



STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

PAT MCCRORY
GOVERNOR

ANTHONY J. TATA
SECRETARY

May 21, 2015

Addendum No. 1

Contract No.: C 203635
TIP No.: R-2635D
County: Wake County
Project Description: Triangle Expressway (Toll NC 540) / Old Holly Springs – Apex Road
(SR 1158) Interchange

RE: Addendum No. 1 to Final RFP

June 26, 2015 Letting

To Whom It May Concern:

Reference is made to the Final Request for Proposals dated May 6, 2015 recently furnished to you on the above project. We have since incorporated changes, and have attached a copy of Addendum No. 1 for your information. Please note that all revisions have been highlighted in gray and are as follows:

The first and second pages of the *Table of Contents* have been revised. Please void the first and second pages in your proposal and staple the revised first and second pages thereto.

Page No. 3 of the *Project Special Provisions* has been revised. Please void Page No. 3 in your proposal and staple the revised Page No. 3 thereto.

Page Nos. 88, 89, 92, and 94, of the *Roadway Scope of Work* have been revised. Please void Page Nos. 88, 89, 92, and 94 in your proposal and staple the revised Page Nos. 88, 89, 92, and 94 thereto.

Page Nos. 100 and 101 of the *Pavement Management Scope of Work* have been revised. Please void Page Nos. 100 and 101 in your proposal and staple the revised Page Nos. 100 and 101 thereto.

Page No. 105 of the *Hydraulics Scope of Work* has been revised. Please void Page No. 105 in your proposal and staple the revised Page No. 105 thereto.

Page Nos. 111 and 114 of the *Geotechnical Scope of Work* have been revised. Please void Page Nos. 111 and 114 in your proposal and staple the revised Page Nos. 111 and 114 thereto.

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Page No. 121 of the *Transportation Management Scope of Work* has been revised. Please void Page No. 121 in your proposal and staple the revised Page No. 121 thereto.

Page No. 141 of the *Traffic Signals Scope of Work* has been revised. Please void Page No. 141 in your proposal and staple the revised Page No. 141 thereto.

Page No. 149 of the *Environmental Permits Scope of Work* has been revised. Please void Page No. 149 in your proposal and staple the revised Page No. 149 thereto.

Page Nos. 165 and 166 of the *Pavement Markings Scope of Work* have been revised. Please void Page Nos. 165 and 166 in your proposal and staple the revised Page Nos. 165 and 166 thereto.

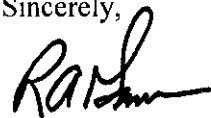
Page Nos. 178, 179, 182, 183, 193, 203, 204, 212, and 215 of the *Intelligent Transportation Systems (ITS) Scope of Work* have been revised. Please void Page Nos. 178, 179, 182, 183, 193, 203, 204, 212, and 215 in your proposal and staple the revised Page Nos. 178, 179, 182, 183, 193, 203, 204, 212, and 215 thereto.

Page No. 234 of the *Utilities Coordination Scope of Work* has been revised. Please void Page No. 234 in your proposal and staple the revised Page No. 234 thereto.

Page No. 241 of the *Right of Way Scope of Work* has been revised. Please void Page No. 241 in your proposal and staple the revised Page No. 241 thereto.

If you have any questions or need additional information, I can be reached by telephone at (919) 707-6900.

Sincerely,



R.A. Garris, PE
Contract Officer

RAG/kmm

cc: Mr. Rodger Rochelle, PE
Mr. Zak Hamidi, PE

Mr. Joey Hopkins, PE
Mr. Tim McFadden

Ms. Teresa Bruton, PE
File

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Refer to the ITS Scope of Work for more information on the following liquidated damages:

Liquidated Damages for Intermediate Contract Time #5 for failure to perform the switchover of all ITS and toll network communications along the Redundant Trunkline within a single continuous 48-hour period are \$2,500 per occasion, per 24-hour period or any portion thereof, until corrected.

Liquidated Damages for Intermediate Contract Time #6 for failure to relocate and reconnect the CCTV-1A camera, pole, cabinet and ancillary equipment within a single continuous 48-hour period are \$2,500 per occasion, per 24-hour period or any portion thereof, until corrected.

Liquidated Damages for Intermediate Contract Time #7 for failure to repair and / or maintain the toll / ITS devices and restore communication, including but not limited to communications with the Customer Service Center, within the timeframes specified in the ITS Scope of Work found elsewhere in this RFP are \$2,500 per occasion, per toll / ITS device, per 24-hour period or any portion thereof, until corrected.

Refer to the All-Electronic Tolling (AET) Toll Zone Facilities Infrastructure Scope of Work for more information on the following liquidated damages:

Liquidated Damages for Intermediate Contract Time #8 for failure to relocate and reconnect the transformer near the T33 mainline AET site within 72 hours are \$2,500 per occasion, per 24-hour period or any portion thereof, until relocated / reconnected.

Liquidated Damages for Toll Facilities Infrastructure and Toll Collection Equipment

If the Design-Build Team damages the toll facilities infrastructure and / or toll collection equipment, the Design-Build Team shall immediately contact the NCTA Director of Toll Road Operations. All repairs to the toll facilities infrastructure and toll collection equipment will be performed by the Toll System Integrator.

The liquidated damages for damages to the toll facilities infrastructure and toll collection equipment are \$2,500 per device, per occasion, or the actual repair cost, whichever is greater.

Liquidated Damages for Toll Revenue Loss

If the Design-Build Team damages existing toll facilities such that toll revenue cannot be collected, the Design-Build Team shall immediately contact the NCTA Director of Toll Road Operations. Based on representative traffic data from the lane(s) in question, the NCTA will calculate the revenue loss resulting from the damage.

**** NOTE **** - In the case of a break in a fiber optic communications cable accessing the Communication Service Center and a toll zone, transaction loss and the associated revenue loss typically does not occur until 90 days after the break.

- Old Holly Springs – Apex Road shall be designed and constructed to meet a 50 mph design speed for a rolling urban major collector. Between the ramp / loop termini intersections, the Design-Build Team shall design and construct a curb and gutter facility that consists of minimum 15-foot berms with five-foot sidewalk along Old Holly Springs – Apex Road. Excluding the curb and gutter section noted above, the Design-Build Team shall design and construct minimum 12-foot outside shoulders, four-foot of which shall be full depth paved shoulders, along Old Holly Springs – Apex Road. The construction limits on Old Holly Springs – Apex Road shall be of sufficient length to tie to existing based upon the current NCDOT guidelines and standards.
- At the project completion, traffic on Old Holly Springs – Apex Road, including the ramps and loops, shall be placed in the pattern shown in the R-2635D Design Public Meeting Map - Interim Design provided by the Department. The Design-Build Team shall separate the interim traffic pattern from the Old Holly Springs – Apex Road widened sections that are not operational with temporary concrete barrier that shall be left in place. The Design-Build Team shall provide appropriate protective end treatments for the aforementioned temporary concrete barrier (e.g. guardrail, flare, etc.) (Reference the Pavement Markings and Structures Scopes of Work found elsewhere in this RFP)
- The Design-Build Team shall design and construct the -Y- Line such that the through movement is not required to change lanes through the project limits.
- Opposite the ramp / loop terminals, the Design-Build Team shall design and construct both paved turnouts shown on the R-2635D Design Public Meeting Map - Ultimate Design to the right of way limits or most western radius point, whichever is furthest west.
- The Design-Build Team shall design and construct one-lane ramps that provide a minimum 16-foot lane width. The Design-Build Team shall design and construct two lane ramps that provide minimum 12-foot lanes. All ramps shall have 14-foot outside shoulders, four-foot of which shall be full depth paved shoulders and 12-foot inside shoulders, four-foot of which shall be full depth paved shoulders.
- The Design-Build Team shall design and construct loops that adhere to Table 3-29, *Design Widths of Pavements for Turning Roadways*, shown in AASHTO's *A Policy on Geometric Design of Highways and Streets* (2011) - Case II / Condition C for one-lane loops; Case III / Condition C for two-lane loops. All loops shall have 12-foot outside shoulders, four-foot of which shall be full depth paved shoulders. Unless noted otherwise elsewhere in this RFP, all loops shall have 2'-6" curb and gutter along the inside edge of pavement, with a 14-foot berm. The minimum loop design shall be 30 mph with a minimum 230-foot radius.
- At all All-Electronic Tolling (AET) Toll Zone Facilities (with and without buildings), the Design-Build Team shall provide 14-foot shoulders, 12 feet of which shall be paved shoulders for the minimum lengths noted below. (Reference the Pavement Management Scope of Work found elsewhere in this RFP)
 - Upstream of all AET Toll Zone Facilities, the Design-Build Team shall provide the aforementioned shoulder widths a length equal to the distance required for a vehicle traveling at the adjacent roadway design speed to stop.

- Downstream of all AET Toll Zone Facilities, the Design-Build Team shall provide the aforementioned shoulder widths a length equal to the distance required for a stopped vehicle to travel the adjacent roadway design speed.
- The minimum lengths noted above shall be in accordance with the 2011 AASHTO *A Policy on Geometric Design of Highways and Streets* Tables 10-3, 10-4 and 10-5. For traffic entering the AET Toll Zone Facility, the minimum length shall be measured from the downstream end of the barrier protecting the facility. For traffic exiting the site, the minimum length shall be measured from the end of the taper shown on the NCTA AET Standard Drawings.
- To provide cross-over protection, the Design-Build Team shall design and construct double-face concrete barrier that separates ramp and loop traffic. Where warranted, the Design-Build Team shall also design and construct double-face concrete barrier between the ramp and loop, of sufficient height, to provide a glare screen. The aforementioned barrier shall utilize details which aesthetically match the existing details within the Triangle Expressway (Toll NC 540) corridor.
- Unless noted otherwise elsewhere in this RFP, the Design-Build Team shall design and construct at-grade intersections with the lane configurations noted in Figure 3, *2016 Opening Year Interchange Interim Laneage and LOS*, of the March 2014 Traffic Capacity Analysis Technical Memorandum provided by the Department. At all intersections impacted by the Design-Build Team's design and / or construction, excluding resurfacing, the Design-Build Team shall design and construct turn lanes that adhere to the greater of the following:
 - All turn lane lengths shall adhere to the NCDOT minimum turn lane lengths as defined in the NCDOT Roadway Design Manual (Reference Section 9-1, Figure 4).
 - All lengths for the turn lanes required by Figure 3, *2016 Opening Year Interchange Interim Laneage and LOS*, of the March 2014 Traffic Capacity Analysis Technical Memorandum provided by the Department shall adhere to the NCDOT Recommended Treatment for Turn Lanes. These lengths shall be determined by adding the storage length defined in the aforementioned Technical Memorandum; the minimum deceleration length, as defined in the NCDOT Roadway Design Manual (Reference Section 9-1, Figure F-4A); and the approach / departure taper.
 - Right turn lanes / tapers shall be provided in accordance with the NCDOT Right Turn Lane Warrants, as defined in the Roadway Design Manual (Reference Section 9-1, Figure F-4C).
- For all intersection / interchange design modifications, the Design-Build Team shall provide a traffic analysis that adheres to the January 1, 2012 Congestion Management Capacity Analysis Guidelines for the Department's review and acceptance.

the Department, resulting from changes to the NCDOT preliminary design, including but not limited to, public involvement, NEPA re-evaluation and / or coordination with other stakeholders, including but not limited to the Town of Apex. The Department shall not honor any requests for additional contract time or compensation for completion of the required activities resulting from changes to the NCDOT preliminary design.

- After the contract has been Awarded, the Design-Build Team shall inform the Design-Build Unit, in writing, of all proposed changes to the design shown in the Technical Proposal.
- After the Department has reviewed and accepted the Design-Build Team's design submittals, the Design-Build Team shall inform the Design-Build Unit, in writing, of any changes to previously reviewed submittals.
- **Excluding the Ramp -Y3RPA- horizontal sight distance**, design exceptions will not be allowed for the -L- Line, including all ramps and loops. NCDOT prefers not to have design exceptions for the -Y- Line. If the Design-Build Team anticipates any design exceptions, they shall be clearly noted in the Technical Proposal. Prior to requesting / incorporating a design exception into the Final Plans, the Design-Build Team must obtain prior conceptual approval from the Design-Build Unit. If conceptual approval is obtained, the Design-Build Team shall be responsible for the development and approval of all design exceptions.
- Within the project limits, the Design-Build Team shall locate and install concrete markers for all parcels. The aforementioned markers shall delineate 1) all proposed right of way, 2) all existing right of way not delineated with markers and 3) all permanent easements. The Design-Build Team shall replace all existing right of way and easement markers / monuments damaged and / or relocated during construction.
- **** NOTE **** Relocated bullet on positively protecting the ends of the temporary concrete barrier on Old Holly Springs – Apex Road
- The traffic pattern for the interim design will not be required to accommodate bicyclists.

General

- The design shall be in accordance with the 2011 AASHTO *A Policy on Geometric Design of Highways and Streets*, 2002 NCDOT *Roadway Design Manual*, including all revisions effective on the Technical Proposal submittal date, January 2012 NCDOT Roadway Standard Drawings, or as superseded by detail sheets located at <https://connect.ncdot.gov/resources/Specifications/Pages/2012-Roadway-Drawings.aspx>, *Roadway Design Policy and Procedure Manual*, *Roadway Design Guidelines for Design-Build Projects*, 2012 *North Carolina Standard Specifications for Roads and Structures* and the 2011 AASHTO *Roadside Design Guide*, 4th Edition and 2012 Errata.
- If the NCDOT *Roadway Design Manual*, the 2011 AASHTO *A Policy on Geometric Design of Highways and Streets*, the 2012 *Roadway Standard Drawings* and / or any other

time extensions or additional compensation associated with any coordination or approval process resulting from design and / or construction modifications.

- Along all -Y- Line and driveway intersection radii, the proposed sidewalk shall parallel the curb and gutter, terminating at the radius point.
- The total outside shoulder width for all facilities with defined usable shoulders shall equal the usable shoulder plus two feet.
- The Design-Build Team shall be responsible for the evaluation of the algebraic difference in rates of cross slope (roll-over) between existing shoulders and roadways and the associated suitability for carrying traffic during construction, if necessary. In the event that the roll-over is found to be unacceptable for the proposed temporary traffic patterns, the Design-Build Team shall be responsible for providing cross slopes that meet design standards and eliminate roll-over concerns.
- The Design-Build Team shall submit Structure Recommendations and Design Criteria for NCDOT review and acceptance prior to the Preliminary Roadway Plans submittal. The Design-Build Team shall develop Structure Recommendations that adhere to the format noted in the March 25, 2003 and September 1, 2004 memos from Mr. Jay Bennett, PE, former State Roadway Design Engineer.
- Unless noted otherwise elsewhere in this RFP, the design speed for all roadways shall be the greater of the minimum design speed for the facility type, as specified in the 2011 AASHTO *A Policy on Geometric Design of Highways and Streets*, or the anticipated / actual posted speed plus five mph. The Design-Build Team will be allowed to use the middle range design speed, as defined in the NCDOT *Roadway Design Manual*, Section 8-3, for Ramp -Y3RPA-. However, if feasible, the Design-Build Team is encouraged to design and construct Ramp -Y3RPA- to adhere to a higher design speed. If a speed limit is not physically posted on an existing facility, General Statutes mandate the speed limit as 55 mph, resulting in a 60 mph design speed.
- Within the vehicle recovery area, the Design-Build Team shall design and construct single face concrete barrier in front of all retaining walls and all elements acting as retaining walls located on the outside shoulder in fill sections. The aforementioned concrete barrier shall be located beyond the typical section shoulder point, requiring the Design-Build Team to widen the outside shoulder beyond the typical section width.
- At all intersections impacted by the Design-Build Team's design and / or construction methods, excluding resurfacing, the following design vehicles shall be required for all turning movements:
 - WB-67 at all ramp / loop intersections with the -Y- Line (For side-by-side turning maneuvers, WB-67 for the outside movement only and SU-30 for inside movement)
 - WB-62 at all other intersections
- Excluding grades required to tie to existing, the minimum -Y- Line longitudinal grade shall be 0.50%.

PAVEMENT MANAGEMENT SCOPE OF WORK (5-18-15)

**** NOTE ** The Department will not consider Alternative Technical Concepts that provide an alternate pavement design.**

The pavement design for the widened mainline travel lanes shall consist of the following:

- 13.5” doweled jointed concrete
- 3.0” B25.0B
- 1.25” SF9.5A
- Subgrade Stabilization

The joints in the mainline travel lane widening shall match the adjacent travel lane joint spacing and location.

The pavement design for the mainline paved shoulders shall consist of the following:

- The mainline paved shoulders shall be a minimum thickness of 10.5” jointed concrete, without dowels.
- The mainline paved shoulder joints shall match the adjacent travel lane joint spacing and location.
- The mainline paved shoulders shall be anchored to the travel lane with tie bars.

In accordance with the requirements noted below, the mainline subgrade stabilization shall consist of chemical stabilization or Class IV stabilization. The Design-Build Team shall specify the proposed mainline subgrade stabilization, or combination, with approximate limits of each type clearly noted in the Technical Proposal.

- Chemical stabilization shall be to a minimum depth of 8 inches for lime and 7 inches for cement. The type of chemical subgrade stabilization and the amount of stabilizing agent shall be determined in accordance with the *Cement and Lime Stabilization of Subgrade Soils* Project Special Provision found elsewhere in this RFP.
- Class IV stabilization shall be in accordance with the *Class IV Stabilization in Lieu of Chemical Stabilization* Standard Special Provision found elsewhere in this RFP.

Other pavement designs for this project shall be as listed in the table below:

LINE	Surface	Intermediate	Base	ABC
-Y3- INT (SR 1153)	3.0” S9.5B	4.0” I19.0B	5.5” B25.0B	-----
-Y3RPA- and -Y3RPD-	3.0” S9.5B	2.5” I19.0B	-----	8.0”
-Y3LPA- and -Y3LPD-	3.0” S9.5B	4.0” I19.0B	-----	10.0”
AET Toll Zone Facilities driveway and parking areas	2.0” S9.5B	-----	5.0” B25.0B	-----

**** NOTE ** Deleted bullet on final surface course placement**

Warm mix asphalt will be allowed on -Y3- INT, but not on the -L- Line, ramps or loops.

For the ramps and loops noted in the table above, the Design-Build Team may substitute an asphalt base course layer for an ABC layer. If such an alternative is proposed, the Design-Build Team shall use B25.0B base course. The thickness of the asphalt base course, used as a substitute for the ABC layer, shall be equal to half of the proposed ABC thickness specified for the roadway. The Design-Build Team shall maintain the same pavement design throughout the ramp / loop construction limits. In the Technical Proposal, the Design-Build Team shall specify the base option chosen (ABC or asphalt) for all ramps and loops. The Design-Build Team may substitute an asphalt base course layer for an ABC layer, as described above, for tie-ins and narrow widening.

The Design-Build Team shall design a resurfacing grade for the existing -Y3- INT pavement that provides a minimum 3.0" S9.5B resurfacing depth. (Reference the Roadway Scope of Work found elsewhere in this RFP)

On all ramps and loops, the adjacent through lane pavement design shall extend to the back of the gore (12-foot width).

Unless noted otherwise elsewhere in this RFP, the minimum narrow widened width shall be six feet. The minimum narrow widened width may be reduced to four feet only if the Design-Build Team demonstrates that their equipment properly compacts narrow widening and obtains prior Department approval. Tapers that tie proposed pavement to existing pavement are excluded from the narrow widening requirements noted above.

Unless noted otherwise elsewhere in this RFP, all longitudinal joints shall be located on a lane line or lane midpoint. Solely to shift a longitudinal joint to one of the aforementioned locations, a maximum 840-foot transition, that locates the longitudinal joint elsewhere, will be allowed. For existing facilities, the Design-Build Team shall indicate in the Technical Proposal how longitudinal joints will be located on a lane line or lane midpoint.

**** NOTE ** Deleted bullet on removal, disposal and replacement of existing concrete pavement**

From approximately Station 57+00 to 119+00 -L- LT and from approximately Station 56+36 -L- to Station 121+00 -L- RT, the mainline outside shoulders were constructed as part of TIP Project R-2635A to function as future travel lanes and may be incorporated into a permanent travel lane. In all other areas along the mainline to be widened, the Design-Build Team shall remove and dispose of all existing paved shoulders, including but not limited to all median paved shoulders.

In areas where the existing -Y- Line paved shoulders are proposed to be incorporated into a permanent travel lane, the Design-Build Team shall be responsible for evaluating the existing paved shoulder regarding its suitability for carrying the projected traffic volumes. In the event that the existing -Y- Line paved shoulder is found to be inadequate, the Design-Build Team shall be

structurally deficient box culverts and / or pipes, including but not limited to replacement. The Design-Build Team shall identify all hydraulically deficient box culverts and / or pipes and their proposed hydraulic mitigation in the Technical Proposal.

- As directed by the Engineer, the Design-Build Team shall provide the appropriate structural mitigation for all structurally deficient box culverts and / or pipes. Structural mitigation, for structural deficiencies in box culverts and / or pipes, including but not limited to all repairs, will be paid for as extra work in accordance with Subarticle 104-8(A) of the 2012 *Standard Specifications for Roads and Structures*.
- In accordance with the Hydraulic Guidelines noted above, the Design-Build Team shall prepare Outfall Analyses for increases in discharge and take appropriate action to ensure that any increases are appropriately mitigated.
- The Design-Build Team shall analyze spread for the bridge identified in the Structures Scope of Work found elsewhere in this RFP and, as necessary, provide mitigation that eliminates 1) spread in a through lane, and 2) spread encroachment beyond half the width of an exclusive turn lane. For the aforementioned analysis, the Design-Build Team shall calculate the hydraulic spread for the Ultimate Design, including but not limited to all future travel lanes, exclusive turn lanes and concrete monolithic island (four-foot wide). If the bridge is not widened to mitigate for the Ultimate Design hydraulic spread, the Design-Build Team shall adhere to the bridge drainage system requirements noted below:
 - The Design-Build Team shall design bridge drainage without the use of Bridge Scuppers (open-grated inlets). If a closed drainage system is used on a bridge, the closed drainage system shall use vertical pipes at the flow line through the deck with no elbow and shall be consistent with that shown in the current NCDOT Stormwater Best Management Practices Toolbox.
- In accordance with the NCDOT Stormwater Best Management Practices toolbox and the NCDOT Post-Construction Stormwater Program effective on the Technical Proposal submittal date, the Design-Build Team shall develop a Stormwater Management Plan that, at a minimum, demonstrates the following:
 - To the maximum extent practicable, stormwater runoff is diverted away from surface waters
 - To the maximum extent practicable, on-site stormwater control measures, as identified in the NCDOT Stormwater Best Management Practices Toolbox effective on the Technical Proposal submittal date, shall be employed to minimize water quality impacts
- Unless noted otherwise elsewhere in this RFP, the Design-Build Team shall remove or fill

Bridge approach embankments shall be defined as embankments within 250 feet of end bents. Design and construct bridge approach embankments such that no more than one (1) inch of settlement will occur after the waiting period or monitoring ends or after embankment fill is constructed to subgrade elevation. Bridge approach embankment settlement monitoring shall be required when a waiting period of more than one month is recommended or more than four (4) inches of settlement is calculated in the foundation design recommendation reports developed by the Design-Build Team. When embankment monitoring is required, construct the embankment and approach fill to the subgrade prior to monitoring. Use an appropriate method to monitor settlement across the length of the embankment (from toe to toe) such as settlement gauges, surveyed stakes or other methods. Submit documentation describing the method and procedures to the NCDOT Geotechnical Engineering Unit, via the Design-Build Unit, for review and acceptance prior to construction of the embankment. Bridge approach embankment waiting periods shall not be ended until less than one (1) inch of the anticipated settlement remains and less than 0.10 inch of settlement is measured over a period of four weeks. Do not drive piles or construct end bent caps until after bridge approach embankment waiting periods are complete.

Design and construct roadway embankments such that no more than two (2) inches of settlement will occur following pavement construction. Embankment settlement monitoring shall be required for locations when a total settlement of more than six (6) inches is calculated in the roadway foundations design recommendation report developed by the Design-Build Team. Where computed settlement is greater than six (6) inches, monitor settlement across the width of the embankment at maximum spacing interval of 250 feet by settlement gauges or other approved methods. Submit documentation describing the method and procedures to the Geotechnical Engineering Unit, via the Design-Build Unit, for review and acceptance prior to construction of the embankment. Roadway embankment waiting periods shall not be ended until less than two (2) inches of settlement is anticipated following pavement construction and less than 0.10 inch of settlement is measured over a period of four weeks.

Soil improvement techniques to mitigate long term settlement problems or to transfer embankment load to a deeper bearing stratum are allowed at bridge approach and roadway embankments. Soil improvement techniques shall follow the current industry standard practices and the guidelines of *Ground Improvement Methods FHWA publication NHI-04-001* or *Geosynthetic Design and Construction Guidelines FHWA-HI-95-038*.

Both borrow and unclassified material that does not meet the requirements of Table 1018-1 of the NCDOT 2012 *Standard Specifications for Roads and Structures* shall be considered unsuitable material. All earth materials within the entire embankment cross-section shall be compacted in accordance of Section 235 of the NCDOT 2012 *Standard Specifications for Roads and Structures* regardless of source of material. The Design-Build Team may propose an Alternative Technical Concept to chemically modify unsuitable unclassified excavation material for use.

connected to the back of the cap, (3) integral abutment with a single row of plumb piles and no reinforcement connected to the back of the cap in accordance with FHWA GEC 11 pages 6-8 through 6-10, (4) drilled piers, or (5) a double row of plumb piles. If fill is required around piles or drilled piers, install foundations before placing any fill. Design abutment retaining walls to account for any additional pressures induced on the wall face due to calculated horizontal foundation movements. All pile foundations for end bents with abutment retaining walls shall penetrate minimum 10 feet into natural ground.

D. Temporary Structures

Design temporary retaining structures, which include earth retaining structures and cofferdams, in accordance with current allowable stress design AASHTO *Guide Design Specifications for Bridge Temporary Works*, the *Temporary Shoring* Standard Special Provision found elsewhere in this RFP, and the applicable NCDOT *Project Special Provisions* available upon request by the Design-Build Team. The only submittal required to use the standard sheeting design is the “Standard Shoring Selection Form”.

Traffic Control barrier on top of walls shall be in accordance with the NCDOT Work Zone Traffic Control Unit details available upon request by the Design-Build Team. If anchored barrier is required, then anchor the barrier in accordance with NCDOT 2012 *Roadway Standard Drawing* Detail No. 1170.01.

IV. CONSTRUCTION REQUIREMENTS

All construction and materials shall be in accordance with the NCDOT 2012 *Standard Specifications for Roads and Structures* and current NCDOT *Project Special Provisions* unless otherwise stated in this scope of work. The Design-Build Team shall be responsible for investigating, proposing and incorporating remedial measures for any construction problems related to foundations, retaining walls, subgrades, embankment settlement, slope global-instability, slope surficial instability, and construction vibrations. Submit these proposals to the NCDOT Geotechnical Engineering Unit, via the Design-Build Group for review and acceptance.

The Design-Build Team shall be responsible for any damage and / or claim caused by construction, including, but not limited to damage caused by vibration (see Article 107-14 of the NCDOT 2012 *Standard Specifications for Roads and Structures*), and siltation or draining of ponds off the right of way. The Design-Build Team shall be responsible for deciding what, if any, pre and post-construction monitoring and inventories need to be conducted to satisfy their liability concerns. Any monitoring and inventory work shall be performed by a qualified private engineering firm experienced in the effects of construction on existing structures. At a minimum, the Design-Build Team shall perform pond preconstruction condition assessments as outlined in the NCDOT

shall keep NCDOT informed of any and all changes or cancellations of proposed lane closures prior to the date of their implementation.

If an emergency condition should occur, a LCN shall be provided to NCDOT within two (2) days after the event. For non-NCDOT controlled facilities, the Design-Build Team shall immediately notify the controlling government entity.

Road Closure Notice (RCN)

Proposed road closures on any road shall be approved by the Engineer prior to incorporation in the Traffic Management Plans,

The Design-Build Team shall issue a Road Closure Notice (RCN) to NCDOT and affected government entities a minimum of twenty one (21) calendar days prior to the publication of any notices or placement of any traffic control devices associated with road closures, detour routing or other change in traffic control requiring road closures.

For a RCN utilizing a non-NCDOT controlled facility, Design-Build Team shall secure concurrence in writing from the controlling government entity. A RCN shall contain the estimated date, time, duration, and location of the proposed work. The Design-Build Team shall keep NCDOT and any other affected government entity informed of any and all changes or cancellations of proposed Road Closures prior to the date of their implementation.

If an emergency condition should occur, a RCN shall be provided to NCDOT within two (2) days after the event. For non-NCDOT controlled facilities, the Design-Build Team shall immediately notify the controlling government entity.

II. Project Operations Requirements

The following are Time Restrictions and notes that shall be included with the Transportation Management Plan General Notes, unless noted otherwise elsewhere in this RFP:

A. Time Restrictions

1. Intermediate Contract Time #3 for Lane Narrowing, Lane Closure, Holiday and Special Event Restrictions.

At all times, the Design-Build Team shall maintain a minimum of two 12-foot wide through lanes in each direction on the Triangle Expressway (Toll NC 540). The Design-Build Team shall not close or narrow more than one lane in either direction on the Triangle Expressway (Toll NC 540) during the times below.

Road	Day	Time Restrictions
Triangle Expressway (Toll NC 540)	Monday thru Sunday	6:00 a.m. to 11:00 p.m.

In addition to the Triangle Expressway (Toll NC 540) lane narrowing and closure restrictions noted above, the Design-Build Team shall not close or narrow more than one lane in either direction on or

TRAFFIC SIGNALS SCOPE OF WORK (5-20-15)**I. GENERAL**

The Design-Build Team shall design and prepare plans for the traffic signal installations required for the signalized intersections shown on the R-2635D Design Public Meeting Map - Ultimate Design. This work shall include, but not be limited to, the preparation of Traffic Signal Plans, Metal Pole Loading Diagrams, Electrical and Programming Details, Utility Make-Ready Plans, Signal Communications Cable & Conduit Routing Plans, and Project Special Provisions. These plans shall be prepared in accordance with the *Design-Build Submittal Guidelines* and the *Guidelines for Preparation of Traffic Signal & Intelligent Transportation System Plans on Design-Build Projects* available on the Design-Build website.

The Design-Build Team shall select a Private Engineering Firm (PEF) that has experience designing and sealing ITS and Traffic Signal Plans for NCDOT on comparable projects. The Technical Proposal shall list projects, including description and similarity to the subject project, for which the PEF has developed ITS and Traffic Signal Plans.

A pre-design meeting shall take place between the Design-Build Team, the NCDOT Intelligent Transportation Systems (ITS) & Signals Unit, the NCDOT Division 5 Traffic Engineer, the NCDOT Regional Traffic Engineer, and any other pertinent NCDOT personnel before signal designs begin. Traffic Signal plan submittals shall only be reviewed and accepted by the Department after this pre-design meeting. All Traffic Signal Plans shall be accepted by the NCDOT prior to the Design-Build Team beginning traffic signal construction or plan implementation.

The Design-Build Team shall install all communication conduit, junction boxes, and foundations for signal cabinets and metal strain poles required for the signalized intersections shown on the R-2635D Design-Public Meeting Map – Ultimate Design provided by the Department. All remaining signal equipment, including but not limited to the metal strain poles, shall be provided to Division 5 Traffic Services (400 Guess Road, Durham, NC) for storage until the traffic signals are warranted.

The Design-Build Team shall design coordinated signal system timing plans for the final traffic pattern shown on the R-2635D Design Public Meeting Map – Ultimate Design, including but not limited to traffic responsive plans that are dependent on the traffic demands and / or projections. All signal system timing plans shall be reviewed and accepted by the Department.

For all approaches, the Design-Build Team's design shall include pedestrian signal heads and crosswalks for both Old Holly Springs – Apex Road / ramp / loop / driveway intersection configurations shown on the R-2635D Design Public Meeting Map – Ultimate Design.

Unless noted otherwise below, all traffic signal designs shall utilize metal strain poles for signal supports.

Signal Inventory Numbers (SIN) will be assigned for each new signalized location by the NCDOT ITS & Signals Unit. Once all the traffic signal locations have been finalized and accepted by the Department, the Design-Build Team shall submit a written request for the SINS

Should additional jurisdictional impacts result from revised design and / or construction methods, suitable compensatory mitigation for wetlands and / or streams shall be the sole responsibility of the Design-Build Team. Therefore, it is important to note that additional mitigation will have to be approved by the environmental agencies and such approval shall require, at a minimum, the preparation and approval of a Mitigation Plan before permits are approved and before construction can commence. To mitigate for these additional jurisdictional impacts, the Design-Build Team shall be responsible for all costs associated with acquiring suitable mitigation. Construction of any on-site mitigation shall be performed by a contractor that has successfully constructed similar on-site mitigation. In the absence of suitable on-site mitigation, the Design-Build Team shall be responsible for acquiring additional mitigation. The additional suitable compensatory mitigation for wetland and / or stream impacts will be calculated at a 1:1 ratio. If available, the Department will debit compensatory mitigation for the aforementioned additional mitigation from the Privateer Mitigation Site and the Design-Build Team shall reimburse the Department for all additional mitigation costs. The aforementioned reimbursement cost for additional suitable compensatory mitigation from the Privateer Mitigation Site shall be at a unit price of \$381.00 per linear foot of stream and \$6,973.60 per tenth of an acre of wetland. Otherwise, the Design-Build Team shall be responsible for acquiring all additional mitigation from the North Carolina Division of Mitigation Services (formerly EEP) or an approved compensatory mitigation banking resource.

The Design-Build Team shall analyze all new areas to be impacted that have not been analyzed during the NEPA Process and any staging areas that are located outside the project right of way. This analysis shall include performing all environmental assessments. These assessments shall require the Design-Build Team to engage the services of a competent environmental consultant to conduct a full environmental investigation to include, but not be limited to, Federally Listed Threatened and Endangered Species, wetlands, streams, avoidance and minimization in jurisdictional areas, compensatory mitigation, FEMA compliance, and historical, archaeological, and cultural resources surveys in these areas. The environmental consultant shall obtain concurrence through PDEA-NES and from the United States Fish and Wildlife Service to document compliance with Section 7 of the *Endangered Species Act* for those species requiring such concurrence. In addition, the Design-Build Team shall identify additional mitigation required, identify the amount of time beyond the aforementioned 11-month period, and fulfill all other requirements that the permitting agencies impose to obtain the permit. Any contract time extensions resulting from additional environmental assessments required by the Design-Build Team's design and / or construction methods impacting areas outside those previously analyzed through the NEPA Process shall be solely at the Department discretion.

Commitments

The NCDOT is committed to incorporating all reasonable and practicable design features to avoid and minimize stream and wetland impacts, and to provide full compensatory mitigation of all remaining impacts. Avoidance measures were taken during the planning and NEPA Process and minimization measures were incorporated as part of the preliminary design. The Design-Build Team shall incorporate these avoidance and minimization features, plus any minimization identified during the interagency hydraulic review meeting and interagency permit impacts meeting, into the design and / or construction methods.

All work by the Design-Build Team must be accomplished in strict compliance with the plans submitted with the permit applications and in compliance with all conditions of all permits and certifications issued by the environmental agencies. The Design-Build Team shall provide each

PAVEMENT MARKINGS SCOPE OF WORK (4-30-15)**General**

The Design-Build Team shall prepare Final Pavement Marking Plans in accordance with the 2009 edition of the *Manual on Uniform Traffic Control Devices* (MUTCD), the 2012 NCDOT Roadway Standard Drawings, “*Guidelines for Preparation of Traffic Control and Pavement Marking Plans for Design-Build Projects*”, the “*Design-Build Submittal Guidelines*” and the contract requirements contained herein.

Final Pavement Marking Plan Requirements

The Design-Build Team shall select a Private Engineering Firm (PEF) that has experience designing and sealing Pavement Marking Plans for NCDOT on comparable projects. The Design-Build Team shall list projects in the Technical Proposal, including description and similarity to the subject project that the PEF developed Pavement Marking Plans.

The Design-Build Team shall develop Pavement Marking Plans that maintain all types of traffic (motorists, bicyclists, and pedestrians within the highway, including persons with disabilities in accordance with the Americans with Disabilities Act of 1990 (ADA), Title II, Paragraph 35.130) as defined by the *Manual for Uniform Traffic Control Devices* (MUTCD).

The Design-Build Team shall show and station all curb ramps in the Pavement Marking Plans for signalized intersections, non-signalized intersections and points of pedestrian crossings. Curb ramps shall be constructed per the current ADA standards and with guidance from the 2012 NCDOT Roadway Standard Drawings. If the roadway geometry does not allow the use of the standard details, contact the Contract Standards and Development Unit for alternative approved curb ramp designs.

Final Pavement Marking Project Limits

The Final Pavement Marking Plans shall address any required modifications to existing pavement markings located outside the project limits to ensure appropriate tie-ins. The Design-Build Team shall install all pavement markings and markers located within and outside the project limits, resulting from the project construction, including but not limited to a complete restriping of all Triangle Expressway (Toll NC 540) lanes throughout the project limits.

Pavement Markings, Markers and Delineation

The Design-Build Team shall submit a complete set of Final Pavement Marking Plans that include the -L- Line, all -Y- Lines, all ramps and loops for review and acceptance. The Design-Build Team shall not place any final pavement markings or markers until the Final Pavement Marking Plans are reviewed and accepted by the Department.

The Design-Build Team shall provide Final Pavement Marking Plans that place traffic in the pattern shown in the R-2635D Design Public Meeting Map - Interim Design provided by the Department. However, on the ramps and loops, the aforementioned interim traffic pattern lane lines shall be at the exact location for the ultimate traffic pattern lane lanes, as shown on the R-2635D Design Public Meeting Map - Ultimate Design provided by the Department.

The Design-Build Team shall use pavement marking and marker products that conform to all NCDOT requirements and are listed on the NCDOT’s Approved Products List. The use of any devices that are not shown on the Approved Product List shall require written approval from the Signing and Delineation Unit prior to incorporation.

The Design-Build Team shall install pavement markings and markers in accordance with the NCDOT 2012 *Standard Specifications for Roads and Structures*, and in accordance with the manufacturer’s procedures and specifications.

The Design-Build Team shall install pavement markings and pavement markers on the final surfaces as follows:

Road	Marking	Marker
Mainline Concrete Pavement	Polyurea with Highly Reflective Elements	* Snowplowable
Asphalt Surfaces and Concrete Bridge Decks	Paint	Raised Markers

* The Design-Build Team shall install snowplowable markers a minimum of 3” from longitudinal concrete joints and a minimum of one-foot from transverse concrete joints.

On asphalt surfaces, the Design-Build Team shall install Heated-In-Place Thermoplastic or Extruded Thermoplastic markings for stop bars, symbols, characters, crosswalks and diagonals.

On concrete surfaces, the Design-Build Team shall install Heated-In-Place Thermoplastic or Cold Applied Plastic (Type II or III) for stop bars, symbols, characters, crosswalks and diagonals.

Using water blasting (hydro blasting) or grinding, the Design-Build Team shall remove all residue and surface laitance on concrete bridge deck prior to placing final pavement marking materials.

Prior to placing pavement marking material on concrete surfaces that are diamond ground, the Design-Build Team shall use an acceptable method to grind ridges smooth only where pavement markings will be installed.

On all Full Control of Access interstate, toll facilities and US Routes the Design-Build Team shall install six-inch wide pavement markings, (i.e., lane line, edge line and skips) for the final pavement marking. The Design-Build Team shall install gore lines that are twice the edge line width.

The Design-Build Team shall tie proposed pavement marking lines to existing pavement marking lines.

The Design-Build Team shall replace any pavement markings that have been damaged by the end of each day’s operation.

The Design-Build Team shall install Polyurea or Epoxy pavement marking materials for black contrast markings on the Triangle Expressway (Toll NC 540) that match existing.

INTELLIGENT TRANSPORTATION SYSTEM (ITS) SCOPE OF WORK (5-18-15)

**** NOTE ** The ITS Concept Plans referenced throughout this RFP, have been provided to the Design-Build Team to guide their design. The conduit and device icons / symbology locations in the aforementioned plans are not absolute. Instead, the ITS Concept Plans have been provided to ensure that the NCTA device functionality goals are met; and to ensure connectivity to the ITS network. Reasonable deviations from the ITS Concept Plans, in terms of device location and connectivity to the network, that are backed by sound engineering judgment and approved by the NCTA will be allowed.**

GENERAL REQUIREMENTS**(A) DESCRIPTION****1. Summary of Work**

This section of the RFP will provide the Department with intelligent transportation system (ITS) devices and toll / ITS communications infrastructure.

The ITS component shall include, but is not limited to:

- Removal and reinstallation of the closed circuit television (CCTV)-1A camera, pole, foundation, cabinet and ancillary equipment.
- Removal and reinstallation of the microwave vehicle detectors (MVD) #6A and #6B sensor, pole, foundation, cabinet and ancillary equipment.
- New microwave vehicle detection systems (MVDS), including sensor, pole, foundation and ancillary equipment.
- Approximately 2.0 miles of trunkline (replacement Primary Trunkline and new Redundant Trunkline) for the toll collection and ITS communications network, and
- Lateral and drop conduit / cable for the toll collection and ITS communications network.

The Design-Build Team will not be required to obtain any additional user or site licenses for any toll / ITS device.

The Design-Build Team shall maintain full functionality for MVDs 7, 8 and 9 throughout construction. Prior to beginning construction, the Design-Build Team shall submit the design method for maintaining the aforementioned communication to the NCTA for review and approval.

When the detection devices, replacement conduit, and toll / ITS fiber in proximity of the interchange are ready to be integrated into the Triangle Expressway (Toll NC 540) fiber-optic network, the Design-Build Team shall perform all splicing and testing required to re-establish all ITS and toll network communications along this primary trunkline, as shown in the "Primary Trunkline Splicing Plan", and / or as allowed otherwise by approved plan deviations, contained within the March 26, 2015 ITS Concept Plans. The communications link along the Redundant Trunkline shall remain connected after final acceptance of the project.

As an alternate approach, the Design-Build Team may determine that all the current cable and conduit in the project limits can remain in place and fully functional throughout construction. The Design-Build Team shall still re-locate CCTV-1A as described above. If

this alternative is pursued, the Design-Build Team shall build, connect, and test the redundant trunkline in order for it to be fully functional at the conclusion of the project, along with new ITS devices such as the new MVD units.

**** NOTE ** Deleted bullet on repair to existing ITS infrastructure**

The Design-Build Team shall not install permanent trunkline conduit within the Triangle Expressway (Toll NC 540) median.

The toll / ITS communications infrastructure, including the Primary and Redundant Trunklines, shall consist of an underground conduit system including conduit, tracer wire, junction boxes, heavy-duty junction boxes and custom junction boxes.

The Design-Build Team shall design and install the complete conduit system (as described in this Scope of Work) to service all ITS devices and toll facilities within the project limits.

Furnish and install fiber-optic cables as described elsewhere in this Scope of Work and as shown in the March 26, 2015 ITS Concept Plans and / or as allowed otherwise by approved plan deviations.

Furnish and install fiber-optic splice / termination centers for both the tolls and ITS systems. Certain tolls equipment described in this Scope of Work will be installed by others.

All communications between proposed ITS field devices and the local hub shall be Ethernet over single-mode fiber-optic cable. Design-Build Team shall furnish and install Ethernet edge switches and related electronics.

The Design-Build Team shall determine the exact location of the ITS devices, junction boxes and conduit routing; and obtain the Engineer's approval of the locations, installing conduit, tracer wire, junction boxes, heavy-duty junction boxes, and developing and implementing test and coordination procedures for the conduit prior to incorporation. The basis of the design shall be the March 26, 2015 ITS Concept Plans provided by the Department.

Upon completion of the work, the Design-Build Team shall conduct field-testing using an approved test plan of the toll / ITS communications system and the ITS devices, including but not limited to relocated ITS devices, and maintain the devices and communications system until final acceptance by the Department.

2. Standard Specifications

Conform to this Scope of Work, the 2012 *Standard Specifications for Roads and Structures*, the 2012 *Roadway Standard Drawings*, and the March 26, 2015 ITS Concept Plans and / or approved plan deviations (which also include the ITS Standard Details). Conform to NCTA *All-Electronic Tolling (AET) Standard Drawings* and *All-Electronic Tolling (AET) Toll Zone Facilities Infrastructure Scope of Work*. Conform to the regulations and codes described in Section 1700 of the 2012 *Standard Specifications for Roads and Structures*.

In the event of conflict between this Scope of Work and the 2012 *Standard Specifications for Roads and Structures*, this Scope of Work shall govern.

Install meter bases and service disconnects as required by the NESC, NEC, local utility companies, and local ordinances. Install standoffs only when required and approved by the local utility companies. Where a standoff must be used, obtain the local utility company's approval prior to installing the standoff.

5. Utility Services

Coordinate all work to ensure electrical power of proper voltage, phase, frequency, and ampacity is available to complete the work. Use electrical services cables with THWN insulation.

The Design-Build Team shall provide electrical and telecommunication service as described in this Scope of Work, contact the utility company and make application to ensure all work can be completed. Obtain authorization for service in NCTA's name for NCTA-owned locations. Make application for service in NCTA's name for NCTA-owned locations.

The Design-Build Team shall be responsible for all expenses associated with utility installation costs, hookups, etc., from the power meter / electrical service tap to the facilities / device being provided power. Once installed, NCTA will be responsible for monthly utility company usage charges prior to final acceptance.

(D) TIME RESTRICTIONS

1. Intermediate Contract Time #5 for Failure to Perform the Switchover of All ITS Devices and Toll Network Communications

Before the commencement of significant earthwork in the vicinity of the existing trunkline, the Design-Build Team shall construct a "Redundant Trunkline" on the north side of the Triangle Expressway (Toll NC 540) that connects the AET T33 toll zone (also known as AET (or ORT) 1.1) with the CCTV-2 site, as shown in the March 26, 2015 ITS Concept Plans and / or as allowed otherwise by approved plan deviations. The Design-Build Team shall perform all splicing and testing required to re-establish all ITS and toll network communications along this Redundant Trunkline, as shown in the "Redundant Trunkline Splicing Plan", and / or as allowed otherwise by approved plan deviations, contained within the March 26, 2015 ITS Concept Plans.

The Design-Build Team shall perform the switchover within a single continuous 48-hour period that starts no earlier than midnight Friday and ends no later than midnight Sunday.

Prior to beginning the switchover, the Design-Build Team shall coordinate with, and obtain approval from, the Toll System Integrator (TSI) to ensure connection to the routing switches provided by the TSI are ready for switchover.

Liquidated Damages for Intermediate Contract Time #5 for failure to perform the switchover of all ITS and toll network communications along the Redundant Trunkline within a single continuous 48-hour period are \$2,500 per occasion, per 24-hour period or any portion thereof, until corrected. (Note – Liquidated Damages for Intermediate Contract Time #5 shall be calculated separately for the toll and ITS communications cable / conduit.)

2. **Intermediate Contract Time #6 for Failure to Relocate and Reconnect CCTV-1A**

Before significant construction starts in proximity to the existing CCTV-1A, the Design-Build Team shall relocate the CCTV-1A camera, pole, cabinet and ancillary equipment to a new foundation in the approximate location shown on the March 26, 2015 ITS Concept Plans. The Design-Build Team shall construct a new fiber-optic drop cable from this site to a new splice enclosure at the west tie-in point. The Design-Build Team shall re-integrate this CCTV camera into the Triangle Expressway (Toll NC 540) camera system and maintain full operation of the camera throughout the remainder of construction. The Design-Build Team shall perform the switchover within a single continuous 48-hour period that starts no earlier than midnight Friday and ends no later than midnight Sunday.

Liquidated Damages for Intermediate Contract Time #6 for failure to relocate and reconnect the CCTV-1A camera, pole, cabinet and ancillary equipment within a single continuous 48-hour period are \$2,500 per occasion, per 24-hour period or any portion thereof, until corrected.

3. **Intermediate Contract Time #7 for Failure to Maintain and / or Repair toll / ITS Devices and Restore Communication**

Ensure that an IMSA certified, or equivalent, Level II traffic qualified technician is standing by to provide emergency maintenance services whenever any electrical work is performed. Standby status shall be defined as being able to arrive, fully equipped, at the work site within two hours ready to provide maintenance services.

Furnish the Engineer with the name, office telephone number, cellular (mobile) telephone number, and pager number of the supervisory employee who will be responsible for maintenance and repair of equipment during all hours.

Maintain and repair all ITS devices and toll / ITS communications related equipment installed by the contractor within the project construction limits from the time of installation until completion of the observation period and receipt of written notification of final acceptance of the project.

For all failures, malfunctions, or damages to equipment, begin necessary repairs within 12 hours of notification. Complete repairs within 24 hours of notification. The inability to contact the supervisory employee or prearranged alternate will not extend repair time requirements.

Remove and replace all ITS devices and toll / ITS communications related equipment that fails.

Except for damages and malfunctions caused by the Design-Build Team's work activities, the Design-Build Team will not be held responsible for pre-existing conditions reported to the Engineer before starting any work at the specific location. The Design-Build Team shall assume responsibility for all maintenance and emergency services necessary once work has begun at an existing device location and for all

For underground, special-sized heavy duty and junction box facility installations, place the enclosure along with required spare cables in the facility in a neat and workmanship like manner. Neatly coil the spare cable in the special-sized heavy-duty junction boxes. In the AET Toll Zone Vaults, neatly coil the spare cable and secure with tie wraps to the communications rack or cable trays.

ELECTRICAL SERVICE

(A) DESCRIPTION

Install new electrical service to new ITS cabinets and devices. For MVD 6A, 6B, 68, 69, 70, and 71, utilize electrical service in the AET Toll Zone Vaults. Relocate the existing electrical service to the new CCTV-1A site (as shown on the March 26, 2015 ITS Concept Plans and / or as allowed otherwise by approved plan deviations) that will be operational during construction. When the electrical service for the AET Toll Zone Vault T32 site is ready, transfer the electrical feed to originate from this location and abandon the separate electrical service. All new electrical services within the NCDOT or NCTA rights of way shall be underground with pedestal-mounted assemblies, as shown in the ITS Standard Details.

(B) MATERIALS

Material, equipment, and hardware furnished under this section shall be pre-approved on the Department's QPL by the date of equipment installation.

Provide UL-listed 1-inch Schedule 80 conduit for underground runs. If electrical conduit shares a trench with fiber-optic conduit, use conduit color other than black, orange, blue or white.

Provide all materials necessary to form a complete electrical service assembly as shown in 2012 *Roadway Standard Drawing* No. 1700.01, "Electrical Service Options".

Provide an external electrical service disconnect at each new ITS device cabinet location. Furnish external electrical service disconnects with a minimum of a double pole 50 ampere circuit breaker with a minimum of 10,000 RMS symmetrical amperes short circuit current rating in a lockable NEMA 3R enclosure. Ensure service disconnects are listed as meeting UL Standard UL-489 and marked as being suitable for use as service equipment. Fabricate enclosure from galvanized steel and electrostatically apply dry powder paint finish, light gray in color, to yield a minimum thickness of 2.4 mils. Provide ground bus and neutral bus with a minimum of four terminals with minimum wire capacity range of number 14 AWG through number 4 AWG.

Furnish NEMA Type 3R meter base rated 200-ampere minimum that meets the requirements of the local utility. Provide meter base with socket's ampere rating based on sockets being wired with minimum of 167 degrees F insulated wire. Furnish four-terminal, 600 volt, single-phase, three-wire meter bases that comply with the following:

- Line, load, and neutral terminals accept #8 to 2/0 AWG copper / aluminum wire
- With or without horn bypass

window, which shall be driven a minimum of 12 inches from the CCTV camera pole. Each grounding electrode shall require an interfacing hemisphere, an imaginary cylinder with a diameter and depth equal to the length of the electrode. Therefore, a grounding electrode that is a minimum of 10 feet long shall be installed 10-20 feet away from any additional grounding electrodes and / or ground-mounted devices.

Install a minimum of one grounding radiant, plus additional radiants as required to achieve a resistance to ground of 20 Ω or less, at each CCTV camera pole. This grounding radiant shall consist of one main grounding rod that is a minimum of 10 feet long located at the structural base of the CCTV camera pole and attached to one additional 20-foot radiant grounding rod placed a minimum of 20 feet away from the main grounding rod. Attach the main grounding rod to the CCTV camera pole by a solid #4 ground cable that shall be exothermically welded. Attach the radiant grounding rod to the main grounding rod with a minimum #4 solid bare copper wire that is exothermically welded at both the main grounding rod and the radiant grounding rod.

(b) Load Side CCTV Camera Power

Install a transient voltage suppressor (SPD) at the CCTV camera power source on the load side. This device shall provide protection between line-to-neutral, line-to-ground, line-to-line, and neutral-to-ground.

(c) Line Side CCTV Camera Power

Install a SPD in the power line side ahead of all CCTV camera electronic equipment. This installation technique is designed to restrict earth current transients induced within the ground, or directly from the power source, from entering the ITS device through the incoming 120-volt power circuit. This device shall provide protection between line to neutral, line to ground, line-to-line and neutral to ground.

(d) Device Data / Video Line and Load Side

Install specialized SPDs at the line and line sides of all low voltage connections to the CCTV camera and its operating subsystems. These connections include, but are not limited to, Category 6 data cables, coaxial video cables, twisted pair video cables, and low voltage control cables that comply with EIA requirements as detailed in the EIA-232/422/485 standards.

MICROWAVE VEHICLE DETECTION SYSTEM

(A) GENERAL

As directed by the Engineer, furnish and install a microwave vehicle detection system (MVDS) as shown in the March 26, 2015 ITS Concept Plans and / or as allowed otherwise by approved plan deviations, that is capable of traffic data collection meeting this section's

requirements. Conform to the placement guidelines found in the Detector Location sheet of the ITS Standard Details. Ensure that the MVDS can be mounted on new MVDS poles, or CCTV camera poles for a side-fire configuration. The final locations and quantity to provide the minimum coverage shown in the March 26, 2015 ITS Concept Plans and / or as allowed otherwise by approved plan deviations shall be the responsibility of the Design-Build Team. All interchange ramps shall be covered with a dedicated detector and not by derivation or calculation of other detectors. Detectors for different ramps may share the same pole if all other requirements are met. A single detector may cover both directions of a mainline location if all other requirements are met.

The detection units shall use Ethernet communications for monitoring and control from the NCDOT Statewide Transportation Operations Center (STOC).

(B) MATERIALS

1. General

Provide an MVDS assembly for the project site that consists of microwave radar sensor(s) in enclosed housing(s) (i.e., the detectors), as shown in the ITS Standard Details and as directed by the Engineer. Provide an installation kit with mounting brackets; home run cable for the transmission and receipt of data and communications between the field detector and the communication system hardware; and all required power and data cables, as detailed in the ITS Standard Details.

2. Detector

Provide a (MVDS) that uses a Federal Communications Commission (FCC)-certified, low-power microwave radar beam to detect vehicle passage and generate volume, occupancy, length-based classification, and speed data. Ensure that the MVDS is a true-presence microwave radar that uses the frequency modulated continuous wave (FMCW) principle. Ensure that any non-background targets reflect the signal back to the microwave radar detector, where the targets are detected and their range measured.

Ensure that the MVDS provides speed-trap emulation and has the ability to detect automatically sensor settings, baud rates, loop spacing, and communication port settings to select an operational mode.

Ensure that the detector has the ability to self-tune and allow manual calibration via supplied vendor software. Ensure that the MVDS is capable of auto-calibration and auto-configuration, and that it does not transmit any signals outside its FCC-approved frequency. Provide a setup program that allows the operator to define detection zones within the detector's field of view. Ensure that the detector automatically configures zones, requiring minimal external tuning. Verify that the unit is not adversely affected by varied weather conditions, such as rain, fog, heat, or wind.

Ensure that the MVDS can compute, store, and provide all required traffic parameter measurements per detection zone in user-selected time intervals from 0 to 60 minutes, including, but not limited to, 10 seconds, 20 seconds, 30 seconds, 60 seconds, 5 minutes, 10 minutes, 15 minutes, 30 minutes, and 60 minutes. The MVDS shall log

(e) Software

If software is required, install the software application(s) on the NCDOT Statewide Transportation Operations Center (STOC) virtual servers for access by all NCDOT Statewide Transportation Operations Center (STOC) operators. Configure data translation applications for those services described above.

COMMUNICATIONS HARDWARE

(A) DESCRIPTION

1. General

All communications between ITS devices and the local hub shall use Ethernet communications. The communications network along the corridor shall consist of local Ethernet edge switches at ITS devices, and existing Gigabit Ethernet routing switches as shown in the March 26, 2015 ITS Concept Plans and / or as allowed otherwise by approved plan deviations.

Provide a minimum of a Fast Ethernet (100 Mbps) optical communications network between all proposed ITS field devices and Gigabit Ethernet routing switches located in the AET Toll Zone Vaults located at the toll zones.

2. Ethernet Edge Switches

Furnish and install a hardened, device-level managed field Ethernet edge switch in each ITS field cabinet location. Ensure that the Ethernet edge switches provide fast Ethernet connectivity at minimum transmission rate of 100 Mbps from each ITS cabinet location to its respective Gigabit Ethernet routing switch. Provide Ethernet Switches capable of being managed with the existing Castle Rock network management software.

(B) MATERIALS

1. General

Ensure that the Ethernet switches are fully compatible and interoperable with the trunk Ethernet network interface and that the Ethernet switches support half and full duplex Ethernet communications.

Furnish Ethernet switches that provide 99.999% error-free operation and that comply with the Electronic Industries Alliance (EIA) Ethernet data communication requirements using single-mode fiber-optic transmission medium and copper transmission medium. Ensure that the Ethernet switches have a minimum mean time between failures (MTBF) of 10 years, or 87,600 hours, as calculated using the Bellcore / Telcordia SR-332 standard for reliability prediction.

All materials and equipment used on the project shall be submitted for review and approval prior to use on the project. Items on the Department's QPL will be approved by manufacturer and part number reference. Items not on the Department's QPL shall have catalog cut sheets submitted and approved that verify compliance with the 2012 *Standard Specifications for Roads and Structures*, *Standard Roadway Drawings*, ITS Standard Details and this Scope of Work. All submittals shall be reviewed and approved by the Department. Absence of comment will not grant approval.

2. Qualified Products

The Qualified Products List (QPL) is available on the Department's Website. Certain signal and communications equipment, material, and hardware shall be pre-approved on the QPL by the date of installation. Equipment, material, and hardware not pre-approved when required will not be allowed for use on the project. Consult the QPL Website to obtain pre-approval procedures.

3. Submittal Requirements

Provide certification to the Department that all Design-Build Team-furnished material is in accordance with the RFP. When requested by the Department, provide additional certifications from independent testing laboratories and sufficient data to verify item meets applicable specifications. Ensure additional certification states that the testing laboratory is independent of the material manufacturer and neither the laboratory nor the manufacturer has a vested interest in the other.

The intent of submittals is to show completely the materials meet the requirements of the March 26, 2015 ITS Concept Plans, and / or as allowed otherwise by approved plan deviations, and this Scope of Work and how the Design-Build Team intends to construct or configure the materials. The Design-Build Team shall clearly demonstrate in the submittals that the desired materials shall meet or exceed the requirements of the March 26, 2015 ITS Concept Plans, and / or as allowed otherwise by approved plan deviations, and this Scope of Work. Each submittal shall be sufficiently complete and detailed for the Department to review and accept. For submittals with surge protection devices (SPDs), the submittal shall include a block diagram that clearly indicates the purpose of each SPD (data, power, comms, etc.) and the placement of the SPD in the path of data / power flow. If the Department deems that the submittal is insufficient in detail or completeness for review or acceptance, the submittal will be returned for corrections. Additional time and / or compensation shall not be granted for re-submittals.

Before material submittal data begins, provide to the Department for review and approval a list of all submittals with approximate dates of submission that the Design-Build Team intends to make. It is incumbent upon the Design-Build Team to schedule reviews in a timely manner that will not delay their schedule.

Certain groups of materials are related in function and operate as a subsystem together. To ensure individual and subsystem compliance with the project requirements materials shall be submitted as packages as follows:

UTILITIES COORDINATION SCOPE OF WORK (5-18-15)

The Design-Build Team shall obtain the services of a Professional Services Firm (PSF) knowledgeable in the NCDOT Utility Coordination Process involved with utility relocation / installation and highway construction. The Design-Build Team shall be responsible for coordinating all utility relocations, removals, and / or adjustments where the Design-Build Team and Utility Company, with concurrence from the Department, determine that such work is essential for highway safety and performance of the required highway construction. Coordination shall be for all utilities whether or not they are specifically identified in this scope of work and shall include any necessary utility agreements when applicable. NCDOT will be the approving authority for all utility agreements and approval of plans.

Cost Responsibility

The Design-Build Team shall be responsible for all costs associated with relocating water and sewer facilities.

The NCDOT will be responsible for all other non-betterment utility relocation cost when the utility company has prior rights of way / compensable interest. The utility company shall be responsible for the relocation costs if they can not furnish evidence of prior rights of way or a compensable interest in their facilities. The Design-Build Team shall be responsible for determining the cost responsibility for the utility relocations. The Design-Build Team shall be responsible for all costs associated with utility relocations due to haul roads and / or any other temporary conditions resulting from the Design-Build Team's methods of operation or sequence of work.

Project Details

The Design-Build Team shall be responsible for verifying the utility locations, type of facilities, and identifying the utility owners in order to coordinate the relocation of any utilities, known and unknown, in conflict with the project and / or in conflict with the future improvements shown on the Design Public Meeting Map – Ultimate Design provided by the Department. The following utilities are known to be located within the project construction limits:

Utility Owner	Utility Type	Cost Responsibility
Duke Energy	Power (Distribution)	NCDOT (normally)
AT&T	Telecommunications	AT&T (normally)
Time Warner Cable	Cablevision	Time Warner Cable
PSNC Energy	Gas (Distribution)	PSNC Energy (normally)
Dixie Pipeline	Gas (Transmission)	NCDOT (normally)
NCDOT	Communications Cable	Reference the Intelligent Transportation Systems (ITS) Scope of Work found elsewhere in this RFP

RIGHT OF WAY SCOPE OF WORK (5-19-15)

**** NOTE ** Prior to negotiating property acquisition with property owners, the Design-Build Team shall meet with the appropriate NCDOT Location and Surveys, Right of Way and Design-Build personnel.**

As shown on the R-2635D Design Public Meeting Map - Ultimate Design provided by the Department, the NCDOT has acquired all right of way, easements and control of access for the parcels noted below. For all other parcels, the Design-Build Team shall acquire all right of way, easement and control of access required to construct the project, as well as required to construct the Ultimate Design shown on the aforementioned Design Public Meeting Map, in accordance with the provisions of this Scope of Work.

As shown on the R-2635D Design Public Meeting Map – Ultimate Design provided by the Department, the Department has acquired the right of way, easement and control of access for Parcel Nos. 4, 5, 6A, 6B, 6C, 6D and 10. Prior to construction, the Department will acquire the additional temporary drainage easement required to drain the existing pond located at approximately Station 50+50 -Y3REV-, RT on Parcel No. 6D; and the temporary construction easements required to construct the paved turnouts on Parcel Nos. 6A and 6B. (Parcel Nos. as identified on the R-2635D Design Public Meeting Map – Ultimate Design)

For the parcels noted above, the cost of the right of way, easement and control of access, as shown on the aforementioned R-2635D Design Public Meeting Map - Ultimate Design, or as described above, has been / will be borne by the Department. The cost of both the acquisition services and the actual cost of any additional right of way, easement and / or control of access within those parcels required by the Design-Build Team's Interim Design, Ultimate Design and / or construction methods (including all erosion control measures), beyond that shown on the aforementioned Design Public Meeting Map, or as described above, shall be the responsibility of the Design-Build Team. The following exception applies to this paragraph:

For the parcel noted above, if the Design-Build Team demonstrates to the Department's satisfaction that the project cannot be constructed, the Ultimate Design cannot be constructed, and / or utilities relocated / constructed, within the right of way, easements and / or control of access, as shown on the aforementioned R-2635D Design Public Meeting Map - Ultimate Design, or as described above, the Department will bear the cost for the portion of the additional right of way, easement and / or control of access that is satisfactorily demonstrated by the Design-Build Team as needed to construct the facility.

For the parcels noted above, the Design-Build Team shall not modify the Control of Access Breaks.

For all additional right of way, easements and / or control of access required by the Design-Build Team's Interim and Ultimate Designs, including all design revisions required by this RFP, and / or construction methods, the Design-Build Team shall carry out the following responsibilities: (Reference the Roadway, Structures, Traffic Signals and Utilities Coordination Scopes of Work found elsewhere in this RFP)

- The Design-Build Team shall employ qualified, competent personnel who are currently **approved by the NCDOT Right of Way Branch** to provide all services necessary to