

# DESIGN-BUILD POST CONSTRUCTION REVIEW

## I-3807 Final Report



**Location:** SR 1128 (Ruin Creek Rd.) widening from just south of I-85 at SR 1218 (Graham Ave.) to north of the US 158 Bypass, approximately 1.04 miles

**Division:** 5 **County:** Vance

**Type of Work:** Grading, Drainage, Structures, Paving, Traffic Control, Traffic Signals, Signing and Pavement Markings

**Type of Contract:** Design-Build

**Proposed Contract Completion Date:** November 1, 2004

**Prepared By:** John Wadsworth, PE  
Alternative Contracts, Constructability Engineer

**DESIGN-BUILD POST CONSTRUCTION REVIEW****TIP #:** I-3807      **COUNTY:** Vance      **DIVISION:** 5**FEDERAL AID #:** IMS-STPNHS-85-4(93)212**DESCRIPTION:** SR 1128 (Ruin Creek Rd.) widening from just south of I-85 at SR 1218 (Graham Ave.) to north of the US 158 Bypass, approximately 1.04 miles**WORK REQUIRED:**

The general scope of work consisted of widening SR 1128, Ruin Creek Road, from the existing two lane road to a five lane curb and gutter facility. The proposed design consisted of two through lanes in each direction with a continuous center left turn lane. All structure and roadway design was the responsibility of the Design-Build Team. The existing bridge across I-85 was originally proposed to be widened, however, the Design-Build Team constructed a new structure providing six lanes with a sidewalk on the west side. The interchange ramps were widened to accommodate future traffic. Coordination with the Division 5 Office and the Construction Unit during the construction of the project to keep the public informed of lane closures, construction progress, etc. was required. All of the drainage design work was completed for the entire project by the Design-Build Team. Temporary pavement designs for detours or temporary widening were also the responsibility of the Design-Build Team. All erosion control design, traffic signal design and signing work was performed by the Design-Build Team. Traffic Control Plans were developed by the Design-Build Team and had Division 5 approval. All structure surveys, all right of way staking and right of way recordation was performed by the Design-Build Team.

The costs and fees associated with the acquisition of right of way and easements required for this project, except for direct payments to property owners for negotiated settlements, recording fees, relocation benefits and condemnation fees, deposits and litigation, were the responsibility of the Design-Build Team. Land required for the project was acquired from approximately 18 parcels. No relocations were required. The Design-Build Team was responsible for coordinating all utility conflicts, utility construction plans and any additional SUE work required by the Design-Build Team's design. The Team was responsible for all non-betterment utility relocation cost when the utility company had prior rights of way or a compensable interest.

No environmental permits were required on the project.

A complete geotechnical investigation package was provided by NCDOT. Any additional geotechnical work was the responsibility of the Design-Build Team.

NCDOT also provided full electronic surveys, a copy of the public hearing map and final pavement designs. CEI work was the responsibility of the NCDOT. A preliminary horizontal alignment and preliminary typical sections were also provided to the Design-Build Team.

**GENERAL CONTRACT INFORMATION:**

<b>DATE RFQ ADVERTISED</b>	11/15/2001	<b>NO. RFQ'S REQUESTED</b>	16
<b>DATE SOQ'S RECEIVED</b>	1/11/2002	<b>NO. OF SOQ'S RECEIVED</b>	2
<b>NO. TEAMS SHORT LISTED</b>	2	<b>TECHNICAL SCORE OF SELECTED TEAM</b>	93
<b>TECHNICAL SCORES OF UNSELECTED TEAM(S)</b>	82	<b>QUALITY ADJUSTED PRICE OF SELECTED TEAM</b>	\$8,075,625.00
<b>QUALITY CREDIT OF SELECTED TEAM</b>	11.5%	<b>LETTING DATE</b>	6/21/2002
<b>AWARD DATE</b>	7/11/2002	<b>AWARD METHOD</b>	Best Value
<b>CONTRACT AMOUNT</b>	\$9,125,000.00	<b>ENGINEER'S ESTIMATE</b>	\$8,791,000.00
<b>NCDOT PROJECT COMPL. DATE</b>	11/1/2004	<b>DESIGN-BUILD TEAM PROPOSED COMPL. DATE</b>	6/1/2004
<b>REVISED CONTRACT COMPL. DATE</b>	11/1/2004	<b>ACTUAL PROJECT COMPLETION DATE</b>	10/12/2004

**CONTRACTOR:** S. T. Wooten Corporation

**DESIGN FIRM:** Rummel Klepper & Kahl

**CEI FIRM:** N/A

**COMMENTS:**

The post construction review of this project consisted of a site visit as well as interviews with the design firm, the construction contractor, NCDOT Division and project personnel, the Roadway Construction Engineer and a representative of Time Warner Cable. Attempts to schedule interviews with representatives of the local hospital and Progress Energy were unsuccessful. The following comments and/or recommendations were received and discussed during the review:

**1. Design-Build Team Constructability Reviews/Partnering**

Constructability reviews by Design-Build Team members were conducted during the design and construction phases of the project. All team members considered these reviews an essential part of the design-build process. While all reviews were considered important, the 25% plan stage review was considered most worthwhile. Potential constructability issues and solutions

identified during the Team reviews included 1) use of black base rather than ABC, 2) replacing the structure over I-85 rather than widening existing bridge, 3) use of 6-inch monolithic islands and 4) use of 2'-6" curb and gutter for channelization. The Design-Build Team chose to include all of these revisions in their final design to reduce construction costs and/or time. The structure scope of work required the existing superstructure, including girders, to be modified to meet HS20 loading. The existing structure was designed for HS15 loading and after analyzing the beam modifications required to upgrade the structure, the Design-Build Team concluded the structure could not be economically modified and replaced the existing structure entirely.

One formal partnering workshop was held for the project. Most individuals interviewed felt the workshop was of benefit especially for the utility companies involved with the design-build process for the first time. Several individuals felt the workshop could have been eliminated because the contractor's representatives and NCDOT personnel had worked well together previously. It may be desirable to consider the size and complexity of projects when determining the need for formal partnering. A preconstruction conference and/or utility preconstruction meeting will be adequate for many small relatively simple projects.

## **2. Public Involvement**

Although not required by the Request for Proposals (RFP), the Design-Build Team maintained a project web site, conducted one public meeting and issued one newsletter for the project. The newsletter was used to announce the location and time for the public meeting. The informational meeting was well received and considered worthwhile. The public was informed of the project schedule and introduced to the contractor's managers. Public response to or use of the web site was not determined by the Design-Build Team and most individuals interviewed felt the worth of the web site was questionable for this project.

## **3. Innovative Designs or Materials**

There were no innovative materials or construction procedures used on the project. One design feature that could be considered innovative was the use of taller than normal end bents to shorten the length of the bridge structure over I-85. While shortening the length of the structure, this design has the potential to create safety issues (see Comment No.10).

#### **4. RFP/Technical Proposal**

The various RFP requirements related to scope of work, question submittals, response time and clarity were discussed with project personnel and the Design-Build Team. Generally everyone agreed the RFP requirements and response times to questions were adequate, however, the following items were identified as problems on this project by the Design-Build Team:

- Project advertised as structure widening required when this was not really a viable option. Existing bridge could not be economically widened. Team felt the RFP should have indicated a new structure would be required or allowed.
- Commitments made by NCDOT to property owners were not made available to Design-Build Team until late in the design process.
- Scope of signing work required along I-85 was unclear.
- Traffic control restrictions for lane closures, schedules, etc. need to be clearer in RFP, possibly chart or spreadsheet would be easier to follow. TCP requirements are not really presented in contractual language.
- ROW acquisition cost and responsibility changed by NCDOT just prior to Final RFP. The original Right of Way Scope of Work placed all the responsibility for all payments, costs and fees associated with acquisition of right of way, including direct payments to property owners for negotiated settlements, relocation benefits and all deposits and fees involved in filing condemnation, on the Design-Build Team. Due to the risks and uncertainty involved with the cost and schedule of the right of way acquisition process, the RFP was revised to make NCDOT responsible for the direct payments to property owners for negotiated settlements, recording fees, relocation benefits and deposits and fees associated with condemnation proceedings.

#### **5. Plans/Project Submittals**

The number and timing of required plan submittals and the review response time were discussed with the Design-Build Team and project personnel. Plan review response times were considered adequate by all parties; however, the review and response time for the Value Engineering Change Proposal (VECP) made on the project was very slow. The Design-Build Team indicated the work was completed prior to receiving a response from NCDOT approving the proposal. The Team indicated approximately six months was required from initial proposal to receipt of approval. The contractor submitted a VECP to eliminate the relocation of Line -Y4- on 4/29/2003. The Value Engineering Report indicates the

preliminary proposal was received by the Value Management Section on 5/1/2003, two separate requests for in-house comments were sent (the last one being on 5/30/03), final in-house comments were received on 6/4/03 and the final recommendation for approval was sent to the Construction Unit on June 12, 2003. The contractor revised the VECP and resubmitted it on April 28, 2004. The revised VECP was not submitted to the Value Management Section for review. The Supplemental Agreement approving the VECP was fully executed by all parties on 10/14/2004.

It is important to note that this delay was, in part, due to hesitation by NCDOT to pay the VECP. Public hearing maps given to the D-B team had shown realigning Gwynn Lane (Y4). The team's VECP proposal was to eliminate realigning Y4, thus avoiding an expensive ROW acquisition. The RFP stated "The Design-Build Team will design and construct all proposed intersections as shown on the hearing map, with the exception of the hospital entrances as noted above." This requirement justified the need to pay the D-B team. Future RFPs need to focus on providing guidance without eliminating design flexibility.

All Scopes of Work in the RFP did not state submittal requirements. A list of submittal requirements was provided to the Team after selection for this project.

The Design-Build Team felt design practices should be conveyed in a more clear and concise manner in the various NCDOT policy and procedure manuals, standard or special detail sheets. Examples on this project include channelization and monolithic islands across the structure. All the of the above were in the interchange section of the Roadway Design Manual. The review team believes it would be beneficial to revise the wording and location of instructions for these items to eliminate the possible need for supplemental agreements on a Design-Build project. Use of the wording "typical transition" or "suggested ramp termini" need to be addressed in the scopes of work. For example, notes and instructions regarding islands across structures is located on a Roadway Design Manual figure labeled Ramp Termini. This figure also indicates a painted island across the structure but a note indicates "A five-lane section, a monolithic island is preferred." It was also noted figures concerning pavement transitions are incorrectly referenced. With no selection guidance or instructions on NCDOT's preferences, the Design-Build Team will select solely on economy, efficiency, availability and what meets minimum design criteria.

The Design-Build Team was required to develop design plans to the same level of detail that NCDOT normally provides. In many cases these plans provide details that are not necessary for the contractor to build the project. The Design-Build Team felt that plans acceptable to the contractor to build the project should be adequate. While abbreviated plans may be suitable for the contractor to use for construction, as-built plans must contain all data that NCDOT may require in the future for maintenance analyses, reconstruction, etc. In addition, plans need to be adequate for inspectors working in the field on the project. It is recommended, that items not on a plan review list, not be commented on such as: arrows on typical sections for direction of traffic, orientation of existing text that is legible, design speed under curve data, etc.

A review of the project submittal log indicates that 85 submittals were received on the project. Thirty (30) of the submittals consisted of meeting minutes, Release for Construction Plans or letters that were shown as "no response required". Fifty-five (55) submittals requiring a response were logged with 44 returned to the Design-Build Team by the response due date. Eleven (11) responses were not returned within the allotted review time. Four responses were one day late, two were three days late, one was four days late, one was five days late, one was seven days late, one was 14 days late and one was 18 days late.

## **6. Right of Way and Utilities**

Unlike later design-build projects, NCDOT initially proposed that the Design-Build Team be responsible for obtaining and paying for right of way. This requirement was modified such that right of way costs were passed through to the Department similar to all subsequent design-build projects. After this change was made there seemed to be no significant issues with right of way. Comments received seem to indicate the right of way process was successful. Benefits of the design-build process included:

- Unified goals
- Easy access to designers
- Ability to be flexible and not hold up project until all right of way was obtained (this project focused on one side first and then worked on acquiring ROW on the other side while construction was occurring).

A change in the NCDOT right of way review process resulted from this job. This project required that all right of way appraisals be reviewed by NCDOT. This resulted in some delay in payments.

This has since been changed with only appraisals in excess of \$750,000.00 requiring NCDOT review and approval. This process seems to be producing faster payments on current design-build projects.

The Design-Build Team was responsible for coordinating all utility relocations and paying the non-betterment utility relocation costs when the utility company had prior rights of way or a compensable interest. Utility companies or local agencies with facilities that could potentially be impacted by the project were Progress Energy, Sprint, Vance County and the City of Henderson. Time Warner Cable also had facilities that required adjustment. Comments received seem to indicate the utility relocation process was also successful. Comments included:

- Utility companies appeared more responsive because of “real” project information/schedule, etc.
- Design-Build Team had a bit more power to press utility owners.
- Use of a utility coordinator on the project seemed successful – contractor stated utility coordinator was busiest person on the job.
- Utility work was made more successful because of partnering meeting held up front.

One suggestion recommended initial contact from NCDOT’s Utility Section to give the utility owners a “heads up” that a project is coming and it will be design-build. Also, there may need to be additional efforts to increase the level of trust between the utility companies and the design-build team. This will be addressed further in future reports on projects where NCDOT paid for the utility relocations.

It seems there may be a deficiency in our internal review of utility work. NCDOT needs to be sure that existing utilities that will be covered by new pavement are of acceptable materials. On this project, a vitrified clay (V.C.) sewer line was left in place under the new pavement rather than being replaced with a new line. NCDOT’s Utility Manual indicates V.C. sewer pipe may be left under new pavement only if the pipe and joints meet specific ASTM specifications. In addition, a number of underground utility lines are shown in the Release for Construction (RFC) Plans as “size and type unknown”. The Utilities Scope of Work may require modification if the Department desires to have all existing lines remaining under pavements classified and evaluated for compliance with the Utility Manual requirements. The RFP refers to the Utility Manual but this manual is not updated for many current practices. In general, it did seem that the utility agreements were approved



in a timely manner. The contractor stated that they would like more utility relocation work included in contracts on traditional projects. This allows them better control of the relocations and reduces scheduling risks.

## **7. Construction**

The construction of this project seemed successful. There were some minor supplemental agreements and some construction issues on the project.

One issue was unequal deflection between the northbound and southbound lanes of the bridge during construction resulting in a ridge along one edge of the closure pour connecting the deck sections. This is a rather common problem in projects using long steel girder spans and occurs in traditional as well as design-build construction. NCDOT currently has a research project at NC State University to develop a better deflection model to eliminate or reduce this problem. One area on the plans required reworking due to steep slopes and a constraining right of way line. There was also some concern about steep rollover at the tie in between Ramp B and the mainline and about large intersections without islands. The contractor stated the pavement designs were fine on this project but noted in general they would like to see more flexibility in pavement designs.



Ridge in bridge deck due to unequal deflections during staged deck construction



Steep rollover at Ramp B-SR 1128 intersection

## **8. Administration**

The contractor proposed an early completion date of June 1, 2004 on this project but did not meet this date. All work on the project was completed on October 12, 2004. Although the NCDOT's intent was to have the Design-Build Team's early date as the contract completion date, the Final RFP stated "The completion date for this contract is November 1, 2004." With this language in the RFP, liquidated damages were not assessed for failing to meet the June 1, 2004 completion date as they would be on current Design-Build projects.

Eight Supplemental Agreements (SA) totaling \$ 241,453.00 were prepared for the project.

1. Three supplemental agreements were prepared to add 125 mm monolithic concrete islands at various locations on the project. Cost for the added islands was \$38,118.00. At two locations on the project (SA 2 & 3) NCDOT requested raised islands be added after submission of the Technical Proposal for traffic control and in response to concerns expressed at the public meeting held on the project. At the third location (SA 7), the Design-Build Teams proposal provided a painted island on the bridge over I-85. NCDOT requested the painted island be revised to a 125 mm concrete island.

2. A Value Engineering Change Proposal (VECP) on the project was approved to eliminate the relocation of Gwynn Lane (Y4). After all credits, the Supplemental Agreement to implement the VECP was \$119,750.00 (SA 8).
3. Symmetrical widening was extended from NC 158 (Y3) to Dabney Drive (SR 1304). The cost to complete the extension was \$57,840.00 (SA 6). The Technical Proposal for the original work terminated all work north of US 158 but south of Red Oak Road (-Y5-) by tapering to the existing typical section. Although the location for the project was described as "SR 1128 (Ruin Creek Road) From SR 1218 (Graham Avenue) Over I-85 To SR 1304 (Dabney Drive)" the Roadway Scope of Work stated "Resurface and/or rehabilitate and widen SR 1128, Ruin Creek Road, to a five-lane curb and gutter facility from SR 1218, Graham Avenue to north of the US 158 Bypass. The proposed design consisted of two through lanes in each direction with a continuous center left turn lane." NCDOT considered it an oversight that widening was not carried to Dabney Drive and requested the Design-Build Team to extend the widening to just past Red Oak Road to Dabney Drive. A more precise scope of work and project limits would likely have eliminated the need for a SA as the work would have been included in the initial Technical Proposal.
4. Providing required right of way services for Parcel 14A cost \$13,270.00 (SA 1). After award of the contract to the Design-Build Team, Parcel No. 14 was divided and a portion of the property conveyed to a new owner, Parcel 14A. SA 1 covers the right of way costs for acquiring the new parcel.
5. Design and construction of a driveway at Sta. 18+70 -L- cost \$5,270.00 (SA 5). The Technical Proposal did not include a driveway for Parcel No. 5 right of Station 18+70. The existing driveway in this area was removed in order to increase the control of access along the -L- line from the I-85 southbound off-ramp. As a part of the right of way agreement, NCDOT agreed to have a "right-in, right-out" driveway installed.
6. Preparation of sign face fabrication details for Type A, B and D signs cost \$7,205.00 (SA 4). The RFP for the project states "Sign designs for Type A, B and D signs showing all sign face fabrication details will be provided by the Department". During

plan reviews, NCDOT requested the Design-Build Team prepare these details.

The DBE goal set for this job was 9% of the construction cost. There was confusion on this project concerning the cost being construction cost or total project cost. There have recently been changes made to new proposals that should clarify this area. The contractor indicated that DBE's are less willing to participate in a lump sum contract because of risk. Also, DBE contractors may have a difficult time meeting the timeframes and handling the size of the job. The contractor indicated they have considered hiring multiple DBE firms to handle one task on design build jobs.

Additional guidance should be provided for division personnel concerning the administration of design build jobs. Areas that need to be addressed include formats for Schedule of Payments and Table of Values, guidelines for field record books and required documentation, guidelines for verification of payments and procedures for payments, processing of "final estimates", receipt of "as-built plans" and project close out. Currently all these issues are being handled similar to a traditional project. As different residents across the state are exposed to design-build projects, this documentation could greatly guide the process.

## **9. Erosion Control**

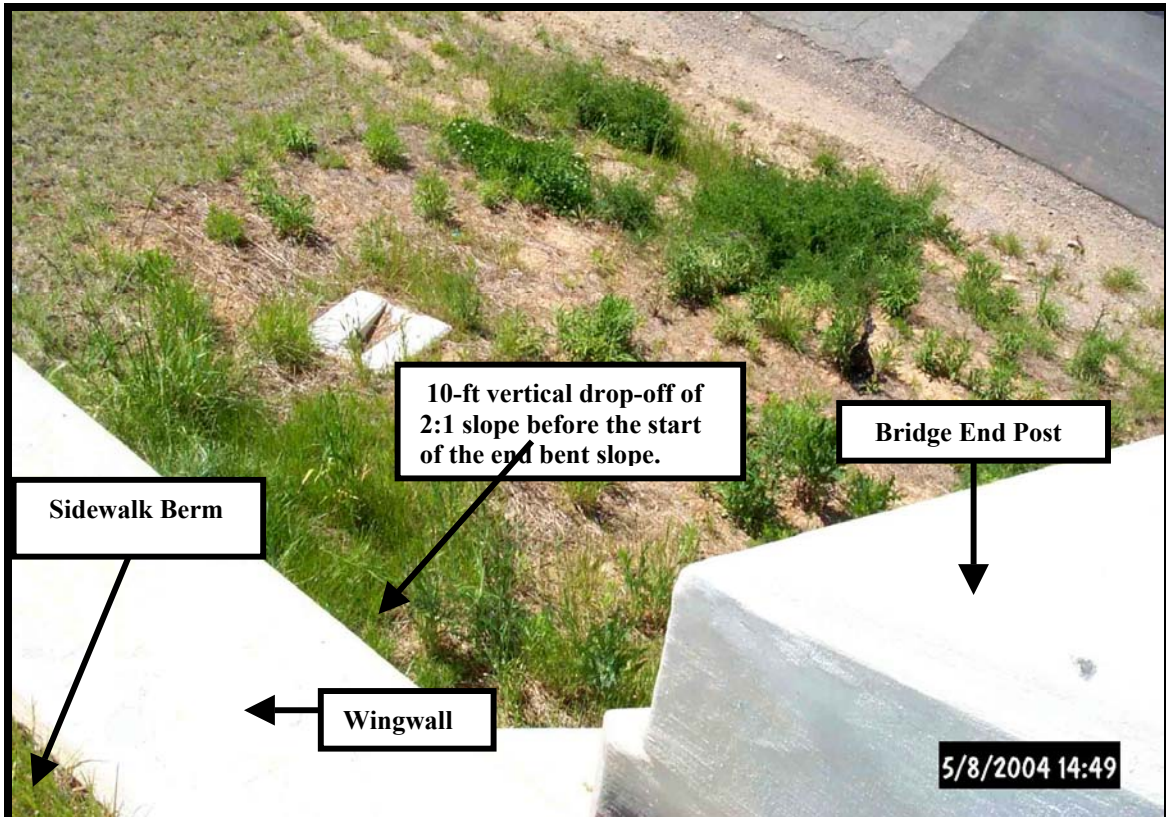
Overall the process of generating and approving erosion control plans went smoothly. It does seem there was some difficulty pinning down the necessary erosion control throughout the project. Besides requiring the Roadside Environmental Unit to approve plans it may be beneficial to allow the Division Environmental Officer to review the plans and coordinate for consistency of review. Both the contractor and the resident's office agreed the erosion control plans are subject to change day by day. The nature of this work makes it difficult for the contractor to bid. They stressed that it is important for changes to be made based on necessity and not based on preferences. If there are preferences in seed mixes, inclusion of specialized seeding at guardrail, etc., these items need to be included in the proposal.

## **10. Safety**

The following items were observed during the onsite visit of the project. The reviewing team felt these items constitute potential safety issues that may or may not be corrected when additional improvements along SR 1128 are let to contract. It is

recommended these types of design details be addressed and eliminated during the design reviews of future highway improvement projects.

The new structure on SR 1128 over I-85 has a sidewalk along the west side of the deck. Although there were no sidewalks constructed along SR 1128, a berm was provided behind the curb and gutter and sidewalks will likely be constructed at some future date. Guardrail was not installed at the southwest and northeast corners of the bridge as recommended by NCDOT. An innovative measure used by the design build team to reduce structure cost was to shorten the bridge length by constructing high end bents. While this shortened the structure, it resulted in a substantial drop-off at the bridge ends. With no guardrail or other delineation, pedestrians using the sidewalk or berm area could fall vertically approximately 10 feet. The review team felt guardrail at this location would reduce the likelihood of a pedestrian fall or injury. In addition the placement of a traffic signal control box on the berm blocks future construction of sidewalk. The following photographs show the areas being described.



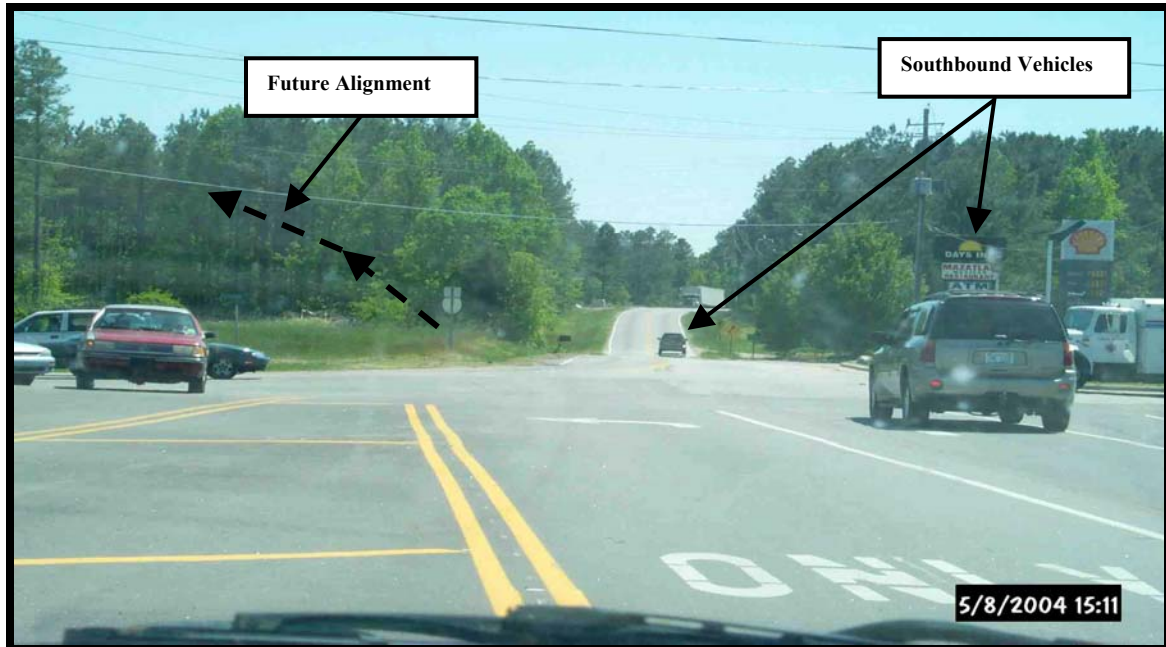
Drop-off at end of bridge rail adjacent to sidewalk berm



Signal control box and electric power meter located on berm at Ramp B intersection with SR 1128. This box will have to be relocated if sidewalk is constructed in the future. The electric power meter is located on a pedestal between the signal control box and the curb and gutter.

The south end of the project presently is a five lane section (2 through lanes northbound, one through lane and right and left turn lanes southbound) with a wide painted island that continues as a two-lane, two-way facility to the south. The two lane, two way portion of SR 1128 lines up visibly with the south bound lanes of the multilane section. Although this will be corrected when the next section on SR 1128 is constructed, northbound traffic on SR 1128 must abruptly move several lane widths to the right when entering the completed portion of the project. The RFC Plans show this lane configuration; however, the painted island is shown tapering to a 0.6-meter radius nose. The design and lane layout appears similar to that shown on the public hearing map provided to the Design-Build Team. The public hearing map did not show a transition from the five-lane to the existing two-lane facility. The Design-Build Team indicated they did not have enough information about the adjoining project to provide the design they preferred. This area was flagged by NCDOT during the review process and the recommendation was made to add an island and widen the road so northbound traffic shift through the intersection would be less abrupt. The D-B team did not choose to add an island. It should also be noted it is the Design-Build Team's responsibility

to bring to the attention of the Department any design concerns not addressed in the RFP. The following photograph shows the extent of the problem.



South end of the project showing the confusing transition from the multilane section to the two lane, two way portion of SR 1128. Future multi-lane alignment will curve to the left on new location.

It is recommended traffic operation in this area be observed and additional markings or delineation be provided if necessary until the intersection is revised by the adjoining project.

#### **11. Warranty**

The RFP did not require a warranty for major components of the project and no warranty was offered by the Design-Build Team.

#### **12. General**

This project was included in the 2002-2008 TIP and shown with a ROW date of June 21, 2002 and a LET date of May 18, 2004. Contract time for the project was calculated to be 855 calendar days. If the project had followed the TIP schedule letting date, the contract completion date would have been approximately November 2, 2006. Using the Design-Build alternative method of contracting, the project was let to contract on June 21, 2002 with a contract completion date of November 1, 2004. Therefore, the project was delivered approximately two years earlier than it would have been using the traditional design-bid-build method of letting. Based on the North Carolina Composite Index inflation factors, project construction costs increased by 30.6% between the years of 2002 and 2004. Therefore,

the project could have cost approximately \$2.5 million more if the letting had followed the TIP schedule.

In general, all parties involved felt the successes included timely completion and a quality project. This seems to be largely attributed to the quality of the contractor selected for this job and the established relationship between the contractor and the Division personnel. One of the biggest challenges for the design build team was the structure on this job. As scoped, the bridge would be widened but the team submitted a total replacement after exhausting possible ways to economically widen the existing structure. The Design Firm felt missed opportunities on the job include building sidewalk on the project and improving the area of the tie in with the future project to provide better interim driving conditions.

### **SUMMARY:**

The following comments and recommendations are made to assist the NCDOT in improving both the Design-Build process and conventional project delivery. A number of problem areas noted during the review have been subsequently addressed on later projects and will not be repeated in this Summary.

- NCDOT preferences, policies and guidance must be available to Design-Build Teams when there are multiple choices available if the lowest cost for the work is to be realized. As previously noted, guidance on when to use channelization, criteria for replacing existing pipe lines under the pavement and when to use a monolithic concrete island in place of a painted island are examples of data that a Design-Build Team would need to design an acceptable project.
- Although the numbers of Design-Build projects are increasing, a number of utility companies or their representatives are not familiar with the Design-Build process. The utility companies object to providing cost estimates to several different firms who have different proposed designs. It would be helpful if the NCDOT Right of Way Utility Section would have a utility meeting with the various companies involved on Design-Build projects early in the project's life to explain the process. It would also speed up the process if the Utility Section would provide the short-listed Design-Build Teams with lists of what prior rights of way or compensable interest the various utility companies have.
- The size and complexity of a project should be a consideration in whether or not formal partnering is required and the need for extensive public involvement. Small rural projects may not benefit from formal partnering, project web sites and public meetings. Large complex projects will probably benefit from extensive public



involvement efforts and multiple partnering meetings rather than a single meeting early in the project.

- Design-Build Teams should be informed if they are expected to address and correct existing or created safety issues on the project even if the RFP does not specifically point out unsafe features. Teams should also understand that some items such as traffic control and erosion control will be subject to constant review and possible revision; compliance with approved plans does not eliminate the possibility of change being required.
- NCDOT should develop internal guidance for timely processing of the Design-Build Team's submissions and proposals. Requiring over seventeen months to process a Value Engineering Proposal from original submission to approval of the implementing Supplemental Agreement appears excessive. It may also be desirable to consider placing time limits on the Design-Build Team for supplying additional information necessary to complete a submission review.
- When writing the RFP, NCDOT needs to provide design guidance but should not hinder design flexibility of the teams. Simple wording can heavily affect the decision to pay supplemental agreements and VECP's.
- The Department should consider allowing contractors to coordinate utility relocations and perform more utility construction on traditional projects in order to better control work and reduce scheduling risks.
- The Department should evaluate flexibility in pavement designs by providing alternate designs to accommodate use of readily available materials and permit changes to address constructability issues.
- Training in contract administration of Design-Build projects should be provided to all NCDOT field personnel. Procedures to verify estimates, verify adequacy of sampling and testing and processing of final estimates are examples of areas where training would be beneficial.
- The Department should evaluate the need to require a written assessment of the condition of existing underground utility lines (water and sanitary sewer) on Design-Build projects. An assessment would assist in determining which lines can remain under pavements and which should be replaced due to condition or type of material.
- This project was a successful design-build project and it is recommended that similar future projects be evaluated for this alternative contract delivery method. The completed project was successful in part due to the strong working relationship between

the NCDOT and the Design-Build Team. Early project completion at an economical cost, when compared to the normal TIP design and construction schedule, support the use of design-build as an alternative project delivery system for similar types of improvements.

- NCDOT plan review comments were not all incorporated into the final plan submittal. It is recommended that the disposition of all NCDOT review comments be addressed by the Design-Build Team in writing and provided with the final plan submission.
- Public hearing maps should address acceptable transitions to the existing facility when adjacent projects will not be completed and opened to traffic at the same time. This has a direct impact to the scope of work along the existing facility.