alternative reduces average travel times by approximately 12 percent (20 minutes) on I-40/I-85 and 14 percent (21 minutes) on US 64/NC 49.
- Expressway Alternative reduces average travel times by approximately 10 percent (17 minutes) on I-40/I-85 and 17 percent (25 minutes) on US 64/NC 49.
- Freeway Alternative reduces average travel times by approximately 17 percent (29 minutes) on I-40/I-85 and 24 percent (36 minutes) on US 64/NC 49.

The travel time savings were calculated by comparing the difference in point-to-point travel times between each of the alternatives along identical origin-destination paths between the Charlotte and Raleigh areas. For the US 64–NC 49 Corridor, as an example, the path began in Charlotte at the I-85/NC 49 connector and continued along NC 49 to its junction with US 64 in Asheboro. The path then continued east along US 64 to the interchange of US 64 and I-40 in Raleigh. The path along I-40 and I-85 used the same origin and destination points as the path along the US 64–NC 49 Corridor. The travel times along these paths, as determined by the regional travel demand forecasting model for each alternative examined, were then compared against the year 2030 travel times along these same paths associated with the No-Build (Baseline) condition. Travel times between Charlotte and Raleigh are shown in **Table 7.1**. The travel time savings associated with each alternative in comparison to the Baseline were calculated and expressed in terms of a percentage difference.

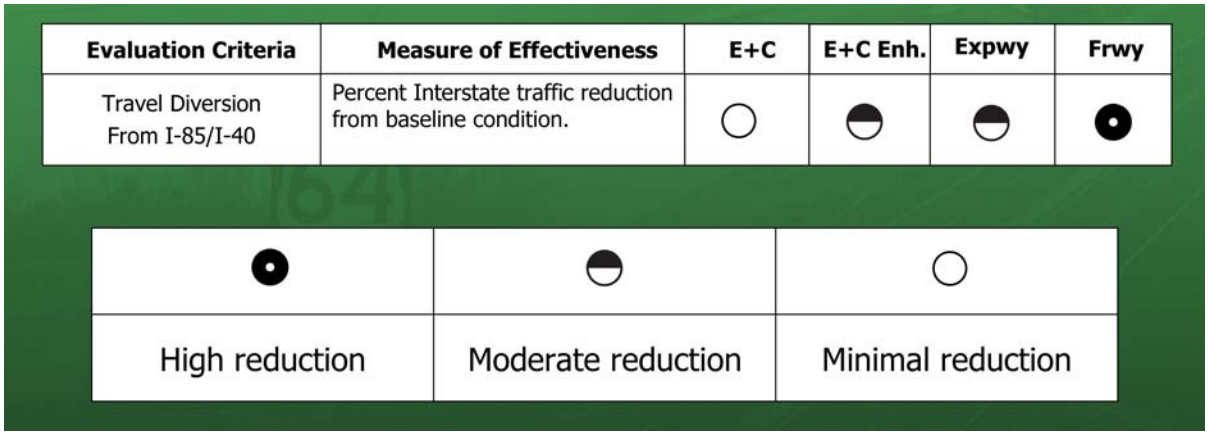
Table 7.1: Model Travel Times Between Charlotte and Raleigh (2030)

Route	Travel Time by Alternative (Minutes)				
	Baseline	E+C	E+C Enh.	Expwy	Frwy
I-40/I-85	168	163	148	151	139
US 64–NC 49	149	139	128	124	113

7.3.2 Travel Diversion from I-40/I-85

Figure 7.4 presents the MOE and alternatives' rating for the *Travel Diversion from I-40/I-85* evaluation criteria.

Figure 7.4: Travel Diversion MOE and Alternatives' Rating



The MOE results for each alternative are provided below:

- E+C Alternative results in a 2,500 vehicle per day (vpd) diversion (two percent) from I-40/I-85.
- E+C Enhanced Alternative results in a 10,800 vpd diversion (eight percent) from I-40/I-85.
- Expressway Alternative results in a 12,600 vpd (nine percent) diversion of traffic from I-40/I-85.
- Freeway Alternative results in a 23,000 vpd (17 percent) diversion of traffic from I-40/I-85.

The diversion of projected year 2030 average daily traffic from the I-40 and I-85 corridor to the parallel US 64–NC 49 Corridor was calculated along Screenline #1 located just west of the junction between I-40 and I-85 in Orange County near Hillsborough (see **Figure 6.6**). The selection of screenline #1 for this analysis was at random. As described in Chapter 6 of the report, 2030 average daily traffic volumes forecasts were generated for all of the regional alternatives that were considered. The resulting traffic volume forecasts at the same locations were then compared to one another with the amount of anticipated diversion (expressed in terms of both vehicles per day and percentage) then being calculated relative to the projected volume at the defined location for the Baseline.

7.3.3 Safety Improvement

Research conducted by NCDOT and the University of North Carolina at Chapel Hill's (UNC) Highway Safety Research Center for NCDOT substantiates the assumption that drivers on divided highways are likely to experience lower crash rates than drivers on undivided roadways. In 2003, NCDOT compared the accident histories of two four-lane divided highways (US 29 in Concord and US 74 in Shelby) with that of a five-lane section of US 64

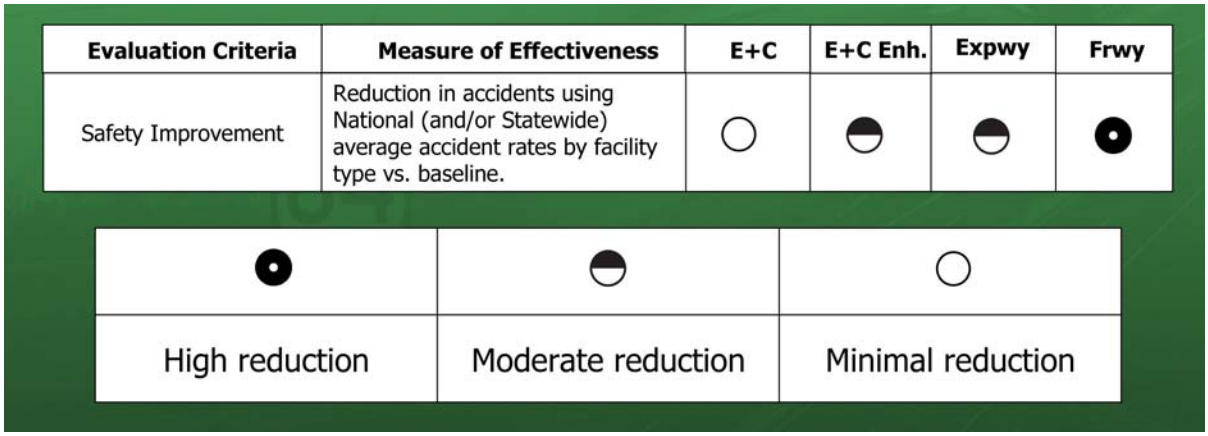
in Asheboro. This study found that the total crash rate on the five-lane section of US 64 in Asheboro (with a two-way, left-turn lane) was significantly higher than those of the other two locations. The rates for the four-lane, divided roadway sections (US 29 and US 74, respectively) were 130 and 206 crashes per 100 million vehicle miles traveled (100 MVMT), while the rate for the US 64 section was 503 crashes/100 MVMT. A similar analysis, which compared accident rates between a five-lane section of US 17 in Wilmington with that of nearby four-lane, divided sections on US 421 and NC 132 with similar daily traffic volumes, revealed similar results.

The UNC study examined factors that contribute to high accident rates on North Carolina roads, using the Highway Safety Information System (HSIS). This analysis revealed that, of all road types, drivers on rural two-lane highways experienced the highest crash rates in North Carolina (2.09 crashes per million vehicles miles traveled), compared to the crash rates experienced on either rural multilane divided, non-Interstate type highways (1.55 crashes per MVMT) or rural freeways (0.61 crashes per MVMT).

In addition to the above information, the Study Team relied on the general understanding that (1) accidents are more prevalent on roads with higher degree of access including at-grade intersections and driveways and (2) accidents are more prevalent on roads designed using older design standards.

Figure 7.5 presents the MOE and alternatives' rating for the *Safety Improvements* evaluation criteria.

Figure 7.5: Safety Improvement MOE and Alternatives' Rating



The MOE results for each alternative are provided below:

- E+C Alternative replaces most, but not all two-lane sections of US 64 and NC 49 with a four-lane, divided or five-lane facility. Generally, there is no control of access or consolidation of driveways. Signalized intersections remain prevalent. There is limited improvement to existing horizontal and vertical alignment. Relative to the

other alternatives, the E+C Alternative would have a minimal reduction in accident rates.

- E+C Enhanced Alternative provides a continuous, four-lane divided facility with consolidation of existing driveways, conversion of major signalized intersections to grade-separated interchanges, and no addition of new signalized intersections. There is limited improvement to existing horizontal and vertical alignment. The E+C Enhanced Alternative would have a moderate reduction in accident rates.
- Expressway Alternative would provide a continuous, four-lane divided facility with limited access control, consolidation of driveways, removal or bypassing of all signalized intersections, and improved horizontal and vertical alignment throughout the corridor. The Expressway Alternative would have a moderate reduction in accident rates.
- Freeway Alternative would provide a continuous, four-lane facility with full control of access, grade-separated interchanges only, and improved horizontal and vertical alignment throughout the corridor. Relative to the other alternatives, the Freeway Alternative would have the highest reduction in accident rates.

7.3.4 Accommodation of Transit Plans

Figure 7.6 presents the MOE and alternatives' rating for the *Accommodation of Transit Plans* evaluation criteria.

Figure 7.6: Accommodation of Transit Plans MOE and Alternatives' Rating

Evaluation Criteria	Measure of Effectiveness	E+C	E+C Enh.	Expwy	Frwy
Accommodation of Transit Plans	Alternative's potential to facilitate implementation of transit initiatives.	○	○	○	○

●	◒	○
Greatest support of transit initiatives	Moderate support of transit initiatives	Minimal support of transit initiatives

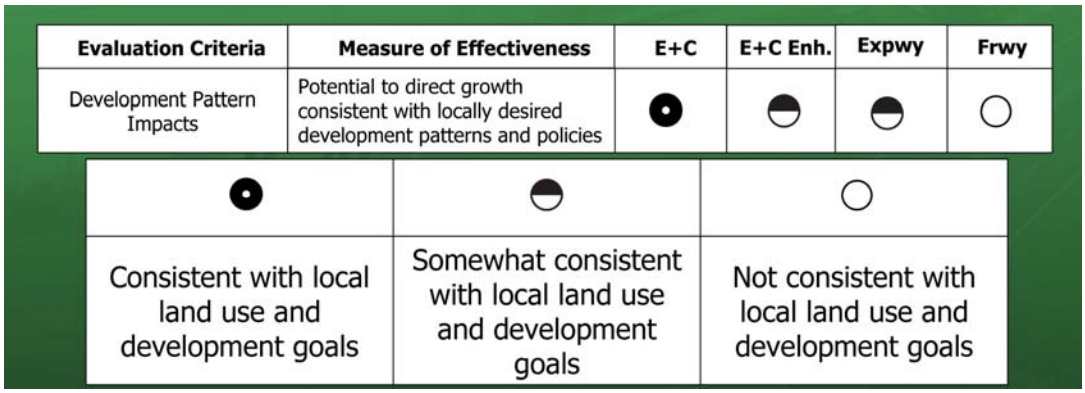
As noted in Section 3.6.6, major transit initiatives within the regional study area are limited to the large metropolitan areas. There are no planned transit improvements in the US 64–NC 49 Corridor other than minor rural transit service upgrades. As such, the alternative definitions do not preclude transit accommodation, but do not directly address it either. All the alternatives were rated as providing minimal support of transit initiatives, since there is no discernable difference between them. For each alternative, urban transit services are not

impacted. In addition, rural public transit and ridesharing services can be expected to benefit from reduced travel time to urban areas for healthcare and job access.

7.3.5 Development Pattern Impacts

Figure 7.7 presents the MOE and alternatives' rating for the *Development Pattern Impacts* evaluation criteria.

Figure 7.7: Development Pattern Impacts MOE and Alternatives' Rating

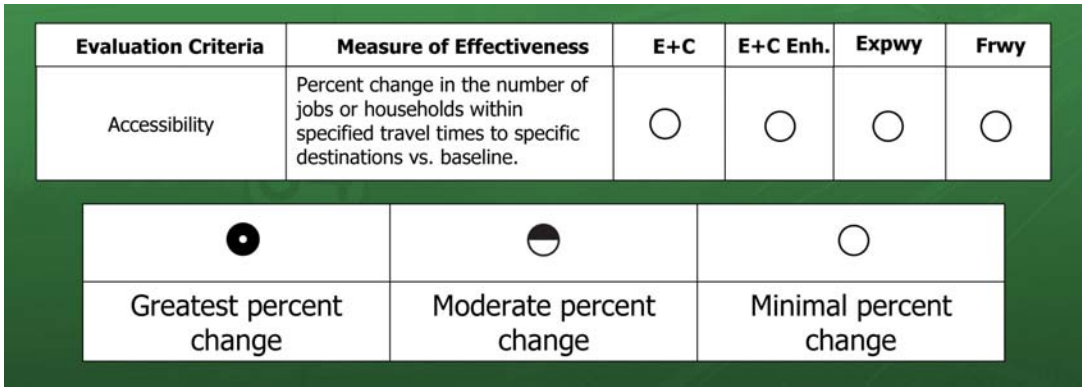


The E+C Alternative is presently what is recognized in the local land use plans and therefore is the "most consistent" with local development patterns and polices. There are some future land use plans that envision US 64–NC 49 as a "major" roadway with access consistent with the Expressway Alternative definition. The Expressway Alternative was therefore rated as "somewhat consistent" with local development patterns and policies. There are no future land use plans within the US 64–NC 49 Corridor that view a Freeway Alternative definition as an essential part of desired development patterns and polices, with the result being that this alternative was rated as "not consistent" with local land use and development goals . The E+C Enhanced Alternative by definition will function as an expressway with respect to land use, and it is therefore rated as "somewhat consistent."

7.3.6 Accessibility

Figure 7.8 presents the MOE and alternatives' rating for the *Accessibility* evaluation criteria.

Figure 7.8: Accessibility MOE and Alternatives' Rating



The measure of effectiveness for *Accessibility* was calculated through a comparison of the total number of jobs within a 60-minute travel time of all residences in the 19-county regional study area for each of the alternatives considered. Initially, the total number of jobs within a 60-minute travel time of all residences for the Baseline condition was calculated. The same calculation was then made for all four of the other regional alternatives examined to determine what impact, if any, the changes in travel time associated with the various levels of highway improvement would have on the accessibility measure. The relative differences in the number of jobs within a 60-minute travel time between the Baseline and each of the alternatives was then expressed in terms of a percent difference.
The MOE results for each alternative are provided below:

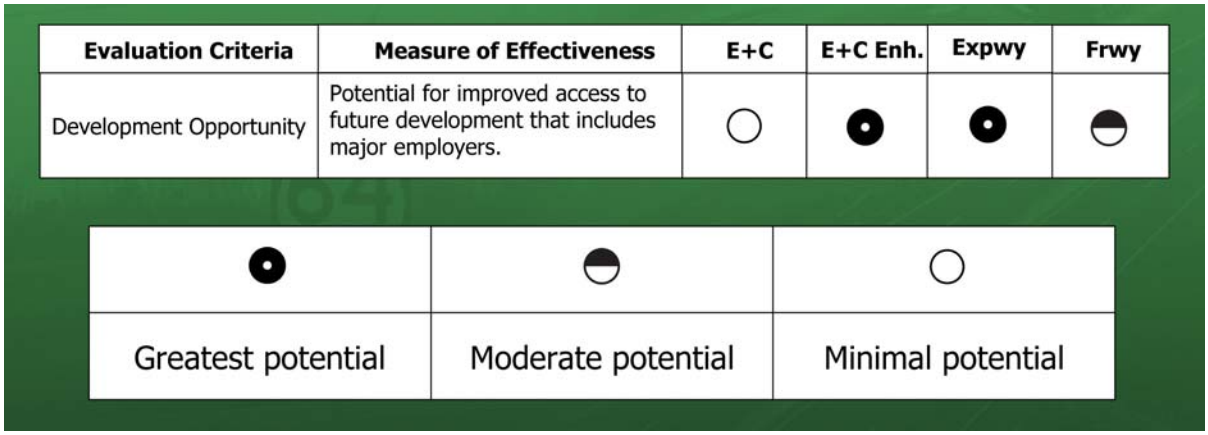
- E+C Alternative results in a change of + 0.62 percent.
- E+C Enhanced Alternative results in a change of + 0.62 percent.
- Expressway Alternative results in a change of + 0.62 percent.
- Freeway Alternative results in a change of + 0.67 percent.

Thus, for all practical purposes, the four investment alternatives have an identical performance in comparison to the projected Baseline condition with regard to this particular MOE.

7.3.7 Development Opportunity

Figure 7.9 presents the MOE and alternatives' rating for the *Development Opportunity* evaluation criteria.

Figure 7.9: Development Opportunity MOE and Alternatives' Rating



Evaluation Criteria	Measure of Effectiveness	E+C	E+C Enh.	Expwy	Frwy
Development Opportunity	Potential for improved access to future development that includes major employers.	○	●	●	◒

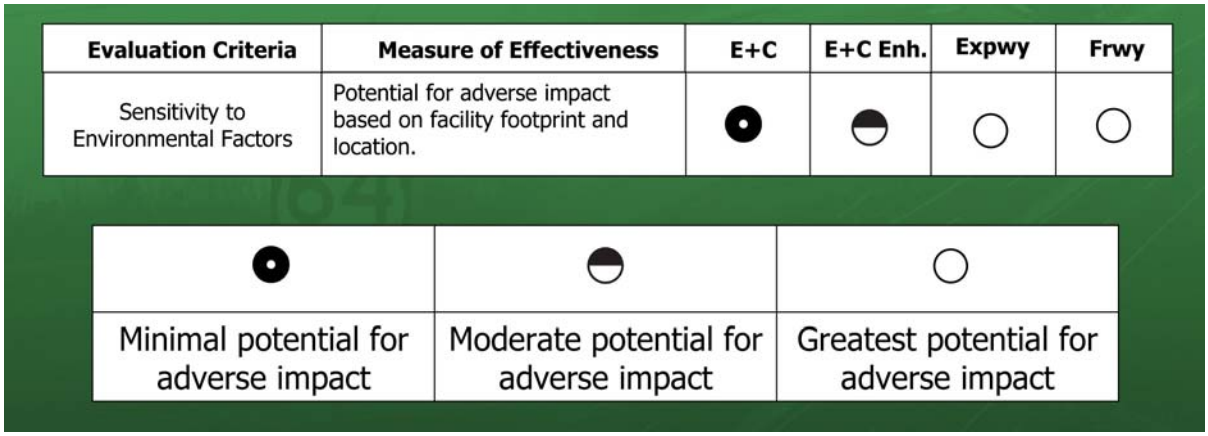
●	◒	○
Greatest potential	Moderate potential	Minimal potential

The potential for development opportunities increases with improved access. Major employers are generally most attracted to sites located adjacent to or near high speed facilities (average travel speed greater than 45 mph), particularly when such facilities provide access to "Greenfield" sites, or near highways where there are or will be relatively high volumes of traffic traveling steadily in an uncongested condition. The Freeway and Expressway alternatives by definition would provide the greatest regional draw or reach, but would be the most restrictive in terms of allowing direct access to adjacent land parcels. The Expressway Alternative while still providing mobility to the region would also have greater access to adjacent areas via at-grade intersections between grade-separated interchanges that would be the case with the Freeway Alternative. For that reason, the Expressway Alternative was rated as having the "greatest" potential for development opportunity while the Freeway Alternative was rated as providing only a "moderate" development potential. The E+C Alternative provides "minimal" travel time improvements to the corridor beyond additional roadway capacity. Since the other three alternatives include locating the facility in part on new alignment thereby opening an undeveloped area (Greenfield) for future development, the E+C Alternative offers comparatively less access to undeveloped land. Therefore, the E+C Alternative was rated as providing only minimal development opportunity. The E+C Enhanced Alternative by definition more closely represents the Expressway Alternative and was rated as also having the "greatest" development potential.

7.3.8 Sensitivity to Environmental Factors

Figure 7.10 presents the MOE and alternatives' rating for the *Sensitivity to Environmental Factors* evaluation criteria.

Figure 7.10: Sensitivity to Environmental Factors MOE and Alternatives' Rating

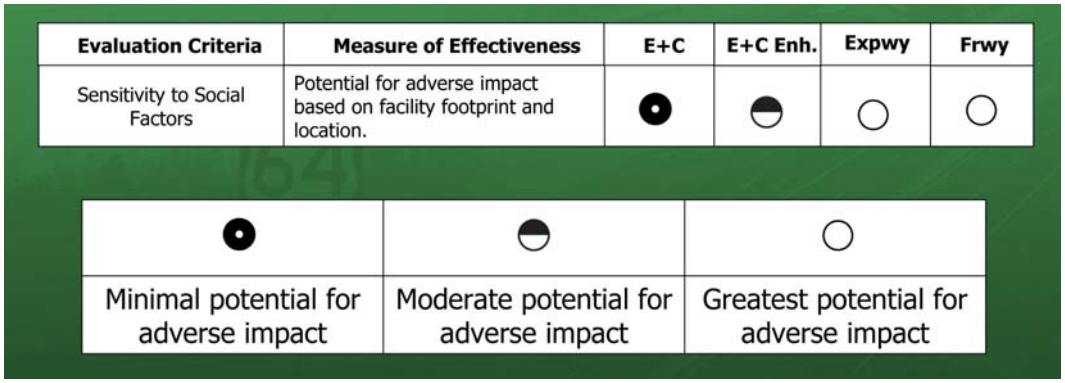


In general, the construction of a roadway on new location creates greater impacts to natural resources than improving an existing road. In addition, the larger the construction footprint required for the roadway, the greater the potential for impacts to natural resources. Both the Freeway and Expressway alternatives would require a significant amount of new location roadway for full implementation and would thus have the largest footprints resulting in the greatest potential impact on natural resources. The E+C Alternative would have minimum new location needs and the smallest footprint, and consequently the least potential impact. The E+C Enhanced Alternative falls between the Expressway Alternative and E+C Alternative with regard to the need for new location alignment and construction footprint size and was thus rated as having a moderate potential impact on natural resources.

7.3.9 Sensitivity to Social Factors

Figure 7.11 presents the MOE and alternatives' rating for the *Sensitivity to Social Factors* evaluation criteria.

Figure 7.11: Sensitivity to Social Factors MOE and Alternatives' Rating

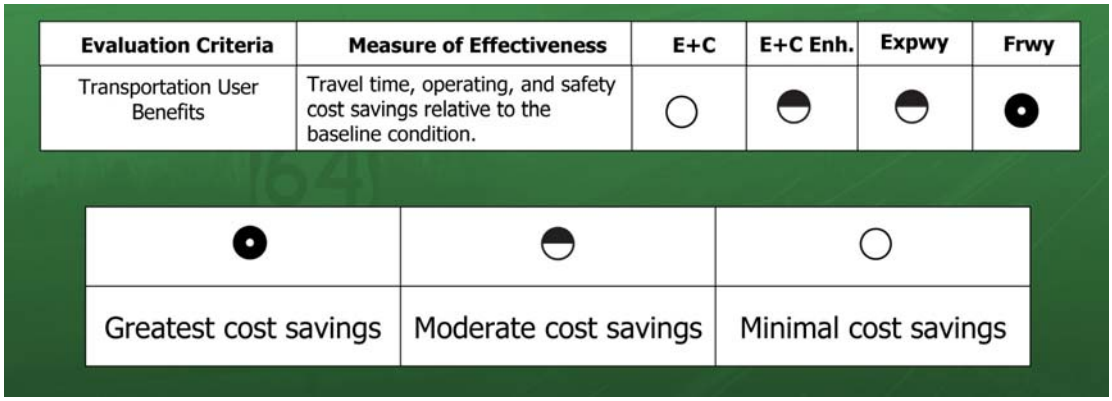


In general, location and construction footprint size dictate a roadway improvements potential for impact to social factors. As noted in Section 7.3.8, the Freeway and Expressway alternatives have the largest construction footprints and greatest amount of new location need. For these reasons, the Expressway and Freeway alternatives were rated as having the greatest potential for adverse impact to social factors. The E+C Alternative has the smallest construction footprint and least amount of new location. The E+C Alternative, therefore, was rated as having the least potential for adverse impact. The E+C Enhanced Alternative falls between the Expressway Alternative and E+C Alternative with regard to the need for new location alignment and construction footprint size and was rated as having a moderate potential for adverse impact.

7.3.10 Transportation User Benefits

Figure 7.12 presents the MOE and alternatives' rating for the *Transportation User Benefits* evaluation criteria.

Figure 7.12: Transportation User Benefits MOE and Alternatives' Rating



For the purposes of this corridor study, "user benefits" were defined as the value of travel time, vehicle operating, out-of-pocket, and internal accident cost savings experienced by the users of the regional highway network over the course of a year. First, for each pair of origins and destinations in the model, the travel time of all users of the system in the year 2030 under the Baseline condition was calculated. This value used the regional travel demand model estimates of average daily travel time across the system (expressed in terms of daily vehicle hours of travel) and converted this to an annual value by application of the factor of 365 days per year. Total vehicle miles of travel on an average daily and an annual basis were calculated as well. Next, the total cumulative travel time and vehicle miles of travel experienced by all users of the system in the year 2030 associated with each of the four alternatives considered was calculated in a similar manner. The relative differences (savings) in annual travel times and vehicle miles of travel between the 2030 Baseline and each of the

four build alternatives and unit values for each cost component (e.g., the value of one hour of time [$8.90], which is the current value used by the Surface Transportation Efficiency Analysis Model [STEAM], an FHWA user-benefit analysis tool) are used to generate total user cost estimates.

The MOE results for each alternative are provided below:

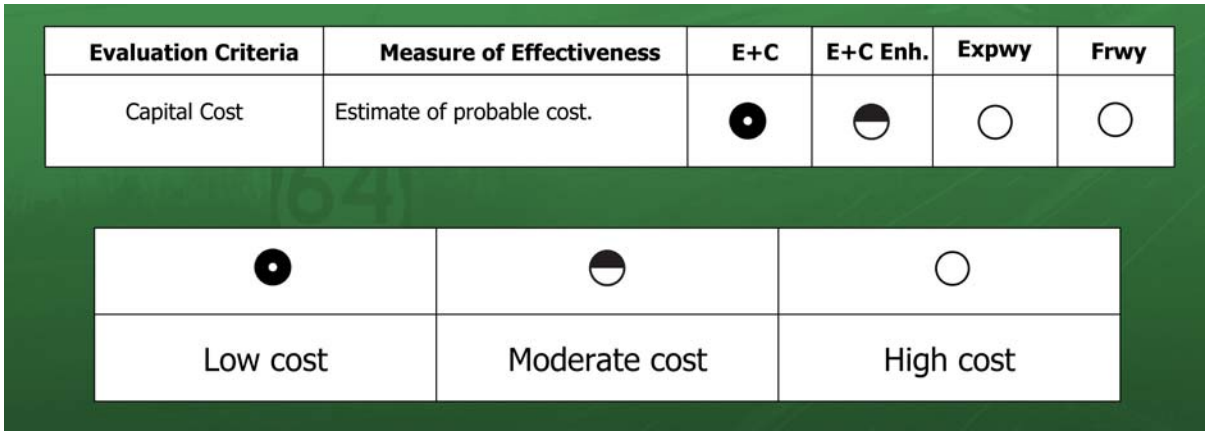
- E+C Alternative achieves user benefits of approximately $11 million per year.
- E+C Enhanced Alternative achieves user benefits of approximately $22 million per year.
- Expressway Alternative achieves user benefits of approximately $23 million per year.
- Freeway Alternative achieves user benefits of approximately $35 million per year.

In comparison to the Baseline condition, the E+C Alternative has minimal cost savings, the E+C Enhanced and Expressway alternatives have moderate cost savings, and the Freeway alternative has the greatest cost savings.

7.3.11 Capital Cost

Figure 7.13 presents the MOE and alternatives' rating for the *Capital Cost* evaluation criteria.

Figure 7.13: Capital Cost MOE and Alternatives' Rating



Planning-level capital cost estimates were prepared by NCDOT using sketch plans of an example implementation scenario for each alternative as well as individual TIP project costs documented in NCDOT's 2004 – 2010 TIP. Costs were based on NCDOT historical estimates of major construction items and activities. The capital cost includes construction and right of way expressed in terms of year 2004 dollars.

The MOE results for each alternative are provided below:

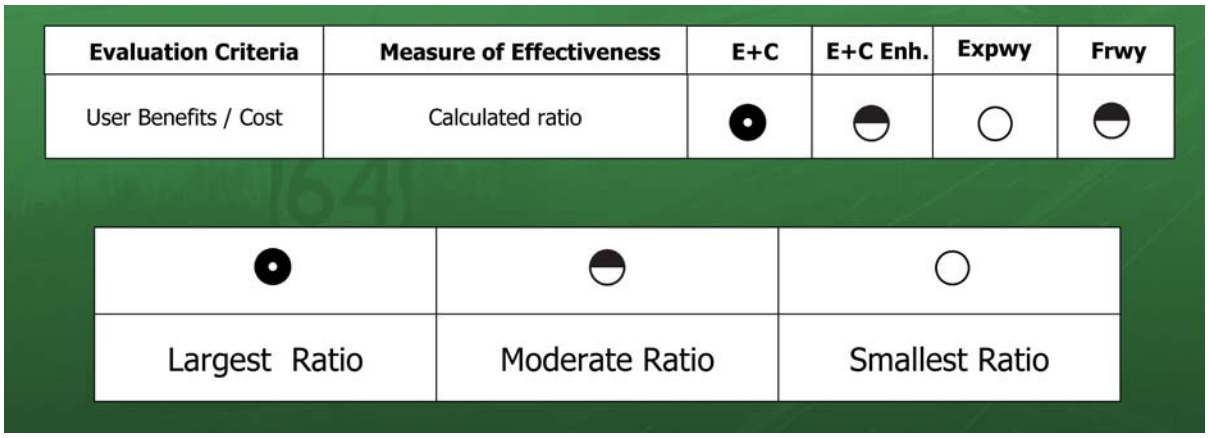
- E+C - $550,000,000
- E+C Enhanced - $1,750,000,000 (includes total cost of E+C projects)
- Expressway - $2,340,000,000 (includes $210 million of E+C projects)
- Freeway - $2,560,000,000 (includes $210 million of E+C projects)

In comparison to the Baseline condition, the E+C Alternative has the lowest cost, the E+C Enhanced Alternative has a moderate cost, and the Expressway and Freeway alternatives have high costs.

7.3.12 User Benefits/Cost

Figure 7.14 presents the MOE and alternatives' rating for the *User Benefits/Cost* evaluation criteria.

Figure 7.14: User Benefits/Cost MOE and Alternatives' Rating



The User Benefits/Cost ratio is a result of the comparison of the *Transportation User Benefits* MOE (Section 7.3.10) to the total estimated *Capital Cost* MOE (Section 7.3.11). User benefits and capital costs are spread across a 20-analysis period (2010 to 2030) in recognition of the time required to construct any of the regional alternatives, and in acknowledgement of the fact that the amount of user benefits experienced by travelers in the study corridor would vary from year to year during the period of construction. The resulting value of total cumulative user benefits was then divided by the total estimated capital cost associated with each alternative to generate the value of the *User Benefits/Cost* MOE.

The MOE results for each alternative are provided below:

- E+C Alternative achieves a user benefits to cost ratio of 0.30.
- E+C Enhanced Alternative achieves a user benefits to cost ratio of 0.19.
- Expressway Alternative achieves a user benefits to cost ratio of 0.15.
- Freeway Alternative achieves a user benefits to cost ratio of 0.21.

The E+C Alternative has the largest user benefits to cost ratio, while the E+C Enhanced and Freeway alternatives have a moderate ratio. The Expressway Alternative has the smallest ratio.

It should be noted that the US 64–NC 49 study used a "standard" benefit/cost analysis as a comparative measure to evaluate the alternatives tested. This approach is widely used for early planning projects, but it is limited in its ability to measure the full impacts of a significant corridor improvement. Thus, B/C ratios tend to be lower than what actually may be achieved, yet are still acceptable for alternative comparision purposes. Only "user benefits" were estimated (see Section 7.3.10) on the benefits side. These account for changes in the value of travel time, vehicle operating, out-of-pocket, and internal accident cost savings experienced by system users. In a more detailed benefit/cost analysis, potential economic and societal benefits are taken into consideration to more fully quantify the magnitude of the expected "benefits" of any major transportation system investment. Large-scale transportation investments in corridors with development potential can spur significant business attraction and business expansion, which increases regional business sales, income, and employment. These additional economic benefits are typically estimated in relation to the positive or negative effects on travel time and accessibility associated with various investment alternatives.. The application of a more detailed economic impact analysis to the US 64 – NC 49 corridor would most likely result in greater higher B/C ratios than those determined through the standard analysis conducted for this study.

7.4 Evaluation of Alternatives Conclusions

The purpose of this section is to present alternative evaluation conclusions in the context of the five study objective categories (outlined in Section 7.1). Whereas the previous section presented performance results for each of the individual evaluation criteria, this section presents broader conclusions through a review of all evaluation criteria under each specific objective category. **Figure 7.15** provides the Alternatives' Evaluation Matrix. The conclusions presented here are utilized in framing the recommended corridor vision that is described in Chapter 8.

Figure 7.15: Alternatives' Evaluation Matrix

ALTERNATIVES EVALUATION MATRIX

Study Objective Category / Evaluation Criteria	Measure of Effectiveness	Alternative: E+C	E+C Enhanced	Expressway	Freeway
MOBILITY BENEFITS					
Travel Time	Percent reduction in travel time from Charlotte to Raleigh vs. baseline condition.	○	◐	◐	●
Travel Diversion I-85 and I-40	Percent Interstate traffic reduction from baseline condition.	○	◐	◐	●
Safety	Reduction in accidents using National (and/or Statewide) average accident rates by facility type vs. baseline condition.	○	◐	◐	●
Accommodation of Transit Plans	Alternative's potential to facilitate implementation of transit initiatives.	○	○	○	○
GROWTH MANAGEMENT BENEFITS					
Development Pattern Impacts	Potential to direct growth consistent with locally desired development patterns and policies.	●	◐	◐	○
ECONOMIC BENEFITS					
Accessibility	Percent change in number of jobs or households within specified travel times to specific destinations vs. baseline condition.	○	○	○	○
Development Opportunity	Potential for improved access to future development that includes major employers.	○	●	●	◐
ENVIRONMENTAL ISSUES					
Sensitivity to environmental factors	Potential for adverse impact based on facility footprint and location.	●	◐	○	○
Sensitivity to social factors	Potential for adverse impact based on facility footprint and location.	●	◐	○	○
COST EFFECTIVENESS BENEFITS					
Transportation User Benefits	Travel time, operating, and safety cost savings relative to the baseline condition.	○	◐	◐	●
Capital Cost	Estimate of probable cost.	●	◐	○	○
User Benefits / Capital Costs	Calculated ratio.	●	◐	○	◐

7.4.1 Mobility Benefits

"Mobility" in its most basic definition is simply the characteristic of being "mobile." With respect to transportation, mobility incorporates several qualitative elements including riding comfort, ease in changing lanes, absence of speed changes, and acceptable and reliable travel time. Typically the primary measure of mobility is travel time (or average operating speed). Mobility is provided at varying levels of service and is inversely proportional to the degree of land access provided.

In the context of the criteria used to define Strategic Highway Corridors, mobility for this study is addressed from a regional perspective with the more favorable alternatives being those that reduce long distance travel times between defined activity centers, improve safety for all system users, and promote better distribution of auto travel through relief of other major roadways. It is somewhat intuitive then to expect high-level facilities (i.e. freeways) to better satisfy these criteria. A review of the alternatives evaluation summary shows this to be the case.

The Freeway Alternative as a fully-controlled access facility performs the best in reducing travel times and encouraging use of the US 64–NC 49 Corridor as an alternative to I-40 and I-85. In addition, full control of access facilities in the broad definition have the lowest accident rates based on national and North Carolina crash data. The Expressway and E+C Enhanced Alternatives trade travel time for a higher degree of access through a greater number of access points. The resulting decrease in travel time savings relative to those achieved for the Freeway Alternative translates into lower traffic diversion from I-40 and I-85. However, the performance of the Expressway and E+C Enhanced alternatives is still quite good when compared to the Baseline condition. The E+C Alternative, while adding additional roadway capacity via upgrades of existing two-lane roadway sections to multi-lanes, does little to reduce land access and therefore has the least travel time saving, lowest interstate diversion potential, and the highest accident rate probability. For accommodation of transit plans, there is no discernable difference between the four alternatives.

Cross referencing mobility with capital cost shows that better performance comes with a price (higher-level facilities require a greater investment). Affordability is a function of need and time. Selection of an appropriate alternative must be balanced between achieving the desired degree of mobility with a reasonable expectation of available funding.

The Study Team concludes that mobility benefits should be considered in the selection of a long-term corridor vision.

7.4.2 Growth Management Benefits

For this study, growth management is measured by one evaluation criteria, *Development Pattern Impacts*, as described in Section 7.3.5. Because the measure of effectiveness is development growth potential consistent with desired local development patterns and policies, the evaluation results favor an alternative definition that is presently represented in the local land use plans. It is therefore important to keep in mind that this local land use plan definition of US 64 and NC 49 is influenced heavily by the present facility's physical and operational characteristics and programmed improvements, which generally maintain the facility status quo. Alternative definitions that redefine the US 64 and NC 49 facility type, such as the Freeway Alternative, are rated less favorable simply from the standpoint that they do not match the present land use plan definition. Obviously, the definition of US 64 and NC 49 in the local land use plans can be changed should the long-term vision of the corridor change.

The Study Team concludes that differences in growth management benefits are not significant in the selection of a long-term corridor vision.

7.4.3 Economic Benefits

Economic benefit was measured through increased job accessibility, which is a function of regional travel time improvements and development opportunity for major employers (not including small business/commercial strip development). Due to broad regional congestion, there is no discernable difference in regional travel time savings from households to jobs. With regard to development opportunity for major employers, such employers tend to favor locations near or around high-level roadway facilities such as freeways and expressways. The Expressway and E+C Enhanced alternatives were rated better than the Freeway Alternative from the standpoint of being able to provide relatively high mobility, but with slightly greater access opportunity. However, with an assumed application of frontage roads for the Freeway Alternative, the difference in rating between the E+C Enhanced, Expressway, and Freeway is not discernable.

The Study Team concludes that economic benefits should be considered in the selection of a long-term corridor vision.

7.4.4 Environmental Issues

In evaluating major investment strategies at this level of planning, environmental issues are broadly assessed using a typical construction footprint and need for new location alignment as noted in Sections 7.3.8 and 7.3.9. During Phase 1 of this study, no specific alignments have been established for the alternatives. Therefore, the potential for environmental impacts

can only be assessed at a qualitative level and thus primarily reflect intuitive expectations – the larger the construction footprint and greater amount of new location, the greater the potential for environmental impacts. Certainly the alternative ratings reflect this. What is not reflected is the potential for positive environmental impacts such as reduced auto emissions through higher operating speed and less stops, opportunities to improve stormwater runoff, and mitigation opportunities for noise, streams, and wetlands. Because of this, the potential environmental impact difference between the E+C, E+C Enhanced, Expressway, and Freeway alternatives is not discernable at the broad regional scale of this study.

The Study Team has concluded that the differences in environmental impacts are not significant in the selection of a long-term corridor vision.

7.4.5 Cost Effectiveness

Cost effectiveness is the relationship of transportation user benefits to the cost of making improvements. For this study, user benefits were developed in terms of travel time, operating and maintenance, and safety cost savings. Capital cost consists of probable construction and right-of-way costs. As would be expected, the higher facility type definitions provide the greatest user benefits. In turn, higher facility types cost more. The evaluation of the cost effectiveness objective category should be accomplished in concert with mobility benefits.

The Study Team concludes that cost effectiveness should be considered in the selection of a long-term corridor vision.